

Personal Computer

US \$2.95/SFr 8.01/RE1.76/BFr 127
Lire 4,500/DKr 31.00

World September 1986 £1.10

Which Atari WP?
Six
tested

BRITAIN'S BIGGEST MICROCOMPUTER MAGAZINE

The 9th
Personal
Computer
Show
PREVIEWED INSIDE



APRICOT STEPS INTO LINE
XENi: Fresh start or final fling?

Multi-user networking in style

The designers of Minstrel 4 were given a simple brief: produce a world-beating, cost-effective and practical multi-user system.

And do it with style.



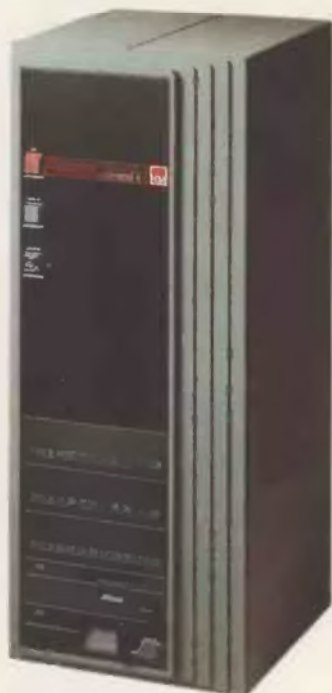
Minstrel power – 80186 master and HTS 186 dual processor slaves.

They passed the latter test with flying colours. But looks aren't everything. Inside this beautifully engineered chassis, you'll find a close coupled TurboDOS⁺ network that holds the key to all your multi-user computer projects.

Now, and for the future.

Minstrel 4 is a multiprocessor machine – every user of the system gets a DEDICATED CPU and 512 Kb RAM. This virtually eliminates the response time degradation you often find on timeshare minicomputers and so-called supermicros.

Minstrel 4 is more powerful than most minis, even in its most basic state. You can start with two users, but a full blown 16 user system will give you 9 MBytes dynamic RAM and 17 CPUs with 80186 instruction sets, running concurrently at 8 MHz. With that



The new Minstrel 4



Minstrel workstations – come complete with function keys and business graphics potential.

sort of power, we're confident that you won't run out of steam.

Minstrel 4 has unprecedented networking capability. The Winchester controller has built in ARCnet. You can network IBM PCs, ATs, Apricots, Olivettis and all lookalikes if required. Gateways to IBM and ICL mainframes are available. Most important, you can network Minstrel 4s together – 255 of them to be precise.

Minstrel 4 supports CP/M, MP/M, MS DOS (including version 3.1 with file and record locking) and has PC DOS emulation, so you can run nearly all the popular business packages.



You can even network stand-alones into the Minstrel System, using Minstrel ARC net cards.

Storage capacity is only limited by your budget. A single Minstrel 4 holds up to 160 MBytes formatted-disk capacity, with onboard streaming back-up of up to 60 MBytes. Direct memory access means you can download 20 MBytes onto tape in less than 4 minutes. Higher capacity drives can be supplied.

A two user Minstrel 4 system, complete with tape back-up and terminals will cost you less than £7,000. Additional workstations, just over £1,000 per user, a price/performance package you'll find unbeatable.

At last there is a serious alternative to the minicomputer, with the sort of costs and flexibility you'd associate with a micro. It's called Minstrel 4, and you should find out more about it. Write or call us for details.



Minstrel design – fast tape back-up for safety and convenience.



With Minstrel, expansion is integral, not an afterthought.

TURBODOSTM
Registered trademark of Software 2000 Inc.

IBM/PC is a trademark of International Business Machines Inc.
Apricot is a trademark of Apricot plc.
MS DOS is a trademark of Microsoft.
Minstrel is a registered trademark of HM Systems Limited.
Arcnet is a trademark of Datapoint Inc.
Olivetti is a trademark of Olivetti.

HM Systems Limited, 220 The Vale, London NW11 8HZ
Telephone: (01) 209-0911 Telex: 266828-HMS G Easylink: 19001060



Systems

Designed and built in Britain.

BASIC LANGUAGE

ZBASIC is new to us and performs well at a very good price. We have some new libraries and utilities also.

BASIC INTERPRETERS

BetterBASIC	PC-DOS	£195
Professional BASIC	PC-DOS	£ 99
Microsoft MS-BASIC	MS-DOS	£245
MEGABASIC	MS-DOS	£265

Dig. Res. CBASIC	CP/M-86	£290
MEGABASIC	CP/M-86	£265
MEGABASIC	MP/M-86	£365

Dig. Res. CBASIC	CP/M-80	£130
Microsoft MBASIC	CP/M-80	£110
BRC BASIC	Z80+CP/M-80	£ 95

BASIC COMPILERS

Microsoft QuickBASIC	PC-DOS	£ 75
Softaid MBASIC	PC-DOS	£ 60
ZBASIC	MS-DOS	£ 75
Alcor Multi-Basic	MS-DOS	£ 95
Microsoft MS-BASIC	MS-DOS	£285
MS Business Basic	MS-DOS	£325
Dig. Res. CBASIC	MS-DOS	£390

Dig. Res. CBASIC	CP/M-86	£390
------------------	---------	------

Microsoft MBASIC	CP/M-80	£185
Dig. Res. CBASIC	CP/M-80	£435
ZBASIC	Z80+CP/M-80	£ 75
Softaid MBASIC	Z80+CP/M-80	£ 65
Alcor Multi-Basic	Z80+CP/M-80	£ 95

LIBRARIES & UTILITIES

Database

CADSAM (source code)	MS-DOS	£135
Retrieve	MS-BASIC + MS-DOS	£225
Retrieve/N	MS-BASIC + MS-DOS	£485
Multikey	MS-BASIC + MS-DOS	£145

CADSAM (source code)	CP/M-80	£135
----------------------	---------	------

Graphics

Multi-Halo	MS-BASIC + MS-DOS	£130
GSS Kernel	PC-DOS	£325
GSS MS-BASIC BINDING	PC-DOS	£110

Tuning & Debugging

Detatools Dev. System	PC-DOS	£110
Figureflow Tuning Kit	PC-DOS	£ 43
Active Trace	MS-DOS	£ 85

Active Trace	CP/M-80	£ 85
--------------	---------	------

FORTRAN COMPILERS

New version from Lahey will ensure its superiority for the present. Microsoft on CP/M-80 is down in price.

Lahey F771 v2.00	MS-DOS	£395
RM/FORTRAN 77	MS-DOS	£450
DR/FORTRAN 77	MS-DOS	£290
MS-FORTRAN V3.31	MS-DOS	£250
Pro Fortran v2.1	MS-DOS	£220

Pro Fortran v2.1	CP/M-86	£220
DR/FORTRAN 77	CP/M-86	£290

MS Fortran-80	CP/M-80	£150
Pro Fortran V1.25	CP/M-80	£220
Nevada Fortran	CP/M-80	£ 35

Pro Fortran 77	ATARI 520ST	£120
----------------	-------------	------

We have Fortran Graphics Libraries and Scientific Subroutines in stock.

PASCAL LANGUAGE

Two notable new products, the Pecan UCSD Pascal, and our first Pascal Interpreter, called ALICE.

PASCAL INTERPRETERS

ALICE Pascal Interpreter	PC-DOS	£ 80
--------------------------	--------	------

PASCAL COMPILERS

Pro-Pascal v2.14	MS-DOS	£220
MS-Pascal V3.3	MS-DOS	£225
MS-Pascal v3.2	MS-DOS	£ 95
SBB Personal Pascal	MS-DOS	£150
SBB Professional	MS-DOS	£335
Pascal MT+86	MS-DOS	£335
Turbo-Pascal	MS-DOS & PC-DOS	£ 49
Practical Pascal	PC-DOS	£145
UCSD Pascal (Pecan)	PC-DOS	£ 65

Pro-Pascal v2.14	CP/M-86	£220
Pascal MT+86	CP/M-86	£335
Turbo-Pascal	CP/M-86	£ 49

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	CP/M-80	£ 49

UCSD Pascal (Pecan)	ATARI 520ST	£ 65
UCSD Pascal (Pecan)	APPLE II	£ 65

We have many Pascal Libraries. Enquire

PASCAL LIBRARIES

New products for use with Turbo Pascal keep coming, otherwise fairly quiet.

TURBO PASCAL LIBRARIES

Blaise Power Tools	PC-DOS	£ 75
Blaise Turbo Asynch	PC-DOS	£ 75
Paragon Supertools	PC-DOS	£ 45
Turbopower Utilities	PC-DOS	£ 75
Turbo Gameworks	PC-DOS	£ 49
MetaWINDOWS	PC-DOS	£ 49
Turbo Graphix Toolbox	PC-DOS	£ 39
Turbo Editor Toolbox	PC-DOS	£ 49
Turbo Database	CP/M & MS-DOS	£ 39
Turbo Tutor	CP/M & MS-DOS	£ 25

GENERAL PASCAL LIBRARIES

Blaise Tools (s'ce)(MS)	PC-DOS	£ 95
Blaise Tools 2 (s'ce)	PC-DOS	£ 75
Blaise Asynch (s'ce MS)	PC-DOS	£145
Retrieve (MS, SBB)	PC-DOS	£245
MetaWINDOWS (MS)	PC-DOS	£120
Multi-Halo (MS)	PC-DOS	£165
Blaise View Mgr. (MS)	PC-DOS	£205
Source extra		£135

Shark database (Propas)	MS-DOS	£250
Prospect Graphics (Pro)	MS-DOS	£ 70
Panel (Screen)	(MS) MS-DOS	£225

Shark database (Propas)	CP/M-86	£250
Prospect Graphics (Pro)	CP/M-86	£ 70

Shark database (Propas)	CP/M-80	£150
-------------------------	---------	------

The excellent XTC Editor comes with MS-Pascal source code @ £ 70

PRICES & 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.

For other products in our range see our other page in this issue or ask us to send you a complete price list.

MODULA-2 COMPILERS

The Logitech range has been reprinted and repackaged. Every Atari programmer should consider the TDI Modula-2.

Interface M2-SDS	PC-DOS	£ 75
Interface M2-SDS-XP	PC-DOS	£185
Modula 2/86 BLS v2.0	PC-DOS	£ 95
Modula 2/86 BLS/B087	PC-DOS	£135
Modula 2/86 BLS/512K	PC-DOS	£180
Volition Mod.2	PC-DOS	£410
Modula Corp. PC Mod.2	PC-DOS	£120

Modula 2/86	CP/M-86	£410
-------------	---------	------

Volition Mod.2	APPLE II	£195
----------------	----------	------

Hochstrasser Mod.2	Z80/CP/M-80	£145
--------------------	-------------	------

TDI Modula-2	ATARI 520ST	£ 75
--------------	-------------	------

MacModula-2	MACINTOSH	£125
-------------	-----------	------

Library source is available with some compilers. Please enquire about other utilities available.

PROLOG LANGUAGE

New to our catalogue are Chalcedony Prolog V & V-Plus. Arity continues to establish a professional reputation.

PROLOG INTERPRETERS

Arity Standard	PC-DOS	£ 85
Arity Prolog v4.0	PC-DOS	£310

Chalcedony Prolog V	MS-DOS	£ 65
Chalcedony Prolog V-Plus	MS-DOS	£ 90
Micro-PROLOG Professnl.	MS-DOS	£265
Micro-PROLOG v3.1	MS-DOS	£150
PROLOG-86 v2.01	MS-DOS	£115
PROLOG-1 v2.2	MS-DOS	£299
ADA Educ. Prolog	MS-DOS	£ 45
ADA FS Prolog	MS-DOS	£ 55
ADA VMI Prolog	MS-DOS	£ 85
ADA VML Prolog	MS-DOS	£165

Micro-PROLOG V3.1	CP/M-86	£150
Prolog-1 V2.2	CP/M-86	£299

Micro-PROLOG V3.1	CP/M-80	£ 75
Prolog-1 V2.2	CP/M-80	£225

PROLOG COMPILERS

Arity Interpreter+Compiler	PC-DOS	£685
Prolog-2 Compiler	PC-DOS	£1995

PROLOG LIBRARIES

Arity Exprt. Sys. Package	PC-DOS	£260
Arity SQL Develop. Pack.	PC-DOS	£260
Arity Screen Dsgn. Tools	PC-DOS	£ 49
Arity File Interchg.	PC-DOS	£ 49
APES Expt. Sys for micro-PROLOG		£150

ADA COMPILERS

The Janus C pack gives an entry to ADA which everyone can afford. Augusta is for budding compiler writers.

JANUS/Ada C-Pack	MS-DOS	£ 75
JANUS/Ada D-Pack	MS-DOS	£ 860
JANUS/Ada S-Pack	MS-DOS	£1275

Augusta (Source)	CP/M-80	£ 75
JANUS/Ada C-Pack	CP/M-80	£ 130
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

GREY MATTER

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

GREY MATTER

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

CONTENTS

Vol 9 No 9 September 1986



Cover photograph by Crispin Thomas; thanks to the Little Angel Marionnette Theatre, London N1, for the loan of the puppet control
Cover story begins on page 128

REGULARS

NEWSPRINT

108

Guy Kewney keeps track of the industry and, what's this — wins an award for software sales?

YANKEE DOODLES

118

David Ahl presents super-fast semiconductors, voice recognition systems, plus the rest of the news from across the Atlantic.

LETTERS

123

Your chance to speak up.



BANKS' STATEMENT

126

Martin Banks speculates on IBM's response to successful clone manufacturers.

SUBSCRIPTIONS

192

Subscribe to PCW now!

BIBLIOFILE

206

The liberation caused by new technology, supercomputers and adventure programming are among this month's books, reviewed by David Taylor.

SCREENPLAY

208

Stephen Applebaum proves that the Commodore 64 still reigns supreme in the games market.

SUBSET

212

David Barrow concentrates on Motorola chips.

COMPUTER ANSWERS

214

Got a problem? Let Simon Goodwin advise you.

NETWORKS

216

Peter Tootill puts Technology Centres into perspective.

PROGRAM FILE

220

Owen Linderholm's choice of your listings.

PROGRAM OF THE MONTH

222

Turbo Pascal LOGIPROG, from Program File stalwart Mark Needham.

END ZONE

251

All kinds of everything, including the result of our Innovation '86 competition.

ADVERTISERS' INDEX

278

CHIPCHAT

288

Get your WORLD processors here!

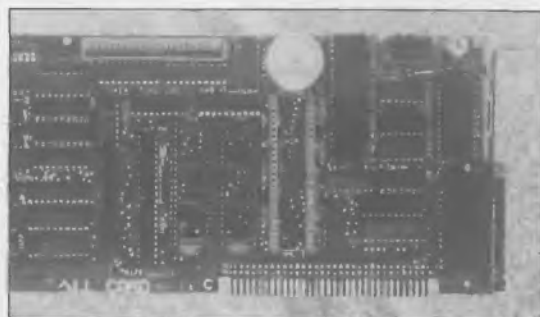
Founder Angelo Zgorelec Editor Peter Jackson Deputy Editor Nick Walker Production Editor Ginny Conran Deputy Production Editor Lauraine Danker Staff Writers Stephen Applebaum, Owen Linderholm Consultant Editors David Tebbutt, Dick Fountain Editorial Secretary Debbie Wallace Group Art Director Peter Green Assistant Art Editor Paul Ballard Sales Director John Cade Publisher Tony Harris Publishing Manager David Mankin Group Advertisement Manager Bettina Williams Advertisement Manager Jan Pitt Assistant Advertisement Managers Claire Barnes, Stephen Corrick Sales Executives Vanessa Greensmith, Gary Lucas, Robert Gardner, Sarah Nisbit-Smith, Peter Wilkinson Advertisement Assistant Val Young Production Assistant Luke Jessup

BENCHTESTS & REVIEWS

APRICOT XENI

128

Apricot's first all-out IBM clone. Admission of defeat or a new beginning? Nick Walker investigates.



TNS COMMSCASE

152

Computer, printer, telephone and modem all in one case. Portable office or portable weight training? Nick Walker finds out.

ALLCARD

138

The ultimate memory expansion for the IBM PC? Peter Jackson reports.

MICROSOFT WORD 3

140

Ben Woolley looks at the latest release of this professional word processor.

COMART QUAD & JAROGATE 144 SPRITE

Peter Jackson Benchtests two low-cost, multi-user machines — plus a sneak preview of Concurrent XM from Digital Research.

OMNIS 3 PLUS

154

From humble Apple II beginnings to a fully-fledged business database. Kathy Lang evaluates the new Macintosh version.

VITAMIN C & PFORCE

188

C programmers can significantly reduce their workloads by using a commercial library of routines. Mike Liardet reviews two leading contenders for the IBM PC.

ATARI WORD PROCESSORS

200

Six ST word processors, compared by Andrew Bennett.

FEATURES

END OF TERM REPORT

158

What has happened to the Government's report into Information Technology in the UK? Robert R Bedford reveals all.



A GAME OF SKILL?

182

David Levy takes a new look at the tree searching and scoring algorithms used in intelligence games programs.

ON THE RIGHT LINES

198

Getting the most out of online systems: Robert Hollier gives some general advice and Owen Linderholm relates it to PCW Online.



ON WITH THE SHOW

162

Yes, folks — it's PCW Show time again! Read all about all there is to see at Olympia from 3-7 September.

ONE LUMP, OR TWO . . .

176

Mike James examines the use of subroutines in data-orientated program design.

PCW Subscription Enquiries Stuart Cruickshank Subscription Rates UK £15, Overseas £33 Subscription and back issues address: 32-34 Broadwick Street, London W1A 2HG, tel: (01) 439 4242 Advertising address 32-34 Broadwick Street, London W1A 2HG, tel: (01) 927 9016 Editorial address 32-34 Broadwick Street, London W1A 2HG, tel: (01) 439 4242. All departments Telex: 23918 VNUG — No material may be reproduced in whole or in part without written consent from the copyright holders © VNU Business Publications by 1986. Typeset by Phase Communications, Pioneer House, 44/48 Clerkenwell Road, London EC1. Printed by Chase Web Offset, St Austell, Cornwall. Distributed by Comag Ltd, Tavistock Road, West Drayton, Middlesex, tel: (0895) 444055

I.S.C.

Offer the UK's Best Service on computer software

**COME TO THE EXPERTS — I.S.C. ARE THE LARGEST
INDEPENDANT 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 or Xenix	
INFORMATION MANAGER	£160
Reads Data directly from Pegasus Files	
ELITE DATABASE	£295
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.*

STATIONARY

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 BIRO	£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	£419
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**

NETWORKING

**FULLY CONFIGURED SYSTEMS READY TO RUN ACCOUNTS,
INTEGRATED SOFTWARE. CHOICE OF NETWORK SYSTEMS**

EXAMPLE:

TANDON PC 10MB/512K
TANDON PC 10MB/512K
TANDON PCA 20MB/512K

FULLY NETWORKED £4995

INSTALLATION AND SUPPORT CONTRACTS AVAILABLE

I.S.C.**XEN IN STOCK**

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

COMPUTERS

All Computers include Mono Screen and DOS

APRICOT F2/9in/MOUSE/GEM	£495
APRICOT F10/9in/MOUSE/GEM	*SPECIAL* £695
APRICOT XIFD/9in/512K	*SPECIAL* £795
APRICOT XIHD/9in/10MB/512K	*SPECIAL* £995
IBM XT SDD/TWIN/640K/KB	£1595
IBM XT SFD/20MB/640K/KB	£1995
IBM AT E/20MB/512K/KB	£2825
IBM AT X/30MB/512K/KB	£3295
FREE ONSITE MAINTENANCE ON ALL TANDON COMPUTERS	
TANDON PCX10/10MB/256K	£P.O.A.
TANDON PCX20/20MB/256K	£P.O.A.
TANDON PCA20/20MB/512K	£P.O.A.
TANDON PCA30/30MB/512K	£P.O.A.
TANDON PCA40/40MB/512K/SP	£2245
COMPAQ 286/MODEL2/30MB/512K	£3095
COMPAQ 286/MODEL3/70MB/640K	£4595
OLIVETTI M24SP/20MB/640K	£2295
OLIVETTI M24/20MB/640K	£1995

**COLOUR SYSTEMS ADD
THE FOLLOWING:-**

APRICOT 195 ... TANDON 260 ...
... OLIVETTI 250 ... IBM 220 ...

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

PRINTERS

EPSON FX85 160CPS/40NLO/80COL	£310
EPSON FX 105 160CPS/40NLO/132COL	£410
EPSON RX100 100CPS/132COL	£195
EPSON LX80 100CPS/22NLO/80COL	£195
EPSON LQ800 180CPS/60NLO/80COL	£435
EPSON LQ1000 180CPS/60NLO/132COL	£575
EPSON EX800 300CPS/50NLO/80COL	£395
NEW	
CANON A50 180CPS/45NLO/80COL	£275
CANON A55 180CPS/45NLO/132COL	£335
JUKI 5510 180CPS/45NLO/80COL	£225
JUKI 5520 180CPS/45NLO/80COL/COLOUR	£370
JUKI 6100 15CPS/DAISYWHEEL	£240
JUKI 6200 30CPS/DAISYWHEEL	£410
JUKI 6300 35CPS/DAISYWHEEL	£630
FUJITSU DX 220CPS/55CPS/80COL	£260
NEW	
FUJITSU DX 220CPS/55CPS/132COL	£350
NEW	
CANON LBPSA1 8PAGEMIN/A4	£1795
CANON LBP8A2 8PAGEMIN/A4/GRAPHICS	£2700
HP LASER 8PAGEMIN/A4	£1980
HP LASER+ 8PAGEMIN/A4/GRAPHICS	£2650

SOFTWARE

PEGASUS SINGLE USER	£160
(2 YEARS SUPPORT)	
PEGASUS SENIOR	£295
(2 YEARS SUPPORT)	
PEGASUS MULTI USER	£345
(2 YEARS SUPPORT)	
DELTA 4	£299
DBASE2	£225
DBASE3	£299
DBASE3+	£355
WORDSTAR PROFESSIONAL	£209
WORDSTAR 2000	£209
MICROSOFT WORD	£270
LOTUS 1-2-3.V1	£179
LOTUS 1-2-3.V2	£269
LOTUS SYMPHONY	£359
SMART INTEGRATED SYSTEM	£419
OPEN ACCESS	£335
LOGISITIX	£255

SPECIALS

APRICOT 256K RAM	£95
APRICOT 512K RAM	£119
IBM 256K RAM	£119
IBM 384K RAM	£139
SONY 3.5 INCH D/S DISKS	£32
FUJI 3.5 INCH D/S DISKS	£27
20MG UPGRADE FOR IBM	£395
AMSTRAD 8256 DUAL DRIVE +MAINTCE	£395

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

Prices Exclude only
VAT and Delivery

I.S.C. LIMITED

GRAPHIC HOUSE
88 WAVENEY ROAD
ST IVES
CAMBRIDGESHIRE
PE17 4FW

TEL: 0480 300530
0480 300533
TELEX: 329115 ISCLTD

FOR APRICOT THE COMPUTAPLANT



Apricot XEN HD 20mb hard disk
single 720K drive 1 Mb RAM



Apricot XEN FD Twin 720K disk drive
512K RAM

COMPUTAPLANT NOW APPOINTED

IBM Compatibles

Tandon PC Twin.....	£call
Tandon PC x 10.....	£call
Tandon PC x 20.....	£call
Tandon PCA20.....	£call
Tandon PCA30.....	£call
Tandon PCA40.....	£call

ARC Turbo Twin 360K 512K RAM.....	£1250
ARC Turbo 10Mb 512K RAM.....	£1550
ARC Turbo 20Mb 512K RAM.....	£1850

Laser Printers

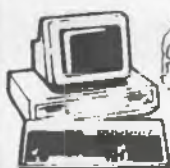
Canon A1 Laser.....	£1850
Canon A2 Laser.....	£2700
H.P. Laser Jet.....	£1980
H.P. Laser Jet +.....	£2650

Printers

Epson FX85.....	£310
Epson FX105.....	£410
Epson LX80.....	£199
Epson LQ800.....	£465
Epson LQ1000.....	£545

Apricots

Apricot F10 + Monitor.....	£600
Apricot F2 + Monitor.....	£475
Apricot XI FD 512K RAM.....	£799
Apricot XI HD 512K RAM.....	£999
Apricot PC Twin 315K.....	£499
Apricot 256K RAM.....	£105
Apricot 512K RAM.....	£165
Box Sony Double Sided Diskettes.....	£35
Box Sony Single Sided Diskettes.....	£15



CONTACT ONE OF OUR BRANCHES FOR
FURTHER DETAILS...

COMPUTAPLANT

ANSWER IS (UK) LTD.

APRICOT
XENi
NOW AVAILABLE



Apricot XI FD TWIN 720K disk drive
512K RAM



Apricot XI HD 10mb hard disk
single 720K drive 512K RAM

XEN MULTI-USER DEALER

Apricot Software

Pegasus Single User	£155
Multi user	£345
Delta 4	£299
DBase II	£225
DBase III	£310
Friday	£125
Word Star Professional	£210
Word Star 2000	£209
Microsoft Word	£270

Lotus 1-2-3	£199
Lotus Symphony	£229
Psion X change	£325
Smart Series	£400
Open Access	£339
Logistix	£259

Trade & Export

STOP PRESS

We now carry the
complete range of Olivetti
printers including the
world's fastest Daisy-
wheel Printer DY800

Prices exclusive of VAT & delivery
All prices are correct at time of printing
Computaplant (UK) Ltd reserves the right to vary prices
without prior notice.

OR VISIT ONE OF OUR SHOWROOMS

Cromwell Mews,
5 Station Road, St. Ives,
Huntingdon, Cambs PE17 4BH
TEL: (0480) 300169

Penwood House,
St. Breward,
Bodmin, Cornwall
TEL: (0208) 850918

140 Queens Street,
Peterhead,
Aberdeenshire
TEL: (0779) 75318

CLIP FAST

CLIP's backup is:

- ★ **The most efficient — fewer diskettes.**
- ★ **The easiest to use — fewer errors.**
- ★ **The fastest on the job — save time.**
- ★ **The most secure —**

and that is what backup is about. CLIP is the product of 5 years specialist experience in hard disk backup. Send now for details why CLIP is more secure than any other product (and its other features). The difference shows when it matters most.

CLIP cuts no corners, it just cuts out the hassle.

CLIP — THE BACKUP PROGRAM

CLIP comes standard with Winchester systems supplied by **Olympia, Cifer Systems, Research Machines, Philips and British Telecom** And is highly recommended by other major manufacturers

£120.00

All prices excl. VAT, post free in U.K.
Most popular disc formats from stock.



KEELE CODES LTD

University of Keele, Keele, Staffordshire, U.K. Tel: (0782) 629221 Telex: 36113.

FREE SOFTWARE???

YES!!

olivetti olivetti olivetti

Up to 600 disks packed **FREE** software available when you buy one of our 100% IBM Compatible personal computer systems. Free software includes spreadsheets, word-processors, databases, games, etc.

BARGAIN PRICES

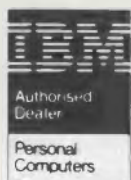
- On **olivetti** M24; two floppies, ten or twenty MB, 640K RAM
Call for best prices in UK — we will better any legitimate competitor.
- Or on other 100% IBM compatibles, eg PC640K IBM keyboard, 8 expansion slots, parallel board, mono screen, MS DOS, etc.
- Printers and software ● Delivery anywhere in the U.K.

DON'T MISS IT, CALL (0342) 28528 NOW

MICROLIVE LTD.

**6A WHITEHALL PARADE LONDON ROAD,
EAST GRINSTEAD, WEST SUSSEX**

WORLDWIDE PRICE LIST



ALSO AVAILABLE - EPSON COMPAQ

LONDON

Spa House, 11-17 Worple Road,
Wimbledon SW19 4JS
Telex: 8955888 WOWICO 20 LINES
01 543 2211

BRIGHTON

Regent House, 2,3,4 North Road,
Brighton,
Sussex BN1 1YA 5 LINES
0273 609331

SCOTLAND

14 Maritime Street, Leith,
Edinburgh EH6 6SB 5 LINES
031 554 4361

IBM

IBM PC 256kb 1x360kb DD	850.00
IBM PC-XTS 640kb 2x360kb DD	1175.00
IBM PC-XTS 640kb 1x360kb DD + 20mb HD	1600.00
IBM PC-ATB 256kb 1x1.2mb DD	2180.00
IBM PC-ATK 512kb 1x1.2mb DD + 20mb HD 6mhz	2400.00
IBM PC-ATK 512kb 1x1.2mb DD + 30mb HD 8mhz	2900.00
IBM PC PC-KT Keyboard/Enhanced	140/155.00
IBM PC PC-AT Keyboard/Enhanced	155/170.00
IBM Mono Display	140.00
IBM Base Colour Display	210.00
IBM Colour Display	375.00
IBM Enhanced Display	475.00
IBM Colour Display/Graphics Adaptor	130.00
IBM Mono Display/Printer Adaptor	140.00
IBM Enhanced Display Adaptor 256kb	515.00
IBM Async Comms Adaptor (RS232)	71.00

Olivetti

Olivetti M19 256kb 2x360kb + K/B Mono	999.00
Olivetti M19 256kb 2x360kb + K/B Colour	1199.00
Olivetti M24 128kb 1x360kb	980.00
Olivetti M24 128kb 2x360kb	1050.00
Olivetti M24 128kb 1x360kb + 10mb HD	1100.00
Olivetti M24 128kb 1x360kb + 20mb HD	1650.00
Olivetti M24SP 640kb 1x360kb + 20mb HD	1950.00
Olivetti M28 512kb 1x1.2mb + 20mb HD	2699.00
Olivetti Mono Display Green/White/Amber	169.00
Olivetti Colour Display	395.00
Olivetti Enhanced Colour Adaptor	455.00
Olivetti Keyboard IBM/Extended	120/135.00

Compaq

Compaq Plus 256kb 1x360 kb + 10mb HD	1897.00
Portable M3 640kb 1x 360 kb + 10mb HD	2897.00
Portable 286 640kb 1x1.2mb + 20mb HD +Tape	3677.00
Deskpro 286 M2 256kb 1x1.2mb 30mb HD	3333.00

Epson

Epson PX8 Portable / + 128kb Ram	649/759.00
Epson PX8 full range of Accessories	Call
Epson PC 256kb 2x360 kb + K/B	729.00
Epson PC + 640kb 2x360 kb + K/B	1450.00
Epson PC + 640kb 1x360 kb + 20mb HD + K/B	1850.00

Apricot

Call to Negotiate Prices
E.E.E.

Morrow

Morrow Portable 640kb 2x360kb/ DD Backlit	1649.00
(Compatible IBM Battery Portable Weight 15lbs)	

Daisywheel Printers

Brother HRI5XL	19cps	335.00
Brother HR25	25cps	609.00
Brother HR35	35cps	695.00
Daisy Step 2000	16cps	219.00
Diablo 630 API	40cps	1425.00
IBM Wheelprinter	25cps	895.00
IBM Quietwriter Mod 2 Graphics	45cps	1010.00
Juki 6100	18cps	299.00
Olivetti DY450	45cps	899.00
Qume Sprint Letter Pro 12/20	22cps	550.00
Qume 11/40	40cps	1175.00
Qume 11/55	55cps	1275.00
Qume 11/90	90cps	1475.00

Ink Jet Printers

Epson SQ2000	272mc1	105/176cps	1450.00
Canon PJ1080A	80mc1	37cps	425.00
Hewlett Packard Thinkjet			399.00

Laser Printers

Canon Laser LBP-8	128kb	8ppm	2149.00
Hewlett Packard Laser	128kb	8ppm	2300.00
Hewlett Packard Laser + 512kb		8ppm	2900.00
Qume Ten Laser	128kb	10ppm	2300.00
Qume Ten Laser +	512kb	10ppm	2900.00

Plotters

Epson HI 80	A4	4pen	349.00
Hitachi 672	A3	4pen	475.00
Hewlett Packard 7470	A3	2pen	899.00
Hewlett Packard 7475	A3	6pen	1499.00
Hewlett Packard 7550	A3	8pen	3415.00
Roland DXY 980	A3		1079.00
Roland DXY 880	A3		725.00

IBM Typewriters

IBM Actionwriter	6715	235.00
IBM Super Selectric I	6746	399.00
IBM Super Selectric II	6747	499.00
IBM Thermotronic	6750	599.00

IBM Compatible Add-Ons

Hercules Mono/Graphics Adaptor	245.00
Hercules Colour/Graphics Adaptor	120.00
EGA Compat Adaptor 256kb + EGM VDU	699.00
Intel/EHS Compat Ram Adaptor inc 1.5mb	399.00
AST SixPac Premium 2mb	499.00
AST Advantage 1.5mb	399.00
AST Rampage 1.5mb	499.00
Qubie Sixshooter 384kb Multifunction	199.00
Clock Card with Batt Back up	45.00
XT Turbo 286 8mhz	475.00
Maths Co-Pro 8087XT/80287AT	120/175.00
Breakout Internal Modem	465.00
Quattro 300-300/2400-2400 Int/Ext Modem	699.00
SummaGraphics Mouse	95.00
Microsoft Mouse	143.00

Hard Disks

10mb to 20mb Hard Disk Exchange	300.00
360kb to 10mb Hard Disk Exchange	400.00
360kb to 20mb Hard Disk Exchange	450.00
Bernoulli Box 20+20mb	3030.00

Printers Dot Matrix

Brother M1109	25/100cps	175.00
Brother M1409	45/180cps	295.00
Brother M1509	272mc1 45/180cps	380.00
Brother TwinWriter 5	40/160cps	975.00
Brother 2024L	272mc1 96/160cps	895.00
Canon PW 1080A	80mc1 27/160cps	249.00
Canon A55 (PW 1150)	156mc1 27/160cps	349.00
Epson LX80	160mc1 16/120cps	275.00
Epson JX80 Colour	160mc1 160cps	430.00
Epson FX85	160mc1 160cps	325.00
Epson FX105	272mc1 160cps	420.00
Epson FX800 opt Colour	160mc1 50/300cps	399.00
Epson LQ800	60/180cps	470.00
Epson LQ1000	60/180cps	595.00
IBM Proprinter	40/200cps	363.00
IBM Proprinter XL	40/200cps	425.00
NEC P5	88/264cps	750.00
Oki Microline 84p	231mc1 200cps	629.00
Oki Microline 182p	137mc1 120cps	230.00
Olivetti DMS305		300cps 959.00
OTC OT700	350/700cps	1750.00
Panasonic KP 1091	24/120cps	245.00
Panasonic KP 1092	24/120cps	385.00

Software

Word Processing	Information Management Accounts	Domino
Displaywrite 3	Cardbox Plus	365
Easywriter 2	Datamaster	93
Multimate Advantage V3.6	dBase II	205
Multimate V3.31	dBase III +	205
Sanna III V.3	dBase III Compiler	99/155
Sanna +	Clipper (dBase III) Compiler	89
Superwriter	dUtil III +	93
Word Perfect 4.1	Delta 4	195
Word 3.0	Filing Assistant	
Wordcraft	Multysoft	
Wordstar Professional	Paradox	
Wordstar V3.4	Pegasus	
Wordstar 2000 R2	Rbase 5000	
Writing Assistant	Reflex	
	Sage Accountant	
	Smart Data Manager	
	Teamwork V2	
Financial Planning Integrated	Project Planning	Utilities & Games
Framework II	Harvard Total Project Manager	Crosstalk XVII
Open Access	Pertmaster 1000 / 2500	Flight Simulator
Smart Full Suite	Project	Gem Collection
Symphony	Super Project + Plus	Gem Desktop
Javelin		Norton Utilities V3.1
Lotus 123 V2		Sidewick (NCP)
Multiplan V2.0		Topview V1.10
Supercalc 2 / 3 V2.1		Windows
Supercalc 4		IDIR
The Twin (1-2-3 Clone)		
Graphics	Languages & Operating Systems	
Autocad2 + Ext. 1+2+3	Basic Compiler	179
Autocad2 Base	Cobol Compiler	383
Chart	Fortran Compiler V2.0	220
	Macro Assembler V2.0	112
	Pascal Compiler V2.0	203
	PC DOS V3.2	70
	Personal Cobol Micro Focus	199
	Professional Cobol Micro Focus	1399
	Professional Portran	425

Special Offers

20MB Olivetti

M24 Base Unit
Compat 20MB Hard Disk
360k Floppy Disk
640K RAM
7 Slot Bus Converter
Olivetti Monitor
Olivetti/IBM Keyboard
DOS 2.11

E1750.00

20MB IBM

IBM XTS-FD Base Unit
20MB Hard Disk
360K Floppy Disk
640K RAM
Hi-res Mono Graphics Adaptor
Mono Display
IBM XTS Enhanced Keyboard
Parallel and Serial Port
Calendar Clock
DOS 3.2

E2100.00

Integral H/H 20MB Streamer (600 Extra
Colour Monitor £710 Extra)

All prices excluding VAT and DELIVERY... AUG. 88

COMPUTER WAREHOUSE

1000's OF
BARGAINS
FOR CALLERS

THE "ALLADINS' CAVE OF COMPUTER AND ELECTRONIC EQUIPMENT"

HOT LINE DATA BASE



The ORIGINAL FREE OF CHARGE dial up data base. Buy, browse or place YOUR OWN AD for goods or services to sell. 1000's of stock items, spares and one off bargains. Updated daily.
ON LINE NOW. CCITT, 8 bit word, no parity.
For 300 baud modems call 01-679 1888
For 1200-75 baud modems call 01-679 6183

FREE

Your monitor from its computer! For only £29.95 it becomes a **SUPERB HIGH QUALITY * COLOUR * TV SET**

The fabulous TELEBOX, an INVALUABLE MUST for the owner of ANY video monitor with a composite input, colour or monochrome. Made by a major UK Co. as a TOP QUALITY, stand alone UHF tuner and costing OVER £75 to manufacture, this opportunity to give your monitor a DUAL FUNCTION must not be missed! The TELEBOX consists of a compact, stylish two tone charcoal moulded case, containing ALL electronics (tuner, power supply etc) to simply plug in and convert your previously dedicated computer monitor into a HIGH QUALITY COLOUR * TV SET, giving a real benefit to ALL the family! Don't worry if your monitor doesn't have sound - THE TELEBOX even has an integral 4 watt audio amplifier for driving an external speaker, PLUS an auxiliary output for superb quality television sound via your headphones or HI FI system etc. Other features include: Compact dimensions of only 15.75" w x 7.5" d x 3.5" h, latest technology, BRITISH manufacture, fully tuneable 7 channel push button tuner, Auto AGC circuit, SAW filter, LED status indicator, fully isolated 240v AC power supply for total safety, Mains ON/OFF switch etc. Many other uses.

LIMITED QUANTITY - DON'T MISS THIS OFFER!!!

ONLY £29.95 OR £24.95 if purchased with ANY of our VIDEO MONITORS. Supplied BRAND NEW with full instructions and 2 YEAR warranty. Post and packing £3.50. *When used with colour crt.

COLOUR & MONOCHROME MONITOR SPECIALS

'SYSTEM ALPHA' 14" COLOUR MULTI INPUT MONITOR

Made by the famous REDIFFUSION Co. for their own professional computer system this monitor has all the features to suit your immediate and future requirements. Two video inputs: RGB and PAL Composite Video, allow direct connection to BBC/IBM and most other makes of micro computers or VCR's, including our very own TELEBOX. An internal speaker and audio amp may be connected to computer or VCR for superior sound quality. Many other features: PIL tube, Matching BBC case colour, Major controls on front panel. Separate Contrast and Brightness - even in RGB mode. Separate Colour and audio controls for Composite Video input. BNC plug for composite input, 15 way 'D' plug for RGB input modular construction etc.

This must be ONE OF THE YEARS BEST BUYS. PC USER Supplied BRAND NEW and BOXED, complete with DATA and 90 day guarantee. **ONLY £149.00** as above OR IBM PC version **£185.00** 15 Day 'D' kit £1.00, BNC kit 75p BBC interface cable £5.50

DECCA 8016" COLOUR monitor. RGB input. Little or hardly used manufacturer's surplus enables us to offer this special converted DECCA RGB Colour Video TV Monitor at a super low price of only £99.00, a price for a colour monitor as yet unheard of! Our own interface, safety modification and special 16" high definition PIL tube, coupled with the DECCA 80 series TV chassis give 80 column definition and quality found only on monitors costing 3 TIMES OUR PRICE. The quality for the price has to be seen to be believed! Supplied complete and ready to plug direct to a BBC MICRO computer or any other system with a TTL RGB output. Other features are: internal speaker, modular construction, auto degaussing circuit, attractive TEAK CASE, compact dimensions only 52cm W x 34 H x 24 D, 90 day guarantee. Although used, units are supplied in EXCELLENT condition. **ONLY £99.00 + Carriage.**

DECCA 80, 18" COLOUR monitor. Composite video input. Same as above model but fitted with Composite Video input and audio amp for COMPUTER, VCR or AUDIO VISUAL use. **ONLY £99.00 + Car.**

REDIFFUSION MARK 3, 20" COLOUR monitor. Fitted with standard 75 ohm composite video input and sound amp. The large screen colour display is ideal for SCHOOLS, SHOPS, DISCOS, CLUBS and other AUDIO VISUAL applications. Supplied in AS NEW or little used condition **ONLY £145.00 + Car.**

BUDGET RANGE EX EQUIPMENT MONOCHROME video monitors. All units are fully cased and set for 240v standard working with composite video inputs. Units are pre tested and set up for up to 80 column use. Even when MINOR screen burns exist - normal data displays are unaffected 30 day guarantee.

12" KGM 320-1 B/W bandwidth input, will display up to 132 x 25 lines. £32.95
12" GREEN SCREEN version of KGM 320-1. Only £39.95
9" KGM 324 GREEN SCREEN fully cased very compact unit. Only £49.00

Carriage and insurance on all monitors £10.00

DC POWER SUPPLY SPECIALS

GOULD OF443 enclosed, compact switch mode supply with DC regulated outputs of +5v @ 5.5a, +12v @ 0.5a, -12v @ 0.1a and -23v @ 0.02a. Dim 18 x 11 x 6 cm 110 or 240v input. **BRAND NEW Call Sales Office.**

GOULD G6-40A 5v 40 amp switch mode supply **NEW £130.00**
AC-DC Linear PSU for DISK drive and SYSTEM applications. Constructed on a rugged ALLOY chassis to continuously supply fully regulated DC outputs of +5v @ 3 amps, -5v @ 0.8 amps and +24v @ 5 amps. Short circuit and overvoltage protected. 100 or 240v AC input. Dim 28 x 12.5 x 7 cm **NEW £49.94**
Carriage on all PSUs £3.00

KEYBOARDS

DEC LA34 Uncoated keyboard with 67 quality gold plated switches on X-Y matrix - ideal micro conversions etc. **£24.05**
AMKEY MPN114 Superb word processor chassis keyboard on single PCB with 116 keys. Many features such as On board Micro, Single 5v rail, full ASCII coded character set with 31 function keys, numeric keypad, cursor pad and 9600 baud SERIAL TTL ASCII OUTPUT! Less than half price
Only £89.00 with data. Carriage on Keyboards £3.50



DON'T MISS THE CPM Deal

OF the CENTURY

The FABULOUS CPM TATUNG PC2000 Professional Business System

A cancelled export order and months of negotiation enables us to offer this professional PC CPM system, recently on sale at OVER £1400, at a SCOOP price just over the cost of the two internal disk drives!! Or less than the price of a dumb terminal!!

Not a toy, the BIG BROTHER of the EINSTEIN computer, the DUAL PROCESSOR PC2000 comprises a modern stylish three piece system with ALL the necessities for the SMALL BUSINESS, INDUSTRIAL, EDUCATIONAL or HOBBYIST USER. Used with the THOUSANDS of proven, tested and available CPM software packages such as WORDSTAR, FAST, DBASE2 etc, the PC2000 specification, at our prices, CANNOT BE BEATEN!!

The central processor plinth contains the 84K, Z80A processor, DUAL TEAC 55F 5 1/4" Double sided 40/80 track disk drives (1Mb per drive), PSU, 4K of memory mapped screen RAM, disk controller, RS232, CENTRONICS and system expansion ports, and if that's not enough a ready to plug into STANDARD "B" DRIVE port for up to FOUR 8" disk drives, either in double density or IBM format. The ultra slim 92 key, detachable keyboard features 32 user definable keys, numeric keypad and text editing keys, even its own integral microprocessor which allows the main Z80A to devote ALL its time to USER programs, eliminating "lost character" problems found on other machines. The attractive, detachable 12" monitor combines a green, anti-glare etched screen, with full swivel and tilt movement for maximum user comfort. Supplied BRAND NEW with CPM 2.2, user manuals and full 90 day guarantee. Full data sheet and info on request.

PC2000 System with CPM Etc
COST OVER £1400

PC2000 Business System with CPM and 'Ready to Run' FAST Sales and Purchase ledger, supports up to 9000 Accounts, VAT etc.
COST OVER £1700

PC2000 Wordprocessor System with CPM and TEC FP25 daisywheel printer
COST OVER £1700

NOW only £399

NOW only £499
Carriage & Insurance £12.00

NOW only £799

MODEMS

Join the communications revolution with our super range of DATA MODEMS, prices and specifications to suit all applications and budgets.
BRAND NEW State of the art products.
DACOM D5L2123 Multi standard 300-300, 1200-75 Auto answer etc. **£268.00**
DACOM D5L2123AQ Auto dial smart modem with multi standard AUTO SPEED detect and data buffer with low control etc. **£365.00**
DACOM D5L2123GT The CREAM of the intelligent modems, auto dial, auto call, index, buffer etc etc. **£498.00**
Stebeck SB1212 V22 1200 baud FULL DUPLEX, sync or async, optional auto dial! **£485.00**
TRANSDATA 307A Acoustic coupler 300 baud full duplex, originate only, RS232 interface. **£49.00**

Ex BRITISH TELECOM full spec, CCITT, ruggedised, bargain offers. Sold TESTED with data. Will work on any MICRO or system with RS232 interface.
MODEM 13A 300 baud unit, only 2" high fits under phone. CALL mode only. **£45.00**
MODEM 20-1 75-1200 baud Compact unit for use as subscriber end to PRESTEL, TELECOM GOLD, MICRONET etc. **£39.95 + pp £6.50**
MODEM 20-2 1200-75 baud. Same as 20-1 but for computer end. **£85.00 + pp £6.50**
DATTEL 2412 Made by SE Labs for BT this two part unit is for synchronous data links at 1200 or 2400 baud using 2780/3780 protocol etc. Many features include 2 or 4 wire working, self test, auto answer etc. **COST OVER £800.** Our price **ONLY £199 + pp £8.00**
DATTEL 4800, RACAL MPS4800 baud modem, Ex BT good working order, **ONLY £295.00 + pp £8.00**

SPECIAL OFFER

MODEM TG2393, Ex BT, up to 1200 baud full duplex 4 wire or half duplex over 2 wire line. **ONLY £85.00 PER PAIR + pp £10.00**

For more information contact our Sales Office.

MATRIX PRINTERS

SPECIAL BULK PURCHASE of these compact, high speed matrix printers. Built in Japan for the Hazeltine Corporation this unit features quality construction giving 100cps bidirectional, full pin addressable graphics, 6 type fonts, up to 95" single sheet or tractor paper handling, RS232 and CENTRONICS parallel interface. Many other features **BRAND NEW and BOXED. COST £420.** Our price **Only £199.00**

RECHARGEABLE BATTERIES

Dry Fit MAINTENANCE FREE by Sonnenschein & Yuasa
A300 07191315 12v 3Ah NEW **£13.95**
A300 07191312 6v 3Ah NEW **£9.95**
A300 07191202 6-0-6v 1.8Ah TESTED Ex Equip **£5.99**

VDU TERMINALS

Standard VDU data entry terminals at give away prices!!
QUME QVT108, Current product, state of the art terminal with detachable keyboard, 12" Green screen, 2 page RAM, TVI 925, Hazeltine, ADMSA emulations, software setup, 25 x 80, Clock, Swivel and tilt base, Printer port, Function keys etc **BRAND NEW and BOXED AT ALMOST HALF PRICE. Only £425.00**
AJ510 - EX RENTAL, Z80 controlled, 15" green screen 24 x 80 display, graphics, cursor addressing, printer port etc. Very good condition TESTED complete with manual only **£225.00**
ADDS 520 - Dumb terminal, used, 12" b/w screen RS232 interface and printer port, TESTED, **ONLY £125.00**. Carriage on terminals £10.00
100's of other terminals in stock, CALL for more details.

SURPLUS SPECIALS ON PRESTEL - VIEWDATA - TELEX

PLESSEY VOTEL, ultra compact unit, slightly larger than a telephone features A STANDARD DTMF TELEPHONE (tone dial) with 5" CRT monitor and integral modem etc. for direct connection to PRESTEL, VIEWDATA etc. Designed to sell to the EXECUTIVE at over £600!! Our price **BRAND NEW AND BOXED** at only **£99.00**
DECCAFAX VP1 complete Professional PRESTEL system in slimline desk top unit containing Modem, Numeric keypad, CPU, PSU etc. Connects direct to standard RGB colour monitor. Many other features include: Printer output, Full keyboard input, Cassette port etc **BRAND NEW with DATA A FRACTION OF COST** only **£55.00**
ALPHATANTEL, Very compact unit with integral FULL ALPHA NUMERIC keyboard. Just add a domestic TV receiver and you have a superb PRESTEL system and via PRESTEL the cheapest TELEX service to be found!! Many features: CENTRONICS Printer output, Memory dialling etc. Supplied complete with data and DIY mod for RGB or Composite video outputs. **AS NEW** only **£125.00**

Post and packing on all PRESTEL units **£8.50**
EX-STOCK INTEGRATED CIRCUITS
4164 200 ns D RAMS 9 for **£11** 4116 ns **£1.50** 2112 **£10.00** 2114 **£2.50** 2102 **£2.00** 6116 **£2.50** EPROMS 2716 **£4.50** 2732 **£3.00** 2764 **£4.95** 27128 **£5.50** 6800 **£2.50** 6821 **£1.68** 6809 **£8** 68B09 **£10** 80B5A **£5.50** 80B6 **£15** 80B8 **£8** NEC765 **£8** WD2793 **£28** 8202A **£22** 8251 **£7** 8748 **£15** Z80A DART **£6.50** Z80A CPU **£2.00** Thousands of IC's EX STOCK send SAE for list.

DISK DRIVES

Japanese 5 1/4" half height, 80 track double sided disk drives by TEAC, CANON, TOSHIBA etc.
Sold as **NEW** with 90 day guarantee **ONLY £85.00**
TEC FB-503 Double sided HH 40 TRK **NEW £75.00**
SUGART SA400 SS FH 35 TRK **£55.00**
SIEMENS FDD100 SS FH 40 TRK **£85.00**
Carriage on 5 1/4" drives **£5.50**
Brand NEW metal 5 1/4" DISK CASES with internal PSU.
DSK1 for 2 HH or 1 FH drive **£29.95 + pp £4.00**
DSK2 for 1 HH drive **£22.95 + pp £3.50**
DKSC 3 As DSK1 LESS PSU **£12.95 + pp £2.50**
DKSC 4 As DSK2 LESS PSU **£10.95 + pp £2.00**
B IBM format TESTED EX EQUIPMENT.
SHUGART 800/801 SS **£175.00 + pp £8.50**
SHUGART 851 DS **£250.00 + pp £8.50**
TWIN SHUGART 851 2 1/2 Mb total capacity in smart case, complete with PSU etc. **£595.00**
MITSUBISHI M2894-63B DS 1 Mb equiv. to SHUGART SA250R. **BRAND NEW** at **£275.00** + pp £8.50
DYSPAN 8 Alignment disk **£29.00 + pp £1.00**
Various disk drive PSUs in Ex Stock SEE PSU section.

HARD DISK DRIVES

DRE/DIABLO Series 30 2.5 Mb front load **£525.00**
Exchangeable version **£295.00**. **ME3029** PSU **£95.00**
DIABLO 44/DRE4000A, B 5+5 Mb from **£750.00**
CDC HAWK 5+5 Mb **£795.00**. **CDC 9782** 80 Mb RMQ3 etc. **£2500.00**
PERTEC C3422 5+5 Mb **£495.00**
RODIME 5+5 Winchester ex stock from **£150** CALL
Clearance Items - Sold as seen - No guarantee.
ICL 2314 BRAND NEW 14" Mb Removable pack hard disk drive, cost over £2000 with data **ONLY £99.00**
BASF 8172 B 23Mb Winchester **£189.00**
Unless stated all drives are refurbished with 90 day guarantee. Many other drives and spares in stock - call sales office for details.

All prices quoted are for U.K. Mainland, paid cash with order in Pounds Sterling PLUS VAT. Minimum order value **£2.00**

Minimum Credit Card order **£10.00**. Minimum BONA FIDE account orders from Government Depts., Schools, Universities and established companies **£20.00**. Where post and packing not indicated please ADD **£1.00 + VAT**. Warehouse open Mon-Fri 9.30-5.30. Sat 10.30-5.30. We reserve the right to change prices and specifications without notice. Trade, Bulk and Export

32 Biggin Way, Upper Norwood, London SE19 3XF

Telephone 01-679 4414 Telex 894502 Data 01-679 1888



COMPUMART

NEXT DAY DESPATCH

IBM COMPAQ Lotus olivetti EPSON

SPECIAL OFFERS

Upgrade your PC/XT with

PLUS 20Mb HARDCARD

This easy-to-install, single slot 20Mb Hard Disk on a card will work in any IBM PC, XT or compatible:

Only £575.00

AST SIX PACK PREMIUM & TAXAN COLOUR MONITOR

Boost your PC/XT beyond 640K and go one-up on IBM's Colour Graphics standard with this outstanding combination of multifunction card and hi-res colour monitor.

Only £799.00

AUTOCAD for Education

Very substantial discounts currently available for bona fide schools and colleges

SOFTWARE

Multimate Word Processor	£275.00
Wordstar 2000 Word Processor	£345.00
Lotus 1-2-3 Spreadsheet	£275.00
Symphony Integrated	£385.00
dBase III Plus Database	£415.00
GEM Collection	£99.00

PRINTERS

Dot Matrix	
NEC P6 (180cps, 72cps NLQ, 80col)	£390.00
NEC P7 (180cps, 72cps NLQ, 136col)	£470.00
NEC P5 XL (264cps, 88cps, LQ 136col)	£830.00
Letter Quality	
NEC Spinwriter ELF (18cps)	£280.00
NEC Spinwriter 8850 (55cps)	£886.00
IBM Quietwriter Model 2 (45cps)	£1115.00

All prices include cable.

ASHTON TATE

NEC

IBM

PC XT (SDD) 640K RAM 2x360K Disks	£1178.00
PC XT (SFD) 640K RAM 360K + 20Mb Disks	£1542.00
PC AT (E) 512k RAM 1.2Mb + 20Mb Disks	£2382.00
PC AT (X) 512K RAM 1.2Mb + 30Mb Disks	£2824.00
Mono Monitor + Adapter	£244.00
Colour Graphics Monitor + Adapter	£435.00
EGA Monitor + Adapter	£800.00
PC XT (S) Keyboard	£126.00
PC AT (E) Keyboard	£142.00
PC AT (X) Keyboard	£126.00
8087 Chip	£154.00
80287 Chip	£195.00
Parallel Adapter	£37.00
Serial Adapter	£54.00
AT Parallel/Serial	£88.00
Display Stand	£50.00
AT 360k Disk	£145.00
PC DOS 3.2	£70.00

COMPAQ

Portables

Portable I (256k RAM 2x360k Disks)	£1377.00
Portable I Plus (256k RAM 360k + 10Mb Disks)	£1797.00
Portable II (640k RAM 360k + 10Mb Disks)	£2707.00
Portable 286 (640k RAM 1.2Mb + 20Mb Disks + 10Mb Tape Backup)	£3442.00

Deskpros

Model 2 (256k RAM 2x360k Disks)	£1447.00
Model 4 (640k RAM 360k + 20Mb Disks + 10Mb Tape Backup)	£2322.00
286 Model 2 (512k RAM 1.2Mb + 30Mb Disks)	£3127.00
286 Model 4 (640k RAM 1.2Mb + 70Mb Disks + 10Mb Tape Backup)	£4597.00

All prices include Keyboard, Monitor & DOS.

olivetti

	Mono	Colour
M24 (128k RAM 2x360k Disks)	£1369.00	£1605.00
M24 (640k RAM 360k + 20Mb Disks)	£1907.00	£2143.00
M24SP (640k RAM 360k + 20Mb Disks)	£2182.00	£2418.00

NEW MODEL

M19 (256k RAM 360k + 10Mb Disks)	£1639.00	£1949.00
----------------------------------	----------	----------

All prices include Keyboard, Monitor & DOS.

Other Printers, Multifunctional Cards & Software available.

Please ring for an immediate response and the latest prices.
Additional discount available for educational orders.

Prices exclude VAT & Delivery. All goods subject to availability.

ALL MAJOR CREDIT CARDS ACCEPTED

0923 55633

Unit 8, Woodshots Meadow, Croxley Centre, Watford, WD1 8YU

THE PROFESSIONAL'S CHOICE -



MACINTOSH WORD PROCESSOR

· Macintosh 512K/800 ·
External Drive 800K ·
Microsoft word.

Purchase Price: £1,795

Lease for £14.53 per week

APPLE IIe SYSTEM

· 64 byte memory · Dual flexible
Disk Drive · Monochrome Monitor ·
80 Column Card ·

Purchase Price: £999

Lease For £8.26 per week

EPSON

Epson — HX20	£349
Epson — PX8	£649
Epson — PC2X360K	£699
Epson — PC20Mbyte	£1349

SOFTWARE - PC

Multimate	£220
Wordstar 2000	£325
Wordstar Professional	£295
Symphony	£385
Open Access	£295
Javlin	£call
Framework	£325
de Base III Plus	£335
Lotus 123	£275
Windows	£70
GemDesk	£99

and many more please enquire

DESKTOP PUBLISHING SYSTEMS

· Macintosh Plus · External 800K
Disk Drive · Laserwriter · MacDraw
· MacPaint · MicroSoft word · Two
AppleTalk Connectors · Aldus Pag-
eMaker · Cartridge

Purchase Price: £7,495

Lease For £61.92 per week

APPLE IIc BUSINESS SYSTEM

128K byte memory · external flexi-
ble Disk Drive · Monochrome
Monitor · Monitor Stand · Apple-
works · Mouse Paint · carrying bag
and colour Modulator

Purchase Price: £867

Lease for £7.00 per week

EPSON PC

· 256K byte memory · Twin 360K
DSDD flexible Disk Drives · Mono-
chrome Monitor · Keyboard · Paral-
lel and Serial Port · Video Card ·
MSDOS

Purchase Price: £899

Lease For £7.42 per week

PRINTER AND PLOTTERS

DOT MATRIX

Epson FX80 Plus	£299
Epson FX85	£350
Epson FX105	£445
Epson LQ800	£499
Epson LQ1000	£660
Canon 1080	£279
Canon 1156 s/h	£349
Okidata	£299

LETTER QUALITY

Brother HR15	£call
Olivetti DY420	£755
Silver Reed 550	£449
Silver Reed 500	£250

HP - Vectra 45 20MEG

· 640K bytes memory · 1.2M byte
flexible Disk Drive · Keyboard ·
Monochrome Monitor · Multi-
mode video Adaptor · DOS 3.1 ·
FREE ONE YEAR SITE Main-
tenance. Security Lock · 20M
byte internal Hard Disk.

Purchase Price: £3,450

Lease for £28.50 per week

COMMODORE AMIGA

· 512K byte memory · 800K 3.5 in
DSDD flexible Disk Drive ·
colour monitor · Keyboard ·
Software

Purchase Price: £1,369

Lease For £11.56 per week

SONY M10 WORDPROCESSOR

· 3.5in Dual flexible Disk Drive
Keyboard · Daisywheel 22 CPS
Printer

Purchase Price: £2,499

Also in stock Model M15, Model
35 workstation and Model 34

LAZER PRINTERS

HP - Lazerjet	£call
HP - LazerPlus	£call
Apple LazerWriter	£call
HP - Font Cartridges	£call

INKJET PRINTERS

HP - ThinkJet	£call
---------------	-------

PLOTTER

Epson HI-80	
HP - 7440A 8 Pen	£999
HP - 7470A HPIB	£860
HP - 7475A 6 Pen	£1,526

COLOUR PRINTERS

Epson	£call
MODEMS	£call

OUR LOWEST PRICE GUARANTEE*



Please
call
for
availability



OLIVETTI M24SP PC - 20 MEG

· 640K byte memory · 360K byte flexible Disk Drive · Keyboard · Monochrome Monitor · 20M byte Hard Disk Parallel and Serial Port · Expansion Bus Board and MSDOS - GW Basic

Purchase Price: £2,379

Lease for **£19.65** per week

HP- 110 THE PORTABLE

· Portable computer includes MSDOS · LOTUS 1-2-3 · Memo-maker Wordprocessor · rechargeable battery and Terminal emulation.

Purchase Price: £1,499

APPLE III SYSTEM ex Demonstration

· 256K memory · flexible 5.25 in internal disk drive · monochrome monitor · AppleWriter III · Visicalc III and Business Graphic.

Purchase Price: £699

OLIVETTI M24 PC - 20 MEG

· 640K byte memory · DSDD 360K · flexible Disk Drive · 20M byte internal Hard Disk · Keyboard Monochrome Monitor · Serial and Parallel Board · 7 slot expansion board · MSDOS & GW Basic.

Purchase Price: £1,895

Lease for **£15.65** per week

KAYPRO 2000 PORTABLE COMPUTER

· 256K memory · 3.5 in DSDD flexible disk drive (720K) 16 lines LCD screen · Wordstar · communication software

Purchase Price: £1,299

HP - 150 TOUCH SCREEN COMPUTER

· 256K memory · 9in monochrome monitor · RS232/RS422 & HPIB Ports · Dual 3.5in flexible disk drive · MSDOS

Purchase Price: £1,699

OLIVETTI M19 PC

· 256K byte memory · Twin 360K DSDD flexible Disk Drives · Keyboard · Monochrome Monitor · MSDOS & GW-Basic Parallel and Serial Port.

Purchase Price: £1,199

Lease for **£9.90** per week

* We are so confident about our low prices that if you can find a lower price, (Advertised by an Authorised Dealer) we will beat it by £10. (This offer does not apply to items under £100). In this instance we will meet any lower price. We reserve the right to request a current written price quote.

Tasha

Business Systems

191 Kensington High Street,
London W8

Phone: 01-937 7896

Telex: 946240 (CWEASY G)

MBX No. 19001120

I am interested in the following.
Please send the further information.

- | | |
|----------------------------|--------------------------|
| APPLE IIe | ☐ |
| APPLE IIc | ☐ |
| MACINTOSH BUSINESS SYSTEMS | ☐ |
| DESKTOP PUBLISHING | ☐ |
| OLIVETTI M24/M21/M28 | ☐ |
| WORD PROCESSING | ☐ |
| COMMUNICATIONS | ☐ |
| TRAINING | ☐ |
| SOFTWARE | ☐ |
| PRINTERS | ☐ |
| HP-VECTRA | ☐ |

Name:

Position:

Company:

Address:

Tel No.:

Authorised Dealers: APPLE - COMMODORE - EPSON - LOTUS - MICROSOFT
ASHTON TATE - OLIVETTI - HEWLETT PACKARD - PANASONIC & SONY

Tasha

Business Systems

191 Kensington High Street, London W8

Prices are Exclusive of VAT, delivery & installation

Prices subject to change without prior notice

TELEPHONE: 01-937 8529 - 937 3366

MICRONIX BREAKS THE PRICE/PERFORMANCE BARRIER

MICRONIX AT TURBO

AT2: 640K RAM, 1.2 MB FLOPPY, KEYBOARD, 20 MB HD;

A) WITH HI-RES MONOCHROME CARD AND TTL MONITOR:

£1,799

B) WITH COLOUR GRAPHICS ADAPTOR AND COLOUR MONITOR

£1,999



SPECIFICATIONS

- IBM PC/AT COMPATIBLE
- 640K RAM CLOCK/CALENDAR BATTERY
- SWITCH SELECTABLE 6 OR 8MHz OPERATION (80286)
- SERIAL AND PARALLEL PORTS
- FREE ONE YEAR ON-SITE WARRANTY BY NATIONAL ADVANCED SYSTEM - FURTHER 2 YEAR EXTENDED WARRANTY AT LOW COST!
- HIGH QUALITY JAPANESE MANUFACTURE

ERICSSON PC 20MB SYSTEM ONLY **£1,299** (LIMITED OFFER SUBJECT TO AVAILABILITY)

TWIN FLOPPY 640K SYSTEM: £999

FOR COLOUR SYSTEM: ADD £300

- 640K RAM SINGLE FLOPPY
- 20MB HARD DISC (NEC OR BASF)
- ERICSSON KEYBOARD
- ERICSSON HI-RES AMBER SCREEN
- ERICSSON HI-RES MONOCHROME GRAPHIC CARD
- DOS 2-11
- GW BASIC
- ALL MANUALS

MICRONIX PC/XT SUPER TURBO WITH STATE-OF THE ART NEC V20 SUPERCHIP

PC1: 640K RAM, TWIN FLOPPY, KEYBOARD, COLOUR GRAPHICS ADAPTOR, MONO MONITOR

£699

PC2: AS PC1 BUT SINGLE FLOPPY, 20MB HARD DISK

£999

(HIGH-RES MONO OPTION AVAILABLE)

V20 BY NEC IS THE SUPERSET OF 8088 AND PIN TO PIN COMPATIBLE WITH 8088, INCREASES SPEED OF PC FROM 40% TO 80% (RATED 1.8 ACCORDING TO NORTON UTILITY 3.0's SYSTEM INFORMATION AT 5 MHz AND 2.5 AT 8 MHz TURBO MODE WHILE IBM PC AND XT ARE RATED 1.0 AS STANDARD). RUNS ALL IBM PC COMPATIBLE SOFTWARE WITH NO PROBLEM.

COLOUR SYSTEMS:

ADD **£200**



SPECIFICATIONS

- NEC V20 4.77/8 MHz SWITCHABLE - FULLY 8088 COMPATIBLE
- IBM PC/XT COMPATIBLE
- 640K RAM CLOCK/CALENDAR BATTERY
- 1 SERIAL PORT (RS232), 1 PARALLEL PORT, GAMES PORT
- HIGH QUALITY, 8 SLOT MOTHERBOARD
- FREE ONE YEAR ON-SITE WARRANTY BY NATIONAL ADVANCED SYSTEM - FURTHER 2 YEAR EXTENDED WARRANTY AT LOW COST
- 150W PSU
- 100 KEY PROFESSIONAL KEYBOARD WITH SEPARATE CURSOR PAD

OLIVETTI M24 20MB SYSTEM **£1,699**

FOR COLOUR SYSTEM: ADD £375

- 640K RAM SINGLE FLOPPY
- 20MB HARD DISC (NEC OR BASF)
- OLIVETTI KEYBOARD
- OLIVETTI MONOCHROME MONITOR
- 7 SLOT OLIVETTI BUS CONVERTOR
- DOS 2-11
- GW BASIC
- ALL MANUALS

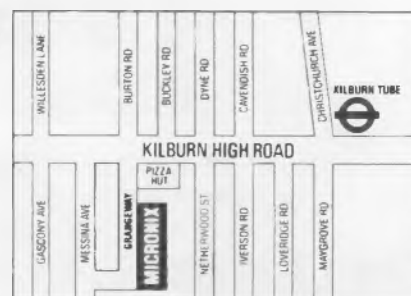
micronix
computers Ltd

1 Grangeway, Kilburn,
London NW6 2BW
Tel: 01-625 0295/9 (5 lines)
Telex: 295173 MICROX G

WE REGRET WE DON'T ACCEPT CREDIT CARDS FOR SYSTEM ORDERS

Ordering Information:

Prices are exclusive of Carriage & VAT. Please add 15% to Total Cost. Carriage: Systems & Subsystems £20, Drives & Keyboards £8, Boards £5, RAM Chips £1. Monitor/Printer £15.
* Visit our brand new Showroom - off-street parking, nearest tube Kilburn (Jubilee Line) OPEN MON-FRI; 9.30am-5.30pm.
CLOSED FOR LUNCH 1-2pm. CLOSED SATURDAY



THE BEST DEAL ON OLIVETTI, ERICSSON AND PERIPHERALS FOR IBM PC/XT, 'AT' AND COMPATIBLES

micronix
computers Ltd

NEW XT COMPATIBLE SUPER TURBO MOTHERBOARD

WITH 640K RAM £199
WITH 1MB RAM £325

MOTHERBOARD FEATURES NEC V20 SUPERCHIP AS STANDARD
• SUPPLIED WITH LEGAL BIOS LICENSED BY FALCON TECHNOLOGY, USA
• SWITCHABLE 8 OR 5 MHz (NEC V20) - SUPER FAST AND FULLY COMPATIBLE WITH DOS
• HIGH QUALITY JAPANESE PCB
• OPTIONAL RAM DISK AND CP/M/MSX EMULATION SOFTWARE

HARD DISK UPGRADES PC/XT, AT & COMPATIBLES (INTERNAL)

20MB - PC/XT £399 40MB - PC/XT £799
20MB - AT (WITHOUT CONTROLLER) £299

INCLUDES SHORT SLOT HD CONTROLLER (EXCEPT FOR AT) WITH JUMPER SELECT FOR 15 DIFFERENT TYPES OF HD. SPLIT DRIVE (E.G. 40MB HD CAN BE LOGICALLY SPLIT INTO 2 x 20MB HD) AND CABLES.

FAST 20MB CASSETTE BACKUP PC/XT, AT & COMPATIBLES

£950
NOW ONLY £499

WHY USE SLOW CARTRIDGE BACKUP? CASSETTE NEEDS NO TIME WASTING SERVO WRITING OR FORMATTING. BACKS UP 20MB IN 4 MINUTES! INTELLIGENT MENU DRIVEN SOFTWARE - ONE KEY COMMANDS. FILE BY FILE BACKUP/RESTORE, IMAGE BACKUP/RESTORE, FILE DIRECTORY AND DIAGNOSTICS. SUPPLIED WITH CONTROLLER, CABLE, SOFTWARE AND MANUAL.

IBM PC/XT COMPATIBLE INTERFACE CARDS

MULTI I/O FLOPPY CARD: CT6260

(SHORT SLOT) £99
PERFECT FOR THE 640K MOTHERBOARD

- 2 DRIVE FLOPPY DISK CONTROLLER - CABLE SUPPLIED
- 1 RS232 SERIAL PORT & OPTIONAL 2ND SERIAL PORT (E16)
- PARALLEL PRINTER PORT
- GAMES PORT
- CLOCK/CALENDAR BATTERY
- SOFTWARE SUPPLIED: CLOCK UTILITIES

MULTI I/O CARD: CT6250

(SHORT SLOT) £79
PERFECT FOR THE 640K MOTHERBOARD

- CLOCK/CALENDAR BATTERY
- 1 RS232 SERIAL PORT: 2ND SERIAL PORT OPTION (E16)
- PARALLEL PRINTER PORT
- GAMES PORT - CABLE SUPPLIED
- SOFTWARE SUPPLIED: CLOCK UTILITIES

MULTIFUNCTION CARD: MF640

WITH 64K RAM £99
WITH 384K RAM £149
COMPARE SPECS & PRICES BEFORE BUYING OTHER CARDS

- UP TO 640K RAM USING 64K AND/OR 256K CHIPS
- CLOCK/CALENDAR BATTERY
- 1 RS232 SERIAL PORT: 2ND SERIAL PORT OPTION (E16)
- PARALLEL PRINTER PORT
- GAMES PORT - CABLE SUPPLIED
- SOFTWARE SUPPLIED: CLOCK UTILITIES, RAMDISK, PRINTPOOLER
- BOTH SERIAL & PARALLEL CONNECTORS ON THE SAME BRACKET
- EXTERNAL SERIAL CABLE (DB9 TO DB25) SUPPLIED

COLOUR GRAPHICS ADAPTOR - JAPANESE QUALITY £79

FULLY COMPATIBLE WITH IBM COLOUR CARD

- 2 VIDEO INTERFACES: RGB COLOUR AND COMPOSITE MONOCHROME
- COLOUR GRAPHICS MODE: 320 x 200
- MONOGRAPHICS MODE: 640 x 200
- LIGHT PEN INTERFACE
- QUALITY JAPANESE MANUFACTURE

CT 7030 NEW FLICKER FREE SHORT SLOT COLOUR CARD £99

ENHANCED GRAPHICS ADAPTOR (EGA)

COMPATIBLE WITH IBM EGA, CT 8090: £199
IBM COLOUR GRAPHIC ADAPTOR, IBM MONOCHROME ADAPTOR AND HERCULES CARD
SUPPORTS MONOCHROME AND COLOUR MODES
640 x 350 MONO, 720 x 348 MONO, 640 x 350 COLOUR, 640 x 200 COLOUR
256K RAM ON BOARD AS STANDARD - SHORT SLOT.

MONOCHROME GRAPHICS CARD £99

FULLY COMPATIBLE WITH IBM MONOCHROME ADAPTOR & HERCULES GRAPHICS

UNIVERSAL MEMORY CARD: CT6280

WITH 64K RAM £49
WITH 384K RAM £99
WITH 512K RAM £109

- UP TO 640K (YES 640K) RAM ON BOARD
- USE 64K AND/OR 256K CHIPS
- USE 3 BANKS OF 256K CHIPS FOR TOTAL 640K RAM

RAM CHIPS:

64K (9 CHIPS) 150NS £10
128K PIGGYBACK (9 CHIPS) 150NS - FOR 'AT' £36
256K (9 CHIPS) 150NS £30

FLOPPY DISK DRIVE ADAPTOR £49

- SUPPORTS UP TO 4 FDOS: DSDD (360K) - 2 INTERNAL, 2 EXTERNAL
- INCLUDES CABLE FOR 2 INTERNAL DRIVES
- STANDARD DB 37 CONNECTOR FOR EXTERNAL DRIVES

PC/XT ASYNCHRONOUS SERIAL CARD WITH 1 RS232 PORT £39

PC/XT PARALLEL PRINTER CARD - SELECTABLE LPT1 OR LPT2 £29

IBM PC/AT COMPATIBLE INTERFACE CARDS

3MB MULTIFUNCTION CARD: MF3000

WITH 64K RAM £199
FULLY COMPATIBLE WITH IBM AT AND COMPATIBLES
ADD £30 PER 256K RAM

- UP TO 3MB RAM ON BOARD - 1.5MB ON MAIN BOARD AND FURTHER 1.5MB ON PIGGYBACK BOARD
- MEMORY STARTING ADDRESS CONFIGURABLE AT 256K, 512K OR ABOVE 1MB
- 1 RS232 PORT - 2ND PORT OPTION
- PARALLEL PORT • GAMES PORT

SERIAL-PARALLEL CARD FOR AT: AT6120 £89

IBM COMPATIBLE KEYBOARDS - AT TYPE SWITCHABLE

FOR PC OR AT £99

- SEPARATE CURSOR PAD
- FULLY PC/XT & AT COMPATIBLE - SWITCH SELECTABLE
- LED STATUS INDICATORS FOR CAPS & NUMBER LOCK
- 100 KEY

MONITORS

IBM COMPATIBLE - COMPOSITE MONOCHROME - CONNECTS TO COLOUR GRAPHICS ADAPTOR £99

IBM COMPATIBLE - TTL - CONNECTS TO MONOCHROME GRAPHICS CARD £129

IBM COMPATIBLE: 14" MITSUBISHI COLOUR MONITOR £249

ENHANCED COLOUR DISPLAY 640 x 350 £499

VISA, ACCESS WELCOME EXCEPT FOR SYSTEM ORDERS AS INDICATED

Ordering Information:

Prices are exclusive of Carriage & VAT. Please add 15% to Total Cost. Carriage: Systems & Subsystems £20, Drives & Keyboards £8, Boards £5, RAM Chips £1. Monitor/Printer £15.
*Visit our brand new Showroom - off-street parking, nearest tube Kilburn (Jubilee Line) OPEN MON-FRI: 9.30am-5.30pm. CLOSED FOR LUNCH 1-2pm. CLOSED SATURDAY.

micronix
computers Ltd

1 Grangeway, Kilburn,
London NW6 2BW
Tel: 01-825 0295/9 (5 lines)
Telex: 295173 MICRUX G

PANASONIC PORTABLE: RL-H7000W

SPECIAL OFFER £999 (NO CREDIT CARDS PLEASE FOR THIS ITEM)

- TWIN FLOPPY
- 256K RAM
- SERIAL & PARALLEL PORTS
- 9" GREEN SCREEN
- BUILT-IN THERMAL PRINTER
- RGB OUTPUT
- DOS
- 1 FREE SLOT

OLIVETTI & ERICSSON AT LOW PRICES

OLIVETTI M24: 640K RAM, SINGLE FLOPPY, OLIVETTI KEYBOARD, OLIVETTI MONITOR, DOS, 20MB/40MB HD (NEC/BAS) & 7 SLOT BUS CONVERTER £1,699

ERICSSON PC: 640K RAM, SINGLE FLOPPY, KEYBOARD, MONITOR, DOS & 20MB/40MB HD (NEC/BAS) LIMITED OFFER

MONO/COLOUR £1,299/£1,599

TWIN FLOPPY SYSTEM 640K RAM MONO/COLOUR ONLY £999/£1,299

(NO CREDIT CARDS PLEASE FOR THIS ITEM)

PANASONIC PORTABLES - WITH PLASMA DISPLAY

1. MODEL J83301: TWIN FLOPPY, 256K, HI-RES 12" PLASMA SCREEN £1,499

2. ABOVE WITH ONE FLOPPY + 20MB HD, WEIGHT 1KG! £1,999

(NO CREDIT CARDS PLEASE FOR THIS ITEM)

POWER SUPPLY

150W FOR PC/XT £89
220W FOR AT £175

IBM STYLE COMPUTER CASE

FOR PC/XT MOTHERBOARD: SWITCH CUTOUT ON SIDE FOR PC/XT STYLE PSU, CUT OUT FOR 6 SLOTS. STEEL CASE, HINGED LID £69

FOR AT MOTHERBOARD: SIDE SWITCH FOR PSU, 6 SLOTS £125

PRINTERS

PANASONIC FOR QUALITY, RELIABILITY AND GREAT VALUE
HARDWARE HLD SWITCH ON ALL MODELS

PANASONIC KXP1092: IBM COMPATIBLE, 80 COLUMN, 180 CPS/33 CPS NLO £299

PANASONIC KXP1592: IBM COMPATIBLE, 136 COLUMN, 180 CPS/36 CPS NLO £399

PANASONIC KXP1595: IBM COMPATIBLE, 136 COLUMN, 240 CPS/81 CPS NLO DUAL LF £599

IBM PRINTER CABLE £17

- (POSTAGE £3)
- DB25 TO CENTRONICS
- SHIELDED CABLE - 3 METRE

FLOPPY DISK DRIVES

1/2 HEIGHT DS/DD 360K (PC/XT) £99

360K FOR IBM AT - BLACK FASCIA £120

800K EXTERNAL 3.5" (MACINTOSH) £345



Brymac Computers

Present

The Personal Computer Plus

This is the machine you have been
waiting for!



At last a fully IBM Compatible with the following specifications:-

- * 256K
- * Mono monitor included
- * Colour Graphics Adaptor
- * Free Software, including Wordprocessor,
Spread Sheet and Database

Optional extras include:-

- | | |
|---------------------------|---------|
| * 10 mb Hard Disk | £325.00 |
| * Mono Graphic Adaptor | £79.00 |
| * Additional Floppy Drive | £89.00 |

All this for only £399.00

Want to know more contact

BRYMAC COMPUTERS, Caverswall Castle, Caverswall, Stoke on Trent
Tel: (0782) 45525

Payment is by Access, Barclaycard or cheque.
All prices exclude VAT, and carriage is £20.00 UK mainland.



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

SPECIALISTS IN EXPORT

APPLE

MACINTOSH PLUS 1720

MAC 512-800	1450
IMAGEWRITER II	355
IMAGEWRITER 15"	395
MAC DRIVE 800K	306
HARD DISK 20MB	1150
APPLE LAZERWRITER until Oct.	3696
LAZERWRITER PLUS until Oct.	4225

MACINTOSH

MACINTOSH DESK TOP PUBLISHING SYSTEMS

Macintosh Plus
External 800k Disk Drive
LaserWriter
Two Apple Talk Connectors
MacDraw
MacPaint
Microsoft Word
Aldus PageMaker
10 Sony D5DD Diskettes

★ £6622 ★

APRICOT

F2 inc mouse + monitor	475
F10 inc mouse + monitor	600
PC 512k 2 x 720	690
XIFD	795
XIHD	999
XI 10 S 512k + 10Mb	1999
XEN 2 x 720 Drive	1595
XEN 20Mb	2390
Apricot 9" mon	75
Apricot 12" mon	115
Paperwhite monitor inc adapter for the XEN	415

IBM COMPATIBLES

POWER WITHOUT
THE PRICE

SEE OUR AD
ON PAGE 24

LAZER PRINTERS

CANON LAZER PRINTER	1850
CANON LAZER PLUS	2750
HP LAZER JET	1950
HP LAZER PLUS	2650

FINANCE

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

All products carry a 12 months Full
Guarantee with HOTLINE Phone Support

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



- ★ Aegis Images – Professional Paint System
- ★ Aegis Animator – Artist's Animation System
- ★ Aegis Artwork – Collection of Clip-Out Images
- ★ Aegis Draw – Computer Aided Design
- ★ Aegis Impact – Executive Graphics
- ★ Logistix – Spreadsheet, Database and Time Management
- ★ MiAmiga File – Filing System
- ★ Gizmoz – Office Desk Utilities
- ★ Digital Link – Communications, VT100 Emulation
- ★ Lattice C Compiler
- ★ Cambridge Lisp
- ★ AC Fortran 77
- ★ MCC Pascal
- ★ K-Seka Assembler
- ★ Amiga Toolkit
- ★ Canon 1080A Colour Inkjet Printer
- ★ Microforge 20/40MB Hard Drives
- ★ Comspec 2MB RAM Expansion
- ★ Stereo Sound Digitizer

★ ...and many more

...all these AMIGA products come from only one place...

FOR
CATALOGUE
'PHONE OR
WRITE!

Precision Software is an established leader in the serious Commodore Market for the whole range from C64 up to the Amiga.

Precision's Superscript and Superbase lead the way to new standards and today continue to be regarded as unrivalled quality business packages.

Precision software has now progressed to become the outstanding supplier of software and peripherals for the AMIGA. It is also a major sales point for the purchase of AMIGA and C128D computers.

For software, hardware and support for Commodore and the AMIGA come to – Precision Software.

...Precision Software



Precision
Software

Precision Software Limited
6 Park Terrace, Worcester Park
Surrey KT4 7JZ
Telex: 8955021 PRECIS G

01-330 7166

...the Amiga place

SYSTEM SHOP

Most Software
Available ex-stock!



NCR The newly released range of computers from NCR are ideal if you are looking for a high performance, high spec and neat looking IBM XT or AT compatible from a large and long established computer manufacturer.

Take for example the PC8, an AT compatible driven by an 80286 8Mhz processor. It comes with an enhanced keyboard and a large screen giving very high resolution (640 x 400), both in colour and mono. Configurations can include fast full height hard disk and tape streamer internally mounted.

To cap it, prices are competitive and all machines come with a three month on-site maintenance contract backed by NCR, plus our service and support.

Epson PC single floppy	£665
Epson PC dual floppy	£750
Epson PC 20Mb hard disk	£1350
Epson PC+ single floppy	£1295
Epson PC+ dual floppy	£1395
Epson PC+ 20Mb hard disk	£1799

These range of machines are unusual in that they combine brand quality with very low cost.

The Taxi PC is fully IBM compatible and is available with mono or colour screens. Configurations available range from single floppy to 20MB hard disk systems, all very competitively priced.

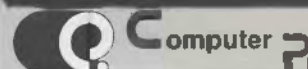
SOFTWARE

Prices for the IBM PC and compatibles for the latest versions, ex VAT. Other titles are available, please call or drop in. Government, Education and Export enquiries welcome.

dBase III Plus	£375	MS Quick Basic Compiler	£85	Sage Bookkeeper	£199
Concurrent Dos XM	NEW £235	MS Windows	£79	Sage Accountant	£345
GEM Collection	£99	MS Word 3	NEW £285	Sage Accountant Plus	£465
GEM Draw	£105	MS Mouse	£140	Supercalc 4	NEW £205
GEM Graph	£140	Paradox v1.1	POA	Summa Mouse	£95
GEM/Summa Mouse bundle	£185	PFS Write (w/speller)	£99	VP Info	NEW £79
Lotus 1-2-3 rel 2	£265	Q & A symantec	£185	VP Planner	£79
MS Chart 2	NEW £185	Reflex v1.1	NEW £70	Word Perfect 4.1	£275
MS Macro Assembler	£120	Sidekick (unprotected)	£55	Wordstar 2000 rel 2	£275
MS Multiplan 2	£145	Smart System III	£450	Wordstar Professional	£235
AST. RAMPAGE 2.0MB	£475	QuadEGA PLUS	£250	MONO GRAPHICS CARD	£95

TURBO COLLECTION

Turbo Pascal ver 3	£45
Turbo Pascal 8087/BCD	£79
Turbo Database Toolbox	£35
Turbo Editor Toolbox	£45
Turbo Gameswork	£45
Turbo Graphics Toolbox	£35
Turbo Tutor	£25
Turbo Jumbo Pack	NEW £175
Turbo Lightning	£70
Turbo PROLOG	NEW £70
SuperKey	NEW £49



01-226 3043

Mon-Fri 9 to 5
Sun 10 to 1

Computer Precision Limited
271 Upper Street
London N1 2UQ



Apple Macintosh

Your Dealer in Central London



State-of-the-Art Macintosh Systems

Apple Macintosh Plus	The latest Mac, with 1 Mb of RAM, 800Kb Disk drive, 128Kb of ROM and fast SCSI port - Brilliant!
Apple HD-20 Hard Disk	Fits unobtrusively under the Mac, with 20 Mb capacity. Uses new Finder with hierarchical directories.
Apple LaserWriter Printer	Link up a number of Macs to this high-quality printer, using the AppleTalk network, mixing both text and graphics output.

If you are looking for a microcomputer for your office, you must call in and try out the Apple Macintosh. With our demonstration facilities, full range of software and helpful staff, we welcome you to our Macintosh Centre

**STIRLING
MICROSYSTEMS**

231 Baker Street, London NW1 6XE

Telephone: 01-935 5262

OPEN MONDAY - FRIDAY, 9.30 AM - 6.00 PM

FAST TURNAROUND on IBM PCB Repairs 24 Hours to 4 days

PC/XT system boards	£70*
Mono/printer adaptor	£50*
Colour graphics adaptor	£50*
Async/parallel adaptors	£25*
IBM memory expansion board	£45*
Floppy disc drive	£50
PC/XT power supply units	£55*
Monochrome display monitor	£55
IBM colour display monitor	£85
Keyboard	£55*
AT power supply units	£65
AT repair price list	P.O.A.

*Price includes parts and labour

All prices exclude VAT and delivery.

For further information write or phone to:

Roy Mistery

ROMTECH LTD
UNIT 2.

Kingstons Industrial Estate
Eastern Road, Aldershot,
Hampshire GU12 4TD

Tel: Aldershot (0252) 334881

XT — Compatible 20 Megabytes

£895

- The XT Turbo
- Legal BIOS
- Switchable 4.77/8 MHz Clock
- 256K RAM, expandable to 640K
- 20MB Half Height Hard Disk
- 360K Half Height Floppy
- Parallel Printer + RS 232 Serial ports
- Clock/Calendar with Battery Back-up

- Monographic/Printer card
- 130W Power Supply
- Professional Keyboard
- Hi-Res 12" Green Monitor
- MS-DOS 2.11
- Full Set of Manuals
- 8 Expansion Slots
- 12 Months Warranty

AT Compatible 10MHz £1595

AVAILABLE NOW, IMMEDIATE DELIVERY



ELONEX (UK) Ltd.

3 OAKDALE,
216, NETHER STREET,
LONDON N3 1JE
TEL: 01-349 0112

Write-Hand-Man
Enter Choice []

- A - Notepad
- B - Phonebook
- C - Calendar
- D - Dir
- E - View
- F - Calculate
- G - Keys
- O - Other

Write Hand Man

This fabulous program sits in the background of your computer ready to spring into action at the press of a key and it doesn't matter what you were doing before, Write Hand Man is always at your beck-and-call.

You're writing a letter and need the pre-VAT price of something; use Write Hand Man's calculator. You're using a spreadsheet and want to make some notes; use Write Hand Man's notepad. Autodial phone numbers with the phonebook. Set up 8 different macro keys with commonly-used phrases or commands. Look at a directory of your disc or view a document while you're editing another document. Write Hand Man is always there to help you.

Write Hand Man works alongside any CP/M 2 or CP/M Plus program on most CP/M machines including Amstrads, comes complete with a manual describing how to add your own applications, includes the source code of all the applications supplied (such as the calculator etc.) and costs only **£29.95**

HiSoft 180 High Street North Dunstable Beds LU6 1AT (0582) 696421

Turbo Pascal? Think!

At long last there is a fast and powerful alternative to Borland's Turbo Pascal at a low, low price;

HiSoft Pascal80

Just look at what you get:

- standard Pascal (very close to Jensen/Wirth)
- fully integrated with the ED80 screen editor, when you get an error, just hit a key and you're back in the editor, positioned on the error with the error message displayed.
- CHAIN any other program from within Pascal80.
- Automatic saving of object code to disc while compiling.
- GSX graphics and Turtle Graphics on machines that support GSX, like the Amstrad CP/M Plus computers.
- Super fast compiling, 2000 lines per minute from 3" disc and 5000 lines per minute from RAM disc!
- only 18K in length.
- and then there's the PCW benchmarks:

BM2	BM3	BM4	BM5	BM6	BM7	BM8	BM9	BM10	BM11	BM12	BM13	BM14	BM15
3.8	6.2	5.3	4.8	5.1	25	20	12	8.5	4.3	8.5	5.3	5.2	8.6
6.5	10	9.4	7.5	7.7	68	54	14	15.1	1.2	15.0	4.5	4.7	58

1st column is Pascal80, second is Turbo. Benchmark 1 is untimeable. On average, the code generated by Pascal80 is just over half the size of that produced by Turbo Pascal.

HiSoft Pascal80 £39.95

HiSoft has many other products for the popular micros s as the Amstrads, Spectrums, Atari 520ST, QL, MSX and CP/M machines. Devpac80 assembler development, C compilers, BASIC compilers, utilities and much, much more.

Call or write for a full catalogue for your computer.

TAY COMMERCIAL SERVICES LTD

WASH LANE, BURY, LANCS BL9 7DU
TEL: 061 705 2288 TELEX: 665233

COMPUTERS

OLIVETTI

M19.....	£CALL
M24.....	£CALL
M24SP.....	£CALL
M28.....	£CALL

SPERRY

MODEL 200.....	£1450
MODEL 400.....	£1799
MODEL 450.....	£2010
P.C./I.T.....	£2450

ARC

2x360K Drives 512K RAM.....	£1250
1x360K, 10MB 512K RAM1.....	£1550

PRINTERS

EPSON LX80.....	£189
EPSON LX86.....	£209
EPSON FX85.....	£319
EPSON FX105.....	£419
EPSON EX800.....	£395
EPSON LQ800.....	£450
EPSON LQ1000.....	£599
EPSON LQ1500(INC.3.2KJ/F).....	£799
EPSON SQ2000.....	£1399
EPSON H180 PLOTTER.....	£315
BROTHER HR25.....	£620
BROTHER H535.....	£739
BROTHER TWINWRITER.....	£1039
CANON LASER.....	£1950
TOSHIBA P351.....	£799
STAR SR10.....	£339
STAR SD10.....	£291
STAR NL10.....	£225
STAR SG15.....	£291
STAR SR15.....	£414
STAR SD15.....	£359
STAR NB15.....	£775

DISKETTES (BOX 10)

5 1/4 DSD 40 TRACK	
3M.....	£18
DYSAN.....	£20
XIDEX.....	£16
5 1/4 DSHD 96 TPI	
XIDEX.....	£24
3 1/2 DSD FUJI	£32
XIDEX.....	£29

SOFTWARE

DELTA 4.....	£350
WORDSTAR PROF.....	£259
WORDSTAR.....	£175
WORDSTAR 2000.....	£275
WORDSTAR 2000+.....	£370
SYMPHONY.....	£399
DBASE III+.....	£379
LOTUS 123.....	£295
SUPERCALC II.....	£139
SUPERCALC III.....	£235
MULTIPLAN.....	£165
MULTIPLAN II.....	£180
MULTIMATE ADVANTAGE.....	£279
PEGASUS.....	FROM £160

THIS IS A LIMITED SAMPLE OF THE GOODS WE OFFER.
PLEASE RING FOR FURTHER DETAILS.

ALL PRICES EXCLUDE VAT AND CARRIAGE
CHEQUE WITH ORDER OR ACCESS/DINERS/AMERICAN EXPRESS

LOOK
LOWER
PRICES



LOOK
QUALITY
DISKS

Same Day
Despatch

WE WILL NOT BE BEATEN !
We'll Better Genuine Lower Prices
Advertised in this Edition of PCW

CAN YOU AFFORD TO BUY ELSEWHERE ?

We sell Factory Sealed - No Repacking
We sell Top Quality - No Seconds
We sell Quality Brands - No Unknown Names

3 1/2" 5.25" DISKS

BOXES OF 10 DISKS		Prices per Box (£)		
		1-4	5-9	10-25
SONY	QM-03440 S/side D Dens	17.99	17.25	16.99
	QM-04440 D/side D Dens	27.45	26.75	25.95
MEMOREX	3450 S/side D Dens	18.95	17.95	16.95
	3460 D/side D Dens	25.75	24.75	23.75
DATALIFE	MF350 S/side D Dens	21.95	20.95	20.25
	MF360 D/side D Dens	28.95	27.95	26.95
BASF	FD3.5 S/side(Boned In 5)	11.25	10.99	10.50
AMSOFT 3"	CF2 D/side Rev.	36.50	35.75	35.00
	CF2 D/side H Dens	51.00	50.25	49.50
SIO-3.5	SEE-10 Library Box for 10 Disk	2.15	2.00	1.75
LB60-3.5	ABA Lockable Box 60 Cap Inc Disk Pen	14.25	14.00	13.50
FL0-3.5	Floppiclone Disk Drive Cleaner	12.95	12.65	12.25

5.25" DISKS

VERBATIM - VEREX	MD150-01HR S/side S Dens	8.15	7.85	7.40
	MD200-01HR D/side D Dens	9.15	8.65	8.25
	MD250-01HR D/side D Dens	10.99	10.65	10.15
	MD257-01HR D/side Q Dens	13.70	13.15	12.65
VERBATIM - DATALIFE	MD525-01HR S/side S or D Dens	10.99	10.75	10.50
	MD550-01HR D/side S or D Dens	14.25	13.99	13.70
	MD577-01HR S/side Q Dens	14.25	13.99	13.70
	MD557-01HR D/side Q Dens	18.75	17.75	17.25
	MDH0 D/side H Dens 1.6MB	24.95	24.45	23.25
	Hard sectors add £1. Library box add £1.60.			
BASF	10 HR S/side D Dens	10.99	10.50	10.25
	20 HR D/side D Dens	12.99	12.50	12.25
	10/96 HR S/side Q Dens	13.49	12.99	12.49
	20/96 HR D/side Q Dens	16.49	15.99	15.49
	5.25 2HD D/side H Dens 1.6MB	28.49	27.49	26.49
DYSAN	104/10 HR S/side D Dens	13.49	12.99	12.75
	104/20 HR D/side D Dens	17.95	17.50	17.00
	204/10 HR S/side Q Dens	18.25	17.75	17.00
	204/20 HR D/side Q Dens	23.25	22.50	21.75
MEMOREX	5151 HR S/side S Dens	9.75	9.49	9.25
	5210 HR S/side D Dens	9.75	9.49	9.25
	5220 HR D/side D Dens	12.45	11.99	11.50
	5410 HR S/side Q Dens	13.75	13.25	12.95
	5420 HR D/side Q Dens	17.65	17.25	16.75
	5660 HR D/side H Dens 1.6MB	27.95	26.95	25.95
HR denotes Hub Rings				
HOK5	Head Clean Kit with Fluid	13.50	13.00	12.50
LC5	EQY Library case for 10 Disks - High Quality	1.90	1.80	1.70
LB40-5	ABA Lockable Box 40 Cap Inc Disk Pen	12.25	11.75	11.25
LB50-5	ABA Lockable Box 50 Cap Inc Disk Pen	13.75	13.50	13.25
LB90-5	ABA Lockable Box 90 Cap Inc Disk Pen	16.50	16.00	15.50
LB100-5	ABA Lockable Box 100 Cap Inc Disk Pen	17.75	17.50	17.00
VCK-5	Verbatim 5" Head clean kit	5.75	5.50	5.25
VCD-5	Verbatim 5" H/c disks (per 10)	8.75	8.45	7.95
DL-5	Disk Labels 100 (5 colours)	3.75	3.50	3.25
DM-5	Disk Mailers 4 disk cap (per 100)	21.00	19.50	18.50

PAPER-LABELS

PAP1	11"x9.5" 60gsm 2000 Sheets Micro Perf Clean Edge	11.00	10.50	10.00
PAP2	A4 Bond 70gsm 2000 Sheets Micro Perf Clean Edge	16.50	15.75	15.00
PAP3	A4 Bond 80gsm 2000 Sheets Micro Perf Clean Edge	24.00	23.25	22.50
PAP4	A4 Bond 90gsm 1000 Sheets Micro Perf Clean Edge	12.50	12.00	11.50
LAB9	89mmx36mm 1 on web 2000 Labels	7.50	7.00	6.50

Many other sizes and weights of paper and labels available.

8" DISKS-RIBBONS-PRINTWHEELS-SOFTWARE-PRINTERS

Please telephone for very competitive prices on a large range of goods.

OFFICIAL ORDERS ACCEPTED FROM GOVERNMENT OR EDUCATIONAL ESTABLISHMENTS.
Please contact us for Quantity Discounts (30+ boxes) and Trade Accounts.

Description	Quantity	Amount
Postage/Packaging (UK)		
5.25/3.5 Disks, HOK5 £1 /Box* (75p 5+, £5 Max)		
8" Disks, VCD8, CL2 £1.3/Box* (95p 5+, £5 Max)		
LC5, DL5, VCK5/8, VCD5, OPEN 50p/pack (35p 5+, £5 Max)		
Lockable Box, Labels £2.5/Box (£2 2+, £5 Max)		
Paper, DM5 £3.5/Box (£2 3+, £15 Max)		
* Add 30p for First Class Post		
Post/Pack		
Total exc VAT		
Vat @ 15%		
Total inc VAT		
Name	Tel. No.	
Address	Post Code	
Access/B Barclaycard/Cheque No.		

Telephone Orders Anytime 01-868 9548

Pinner Wordpro

34 CANNONBURY AVENUE PINNER
MIDDX HA5 1TS



PROGRAMMERS — LET THE VICAR SOLVE YOUR PROBLEMS!

NEW!

"WORTH ITS WEIGHT IN GOLD"

IF YOU ARE:

- ◇ writing large computer programs?
- ◇ translating from one computer language to another?
- ◇ updating to a new version of a language?
- ◇ working with several programmers on one project?
- ◇ maintaining someone else's program?
- ◇ working on a program you wrote long ago?
- ◇ introducing a new procedure or variable to replace an old one?

THEN YOU NEED THE VICAR

The VICAR saves you hours in understanding your program and in debugging changes. It gives a very comprehensive super-cross-reference.

- ◇ It deals with all your source files in one go.
- ◇ It gives the complete context where each identifier occurs. In most cases you can see what your program is doing without even looking up the source code. The VICAR provides instant answers time after time.

AVAILABLE FOR:

- ◇ dBASE II & III
- ◇ BASIC
- ◇ CBASIC
- ◇ C
- ◇ PASCAL
- ◇ TURBO PASCAL

FOR: MSDOS & CP/M

VARIABLES IN CONTEXT ANALYST AND REPORTER

PRICES FROM: £26.05 (AMSTRAD) and £49.00-£129.00 (MSDOS) + VAT.

ALL IANSYST MAIL ORDER SOFTWARE CARRIES A MONEY BACK GUARANTEE OF SATISFACTION.

IANSYST LTD. PCW9, FREEPOST, LONDON N7 8BR. 01-607 5844

IANSYST



3-7 SEPTEMBER 1986
OLYMPIA LONDON
Sponsored by Personal Computer World
SEE US ON STAND NO: 6002/10

A PORTABLE PERSONAL COMPUTER FOR

The SPECTRAVIDEO SVI-738 X'PRESS is only available on Direct Mail Order and offers the following features as standard -

- * BUILT-IN 3½ DISK DRIVE (360K)
- * RS232 INTERFACE
- * CENTRONICS PRINTER PORT
- * BUILT-IN 80 COLUMN CAPABILITY
- * TV AND MONITOR VIDEO OUTPUT
- * Z80A 64K RAM
- * 16 COLOURS, 32 SPRITES
- * 3 CHANNEL SOUND, 8 OCTAVES
- * COMES WITH CP/M 2.2 SYSTEM DISK AND MSX-DOS SYSTEM DISK



3-7 SEPTEMBER 1986
OLYMPIA LONDON
Sponsored by Personal Computer World
SEE US ON STAND NO: 6002/10

£399.95* INCLUDING V.A.T.

SVI-738
HOME COMPUTER

The SPECTRAVIDEO SVI-738 X'PRESS is the ultimate Business/Home Computer and is supplied complete with a free carrying case.

QTY	COMPUTER	PRICE	TOTAL
	*SPECTRAVIDEO SVI-738 X'PRESS	£399.95	
	SVI-738 X'PRESS COMPLETE WITH WORDSTAR, MAILMERGE, DATASTAR, CALCSTAR, REPORTSTAR.	£499.95 Inc. V.A.T.	

CHEQUES/P.O. PAYABLE TO: SPECTRAVIDEO LTD.

NAME _____

ADDRESS _____

TEL No. _____

☐ PLEASE TICK BOX IF CATALOGUE AND TEST REPORTS ARE REQUIRED.

SPECTRAVIDEO LTD.

165 Garth Road, Morden, Surrey SM4 4LH, England.
Tel: 01-330 0101 (10 lines) Telex: 28704 MMH VANG
PCW9/86

SVI
SPECTRAVIDEO

© 1986 SPECTRAVIDEO INTERNATIONAL LIMITED



ATT CORPORATION LTD
PRESENTS
PRICE BUSTERS

CALLERS BY APPOINTMENT ONLY

EXPORT & DEALER ENQUIRIES WELCOME

**ATT
SYSTEM ONE**

BASIC STARTER SYSTEM

SYSTEM UNIT WITH 256K
ONE DISKETTE DRIVE
SERIAL PORT — PARALLEL PORT
GAMES PORT — CALENDAR & CLOCK
MONO GRAPHICS CARD — KEYBOARD
& MONOCHROME MONITOR

* £995 *

**ATT
SYSTEM TWO**

GENERAL BUSINESS MACHINE

SYSTEM UNIT WITH 256K
TWO DISKETTE DRIVE
SERIAL PORT — PARALLEL PORT
GAMES PORT — CALENDAR & CLOCK
MONO GRAPHICS CARD — KEYBOARD
& MONOCHROME MONITOR

* £649 *

**ATT
SYSTEM THREE**

FULLY IBM XT COMPATIBLE

SYSTEM UNIT WITH 640K
ONE DISKETTE DRIVE PLUS
A 20MB HARD DISK
SERIAL PORT — PARALLEL PORT
GAMES PORT — CALENDAR & CLOCK
MONO GRAPHICS CARD — KEYBOARD
& MONOCHROME MONITOR

* £995 *

**ATT
SYSTEM FOUR**

IBM ATE COMPATIBLE — HEAVY OFFICE
WORK AND MULTI-USER APPLICATIONS

AT SYSTEM UNIT WITH 512K
ONE DISKETTE DRIVE — 20MB HARD DISK
HARD/FLOPPY CONTROLLER CARD —
SERIAL PORT — PARALLEL PORT —
GAME PORT
CALENDAR & CLOCK — MONO
GRAPHICS CARD
KEYBOARD. MONOCHROME MONITOR

6/8/10MHZ SWITCHABLE

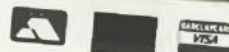
* £1799 *

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 GEOMS G



apricot

olivetti

VICTOR

Release 1.9

June 1986

FILE

About face: Apricot changes direction

IBM-compatible Xs as main product

15 million year-end loss

PC and X-11 sold

F series killed

180 sacked

By Nathan Felter

Apricot's bad year was forecast all right with a bad week. At the apex of last year, the company came up with this list:

- 1 million IBM compatibles
- No service set of year accounts may show a \$15 million gain to an equally reduced loss
- No draw all on Commodore computers' products to which previously were purchased using the first IBM chip in the F series and the second X-11
- A heavily-purchased main marketing to City Limited that produced all kinds of bad press and use the cover page pictures from around the city
- A couple that and the others all the other they read it in their own way
- A couple other-firm from the highly days of "Apricot doesn't want to follow anyone else's model" and showed that in their own way
- The person to serve in conformity, in the current case with a better loss, level of year-end by eliminating the main market and using for high-level added value since particularly of main-type systems

Apricot CEO Ron Lewis described the whole thing as a "bad season" for the company. Other Mayanapricot (Apricot) might come to mind. From Mayanapricot to the good for a few, and then it's all in the end. The company's main market was the main market and using for high-level added value since particularly of main-type systems.

Let's be realistic and use the word "bad" in all this. Things might be in bad in their own, in their own, in their own.

1. APRICOT'S LOSS IN 1985

In this issue

IBM-compatible Xs as main product

15 million year-end loss

PC and X-11 sold

F series killed

180 sacked

By Nathan Felter

Apricot's bad year was forecast all right with a bad week. At the apex of last year, the company came up with this list:

• 1 million IBM compatibles

• No service set of year accounts may show a \$15 million gain to an equally reduced loss

• No draw all on Commodore computers' products to which previously were purchased using the first IBM chip in the F series and the second X-11

• A heavily-purchased main marketing to City Limited that produced all kinds of bad press and use the cover page pictures from around the city

• A couple that and the others all the other they read it in their own way

• A couple other-firm from the highly days of "Apricot doesn't want to follow anyone else's model" and showed that in their own way

• The person to serve in conformity, in the current case with a better loss, level of year-end by eliminating the main market and using for high-level added value since particularly of main-type systems

Apricot CEO Ron Lewis described the whole thing as a "bad season" for the company. Other Mayanapricot (Apricot) might come to mind. From Mayanapricot to the good for a few, and then it's all in the end. The company's main market was the main market and using for high-level added value since particularly of main-type systems.

Let's be realistic and use the word "bad" in all this. Things might be in bad in their own, in their own, in their own.

1. APRICOT'S LOSS IN 1985

The Newsletter
for Apricot users

[illegible][illegible]

■■■ the independent monthly newsletters for Apricot, Olivetti and Victor/Sirius owners ■■■

RETURN THE SLIP FOR YOUR FREE SAMPLE COPY — NO STAMP REQUIRED

Tick one: ☐ APRICOT FILE ☐ OLIVETTI FILE ☐ VICTOR SIRIUS FILE

ADDRESS:

COUNTRY if not UK:

Mail to: TP GROUP ■ FREEPOST ■ PO BOX 509 ■ LONDON N1 1BR

DON'T BUY AN OLIVETTI PC OR ANY SOFTWARE

COMP. STAND. LTD. Before you call us
are able to offer highly competitive prices on all
Olivetti PC Products, and popular software.

Example	
Olivetti M24	
20Mb Hard Disk	
360 Kb Floppy Drive	
640 Kb RAM	
Monochrome Display	
Keyboard	
MS-DOS	£ 1725
As above with 30 Mb hard disk	£ 1815
Super discounts on all other configurations including M19 and M28.	

Printers	
HP Laserjet	
Cannon Lasers	
Ricoh Laser	
Epson	
Olivetti	
Juki	Call for best prices

Software	
Lotus 1-2-3	£ 245
Symphony	£ 340
Framework 11	£ 330
DBase 111+	£ 345
Wordstar	£ 165
Wordstar Prof	£ 215
Wordstar 2000/2	£ 222
Wordstar 2000 +	£ 297
MS-Word	£ 262
MS-Chart	£ 175
MS-Project 2	£ 237
Multipart 11	£ 167
Psion Xchange	£ 275
Multimate	£ 217
Sage	
Bookkeeper	£ 207
Accountant	£ 347
Accountant Plus	£ 487
Fin. Controller	£ 696
ALL LATEST VERSIONS	

Prices for Add on Boards, Hard Disks and other software available on request.

CALL US NOW ON CHICHESTER (0243) 771786.

COMP. STAND. LTD. Quarry Lane, Chichester,
West Sussex, PO19 2NY

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

ALMA COMPUTER SYSTEMS

EPSON

LX86
GX80
FX85
JX80
FX105
LQ800
LQ1000
SQ2000 inc 2K I/F
SQ2000 inc 32K I/F
Hi-80 Plotter

CWO

214.50
194.22
341.64
374.40
443.82
464.10
620.10
1423.50
1501.50
312.00

QUME

Sprint 11/40 (not inc I/F)
Sprint 11/55 (not inc I/F)
Sprint 11/90 (not inc I/F)
Sprint 11/130 (not inc I/F)
Sprint 11/130WT (not inc I/F)
Sprint 12/20 Letterpro (Serial)
Sprint 12/20 Letterpro (Parallel)
Sprint 12/20 Letterpro (D/Write 2)

CWO

993.72
1126.32
1305.72
1572.48
2159.04
428.22
464.10
506.22

BROTHER

HR10 (Ser & Par)
HR15XL (Ser & Par)
HR25 (Ser & Par)
HR35 (Ser & Par)
2024L (Ser & Par)
Twinwriter (Parallel)
M1509 (Ser & Par)
M1409

CWO

229.43
358.23
635.95
804.95
724.95
1042.48
398.48
309.93

OTC

OTC 700 (700 chars per sec)

CWO

1605.98

APPLE COMPUTERS AND PERIP MAIL ORDER ONLY

Macintosh 512/800K	1516.00
Macintosh Plus	1836.00
Macintosh Ext Disk 800K	316.00
Apple Modem	236.00
Imagewriter II	356.00
Daisywheel Printer	1065.60
Laserwriter	3996.00
Hard Disk 20 Meg	1000.00

//c Bundle twin drives, 128K computer, monitor+stand, +software 850.00

Apple//e 128K, twin drives + monitor + software 1363.00

Desktop Publishing System
Macintosh Plus + Laserwriter + software POA

**LASERWRITER PRINTING
SERVICE — CALL FOR
DETAILS**

AUTHORISED APPLE DEALER

LEVEL 1 SERVICE CENTRE

LASERWRITER DEALER

JUKI

6100 (Par/Ser/IBM)
6200 (Parallel IBM)
6300 (Par/Ser/IBM)
6300 (Serial)
5520 (Parallel)
5510 (Parallel)

CWO

289.67
414.17
746.17
663.17
372.67
248.17

OKI

Microline 84 (Parallel)
Microline 84 (Serial)
Microline 84 XS
Microline 182 (Par & IBM)
Microline 182 (HS Serial)
Microline 192 (Par & IBM)
Microline 192 (Serial)
Microline 193 (Par & IBM)
Microline 193 (Serial)
Microline 292
Microline 293
Microline 294
OKI 2350 (Parallel)
OKI 2350 (Serial)
OKI 2410 (Parallel)
OKI 2410 (Serial)
OKIMATE 20 (Par, Ser & IBM)
Microline 192 (Serial)

CWO

643.20
723.70
1042.48
208.50
232.65
321.20
374.33
441.95
495.08
439.20
599.20
796.00
1412.78
1461.08
1509.38
1557.68
208.50
374.33

TOSHIBA

P351 (Ser & Par)
P321
P341E
P351C

CWO

769.60
442.50
521.25
1046.25

CANON

PW1080A
PJ1080A
A50
A55
LBP8-A1
LBP8-A2

CWO

279.20
399.20
295.62
350.22
1975.00
2999.10

MICROP

MP165
MP200
MP201

CWO

190.07
239.93
287.20

HEWLETT PACKARD

Laserjet
Laserjet+ (RS232 & Par)
Laserjet 500

CWO

2157.84
2849.58
3564.85

Access/Barclaycard/Visa accepted. All prices are exclusive of VAT. Telephone for quotations for other
Printers or Accs.

Prices correct at time of going to press. Cable from £15 extra. Carriage Printers £7 (except lasers)
Lasers £20. Printers — Mail Order only — Terms strictly cash with order.

Phone (0730) 62808 16A College Street, Petersfield, Hampshire GU31 4AD

Ours won't flop.



Everyone, it seems, is selling floppy disks these days. Not everyone, though, makes them in all three leading formats. And in three sizes – 8", 5¼" and 3½"

Not everyone can guarantee them 100% error-free after 20 million read/write passes.

Only a handful of companies make them from start to finish. And fewer still supply their disks in durable storage boxes.

Clearly, everyone else is lacking our ten years of successful magnetic media experience.

JVC

Logon please: To the world of THEOS!

Why do most multi-user applications in the Benelux run under THEOS?

For the past five years, THEOS has been the standard multi-user operating system for business applications in the Benelux. Since its release, THEOS has been successfully used by software houses on multi-user microcomputer systems.

Here is why they selected THEOS:

- **Multi-user/Multi-tasking** . . . for better productivity
- **Automatic record-locking** . . . for secure data processing
- **ISAM files** . . . for sophisticated applications
- **Terminal class codes** . . . for full portability
- **Clear, simple command names** . . . for ease of use
- **Built-in "help" files** . . . for quick learning
- **Basic Syntax Analyser** . . . for bug-free applications
- **Exec Job Control Language** . . . for process control
- **Passwords and privilege levels** . . . for access security
- **And, decimal comma, European date format and multi-lingual functions** . . . for those users often overlooked by American system software designers!

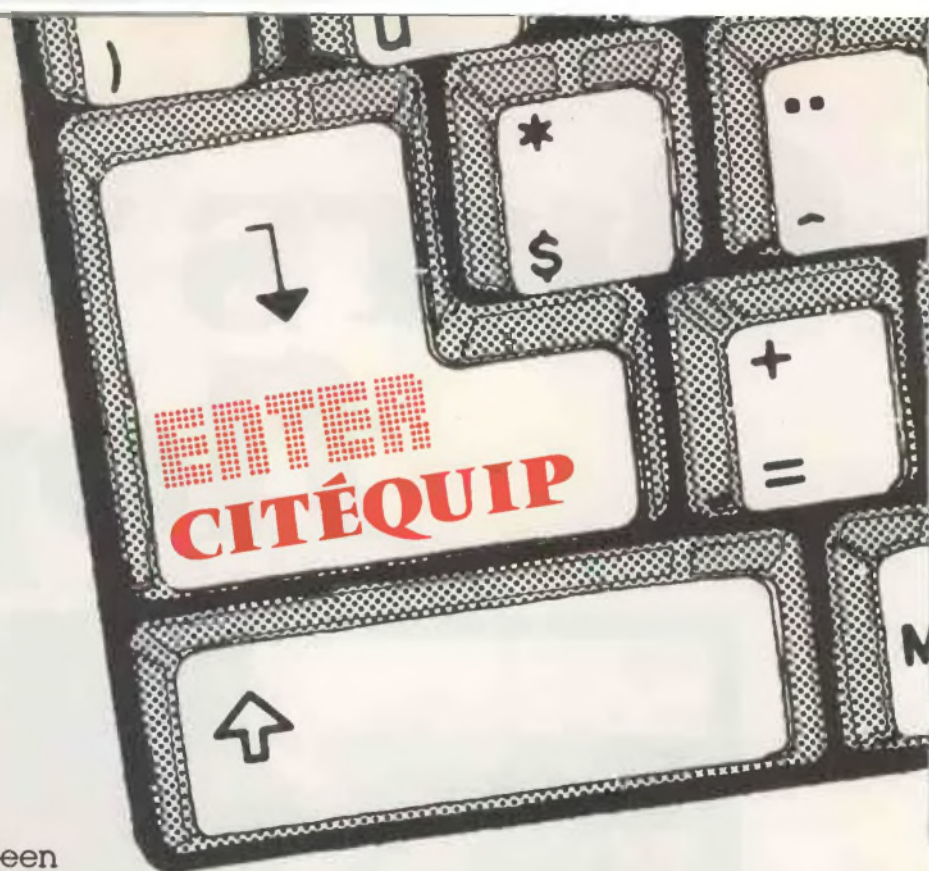
THEOS, a great development tool, a professional environment, a system for all serious business application users.

So, when do you "Logon please:"?

CITÉQUIP

Software & Communications

Rockford House,
34-38 Heathcote Street
Nottingham NG1 3AA
Telephone: (0602) 588500
Facsimile No: (0602) 588505
Telex: 377041 CEQUIP G



3 STATION LOCAL AREA NETWORK

ONLY £3250

included:

- * ONE 20MB PC SERVER with mono screen keyboard, clock & printer port
- * TWO SATELLITE PCs with mono screens keyboards, clocks & printer ports
- * 100ft cable
- * 1MB OF RAM on server & 256K on each satellite
- * ON SITE MAINTENANCE for the 1st year
- * MS-DOS version 3.2 & G W Basic
(The network's operating system runs under PC-Dos 2.0 & MS-Dos 3.0)
- * Installation
- * File & record locking
- * Remote communication support

CALL SYSTEMWARE LTD tel: 01-653 6544

IN CASE YOU MISSED US AT THE PC USER SHOW

Slough Computers



BRING YOU AN UNBEATABLE OFFER
THE BONDWELL PC

TWIN 360K DRIVES. 640K RAM
MONITOR. MSDOS 2.11. GW-BASIC
ONLY **£555**

HARD DISK VERSIONS AVAILABLE FROM £877
WORD-PRO SYSTEM

THE BONDWELL PC
DAISYWHEEL PRINTER
JOTTER WORD-PRO SOFTWARE
ONLY **£699**

FOR ALL YOU HIGH SPEC ADDICTS WE HAVE THE
NEW OPUS PC

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

£699

(Systems from £499)



**245 HIGH STREET,
SLOUGH, BERKS SL1 1BN.
TEL: SLOUGH 21594**

AMSTRAD WORD PROCESSORS & SOFTWARE ALSO CARRIED.
TELEPHONE/MAIL ORDERS WELCOMED.
VAT & CARRIAGE MUST BE ADDED TO ALL PRICES.

1st
FIRST SOFTWARE LTD

dBASE™

AMSTRAD
ATARI

£119 incl.vat

ANOTHER FIRST FOR FIRST - **dBASEII**, the world's best selling database is now available on your computer (if you have an AMSTRAD 6128, 8256 or 8512, Commodore 128, Tatung and Atari) exclusively through First Software Ltd or your local dealer for only £119.00 inc VAT, including the full manual.

Join the millions of users worldwide, doctors, students, solicitors, accountants, stockbrokers and collectors, who get the best from their information by using **dBASEII**. Use simple English like commands to do your repetitive tasks, by commands such as Do invoices, Do analysis etc.

At last, the business world's standard database, available for you.

dBASEII quite simply dBEST.

For more information call us on 07357-5244 or write to First Software Ltd, No. 20 Horseshoe Park, Pangbourne, Berks.



**Software
City**

382 KINGS ROAD CHELSEA Tel. 01 352 9220

1st
FIRST SOFTWARE LTD

PROVIDING A RELIABLE SERVICE TO THE MICRO MARKET FOR 15 YEARS

SICON PC Compatible

- 8088 CPU 16 bit 4.77 MHz 640K RAM.
 - 2 DS/DD 5.25" Floppy Drives 360K each.
 - 8 IBM Compatible Expansion Slots.
 - RGB Colour Graphics Port & composite Video Port.
 - RS 232 Serial Port and Parallel Printer Port.
 - Clock/Calendar with battery back up.
 - Detachable Keyboard (83 keys).
- Fitted with high quality Japanese boards.*.....£579 (a)

SICON XT Compatible

As above but with a single floppy and SEAGATE 20 Mbyte Winchester drive.....£939 (a)

HARD DISC UPGRADE For PC/XT & Compatibles

20 Mbyte SEAGATE Winchester drive with short slot card and various configuration options plus cables.....£400 (a)

PRINTERS & PLOTTERS

Epson FX85
Fully IBM Compatible,
8k buffer, NLQ.....£315 (a)

Epson FX105
As FX85 but 136 cols.....£449 (a)

Epson LQ800
24 pin head, 200 cps draft,
67 cps letter quality.....£479 (a)

Epson Hi-80
A4 4 colour plotter.....£325 (a)

Hitachi 672
A3 4 colour plotter.....£465 (a)

Parallel Printer Lead
Shielded Cable.....£12 (c)

A large range of printer accessories and interfaces available from stock.

PRINTER/BUFFERS/ SHARERS

TSB sharer/buffer — Connects 3 computers to one printer — auto scan for data and auto switching — 64K or 256K buffer. PAUSE, RESET & COPY facilities. Centronics interface.

TSB 64K.....£199 (b)

TSB 256K.....£275 (b)

RT 256
3 input/1 output or 1 input/3 output.
3 port switchover serial interface.
256K buffer. Input/output baud rate independently selectable.
Full details on request.....£375 (b)

Buffalo A 32K buffer centronics fits internally on most printers.
.....£75 (d)

PRINTER SHARERS: (All lines are switched)

	Parallel	Serial
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)
TCS26 1 computer to 2 printers for BBC		£19.50 (c)

Cable sets for all popular computers available.

External Serial/Parallel or Parallel/Serial Converter.....£89 each (c)

INTERFACE CARDS for IBM PC/XT & Compatibles

All cards from high quality Japanese manufacturers.

EGA Board

- Multimode card including all the capabilities of IBM, EGA, Hercules mono card, IBM colour and mono card.
- Compatible with PC, XT & AT.
- 256K RAM on board.
- 640 x 350 mono, 720 x 340 mono (Hercules), 640 x 350 colour (IBM enhanced colour display)
- 640 x 200 colour.....£329 (b)

Multi-function Card

- 348K RAM.
- One Serial Port.
- One Parallel Printer Port.
- One Games Port.
- Battery backed clock/calendar.
- RAM disk & print spooler compatible.....£149 (b)

Multi 1/0 Card

- One Serial Port.
- One Games Port.
- One Parallel Printer Port.
- Battery backed clock/calendar.
- Floppy Controller (2 drives).....£79 (b)

RAM Card 512K
Full length board (not populated).....£49 (b)

Extra 64K RAM (9 x 4164-15).....£10 (d)

Extra 256K RAM (18 x 41256-15).....£60 (d)

Colour Graphics Card

- 320 x 200 colour graphics mode.
- 640 x 200 Hi-Res mono graphics mode.
- Light Pen interface.....£69 (d)

Monochrome Graphics Card

Fully compatible with IBM monochrome adaptor and Hercules graphics card. Includes parallel printer port.
.....£79 (b)

Disk Drive Adaptor

Supports up to 4 D/S floppies.
Cables included for 2 internal drives.....£39 (b)

Parallel Interface Card

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

RS 232 Serial Card

Short slot card for Modems, etc.....£34 (c)

PC Compatible Mouse

Supplied with serial interface card, operating manual, and application software.
.....£65 (d)

MONITORS

Monochrome 12"

Composite Video (for use with colour graphics card).

Philips 7502 Green.....£75 (a)

Philips 7522 Amber.....£79 (a)

Taxan KX1201G Green.....£90 (a)

Taxan KX1203A Amber.....£96 (a)

TTL (for use with monographics card)

Philips 7513 Green.....£110 (a)

Taxan KX1212G Green.....£129 (a)

RGB

14" Mitsubishi XC1404.....£239 (a)

12" Taxan Super Vision III.....£324 (a)

MODEMS

All modems BT approved.

Miracle WS4000 V21/23

Hayes Compatible, intelligent,

Auto Dial, Auto Answer.....£149 (b)

Miracle WS3000 V22

As above but with 1200 baud duplex and Bell standard.

Battery back up for memory.....£495 (a)

Miracle WS3000 V22 bis

As WS3000 V22 but with 2400 baud full duplex.
Full details on request.....£650 (b)

Data Cable for above modems.....£10 (d)

Data Talk Comms package

If purchased with one of the above modems.....£70 (d)

3M FLOPPY DISCS

Industry standard high quality discs with reinforcing hub rings and guaranteed error free performance for life. In packs of 10 in library case.

5¼" 745 48TPI DSDD.....£15 (d)

5¼" 747 96TPI DSDD.....£19 (d)

3½" 96TPI DSDD.....£27 (d)

3M DATA CARTRIDGES

Back up cartridges for tape streamers from 3M.

DC1000.....£18.50 each (d)

DC3000 XL.....£21.00 each (d)

DC600A.....£26.50 each (d)

ALL PRICES EXCLUDE VAT

Please add carriage indicated as follows:

(a) £8 (b) £2.50 (c) £1.50 (d) £1.00.

CP/M & MS DOS SOFTWARE

Wordstar.....£230 (d) Dbase II.....£295 (d)

SuperCalc.....£165 (d) Lotus 123.....£360 (d)

Smart.....£500 (d) Multimate.....£220 (d)

ProPascal.....£275 (d) Wordstar

Professional.....£279 (d)

Dbase III.....£380 (d) SuperCalc III.....£180 (d)

Symphony.....£405 (d) Open Access.....£300 (d)

BOOKS (No VAT £2 p+p)

Wordstar Made Easy.....£16.95

Multiplan Made Easy.....£18.95

Wordstar Handbook.....£11.95

RS232 Solution.....£17.95

Intro to Wordstar.....£17.95

Multimate Complete Guide.....£16.95

Understanding UNIX.....£18.45

Understanding dBase II.....£22.95

dBase II for the 1st time User.....£16.95

Understanding dBase III.....£22.95

CP/M Handbook.....£14.95

Mastering the CP/M.....£17.95

ABC of LOTUS 123.....£15.95

UNIX User Guide.....£19.95

TECHNOMATIC LTD

MAIL ORDERS TO: 17 BURNLEY ROAD, LONDON NW10 1ED

SHOPS AT: 17 BURNLEY ROAD, LONDON NW10 1ED

(Tel: 01-208 1177 (4 lines) Telex: 922800)

305 EDGWARE ROAD, LONDON W2 Tel: 01-723 0233

Please add carriage as indicated & 15% VAT.

(Export: no VAT, p+p at Cost)

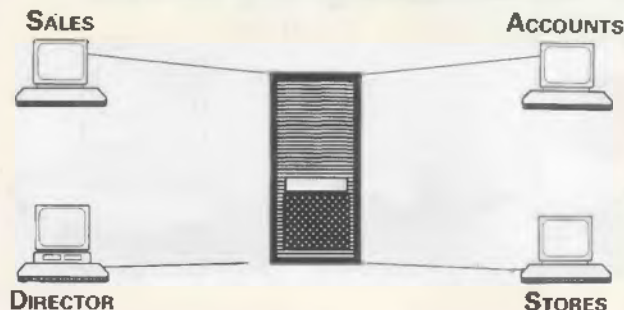
Orders from Government Depts. & Colleges etc. welcome.

Minimum Telephone Order £5.

Detailed Price List on request.

Stock items are normally by return of post.

MULTI USER COMPUTERS FOR LARGE & SMALL COMPANIES



WE WILL SUPPLY, INSTALL, TRAIN, & SUPPORT ON:

**DATASOLVE — SMB
PEGASUS MULTI-USER**

XENIX & CONCURRENT-DOS

GRESHAM BUSINESS COMPUTERS LIMITED
22/27A ST MARY STREET
SOUTHAMPTON
HANTS SO1 1NP



TELEPHONE — (0703) 39719
Contact Bob Stevenson

Package Deal

FARSIGHT

SPREADSHEET (1-2-3 Compatible)

+ WORD PROCESSOR

+ MULTIPLE WINDOWS **£89**

For IBM PC and true compatibles.

	IBM PC True Compatibles				Amstrad PCW	
SOFTWARE	It Figures	£39	PC Easy	£79	dBase II	£99
	Resident	£89	Pocket APL	£99	Supercalc	£49
	Smalltalk/V	£99	SQZ!	£POA	Sage Accls	£POA
					Templates	£POA
CBT	dBase II	£65	Intro Cmpgtg	£65	dBase II	£24
	Supercalc	£65	Lotus 1-2-3	£POA	Supercalc	£24
	Wordstar	£65	Mailmerge	£49	Cam/Plus	£24
	Cobol Pascal C			£POA	Locoscript	£24

VIDEO TUTOR

Comprehensive guide to the technical aspects of the IBM PC. Ideal for INFORMATION CENTRES, IN-HOUSE TRAINING, OPEN LEARNING, EDUCATION.

£89

All prices are exclusive of VAT and P&P (£2)
1-2-3 is a registered trademark of Lotus Development Corporation
IBM is a registered trademark of International Business Machines Corporation.

021-355 1886

Package Deal

PO Box 876, Birmingham B3 1NQ



Goto Computers

10 Old Crown, Windsor Road, Slough, Berks SL1 DL
Sales Hotlines: **Slough (0753) 34191**
(0753) 824767

60 MILE FREE DELIVERY

(£7.50 ON SALES UNDER £100 AND BEYOND 60 MILES)

COMPUTERS	£	PRINTERS	£
Olivetti M24 640k 2x360k Dr + Mon	1495	Canon PW1080A NLQ/160cps 80col	225
Olivetti M24 640k 20mgNEC 1FD Mon	1895	Canon A50 NLQ/180 cps 80col	265
Olivetti M24SP 20 meg 1FD + Dr Mon	2490	Canon A55 NLQ/180cps 135col	365
Olivetti M19 256k 10mg 1FD + Col Mon	1955	Canon Bubble Jet BJ-80	415
Commodore PC10 256k 2FD IBM Comp	750	Canon Laser LBP-8 A2 Graph	2650
Bondwell 34 PC Compo 640k 2FD Mon	585	Juki 6100 Daisywheel 18cps	238
Bondwell 22 Portable PC 512k720 Dr	1225	Juki 6200 Daisywheel 32cps	405
Walters XT 256k 1FD Mono Monitor	599	Juki 6300 Daisywheel 40cps	630
Epson PC + 640k 2FD Dos 3.1 Mon	1425	Juki 6500 Daisywheel 60cps	865
Commodore Amiga 512k 800k Dr Col	1475	Juki 5510 NLQ/180cps	226
Atari 1040ST 1mg RAM 720d Col Mon	*899	Juki 5520 NLQ/180 7 colors	320
Atari 1040ST 1mg RAM 720d Mono	*799	Juki 5510 color upgrade	90
Canon A200 PC640k 2FD col Mon XD	1200	Epson LX 85 NLQ/120 NEW	240
Acorn Masterclass 128k	395	Epson FX 85 32NLQ/160cps 80col	312
Amstrad 8512 512k 2 drives	499	Epson FX 105 32NLQ/160cps 156cl	418
Amstrad PC	Ring	Epson LQ 800 60LQ/160cps 80cl	450
		Epson LQ 1000 60LQ/160cps 156cl	575
		Epson Hi-80 4 pen A4 plotter	314
		Epson JX80 color	380
		Epson EX800 50LQ/300cps NEW	505
		Mannesmann Tally MT80+	160
		Mannesmann Tally MT85 180cp 80c	264
		Mannesmann Tally MT86 180cp 136c	364
		Mannesmann Tally MT290	650
		Taxan B10 NLQ/150cps 80 col	225
		Taxan B10 IBM	245
		Taxan 910 NLQ/150cps 156col	320
		Brother HR15XL Par 18cps	340
		Brother HR25 Par 25cps	585
		Brother HR35 Par 35cps	665
		Brother 1509 NLQ+Tractor	390
		Siekosha SP1000A NLQ/100cps	183

SOFTWARE

Autocad Computer-Aided Design	123	1450
dBase 11 Plus		340
DMS Delta 4 Database		340
Framework 11		335
Graphwriter Combination		320
GEM Graph NEW		145
Flight Simulator 11 Color		60
Javlin		395
Lotus 123 Release 11		285
Lotus Symphony 1.1		355
Multimate Advantage 3.60		245
Multiplan 11		180
MicroPro Pocket Wordstar Amstrad		65
Paradox v 1.1		445
Q & A Symantec		220
R Base 5000		372
SAGE Popular Accounts Amstrad		70
SAGE Financial Controller		750
SuperCalc 4 NEW		245
SuperProject NEW		345
SUBJECT Software Accounts ALL		850
Smart System 11 Integrated Pack		445
Sidekick		42
Networking by Novell		CALL
dBase 11 Amstrad NEW		85
Turbo Pascal Version 3		45
Wordstar 2000 Release 11		275
Wordstar Professional		230
Superkey NEW		49
Open Access		275

MODEMS BOARDS ACCESSORIES ETC

Miracle WS 2000 V21 V23 Manual	95
Miracle WS 3000 V21 V23 Hayes	260
Miracle WS 3000 V22 1200/1200	450
Miracle WS 3000 2400 full duplex	585
Miracle WS 4000 V21/V23 Auto D/A	149
PAGE Nightingale/Commstar 11 NEW	120
RACAL Modem(int) + Speakeasy	360
Minimo Plus datatalk	330
Hayes Smartmodem 1200(RS232)	410
Microsoft Mouse Bus or Serial	140
NEC 20meg Hard Drive + Controller	349
Multifunction Card Ck/Cal Ser etc	125
XT Motherboard 8 slot 8088	150
135 watt PSU for PC/XT	85
8087 Maths Co-Processor 5 Mhz	99
360k Half-Height Drive	79
NEC 256k D Ram Chips(9) 150ns	18
EGA Board 256k RAM PC/EX/AT	299
PC Memory Board with 512K	120
Multi I/O Card disk cont/MI Board	105
Alloy 60 meg TapeStreamer	775
Mountain Dvencard 20meg	695
Hercules Mono/Graphics/Printer	175
Centronics IBM Cable Moulded	16
Plus Board 12 position	42
Summa Mouse	95
IBM Compatible Keyboard	65
Atari SF 314 1 Megabyte Drive	173
Opus 5802D for BBC	235
AST Six Pack Plus 384k	240

QUICK TURNROUND ON REPAIRS AT REASONABLE PRICES

DISKS	
Elephant 5 1/4" SS/DD(10)48tpi	11.00
Elephant 5 1/4" DS/DD(10)48tpi	13.00
Elephant 5 1/4" DS/DD(10)96tpi	27.25
Fuji 3 1/2" SS/DD(10)135tpi	23.00
Fuji 3 1/2" DS/DD(10)135tpi	32.00
Fuji 3 1/2" DS/DD(10)48tpi	14.75

*FREE PACK OF FUJI 3 1/2" DS/DD DISKS WITH MARKED ATARI PRODUCTS

WE MOVE SERVICE NOT BOXES

ORDERS TAKEN FROM UK GOVERNMENT BODIES - EDUCATIONAL
ESTABLISHMENTS - COMPANIES

EXPORT ORDERS TAKEN

LEASING HP AND CREDIT SALE ARRANGEMENTS

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

OPEN 9.00 AM TO 5.30PM MON THRU FRIDAY AND TILL 1.30PM SATURDAY





Apple. The power to succeed.

Apple Approved Dealer. Apple Approved Level One Service Centre
Apple Approved Laserwriter Dealer.

Macintosh Desk Top Publishing System

incorporating the Intelligent Image Scanner

Macintosh Plus
Hard Disk 20
Laser Writer Plus
Apple Talk Cable and Connector
FullPaint
MacWrite
Microsoft Word
Aldus Page Maker

Intelligent Image Scanner
Box of Paper And
Five Diskettes

£ 10,500



Word Processing

Macintosh 512K/800K
External Drive
Microsoft Word
Image Writer II
Sheetfeeder
Box of Paper
5 Diskettes

£ 2555



Powerful Data Base

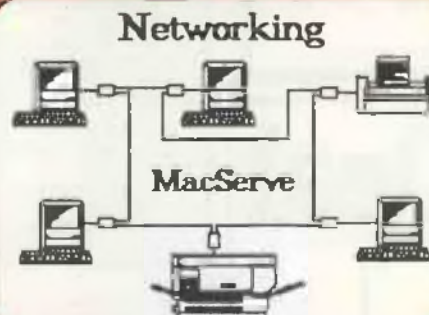
Macintosh Plus
Hard Disk 20
Imagewriter II
Omnis 3 Plus
Box of Paper
5 Diskettes

£ 3770

Apple Accounting

Macintosh Plus
Hard Disk 20
Nominal, Purchase
and Sales Ledgers
Imagewriter II
Box of Papers
5 Diskettes

£ 4238



Excel Software

Macintosh Plus
External Disk Drive
Imagewriter II
Excel
Box of Paper
5 Diskettes

£ 3700

Single or Multi-user

The various applications shown are for single user. However more and more companies are putting off expanding their systems because it means not only an other computer but also printers and disk drives. With Macserve each user can share the existing hard disk, printer etc on the same system. For more details contact us now on 01-263 9493/5 or 01-883 3705

We operate Apple's SPECIAL promotional DEALS for Writers, Journalists, University's, Colleges, Teaching establishments, and various other Government establishments and Medical Institutions.

*** Service * Support * Training ***
*** Maintenance * Supplies ***

CHROMASONIC COMPUTER CENTRES

48 Junction Rd, Archway, London N19 5RD

238 Muswell Hill Broadway, London N10 3SH

01-263 9493/5

Phone 01-883 3705

You can **KISS** and tell in this office affair



**There's no secret about this KISS~
it's simply the best low-cost laser
on the market.**

- **Emulates Epson® FX80, Diablo® 630 and QUME® Sprint**
- **400 cps/6ppm at 300 x 300 dots/in**
- **Whisper quiet at less than 55dBa**
- **Nine resident founts**
- **Integral cut-sheet feeder**

This is the ideal office printer. It's fast, quiet, and reliable. Compare it with a daisy – it doesn't have spokes to break, you change founts by software command, and you don't need a silencer.

Nine resident founts give maximum flexibility, and you can mix them all on one line, whether they are portrait or landscape.

Why not try a Kiss? It's going to become very popular.

*Ring Pragma for details: Southern
Office, 0296 34751; Northern Office,
0270 258444; Scottish Office,
041-956 2260.*

Epson, Diablo and QUME are registered trademarks of QUME Corp., Xerox Corp.
and Epson America Inc. respectively.

Pragma Ltd

Pragma House, Radlett Road, Coiney Street,
St. Albans, Hertfordshire AL2 2EP. Telex: 922625.

AMSTRAD 8256 SINGLE DISK DRIVE £379 ● AMSTRAD 8512 DOUBLE DISK DRIVE £475
 FAST ON-SITE MAINTENANCE AVAILABLE 8256 £39.95 8512 £49.95 FOR ONE YEAR
 UPGRADE KIT AMSTRAD 8256 TO AMSTRAD 8512 £165
 CARRIAGE FREE ON ALL THE ABOVE AMSTRAD PRODUCTS
 AMSTRAD DISKS AND RIBBONS AVAILABLE – PLEASE CALL

LASER PRINTERS

CANON 8A1 (S).....£1934
 CANON 8A1 (P).....£1997
 ALL LASER ACCESSORIES
 AVAILABLE
 BROTHER 1109.....£171
 BROTHER 1409.....£372
 DIABLO 635.....£816
 NEC P5 (P).....£710

EPSON LX80 + TRACTOR £213
 EPSON LX86 (P).....£212
 EPSON GX80.....£192
 PICS FOR GX80.....£50
 EPSON EX800.....£385
 EPSON LQ1500.....£725
 EPSON SQ2000.....£1349
 EPSON DX100 (S).....£319
 EPSON SPARES.....CALL

OKi 182 (P).....£179
 OKi 84 (P).....£589
 QUME 11/40.....£949
 QUME 11/55.....£1079
 QUME 11/90.....£1249
 THE ABOVE QUME DO NOT
 INC. INTERFACES
 QUME 12/45.....£599
 JUKI.....CALL PLEASE

MODEMS ALSO SUPPLIED – EXAMPLE MIRACLE TECHNOLOGY WS2000 £99 WS4000 £129

COMPUTERS SUPPLIED AT INCREDIBLE PRICES – ZENITH, EPSON, SANYO, LOGICAL ETC.

SOFTWARE FOR AMSTRAD, ADD ON BOARDS MONITORS, ANYTHING IN COMPUTERS – CALL
 CARRIAGE ON ALL PRINTERS EXCEPT LASERS £6.50 CARRIAGE EXTRA ON ALL OTHER ITEMS
 EXCEPT AMSTRAD COMPUTERS. ALL PRICES SUBJECT TO CHANGE WITHOUT NOTICE. VAT
 EXTRA ON ALL PRICES INCLUDING CARRIAGE.

NEW WORLD COMPUTERS LTD.

61 RICHMOND CRESCENT, MOSSLEY, ASHTON-U-LYNE. OL5 9LQ TEL: 045 75 4270

The unique true multi- mode 700 cps dot matrix printer

£1995.00



The OT-700

Features:

- 700 cps in draft mode
- 350 cps in N.L.Q.
- four dot addressable graphics
- serial and parallel interfaces
- 8K buffer
- 16 inch tractor adjustable down to 4 inches

The OT-700 is the one printer
for all your office needs

Contact Micro Macro on

linkline

0800-898 404

for your nearest dealer.

Dealer enquiries welcome.

Price quoted exclusive VAT and delivery.



Northington House

59 Grays Inn Road London WC1X8TL



**micro
macro**

THERE'S A PRICE ON THEIR HEADS

...and paying it won't hang you

£599



3-7 SEPTEMBER 1986
OLYMPIA LONDON
Sponsored by Personal Computer World
SEE US ON STAND NO: 4208

£1399



Walters XT

Price includes:-

- CPU 8088/Clockspeed 4.77MHz
- 8-slot motherboard
- 256k memory expandable to 640k on board
- 360k floppy disk drive
- floppy disk controller
- keyboard
- mono monitor
- mono/parallel printer card

With 10 meg Winchester drive £899.00

With 20 meg Winchester drive £995.00

You can search high and low, but we doubt you'll find better prices for PC compatibles than these. The XT model from Walters International is an amazing £599* and the AT £1399.

Of course price isn't your only consideration. Nor is it with Walters. The machines are assembled at the company's UK factory and undergo rigorous testing procedures. And they're backed up with a 2-year on-site maintenance agreement.

If your business should expand, Walters offers a wide range of plug-compatible add-on boards and equipment that can greatly increase the power and scope of your system.

So send in the coupon today and maybe you can call off the hunt for that best value compatible.

*Prices correct at time of going to press and do not include VAT.

Walters AT

Price includes:-

- CPU 80286 Clockspeed 6 MHz
- 8-slot motherboard
- 512k memory expandable to 4 mbyte
- 1.2 mbyte floppy disk
- hard and floppy disk controller
- keyboard
- clock/calendar
- mono monitor
- mono/parallel printer card
- 4 half height drive slots

With 20 meg Winchester drive £1899.00

I would like to find out more about
PC compatibles from Walters International

Name _____

Company _____

Job Title _____

Address _____

Telephone No _____

Walters International Ltd., Matrix House,
Cressex Industrial Estate, High Wycombe,
Bucks HP12 3RD.

Tel: (0494) 32751-6 Telex: 838882 MATRIX G

PCW/9/86



If you purchased a Master 128 or ET between January-May 1986 please read on.

This is an important message for users of BBC Master Series micros purchased between January and May 1986. You should read this announcement carefully then contact your Acorn dealer if you have not already done so.

It has been found that when the battery in the above models is close to exhaustion, the microcomputer may attempt to recharge it. This is contrary to the recommendations of the battery manufacturer.

An upgrade kit which prevents this happening has been developed and is now available from any Acorn dealer at no cost. Fitting can be carried out easily either by you or free of charge by your supplier. This will not invalidate your guarantee.

If you have difficulty in obtaining a kit, please call 0223-214411 and ask for Department A2.

In the meantime, we suggest you follow standard electrical appliance guidelines and keep the power switched off when your microcomputer is not in use.

We apologise for any inconvenience that this upgrade will cause but we hope that Acorn's customers will be assured by our desire to maintain a high standard of product in the field.

Avro Systems Technology Ltd.

Apple · IBM · Apricot · Epson · Victor · Sanyo

Apricot Xi 512K 10MB	995
Apricot Xi 512K 2xDD	725
Apricot 12" Monitor	135
Apricot 9" Monitor	90
(Free On-Site Maintenance for 1 Month)	

Mitsubishi Diskettes (per box of 10)

3.5" SS DD 135 TPI	16.50
3.5" DS DD 135 TPI	24.00
5.25" DS DD 40 Trk	10.00
5.25" DS QD 96 TPI	11.50

All prices exclude VAT & Carriage

Please call for further information.

01-848 1407



79 Coldharbour Lane,
Hayes, Middx. UB3 3EF

APRICOT

HELP!

BOOKLETS
AVAILABLE FOR

**PC/Xi
MANAGER**

**PC/Xi
ACTIVITY**

Portable

F1/F1e

Xen FD/HD

F2/F10

Point 32

WordStar

SuperCalc

**BATCH
FILES**

WE NOW PUBLISH OVER 20 BOOKLETS FULL OF PRACTICAL, USEFUL HELP — THE GUIDANCE THE APRICOT MANUALS AND THE "OFFICIAL" BOOKS NEVER GAVE YOU.

SPECIFIC GUIDES COVER THE MODELS, THEIR APRICOT MASTER SOFTWARE AND THE PACKAGED SOFTWARE LISTED ALONGSIDE, WITH NEW GUIDES TO THE XEN FD/HD, POINT 32, & MS-DOS 3.10 RECENTLY PUBLISHED.

OVER 1,400 USERS ALREADY HELPED.

AS REVIEWED IN APRICOT USER (JUL 85)
COMPUTERS IN SCHOOLS (OCT 85)
WHAT MICRO (DEC 85)
AND APRICOT FILE (JUNE 86) MAGAZINES.

ALL FOR JUST £3.75/£4.25 EACH
INCLUDING P&P

WRITE OR PHONE OUR ANSWERING
MACHINE FOR FULL DETAILS.

USER PROMPT guides

54 Stanhope Road, Swadlincote,
Burton-on-Trent, DE11 9BQ
0908-665038

PAINLESS PROM PROGRAMMING



- Direct from the serial port of your PC.
- Over 35 different types of EPROM and EEPROM.
- No personality modules required.
- Manufacturers specifications accurately followed.
- User friendly software provided on diskette.
- MS-DOS, PC-DOS operating systems.
- Check with us for others.
- Computer displays status and diagnostics.

The Jebal Programmer Pod comes ready to go, with leads and software.

Price £395 exc. VAT.

Also available: 'C' Cross compiler for 8051 to run on MS-DOS.

For further details contact:

Jebal Microsystems Ltd.
Easton Lane, Winchester, Hants. SO23 7SP.
Tel: (0962) 65762.



'Have You Had Enough Of Arcade Games Or Spreadsheets?'

'There Is An Alternative..'

STRATEGIC PLUS

ATARI XL/XE
C.64 ATARI ST

SOFTWARE

IBM
APPLE II

SPECIALISTS IN QUALITY COMPUTER GAMES FOR
THE DISCERNING GAMER

Ring for our FREE Catalogue
AND DISCOVER A WORLD OF ENTERTAINMENT

01-979 2987

STRATEGIC PLUS SOFTWARE PO BOX 8 HAMPTON
MIDDX TW12 3XA

LONDON'S LARGEST DISPLAY OF PRINTERS MONITORS COMPUTERS AND PERIPHERALS

DON'T TAKE A CHANCE

—COMPARE BEFORE YOU BUY

OVER 40
PRINTERS ON
DISPLAY — MOST ON
DEMONSTRATION

HI VOLTAGE London's Largest Computer Shop

CITIZEN 120D

NLQ Dot Matrix Printer
120 c.p.s., 4K Buffer,
Friction/Tractor, Epson/
IBM Compatible

£179.95 inc VAT

COMMODORE AMIGA

In Stock Now - Phone
for free software and
peripheral catalogue

DAISY WHEEL PRINTER

Dyneer DW12. (Identical to
Silver Reed EXP400) high
quality daisy wheel printer
with superb specification.

£139.95 inc VAT

ATARI 520 STM

512K Ram Gem O.S. in
Rom plus T.V. modulator

£349.95 inc VAT

1mb Ram model
£469.95

ALL PRICES INCLUDE VAT

EXPORT

Contact our specialist export department on 01-686 6362

DOT MATRIX PRINTERS

Amstrad DMP2000 NLQ	£159.95
Brother HR5	£89.95
Brother 1409 NLQ	£275.95
Brother 1509 NLQ	£482.95
Epson P40 Thermal AC/DC	£59.95
Epson LX80 NLQ	£229.95
Epson LX86 NLQ (120CPS)	£253.95
Epson GX80 NLQ	£229.95
Epson FX85 NLQ	£409.95
Epson FX105 NLQ	£529.95
Epson EX800 NLQ	£479.95
Epson LQ800 NLQ	£559.95
Epson LQ1000 NLQ	£749.95
Epson JX80 Colour	£479.95
Canon PJ1080 colour	£379.95
Juki 5510	£289.95
Juki 5520 NLQ (colour)	£499.95
Okidata 20 Colour + software	£199.95
Shinwa CPAB0 plus NLQ	£195.95
Micro P. 165 NLQ	£239.95
Seikosha GP50A	£79.95
Seikosha GP500A	£105.95
Seikosha SP1000 NLQ	£229.95
Seikosha MP1300A NLQ 300 cps	£459.95
Smith Corona D300 NLQ	£399.95
Star NL10 NLQ incl/F	£259.95
Star SD10 NLQ	£379.95
Star SD15 NLQ	£469.95
Star SR10 NLQ	£459.95
Star SR15 NLQ	£578.95
Kaga Taxan KP810 NLQ	£279.95
Kaga Taxan KP910 NLQ	£439.95

DAISYWHEEL PRINTERS

Brother HR15(P)	£359.95
Brother HR25	£699.95
Brother HR35	£849.95
Dyneer DW12	£139.95
Epson DX100	£279.95
Juki 6000	£229.95
Juki 6100	£299.95
Juki 2200 Typewriter Pos S	£265.95
Commodore DPS1101	£279.95
Uchida DWX 305	£179.95

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.

MONITORS

Microvitec Colour	
1431 DS STD RES RGB	£209.95
1431 MZ STD RES Spectrum	£229.95
1451 DS MED RES RGB	£264.95
1451 DS MED RES QL	£264.95

1451 APDS MED RES	£333.95
1441 DS High RES RGB	£449.95
Philips Monitors (Monochrome)	
BM 7502 Green	£86.95
BM 7522 Amber	£91.95
BM 7542 Paperwhite	£98.95
Philips Monitors (Colour)	
CM 8501 RGB STORES	£209.95
CM 8524 Comp/STD	£259.95
CM 8533 RGB/IBM/MED	£299.95
1114 Monitor/TV	£199.95

COMPUTERS

Amstrad Send For Full Price List	
PCW8512 512K 2xD Drive	£571.95
PCW8256 256K 1xD Drive	£456.95
FD21 Mb Second drive	£172.95
CPS Serial/Parallel I/F	£68.95
Full range of business software	PHONE
CPC6128 Green Monitor	£298.95
CPC6128 Colour Monitor	£398.95
CPC464 Green Monitor	£198.95
CPC464 Colour Monitor	£298.95
FD1 Second drive including cable	£107.95
MP2 Modulator	£29.95
Atari Send For Full Price List	
520ST ROM O.S. + Database	£329.95
520STM	£349.95

1040STF 1MB + D.D. + Col. Mon.	£1149.95
500K ST Disk Drive	£142.95
1MB ST Disk Drive	£195.95
ST Colour Monitor Std Res	£289.95
ST 10MB Winchester Hard Disk	£829.95

BBC Send For Full Price List
NewMaster Series

PHONE

Commodore Send For Full Price List

NEW CBM 64C	PHONE
CBM 128/CPM Compatible	£259.95
CBM 128D inc 1571	£499.95
CBM 128D + Monitor	£599.95
CBM 1541 Disk Drive for 64	£164.95
CBM 1571 Disc Drive for 128	£259.95
CBM 64	£159.95
DPS 1101 Daisy Wheel Printer	£279.95
MPS 803 Printer	£149.95
MPS 1000 NLQ Printer	£249.95
1900M Green Screen Monitor	£99.95
1901C RGB Colour Monitor	£289.95
Commodore Amiga	PHONE

Sanyo	
MBC 555 128K 2 x 160K	£399.95
Sinclair Send For Full Price List	
QL	£159.95
Spectrum PLUS	£109.95
NEW Spectrum 128K	£129.95

EXCHANGE YOUR PCW8256 FOR A NEW PCW8512 OR AMSTRAD PC (IBM)

For not much more than
the cost of the second
disc drive.
Phone for details

DAISY WHEEL PRINTER PACKAGE FOR PCW8256/8512

£199.96 + VAT
(£229.95 inc VAT)

Everything you need to produce
letter quality print from the
Amstrad PCW range inc:
Dyneer DW12 printer, interface,
cable and W/P software.

NEW AMSTRAD PC (IBM COMPATIBLE)

IN STOCK NOW
Phone for details

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

Floppy disks from BASF, 3M, Verbatim, Dysan,
TDK, Sony, Maxell and JVC.

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 you can Telex your order
on: 946240 Attn 19001335

OPEN MONDAY-SATURDAY 9 AM-6 PM

OPEN MONDAY-SATURDAY 9 AM-6 PM

ALSO VAST RANGE OF DISK DRIVES, JOYSTICKS, DISK BOXES, INTERFACES, SHEETFEEDERS, ETC.

HI VOLTAGE 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.S.O.S.

Hands up who would like an IBM® PC, AT or compatible?



Hands up who would like a multi-user IBM® PC, AT or compatible?



Transform your PC, AT or compatible, into a real multi-user small business system with a single add-in card from Technology Concepts Limited.

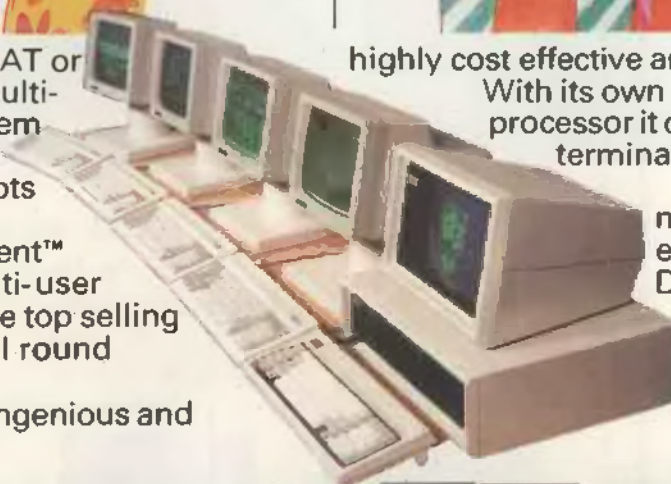
By running Concurrent™ PC-DOS you get true multi-user and continue to run all the top selling PC-DOS packages with all round compatibility.

At the heart of this ingenious and

highly cost effective answer is the TCL+4 card. With its own on-board Intel™ iAPX 188 processor it drives up to 4 standard terminals at 19,200 baud.

Now you can go multi-user with speed, ease and style!
Do we have to say more?

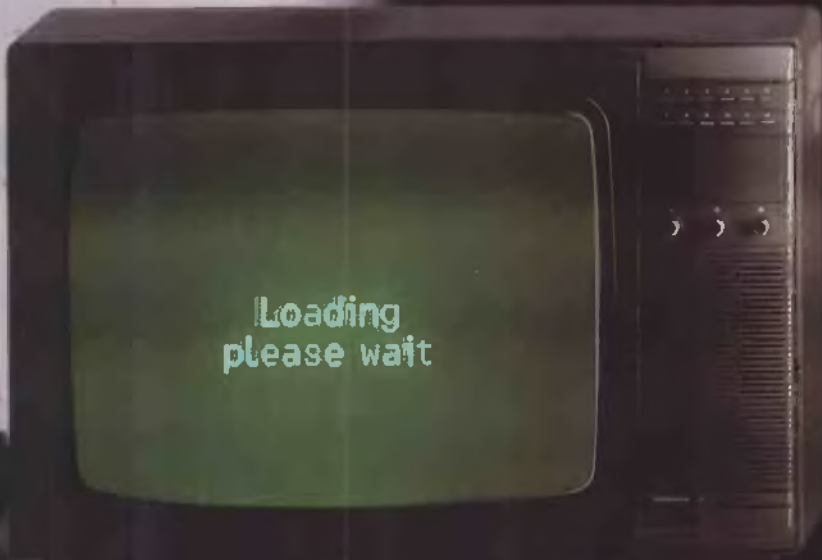
Intel is a trademark of Intel Corporation Inc.
IBM is a trademark of International Business Machines Inc.
Concurrent is a trademark of  DIGITAL RESEARCH
Digital Research Inc.



A stroke of genius from

Full technical data available from
Technology Concepts Limited, Raglan House,
Llantarnam Park, Cwmbran, Gwent NP44 3AX,
U.K. Telephone 06333 72611.

TECHNOLOGY CONCEPTS LIMITED



Loading
please wait

While other computers are still
starters orders, you're off and running

The Amstrad 6128 has a built-in advantage over most other home computers.

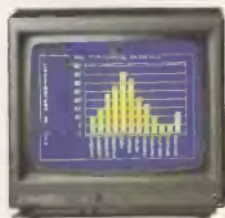
Its fast loading disc drive unit.

An ordinary cassette driven computer can take as long as 15 minutes to load.

Whereas the 6128's built-in disc drive will load the same programme in seconds.

Which means you don't waste valuable playing time loading.

And it also means you can quickly get into more sophisticated programmes using more of the 6128's big 128K memory.



Loads more business programmes

There are hundreds of games to play on the 6128, but it also has its serious side.

It can handle spreadsheets, database and account management programmes.

It can file and index, produce standard letters and compile reports.

And it will even keep track of rates, mortgage and H.P. payments for you if you want it to.

The 6128 comes complete with green screen or full colour monitor, as well as keyboard with



under
nning.



built-in disc drive.

But if you want still more, additional disc drives, printers and joysticks are all available.

You could be off and running on a 6128 for as little as £299 (green screen) or £399 (colour monitor).

At those prices, you won't be surprised to learn that it sells almost as fast as it loads.

WITH GREEN SCREEN AROUND

£299

WITH COLOUR MONITOR AROUND

£399

Please send me more information fast.

Name _____

Address _____

6128/PCW1

The Amstrad 6128.
With disc drive and 128K memory.
Amstrad P.O. Box 462, Brentwood, Essex CM14 4EF.

Back-up your PC/XT/AT- and most compatibles with the CRISTIE TS1000.

- The TS1000 backs up all files through a file image or selectively backs up files (modified files only dated files etc.)
- Directory of files backed up available on screen or printer.
- Selective restore.
- Needs no internal slots.
- Friendly menu driven operation or command line.
- Password protection of data volumes.
- Designed, manufactured and supported in the U.K.
- £955 end user.

**"Best all-round
Tape Streamer."**

P.C. BUSINESS WORLD
JUNE 1985.

**25 MByte
Capacity**

**Operates
with the AT and
PC Compatibles
as well as with
the XT.**

**"The TS1000
distinguishes
itself by paying
attention to detail
in the software
utilities."**



Cristie Electronics Limited
Bonds Mill, Bristol Road, Stonehouse, Glos. GL10 3RG.
Telephone: 045382-3611

ATARI COMPUTERS



The 1040ST, 520ST and 520ST+ come with os and gem in rom and logo, basic, neochrome, flashword, db master one, doodle and megaplot, 1040ST with disc drive, mouse and monitor - monochrome £238 (£183) £918, colour £1046 (£1046) £1158. Atari 520ST Computer (512K version) £380 (£238) £378. Atari 520ST+ (1 Megabyte version) £435 (£416) £466. Limited period special offer: Atari 520ST+ with 500K disc drive £412 (£396) £456. Atari 520ST+ with 500K disc drive £501 (£479) £539. 1 megabyte upgrade for the Atari 520ST £39 (£29) £109. Cumana economy 1000K disc drive for the 520ST+ single £148 (£148) £170, dual £235 (£235) £271. Atari 500K ST disc drive £130 (£132) £152. Atari 1000K ST disc drive £173 (£172) £192. Atari ST monochrome monitor £136 (£148) £194. Economy Fidelity ST colour monitor £199 (£204) £264. Atari 14" medium resolution ST colour monitor £354 (£349) £399. 20 Megabyte ST hard disc £730 (£899) £789. Atari 120XE computer + game £115 (£121) £141. 120XE computer + cassette recorder + software £148 (£147) £172. 120XE computer + disc drive + software £234 (£233) £263. 130XE computer + disc drive + 1027 printer + software £307 (£309) £389. Atari 1027 £116 (£122) £148. Atari 1050 £116 (£122) £148.

SINCLAIR COMPUTERS



Sinclair Spectrum 128 £136 (£138) £150. Sinclair pocket TV £97 (£95) £101. Sinclair QL Computer £194 (£196) £229. QL Floppy disc interface (See Cumana disc section below for suitable disc drives) £86 (£84) £94. Sinclair Spectrum Plus Computer £88 (£96) £119. Spectrum Plus Computer + cassette + 4 games + joystick with interface £129 (£129) £159. Kit to upgrade the Spectrum to Spectrum Plus £40 (£40) £58. Microdrive £49 (£50) £86. RS232 interface £49 (£50) £80. Special offer: Microdrive + interface 1 + 4 blank cartridges £37 (£39) £197. Blank microdrive cartridge £2.50 (£3) £4. Spectrum floppy disc interface (See Cumana disc section for suitable disc drives) £107 (£99) £109. Spectrum Centronics printer interface £46 (£42) £47.

SWANLEY ELECTRONICS

The Computer Export Specialists
Dept PCW, 32 Goldsel Rd., Swanley, Kent BR8 8EZ, England

Tel SWANLEY (0322) 64851. 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.

COMMODORE COMPUTERS

Commodore 128 £250 (£249) £279. New Commodore 128 compendium pack £275 (£275) £310. Commodore 1280 £466 (£466) £510. 1571 Disc drive £257 (£250) £270. Commodore 64 + recorder + musicmaker keyboard + software £191 (£195) £226. Converter to allow most ordinary mono cassette recorders to be used with the Commodore 128 and the Commodore 64 £9.78 (£9) £11. Centronics printer interface for Commodore 128 and the Commodore 64 £30 (£30) £35. MPS803 Printer £138 (£145) £175.

AMSTRAD AND ENTERPRISE COMPUTERS

New Amstrad PCW8612 £544 (£575) £675. Amstrad PCW8256 £449 (£460) £550. Amstrad 464 Colour £297 (£322) £402. Amstrad 464 Green £197 (£230) £310. Amstrad 128 Colour £397 (£420) £500. Amstrad 6128 Green £297 (£322) £462. Amstrad DMP2000 printer £154 (£159) £191. Extra disc drive for Amstrad £128 £99 (£143) £133. Enterprise 64 £110 (£116) £156. Enterprise 128 £159 (£163) £203. Enterprise disc drive interface (See Cumana disc drive section for suitable disc drives) £84 (£80) £85.

CUMANA DISC DRIVES

To suit disc interfaces of Sinclair QL, Spectrum, Enter price and BBC. B. 80 track double sided, cased and with power supply: single 3.5" £134 (£134) £156, dual 7.5" £224 (£224) £254, single 5.25" £172 (£172) £201, dual 5.25" £310 (£310) £350.

PRINTERS

New Epson LX80 £249 (£249) £282. Tractor for LX80 £20 (£20) £30. Brother HPS £111 (£113) £133. Brother M1109 £220 (£220) £280. Shiva CT1 CP480 + £193 (£192) £228. Cannon PW1080A £309 (£308) £356. Micro peripherals MP165 £223 (£223) £263. Brother EP44 £224 (£220) £240.

PCW
Stand
No 1617



A NEW NAME IN GAMES FROM MACMILLAN PUBLISHERS

Get in the swim with these great games
fished from the Piranha tank.

- ★ ROGUE TROOPER ★
- ★ THE TRAP DOOR ★
- ★ NOSFERATU THE VAMPYRE ★
- ★ STRIKE FORCE COBRA ★
- ★ THE COLOUR OF MAGIC ★

Spectrum · Commodore · Amstrad ·

For further information on Piranha software
please contact: **Richard Bason, Piranha**
4 Little Essex Street London WC2R 3LF

Tel: 01-836 6633

SIERRA Computer Consultants Ltd.

TANDON, OLIVETTI, JUKI, PEGASUS, SAGE, CASHLINK, AUTHORISED DEALERS

FREE
***640 KB UPGRADE & PRINT
SPOOLING SOFTWARE ON ALL
SYSTEMS SOLD THIS MONTH***

***VERY SPECIAL PRICES ON
PEGASUS EP.O.A***



PCX, THE TANDON XT
Intel 8088, 360Kb FDD, 640 KByte main
storage memory 20 MByte Fixed disk drive.
14" Tilt/Swivel Hi Res monitor, keyboard,
MSDOS

**The PCX-20 costs £1495
or PCX-10 Mb £1295**

SOFTWARE PACKAGES

dBASE II	£251
dBASE III PLUS	£355
DELTA 4	£364
FRAMEWORK II	£339
LOTUS 123 V2	£275
MULTIMATE	£276
MULTIPLAN	£165
NORTON UTILITIES	£62
SAGE BOOK-KEEPER	£199
SAGE ACCOUNTANT	£459
SAGE PAYROLL	£140
SMART SYSTEM V3	£495
SYMPHONY	£358
WORDSTAR	£191
WORDSTAR 2000	£294
WORDSTAR PROF	£241



PCA, THE TANDON AT
Intel 80286 6/8 Mhz, 1.2 Mb FDD, 640 KByte
main memory, 30 MByte Fixed Disk, 14"
Tilt/Swivel Hi Res monitor, keyboard, MSDOS

**NEW PCA-40 £2995
THE PCA-30 costs £2495
or PCA-20 Mb £1995**

HARDWARE UPGRADES

10 MByte fixed disk	£395
20 MByte fixed disk	£475
Mono Graphics card	£190
Hercules color card	£146
Microsoft mouse	£138
Sage Chat Chat modem	£298

PRINTERS

Epson FX85	£339
Epson FX105	£459
Epson L8000	£486
Juki 5510	£269
Juki 6000	£199
Juki 6100	£349
CANON PW1156a	£389
CANON PW1080a	£259

olivetti



OLIVETTI M19	£P.O.A
OLIVETTI M22	£P.O.A
OLIVETTI M24	£P.O.A
OLIVETTI M24SP	£P.O.A
OLIVETTI M28	£P.O.A

RENTAL PACKAGES

1. TANDON PCX-20 LOTUS 123 EPSON L8000 Disks & paper Cash price £2579 Rent from £25pw	
2. TANDON PCA-30 CONCURRENT DOS TAPE STREAMER 2 WYSE TERMINALS EPSON L1000 Disks & paper Cash price £5295 Rent from £50pw	

Rental prices include full insurance cover and on site maintenance. There are just a small sample from the wide range of packages available. Please telephone for your particular requirements. Agencies and exclusive of VAT and carriage.

SANDERSON CENTRE, LEES LANE, GOSPORT, HANTS PO12 3UL. Telephone: (0705) 504874

Computers by Post

LOWEST U.K. PRICES GUARANTEED



PRINTER RIBBONS

		2+	5+	12+
ACORN	AP80	£2.95	£2.40	£2.30
	AP100	£2.95	£2.40	£2.30
AMSTRAD	DMP1	£3.90	£3.30	£3.10
	DMP2000	£4.60	£4.30	£4.20
BROTHER	PCWB256/8512	£4.60	£4.30	£4.20
	HR5	£3.00	£2.80	£2.60
BROTHER	HR15 Corr	£2.90	£2.50	£2.30
	HR15 FAB	£3.60	£3.10	£2.90
BROTHER	HR15 MS	£3.50	£3.00	£2.80
	HR15 also for HR25/HR35			
CANON	EP44	£2.90	£2.50	£2.30
	M1009	£3.70	£3.20	£3.00
CANON	PW1080A Black	£3.40	£2.90	£2.70
	PW1080A Red or Blue	£5.30	£4.70	£4.40
CANON	PJ1080 Ink Jet Colour, One Off			£10.90
	PJ1080 Ink Jet Black, One Off			£8.90
CBM	1515	£2.95	£2.40	£2.30
	1525	£2.95	£2.40	£2.30
CBM	MP5801	£3.90	£3.30	£3.10
	802/1526	£4.00	£3.20	£3.00
CBM	803	£3.70	£3.20	£3.00
	MP51000	£3.00	£2.60	£2.40
CBM	4022	£3.00	£2.60	£2.40
	MSC801 Colour, One Off			£18.50
CENTRONICS	DPS1101 SS	£1.60	£1.30	£1.20
	DPS1101 MS	£2.50	£2.10	£2.00
CENTRONICS	DPS1101 Corr	£1.80	£1.50	£1.40
	GLP	£3.70	£3.20	£3.00
CITIZEN	120D	£5.00	£4.60	£4.30
	2000 MS	£3.10	£2.60	£2.40
DAISYSTYEP	2000 FAB	£4.90	£4.20	£4.00
	EPSON			
EPSON	MX/FX/RX80 Black	£3.00	£2.60	£2.40
	MX/FX/RX80 Red or Blue	£4.20	£3.50	£3.30
EPSON	100 Series	£5.00	£4.60	£4.30
	LX80	£3.00	£2.60	£2.40
EPSON	JX80 Colour, One Off			£18.50
	LQ800	£3.90	£3.50	£3.30
JUKI	LQ1500	£4.50	£3.90	£3.60
	6000/2200 FAB	£3.70	£3.40	£3.20
JUKI	6000/2200 Corr	£4.00	£3.60	£3.40
	6000/2200 SS	£3.10	£2.70	£2.50
JUKI	6100 MS	£2.50	£2.10	£2.00
	6100 SS	£1.60	£1.30	£1.20
JUKI	6100 Corr	£1.80	£1.50	£1.40
	KP810 Black	£3.40	£2.90	£2.70
KAGA	KP810 Red or Blue	£5.30	£4.70	£4.40
	MT80	£4.00	£3.20	£3.00
M/TALLY	80/82	£1.60	£1.30	£1.20
	84	£3.90	£3.40	£3.20
M/TALLY	Male 20 Colour	£7.00	£6.50	£6.20
	Male 20 Black	£6.60	£6.20	£6.00
OKI	KX1091/2	£5.00	£4.60	£4.30
	DWP1120 MS	£3.10	£2.60	£2.40
PANASONIC	DWP1120 FAB	£4.90	£4.20	£4.00
	QUENDATA			

QUME	Sprint 7/9 MS	£3.10	£2.60	£2.40
	Sprint 7/9 FAB	£4.90	£4.20	£4.00
SEIKOSHA	GP50	£6.00	£5.50	£5.20
	GP80	£2.95	£2.40	£2.30
SHINWA	GP100/250	£2.95	£2.40	£2.30
	GP500/550	£3.90	£3.30	£3.10
SMITH	GP700 Colour, One Off			£18.50
	SP1000	£6.00	£5.50	£5.20
CORONA	CP80	£4.00	£3.20	£3.00
	TP1 M/S	£8.50	£7.90	£7.20
CORONA	TP1 Fabric	£3.90	£3.60	£3.40
	TP1 Corr	£5.00	£4.70	£4.50
STAR	Forrest 80X	£6.00	£5.50	£5.30
	D100/200	£9.00	£8.50	£8.20
STAR	D300	£6.00	£5.50	£5.30
	DP/GEM/SG	£1.60	£1.30	£1.20
STAR	SR15	£4.90	£4.50	£4.30
	NL10	£5.60	£4.90	£4.60

FLOPPY DISKS

JVC inc Plastic Case	MD-1D	S/size D/dens 40TR	£9.99	£9.50	£9.25
	MD-2D	D/size D/dens 40TR	£11.99	£11.50	£11.25
JVC	MD-2DD	D/size Q/dens 80TR	£15.99	£15.50	£15.25
	MD-2HD	D/size H/dens 1.6MB	£26.99	£25.99	£25.49
BASF	1D	S/size D/dens 40TR	£10.99	£10.50	£10.25
	2D	D/size D/dens 40TR	£12.99	£12.50	£12.25
BASF	1D/96	S/size Q/dens 80TR	£13.49	£12.99	£12.49
	2D/96	D/size Q/dens 80TR	£16.49	£15.99	£15.49
BASF	2HD	D/size H/dens 1.6MB	£28.49	£27.49	£26.49
	VERBATIM - DATA LIFE				
JVC	MD525	S/size D/dens 40TR	£11.99	£11.75	£11.49
	MD550	D/size D/dens 40TR	£14.99	£14.75	£14.49
JVC	MD577	S/size Q/dens 80TR	£14.99	£14.75	£14.49
	MD557	D/size Q/dens 80TR	£19.99	£18.99	£18.50
JVC	MD HD	D/size H/dens 1.6MB	£27.99	£26.99	£25.99
	SONY	S/size D/dens 40TR	£12.49	£11.99	£11.75
SONY	SONY	D/size D/dens 40TR	£15.49	£14.99	£14.75
	SONY	D/size Q/dens 80TR	£20.49	£19.99	£19.75
BULK 3 1/2" D/SIDE D/DENS DISKS BY VERBATIM	5 x Disks		£3.13 each	£15.65 pack	
	10 x Disks		£2.50 each	£25.00 pack	
3" DISKS	CF2 5 Disks		£3.49 each	£17.45 pack	
	CF2 10 Disks inc plastic library case		£3.05 each	£30.50 pack	
3" DISKS	CF2DD 5 Disks		£6.10 each	£30.50 pack	
	CF2DD 10 Disks inc plastic library case		£5.25 each	£52.50 pack	

DISK STORAGE



LOCKABLE DISK BOXES			
MODEL	SIZE	CAPACITY	PRICE
DD40L	3 1/2"	40	£8.90
MD60T	3 1/2"	60	£12.50
DD50	5 1/4"	50	£8.90
DD70	5 1/4"	70	£10.90
DX85	5 1/4"	90	£12.90
DD100	5 1/4"	100	£13.90
LIBRARY CASE	5 1/4"	10	£1.50
NON-LOCKABLE DISK BOXES			
MD12/30	3 1/2"	24	£7.20
MF50	5 1/4"	50	£8.00
MICRODRIVE HOLDERS			
WALLET		4	£1.75
WALLET		20	£4.50

PRINTER CABLES & INTERFACES



AMSTRAD	Parallel	£8.90
ATARI ST	Parallel	£14.50
BBC	Parallel	£6.50
IBM	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			
SIZE	GSM	QUANTITY	PRICE
11 x 9 1/2	60	2000	£12.90
11 x 9 1/2	80	2000	£15.90
EXACT A4	70	2000	£21.50
11 1/2 x 9 1/2	90	1000	£13.50
			£11.25

COMPUTER LABELS

PRICE PER THOUSAND			
	1000	2000+	
70 x 36mm	£4.40	£4.00	
89 x 36mm	£4.50	£4.10	
89 x 49mm	£6.20	£5.70	
102 x 36mm	£4.70	£4.40	
Please state number of labels across sheets (1, 2 or 3).			

ENVELOPES

PRICE PER BOXED BOX			
	500	1000	
110mm x 220mm White Self Seal 90gsm	£11.50		
110mm x 220mm Manilla Bonker Gummed 70gsm	£9.50		
324mm x 229mm Manilla Self Seal 90gsm	£17.90		

PRINTERS

Epson LX80	£189.95	Star SD15	£429.95
Epson LX86	£209.95	Star SR15	£479.95
Epson FX85	£334.95	Julia 6100	£249.95
Epson FX105	£435.95		
Epson EX800	£386.95	Acom BBC Master	£419.95
Epson LQ800	£454.95	Amstrad PCW8256	£389.95
Epson LQ1000	£607.95	Amstrad PCW8512	£489.95
Epson JX80 colour	£369.95	Amstrad CPC464 Green	£169.95
Citizen 1200	£155.95	Amstrad CPC464 Colour	£254.95
Amstrad DMP2000	£139.95	Amstrad CPC6128	£339.95
Brother 1509	£416.95	Amstrad CPC6128 Colour	£339.95
Okidata 20 Colour	£169.95	Atari 520ST ROM	£269.95
Micro P MP165	£199.95	Atari 520STM	£279.95
Seikosha SP1000A	£199.95	Atari 1040STF + mono mon.	£685.95
Seikosha MP1300A	£349.95	Atari 1040STF + col. man.	£799.95
Star NL10 inc I/F	£209.95	Commodore C64	£139.95
Star SG15	£299.95	Commodore C64C	P.O.A.
Star SD10	£299.95	Commodore C128 + case	£209.95

COMPUTERS

Commodore C128D	£429.95
Commodore MP5803	£129.95
Commodore MP51000 NLQ	£219.95
Commodore DPS1101 Daisy	£239.95
Commodore C1901 col. mon.	£259.95
Commodore C1541 D. Drive	£143.95
Commodore C1571 D. Drive	£233.95
Commodore C2N Cass.	£29.95
Sinclair Spectrum Plus	£89.95
Sinclair Spectrum 128	£119.95
Sinclair QL	£159.95

MONITORS

Philips CM8501	£205.95
Philips CM8524	£229.95
Philips CM8533	£265.95
Philips BM7502 Green	£79.95
Philips BM7522 Amber	£85.95
Philips BM7542 White	£89.95
Philips BM7513 IBM	£105.95

SOFTWARE

AMSTRAD
COMMODORE • BBC
The UK's Lowest Prices
Phone for our list

DELIVERY

Hardware
E5 + VAT 4 Day Delivery
E9 + VAT 24 Hour Delivery

GALASET 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, Galaset will refund the difference.

All prices exclude VAT
CREDIT CARD HOT-LINE

01-760 0014

Galaset Ltd, 30 Bayford Road, Littlehampton, West Sussex.

Export Enquiries Welcome

To: **Galaset Ltd, 30 Bayford Road, Littlehampton, West Sussex.**
I wish to order _____

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

Name _____

Signature _____

Address _____

Postcode _____

Tel No: _____

APPROVED

FOR

SOFTWARE

by



PEGASUS

Single-User, Senior, Multi-User

WORDRAFT

Lotus

Symphony

dBASE II & III PLUS



HARDWARE

by

IBM

Personal Computers

COMPAQ®

apricot

VICTOR

Panasonic



PRINTERS

by

EPSON

brother

OKI

Canon

Laserjet

IBM

Quietwriter



NETWORKING

by

NOVELL



SERVICES

Installation

Training

Maintenance

Hotline Support

After-Sales Service



**Da Vinci
Computers**

01-202 2272/3/4

112 Brent Street London NW4 2DT

Telex: 265871 (MONREF G) Refer to 81:MMD 102

Telecom Gold: 81: MMD 102

We Want Your Seal Of Approval.

EVEN THE PRICE IS MICRO



OSL PROGRESSIVE BUSINESS PACKAGE

A complete package for the small or medium sized business from only £2495 + VAT (delivered).

This unique combination of hardware and software creates a 3 in 1 package.

Comprising: Cordata PC/XT, 512K RAM, 20 MB HD, Citizen MSP25 printer, MILLION integrated accounts package, MY WORD word processing including mail merge and spelling verifier, and the TWIN spreadsheet package.

OSL Progressive Business Package — A complete working office that works out cheaper.

THE DESKTOP PRINTSHOPTM

The Quality Laser Printer That's Fast, Quiet, and User Friendly.

The Desktop Printshop is designed with a superior and unique range of performance benefits as standard to deliver more than any other comparable Laser printer.

- ☛ Professional, typeset quality output.
- ☛ Powerful High Speed Graphics — 300 x 300 dots per inch at speeds up to 30 times faster than Hewlett Packard LaserJet.
- ☛ IBM PC* and PC compatible Hardware Interface.
- ☛ Epson* software emulation.
- ☛ Letter Quality, variable page formats, with printing speeds to 8 pages per minute.
- ☛ 38 Fonts — downloaded automatically.

The Desktop Printshop — quietly delivering more print performance at less cost than a fully equipped Daisywheel or Graphics Printer.

Discover the advantages . . .



©1986, Corona Data Systems, Inc. Specifications subject to change without notice. Desktop Printshop is a trademark of Corona Data Systems, Inc., PC and IBM are registered trademarks of International Business Machines Corp. Epson is a trademark of Epson America, Inc.

The 9th
**Personal
Computer**
World
Show

**3-7 SEPTEMBER 1986
OLYMPIA LONDON**



'Computer hardware & software that wears well'

OLYMPIC SYSTEMS LIMITED

BOSTON ROAD, BEAUMONT LEYS, LEICESTER LE4 1AA.

Telephone: (0533) 358399. Telex: 342208 LYMPIC G

London: 43 NEW OXFORD STREET, LONDON WC1A 1BH. ENGLAND

Telephone: 01-240 8828. Telex: 291088 MARINE G

**See us on stand
No 4041**

THE FIRST SERIOUS SOFTWARE AT UNDER £60

STAND NO
3122
AT PCW SHOW

Now from Timeworks comes a range of advanced software that gives you *real* power and *real* performance. A range that maximises the capabilities of your Commodore 128 or Atari ST. And all at a quite remarkable price.

Timeworks is one of the leading software publishers in America, where all four of these programs have already enjoyed enormous success with home and business users alike. The versions available here have been specially re-written for the U.K.

Each program is exceedingly easy to use, both individually or when interfacing with each other.

With Timeworks you don't just get better software, you get a better back-up service too.

First of all, there's our Customer Technical Support Helpline. Should you have any problems at all just ring us on Maidenhead (0628) 74678.

Secondly, all four programs carry our no-quibble Money Back Guarantee. If, for any reason, you're not happy with your Timeworks program, just send us your Timeworks package together with your receipt within 30 days and we'll send you a full refund.

Thirdly, if at any time we update a program, you may exchange your original program for it, paying only the difference in price (if any) plus £7 to cover packing and delivery.

WORD WRITER £57.50

with Spell Checker

- A super-efficient, 80-column professional word-processing system which includes an 85,000 word Spelling Checker and also a built-in, 5-function calculator.
- Contains all the features you'll need for everyday word-processing, plus most of the sophisticated features found in more expensive programs: on-screen highlighting; superscript and subscript; headers and footers; document chaining; form letter printout; page separations; horizontal and vertical scrolling; and more.



DATA MANAGER £57.50

with Report Writer

- A complete general information storage and retrieval system with report-writing, graphics, statistics, and label-making capabilities.
- Exclusive X-SEARCH, X-SORT and X-CHART features allow you to cross-search any category of information; sort items alphabetically, numerically or by date; break down statistical information into categories; and graphically view your results.

SWIFTCALC £57.50

with Sideways & Super Graphics

- A powerful easy-to-use electronic spreadsheet designed for home and small business life.
- Super Graphics: Graphically displays and prints out numerical information using pie charts; vertical bar charts; scatter diagrams; line graphs; and three-dimensional staggered bar charts.
- The Sideways option lets you print all your columns on one continuous sheet ... sideways.

- 250 rows and up to 250 columns provide up to 62,500 cells in which to place information.
- Performs mathematical functions up to 17 digits.

SIDEWAYS £34.50

- Prints your spreadsheet reports sideways – eliminates the need to cut and paste together multiple sections of a printout.
- Can print any normal text of virtually any width. Allows an almost unlimited number of columns (more than 65,000 characters) on a continuous line of output.
- Wide variety of type size; also complete control over line and character spacing.

Timeworks programs are now available at leading stockists. If you have difficulty in obtaining them ring our Customer Support Helpline on 0628 74678 or write to us at Timeworks (UK) Ltd., P.O. Box 453, Maidenhead, Berkshire SL6 1ST.

TIMEWORKS

GEMINI

PROMOTING PERSONAL

INTERgem

THE MULTI-STANDARD DISK INTERFACE FOR THE AMSTRAD PCW

INTRODUCTION The AMSTRAD DISK DRIVE ADAPTOR ('InterGem') will allow the fitting of any BBC Microcomputer compatible disk drive to the AMSTRAD PCW 8256, in place of the second disk drive. The drive(s) may be 5.25", 3.5" or 3", 80, or 40/80 track; half-height and with or without power supply. 'InterGem', which should NOT be confused with other inferior products which it clearly out-performs, is easily fitted via the front panel which covers the slot for the second drive, and where the Amstrad label is affixed.

'InterGem' offers an additional 720 kilobytes of storage space, four times the amount offered in a single drive system. It allows a 5.25"/3.5" drive to mimic the AMSTRAD PCW 8256 second drive.

HARDWARE 'InterGem' is supplied in the form of a PCB, mounted on a replacement front panel. The PCB of 'InterGem' has the necessary connectors for linkage to the PCW 8256 second drive connectors. Connections are also available for the linkage of a BBC compatible disk drive WITHOUT POWER SUPPLY, via a socket on the 'InterGem' front panel.

SOFTWARE The software supplied is on 3" disk, and enables the user to configure a 5.25" or 3.5" BBC compatible drive to accept CP/M disks in double density format for nearly 80 other machines.

'InterGem' can also be used in the same way as the 3" PCW second drive, with LOCOSCRIP and CP/M. Software is provided to enable the PCW, via 'InterGem', to READ FROM and WRITE TO machines running MS-DOS/PC-DOS, including the IBM PC/PC-XT formats and compatibles, (and APRICOT computers using 3.5" drives), and the BBC Microcomputer using a double density DFS (e.g. Watford DDFS, Solidisk DDFS, Acorn ADFS, OPUS D-DOS, etc.). In addition to this software a program is included which will allow the transfer of information on single density BBC disks to double density (using a BBC).

This package also comes complete with a comprehensive, user-friendly manual which explains the installation and use of 'InterGem' and accompanying software.



IMPORTANT ADVANTAGES OF

'InterGem' The cost of 'InterGem', plus a new 40/80 track, double side 5.25" disk without power supply, is comparable to the cost and installation of the Amstrad PCW 3" second drive.

One of the chief advantages is the cost and availability of the media, as double density 5.25" disks are at least a third of the cost of double density 3" disks (CF2-DD). In effect, a company using 50 or more disks would recover its outlay for 'InterGem' PLUS the drive, because of the swinging price differential between 5.25" and 3" disks. (If you can get them!)

Importantly too, there is a great deal of commercial software available in CP/M on 5.25" disks, which the installation of 'InterGem' would allow the user to take advantage of on his AMSTRAD PCW 8256, where that software is not available on 3" disk. Many companies and educational establishments with information stored on 5.25"/3.5" disks, in CP/M, MS-DOS/PC-DOS, or ACORN 1770 DFS (or equivalent) formats, (with readily available 5.25" disk drives), would find the AMSTRAD DISK DRIVE ADAPTOR an invaluable asset if they wished to take advantage of the AMSTRAD PCW 8256 and its facilities.



FREE with InterGem comes the classic **SPACE INVADERS**, the **FIRST** arcade action game ever to be written for the Amstrad PCW

£99.95 inc.
or with 400K D/S drive
ready **to run £199.95 inc.**

Are you frustrated with this print quality? or indeed, even this?

**NEW
for the PCW!
£19.95
inc.**

FONTgem

8 ALTERNATIVE TYPEFACES IN NLQ!

'FontGem' for the PCW is a revolutionary piece of software that will enhance your printed Locoscript documents (and all other text files) beyond belief! Simply install 'FontGem' on your work disk, and choose which super business font you require from the menu. From then on, your PCW printer will use the font you have chosen, and will respond, automatically to style and emphasis changes marked in your text. Please note that 'FontGem' is a low level software patch to CP/M, and will therefore work with ALL your software.

PRODUCTIVITY FOR THE AMSTRAD PCW

DATA *Gem*

£39.95
inc.

THE DEFINITIVE DATA BASE FILING SYSTEM

OUTLINE In view of the incredible success of the Amstrad PCW8256, and now the PCW8512, the market for suitable serious software to complement the primary word processing function is expanding rapidly. The first reaction of most software houses in their anxiety to capture their slice of that market is to look to existing products and re-compile their source code on the Amstrad computer. Any software technician will agree that this cannot result in 'optimised' code, and in most cases, this procedure will not always allow the exploitation of the superb features of the Amstrad PCW, such as the RAM disk, the printer and the 2nd optional double-density disk drive if fitted (although standard on the PCW8512).

Gemini have written 'DataGem' SPECIFICALLY for the Amstrad. It uses ALL the features of the hardware, and uses advanced 'hashing' techniques to provide the FASTEST sorts and searches. It also boasts features that represent the state-of-art of today's databases, not those written years ago which were always an attempt just to replace the ubiquitous card index.

BBC ROM VERSION
(£39.95 also)

Please enquire

'DataGem' SPECIFICATIONS

- Fully compatible with 'InterGem' • MENU DRIVEN with prompts – ideal for both novice and professional • Record CAPACITY up to 32,000 or even more with a hard disk • Up to 1498 chars per record • Uses RAM DISK and 1 or 2 other logical drives, e.g. :A and :B • Up to 32 FIELDS • Up to 8 KEY FIELDS, each with up to 31 chars indexed for FAST retrieval • CHARACTER fields (string) of up to 88 chars, using FULL WIDTH of PCW screen • NUMERIC fields up to 9 digits, 8 decimal places if required • DATE fields validated by internal calendar, and automatically sorted chronologically • MONEY fields allow automatic insertion of commas • 1 or 2 FILES OPEN at one time • Supplied PRINTER FULLY SUPPORTED with 2 user-definable REPORT templates for each file • FUNCTION KEYS are definable • PAINT on screen file LAYOUT • SEARCH on ANY field or fields with up to 32 criteria • LIGHTNING FAST searches using 'hashing' techniques • Perform MATHEMATICAL CALCULATIONS on numeric fields • Printer SUMMARIES of data include COLUMNS, TOTALS, AVERAGES, NUMBER OF RECORDS FOUND etc. • MERGE file option for EXPANDING files or exchanging information without tedious re-typing
- Easy on-screen EDITING and DELETION
- Professional MANUAL and auto-boot DISK – with simple installation procedure, no complex CP/M commands to master
- Software FULLY SUPPORTED with NO CHARGE and NO TIME LIMIT • Available EX-STOCK – price sterling £39.95 includes VAT and P/P • Trade, export and licensing enquiries welcome,

CARE!!! GEMINI suggest that you check PRICE, PERFORMANCE and SPECIFICATION before you buy your Amstrad software. We shall be pleased to advise customers in respect of special database implementations, and use of 'DataGem' with hard disk systems. Gemini are also able to supply your HARDWARE requirements. Please telephone for details.

**The Amstrad PCW made the typewriter obsolete...
DataGem will now make your Amstrad PCW absolute.**

Distributed to the trade by

CentreSoft
Tel: 021 3563388

*All work and no play
makes Jack a dull boy!
Come on – spoil yourself –
play Classic Invaders!*

SUPERNOVA SOFTWARE CLASSIC SPACE INVADERS

**COMING SOON....
CLASSIC PACMAN
AND FROGGER each £12.95**

ORDER NOW 0395-265165

Post to: Gemini Marketing Limited, 'Gemini House', Dinan Way, Exmouth, EX8 4RS.
Please send me further information ☐ Your Credit Card No. _____
Please send me _____
Name _____ Address _____
Post code _____

**24 HOURS CREDIT CARD
HOTLINE 0395-265165
(4 lines)**

PCOX

is all you need to turn your IRMA board into a 3270 PC

PCOX; pronounced "peacocks"; not, we suppose, altogether unreasonable when you consider the fact that there's also the PCOX/GRAPHICS™ board; which gives you mainframe colour graphics on your PC.

Actually, there are PCOX products to do a load of other things as well; like getting System/3x data onto a PC, or accessing host information on any IBM PC (or compatible) network; to name but two.

We won't mention the rest because we're off the peacocks theme; which, in a spot colour ad, was pretty inappropriate anyway. Still, you could send for a brochure; which, by the way, is in full colour. Write to us at the address below, or 'phone Jon Stuart on linkline 0800-898 404.



**micro
macro**

**the new force in
international marketing**

Northington House
59 Gray's Inn Road
London WC1X 8TL

Micro Anvika

COMPUTERS, PERIPHERALS & ACCESSORIES
220 TOTTENHAM COURT ROAD, LONDON W1P 9AF.

LONDON

COMPUTERS

ATARI

Atari 1040 STF Mono	£918.00
Atari 1040 STF Colour Low Res	£1025.00
Atari 1040 STF Colour Mid Res	£1145.00
Atari 520 STM. CALL FOR SPECIAL OFFER DEALS	
Atari SM124 B/W monitor	£149.00
Atari SF354 1/2 Meg disk drive	£149.00
Atari SF314 1 Meg disk drive	£199.00
Atari CM36512 Colour	£385.00
Atari New Mid Res Colour	£TBA
Atari 20 Meg Hard Disk	£835.00

AMIGA

AMIGA SYSTEM 1	
-CPU with 3.5" drive: 880Kb	
-512Kb RAM, Keyboard and Mouse	
-Colour Monitor with Sound	
-Kickstart, Workbench, Amiga Tutor	
	£1600.00

AMIGA SYSTEM 2

-As System 1 but with External 3.5" Drive: 880Kb	£1880.00
A1010 External 3.5" Drive: 880Kb	£285.00
A1020 External 5.25" Drive	£340.00

AMSTRAD

Amstrad PCW8512	£573.00
Amstrad PCW8256	£455.00
Amstrad CPC6128 with Green Screen	£299.00
Amstrad CPC6128 with Colour	£399.00
Amstrad OD1 Disk Drive 3"	£159.00
Amstrad FD1 Second Drive for CPC	£99.00
Amstrad FD2 Second Drive for PCW	£182.00
Amstrad MP1 TV Modulator CPC46	£14.95
Amstrad MP2 TV Modulator CPC6128	£29.95

ACORN

BBC Master Series	PHONE
-------------------	-------

SINCLAIR

Sinclair QL 128K	£145.00
Sinclair Spectrum 128	£135.00
Sinclair Spectrum Plus	£99.00

PRINTERS

DOT MATRIX PRINTERS

Amstrad DMP2000 NLQ	£159.00
Brother 1409 Dual I/F + NLQ + Tractor	£380.00
Canon PJ1080 Colour	£369.00
Citizen 120D 120CPS 4K buf	£174.00
Citizen LSP 10 120CPS	£199.00
Citizen MSP20 200CPS 8K Buf	£349.00
Citizen MSP25 200 CPS 132Col	£495.00
EPSON LX80 100 CPS, NLQ	£229.00
EPSON LX86 120 CPS, NLQ	£269.00
EPSON EX800 300CPS, NLQ	
H'DUTY	£550.00
EPSON FX-85 160CPS, NLQ, 80 Col	£425.00
EPSON FX-105 160 CPS 132Col	£549.00
EPSON LQ800 180CPS 24 Wire	£579.00
Juki 5510 180CPS Colour Option	£289.00
Oki-Mate20 Colour + AMS S/ware	£195.00
Panasonic KX-P1080 120CPS NLQ	£199.00
Star NL10	£254.00

Daisywheel Printers

Brother HR10	£199.00
Citizen Premiere 35	£549.00
Juki 6100	£299.00
Quen Data DWP1120	£199.00

PRINTER ACCESSORIES

BUFFERS

UPGRADE TECH Inline 64K PPBuffer	£155.00
UPGRADE TECH Inline 64K SSBuffer	£155.00
UPGRADE TECH Inline 64K SPBuffer	£155.00

PRINTER SWITCHES

Typro 2 Way Centronics switch with cables	£59.95
---	--------

PLEASE CALL FOR LATEST PRICE LIST
ALL PRICES INCLUDE VAT MAIL ORDER (CARRIAGE EXTRA)
Price Subject to change without notice
WE ACCEPT VISA & ACCESS CREDIT CARDS. OPEN MONDAY
TO SATURDAY 9.00 TO 6.00

Typro 2 Way Serial switch No Cbl	£49.95
Typro Serial to Centro Converter	£59.95

INTERFACES

Citizen 120D Serial Interface	£45.00
Citizen 120D CBM 64/128 Interface	£45.00
Citizen MSP Series Serial I/Face	£39.00
Epson RS232 OK 8143	£33.00
Epson RS232 2K 8145	£65.00
Panasonic RS232C Interface	£65.00

We can make switch boxes made to your specifications and also solve most interface problems. We carry a large range of printer cables ex stock. Call for details.

MONITORS

PHILIPS (Monochrome)

BM7502 12" Green	£85.00
BM7522 12" Amber	£95.00
BM7513 12" Green IBM Compatible	£120.00
BN7542 White	£99.00

PHILIPS (COLOUR)

CM8501 RGB STANDARD RES	£235.00
CM8533 Med Res RGB + CV	£289.95

Sony (Colour)

10" Colour	Phone
12" Colour	Phone
Taxan	Phone

DISK DRIVES

CUMANA/ATARI ST SINGLE 720K	£175.00
CUMANA/ATARI ST DUAL 720K*2	£299.00
CUMANA/QL 720K*2 WITH INTERFACE	£285.00
CUMANA CSX 400 5.25" 40/80	£139.00
CUMANA CS 400 40/80 WITH PSU	£165.00
CUMANA CD800S 40/80 DUAL WITH PSU	£319.00
PCML 3.5" DUAL FOR QL WITH I/FACE	£289.00
CUMANA/QL DISK INTERFACE	£89.00
PCML/QL DISK INTERFACE	£99.00
BBC DFS KIT	PHONE

DISKETTES

Go Bananas with BANANA 5.25" Diskettes	
*DS DD 40 or 80 Tracks	
*Suitable for Double Sided Drives	
*All Bananas are individually certified	
ONLY £11.00 per box of Ten inc P & P.	

We also keep AMISOFT, SONY, MAXELL, 3M, FUJII, VERBATIM diskettes.

DISK BOXES

DD50L holds 50 5.25" with lock	£11.95
Multi Form holds 40 3.5" with lock	£14.95
Multi Form holds 20 3" with lock	£14.95

PVC DUST COVERS

DUST COVERS AVAILABLE FOR:

Amstrad Computers	
Atari ST Computers	
BBC & BBC Master	
CBM Computers	
Sinclair QL	
Citizen Printers	
Epson Printers	
Canon PW1080	
Etc.	

MODEMS

Amstrad V21/V23 Modem	£99.00
Answercall Minimodem V21	£79.00

Epson CX21 V21 Acoustic Coupler	£135.00
Epson CX21 V23 Acoustic Coupler	£169.00

Pace Nightingale V21/V23	£119.00
Pace Nightingale + Commstar BBC	£149.00
Pace Nightingale + Commstar	
AMSCPC	£179.00
Pace Nightingale + Commstar PCW	TBA
Pace Series Four V22 V22Bis	TBA
Pace AA AD Board for Nightingale	£59.00
Miracle Tech WS2000 V21/V23	£124.00
Miracle Tech WS3000 V22/V21/V23 AA AD (Hayes)	£550.00
Miracle Tech WS4000 V21/V23 AAAD (Hayes)	£169.00
Miracle Tech 64 Multi Modem	£110.00
Sagesoft Chit Chat Amstrad Pack	Phone

SINCLAIR PRODUCTS

Saga 1 Spectrum Keyboard	£38.00
Saga 3 Elite Spectrum Keyboard	£58.00
Multiface 1	£39.00
Kempston Centronics E Interface	£39.00
Kempston Tristat Dual Joystick I/F	£12.00
Kempston Pro Joystick Interface	£18.00
AMX Mouse	£65.00
QL Mouse (Eidersoft)	£89.00
Miracle Systems 512K Expanderam	£119.00
Miracle Systems 256K Expanderam	£89.00
Miracle Systems Centronic I/Face	£19.00

AMSTRAD PRODUCTS

Light Pen for PCW8256/8512	£78.00
CPS8256 Serial/Parallel 8256/8512	£69.00
Pace 8256/8512 Serial/Parallel I/F	£59.00
MCS Parallel Interface 8256/8512	£47.00
PCW8256 Upgrade Kit (512K+2nd drive)	£189.00
6128/464 RS232 Interface	£49.00
464 Speech Synthesiser SSAI	£29.00
Rombo Sideway Rom Board 464/6128	£34.00
AMX Mouse 6128/464	£65.00
Graph Pad Two 6128	£72.00
Graph Pad Three PCW8256/8512	£149.00
OKT 6128 256K Silicon Disk	£95.00
OKT 6128 256K 256K Memory	£95.00

Joysticks

Euromax Pro Ace	£11.00
Euromax Micro Ace (Micro Switched)	£15.00
Euromax Micro Pro (Micro Switched)	£16.00
Euromax Joy Ball	£29.00
Quickshot II	£9.95
Speed King	£13.00

BOOKS

For Atari

*Anatomy of the Atari ST	£12.95
*GEM on the Atari ST	£12.95
*TRICKS & TIPS of ATARI ST	£12.95
*The ATARI ST Explored (Kuma)	£8.95
*Glentop Using GEM on Atari ST	£7.95
*Glentop Using Graphics on ST	£7.95
*Glentop Business Application ST	£7.95
*Glentop Advanced User's Guide St.	£12.95
*Glentop Using Basic On ST	£7.95

For Amiga

*Presenting the Amiga	£9.95
*The Amiga System An Introduction	£9.95

For Amstrad

*Using the PCW 8256/8512	£8.95
*The Anatomy of the CPC's (H/Back)	£14.95
*The Amstrad CP/M Plus	£14.95

Other Items Available Include:

Software for: ATARI ST, AMIGA, AMSTRAD, SINCLAIR QL & OTHERS.
COMPUTER STATIONERY & RIBBONS AT KEEN PRICES

MICRO ANVIKA.
220a TOTTENHAM COURT ROAD, LONDON W1P 9AF.
TEL: 01-636 2547/580 6382 TELEX: 946240 CWEASY G
(Quote 19010170) Easylink No. 19010170

Micro Products International (0) 2968-7854
 Tlx: 11258 MPINT NL Fax: (0) 2968-5636
 Jan van Genstraat 160, 1171 GP Badhoevedorp,
 The Netherlands

**Our 1986 Catalog is
 HOT off the press!**
**Dealers! Check our
 Profitable Discount
 Pricing!**

**LOOK what's
 Inside!**

5 Complete Systems



The **XAT** is our most versatile and powerful system. Using Intel's 80286 processor, the system runs at 6 and 8 MHz with a true 80286 data bus. Comes standard with a 3 megabyte add-in board, 2 parallel & one serial port, monitor, keyboard, DOS 3.1, two 5.25 inch 5.25 DD 1.2 meg floppies.



This standard system is as compatible with IBM as it can be. Featuring a 4-layer motherboard, 8-slot expansion, up to 640K memory on the motherboard, and the 6.67 MHz **TURBO** mode. Also included: DOS 3.1, keyboard, 135 watt power supply, TTL 720, 3dB resolution video card, green or amber monitor, serial & parallel ports, Real Time Clock and software.



The perfect choice for the system integrator who needs the IBM compatibility but not in the standard PC cabinet. This model features hinged and removable sides, up to 3 1/2 height peripherals out front, front mount AC switch and rear mount 135 watt power supply. Also makes an ideal Host or File Server unit in multi-user configurations!



The **XT jr.** is only junior in size! With up to 640K memory on the motherboard and four expansion slots, this stand-alone system is also great for workstations in a networking environment. It can be upgraded to the **TURBO** two speed motherboard and you can also add up to 2 serial & 2 parallel ports for any IBM compatible expansion card. A perfect word processing data entry system.



This is truly the affordable portable, and we'll build it to your specifications. Need a 20 megabyte hard disk and 20 megabyte tape with 640K memory in your portable? No problem! The **XPC Compact** comes standard with a 9" amber TTL monitor, 135 watt P.S., 256K memory, two 360K drives, Real Time Clock/Calendar, w/ battery Back-up, serial & parallel ports, and our **TURBO** Motherboard.

Amsterdam ■ (0) 2963-7854

24 Add-On Cards

Germany ■ 241-59031

2 Meg Above Board



This board satisfies the new Above Board approach suggested by Intel and Lotus 1-2-3. Also may be used on our **XT-SBC TURBO** board for memory based AI OK.

Hard Disk Controller



This Western Digital controller handles 1 or 2 drives, 5 to 140 megabytes with minimum software configuration. Features DOS 2.1 & 3.1 compatibility and ST-506 interface.

384K Multi-Function



A Multi-function board featuring Parallel Port, Serial Port, Game Port, Real Time Clock/Calendar with Battery Back-up, expanded to 384K, all Cables, PrintSpooler and Disk Disk Software and Manuals.

4 Meg Token Ring



Connect your workstation to an existing 4 Megabyte IBM token ring system or build up your own IEEE 802.5 standard system. The lowest possible cost for 100% industry standard compatibility.

AT H.D. & Floppy



This new Western Digital controller handles high-speed VLSI technology, 5.25 inch diskette, 50" format, using combo board in the AT. Runs both 360K and 1.2 meg floppy disk drives.

Mono & Color Graphics



Supports two levels of graphics, and test in composite, monochrome or RGB color. Low resolution 320 x 200 pixel, high resolution 640 x 200 pixel.

7 PAK Multi-Function



Features Floppy Controller, Parallel Port, Serial Port (optional 2nd Serial), Game Port, Real Time Clock/Calendar with Battery Back-up, RAMDisk, PrintSpooler, all cables & manuals.

PROM Laser



High speed algorithms will burn 2716, 2732, 2732A, 2764 (in 52 sec), 27128, 27256 EPROMs under software control using your PC. Zero Force Insertion. See manual for details.

England ■

35 Components

Bombay ■ 357172

Motherboards



XAT TURBO
 • RTC Calendar
 • 6 & 8 MHz clock
 • 8 slot expansion
 • Intel 80286

XT-SBC
 • 4 7.7 & 8 MHz clock
 • Serial 3 Parallel
 • 4 layer PCB design
 • ATC Calendar

XPC TURBO
 • 4 7.7 & 8 MHz
 • 4 layer PCB design
 • 8 slot expansion
 • up to 640K Memory
 • 8088-2 processor

XPC-XT
 • Standard 4 7.7 MHz
 • up to 640K memory
 • 8 slot expansion
 • standard 8088 CPU
 • 8007 socket avail

Power Supplies

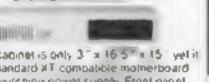


XT 135 watt XT 150 watt
 • 135w switching
 • Whisper Fan
 • 2.5V 20A switch
 • +5V 15A - 5V 5A
 • +12V 4.2A - 12V 5A
 • +12V 5.5A - 12V 5A

AT 200 watt XTC 135
 • 200 Watt power
 • Exterior AC switch
 • 4 DC power conn
 • +5V 20A - 5V 5A
 • +12V 7.7A - 12V 5A

XT 135 watt XT 150 watt
 • Whisper fan
 • Hi-output 150 watt
 • 4 DC connectors
 • +5V 15A - 5V 5A
 • +12V 5.5A - 12V 5A

Cabinets



The **XT jr.** cabinet is only 3" x 16.5" x 15" yet it will hold a standard XT compatible motherboard including a switching power supply. Front panel cut-out for a half-height floppy or hard disk.

Our **XPC-XT** cabinet has an 8 slot back panel with additional cut-outs for two RS-232C ports. Features mounting for up to four half height peripherals.

The right choice for an external add-on cabinet! And on a floppy tape back-up or up to 33 meg of hard disk (half height). Switching power supply is included.

The right choice for an external add-on cabinet! And on a floppy tape back-up or up to 33 meg of hard disk (half height). Switching power supply is included.

Keyboards

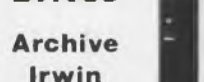


AT
 This Keyboard is standard equipment with 3" of our **XAT** systems, but the layout is so well liked, we're offering it here.

XT
 Our volume purchases of these IBM style units allows us to lower the price once again.

5151
 Now a fully selective unit at an affordable price. Features a 10 key numeric pad & a separate cursor pad.

Drives



Archive
Irwin
Maxtor
Memtek
Miniscribe
Panasonic
Seagate
TEAC
Tulin

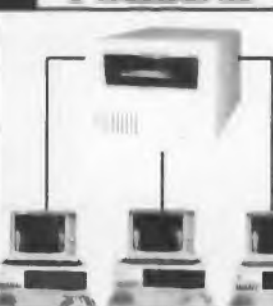
3 Sub-Systems



A perfect cabinet for tape back-up with full or half height Hard Disk inside for two hard disks.

Choose from single, half height, or full height with full height base. All Sub-systems include connector cables, software and manuals.

3 Networks



One way to stay ahead of the competition is by using a Multi-user or Network system configuration from **Micro Products International**. Choose Microspeed RS-232C, RS-485, 3000 or Token Ring. Data transfer rates up to 4 megabytes second can be obtained.

Cassette Training



What is the Cassette Training concept? Using Interactive Audio Training to combine the advantage of classroom and self-teaching methods. The Method: One audio track delivers a lecture explaining the program, while the second track emulates the keyboard actually running the student's computer. At frequent intervals the tape pauses, automatically connecting to a keyboard emulator. **MITS COED**

Int/Ext Modems



• FCC approved for direct RJ-11 connection
 • Phone Cable & Power Supply
 • Runs the popular Hayes communications software
 • Finally a price breakthrough on a Hayes compatible external 300, 1200 baud modem. Includes driver software.

• Q-Modem software included
 • Also runs XCOM software
 • All cables included
 • We included every feature you would want in a modem card. It's FCC registered, direct connection to your modular phone line with the cord included.

MG DISCOUNT

PLEASE CALL FOR ADVICE ON EQUIPMENT SELECTION

TELEPHONE AND MAIL ORDER PRICE LIST

* MICROCOMPUTERS *

* AMSTRAD 8256	£399	*
* AMSTRAD 8512	£499	*
* AMSTRAD CPS Interface	£69	*
* APRICOT F2/F10	£POA	*
* APRICOT Xi-FD/HD	£POA	*

EPSON PRINTERS

Epson LX80 Friction NLQ	£199
Epson FX85 160 cps NLQ	£335
Epson FX105 160 cps NLQ	£429
Epson LQ800 Dual I/F NLQ	£460
Epson LQ1000 Dual I/F NLQ	£645
Epson RX 100+	£250
Epson JX80 Colour	£395

CENTRONICS PRINTERS

Full range of Centronics Printers available. Printstation 250 & 350 plus 400/800/1200 Linewriter Band Printers. - Superb performance.

* ATTENTION EDUCATIONAL USERS:- *

* 'MEADNET' NETWORK SYSTEM *

- * From £400 for 3 BBC Stations
- * Use an RML 380Z as a Server
- * and control up to 16 BBC's.
- * Easy to install. Many in use
- * throughout the country.

LASER PRINTERS

Canon Laser LBP-8A1 8 Page/min	£1995
Canon Laser LBP-8A2 Graphics	£3200
Canon Laser Font Cartridges	£179
Canon Toner Cartridge	£79
Canon Sheet Feeder 2 Bin + Env	£1395
Q.M.S. K-I-S-S Laser	£1800

* JUKI PRINTERS *

* JUKI 2200 Typewriter/Ptr	£235	*
* JUKI 5510 180 cps NLQ 80 Col	£245	*
* JUKI 5520 180 cps Colour	£350	*
* JUKI 6000 80 Col 10 cps	£170	*
* JUKI 6100 132 Col 20 cps	£250	*
* JUKI 6200 132 Col 30 cps	£410	*
* JUKI 6300 132 Col 40 cps	£680	*

CANON PRINTERS

Canon PW1080A 160 cps 80 Col	£240
Canon PW1156A 160 cps 132 Col	£345
Canon PJ1080A Colour	£433
Canon A50 180 cps 80 Col NLQ	£305
Canon A55 180 cps 156 Col NLQ	£415

PRINTER SWITCHES

Serial 2-Way 24 Lines Switched	£65
Serial 3-Way 24 Lines Switched	£80
Centronics 2-Way 36 Switched	£78
Centronics 3-Way 36 Switched	£95
Cross-over Switches	£110

* MICROLINE MATRIX PRINTERS *

- * New additions to the range
- * now available with 200 cps
- * draft and 100 cps NLQ.
- * Colour is standard feature.
- * Call for details.

* HIGH SPEED MATRIX PRINTERS

OKI 2350 Par. 350 cps	£1755
OKI 2350 Ser. 350 cps	£1810
OKI 2410 Par. 350 cps NLQ	£1875
OKI 2410 Ser. 350 cps NLQ	£1935
OTC 700 700 cps Triple Head	£1995

OTHER PRINTERS & PLOTTERS

MP 165 80 Col 160 cps	£199
Shinwa CPA-80+ 100 cps	£145
Mannesmann MT-85	£325
Epson HI-80 Plotter A4 Size	£375
Hitachi 672 Plotter A3 Size	£495

QUENDATA DAISYWHEEL SPECIAL

Quendata 1120-D 18 cps Par	£135
Quendata Tractor Feed	£99
Quendata Sheet Feeder	£199

INTERFACE CABLE SERVICE

- Full range of cables available.
- Cables made to length required.
- Fast service provided.

TELEPHONE ORDERS taken 9-5.30 Mon to Fri. & 9-12.00 Sats.
Delivery Charge of £9 + VAT on all printers and computers

ALL PRICES EXCLUDE VAT & CARRIAGE.
Prices subject to change without notice.

Complete range of Printer Buffers, Interfaces, Cables and Switches available. Please call for advice.

MG
DISCOUNT
A DIVISION OF MICRO GENERAL

SCREENS PRICE SENSATION!

NOW FOR LESS THAN THE PRICE OF SOME HOME MICRO'S, A POWERFUL DESK TOP *IBM COMPATIBLE PC CAN BE YOURS. CHECK THE SPECIFICATIONS, THIS IS NO COMPROMISE. THE GAP BETWEEN 'HOME' AND 'BUSINESS' MICRO'S HAS BEEN BRIDGED!

- ★ BONDWELL 30 SERIES PC ★ 8088 MICROPROCESSOR (4.77MHz)
- ★ 640K USER RAM INSTALLED
- ★ FIVE EXPANSION SLOTS (FOUR UNOCCUPIED IN BASIC MACHINE)
- ★ 12" ANTI-GLARE MONOCHROME MONITOR (80 CHARACTERS x 25 LINES)
- ★ DUAL DOUBLE-SIDED, DOUBLE DENSITY DISK DRIVES EACH 360K FORMATTED
- ★ 84 KEY FULL STROKE, ENHANCED IBM COMPATIBLE KEYBOARD
- ★ CENTRONICS PARALLEL PRINTER INTERFACE
- ★ SUPPLIED WITH *MS-DOS V2.11 AND *GW BASIC V2.02!

BONDWELL 30 SERIES CAN BE USED AS A STAND ALONE PC OR AS PART OF A NETWORK. USING INDUSTRY STANDARD SOFTWARE IT PUTS YOU IN BUSINESS IMMEDIATELY. NOW CHECK OUR AMAZING PRICE!

£599 (+VAT)!

CASH 'N' CARRY OR DELIVERY EXTRA

OPTIONS AVAILABLE AT EXTRA COST

* BONDWELL 36XT

SPECIFICATIONS AS ABOVE BUT WITH ONE

FLOPPY DRIVE PLUS 20 MB WINCHESTER

HARD DISK

★ COLOUR GRAPHICS CARD £79 + VAT!

★ MULTI PURPOSE CARD £79 + VAT!

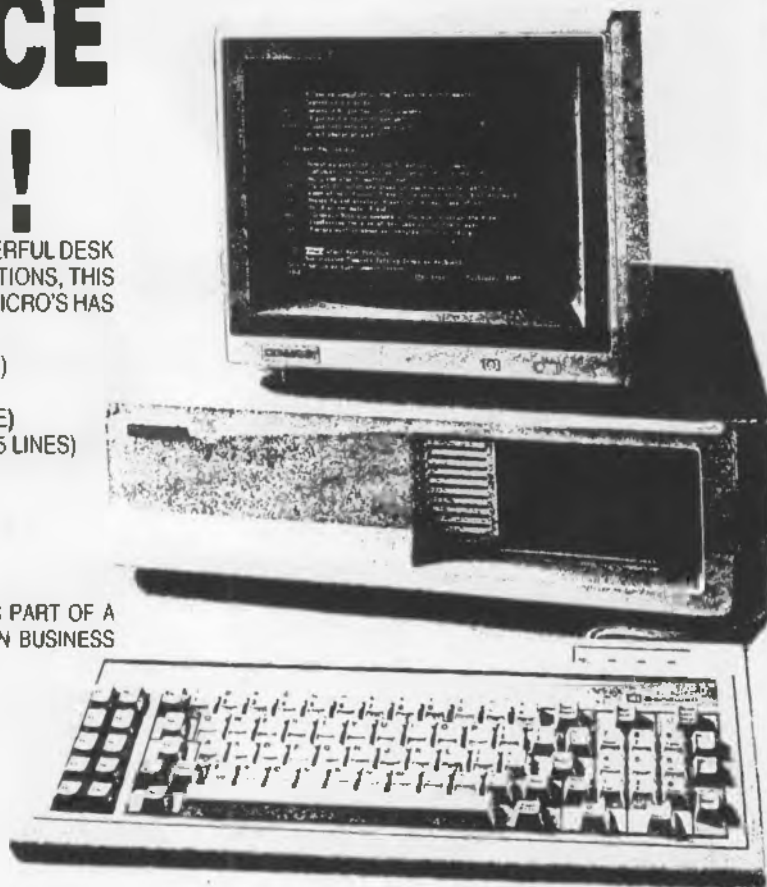
★ SOCKETED RAM CARD £79 + VAT!

★ WORRY FREE MAINTENANCE FROM £55 + VAT PER YEAR

★ CUT PRICE SOFTWARE SUPPORT FROM SCREENS

★ OPTIONAL COLOUR MONITOR AVAILABLE.

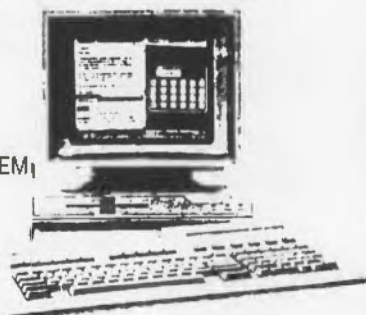
£999 (+VAT)!



FABULOUS APRICOT

XEN-i

A BUSINESS COMPUTER SYSTEM,
UNRIVALLED IN SPEED
PERFORMANCE AND SHEER
ALL ROUND CAPABILITY
AT SCREENS NOW!



- ★ INTEL 80286 MICROPROCESSOR (10 MHz)
- ★ UP TO 2MB RAM INSTALLED EXPANDABLE TO MASSIVE 11 MBYTES!
- ★ 1.2 MB 5.25" FLOPPY DRIVE PLUS UP TO 50 MBYTE HARD DISK
- ★ *IBM AT COMPATIBILITY ★ 101 KEY IBM AT COMPATIBLE KEYBOARD
- ★ BUNDLED SOFTWARE INCLUDES MS WINDOW, MS WRITE, MS PAINT, CARD INDEX, NOTEPAD, CLOCK, CALCULATOR, GW BASIC.

**CHECK OUR SUPERDEALS
TODAY**

APRICOT SPECIAL OFFERS

AVAILABLE ON PC, XI, XEN, F1 & F2 WHILE STOCK LASTS
PHONE SCREENS TODAY

FROM £3099 (+VAT)!

AMAZING COMMODORE

AMIGA MULTI-TASKING PC AT SCREENS NOW!



- ★ MOTOROLA MC 68000 MICROPROCESSOR (8 MHz)
 - ★ 512K RAM INSTALLED EXPANDABLE EXTERNALLY TO 8.5 MB!
 - ★ CONTROL PORT, EXPANSION BUS, CENTRONICS & SERIAL PORTS, STEREO SOUND, RGB ANALOGUE & DIGITAL, COMPOSITE VIDEO ALL STANDARD IN PRICE
 - ★ HIGH RESOLUTION GRAPHICS (640 x 400 PIXELS) 4096 COLOURS AVAILABLE.
- THIS EXCEPTIONAL WINDOW, ICON, MOUSE & PULL DOWN MENU COMPUTER OFFERS MULTI-TASKING, SPEECH, OUTSTANDING GRAPHICS AND STEREO SOUND.
- CHECK SCREENS ACCESSORY & SOFTWARE SUPPORT TODAY AND ORDER WITH CONFIDENCE
- SCREENS
CASH 'N' CARRY PRICES**

FROM £1475 (+VAT)!

ORDER WITH CONFIDENCE TODAY FROM

SCREENS MICROCOMPUTERS & ELECTRONICS

MAIN AVENUE, MOOR PARK, NORTHWOOD, MIDDLESEX, ENGLAND

TELEPHONE: 09274 20527 TELEX: 923574 ALACOL G PRESTEL: 927420664

*IBM IS A TRADEMARK OF INTERNATIONAL BUSINESS MACHINES. MS-DOS IS A TRADEMARK OF MICROSOFT CORP. GW BASIC IS A TRADEMARK OF MICROSOFT CORP.

E & O E ALL OFFERS SUBJECT TO AVAILABILITY. ALLOW 10 DAYS FOR DELIVERY.
GOODS OFFERED WITH MAKERS WARRANTY.
CALLERS OPEN 9AM - 6PM MONDAY - SATURDAY. CLOSED HALF DAY WEDNESDAY
OPPOSITE MOOR PARK MET. LINE
POST CHEQUES PAYABLE TO "SCREENS". DESPATCH ON CLEARANCE.
REQUEST OUR FULL PRODUCT LIST TODAY.



MICRO COMPUTER TECHNOLOGY LTD

31 Forge Lane, Hanworth, Middlesex. TW13 6UN.

01-898 0560

DISKS AND DISK STORAGE

5.25 Inch in boxes of 10

3M 744 SS/S-DD 48 tpi	£14.99
3M 745 DS/DD 48 tpi	£17.99
3M 746 SS/DD 96 tpi	£20.99
3M 747 DS/DD 96 tpi	£26.99
3M Hi Density DS/HD 96 tpi	£37.99
Maxell MD1-D SS/DD 48 tpi	£16.99
Maxell MD2-DDS/DD 48 tpi	£24.00
Maxell MD2-HD Hi-density	£37.99

3.5 Inch in boxes of 10

3M35SSDD SS/DD	£23.99
3M35DSDD DS/DD	£37.99

Storage boxes 5.25 Inch

40 disk capacity ABAM35	£14.50
80 disk capacity ABAM85	£17.50
50 disk capacity FDD6	£8.99
10 disk capacity SEE-10	£2.25

Storage boxes 3.5 inch

60 disk capacity MD60T	£16.99
10 disk capacity SEE-10	£2.25

Prices for data Cartridges are available on request

PRINTERS

Dot Matrix

Epson RX-100+	£249.00
Epson LQ-1000	P.O.A.
Epson LQ-800	P.O.A.
Epson FX-85 Parallel	£385.00
Ritman II Parallel	£270.00
Ritman 15 Parallel	£460.00
Ritman F+ Parallel	£249.00

Daisy wheel

Diablo 635 Parallel	£1,000.00
Olivetti DY450 Ser/Paral.	£950.00
Olivetti DY250 Ser/Paral.	£650.00
Brother HR-15 Ser/Paral.	£380.00
Brother HR-25 Ser/Paral.	£700.00
Brother HR-35 Ser/Paral.	£795.00

We also have stock of Single bin or Double bin cut sheet feeders and tractor units please call for more details

Other prices for Apple II, Apple Mac and IBM PC Available on Request. Please remember that we are here to help you, no problem is too small and we will endeavour to find a solution for you, so please don't hesitate to contact us on 01-898 0560.

Please add £5.00 and 15% VAT to total

We will accept payment by Visa, cheque and of course good old fashioned cash.

Callers welcome by appointment.



LASERJET PRINTERS AND ACCESSORIES

H.P. Laserjet printer

Using the latest advances in laser technology the laserjet offers a vast choice of printing possibilities, however complex or demanding, moreover it's compact, cost efficient and compatible with a wide range of systems.

A printing speed of 8 pages a minute makes the Laserjet much quicker than most other printers and it prints so quietly you hardly know it is working.

The Laserjet turns out crisp, clear images time and time again, providing maximum legibility and upgrading the quality of your presentation. And it's easier to operate than most conventional printers. Paper Cassettes are available in A4, B4 and letter sizes. With manual sheet feed, you can print onto coloured paper, tracing paper and even OHP film, which makes a Laserjet a truly flexible printer.

	List Price	Our Price
H.P. Laserjet Printer	£2,650.00	£2,299.00
Toner Cartridge for Laserjet	£87.42	£81.50
Extra Font Cartridge from	£ 197.00	£ 180.00

COMPUTERS AND COMPUTER EQUIPMENT

Phillips P3100 (IBM PC Compatible)

512k Ram, 1 x 360k floppy disk drive, 10 Mbyte Hard disk, Monitor, IBM Layout keyboard, 1 x Parallel, 1 x Serial Port for Comms or Printer.

List Price £3,100.00 Our Price £2,759.00

Please Call for more details

Apple II and IIe

QuickFile Database IIe	£33.50
Format-80 Wordpro II & IIe	£99.00
Wildcard Plus II & IIe	£65.00
Real Time Clock	£89.00
Cirtech Flipper	£299.00

Apple Macintosh

PFS: File & Report Combo	£60.00
MacPublisher	£90.00
FileVision	£25.00
MAC Multiplan	£150.00
Quartet	£150.00

For further details please phone:



01-898 0560

COME AND SEE US
AT THE PCW SHOW
STAND 400!



We challenge you to find a better spreadsheet package.

From the makers of WordPerfect comes a powerful new spreadsheet package which combines data management with text graphics.

MathPlan offers all the versatility, speed and flexibility you're ever likely to want.

Colour-coded function keys simplify the use of the many features available.

Graphics can be produced on a mono screen without the expense of a graphics adaptor, or in colour if you prefer.

MathPlan uses a virtual memory technique which allows you the use of all 64,000 cells with no more than 192K.

Individual spreadsheets, which can be linked together, allow for consolidation of many plans.

Feature for feature, MathPlan compares with the most popular spreadsheet.

The difference is that MathPlan costs just £195.

Can you really afford not to see this program in action.



SENTINEL
SOFTWARE

Sentinel, Wellington House,
New Zealand Avenue,
Walton-on-Thames, Surrey, KT12 1PY.
Telephone: (0932) 231164.

WordPerfect

MathPlan

SSI Database

MODEMS

ANSWERCALL / CONCORD DATA / DACOM / EASYDATA / EPSON / GENERAL DATACOM / INTERLEKT / ISTEK / MICOM BORER / MIRACLE TECHNOLOGY / MODULAR TECHNOLOGY / PACE / PC COMMS / RACAL / SAGESOFT / SENDATA / STEEBEK / TANDATA / THORN EMI

STEEBEK

QUATRO	£595
STEEBEK SB1212 V22 AA	£369
STEEBEK SB1212 AA AD	£495
STEEBEK SB1212 V22 AA AD (HAYES)	£495
STEEBEK SB1212 ERROR CORRECTION	£529
STEEBEK MIMMO V21/23 AA AD	£209
STEEBEK TRIO V21/22/23 AA AD ERROR CORRECTION	£495
STEEBEK SB2426 V26 D/L	£269
STEEBEK SB2426 V26 D/L + SB SA	£325
STEEBEK SB2426 V26 D/L + SB AA	£310

PACE

PACE NIGHTINGALE MODEM	£99
PACE COMMSTAR PROM FOR BBC	£27
PACE AUTO DIAL/AUTO ANS FOR APPLE	£199
PACE AUTO DIAL/AUTO ANS FOR BBC	£109
AUTO DIAL BOARD/APPLE-BBC	£45

MIRACLE TECHNOLOGY

MIRACLE TECHNOLOGY WS2000 V21/23 AD	£85
MIRACLE TECHNOLOGY WS3000 V21/23 AA AD (HAYES)	£245
MIRACLE TECHNOLOGY WS3000 V22/21/23 AA AD (HAYES)	£405
MIRACLE TECHNOLOGY WS3000 V22Bis/V22/21/23 AA AD (HAYES)	£545
MIRACLE TECHNOLOGY WS4000 V21/23 AA AD (HAYES)	£140

RACAL

RACAL INTERNAL + SOFTWARE V21/23 AA AD	£367
RACAL INTERNAL V21/23 AA AD	£289
RACAL EXTERNAL + SOFTWARE V21/23 AA AD	£369
RACAL EXTERNAL V21/23 AA AD	£275
RACAL MPS 1222 V22	£612
RACAL MPS 1222 V22 AD	£703
RACAL MPS 24 V26/26	£519
RACAL V12422 V22/V22 AA AD	£846

SAGESOFT

SAGESOFT CHIT CHAT IBM PACK V21/23 AA AD	£289
SAGESOFT CHIT CHAT APRICOT PACK V21/23 AA AD	£289
SAGESOFT CHIT CHAT AMSTRAD PACK V21/23 AA AD	£189

CONCEPT

CONCEPT HOMEBASE + ONE TO ONE + MODEM	£299
CONCEPT ONE TO ONE + MODEM	£249
CONCEPT HOMEBASE + ONE TO ONE	£89

MODEM SOFTWARE

SAGESOFT / DATATALK / VICOM / MULTICOM

SAGESOFT

SAGESOFT CHIT CHAT IBM	£99
SAGESOFT CHIT CHAT APRICOT	£99
SAGESOFT CHIT CHAT AMSTRAD	£65

VICOM

VICOM FOR MAC	£125
VICOM FOR APPLE	£125
VICOM FOR IBM	P.O.A.

MULTICOM

MULTICOM FOR IBM	£125
MULTICOM FOR APRICOT	£125
MULTICOM FOR SIRUS	£125
MULTICOM FOR CPM/80	£125

GENERAL COMMUNICATIONS

ACCESS 10	£375
BSTAM	£135
CROSSTALK	£120

SOFTWARE

BUSINESS GRAPHICS

DR ASSEMBLER PLUS TOOLS	£169
DR DRAW	£195
DR GRAPH	£195
DR LOGO	£124
DR LEVEL II COBOL	£525

DIGITASK

Telephone (0342) 24631

Telex: 957418

DIGITASK Business Systems Ltd,
Unit M, Charlwoods Business Centre,
Charlwoods Rd, East Grinstead W. Sussex RH19 2HH

SOFTWARE

OTHER

COPY II PC	£39.95
FLIGHT SIMULATOR	£54
GEM PROGRAMMERS TOOL KIT	£350
GEM COLLECTION	£94
GEM DESKTOP	£47
GEM DRAW	£100
GEM COLLECTION	£115
GEM GRAPH	£136
GEM WORDCHART	£115
GSX PROGRAMMERS TOOLKIT	£275
PARADOX	£458
Q&A SYMANTEC	£175
SIDEKICK WITH TRAVELLING SIDEKICK	£75
SIDEKICK	£42
SIDEWAYS	£39
TRAVELLING SIDEKICK	£42
TURBO HOLIDAY NEW PACK	£59
TURBO HOLIDAY JUMBO PACK	£145
TURBO GRAPHICS TOOLBOX	£32
TURBO GAMEWORKS	£42
TURBO EDITOR TOOLBOX	£42
TURBO TUTOR	£21
TURBO TOOLBOX	£34
TURBO PASCAL	£42
TURBO PASCAL W/BCD V.3.0	£64
TURBO PASCAL W/8087	£64
TURBO PASCAL 8087W/BCD	£75
TURBO LIGHTNING TOOLBOX	£55
VP PLANNER	£57
WINDOWS	£89

DATABASE MANAGEMENT SYSTEMS

CARDBOX PLUS	£240
DATAMASTER	£495
DBASE III PLUS	£335
DBASE II	£224
DBASE III	£315
DELTA 4	£313
DMS +	£180
DMS DELTA	£345
INFOSTAR	£180
R BASE 5000	£372

PERSONAL PRODUCTIVITY

FRAMEWORK II	£321
NORTON UTILITIES	£69
OPEN ACCESS	£275
PERTMASTER 1000	£475
PERTMASTER 2500	£600
PERTPLOTTER	£375
PERTPRINTER	£235
SMART	£386
SUPERPROJECT	£345
SYMPHONY	£346

ACCOUNTS

ACCOUNTANT + PAYROLL	£377
ACCOUNTANT PLUS	£435
ACCOUNTANT PLUS + PAYROLL	£530
ACCOUNTANT	£315
BOOKKEEPER + PAYROLL	£290
BOOKKEEPER	£190
PAYROLL	£139
SAGE ACCOUNTS + PAYROLL	£315
SAGE PLUS + PAYROLL	£490
SAGE PLUS	£435
SAGE ACCOUNTS	£240

WORD PROCESSORS

CORRECTSTAR	£125
DISPLAYWRITE 2	£375
DISPLAYWRITE 3	£418
EASY	£125
EASYWRITER	£215
MACSPELLER	£57
MAILMERGE	£125
MULTIMATE ADVANTAGE	£220
MULTIMATE	£215
PERFECT WRITER II	£95
SPELLSTAR	£125
STAR INDEX	£98
WORD	£265
WORDCRAFT	£350
WORDPERFECT	£260
WORDSTAR 2000	£263
WORDSTAR PROFESSIONAL	£220
WORDSTAR 2000 PLUS	£335
WORDSTAR	£165

FINANCIAL MODELLERS & SPREADSHEETS

F-2-3 REPORTWRITER	£99
CALCSTAR	£75
JAVELIN	£457
LOTUS F-2-3	£242
MULTIPLAN	£159
PFS WRITE	£95
PFS PLAN/GRAPH	£140
PFS FILE/REPORT	£140
SUPERCALC II	£130
SUPERCALC III	£220

Prices do not include VAT and carriage



We Want to Limit Your Options

by including most of what you need at a realistic price



Of course, we can also provide real options and expansion capability such as: on-line telex facility, Email, networking, 9-track tape, disk capacity beyond 1 Gigabyte, graphics workstation capability (including the incredible GIP), up to 32 Megabyte RAM, bus adaptors, and our unique field-interchangeable CPU modules that ensure future processor independence.

Designed and manufactured in the U.K.

Trademarks
ROOT, ROOTmap, and WriteWord are trademarks of ROOT Computers
UNIX is a trademark of AT&T Bell Laboratories
MS-DOS is a trademark of Microsoft Inc.
PC-AT is a trademark of IBM
GIP is a trademark of benchMark Technologies Ltd.

Our products are continually being improved, so we reserve the right to change specifications without notice.

Our 32 Bit Multiuser UNIX System is ready with these "options" included:

Complete UNIX V.2 Operating System

16 user licence and update subscription; full set of compilers, tools and utilities; online manual (man); bourne shell, C shell

MS-DOS 3.10 Operating System

Compatible with MS-Net and similar networking schemes

ROOT Office Automation Suite

ROOTmap suite includes menu front end, mail, dairy, file system manager, and printer manager; WriteWord word processor

32-Bit Processor

NS32032 with full 32 bit ALU and data path (NS32332 when available) (68020 and 80386 are future options)

Demand-Paged Virtual Memory

16 Mbyte virtual address space for each process (4 Gbyte with NS32332)

Floating Point Co-processor

Compatible with proposed IEEE standard

8 Megabyte Onboard RAM

32-bit word; 120ns with parity; 50ns RAM cache – allows processor speeds in excess of 25 MHz with no wait states; dual-ported with the input-output processor

72 Megabyte Hard Disk Drive

20ms average access; cache assisted

60 Megabyte Cartridge Tape Drive

Auto-servo track alignment; uses 600 ft cartridge

360 Kbyte or 1.2 Mbyte Floppy Disk Drive

PC or PC-AT compatible

16-Bit Input-Output Processor

10MHz 80186 with its own 1 megabyte RAM; runs MS-DOS and real-time tasks concurrently with UNIX

Bit-Mapped Graphics

1780 x 800 pixels; compatible with GKS/VDI; may be used for high resolution A4 WP terminal with multiple fonts

Battery-Backed Power Supply

Orderly system shutdown in event of mains failure, provides power for system terminal and printer

Ports

16 serial sync/async RS232/RS423; IEEE 488 (GPIB); parallel (Centronics); keyboard (PC serial and ASCII parallel); SCSI/SASI

System Terminal and Printer

VT100 compatible terminal; dot matrix printer for system logging

Paperware

UNIX V manuals (7 vols); MS-DOS manuals (2 vols); ROOTmap manuals; WriteWord manual; System Administrator's Reference; Hardware Maintenance Guides; System Reference Notes; a selection of introductory and reference texts.

– all this and more for

LESS THAN £20,000 (Excluding VAT)

priorKnowledge
Systems Ltd

1-5 The Horsefair
Romsey
Hampshire SO51 8EZ
Tel: (0794) 515522
Telex: 47125 PKS G

pkS

Your key to communications!



PRESTEL

FREE Electronic Mail . . . International
Telex . . . 10 National Chatlines (Interactive
Bulletin Boards) . . . 70,000 users across the
UK . . . Teleshopping . . . Multi-User
Interactive Strategy Games

Instant computer news . . . Hardware and
software reviews . . . Technical features . . .
Hints and tips . . . On-line business advice
and features

FREE and discounted quality software to
download direct to your micro - **24 hours a
day**

300,000 pages of information on the huge
Prestel database

for just 20p a day

Micronet 800-
The ultimate
peripheral

Micronet 800
8 Herbal Hill, London EC1R 5EJ
Telephone: 01-278 3143

To: Micronet 800, 8 Herbal Hill, London EC1
Please send me a brochure on Micronet 800

Name _____

Address _____

_____ Telephone No _____

Age _____ Micro _____

PER/CW/SEPT 86

ATHANA DISKETTES

THE BEST DISKETTE THAT MONEY CAN BUY!

LIFETIME WARRANTY Certified Error Free



8.00"

SSDD £1.48 - DSDD £2.08

YOU KNOW US BY NOW.

BUT JUST IN CASE YOU DON'T, WE ARE THE PEOPLE THAT MAKE THE DISKETTE FAVOURED BY MAJOR SOFTWARE COMPANIES AND OEM'S. AND THAT INCLUDES SOME OF THE BIGGEST NAMES IN THE INDUSTRY. COMPANIES WHOSE NAMES ARE HOUSEHOLD NAMES AROUND THE WORLD. ATHANA DISKETTES ARE GOOD. SO GOOD THAT A LOT OF MAJOR SOFTWARE PUBLISHERS, COMPUTER MANUFACTURERS AND MARKETERS INSIST ON THEM.

"AT'S" THAT WORK!

THAT'S RIGHT, HIGH DENSITY DISKS FOR THE IBM "AT" AND COMPATIBLES, THAT WORK, EVERY TIME, ALL THE TIME.

£35.00 - PACKAGE OF 10

COLOURED DISKETTES

ATHANA DISKETTES ARE ALSO AVAILABLE IN LIGHT BLUE, DARK BLUE, RED, SILVER AND YELLOW AT A SMALL 10% UP-CHARGE. MINIMUM ORDER 50.



5.25"

SSDD	DSDD
£0.99 48 TPI	£1.09 48 TPI
£1.24 96 TPI	£1.34 96 TPI

ATHANA DISKETTES ARE SOLD IN THREE PACKAGING CONFIGURATIONS — POLYBAGS OF 25, STANDARD PACKAGE OF 10, AND PLASTIC LIBRARY CASE OF TEN. ALL COME WITH SLEEVE, REINFORCED HUBS, USER ID LABELS AND WRITE PROTECT TABS. PRICES ARE SLIGHTLY HIGHER, IF PURCHASED IN STANDARD PACKAGING OR IN PLASTIC LIBRARY CASE.

HOW TO ORDER — 0-800-525585

FOR FAST SERVICE CALL OUR TOLL FREE NUMBER ABOVE AND USE YOUR ACCESS CARD, OR CHEQUE IN ADVANCE. WE ALSO ACCEPT PURCHASE ORDERS FROM GOVERNMENT DEPARTMENTS. SHIPMENT IS NORMALLY WITHIN 24 HOURS AND WE OFFER A MONEY-BACK GUARANTEE. ALL PRICES ARE PLUS VAT. QUANTITIES OF 50 DISKETTES OR MORE ARE SHIPPED FREIGHT ALLOWED. FOR ORDERS LESS THAN 50 ALLOW £2.00 FOR POSTAGE AND PACKING.



3.50"

SSDD £2.20 - DSDD £2.80

**WHEN MEMORIES ARE WORTH
KEEPING.....IT'S**

ATHANA DISKETTES!

ATHANA DISKETTES ARE MANUFACTURED BY OUR PARENT COMPANY IN LOS ANGELES UNDER THE MOST STRINGENT QUALITY PROCEDURES THEY WORK TIME AFTER TIME, EVERY TIME! AFTER ALL WHEN A MAJOR SOFTWARE COMPANY OR OEM PUT THEIR NAME ON A DISKETTE, THEY CANNOT AFFORD TO TAKE CHANCES

BE OUR GUEST IN CALIFORNIA FOR A WEEK

THE WINNER OF OUR CALIFORNIA WEEK IS RICHARD STREET OF MORETON-IN-MARSH, GLOUCESTERSHIRE. RICHARD IS MANAGING DIRECTOR OF THE FIRM BEARING HIS NAME, SPECIALIZING IN PROVIDING HIGH QUALITY MAILING LISTS TO MAJOR ORGANISATIONS, MANY OF THEM HOUSEHOLD NAMES. PRIOR TO SETTING UP HIS OWN BUSINESS IN 1984, RICHARD WAS INSTRUMENTAL IN SETTING UP A PILOT MOVIE CHANNEL SERVING SOME 150,000 LONDON HOMES. RICHARD ALSO GAINED VALUABLE EXPERIENCE WITH THE BBC. WE WISH RICHARD STREET ASSOCIATES GOOD LUCK IN THE FUTURE AND LOOK FORWARD TO WELCOMING THEIR M.D. TO LOS ANGELES.

FOR ORDERS & DEALER INQUIRIES:



Athana International Ltd

470 LONDON ROAD, SLOUGH, BERKS SL3 8QY ENGLAND
TEL (0753) 682923 OR TELEX 847185 FAX (0273) 40990

0-800-525585



Within Your Reach

£149.95* for a Hayes compatible, autodial, autoanswer with speed seeking smart modem from one of the UK's best-known modem manufacturers — that really brings the world of data communications within your reach!

If that wasn't enough, the new WS4000 is also fully intelligent and speed buffered. And you can add your choice of optional extras now or later, taking it right up to full V22 or even the 2400 bps V22 bis standard.

For only £149.95* you can reach out to Prestel, Telecom Gold, Micronet, Microlink and the world's databases, bulletin boards and telex links through your own telephone line. User-user file transfer too.

WS4000 is made to the same high quality as all our products. The price breakthrough is a direct result of our massive component buying power through high volume sales to business, home, educational and Government users throughout the world.

If £149.95* is within your reach — then so is the world.

* Price excludes VAT. Total delivered price, UK mainland, is £178.19. Prestel, Telecom Gold, Micronet and Microlink are registered trade marks of those companies. Access & Visa cards accepted.



MIRACLE TECHNOLOGY

MIRACLE TECHNOLOGY (UK) LTD ST PETERS STREET IPSWICH IP1 1XB ENGLAND
☎ (0473) 216141 6 LINES TELECOM GOLD 79: KEY 001 (Dealerlink 72: DTB 10135)
☎ 946240 CWEASY G 19002985 PRESTEL MAILBOX 919992265

The Professional Choice

The best PC Compatibles – the best prices.
Plus – all systems include free Microcache software, a powerful disk-caching program which speeds up applications dramatically.



Victor VPC2

Why bother with a clone?
This system offers high spec.
at an unbeatable price, incl
full on-site 12mth warranty.
640K RAM, 20MB Microscience
hard disk, mono display, DOS 3.1

£1299



Olivetti M24

Widely acclaimed as the best
PC compatible available
high speed and superb display
640K RAM, 30MB Seagate
hard disk, green or amber
display, keyboard, MS.DOS

£1995



Sperry PC/IT

High performance AT compatible
for the most demanding applications
from this leading computer maker

Fast 80286 – no wait states
512K RAM, 44MB (30ms) hard
disk, 2 ser ports, 7 bus slots
high res mono display, DOS 3.1

£3345

Computer systems

APRICOT	£
Xi FD 512K 2 x 720K	699
Xi HD 512K + 10MB	999
9"/12" Monitor	75/125
COMPAQ	
Portable Plus 256K + 10MB	1995
Portable II 640K + 20MB	3495
Deskpro 3 640K + 20MB	2195
Deskpro 4 640K + 20MB	
+ Tape	2695
Deskpro 286 512K + 30MB	
+ Tape	3995
TANDON	
PC 256K 2 x 360K	995
PCX 256K + 10MB	1195
PCX 256K + 20MB	1295
PCA 20 512K + 20MB	1795
PCA 30 512K + 30MB	1995

Computer systems

OLIVETTI	£
M19 256K 2 x 360K	1075
M19 256K + 10MB	1695
M24 128K 1 x 360K	1285
M24 256K 2 x 360K	1495
M24 640K + 20MB OLIVETTI	1930
M24 640K + 30MB Seagate	1995
M24 SP 640K + 20MB	2295
Hard disk/tape units	
SEAGATE + WESTERN DIGITAL	
20MB Hard Disk Upgrade	425
30MB Hard Disk Upgrade	625
Christie 20MB ext Tape	795
Archive 60MB ext Tape	675
ARCHIVE 60MB INT TAPE	695
OLIVETTI 20MB DISK CARD	599

Printers

EPSON	£
LX80 + TRACTOR	219
FX85 160CPS + NLQ	339
FX105 160CPS + NLQ	420
LQ800 180CPS + NLQ	475
LQ1000 180CPS + NLQ	595
JUKI 6100 20CPS	299
JUKI 6200 30CPS	425
NEC PINWRITER P6	395
NEC PINWRITER P7	465
NEC 3550 35CPS	545
OLIVETTI DM290 160CPS/NLQ	375
OLIVETTI DY450 45CPS	755
OLIVETTI DY800 80CPS	945
TOSHIBA P351 280CPS	895
CANON LBP8 A1 LASER	2175
HEWLETT PACKARD LASERJET	2195

Software (IBM)

	£
CROSSTALK	120
DBASE 3 PLUS	335
DMS DELTA 4	350
FRAMEWORK 2	325
GEM COLLECTION	95
ASHTON TATE JAVELIN	395
LOTUS 123 REL 2	275
LOTUS SYMPHONY	375
MULTIMATE	265
MULTIPLAN 2	190
NORTON UTILITIES	59
OPEN ACCESS	295
SMART SYSTEM	450
SUPERCALC 3 V2	199
WORD 3	275
WORDPERFECT 4.1	275
WORDSTAR PROFESSIONAL	245
WORDSTAR 2000 REL2	299

MAYFAIR MICROS

01-871 2555 / Telex 936066

**Blenheim House, Podmore Road
London SW18 1AJ**

STOP PRESS...STOP PRESS...STOP PRESS...STOP PRESS...STOP PRESS...STOP PRESS...STOP PRESS...

FREE SUMMER '86 CATALOGUE & COMPREHENSIVE PRICE LIST NOW AVAILABLE

Please send 12 1/2" x 9" SAE (18p) for immediate despatch.

PC/XT PERIPHERALS

AST / TECMAR / PERSYST / QUADRAM / HERCULES / IOMEGA / NOVELL	
SUPER TURBO XT MAINBOARD	£149
640K MULTIFUNCTION CARD	£97
576K RAMASTER EXPANSION CARD	£89
PARALLEL PRINTER ADAPTER	£18
ASYN. SERIAL COMMS. ADAPTER	£27
ASYN. 2 PORT COMMS. ADAPTER	£39.50
MULTI-ASYN. CARD (PC/XT)	£119
ADD-ON SERIAL PORT KIT	£12.50
514-4 FLOPPY DRIVE CONTROLLER CARD	£54
514-48 FLOPPY DRIVE CONTROLLER CARD (SHORT)	£32
MULTI I/O CARD WITH CABLES	£95
PSIO-405XT MULTIFUNCTION CARD	£129
MONOCHROME/GRAPHICS CARD	£87
COLOUR GRAPHICS CARD	£79
COLOUR/GRAPHICS AND PRINTER ADAPTER	£129
GAMES ADAPTER	£24
8255 I/O CARD	£89
PCP 128 EPROM PROGRAMMER	£149
130/150W POWER SUPPLY UNIT	£89
512K 4 BANK PROMBLASTER EPROM	
PROGRAMMER/ANALYSER	£259
PC/XT SWING TOP CASE	£55
360K HALF HEIGHT FLOPPY DISK DRIVE (MITSUBISHI)	£69

PROTOCOL CONVERTERS

Serial In, Parallel out	£39
COMMODORE 64 IEEE in, Parallel out	£49

HARD DRIVES FOR SOFT PRICES

10MB Plus Controller & Cables	£322
20MB Plus Controller & Cables	£399
30MB Plus Controller & Cables	£569
45MB Plus Controller & Cables	£889
60MB Plus Controller & Cables	£999

All above are internal upgrades for PC/XT[®] emulation (IBM[®] and Compatible)

20MB (Voice coll) High Performance	£599
30MB (Voice coll) High Performance	£699
40MB (Voice coll) High Performance	£849
70MB High Performance (25ms Access)	£1699
85MB High Performance (25ms Access)	£1799

All above are internal upgrades for PC/AT[®] and Compatible.

External Housing for 2 half-height drives-includes 40W power supply, cooling fan and LED power Indicator	£99
K-150L CHERRY TOP KEYBOARD	£69
K-150L AT-Style Keyboard for PC/XT	£89
EXTENDED GRAPHICS ADAPTOR	£299
IRWIN-110 10MB TAPE BACK UP	£399
IRWIN-225 20MB TAPE BACK UP	£475
4164 DRAM CHIP	£0.99 (each)
4128 DRAM CHIP	£4.75 (each)
41256 DRAM CHIP	£2.99 (each)
INTEL 8087-2 MATHS CO-PROCESSOR	£139
INTEL 8087 MATHS CO-PROCESSOR	£135
INTEL 80826 MATHS CO-PROCESSOR	P.O.A.

PC/AT PERIPHERALS

3MB MULTIFUNCTION CARD FOR THE AT	£449
SERIAL/PARALLEL CARD FOR THE AT	£89
PSIO-405AT MULTIFUNCTION CARD	£149
MULTI-ASYN. CARD FOR THE AT	£195
1.2MB FLOPPY DRIVE (White/Black facial)	£149
360K TANDON AT GREY FLOPPY	£89

PRINTERS—DOT MATRIX

ANADEx / BROTHER / CANON / TOSHIBA / DATAPRODUCTS / EPSON / HONEYWELL / JUKI / MANNESMANN TALLY / MICRO-PERIPHERALS / NEC / NEWBURY DATA / OKI—MICROLINE / PANASONIC / TEC / RITEMAN / COPAL / STAR / TAXAN / CITIZEN / OLIVETTI	
OLIVETTI DM 100/1 80 col, 120cps, 25NLQ, parallel F/T (LX-80 equiv.)	£169
OLIVETTI DM 280/1 80 col, 160cps, 35NLQ, parallel F/T (FX-85 equiv.)	£295
[also available with dual interface, parallel & serial]	
OLIVETTI DM 290/1 132 col, 160cps, 35NLQ, parallel F/T (FX-105 equiv.)	£365
[also available with dual interface, parallel & serial]	
OLIVETTI DM 5305 132 col, 300cps, parallel, IBM graphics	£799
CITIZEN 120D, F/T 80col 120cps 25 NLQ	£141
CITIZEN MSP10 F/T 80col 160cps 40 NLQ	£340
CITIZEN MSP25 F/T 136col 200cps 50 NLQ	£589
CANON A50 80col 180cps 4K buffer	£260
CANON A55 136col 180cps 4K buffer	£330
EPSON LX-80 80col 100cps 16cps NLQ	£175
EPSON LQ-800 80col 180cps 60cps NLQ	£439
EPSON LQ-1000 132col 180cps 60cps NLQ	£589
EPSON FX-85 80col 160cps 30cps NLQ, 8K buffer	£305
EPSON FX-105 F/T 130col 160cps 30cps NLQ	£386
EPSON LQ-1500 200cps (NLQ)	
4 to 16" paper width	£749
EPSON SQ2000 136col 176cps 1055cps NLQ P+S+IEEE	£1385
JUKI 5510 80col 18cps F/T	£229
STAR NL-10 (F/T) 120cps 30cps NLQ	£235
STAR SG-15 (F/T) 120cps, 136col, (50cps NLQ)	£269

PRINTERS—DAISY WHEEL

BROTHER / TOWA / DIABLO / EPSON / JUKI / NEC SPINWRITER / PANASONIC / QUME / RICOH / SILVER-REED / TEC STARWRITER / OLIVETTI	
OLIVETTI DW 450/1 132 col, 45cps, parallel, Diablo compat.	£759
OLIVETTI DW 800/1 132 col, 80cps, parallel, Diablo compat.	£995
BROTHER HR-15 XL Parallel 20cps	£345
BROTHER HR-25 Parallel 25cps	£589
BROTHER HR-35 Parallel 35cps	£652
EPSON DX-100 Parallel 20cps	£307
JUKI 6100 18cps	£232
QUME 12/20 Letter pro (P or S)	£445

COLOUR/LASER/PLOTTERS

ANADEx / ASTAR / CANON / DIABLO / EPSON / JUKI / MANNESMANN TALLY / OKIMATE / PENMANN / SILVER-REED / OLIVETTI	
OLIVETTI DM 285/1 80 col, 160cps, 35NLQ, parallel, F/T colour	£345
[also available with dual interface, parallel & serial]	
OLIVETTI DM 295/1 132 col, 160cps, 35NLQ, parallel, F/T colour	£449
[also available with dual interface, parallel & serial]	
JUKI 5520, 180cps F/T 7 colour ink set	£339
CANON LASER LBP8	£1890
BDS 630 CANON COMPATIBLE LASER	£2225
APTEC LASERFLOW	£2230
QUME LASER TEN	£2630
NEC LC800	EP.O.A.
HEWLETT PACKARD	£1990

MONITORS

PHILIPS 7502 12" Green, composite 20MHz	£69
PHILIPS 7513 12" Green, IBM [®] Compatible 20MHz	£85
PHILIPS CM8533 MED CV RGB/LINEAR RGB/TTL (IBM)	£225
TAXAN KX 1201G 12" 20MHz, Green, P31 tube	"89
TAXAN KX 1202G 12" 20MHz, Green, P39 tube	£99
TAXAN SUPERVISION II	EP.O.A.
TAXAN SUPERVISION III	EP.O.A.
TAXAN SUPERVISION IV	EP.O.A.
TAXAN VISION PAL	EP.O.A.
TAXAN VISION LX MULTISTANDARD	EP.O.A.
ZENITH ZVM 1220 Amber 12" monitor	£75
ZENITH ZVM 1240 IBM [®] PC Compat. Amber	£91

ACCESSORIES

T-SWITCH PARALLEL	£34.95
T-SWITCH SERIAL	£34.95
PRINTER/MODEM CABLES, almost any config.	£14.95
DUST COVERS—PC/Keyboard/Monitor/Printer etc	£4.95
5 1/4" DISK CLEANING KIT	£4.95

APPLE COMPATIBLE PERIPHERALS

Digitask is the major supplier of peripherals in the U.K.—This month all items in stock at 'Sales' prices!!!

Call for free price list

SOFTWARE TOP 10

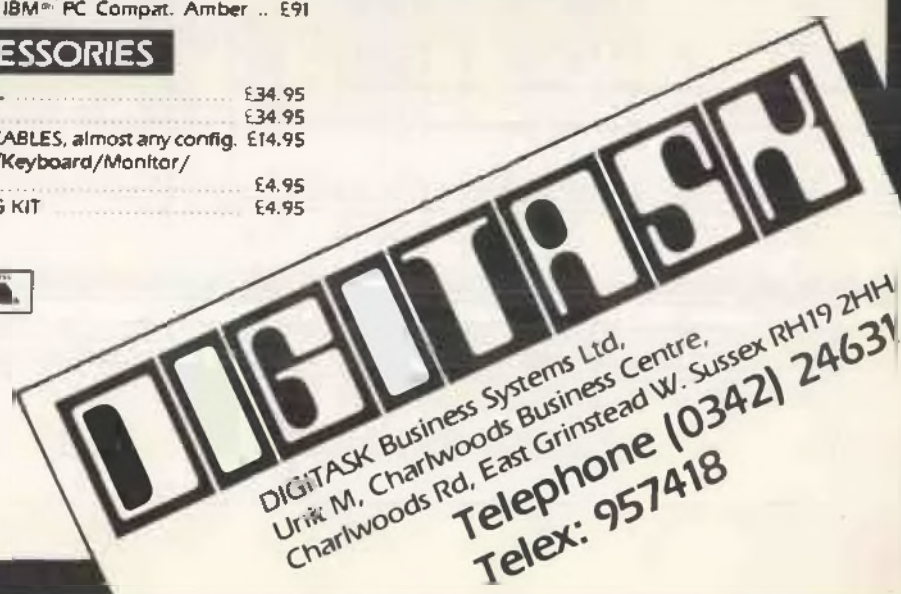
LOTUS 123	£265
D BASE III+	£375
MULTIMATE	£215
CROSSTALK X VI	£120
BORLAND REFLEX	£59
MULTIPLAN	£175
SUPERCALC IV	£288
WORD PERFECT	£260
VICOM	£145
SMART	£386

We stock a very large selection of software packages, with the best prices in the U.K. Please telephone for details.

COMPUTERS

APRICOT / EPSON / CANON / AMSTRAD / COMPAQ / IBM / OLIVETTI / SANYO	
DIGITASK TURBO PC	
STARTER SYSTEM	£449
FULL FEATURE SYSTEM	£695
PREMIERE 10MB SYSTEM	£899
BUSINESS PRO 20MB SYSTEM	£975

*Prices do not include P&P and VAT.



DIGITASK Business Systems Ltd,
 Urik M. Charlwoods Business Centre,
 Charlwoods Rd, East Grinstead W. Sussex RH19 2HH
Telephone (0342) 24631
Telex: 957418

PEOPLE LIKE S&S'S £10 SOFTWARE! It Still Costs £10, But You Can Choose Any Five For £40

UNDELETE: Lets you recover files that you have accidentally deleted from floppy or hard disk; also works in sub-directories.
SECRET: Makes files invisible/visible to directory searches.
READONLY: Makes files so that they cannot be deleted or changed.
ENCRYPT: Encrypts files without a password; also decrypts.
ZAP: Permanently deletes files by overwriting their contents.
DOSMENU: A menu-driven front end for DOS; choose any program or DOS command from menu.
DOTOALL: Makes command and programs apply to all sub-directories.
QDEL: Wild-card deletion of files on a disk, with confirmation.
QMOVE: Quick move of files between subdirectories.
QCOPY: Wild-card copy of files, with confirmation for each one.
SSDISK: Turns part of your memory into a very fast floppy disk.
HEXDUMP: Displays a file in hexadecimal and ASCII.
FXPOUND: Makes Epson FX Printers do a £ and all other characters.
SETFXPR: Makes your Epson FX do double width, compressed, etc.
CRISIS: Cash Crisis; not space invaders, but similar.
TYPEWRITL: Turns your computer into a typewriter.
QUERY: Lets you ask Yes/No questions in a batch file.
QPRINT*: Lets your printer run while you use your PC.
FASTKEYS*: Makes your keyboard work much faster.
FASTHELP*: You can design pop-up help screen inside any program.
EPSTAR: Lets your Epson print out WordStar documents with bold, subscript, superscript, italics, condensed etc.
SIDELINE: Prints your wide spreadsheet printout sideways.
ADVENTURE: The original classic Colossal Cave adventure.

These programs will work on any MS-DOS computer, except those marked *, which need an IBM compatible. They cost £10, except Undelete, £15. You can buy a package or any eight for £65, or any five for £40. Add 15% for VAT. Add £5 for Apricots.

Send your order to:

S&S ENTERPRISES (AMERSHAM) LTD.
 Micro Division, 31 Holloway Lane,
 Amersham, Bucks HP6 6DJ

Or phone: Amersham (02403) 4201 or Amersham (02403) 28095



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.

All machines — IBM, Apricot, Sirius/Victor, DEC, CBM,

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



COMPUTER EXPERTISE FROM CHAPMAN AND HALL

Artificial Intelligence: Principles and Applications

Edited by Masoud Yazdani

This is an authoritative and up-to-date description of AI for readers already acquainted with the fundamentals of computing. The principles of AI, the main areas of applications and their social implications are all considered in this comprehensive book.

(June 1986)

Hardback 0 412 27230 X £27.50 368pp

Paperback 0 412 27240 7 £14.95 368pp

The AMSTRAD BASIC Idea

by Richard Forsyth and Brian Morris

This book — the successor to best-selling *The BBC BASIC Idea* — aims to turn the Amstrad computer user into a computer programmer. It explains the use of modern methods of problem analysis and design to solve programming problems thus making computing more enjoyable and profitable.

(August 1986)

Paperback 0 412 28070 1 £7.95 314pp

The Complete Commodore Machine Code Programming Course

by Surya and Bennett

This complete course first explains the background concepts necessary for an understanding of the subject and

then guides the reader through the first simple and later more complex programming steps on both the C64 and C128 computers. An assembler written especially for the text and therefore 100% compatible, is included with the book.

(July 1986)

Paperback 0 412 27250 4 £7.95 120pp

Apple IIc and IIe Assembly Language

by Jules H. Gilder

In this introduction to assembly language programming on the Apple IIc and IIe computers, the reader is provided with some fundamental theory on the subject, a full description of all the machine language instructions available and suggestions for their suitable application.

(September 1986)

Paperback 0 412 01121 2 £12.95 220pp

Hitch-Hiker's Guide to Artificial Intelligence

by Richard Forsyth and Chris Naylor

Now available in two more versions — Amstrad and IBM PC.

Amstrad edition (May 1986)

Paperback 0 412 28130 9 £8.95 272pp

IBM PC edition (May 1986)

Paperback 0 412 28140 6 £8.95 272pp

All the above books can be obtained through your bookseller.

**Chapman and Hall, 11 New Fetter Lane
 LONDON EC4P 4EE**

PROGRAMMING THE 68000 • BY METACOMCO •

LANGUAGES AND TOOLS FOR THE ATARI ST COMMODORE AMIGA AND SINCLAIR QL

LATTICE C

The C compiler for 68000 based micros. A full Kernighan and Ritchie implementation with comprehensive libraries of UNIX and utility functions.

Compatible with Lattice C compilers on other machines. Full IEEE format floating point arithmetic; powerful data types including pointers, arrays, structures, unions, register variables; macros; conditional compilation and other pre-processors.

Now available for the Amiga.

CAMBRIDGE LISP

A LISP interpreter/compiler providing a complete LISP development environment*; with rational arithmetic, trigonometric functions, catch throw and errorset, full tracing in interpreted and compiled modes, floating point arithmetic, integers of any size, vectors, full garbage collection, load on call facility etc. Now for the ST.

BCPL

A powerful compiler offering the convenience of a high level language combined with the flexibility of an assembler.

Includes a runtime library containing all the standard BCPL functions. Now for the ST.

APL

Keyword and symbolic versions of this important language from MicroAPL.

MENU+

Provides an easy-to-use environment to control programs using menus and the mouse. Runs single programs or batches and the user can add his own tools, arguments and options.

Now included free with all Metacomco languages for the Atari ST.

MCC PASCAL

A popular and powerful Pascal compiler validated to ISO 7185 standard (level O, Class A (no errors)).

A fast single pass compiler generating native code, comprehensive error handling, 32 bit IEEE format floating point arithmetic⁰ and full 32 bit integers.

MCC BASIC

An advanced Basic interpreter with immediate syntax checking, effective error trapping, IEEE single and double precision floating point etc. The leading Basic for the 68000.

TOOLKIT

Provides useful tools and utilities including librarian, extra CLI through serial port, pipes, file compression etc.

THE RANGE

PRODUCT	ATARI ST	COMMODORE AMIGA	SINCLAIR QL
Lattice C	£99.95	£129.95	£99.95
PASCAL	£89.95	£89.95	£89.95
ASSEMBLER	£49.95	§	£39.95
LISP	£149.95	£149.95	£59.95
BCPL	£99.95	—	£59.95
APL	TBA	TBA	£99.95
BASIC	†	§	—
MENU+	£19.95	—	—
TOOLKIT	TBA	£39.95	—
MAKE	£49.95	TBA	—
SHELL	TBA	£49.95	—

§ Available from Commodore.

† Available from Atari.

Prices include VAT and UK carriage.

Contact Metacomco for more information and the name of your nearest dealer.

Credit cards are welcome for telephone and mail orders.

METACOMCO

MCC ASSEMBLER

A professional macro assembler with standard 68000 mnemonics, macro expansions, over 160 explicit error messages, fully formatted listings, large range of directives; absolute, position independent or relocatable code and conditional assembly.

FEATURES

Standard: Metacomco's languages are designed to popular industry standards, making programs straightforward to write and simple to port between systems.

Integrated: Metacomco's range of languages provides an integrated and consistent programming environment, sharing the same editors, linkers, libraries, etc. Program modules written in different languages can be linked together.

Supported: Metacomco's team of professional programmers provide registered users with technical support, advice, and product upgrades.

Complete: All Metacomco languages come complete with a detailed manual, and, where appropriate, a linker, screen editor and GEM DOS, AMIGA DOS or QDOS libraries.

PCW SHOW
3-7 SEPT '86
SEE US ON
STAND 3079
IN THE GALLERY
OF THE
NATIONAL HALL

METACOMCO plc, 26 Portland Square, Bristol BS2 8RZ, UK. Telephone: Bristol (0272) 428781 Telex: 444874 METACO G
5353E Scotts Valley Drive, California 95066, USA. Telephone: (408) 438-7201

Lattice is a trademark of LATTICE INC. GEM DOS is a trademark of DIGITAL RESEARCH INC. UNIX is a trademark of AT&T Bell Laboratories. Amiga Dos and Amiga are trademarks of Commodore. Amiga Inc. QL and QDOS are trademarks of Sinclair Research Ltd. QL LISP is an interpreter, with a limited set of features. * Floating point on QL Pascal is QDOS standard.

GREAT VALUE ON IBM & COMPAQ PC's



Authorised
Dealers

COMPAQ

☎ 01-891-4477

IBM

IBM PC 256k 1 x 360k D/D	£825
IBM PC 640k 2 x 360kb D/D	£1180
IBM PC 640k 1 x 360k D/D 1 x 20 MEG Hard Disk	£1550
IBM ATE 512k 1 x 1.2MB D/D + 20MB H/Disk	£2385

IBM Colour Display	£360
IBM Mono Display	£138
IBM 360k D/D	£135
IBM Mono Display/Printer Adapter	£140
Keyboard IBM AT	£157
Keyboard IBM Enhanced	£135

SOFTWARE TOP 10

Symphony	£375
Lotus 1-2-3	£275
Rbase 5000 database	£385
dBASE II	£270
dBASE III Plus	£415
Framework	£375
Wordstar 2000	£275
Wordstar Professional	£245
Multimate Advantage	£285
Smart	£520

Full training
courses are
available on all
these packages

IBM ADD-ONS

Extra Memory 64kb (9 Chips)	£30
Hercules Colour Graphics/Printer Card	£181
Hercules Mono Graphics/Printer Adapter	£325
IBM Colour/Graphics Adapter	£120
IBM Asynch Comms Adapter	£60
IBM PC Dos V3.2	£55
IBM Printer Adapter	£41
Multifunction Card 1 Serial, 1 parallel clock and 384k	£210
384k Memory Card	£130

COMPAQ PORTABLES

Portable 2 x 360k D/D 256k	£1300
Portable 'Plus' 1 x 360k D/D + 1 x 10MB H/Disk	£1795
★ Portable II Model III 640K + 10MB H/Disk	£2710
Portable II Model IV 640K + 20MB	£3000

COMPAQ DESKPRO MODELS

640k 1x360k D/Drive + 20MB H/Disk with Keyboard + Monitor	£1850
10 meg Tape backup unit	£500
Deskpro 286 - 30 meg H/Disk with keyboard + Monitor	£3120

NETWORKS

TORUS
TAPESTRY
NOVELL

FULL TRAINING
INSTALLATION AND
SUPPORT

SPECIAL OFFER

★ IBM PC XT FD 10MB HARD
DISK

IBM XT 256K RAM
1 x 360K DISK DRIVE
1x10 MEG. H/D
MONO DISPLAY/MONO DISPLAY
PRINTER ADAPTER CARD
UK KEYBOARD

£1699

For computerised solutions to business problems contact

SIMMONS MAGEE COMPUTERS LTD

13 YORK STREET, TWICKENHAM, MIDDLESEX TW1 3JZ

Telex 947080

01-891-4477 All prices exclusive of VAT

FOR FRIENDSHIP, LOVE OR MARRIAGE

'You meet such nice people through Dateline'

If all your friends are married, you're not meeting anyone at work, you've moved to a new area or you are newly single again, joining Dateline is really just a sensible way of meeting lots of compatible people, and perhaps someone special...

● WHO JOINS DATELINE?

People just like you! Currently 2,000 people a month join Dateline, so you probably already know people who have used Dateline or met through Dateline.

People who join Dateline come from all over the country — from farms, villages, market towns and cities. The problems of meeting people are not confined to any particular locality. The backgrounds and occupations of Dateline members are equally varied — MP's, surveyors, solicitors, engineers, doctors, journalists, teachers, secretaries, stockbrokers, nurses, chemists, receptionists, bus drivers and even zoo keepers. Loneliness is classless. What all Dateline members have in common is an optimistic, positive attitude in tackling the problem practically. Meeting someone special is difficult, but after that the romance is easy.

● HOW DOES DATELINE WORK?

Forget fears of cold-hearted computers! You choose the sort of people you want to meet. When you join Dateline you will complete a very comprehensive questionnaire. Information from this will be locked into our computer memory, and the matching process, in which your data is compared with that of every Dateline member of the opposite sex, will begin. The most compatible matches will be found and their details forwarded to you immediately. You will also be matched to other compatible people and they will contact you, and so a whole new social life begins.

● MORE PEOPLE TO MEET

Dateline is the LARGEST computer dating agency in the world; and the more Dateline members there are, the more people we have for you to meet. However, size has not made us impersonal. We are not just a box number; our friendly staff are always happy to help you either in our Kensington office or on the telephone.

● INEXPENSIVE

Dateline is certainly the best VALUE FOR MONEY service, simply providing more people for you to meet.

● RESPONSIBLE AND EFFICIENT

20 years of experience, and a caring approach, give us a justifiable pride in the professional, reliable and confidential service we provide.

● WE CARE

We want your membership of Dateline to be successful, whether it's friendship, love or marriage you are seeking, so our Dateline system and personal service are geared to cater for your individual requirements.



Maxine and Roger

Maxine Breed was an independent woman with two teenage sons, who had been very successful in rebuilding her life after the break-up of her marriage. 'I am not a quiet, stay-at-home sort of person. I led a very busy life before I joined Dateline. I played various sports, sat on several committees and socialised quite a bit. I had a number of men friends — but they were not romantic links. I started to think about Dateline because I feel if you have been married for any length of time, you do miss having a commitment to another person. I joined Dateline in the hope that I would meet men with a lasting relationship in mind.'

Maxine has recently married Roger Higgs, a landscape designer, who had joined Dateline to 'do something about his lifestyle.' When he inquired he had been impressed with the quality of literature supplied about Dateline and had joined immediately. Maxine was the second person he contacted. 'I thought she was incredibly beautiful, when I opened the door I couldn't believe it!' Roger proposed several times to Maxine before she finally agreed to marry him. 'Maxine wanted to wait three years, but in the end she compromised on two. I couldn't believe my ears when she finally said yes!'

If you would like to be one of the many thousands of people nationwide who have been finding love and enjoying a new social life through Dateline, complete this simple questionnaire. We will send you confidentially and completely free, full details about Dateline and how it works, and details of just one of the Dateline members who are compatible with you. Send to: Dateline Computer Dating, 23 Abingdon Rd., London W8 6AH. Tel: 01-938 1011.

Dateline is a member of the Association of British Introduction Agencies
29 Manchester St, London W1.

CONFIDENTIAL

FREE

Computer Test to Find Your Ideal Partner

1 START HERE

Do you consider yourself:

☐ Shy

☐ Extrovert

☐ Adventurous

☐ Family type

☐ Clothes-conscious

☐ Generous

☐ Outdoor type

☐ Creative

☐ Practical

☐ Intellectual

2

Indicate which activities and interests you enjoy by placing a '1' (one) in the appropriate box. If you dislike a particular activity, write a '0' (nought) in the appropriate box. If you have no preference, leave the column blank.

☐ Pop music

☐ Fashion

☐ Pubs

☐ Sport

☐ Pets

☐ Folk music

☐ Jazz

☐ Travelling

☐ Cinema

☐ Good food

☐ Politics

☐ Classical music

☐ Art/Literature

☐ 'Live' theatre

☐ Science or technology

☐ Creative writing/painting

☐ Poetry

☐ Philosophy/Psychology/Sociology

☐ History/Archaeology

☐ Conversation

3

I am over seventeen and would like you to send me completely free and without obligation a description of my ideal partner. Plus a free full colour brochure and lots more information about Dateline. I enclose two first class stamps.

Your sex put M or F

Your Height ft ins

Your Age yrs. Age you would like to meet Min. Max.

Christian Name

Surname

Address

Nationality Religion

Occupation

Send today to:

Dateline, Dept PCL

23/25 Abingdon Rd

London W.8.

01-938 1011

Dateline

EXPORT

AND OVERSEAS VISITORS

**ALL MAKES OF MICRO
COMPUTERS, PRINTERS,
PERIPHERALS AND SOFTWARE
SUPPLIED AT DISCOUNT
PRICES.**

**AMSTRAD • ORIC • SINCLAIR
• BBC MICRO • ATARI •
COMMODORE • APRICOT •
STAR • BROTHER AND ALL
POPULAR MAKES**

MICROGOLD

**UNICOM HOUSE
182 ROYAL COLLEGE STREET,
LONDON NW1 9NN
TELEX: 295932 UNICOM G
TELEPHONE: 01-482 1711**

aptus

HIGH QUALITY IBM COMPATIBLES AT "CLONE" PRICES

All the models listed include 256K expandable to 640K on motherboard, 130W power supply, 14 inch high resolution monochrome monitor with tilt and swivel stand, high quality keyboard, MSDOS and BASIC. Full Warranty.

Victor VPC with dual 360K Floppy Drive.....	£700
Victor VPC with single 360K floppy and 10MB Hard Disk	£1,050
Victor VPC with single 360K floppy and 20MB Hard Disk	£1,100

All prices exclude VAT

APTUS LTD

0676 33854

Clearance Sale!

This is the Morse stocktaking clearout sale at prices that are in nearly every case far below dealer cost. Most items are available in ones and twos, first-come-first-served. Errors and omissions excepted! No mail order for these items.

APRICOT

Limited special offer on complete Apricot Point 32 multi-user network system! complete with 10mb network manager/file server, 3 workstations (each with 720k disk drive, keyboard and monitor), interface boards, tap boxes, software and cabling, installed and tested Greater London area. Listed at £6289, Morse price for complete 3-user system **1700.00**
 Additional workstations **490.00**
 Point 7 multi-user Xi (£3295) **995.00**
 Point 32 network file server with 10mb h/disk (£2995) **PHONE**
 Databank 100mb for Point 32 **595.00**
 Network board + tap box **135.00**
 F1 256k **295.00**
 F1 12 inch mono monitor **85.00**
 Xi 10 256k **895.00**
 Xi 9 inch mono monitor **95.00**
 Xi 10 inch colour monitor **150.00**
 Colour board **195.00**
 Portable Mouse **65.00**
 F1 Mouse **65.00**

SANYO

CRT-70 colour monitor **140.00**

MISC

Casio FP200 computer spreadsheet etc. (£299) **75.00**
 Brother HR-15 printer (serial) **225.00**
 Qume 11/40 **650.00**

Qume 11/40 parallel I/F **90.00**
 Qume 11/40 sheet feeder **195.00**
 Acoustic hood med. (£365) **110.00**
 Visi-on RS232 Mouse (£149) **119.00**
 Ricoh printer special offer **245.00**

IBM FORMAT

Advanced DB-Master (£505) **50.00**
 Easy Junior Accounts (£395) **75.00**
 Mail Merge Manager (IBM) **2.00**
 Personal Pearl program generator (£195) **20.00**
 Correctstar (£160) **20.00**
 Symphony 1.0 upgrd to version 1.1 (£550) **275.00**
 Slidekick (non copy protected) (£49) **25.00**
 PFS software specials
 PSF Write & spell **149.00**
 PSF Plan & graph **149.00**
 PSF File & report **149.00**

APRICOT FORMAT

Micro Modeller (£595) **50.00**
 Easy Junior Accounts (£395) **75.00**
 Lotus 123 1A (£395) **230.00**

All prices are subject to 15% VAT

MORSE COMPUTERS

78 High Holborn, London WC1V 6LS.
 Telephone 01-831 0644. Telex 262546.



COMPUTER BOOKS

New PUBLICATIONS SUMMER 1986



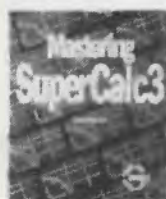
Understanding dBase III Plus
 Alan Simpson
 0 89588 349 X
 £19.95



Amiga Programmer's Handbook
 Eugene P Mortimore
 0 89588 343 0
 £24.95



Operating the IBM PC Networks
 Paul Berry
 0 89588 307 4
 £19.95



Mastering SuperCalc3
 Greg Harvey
 0 89588 312 0
 £19.95



Programming the 65816
 William Labrak
 0 89588 324 4
 £22.95



Turbo Pascal Library
 Douglas S Stivison
 0 89588 330 9
 £14.95



Better Symphony Spreadsheets
 Carl Townsend
 0 89588 339 2
 £19.95



Mastering 1-2-3
 Carolyn Jorgensen
 0 89588 337 6
 £19.95



Assembly Language Techniques for the IBM PC
 Alan R Miller
 0 89588 309 0
 £22.95



Mastering WordPerfect
 Susan Baake Kelly
 0 89588 332 5
 £19.95



Data Handling Utilities in C
 Robert A Radcliffe & Thomas J Raab
 0 89588 304 X
 £19.95

Sybex Computer Books
 - from your local bookseller
 or telephone
 0279 29655



Longman

For a complete catalogue write to:
 Dept LS2, Longman Group Ltd, Longman House,
 Burnt Mill, Harlow, Essex CM20 2JE

Name: _____
 Address: _____
 PCW
 Please allow 28 days delivery

WE ARE DOING IT AGAIN!! BEAT US IF YOU CAN!!

BEST PRICES

BEST SERVICE

SPECIAL OFFERS

PC - COMPATIBLE

- Twin 360k floppy
- 640k RAM
- Colour graphics
- 8 slots + Parallel printer port
- Mono monitor
- DOS 2.1 or later

£699

INC. FREE S/W

XT - COMPATIBLE

- As PC but with
- Single 360k floppy + 20mb
- Switchable turbo 4.77-8mhz
- 30mb (optional)
- 40mb (optional)

£969

INC. FREE S/W

AT - COMPATIBLE

- As PC but with
- 80286 with 512k ram
- one 1.2mb floppy
- 20mb hard disk
- 1 serial + 1 parallel
- 30mb (optional)
- 40mb (optional)

£1899

INC. FREE S/W

**FREE!! WP * SPREADSHEET * RELATIONAL DBASE
MULTISOFT ACCOUNTS "UK'S BEST A/C SOFTWARE"**

**Sales Ledger, Nominal Ledger, Purchase Ledger, Stock Control, Payroll, Invoicing,
@ 250.00 per module.**

COMPUTER SYSTEMS

(all supplied with FREE WP Spreadsheet Dbase)

ZENITH

148/42 256k 2 x 360k over switch + mono	£815.00
158/42 256k 2 x 360k over switch + mono	£1206.00
158/2 256k 2 x 20mb + 360k floppy	
+ mono	£1585.00
200 512k + 20mb + 1.2mb + mono	£2262.00
All Zenith models always in stock.	

PORTABLES

Zenith 171 256k 2 x 360k "lap top - UK's best seller"	£1300.00
Zenith 138 256k 2 x 360k "luggable"	£906.00

EPSON

P x 8 + 128k	£730.00
PC 256k 2 x 360	£725.00
PC 256k 20mb 360k floppy	£1500.00

AMSTRAD

8256 Single floppy	£426.00
8512 Double floppy	£535.00

OLIVETTI

M19 256k 2 x 360k	£1070.00
M19 256k + 10mb	£1690.00
M24 128k + 360k floppy	£1280.00
M24 256k + 2 x 360k floppy	£1490.00
M24 640k + 20mb	£1925.00
M24 640k + 30mb	£1990.00
M24 SP 640k + 20mb	£2290.00

IBM

Call for prices.

DAISYWHEEL PRINTERS

Brother HR15XL	£334.00
Brother HR25	£605.00
Brother HR35	£746.00
TEC F10/40	£649.00
Dume 11/40	£1150.00
Dume 11/55	£1250.00
Dume 11/90	£1450.00
IBM Wheel printer	£1074.00
IBM Overwriter	£1040.00

DOT MATRIX PRINTERS

Brother 1109	£170.00
Brother 1409	£290.00
Brother 1509	£375.00
Epson LX86	£270.00
Epson FX85	£325.00
Epson FX105	£415.00
Epson LQ800	£465.00
OKI 84P	£625.00
OKI 182P	£220.00
IBM Proprinter	£380.00
IBM Proprinter XL	£450.00

ACCESSORIES FOR PC/XT/AT

'Hercules' mono compatible	£160.00
'Hercules' colour compatible	£99.00
Enhanced colour adaptor	£289.00
8087-3 for 4.77mhz machines	£120.00
8087-2 for 8mhz	£135.00
Tape streamer 60mb external	£895.00
Call for anything else not listed.	

COLOUR MONITORS

Sanyo 14"	£200.00
Philips 14"	£200.00
Talung 14" 720 x 240 0.31 pitch hi-res.	£370.00
Talung 14" 640 x 240 0.43 pitch mid-res.	£310.00
Taxan 14" Vision EGA RGB ULTRA RES IBM EGA COMPATIBLE	£455.00

LASERS

Canon Laser	£2100.00
Aptec/Ricoh Laser	£3996.00
BOS Laser	£2100.00
Dume Ten Laser	£2250.00
Hewlett Packard Laser	£2300.00
Hewlett Packard Laser +	£2900.00

COMPUTER DISCOUNT STORES LTD

TRAINING - INSTALLATION - LEASING - OPTIONAL

MAIL ORDER - DEMONSTRATION BY APPOINTMENT - PC/XT/AT ARE TRADEMARKS OF IBM

All prices exclude VAT + £10.00 delivery. All products carry 12 month warranty.

ORDERS AND REMITTANCE TO: 20 BEDFORD SQUARE LONDON WC1B 3HF
01-580 2757; 01-397 9908; 01-397 9983

BE SAFE - RENT - EVALUATE - THEN BUY

"TRENDSETTING ACCOUNTING PRODUCT OF THE YEAR"

PC World December 1985

"Best Software Value"

Info World 1985 "Product of the Year" Awards

PCW Show
Introductory
Price

£99.99* for all seven
modules!



"Amazing". "Incredible".
"Unbelievable". That's how the
American Software industry's
most important reviewers describe
Dac-Easy Accounting –
Dac Software's full featured,
integrated accounting package is
now available in a full U.K. version
priced at only £99.99!
They compare it favourably to
accounting packages (sold module
by module) costing many times
more!

But it's more than the price that
had the critics raving. Compare
our features to those of any other
accounting package at any price.

Dac-Easy Accounting offers
instant access to Nominal Ledger,
Sales Ledger, Purchase Ledger,
Stock Control, Invoicing, Purchase
Ordering and Forecasting. Perfect
integration between all seven
modules gives you fast, accurate,
flexible management of
information and Dac-Easy is
designed to manage both product
and service oriented businesses.

Only Dac-Easy maintains a three
year history on all principal files,
and provides spreadsheet like
forecasting based on history.
Plus, you can generate any of 300
different reports for instant access
to the exact information you need.

We're so confident about Dac-Easy
that we are offering a
**30-day money back
guarantee.**

**SEE US AT THE PCW SHOW
STAND NO. 4215**

PARTIAL LIST OF FEATURES

GENERAL INFORMATION

- Menu driven
- Password protection
- File capacity limited only by disk space
- Support contract available

NOMINAL LEDGER

- Unlimited multi-level accounts
- Pencil and pen feature to correct mistakes
- VDU transaction enquiry
- Activity report, trial balance financial statements, multiple departments and journals

SALES LEDGER

- Open invoice or balance forward
- Customised ageing report
- Unlimited number of customers
- Flexible mailing and directories
- Supports partial payments
- Three year customer history for invoices, sales, costs and profits
- Customised statements
- Cash flow analysis/sales analysis
- Automatic sales forecasting

PURCHASE LEDGER

- Cheque printing with multiple invoices and cash available routines
- Ageing reports with seven customised columns
- Unlimited number of vendors
- Flexible mailing labels and directories
- Three year vendor history
- Unlimited allocations per invoice

STOCK CONTROL

- Supports average, last purchase and standard costing methods
- Powerful physical inventory routines
- Accepts any unit of measure
- Three year product history in units, pounds costs and profits
- Automatic forecasting of product sales
- Automatic pricing assignments
- Alert activity reports with 11 sorts
- VDU shows on-hand/on-order/committed/sales/cost/profit/turns/GROI

PURCHASE ORDERING

- Inventory and non-inventory items
- Allows up to 99 lines per P.O.
- Per line discount in %
- P.O. accepts generic discounts/freight/tax/insurance
- P.O. accepts back orders and returns
- Purchases daybook

INVOICING

- Service or stock invoicing on plain or pre-printed forms with remarks
- Print sales daybook
- Allows credit notes

FORECASTING

- Unique program that automatically forecasts using your three year history
- Revenue and expense accounts
- Supplier purchases
- Customer sales, cost and profit
- Stock item usage
- Forecast by same as last year, or % base from last year, or trend, or least square trend line analysis method

"I've never before in a review
come right out and told readers
to buy a product, but I'm doing it
now. Dac-Easy is an incredible
value."

PC Week 27 August 1985

* PCW Show introductory price is valid until 7 Sept '86.
From 8 Sept '86 the RRP will be £129.99.

Minimum systems requirements

IBM or other compatibles □256K memory, two disk
drives, MS-DOS, PC-DOS 2.0 or later, 132 column in
compressed mode, colour or monochrome monitor.

MS-DOS is a trademark of Microsoft Corp. IBM and
PC-DOS 2.0 are registered trademarks of International
Business Machines Corp. Dac-Easy is the trademark of
DAC Software Inc.

As Dac is new to the U.K. quotations in this
advertisement are from U.S. publications.

30-day money back guarantee

Technology Software offers an
unconditional guarantee on all Dac-Easy
products (less shipping charges). There is a
£10.00 restocking fee if the disk seal is
broken. This guarantee is available on all
products bought directly from Technology
Software Ltd.



Technology Software Ltd

Hallams Court, Blackheath
Guildford GU4 8QZ

**Call (0483) 898140
for immediate attention**

Please rush me copies of
Dac-Easy Accounting at the special price of
£99.99 + VAT + £2.00 P&P (Total £117.29).

Enclosed is a cheque/P.O. in the amount
of £

Name

Address

Tel. no.

Walk away with a
Wordprocessor,
Spreadsheet, Database, Monitor,
Near Letter Quality printer,
and Micro, 256K RAM
expandable
to 640K and access
to the expanding library
of IBM PC™ software.

Fully Compatible
at less than a third
of the price of
the IBM PC™.

PC Sport



**Applied
Microsystems
Technology
Limited**

32-34 Cricklewood Broadway,
London, NW2 3ET
Telephone: 01-452 4286 (4 lines)
Easylink No: 19005605
Telex: 946240 CWEASY G
(Ref: 19005605)



**LIVE
DEMONSTRATION
AT STAND 1203**



THE COMPLETE CENTRE FOR THE AMAZING PSION ORGANISER II, THE PC IN YOUR POCKET!!

PSION Organiser II brings Effortless and Professional Data Collection and Retrieval within reach of the smallest business.

The Basic Organiser II provides you with a sophisticated Diary, Calculator, Alarm Facility, simple Data Base and an advanced Programming Language.

EIDERSOFT is pleased to announce a range of powerful, hardware and software applications to help you get the best out of your Organiser II.

TEXTBASE is a sophisticated user-defined data base for the Psion Organiser II.

— features —

- ★ Powerful Search and Select Facilities.
- ★ Label Printing.
- ★ File Maintenance.
- ★ Import and Export from IBM, APRICOT, ATARI, QL and most PC's.

Automatic Import and export into Psion Xchange™.

*Requires RS232 lead.

NUMBASE has been especially designed for numeric data collection and processing.

— features —

- ★ Up to 255 undefined fields.
- ★ Analysis and selection on any no. of fields.
- ★ Mean, standard deviation and frequency distribution on any field.
- ★ Graphic print outs.
- ★ Import and export from IBM, APRICOT, ATARI, QL and most PC's.
- ★ Direct import into Xchange™ business graphics and spread sheet.

PRICE LIST All prices include 15% VAT.

Psion Organiser II; Model CM	£99.50
Psion Organiser II; Model XP	£139.50
16K Datapak	£19.95
32K Datapak	£34.95
64K Datapak	£79.95
Text Base	£34.95
Num Base	£34.95
Finance Pack	£29.95
Maths Pack	£29.95
Concise Oxford Spelling Checker	£29.95
RS232 Link	£47.95
Link—Up adaptors (specify type)	£12.95
Mains Adaptor	£12.95
Barcode Reader	£172.50



up front in communications

Eidersoft, The Office,
Hall Farm, North Ockendon,
Upminster, Essex RM14 3QH.

OFFICIAL ORGANISER CENTRE

Organiser and Xchange are the Trademarks of Psion Ltd.

SALES HOTLINE —
0708 851099



FREE OVERNIGHT DELIVERY!*

01-455 9823

COMPUTERS/CALCULATORS/PLOTTERS

LASER PRINTERS		PLOTTERS	
CANON 8A1	£2034.00	HP 7470A (A4 2 Pen Plotter)	£860.00
BDS	£2197.00	HP 7475A (A3 6 Pen Plotter)	£1525.00
QUME	£2426.00	HP 7550 (8 Pen A4/A3)	£3220.00
NEC LC08	£2399.00	HP 7440 (8 Col 2 Pen)	£986.00
HP LASER	£2150.00	HP 7580B (A1)	£7500.00
OLIVETTI M24		SHARP PC 1500A	£147.50
M24 128K 1 x 360K	£1285.00	CE 158 RS232 and Cent IF	£120.00
M24 256K 2 x 360K	£1495.00	CE 150 printer cassette IF	£125.00
M24 128K 10MB	£2050.00	PC 1600 (16K)	£220.00
M24 640K 30MB SEAGATE	£1995.00	CE 1600P (4 Col plotter printer/cas. I/F)	£230.00
M24 SP 640K 20MB	£2295.00		
TANDON		EPSON QX-10 (desk top computer)	£1599.00
PC 256K 2 x 360K	£995.00		
PCA 20 512K + 20MB	£1795.00	EPSON HX20 Briefcase computer, 16K expandable, S/RS232 interface	£345.00
HEWLETT PACKARD		EPSON PX-8 (portable 64K Computer/Word Processor)	£650.00
HP 41CV (SCI Computer)	£139.00	Epson PC range available	POA
HP 41CX (Computer)	£199.00		
HP 71B (portable computer)	£425.00		

MONITORS/PRINTERS

OKI		MT 85 (80 Col IBM/Apple Com)	£350.00
MICROLINE 182 (120CPS)	£193.50	MT 86 (as above but 136 Col)	£390.00
MICROLINE 192 (160CPS)	£307.50	Epson LX80 (80CPS + NLQ)	£198.50
MICROLINE 84T/F (200CPS/NLQ)	£620.00	Epson LX86 (120CPS)	£236.00
OKI294	£700.00	Epson FX 100FT Plus (160CPS)	£410.00
CANON A50 (180CPS)	£315.00	Epson RX100FT Plus (100CPS)	£324.00
CANON A55 (165 Col/180CPS)	£415.00	Epson LQ1500 Plus (200CPS)	£729.00
FUJITSU range from	£850.00	LQ1000 (7K Buffer 180CPS)	£595.00
TAXAN range from	£299.00	LQ800 (80C 180CPS)	£448.50
NEC 3500 Series	from £639.00	FX85 (160CPS 80C)	£333.00
8800 Series	from £1000.00	FX105 (160CPS 132C)	£420.00
NECP7	£465.00	BROTHER	
NECP5	£750.00	HR15 (3K Buffer 18CPS)	£295.00
DISK DRIVES/TAPE STREAMERS		HR15 XL (20CPS)	£394.00
QUME 12/20	£466.00	HR25 (3K Buffer 25CPS)	£549.00
QUME 11/90 (90CPS)	£1355.00	HR35 (35CPS)	£659.00
JUIKI range stocked (6100/6200)	POA	Brother 1509 (IBM/FX 100 Comp)	£400.00
SEIKOSHA range stocked	POA	Brother 2024L (190CPS/NLQ)	£690.00
STAR range stocked	POA	Twin Writers	£1150.00
PANASONIC		CANON Jet Printer (7 colour)	£450.00
KXP 1091 (120CPS/NLQ 22)	£250.00	HP Jet Printer (150CPS)	£368.00
KXP 1092 (180CPS/NLQ 33)	£379.00	DIABLO 635	£699.50
MODEMS		630 (API) (IBM COM)	£1295.00
(Dacrom/Master/Epson/Nightingale/Intertek/Starbuck/Answercall etc.)		MONITOR/TERMINALS	
from	£73.50	ZENITH	from £425.00
MANNESMAN TALLY		TELEVIDEO	from £280.00
MT 290 (IBM/Epson Com)	£600.00	WYSE	from £360.00
MT 4600 (200CPS/NLQ 50)	£120.00	QUME	from £360.00
		HAZELTINE/ESPRIT	from £425.00
		SANYO/PHILIPS/ZENITH	from £75.00

**CAN YOU FIND A LOWER PRICE
PHONE US FOR BEST DEAL**

SOFTWARE

IBM/COMPAD/OLIVETTI/APRICOT		Open Access	£309.00
Wordstar (update to W/S 2000)	£200.00	Smart System	£388.00
Lotus 1-2-3	£275.00	Smart Spread Sheet	£299.00
Symphony	£395.00	Smart Word Proc	£220.00
D/Base 11 (PC/DOS)	£299.00	Data Manager	£299.00
Graphwriter Combo Pak	£339.00	Microsoft Project	£185.00
Lotus 1-2-3	£275.00	Semnal III	£345.00
Symphony	£395.00	Supercalc III Release 2-1	£248.00
Framework II	£346.00	Supercalc 4	£299.00
D/Base III+	£368.00	Turbo CAD	£350.00
JAVELIN	£399.00	Word Star 2000	£275.00
Cornerstone	£299.00	Word Star Professional	£229.00
R/Base 5000	£385.00	Multimate	£225.00
D/Base Clipper	£550.00	Quickcode III	£79.00
Easy Filer	£199.00	Sage Chit-Chat	£99.00
Teach Yourself Framework	£60.00	Sage Accounts	£250.00
Teach Yourself Symphony	£60.00	CrossTalk (Release XVII)	£140.00
Logistix	£295.00	OMNIS II Information Manager	£215.00
Hercules Graphic Card	£299.00	GEM Paint/Write	£125.00
FORMATTING OF SOFTWARE		Easy Business System	£350.00
AVAILABLE		BORLAND Turbo Range	from £22.00
HARVARD Presentation Graphics	£250.00	Intelligent back-up (full file back-up)	£99.00

GOODS FULLY GUARANTEED. PRICES EXCLUDING VAT (P&P EXTRA ON ORDERS 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

I.S.C.**XEN IN STOCK**

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

COMPUTERS

All Computers include Mono Screen and DOS

APRICOT F2/9in/MOUSE/GEM	£495
APRICOT F10/9in/MOUSE/GEM	£695
APRICOT XIFD/9in/512K	£795
APRICOT XIHD/9in/10MB/512K	£995
IBM XT SDD/TWIN/640K/KB	£1595
IBM XT SFD/20MB/640K/KB	£1995
IBM AT E/20MB/512K/KB	£2825
IBM AT X/30MB/512K/KB	£3295
FREE ONSITE MAINTENANCE ON ALL TANDON COMPUTERS	
TANDON PCX10/10MB/256K	£P.O.A.
TANDON PCX20/20MB/256K	£P.O.A.
TANDON PCA20/20MB/512K	£P.O.A.
TANDON PCA30/30MB/512K	£P.O.A.
TANDON PCA40/40MB/512K/SP	£2245
COMPAQ 286/MODEL2/30MB/512K	£3095
COMPAQ 286/MODEL3/70MB/640K	£4595
OLIVETTI M24SP/20MB/640K	£2295
OLIVETTI M24/20MB/640K	£1995

COLOUR SYSTEMS ADD

THE FOLLOWING:-

APRICOT 195 ... TANDON 260 ...
... OLIVETTI 250 ... IBM 220 ...

**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**

PRINTERS

EPSON FX85 160CPS/40NLQ/80COL	£310
EPSON FX 105 160CPS/40NLQ/132COL	£410
EPSON RX100 100CPS/132COL	£195
EPSON LX80 100CPS/22NLQ/80COL	£195
EPSON LQ800 180CPS/60NLQ/80COL	£435
EPSON LQ1000 180CPS/60NLQ/132COL	£575
EPSON EX800 300CPS/50NLQ/80COL	£395
CANON A50 180CPS/45NLQ/80COL	£275
CANON A55 180CPS/45NLQ/132COL	£335
JUKI 5510 180CPS/45NLQ/80COL	£225
JUKI 5520 180CPS/45NLQ/80COL/COLOUR	£370
JUKI 6100 15CPS/DAISYWHEEL	£240
JUKI 6200 30CPS/DAISYWHEEL	£410
JUKI 6300 35CPS/DAISYWHEEL	£630
FUJITSU DX 220CPS/55CPS/80COL	£260
FUJITSU DX 220CPS/55CPS/132COL	£350
CANON LBPSA1 8PAGEMIN/A4	£1795
CANON LBP8A2 8PAGEMIN/A4/GRAPHICS	£2700
HP LASER 8PAGEMIN/A4	£1980
HP LASER+ 8PAGEMIN/A4/GRAPHICS	£2650

SOFTWARE

PEGASUS SINGLE USER	£160
PEGASUS SENIOR	(2 YEARS SUPPORT) £295
PEGASUS MULTI USER	(2 YEARS SUPPORT) £345
DELTA 4	£299
DBASE2	£225
DBASE3	£299
DBASE3+	£355
WORDSTAR PROFESSIONAL	£209
WORDSTAR 2000	£209
MICROSOFT WORD	£270
LOTUS 1-2-3.V1	£179
LOTUS 1-2-3.V2	£269
LOTUS SYMPHONY	£359
SMART INTEGRATED SYSTEM	£419
OPEN ACCESS	£335
LOGISITIX	£255

SPECIALS

APRICOT 256K RAM	£95
APRICOT 512K RAM	£119
IBM 256K RAM	£119
IBM 384K RAM	£139
SONY 3.5 INCH D/S DISKS	£32
FUJI 3.5 INCH D/S DISKS	£27
20MG UPGRADE FOR IBM	£395
AMSTRAD 8256 DUAL DRIVE + MAINTCE	£395

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

Prices Exclude only
VAT and Delivery

I.S.C. LIMITED

**GRAPHIC HOUSE
88 WAVENEY ROAD
ST IVES
CAMBRIDGESHIRE
PE17 4FW**

**TEL: 0480 300530
0480 300533
TELEX: 329115 ISCLTD**

Looking more business-like has a way of attracting more business.

They say looks aren't everything. But it's hard to look professional when your documents don't.

On the other hand, a document that looks good makes you look good.

And that goes for everything you produce on the Apple™ Desktop Publishing system.

Reports, memos, newsletters, training material, technical manuals, forms, you name it. In different type styles, sizes and weights. Printed out on plain paper, your own letterheads, even transparencies. With illustrations, reversed-out panels, graphs and photos dropped into the text wherever you want.

Transform in-house printing.

If you now send your print work out to be done professionally, you'll have the quality - and the bills to prove it. If you do it in-house with the Apple Desktop Publishing system, you'll just have the superb quality!

Apple Desktop Publishing is inexpensive, fast, and simple to learn. It lets you plan better and present

more convincingly.

As for the results, we think they



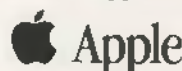
speaks for themselves.

The quality of our printing is so good, in fact, that we're actually selling the system to printers themselves. (If they don't know, who knows?)

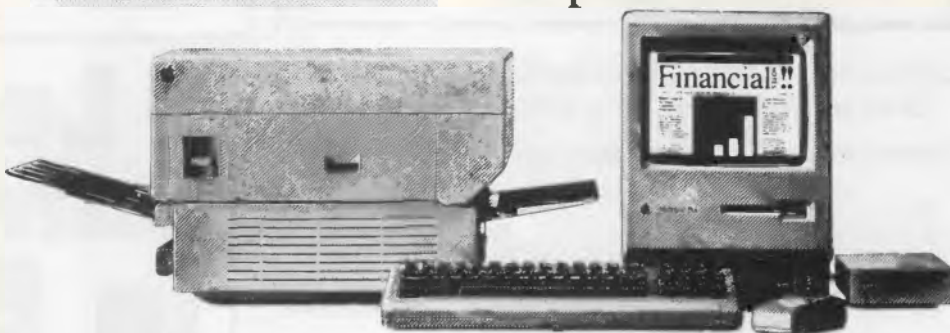
We'll prove it, free.

We're so confident of that quality that we want you to put it to the test. Just bring us a page (the busier, the better) from one of your presentation documents and we'll redo it on the Apple Desktop Publishing system and send it back.

We call this the Apple Challenge.



Apple
The power to succeed.



There are almost 200 Apple Macintosh dealers in the U.K. This advertisement was sponsored by a group of them who liaise closely, and whose aim is to pool and enhance their knowledge in the field of Desktop Publishing to the benefit of their customers.

Scotland	North East	North West	Liverpool	Midlands
McQueen Systems Elliot House 8-10 Hillside Cres Edinburgh Tel. 031 558 3333	Newcastle Computer Services 906/908 Shields Road Newcastle Upon Tyne Tel: 0632 761168	Computer City 78 Victoria Road Widnes Tel. 051 420 3333	Computer City 5, Alsop Arcade Liverpool University Tel. 051 709 5959	Second City Systems Second City House Warwick Road Birmingham Tel. 021 707 8739
East	North London	South East	South	Wales
Harram Computers 11, Guildhall Street Bury St. Edmunds Tel. 0284 705808	Chromasonic Business Centre 238, Muswell Hill Broadway Tel. 01 883 3705	Microspot 9, High Street Lenham Maidstone Tel. 0622 687771	M.E. Electronics Ltd 5, Hatherley Road Reading Tel. 0734 669480	Cardiff Micros 46/48 Charles Street Cardiff Tel. 0222 373072

For further details please send your completed coupon to the nearest dealer above.

Name.	Position.	Company.	Please tick
Address.		Please send me details on	Apple's Desktop Publishing
			Training Plan
			System Prices
Tel:		PCW3	I would like to arrange a demonstration

Galileo Computers Ltd.

Phone 0707-46340
Evenings 043871-6643

	mfp	cwo
Honeywell EP (PC) 256Kram, 2 x 360KFD, 8088-2, 4.77/8MHz, mono disp	£1,540	1,386
Honeywell XP (XT) 256Kram, 1 x 360KFD, 8088-2, 4.77/8MHz, 20MbHD, mono disp	£2,470	2,223
* Honeywell AP (AT) 512Kram, 1 x 1.2MB, 80286, 8MHz, 20MbHD, mono disp	£3,635	3,272
Opt tape cartridge 45/60mb (start stop or streamer) MTU0702	£1,459	1,349
Opt tape cartridge 10 Mb MTU0701	£900	810
* Honeywell Printer M32 132 Col, 150cps, 50cps nlq	£595	535
M34 132 Col, 270cps nlq	£995	895
4/66 136 col, 480cps 180cps nlq, 100cps B	£1,750	1,575
Hewlett Packard Vectra45(AT)540Kram, 1 x 1.2MBFD, EGA monitor & card	£3,865	3,479
* Think Jet printer (IBM compatible) x cable, quiet ink jet type	£445	399
Laser Jet +, laser printer	£3,518	3,166
Asyst scientific software, & other applications software	POA	
* Tandon PCA(AT)512Kram, 1.2MBFD, 80286, 8MHz, 20MbHD, mono monitor	£1,995	1,796
* Tandon PCA(AT) as above but with 30ms 40MbHD	£2,995	2,696
Colour add	£295	266
* Business card 21.3Mb 11 watt, plug-in hard disc card	£775	696
* ARC Jet 80286 (XT/AT)512Kram, 360KFD, colour or mono card	£1,495	1,346
* ARC Turbo 8088-2(PC/XT) 512Kram, 360KFD, 4.77/8MHz, colour or mono card	£495	446
mono monitor for above	£99	89
13" RGB colour monitor for above	£349	314
* BASIC WP station ARC Turbo, Silent Printer, Bonny Blue, mono disp	£1,138	999
* PCXT Eight pack plus (Multifunction and 384Kram)	£139	125
Kaga Taxan II monitor, 385 dot pitch	£389	350
Kaga Taxan IV/Monitor, 37 dot pitch	£499	449
* KIF 560 board, 640x400pixels EGA, CGA, HRC, Mono	£289	260
Kaga taxan printers, plotters, Hayes modems etc	POA	
Wordstar	£295	266
Microsoft Word III	£400	360
* Volkswriter III (this is a special price for Tech Authors)	£325	260
* Bonny Blue WP (with wordstar conversion)	£99	89
dbase III +	£595	536
Paradox relational database, Up to 5 times the speed of others	£550	495
* Turbo Pascal	£47	44
* Turbo Prologue	£67	60
Lotus 1-2-3	£395	356
* Farlight (performs like a clone of lotus 1-2-3) with WP & windows!	£99	89
* Prodesign II (CAD)	£249	224
* Autocad - The industry standard CAD software	£2,500	2,250
* Unix System V.2 for IBM compatibles (all three parts) Super price	£527	475
Training: includes all course material, but not accom & meals		
Introduction to computing with IBM PC compatibles level 0,1,2	£390	349
MS DOS levels 0,1,2	£390	349
Pascal levels 0,1,2	£390	349
db II levels 0,1,2	£390	349
dbIII levels 0,1,2 starting soon	POA	
Wordstar word processing	£260	234
Bonny Blue word processing	£260	234

Professional Systems
Word processing, desk top publishing, scientific, CAD, CAE, scientific Test systems, data acquisition etc
Please add 15% VAT to all items. Carriage add £5 to all items under £200

£100,000 TYPESETTING MACHINE 99% OFF.

Typesetting from 4 to 360 point. Over 150 typefaces. The ultimate in typesetting for the ultimate in money saving.

How is it all possible? You just send your specially coded copy electronically. Our system then decodes and sets it.

No problems, no catches just the future of typesetting waiting to be used.

Write to Lightning Graphics Limited, Security House, Sumatra Road, London NW6 1JL, or ring Ivor Jacobs on 01-794 8138.

He'll talk type without hype.



Lightwave

Quality tested cables and accessories

64K Printer Buffer — Centronics (parallel) Features: Bypass, Copy, Multiple Copies, Buffer Status & Reset	£184.00
Interface Selector 'T' switch serial (RS 232).....	£65.95
Interface Selector 'T' switch Parallel (centronics).....	£59.95
'Multilink' Switchable RS232 cable M/M (2 metres)	£32.95
'Multilink' Switchable RS232 cable M/F (2 metres)	£32.95
IBM Printer cable (2 metres)	£13.95
IBM Printer cable (3 metres)	£15.95
IBM Printer Cable — Pin 31 N/C..... (2 metres)	£13.95
IBM PC/AT RS232 cable (DTE equipment) (2 metres)	£9.95
IBM PC/AT RS232 cable (DCE equipment)..... (2 metres)	£9.95
IBM 'Token Ring' network cable (2 metres)	£21.95
IBM 'Token Ring' network cable (3 metres)	£24.95
IBM PC to Philips Monochrome monitor (2 metres)	£5.95
IBM PC Keyboard extension cable (2.5 metres coiled)	£3.95
IBM PC Monitor extension cable (2.5 metres coiled)	£8.95
IBM Power extension cable..... (2 metres)	£6.95
IBM PC Keyboard dustcover	£6.95

This is just a small selection from our range. Please phone for more details. Trade and Export enquiries welcome. All prices include VAT and P&P

Please send cheques/PO's to

LIGHTWAVE LEISURE LTD,
PO Box 23, Wallasey, Merseyside, or phone 051 639 5050 and order via ☐

IBM COMPATIBLES

TOSHIBA	
T3100 Portable 1 x 3.5 drive + 1 x 10Mb H disc (80286)	£3,000
T2100 Portable 2 x 3.5 drives (8086-2)	£2,000
T2100 Portable 1 x 3.5 drive + 1 x 10 Mb disc (8086-2)	£2,500
T1100 Portable 1 x 3.5 drive (battery) (80C88)	£1,399
Expansion Box 5 slots (for T2100/3100)	£650
External 5.25 disc drive (360K)	£350
TANDON (with 14 inch Monochrome monitor) XT compatible (8088 — 4.77 MHZ)	
PCX 2 x 360K drives 5.25	£1,000
PCX10 1 x 360K + 1 x 10Mb H disc	£1,195
PCX20 1 x 360K + 1 x 20Mb disc	£1,395
at compatible (80286 — 6/8MHZ switchable)	
PCA 1 x 1.2Mb drive	£1,695
PCA20 1 x 1.2Mb + 1 x 20Mb H disc	£1,895
PCA30 1 x 1.2Mb + 1 x 30Mb H disc	£2,395
PCA40 1 x 1.2Mb + 1 x 40Mb H disc	£2,895
Additional charge for 14 inch Colour Monitor and card	£245
Business Card 21Mb hard disc on a card	£700
SHARP	
PC 7000 Portable 2 x 360K 5.25 (with case) (8086-7MHZ)	£1,695
PC 700P Printer	£395
CE 710E Expansion unit 3 slots	£400
CE 700E Expansion unit with 10Mb H disc	£1,295
CE 700A Colour CRT adapter	£200
HERMES (with 12 inch green monitor)	
H80 512K 1 x 360K 5.25 drive (8086-4.7MHZ)	£1,340
H80 512K 2 x 360K 5.25 drives	£1,450
H80 512K 1 x 360K + 1 x 10Mb H disc	£2,040
Additional cost for 12 inch Colour Monitor	£200
H100 512K 2 x 360K 5.25 drives (8086-8MHZ)	£1,900
H100 512K 1 x 360K 5.25 drive + 1 x 10Mb H disc	£2,400
H100 512K 1 x 360K 5.25 drive + 1 x 20Mb H disc	£2,620
Additional Colour Monitor	£320
BONDWELL	
Model 8 Lapsize portable 1 x 360K 3.25 drive LCD	£1,000
Model 18 portable 2 x 360K 5.25 drives	£800
Model 36XT 1 x 360K + 1 x 20Mb H disc 12 inch monitor	£1,200
MICROVITEC	
Full range of these excellent monitors all at 10 per cent discount from normal retail prices. Phone for details and prices.	
SOFTWARE	
All good software available 1E Pegasus, Microsoft etc.	
CAD SYSTEMS	
We can supply complete CAD Systems, including software, digitisers, plotters etc. Prices range from £250 for software and £3,000 to £10,000 for complete systems.	
VAT and carriage to be added to all prices. Callers by appointment.	

SHEP ASSOCIATES,
Long Barn, North End, Meldreth, Royston, Herts.
Tel: 0763 61686 Telex: 8950511 One One G quote Ref. 25429001

LEIGH COMPUTER SYSTEMS

Sperry PC, IT and full range of other equipment Olivetti M24, M21, M24SP.
Apricot FI, full range Tallgraph, tape discs and tape streamers.
North Star multiuser, phone for demonstration.
Regular delivery to London and Home Counties on own transport.
IBM Computers supplied.

COMPUTERS

Apricot	EPOA
Victor	EPOA
Tandon	EPOA
Olivetti	EPOA
Amstrad PCW 8256	E399
Atari 520 ST	E852

Suppliers of Olivetti and Sperry equipment

HARD DISKS

INTERNAL	
PC 10Mb	E450
PC 20Mb	E499

Phone for external AT Hard Discs and Tape Streamers

MONITORS

Philips 7502 (green)	E74
Philips 7522 (amber)	E78
Philips 7513 (IBM)	E89
Microvitec 1431	E189
Microvitec 1451	E235
Microvitec 1441	E389

Microvitec IBM monitors... prices on application

PRINTERS

Mannesman Tally MT80	E155
Mannesman Tally MT85	E295
Epson LX80	E218
Epson FX85	E324

Epson FX105	E415
Epson JX80	E425
Epson DX100 Daisywheel	E355
Epson LQ1500	E825
Epson M180	E355
Canon 1080A	E242
Canon 1156A	E329
Juki 6100	E325
Juki 6300	E825
Sheet feeder for above	E185
Silver Reed 400	E275
Silver Reed 500	E325
Silver Reed 550	E499
Silver Reed 770	E725
Sheet feeder for 550/770	E199
Eprams 27128	E475
Brother HR5	E128
Brother HR15	E325
Brother HR25	E630
Brother HR35	E685
Brother M1009	E154
Brother EP44	E184
Brother 2024	E779

CAD-CAM EQUIPMENT

AUTOCAD DAX CAD
Pictor's
Roland, Benson, Hewlett Packard.
Digitisers
Benson, TDS etc.
High Resolution monitors and controllers.
Demonstrations Available on Request.

All price exclusive of VAT and £8 carriage.
Seminars available on range of standard software - phone for details. Many other products supplied, including many standard business software packages at competitive prices. Competitive prices matched on cash and carry.

75 CROSS ST, SALE
GREATER MANCHESTER
Tel: 061-905 2144

7 COVENTRY RD, HINCKLEY
LEICESTERSHIRE
Tel: 0455 612139

VMS DATA SYSTEMS LTD

TAKE A LOOK AT THE FAMOUS FIVE

Intel 80286 processor, floppy disk drive with 1.2 MByte, 20 MByte fixed disk drive, main storage memory with 512 KByte, expandable to 16 MByte, high resolution 11" monitor.

PCX-10 £1,295

PCA-20 £1,995

PCA-30 £2,495

PCA-40 £2,995

PCX-20 £1,495

Tandon Computer

Upgrades	
10 Mb 1/2 Hgt inc. controller	399
20 Mb 1/2 Hgt inc. controller	475
Tandon business card 20MB	650
HARDCARD 20MB Western digital	675
20MB tape streamer	599
Intel Aboveboard PC 2MB Ram	675
Intel Aboveboard AT 2MB Ram	795
Intel Aboveboard PS 512K Ram	395
Intel Aboveboard PS 1.5Mb Ram	595
80287 Math coprocessor	135
Speed card (80286 8 Mhz)	575

Tandon Computer

Software	
Lotus 123 Rel 2	275
Symphony	375
Framework 2	368
Dbase 2	255
dBase 3+	368
Smart Full System	499
O&A	225
Wordstar Prof	241
Wordstar 2000 (Rel.2)	299
Supercalc 3 ver 2.1	199
Norton Utilities	62
Concurrent PCDOS	195
Superproject	420

DELIVERY Computers and Printers £10, Others £5 All Prices Subject to 15% VAT

YOU GET A GREAT DEAL FROM

VMS DATA SYSTEMS LTD

436 Foleshill Road, Coventry CV5 5JX.
0203-686667

DISKCOVERY

**** Diskcover your way to cheaper disks! ****

	48 TPI	50	100	250
5 1/4"	SS/DD	£0.65	£0.55	£0.47
5 1/4"	DS/DD	£0.82	£0.72	£0.62
	96 TPI			
5 1/4"	DS/DD	£0.90	£0.80	£0.70

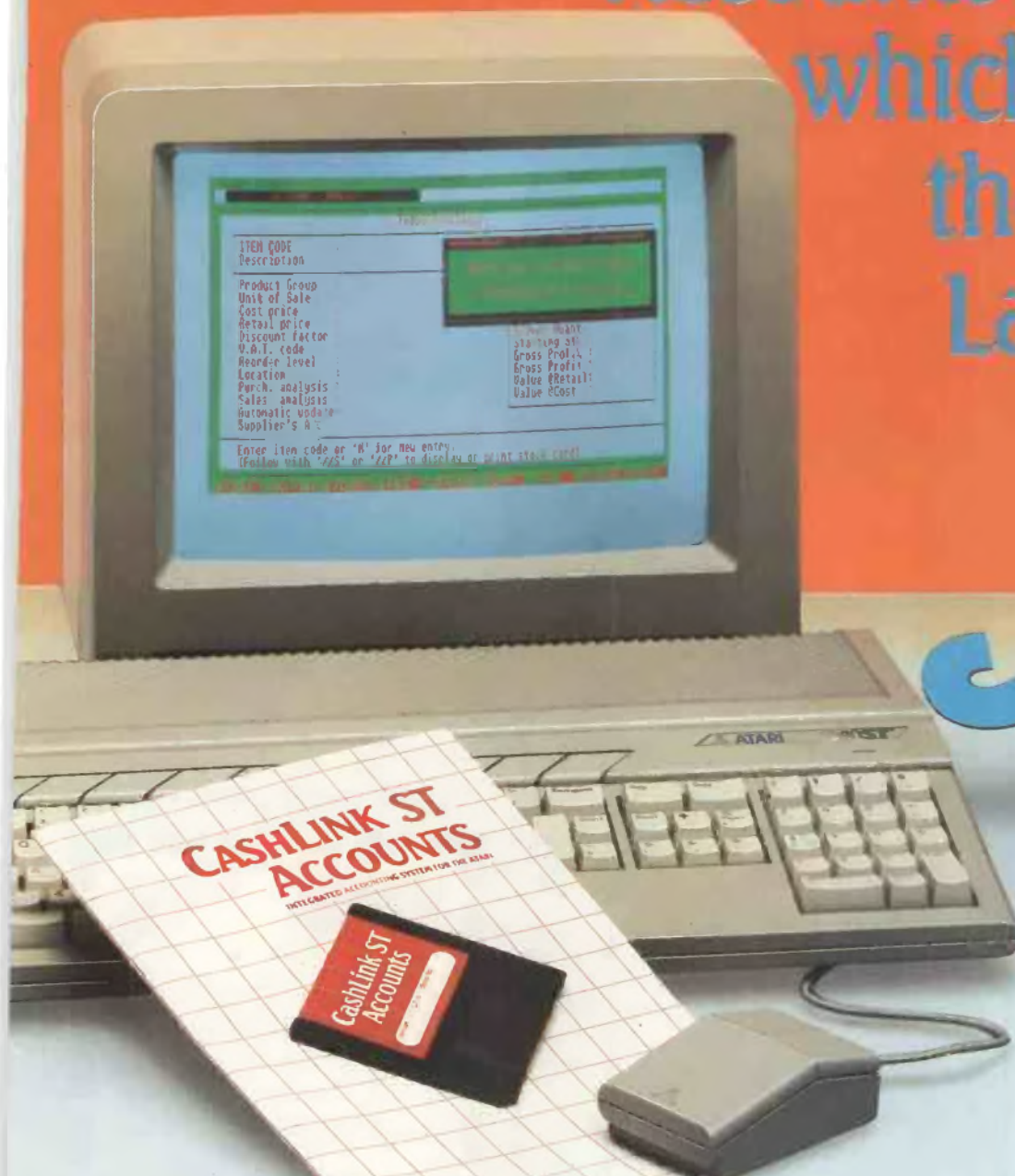
ALSO AVAILABLE, KEENEST PRICES ON 3" AND 3 1/2" DISKS

**** Bulk packed in 50's ****
*** Fully certified, error free ***
***** Life Time Warranty *****

Call the HOTLINE
01-807 1556
10 The Concourse
Edmonton, N9 0TY



Now there's a Professional Accounts Package which speaks the ATARI's Language



**CashLink
ST Accounts**

£295

Value for money

The Atari ST range has already made quite an impression on the business world.

It's a Personal Computer which combines power and versatility with astonishing value for money.

Now here's a professional accounts package which speaks the Atari's language. A package designed to make the most of the Atari's power, at a very reasonable price.

It's called **CashLink ST Accounts**. And it's a proven success, with 2,000 packages already in use on machines like the IBM PC and compatibles.

On the Atari ST, the package features up-to-date programming techniques such as pop up windows and function keys. You can work in colour or monochrome, and there's a full Word Processor built in.

It's an easy package to use, too — even enjoyable. And despite a very high capacity — as many as 1500

stock lines, 1800 invoices and 600 accounts can be maintained at once — it's all held on a 3½ inch disk.

Which means your Atari ST can handle Sales, Invoicing, Purchasing and General Ledgers, Stock Control and Word Processing easily.

So, if you'd like an accounts package that really means business on the Atari ST range, find out more about **CashLink today**.

You'll soon find we speak your language.

For further details, call 076-686 551, or ask your local dealer.

CashLink Software (UK) Ltd
Clogwyn Manor, Rhyd Ddu
Caernarfon
North Wales
LL54 7YS

☐ I would like further details on CashLink ST Accounts

Name: _____ Company: _____

Position: _____ Address: _____

Telephone: _____

Return to: CashLink Software (UK) Ltd,
Clogwyn Manor, Rhyd Ddu,
Caernarfon,
North Wales LL54 7YS.
PCW 9 86

TASTM*Relational Database***£69**

TAS-Plus just made it faster, easier and cheaper to build database applications. TAS-Plus combines the power of a relational database with the ease of a screen printer and a program generator. Then TAS-Plus adds a runtime compiler to produce lightning fast code that will outperform any database we know of. Just look at what TAS-Plus gives you: —

- + Relational Database
- + 4th Generation Language
- + Source Code Editor
- + Runtime Compiler
- + Screen Painter
- + Program Generator
- + Database Browser
- + Report Writer

TAS-PLUS FOR NOVICE AND PROFESSIONAL

With TAS-Plus you can build professional database applications on day one. Even if you have never programmed before. Just "paint" the screen the way you want and the TAS-Plus program generator writes the program for you, and custom reports are just as easy. When you have created your first database applications, the database browser and report generator allow you to retrieve the information quickly and print it to screen, disk or printer.

The excellent 350-page tutorial and reference manual will teach you step-by-step how to use the source code editor and expand your programs to support multiple files and screens including the "fancy stuff" such as pull-down menus and TAS-windows (we're the ONLY database that can do this). TAS-Plus has 128 colour combinations available and can display all IBM graphic characters. You can even get at or set the system time and date. TAS-Plus allows you to produce programs that are more professionally looking and with more "polish" than even the very expensive so-called "professional" software packages.

Finally, when it comes down to the speed of writing and more importantly running your programs (because that's what you do every day) you will find that the compiled code makes it load, read and write data quicker than any other database we know of. And don't feel sorry for yourself if you already have dBase, TAS-Plus can read and write those files as well. Now, you must agree that's respectable at any price, at £69.00 its awesome. And if you still need convincing that this is the bargain of a lifetime we offer a 60-day money back guarantee*.

AT £69 TAS-PLUS IS COMPLETE

It consists of the Relational Database, 4th Generation Language, Source Code Editor, Runtime Compiler, Screen Painter, Program Generator, Database Browser, Report Writer and 350 Page Tutorial and Reference Manual. TAS-Plus has over 86 commands and over 200 options available in its source code editor. TAS-Plus supports 16 simultaneous open files, each with up to 16 indices and a total of 65,000 records per file with up to 10,000 characters per record.

So Stop Evaluating

dBase	£595
Rbase	£595
Dataflex	£995
Paradox	£550
Delta	£495
TAS-Plus	£ 69

TAS-PLUS DEVELOPER'S VERSION £199

For those who need even more power. Open 32 files, each with up to 32 keys per file. Save up to 17 million records. Includes programmers toolkit (includes the source code of the editor which is written in TAS).

TAS-PLUS MULTI-USER VERSION £299

Includes TAS-Plus developer and supports DOS 3.1 NETBIOS file and record locking.

SYSTEM REQUIREMENTS

TAS-Plus runs on IBM PC, XT, AT and all true compatibles. It requires at least two floppy discs and a minimum of 384KB RAM. The current TAS Level-1 product is available for CP/M and non-IBM compatible MS-DOS systems (including Apricot) for £199.

TAS-PLUS FOR THE TECHNICALLY MINDED

Because TAS compiles down to intermediate machine code your programs will execute fast, TAS itself is written in Assembler. TAS uses B-Tree multi-key file access and is the fastest database we know of. It provides an incredible, but easy to learn, 85+ commands including IF, DO, WHILE, FOR/NEXT, GOTO, GOSUB, ON

statement etc. Excellent array handling and string manipulation.

Time and date fields are supported (incl. European and long or short dates). Full date arithmetic (add and subtract dates). Get/set system time and date. TRAP all functions keys, numeric keypad and file IO. Run other TAS programs. Run non-TAS programs. Run DOS commands. Read and write dBase files. Read and write non-TAS (ASCII) files. Multi-company filing system and commands. Initialize, rename, reindex and delete files from within programs and calculate file sizes. You can even compile programs as a command.

Excellent 350 page tutorial and reference manual. Totally automated menu-driven, syntax-checking Source Code Editor which even tells on which page in the manual to get help. Create pull down menus and 10 overlapping windows. Up to 128 colour combinations. All IBM business graphics supported. Set video highlight/normal/reverse. Powerful scroll and wrap commands. User definable printer control characters. Full Function Key access and control. Not Copy Protected. So... at £69.00 it's a must.

ORDER YOUR COPY TODAY

NOT COPY PROTECTED



Please send me the following items:

TAS-Plus @ £ 69: _____

TAS-Plus Developer @ £199: _____

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 needs to be different from card name and address.

60 Day Money Back Guarantee

*Money back guarantee valid for 60 days after date of purchase if product does not perform in accordance with our claims (excludes shipping and handling charges).

BUSINESS TOOLS

Exclusively Distributed by MEGATECH* •
111-113 Wandsworth High Street, London SW18 4JB.
Tel: Orders: 01-874 6511. Enquiries: 01-870 8541. Telex: 21768.

(Apologies, there are at present no brochures available for TAS-Plus).
* Previously the software division of NEWTONS Laboratories.
All trademarks are recognized.

How NCR keep it in the family...



and use industry standards to help you
get the most from your investment.

NCR have established themselves not only as manufacturers of high quality, competitive products, but pioneers in computer design and construction.

That's why our developing Industry Standard range of PC workstations has been planned as a family for maximum compatibility and growth potential.

So you can be sure that the NCR PC family can supply desktop computing power to meet all requirements. Our current range includes:-

PC8 - 80286 (8MHz) based, for fast, powerful single user and multi-user XENIX* based applications.

PC6 - Incorporates power and speed (4.77/8MHz) with extensive expandability.

PC4i - Low cost, entry level Personal Computer: ideal for networks.

And with the wide range of industry standard software/peripherals available on the market, the NCR PC range will fit easily anywhere in your business.

So it's an investment you can count on. Now and in the future.

For further information on the NCR PC workstation family, please fill in the coupon, and send it to: NCR Information Centre, 206 Marylebone Road, London NW1 6LY. Tel: 01-724 4050.



*XENIX is a trademark of Microsoft Corp.

To: NCR Information Centre,
206 Marylebone Road, London NW1 6LY.
☐ Please send me further information about
your PC workstation range.
The application I am interested in is:

Name _____
Position _____
Company _____
Address _____
Telephone _____

PCWB/BE

APRICOT

XEN, XENi, PC,
Xi, FI(e), FP



IBM



PC, XT
AND IBM
COMPATIBLES

SIRIUS



VICTOR
9000



PLUS-FD: Floppy disc drives that make transfer of files between PC's as simple as inserting a floppy diskette.

PLUS-FD: Includes a floppy disc drive, power supply, cable and interface card.

PLUS-FD: Supplied with driver software and format programs. FD appears as the next available volume (e.g., drive C - on Apricot PC).

PLUS-FD: May be used for additional storage. ALL FILES ARE ACCESSED DIRECTLY.

PLUS-FD: Available in 3 1/2" and 5 1/4" options for a wide range of PC's.

Installed on:	DRIVE	Compatible with	PRICE (£)	Quote Model
IBM PC	3 1/2"	APRICOT (Inc. XEN) & 3 1/2" IBM CLONES	250	FD3IA
APRICOT XEN	5 1/4"	IBM PC	295	FD5XI
APRICOT F Series PC & XI	5 1/4"	IBM PC	450	FD5AI
APRICOT XENi	3 1/2"	APRICOT (Inc. XEN)	295	FD3XA
APRICOT XEN/XENi W/Station	5 1/4"	IBM PC	450	FD5XW
APRICOT XEN/XEN W/Station	3 1/2"	APRICOT (Inc. XEN)	350	FD3XW
SIRIUS/VICTOR 9000	5 1/4"	IBM PC	450	FD5SI
SIRIUS/VICTOR 9000	3 1/2"	APRICOT (Inc. XEN)	350	FD3SA

ALSO AVAILABLE

A second 3 1/2" floppy drive for APRICOT range (ideal for FI or FP). Read/write & format single/double-sided diskettes.

Only £250 (Model FD3A)

APRICOT PC & XI INTERNAL UPGRADES

FAST 20Mb SCSI drive - Completely invisible because the hard disc is built-in, with all your data and programs held inside.

TRANSPORTABLE - Includes head parking facility.

MULTIPLE VOLUMES - Includes multi-volume software allowing you to partition the disc. Up to 26 volumes of any size to suit your requirements.

DISC SHARING - Plusnet software is also available for the PC version only. For further details please contact PLUS 5 on Tel. No. 08926 63211.

INSTALLATION - Our hard disc kits are easy to install, but for the inexperienced, we will carry out the installation.

PRICES - APRICOT PC £795.00 ORDER REF NO: - PLUS-HOU
- APRICOT XI £595.00

DELIVERY - Ex-Stock

Optional On-Site Maintenance

Prices exclude VAT

Warranty - 12 months parts and labour

AVAILABLE FROM

PLUS 5 DISTRIBUTION

73, Evendons Lane, Wokingham RG11 4AD. Tel. (0734) 794963 - 774079 Telex 95538 PLUS G
(A Division of PLUS 5 ENGINEERING LIMITED)

APRICOT RAM (including XEN)

APRICOT PC/XI IF - range - A top quality single-board construction, featuring:

- Full Processor speed operation (ie NO WAIT STATES)
 - 256k and 512k boards (Also - 256k board is upgradeable)
 - Suitable for systems with existing installed 256k or 512k ram
- 256k Ram board £115 (Model AP256)
512k Ram board £150 (Model AP512)
APRICOT XEN and XENi - DAUGHTER BOARD RAM
- Runs parallel to main system ram
 - Full processor speed operation
 - Ability to stack
- 512k Daughter Ram board £250 (Model XAS12)



COMPLEX

COMPUTERS-PRINTERS-MONITORS-DRIVES-SOFTWARE

COMPUTERS

Amstrad PCW 8256	£795
Amstrad PCW 8512	£485
BBC Master	£391
Apricot F1 256K RAM 1x720K DD	£399.00
Apricot F2 512K RAM 2x720K DD Cordless Mouse	£575.00
Apricot F10 512K Ram 1x720K DD 10Mb HD Cordless Mouse	£899
Apricot X1FD	£750.00
Apricot X1MD	£999.00
Apricot XEM FD	£1532.00
Apricot XEM CD	£1897.27
Apricot XEM HD	£2262.27
Olivetti M24 1x350K DD 256K	£1350
Olivetti M24 2x350K DD 256K	£1450
Olivetti M24 1x350K DD 20 Meg HD Separate 640K	£1750
Bus Converter	£79
All M24 Machines with Green Screen Monitor, keyboard and MS-DOS Colour Option	£240
Olivetti M19, M21, M28	EP.O.A.
Tandon PC, PCX	EP.O.A.
Tandon PCA 20, 30 + 40	EP.O.A.
Colour Option Add	£239
256 to 640K Upgrade	£80
Victor PC full range	EP.O.A.
Victor 80 full range	EP.O.A.
Hard Disk Upgrades:	
PC Hard Disk Upgrade 10 Meg	£375
PC Hard Disk Upgrade 20 Meg	£399
20 Meg tapestreamer upgrade	£599
IBM, Sperry and Olivetti supplied. Sperry products at competitive prices.	

MONITORS

Philips (Amber)	£74
Microvitec 1431	£164
Microvitec 1451	£225
Microvitec 1441	£347

PRINTERS

Mannesman Tally	£165
Epson LX80	£147
Epson FX85	£312.00
Epson FX105	£414.00
Epson LX80	£416.00
Epson DX100 daisywheel	£349.00
Epson LX 1500	£799.00
Epson H1180	£329.00
Canon A50	£299
Canon A55	£349
Juki 6100	£321.00
Juki 6300	£799.00
Sheet feeder for the above	£179.00
Brother HRS	£168

Further range of printers available — phone for details.

Business Software at competitive prices. BBC Disc Drives, Opus and Cumana prices on application.

CAD Equipment IE plotters, Digitisers, High Line Rate, Monitors, Mathsco processors, available on request. Installation At Extra Cost If Required.

GOVERNMENT AND EDUCATIONAL ORDERS WELCOME, EXPORT ENQUIRIES WELCOME.

STANDARD DELIVERY £5 AND NEXT DAY £9.50 — ADD 15% VAT TO ORDER TOTAL

COMPLEX

Unit 7, File St., Nuneaton, Warwickshire CV11 5PR
Nuneaton (0203) 371371
Manchester Hotline 061-976 3763
All Orders to Nuneaton

CICAT 20MB AT COMPATIBLE

— 8/10MHz / colour 640K version / high res colour monitor / EGA / 1.2FDD / 225Watt / serial parallel £1895, any configuration available.

CICXT 20MB XT COMPATIBLE £995

— Turbo 8MHz switchable / 640K / 360K floppy / 8 expansion slots / mono graphic printer / 150W power / high res monitor / parallel / serial / clock calendar (colour monitor add £200)

Demo machines available for large corporates

XT/PC colour graphics card also gives composite output £125
XT/PC 512K memory expansion fully populated £139
XT/PC multifunction 384K/parallel/serial/clock calendar fully populated £139
XT/PC I/O plus card two serial/one parallel/clock calendar £59
AT/XT/PC mono graphic high res 720x348 with parallel port £95
AT 2.5MB memory expansion populated to 128K £95
AT floppy drive controller £65
AT serial / parallel £79
XT/PC power supply £85
AT power supply £119
IBM printer cable 25/36 pin £13

Apple Apple Apple Apple Apple

Numeric Keypad for IIe £39 64K/80 Column Card IIe £29
16K RAM Card £29 80 Column Videx Compatible for II+ £39
128K RAM Card £89 RS232 serial £29
Z80 CP/M board £29

ACCELERATORS: For II+ £99: different timing for IIe £150

PRINTER INTERFACES: Centronics/Epson £29
Grappler compatible £39, Grappler with 64K buffer £79

HD power supply for II+ and IIe £49

Fan II+/IIe £29

Apple compatible half height disc drives £89

Tel: 021-705 7097

C I Cayman Ltd

P O Box 77 · Solihull · West Midlands · B91 3LX

LOWEST PRICES IN U.K.

MICROS

Sinclair Spectrum Plus	£87
Sinclair Spectrum 128	£117
Sinclair QL	£113
Commodore 64	£130
Commodore 64 Comp Pack, Recorder, Music Maker & Software	£166
Commodore 64 with Disk Drive	POA
Commodore 128	£220
Commodore 128 Comp. Pack, Recorder, Joystick, Music Maker & Software	£247
Commodore 1280	£412
Commodore 128 & Disk Drive	POA
Amstrad PCW 8512 (5 blank disks)	£499
Amstrad PCW 8256 (5 blank disks)	£399
Amstrad CPC 6128 Green Monitor	£260
Amstrad CPC 6128 Colour Monitor	£347
Pison Organiser 11xP	£115
Pison organiser 11CM	£82
Bondwell 3x (IBM Compatible)	£599

PRINTERS

Commodore MPS 803	£140
Commodore MPS 1000	£221
Epson LX80	£199
Star NL 10	£230
Citizen MSP10	£296

MONITORS

Commodore 128 Colour	£248
Commodore Green	£78
BBC Colour	£173

DISK DRIVES

Commodore 1541 with Future Finance	£140
Commodore 1571	£221
Amstrad 3" DD1	£139
Amstrad 3" FD1	£87

TYPEWRITERS

Canon Typestar 6 11	£148
Canon Typestar 7	£175
Canon Typestar SR RS232	£139
Casio CW10	£130
Casio CW20	£174
Casio CW25 Built-in Interface	£239
Brother EP44 RS 232	£195

ACCESSORIES-Postage Paid In U.K.

For Amstrad	£79
Popular Accounts-Sagesoft	£117
Pop Accounts Payroll-Sagesoft	£117
Pop Accounts Plus-Sagesoft	£117
Payroll-Sagesoft	£55
Imaging Stock Control-Sagesoft	£55
Chit Chat Communication Pack, Sagesoft	£188
Chit Chat Combo-Sagesoft	£79
Chit Chat F Mail-Sagesoft	£55
Chit Chat View Data-Sagesoft	£55
Cardbox-Carton	£79
Scratch Pad Plug-Carton	£55
Brian Storm-Carton	£40
Touch 'N' Go-Carton	£20
Smart Key-Digital	£40
Dr Draw-Digital	£40
Dr Graph-Digital	£40
Basic Compiler-Digital	£40
Pascal MT+ - Digital	£40
Pocket Word Star Deluxe	£55

DISKS-Postage Paid In U.K.

3" Amosoft SS/DD For 10	£36
Amosoft DS/DD-For 10	£60
5 1/4" 3M SS/DD-For 10	£13
DS/DD-For 10	£17
5 1/4" 3M SS/DD-For 10	£18
DS/DD-For 10	£22
3 1/2" DS/DD-For 10	£39
SS/DD-For 10	£27

VIDEO RECORDERS-Export Models

Panasonic NV430	POA
Panasonic NV610	POA
Panasonic NV730	POA
Panasonic NV810 Hi-Fi	POA

CASIO-Postage Paid In U.K.

FX750	£75	PB110	£33
FX770P	£69	TV25	£95
FX7000	£52	Data Bank	£31
FX720P	£42	Watches	POA
FX4000P	£30	Calculators	POA
PB4110	£42	Keyboards	POA
answering machines	POA		
Telephones	POA		
Copiers	POA		

Complete range of Casio, Amstrad, Commodore & Spectrum add ons at discount prices. Prices/Goods subject to availability and change without notice. ALL PRICES EXCLUDE VAT. P&P £5 (within U.K.) Export enquiries welcome. TELEX: 268312 WESCOM G ATTH KKS.

K.K. STATIONERS

107 Edgware Road
Marble Arch
London W2 1ET
Tel: 01-723 1436

126 Edgware Road
Marble Arch
London W2 2AZ
Tel: 01-402 4592

172 Queensway
Queensway
London W2 4QT
Tel: 01-229 3247

NEW

MODULAR FORTH

- * FORTH 83 in Modules
- * MULTI-TASKING, Floating Point and many more features
- * AN INNOVATIVE FORTH

NEW

FORTH 83 FOR ATARI ST

- * WITH COMPLETE GRAPHICS

AND

Our dependable Work-Forth

- * Takes the hard work out of Forth

EXTRAS: Floating Point

Source level De-bugger

Show prices: £48.00 + VAT
and AMSTRAD £35.50 + VAT

MicroProcessor Engineering Ltd

21 Hanley Road, Shirley
Southampton SO1 5AP
Tel: 0703 780084



mpe

are at the PCW Show
Stand No.1918

IMPORTANT ANNOUNCEMENT

A MAJOR SUPPLIER HAS FOR DISPOSAL A LIMITED STOCK OF BRAND NEW DAISY WHEEL PRINTERS



FOR WELL UNDER

HALF PRICE!

**SAVE!
£296!**

ORIGINAL RRP
£495 + VAT
NOW ONLY

£199

+ VAT & Carr.

INCLUDES 12 MONTH
GUARANTEE

Excess stockholding has enabled us to offer - for a limited period - a consignment of professional high quality daisywheel printers manufactured in Japan. These machines offer an exceptional specification which will never again be repeated at this price.

- ★ Works with any home or business computer.
- ★ 20 cps print speed
- ★ 10, 12, 15 and Proportional
- ★ 2000 hour MTBF
- ★ Full WordStar compatibility
- ★ Qume compatible
- ★ Low noise - 60 dBA
- ★ Centronics interface
- ★ Self-test facility
- ★ Accepts Qume daisywheels and ribbons
- ★ Snap-in cartridge with 'ribbon out' detector
- ★ Optional tractors and sheet feeder

FREE Each printer is supplied with an interface cable to your choice plus spare ribbons and one extra daisywheel - WORTH £30.

HURRY - Order in confidence now whilst stocks last - Just complete the coupon or telephone our 24 hr hotline. We will deliver to your door - carriage charge £7 UK & Mainland only

**24hr HOTLINE
FOR ACCESS & VISA
CARD HOLDERS
0242
573573**

DATAPLUS

(Dept PCW)

39-49 Roman Road,
Cheltenham GL51 8QQ

DATAPLUS PSI Ltd (Dept PCW)
39-49 Roman Road, Cheltenham GL51 8QQ
Please supply _____ Daisy Wheel
Printers @ £228.85 each (incl VAT) plus
£7 carriage.

I enclose cheque for £ _____ or debit
my ACCESS/VISA CARD No _____

NAME _____

ADDRESS _____

Reg In Eng. No. 1715271

WIDE CHOICE OF DAISY WHEELS & RIBBONS IN STOCK

DON'T MISS AN ISSUE!



NEW DESIGN FOR PC/AT/XT
COMPATIBLES

Computers and Add-On Cards for PC/XT/AT Compatibles

- SI-8000 for IBM PC/AT Compatibles
- SI-3005T PC/XT Turbo Compatibles
- AT/XT Main Board (6-8-10-12.5 MHz)
- AT, XT, 1.2MB Floppy Controller
- AT H.D.D.M.F. D.D. Adaptor
- AT 2.5MB, 3MB RAM Card.
- AT 2.5MB, 3MB, 3.5MB Multifunction Card
- XT Multi I/O Adaptor
- AT, XT 384, 512, 640KB RAM Card
- AT, XT Eeprom Writer (2716 to 27512A)
- AT, XT Serial/Parallel Adaptor



Manufacturer & Exporter

SAILING STRONG INTERNATIONAL CO. LTD.

Office: 5-5f, 191, Fu-Shing N. Rd., Taipei, Taiwan, R.O.C.

P.O. Box 18-105, Taipei, Taiwan, R.O.C. Fax: 886-2-7213094

Tel: (02)716-7737, 716-2841 Telex 10318 SITNL

Factory: No. 47-1, Pao Shin Rd., Shintien, Taipei, Taiwan, R.O.C.

NEW!

- AT, XT, E.G.A. Card (721x343)
- Multi I/O Video F.D.D. Card
- Short Type HDD Controller
- Multi Display Card.
- MonoColor Graphics Display Card

AGENT WANTED!

NEW!



IBM PC/XT/AT are registered trademark of IBM Corp.

BRK COMPUTER SERVICES

TEL: 01-572 0847/5457

*** HIGHLY COMPETITIVE PRICES ***

COMPUTERS: (IBM COMPATIBLES)

TANDON ECALL
VICTOR ECALL
OLIVETTI ECALL
EPSON ECALL

NETWORK TERMINALS, ADDITIONAL CARDS ETC.

PRINTERS: (FULL RANGE OF DOT MATRIX) (DAISYWHEEL & INK JET)

EPSON ECALL
STAR ECALL
JUKI ECALL
BROTHER ECALL
TOSHIBA ECALL
SIEMENS ECALL

MONITORS: (MONOCHROME & COLOUR)

PHILIPS ECALL
TAXAN ECALL
MICROVITEC ECALL

SOFTWARE:

LARGE RANGE AT COMPETITIVE PRICES

ACCESSORIES:

DISKETTES, COMPUTER PAPER, RIBBONS
PLUS ALL OTHER ACCESSORIES

OTHER SERVICES:

CUSTOMISED DATABASE SYSTEMS, NETWORK SYSTEMS
MULTI-USER SYSTEMS, MAINTENANCE & INSTALLATION

**216 GREAT WEST ROAD
HOUNSLOW, MIDDX TW5 9AW
01-572 0847/01-572 5457**

(SHOP & SHOWROOM OPENING SOON)

**Candid Sales Leads
Administration Software**
— a must for any sales organisation.

Candid Simple Accounting System.

Easy to learn — Easy to use ... 99.00

Dbase II & III / Turbo Pascal utilities.

Improve the efficiency of your programs ... from £19.50

Candid Communications.

For mobile cellular telephones
& Modem — from the experts — highly
competitive prices.



CALL US ANYTIME ON
01 833 2894
0836 233900

Candid Computer Technology Ltd

88 Pentonville Road — London N1 9HS
(by appointment please).

NORTHWEST COMPUTER SUPPLIES (PCC LTD)

82 School Lane, Didsbury, MANCHESTER M20 0RY

Tel: (061) 434 9747 MicroLink 72:MAG003



2 mins M63/A34 Junction — Upgrade fitting service available



BORLAND/TURBO PASCAL

Turbo Pascal (vers 3).....	39	Turbo Editor Toolbox.....	39
Turbo Pascal (V3 with 8087 Support).....	56	Turbo GameWorks (Inc. CHES5 prog).....	39
Turbo Pascal (V3 with BCD).....	56	Holiday Special (Editor/GameWork).....	53
Turbo Pascal (V3 with BCD and 8087).....	65	Sideloek Unprotected.....	40
Turbo Database Toolbox (Team etc).....	31	Sideloek and Travelling Sideloek.....	64
Turbo Tutor.....	21	Travelling Sideloek.....	37
Special — Turbo Pascal/Toolbox/Tutor.....	86	Turbo Lightning (Spell & Thesaurus).....	49
Special Turbo Toolbox/Tutor/BCD/8087.....	109	Lightning Word Wizard NEW.....	49
Special Turbo Toolbox/Tutor/BCD.....	99	Turbo REFLEX: the analyst database.....	54
Special Turbo Toolbox/Tutor/8087.....	99	Prolog.....	59
Special Turbo Toolbox/Tutor/du/GAME/Gap.....	129	Superkey.....	57
Graphics Toolbox (IBM compats only).....	29	Most formats now available.....	Call

COMPUTERS — EPSON/IBM Compatibles

Epson PC + IBM processor — 5 slots, clock 640K, Ser, Par, 20MB, 1K/360K Herc/Col Graph etc).....	1795	PC 2000 (XT Turbo) (2x360K, 640K RAM, Parallel, Ser, Clock Herc Comp & H-Ras Monitor, 60MHz).....	775
Epson PC (with 1K/360K drives, 256K Ram Serial/Parallel/MS DOS 2.11).....	760	PC 2000 AT (AT Compatible) (512K, 1K/1.2MB, clock Par, Ser, Herc Comp & H-Ras Mon).....	1995
Epson PC (as above with 1K/360 and 1K/20mb).....	1280	Free Database/Spreadsheet/WordProcessor with all above Computers	

EXPANSION CARDS/MICE/CO-PROCESSORS

NCS Boards RAM/Multifunction Card (With 384K RAM Ser/Par/Clock/Games Ram Disk/Spooler Software etc).....	159	Serial Card (1 with 2nd option).....	35
Ram Card 384K (Short).....	99	MEMORY UPGRADES (IBM's etc) 64K DRAMS (256K).....	40
H-Ras Mono/Par (Herc Compat).....	99	256K DRAMS (512K).....	59
Clock Calendar.....	49	CO-PROCESSORS 8087's 5mhz/8mhz/10mhz.....	95/180/295
2mb RAM Board (2mb fitted).....	459	Microsoft Mouse (Serial or Bus).....	165
		Mouse Systems Mouse with PC Paint.....	145

MODEMS/COMMS SOFTWARE

MODEMS Pace Nightingale V21/V22.....	95	COMMS SOFTWARE DataLink 3.0 (Inc. Prestal Graphics).....	119
Pace Series 4 (V21/V22/V23).....	435	Crosstalk 3.6 (Inc. KERMIT).....	95
Epson CX21/CX23 Acoustic Coupl. 109/149		Mi-Term (Sanyo 55k Ser only).....	65
WS4000 V21/V23 (Buffered V23).....	135	Chi Chat (for SANYO 55k ser) 2.11.....	129
WS3000 V21/V23 Auto-answer/rdal.....	265	Vicom.....	149
WS3000 V21, V22, V23 Auto-answer/rdal.....	475	Cable (Modem/Compl).....	14
WS3000 V21, V22, V23 V22bis Auto a/d.....	625	MISC Tandy 100/NEC 8401/Olivetti M10 3k Memory Chips.....	30
UDS 1200 Bell (not 848T).....	225		
FREE Registration for MicroLink			

send for full lists

ADD: £10 F&P for each Computer/Printer/Monitor Purchased
Otherwise FREE Postage & Packing
All prices plus VAT at 15% (except EXPORT)
Manufacturer's Guarantees
Credit orders only by prior approval

TURBO PC RUNS FAST AND STABLE

The most reliable TURBO PC, what you really need!

CR-220

- *CPU: 8088-2, 4.7718 MHz, socket for 8087-2 co-processor.
- *8 slots, 640KB RAM on board.
- *7-PAK multifunction card.
- *Monochrome Graphics.
- *84 keys keyboard, "CHERRY" key switch, FCC approved.
- *FCC approved 135W power supply.
- *Metal case meet FCC standard.
- *TEAC PANASONIC, MITSUBISHI...360KB floppy disk drive.



CR-209

- *CPU 80286, 6/8 MHz, socket for 80287.
- *640KB DRAM on board, expandable to 1MB DRAM.
- *One 5 1/4" 4.2 MB NEC, TEAC, MITSUBISHI...floppy disk drive.
- *One SEAGATE 20MB hard disk drive.
- *8 I/O expansion slots.
- *2 Serial, 1 parallel
- *Monochrome Graphics, optional Enhanced graphics adapter.
- *84 keys keyboard, "CHERRY" key switch, FCC approved.
- *200W power supply, FCC approved.
- *14" monochrome monitor, optional multi-display monitor or EGA monitor.

If you need detail information, Please give us a message!



C.R. Electronic Co.

Golden Bldg., Shopping Ctr., LG/F, Shop No. 12,
156, Luk Wah Street, Kowloon, Hong Kong,
Tel: 3-7286832. Telex: 52713 CRYHY HX



IMPORTANT NOTICE

Do you own or use
an Apple II?

Call
'FREEPHONE APPLE'*
now!

*Dial 100 and ask for 'FREEPHONE APPLE'

connexions

The complete
answer to all
your cabling and
connection problems

FOR ADVICE OR A
PRICE PHONE
01-441 1282

SMC SUPPLIES
125 EAST BARNET ROAD, NEW
BARNET, HERTS. EN4 8RF

AUTHORISED DEALERS FOR

**ATARI
AMSTRAD
VICTOR
Tandon**

FULL RANGE OF SOFTWARE &
PERIPHERALS, PLUS
OUR COMPLETE AFTER-
SALES SUPPORT.

SUMMER SPECIALS

ATARI 1040 STF MONO SYSTEM £795 + VAT
ATARI 1040 STF COLOUR SYSTEM £995 + VAT
VICTOR VPC II 20MB H/D SYSTEM £1850 + VAT
TANDON PCA20 (AT) 20MB SYSTEM £1950 + VAT

ABOVE PRICES INCLUDE: FREE 80 COLUMN PRINTER (NLQ)
1-2-1 MAIL-BOX, 10 DISKETTES, BOX OF PAPER AND
ON-SITE MAINTENANCE ON TANDON & VICTOR MACHINES.

AMSTRAD PCW 8256 £375/8512 £465 + VAT
NEW AMSTRAD PC - CALL

LEASING & CREDIT
TERMS AVAILABLE

Osprey Business Computers
5 The Bridge, Wealdstone, Middlesex HA3 5AB
Telephone: 01-863 5162/01-861 2407

OPEN MON-SAT. 9AM - 6PM

A complete word processing system!



PHILIPS P2010 COMPUTER + WORDSTAR, CALCSTAR AND DAISYWHEEL *PRINTER!



Package includes the powerful
Philips P2010 twin-processor
business computer, dual 5 1/4"
disk drives, hi-res graphics
monitor, CP/M, Wordstar w/p
software, Calcstar spreadsheet,
Silver Reed EXP400 daisywheel - superb letter qual-
ity printing. *Printer cable included. An incredible
but genuine saving on the original
RRP of £1695 - brand new, boxed
and guaranteed!

VAT extra

£490

MORGAN COMPUTER CO.
179 Tottenham Court Road, W1. 01-636 1138
and from **LENO** branches in Manchester,
Birmingham, Bristol, Southampton, Reading and Feltham.

**ARE YOU BORED TO DEATH WITH THE LIMITATIONS OF YOUR
PC'S OPERATING SYSTEM?
FED UP WITH TEXT EDITORS THAT DON'T UNDERSTAND
PROGRAMMERS REQUIREMENTS?
INFURIATED AT THE RIP OFF PRICES BEING CHARGED FOR
MULTI-TASKING MULTI-USER SOFTWARE?
FROM NOW ON THINGS ARE GOING TO BE DIFFERENT.
LOOK WHAT WE'VE GOT FOR YOU . . .**

**THE PERSONAL OPERATING SYSTEM THAT GIVES YOU A
UNIX ENVIRONMENT ON PERSONAL COMPUTERS**

PCNX™

**THE PERSONAL OPERATING SYSTEM
FOR SYSTEM PROGRAMMERS**

£79.95

PCUNIX is powerful! It is a true multitasking, multiuser operating system similar to that sold by AT&T. This first release includes over 70 utilities, designed to make your program development a snap.

PCUNIX is versatile! It runs MS-DOS and PC-DOS programs, so that you'll never have to buy another set of development tools! Simply use your existing compilers and linkers. You need nothing more! As with the development of all our Operating Systems, Wendin has used the Wendin Operating Systems Toolbox to construct PCUNIX. Because of this, your programs will have access to the over 70 enhanced system services found in the Wendin Operating System Toolbox.

PCUNIX is complete! Full source code to the shell and all utilities, written in 'C', is included with this Incredible package. And if you would like the source to Wendin's Personal Operating System Kernel, you may also want to purchase the Wendin Operating System Toolbox™.

**THE PERSONAL OPERATING SYSTEM THAT GIVES YOU
VAX/VMS PERFORMANCE ON PERSONAL COMPUTERS.**

PCVMS™

**THE PERSONAL OPERATING SYSTEM FOR
APPLICATIONS PROGRAMMERS**

£79.95

PCVMS is Wendin's version of the popular VAX/VMS operating system, which was developed by Digital Equipment Corporation for their line of VAX computers. PCVMS turns your IBM-PC, XT, AT, or true compatible into a supercharged, multitasking, multiuser workstation that runs MS-DOS and PC-DOS programs.

As with the development of all our Operating Systems, Wendin has used the Operating System Toolbox to construct PCVMS, allowing your programs access to the over 70 enhanced system services available in the Toolbox.

PCVMS comes with full source code to the PCVMS shell and its utilities, all written in 'C'. If you also want the source to Wendin's Personal Operating System Kernel, you may want to purchase the Wendin Operating System Toolbox.

THE ULTIMATE PROGRAMMER'S EDITOR

XTC®

**THE ULTIMATE PROGRAMMER'S
EDITOR**

£69.95

XTC is the world's first multitasking editor for the IBM PC. It also runs on IBM XT and IBM AT computers, as well as true compatibles. Designed by programmers for programmers, XTC is the ultimate editing tool for software developers using 'C', Pascal, Assembly, Basic, Fortran and other languages.

Why is XTC the ultimate tool for editing in your development environment? Because it has powerful features like multitasking macros, windows, text buffers, undo N times, macro programming, control structures and variables, as well as blinding speed that leaves other editors in the stone age.

XTC comes with full source code written in Microsoft Pascal on two DSDD disks.

**THE PERSONAL OPERATING SYSTEM CONSTRUCTION SET
THAT YOU CAN USE TO BUILD YOUR OWN MULTITASKING,
MULTIUSER OPERATING SYSTEM.**

OPERATING SYSTEM TOOLBOX™

**YOUR GATEWAY TO A BETTER PERSONAL
OPERATING SYSTEM**

£79.95

Operating System Toolbox is a software construction set that enables you to build your own multitasking, multiuser operating system. All you need is your creativity and imagination to write a shell and link it with the Toolbox. What you receive for your effort is an operating system that interacts with the way you work, performs the jobs you need in the way you want them done. Toolbox runs MS-DOS and PC-DOS programs with full source code written in Microsoft 'C' organised into 7 basic modules, all on disk. The package includes both source and object code for each module (just in case you don't have Microsoft 'C'), plus a fantastic, in depth, step-by-step instruction manual on how to build your own personal operating system.

The best part of the news is the price, so low you'll want to order today, just to keep up with the state of the art in operating systems.

**NOW AVAILABLE IN THE U.K. THROUGH
C.O.L. SOFTWARE SERVICES TELEPHONE
01-351 5585**



Barclaycard/Access/American Express (delete N/A) Card No

Expiry Date / / Signature

Please add £2.30 (Postage & Packing per order)



The people who make quality
software tools affordable.

PC-DOS is a trademark of IBM
MS is a trademark of Microsoft
Unix is a trademark of AT & T
VAX/VMS is a trademark of Digital Equipment Corporation
Wendin and XTC are Registered Trademarks of Wendin, Inc.
PCVMS, PCUNIX, and Operating System Toolbox are Trademarks of Wendin, Inc.

PLEASE SEND ME:

		Quantity
PCNX	£79.95	_____
PCVMS	£79.95	_____
OPERATING SYSTEM TOOLBOX	£79.95	_____
XTC	£69.95	_____

MORE DETAILS PLEASE

Total enclosed (add 15% VAT) _____

NOT COPY PROTECTED

Official orders accepted from PLC's government and education authorities only. Outside UK: make payment by bank draft payable in pounds sterling.

NAME

ADDRESS

.....

.....

.....

.....

.....

.....

.....

.....

.....

**Make cheques payable to: COL SOFTWARE SERVICES,
1a REDCLIFFE GARDENS, LONDON SW10 9BG.**



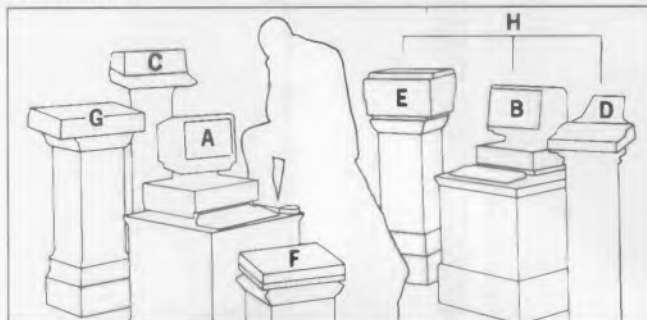
SYSTEM A-200 II is a new concept in computer hardware that gives you high specification, maximum expandability and perfect co-ordination between every product in the range. Two powerful new personal computers are the SYSTEM A-200 II flagships. They have a basic memory of 256K that can be expanded to 640K. They have six expansion slots for peripherals. And they can run IBM PC software without modification at the PC standard speed or up to 50% faster. The floppy disk model has a storage capacity of 2 x 360K and the hard disk model gives you a full 20MB. SYSTEM A-200 II co-ordinated peripherals include laser beam, bubble jet and dot impact printers to improve your presentation. An image scanner to take you into the age of electronic publishing. And an EPOS terminal for counter intelligence. You may not need them *all* today. But think of tomorrow.

IBM is a trademark of International Business Machines Corporation

SYSTEM
THINKING OF



POST TODAY



To: Canon (UK) Ltd., Computer Systems, Canon House,
Manor Road, Wallington, Surrey SM6 0AJ. Tel: 01-773 3173.
Please tell me more about:

- A. SYSTEM A-200 ☐ PERSONAL COMPUTER (Hard Disk model) ☐
 B. SYSTEM A-200 ☐ PERSONAL COMPUTER (Floppy Disk model) ☐
 C. SYSTEM A-200 ☐ EPOS TERMINAL ☐
 D. SYSTEM A-200 ☐ IMAGE SCANNER ☐
 E. SYSTEM A-200 ☐ LASER BEAM PRINTER ☐
 F. SYSTEM A-200 ☐ BUBBLE JET PRINTER ☐
 G. SYSTEM A-200 ☐ DOT IMPACT PRINTER ☐
 H. SYSTEM A-200 ☐ ELECTRONIC PUBLISHING ☐ TICK BOXES

Name: _____

Company: _____

Position: _____ Type of business: _____

Address: _____

Post Code: _____ Tel: _____ TKR/PCW2

A-200 II

TOMORROW

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 RS232C, 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 line condition.

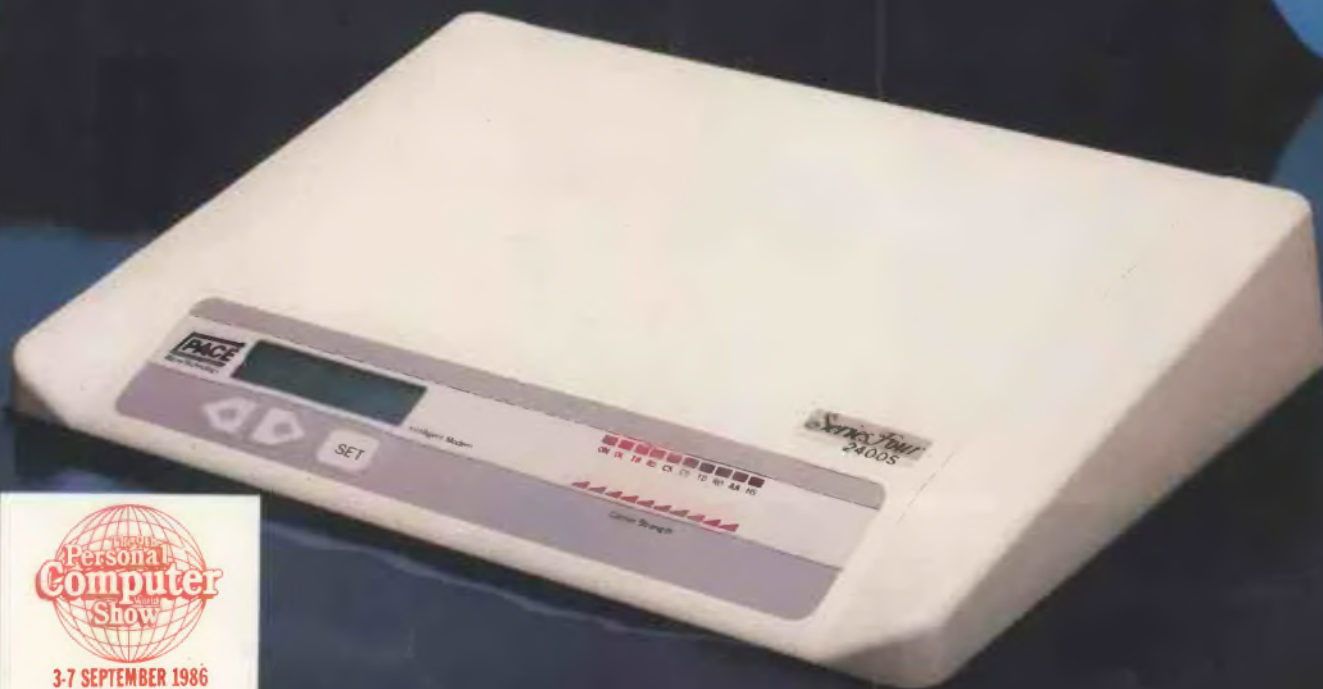
Multiple baud rates are supported by all *Series Four* models with 300/300, 1200/75 and 75/1200 rates

being available for use with standard vlewdata 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 *Series Four* include:

- 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
- 64 number/service store
- 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.



3-7 SEPTEMBER 1986
OLYMPIA LONDON
Sponsored by Personal Computer World
SEE US ON STAND NO. 2102

PACE

PACE Micro Technology
Juniper View, 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.

LARGEST COMPUTER CENTRE IN NORTH WEST UK

Computers — Business

Amiga	CALL
Atari 1040 Mono	£759
Atari 1040 Colour	£949
Ferranti 860	£1050
Ferranti 10Mb	£1215
Ferranti 20Mb	£1525
Epson PC	£745
Epson PC/FD	£862
Epson PC/HD	£1599
Sharp PC7000	£1395
Sperry PC IT	£2422
Sperry PC IT Exp	£3527
Amstrad PW8256	£399
Amstrad PW8512	£499
Commodore PCS	CALL
Kaypro PC	£1050
Kaypro PC/20	£1530
Kaypro 2000 Lapheld	£1050
Nec Lapheld	£399
Sanyo 550/2	£597
Sanyo 555	£597
Sanyo 555/2	£746
Sanyo Other	CALL
Olivetti M24 (640K + Monitor + MS DOS)	£1595

Printers

Brother, Canon, Epson, Juki,
Star, Citizen, Panasonic,
Dyneer, Okimate (all exstock
and on display)

Bargain Software — Limited Stock

Qed +	£99
DBase 2	£199
Open Access	£199
Friday	£95
Lattice O	£150
Microsoft Fortran	£150
Microsoft Pascal	£150
Microsoft Window	£98
Microsoft Cobol	£199
Communication Edge	£40

What Else?

Books Over 500
Monitors
Listing Paper,
Floppy Discs, Cleaners
Specialist Calculators
Rams/Roms/Joysticks
Cables
Joysticks, Mouse

Computers — Home

Amstrad, BBC, Commo- dore	£28
Atari 520	CALL

Large Showroom. All items exclude VAT.
FREE delivery mainland UK for items £1000 or over
Personal export specialists
All export items tested before despatch

M MIGHTY MICRO M

NO ORDERS TOO SMALL
268 Wilmslow Road
Fallowfield, Manchester M14 6WL
Tel: 061-224 8117
Easy access M56, M61, M62, M63

DESK TOP ELECTRONIC PUBLISHING USING

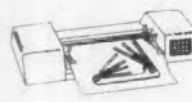
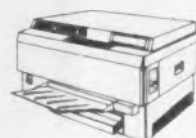
Any MS DOS or
PC DOS
Micro Computer



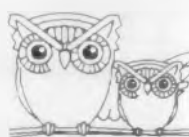
Standard Word
Processing
Software e.g.
Wordcraft,
Wordstar, Multimate,
MS-Word, Samna, etc



A wide range of
dot matrix printers, laser printers and pen plotters.



Superb
Graphics
Software



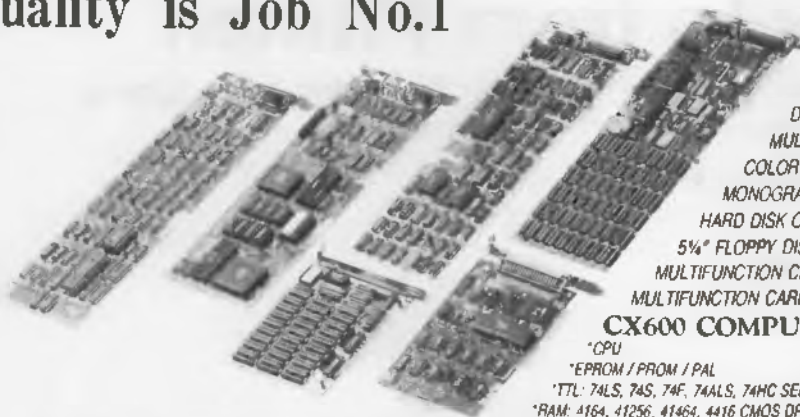
Whatever your
requirements - we can
supply - from complete
systems to individual

components. PLUS an extensive support and training
service. For details call or write to :
ELDONCRAY LTD 137 Stewart Road Bournemouth BH8 8PA
Tel 0202 21505 Fax 0202 298325 Telex 418217 BHNEWS G

CARDEX

Quality is Job No.1

DESIGN → MANUFACTURE → DISTRIBUTION



IBM PC/XT-AT INTERFACE CARDS

- ENHANCED GRAPHICS ADAPTER I
- ENHANCED GRAPHICS ADAPTER II (SHORT CARD)
- ENHANCED GRAPHICS ADAPTER III (4-LAYER)
- HARD DISK CONTROLLER FOR PC/XT
- DISPLAY MULTI I/O CARD
- MULTI I/O SHORT CARD FOR PC/XT/AT
- COLOR GRAPHICS AND PRINTER ADAPTER
- MONOGRAPHS AND PRINTER CARD
- HARD DISK CONTROLLER FOR PC/AT
- 5 1/4" FLOPPY DISKETTE DRIVE ADAPTER
- MULTIFUNCTION CARD FOR PC/AT 3MB EXPANDABLE
- MULTIFUNCTION CARD FOR PC/XT 640KB EXPANDABLE

CX6000 COMPUTER COMPONENT

- *CPU
- *EPROM / PROM / PAL
- *TTL: 74LS, 74S, 74F, 74ALS, 74HC SERIES
- *RAM: 4164, 41256, 41464, 4416 CMOS DRAM / SRAM
- *ELECTRONICS PARTS



DISTRIBUTORS & OEMs

We welcome Distributors, OEMs, and
any other design you have and would
like it manufactured in Taiwan to
reduce your cost. We guarantee it.

CARDEX COMPUTER PRODUCTS CORP.

2F., No. 394, Keelung Rd., Sec. 1, Taipei, Taiwan, R.O.C.
TEL: (02) 7042134-6 FAX: (02) 7047553
TLX: 13138 AQUSSYS



CX501 PC/AT MAIN BOARD

- *FULLY COMPATIBLE WITH LEGAL BIOS
- *USING 4-LAYER BOARD, 6/8 MHZ 80286 CPU, 8 MHZ
IN ONE WAIT STATE
- *FULLY SOCKETED 2MB DRAM WITH 512KB ON
BOARD, USER EXPANDABLE UP TO 16MB
- *TWO RS232C SERIAL PORT
- *PARALLEL PRINTER PORT
- *RTC / C AND MANY MORE



PROGUARD, the most user-friendly cleaning disk in the world

Introducing the all new PROGUARD CLEANING DISK in 3 1/2", 5 1/4" and 8" configurations incorporating a dry head cleaner with a patented bonding process to give you a multi-user capability with each size of disk.

There are no extraneous marks on a Proguard disk and the light transmissivity factor is reduced to 0.1% which exceeds both ANSI and ECMA standards.

Available in three sizes in either Proguard brand or private label configurations.

All Proguard Cleaning Disks are guaranteed for 50 cleaning cycles.

Maintain cleanliness in your computer environment with PROGUARD COMPUTER CLEANING Products.

Xycorp Ltd

1 Whitworth Road, Pin Green, Stevenage, Herts SG1 4PZ
Tel: Stevenage (0438) 314130

FOR ALL YOUR COMPUTER REQUIREMENTS AT



**LOW! LOW!
LOW! LOW!
PRICES**

ATARI

ATARI 1040 Colour System.	£940.00
ATARI 1040 B/W System.	£749.00
ATARI 520 STM Computer.	£329.00
ATARI SM124 B/W Monitor.	£120.00
ATARI SF354 1/2mg Drives.	£120.00
ATARI SF314 1mg Drives.	£159.00

ATARI SPECIAL OFFER

520STM Computer 1/2 Meg Disk Drive	£390.00
------------------------------------	---------

COMMODORE

Commodore Amiga System I.	£1475.00
Commodore Amiga System II.	£1675.00
Commodore 128D.	£433.00
Commodore 1571 Drive.	£219.00
Commodore 1901 Monitor.	£247.00
Commodore 64 Pack.	£173.00

AMSTRAD

Amstrad 8512 W/Processor.	£499.00
Amstrad 8256 W/Processor.	£399.00
Amstrad 6128 Colour.	£346.00
Amstrad 6128 Green.	£260.00

ACORN

B.B.C. Master 128K.	£433.00
---------------------	---------

TOSHIBA

T1100 portable 256K.	£1390.00
----------------------	----------

ACCESS ☐ BARCLAY ☐ AMERICAN ☐ DINNERS ☐

CARD NO.

NAME

ADDRESS

TELEPHONE NO.

PRINTERS

Juki 6100 Daisywheel	£229.00
Juki 2200 Typewrite/print	£219.00
Juki 5510 180cps Dot Matrix.	£169.00
Juki 6000 Daisywheel	£159.00
Canon PW1080 Dot Matrix	£219.00
Canon BJ1080 Bubble Jet	£449.00
Canon PJ 1080 Colour Inkjet	£449.00
Epson LX80 Dot Matrix	£199.00
Citizen 120D Dot Matrix	£155.00
Commodore MPS 1000 Dot Matrix	£219.00
Commodore DPS 1101 Daisywheel	£174.00

MONITORS

Philips BM 7502 Green	£69.95
Philips 8533 Colour	£227.00
Micovitec 1451 Colour	£227.00
Sony KX14P Colour	£346.00
Thompson Colour Monitor	£346.00

**We Stock Range of Software
Accessories and
All Prices Marked Are
Excluding VAT**

G & B

Computer Electronics

230 Tottenham Ct Rd. London W1
242 Tottenham Ct Rd. London W1
01-580 3702 or 01-636 6500

More Bestsellers and Important New Books from Pitman

For this year's PCW Show we have more top titles from Sams, Ashton-Tate and Sunshine.

Commodore 128 Reference Guide for Programmers

David Heiserman, £16.95

Practical Amstrad Wordprocessing

Lawrence and England, £7.95

The Amstrad Companion

Lawrence and England, £7.95

Advanced Programmer's Guide featuring dBASE III, dBASE III PLUS and dBASE II

Castro, Rettig and Hanson, £24.95

There are many books for all levels and areas of interest:

Amiga ☆ Lotus ☆ UNIX ☆ Telecommunications ☆
MS-DOS ☆ PC-DOS ☆ Macintosh ☆ C Language ☆
Electronics ☆ dBASE ☆ Framework ☆ Atari ☆
Wordstar ☆ Multiplan ☆ CP/M ☆ IBM ☆
Amstrad ☆ Commodore

All books are competitively priced. Come and see for yourself at Olympia,
3-7 September, Stand 4021

Pitman

**BEAT
THIS
PRICE**

2001 XT OPTIONS

- with 20 MEG NEC winchester drive 990
- with 640k Memory 635
- with 640k Memory and 20Meg NEC winchester Drive 1025
- Many other variants available

Please telephone for further details

I would like to know more about
PC compatibles
From 2001 SYSTEMS LTD.

NAME

ADDRESS

TEL NO

2001 SYSTEMS LTD
35/35A FORE ST.,
WELLINGTON, SOMERSET
Tel (082347) 7628 Telex 46529

➔ £589



2001 XT

Price Includes

- Zenith Mono monitor
- CPU 8088/clockspeed 4.77MHz
- 256K memory expandable to 640K on board
- 360k Floppy disk drive
- Floppy disk controller
- Keyboard
- mono/Parallel printer card

Prices do not include VAT

**THE FULL SOLUTION
IS
COMING**



**PACKED WITH SERVICE AND
MARKET INFORMATION
DELIVERING RELIABLE AND
POWERFUL PC SYSTEMS**

WINTON provides you the real solution, far more than a mere product.

No longer do you have to look for several suppliers, for Winton does it all!
Save your time and work more profitable!

THE WINTON 286 SYSTEM is equipped with an 8MHz 80286 microprocessor, its memory capacity runs to 1 megabyte, an optional 80287 co-processor helps to manage more complicated and complex mathematical requirements.

This and the full compatibility with IBM PC/AT* ensure you higher speed and higher efficiency.

One year warranty is a matter of course.
Contact us now for further information!

Distributor wanted

Winton

WINFORTUNE ENTERPRISE CO., LTD.

3F/3, NO. 125, SEC. 3, ROOSEVELT RD.,
10762 TAIPEI, TAIWAN, R.O.C.

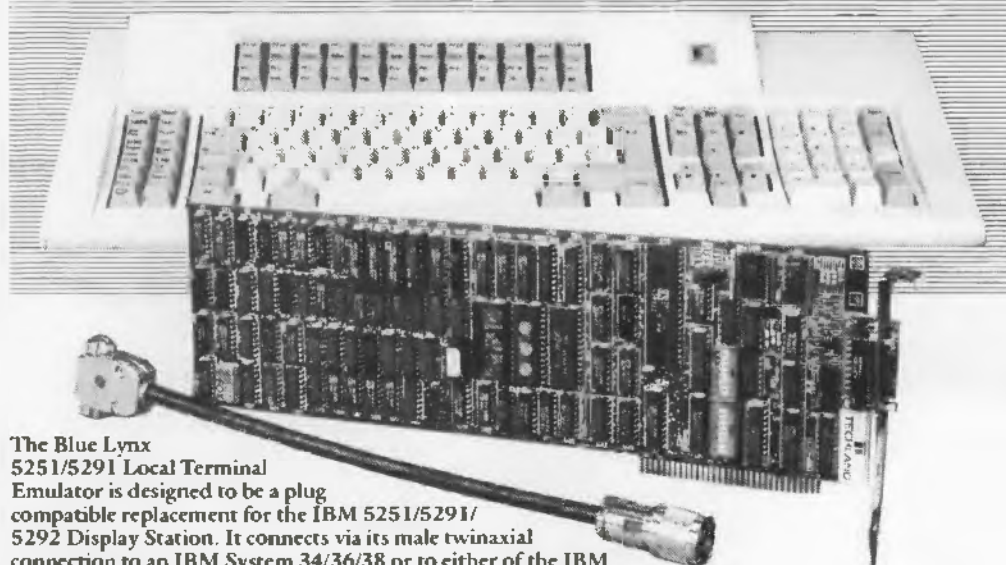
TEL: (02)3915226

TELEX: 14553 WFTLTD

registered trademark of
THE INTERNATIONAL BUSINESS MACHINES.

**From the manufacturers of the first
link between PC's and IBM small systems.
The most advanced 5251-11 emulator available.**

Blue Lynx 5251-11



- ## FEATURES:

- * Full screen 5251, 5291, 5292 Emulation
- * Seven Host Sessions supported simultaneously
- * One PC printer supported as 5224 5225 or 5256
- * Can 'HOT KEY' to/from DOS at any time
- * Support of hard disk while emulator is active
- * Fully modifiable keyboard and translation tables
- * Compatible with IBM File Support and File Transfer utilities
- * Choice of three file transfer packages
- * Printer fully supported in background mode
- * Complete set of 'User Hooks' for interfacing custom programs
- * Multiple Virtual disk support with IBM FSU
- * Printer Control Strings can be configured to support any PC printer
- * 3180 Keyboard available from Techland
- * Uses only 45K of memory
- * No DMA or IRQ required

PRICE £850.00

Including Cable + T Connector

TECHLAND SYSTEMS INTERNATIONAL LTD, WYEBRIDGE HOUSE, CORES END ROAD, BOURNE END, BUCKS, SL8 5HH TEL (06285) 26535/26754

SJB

The MASTER Disk Distributor

Prices & Delivery Subject to Availability

3 1/2" BLANK DISKS

Top Quality 3 1/2" Microdisks

	50	100	300	500	1000
3 1/2" DS(135TP)	1.69	1.49	1.39	1.29	1.19
3 1/2" DS(135TP)	1.99	1.89	1.79	1.69	1.59

From Leading Manufacturers - Bulk Packed in 50's
Please call for keenest prices on quantities OVER 1000
Prices are £ PER DISK

3" AMSOFT DISKS

SPECIAL LOW RATES for SOFTWARE HOUSES

	100	300	500	1000
3" CF2 MICRODISKS	2.99	2.89	2.79	2.69

Prices are £ PER DISK

LIFETIME WARRANTY

OFFICIALLY APPOINTED DISTRIBUTOR of 3" CF2 Microdisks to Both Trade & Software Houses
Please call for keenest prices on quantities OVER 1000

THE LEADING NAME FOR 3" DISKS

5 1/4" BLANK DISKS

Highest Quality 5 1/4" Individually Certified Bulk Packed Disks

Manufactured in the U.K. by PARROT & inclusive of Hub Rings, Labels etc.
Packed in TYVEN Envelopes & Shrink Wrapped in 10's

	50	100	300	500	1000
5 1/4" SS/DD	0.69	0.59	0.49	0.45	0.39
5 1/4" DS/DD	0.85	0.75	0.65	0.59	0.55

Please call for keenest prices on quantities OVER 1000
Prices are £ PER DISK
LIFETIME WARRANTY

New Summer Price Cuts

FREE!!!.....24 HR Despatch in the UK

SJB DISKS LTD Dept PCW
City House, Maid Marion Way, Nottingham - NG1 6BH
Tel 0602 413258 Fax 0602 413820 Telex 577864 ADR PL 5-0 Post SJB

Prices Excl. VAT at 15%...

Dealer Hotline
0602 413258

dBASE III PROGRAMMERS

your prayers answered

Would you like to reduce programme development time?
Would you like to offer more facilities to your users?
Would you like to improve your programme's presentation?

TAOS tools 1 (£49.99 + VAT)

Although dBASE III is probably the best tool for developing powerful, user friendly database systems on micros in a relatively short space of time, the language often falls short of the mark when it comes to those professional touches. We can offer the following new functions for dBASE III Plus users.

**PULL DOWN MENUS
WINDOW SCROLLING
PASSWORD PROTECTION
ENVIRONMENT TESTING
PHONETIC CODING
CURSOR FLASH CONTROL**

These facilities increase the dBASE vocabulary and are accessed via the dBASE 'CALL' function. All the functions are written in the 'C' language by a team headed by an ex-Ashton-Tate programmer. These new functions will enable you to produce software of greater visual impact and increased performance for less effort!!



THE ART OF SOFTWARE LIMITED

262 Hayling Road, Watford, Herts, WD16QA (01-421 4206)

TurboCAD

£326

Ex VAT + Postage

7 Day Trial Period or Your Money Back Guaranteed

- * VERY EASY TO USE FULLY MENU DRIVEN
- * HAS ALL THE FEATURES GENERALLY ASSOCIATED WITH PACKAGES 4-6 TIMES THIS PRICE
- * USED IN AT LEAST 12 COUNTRIES IN 4 CONTINENTS
- * RUNS ON ALL IBM & COMPATIBLES

FEATURES INCLUDE:-

COPY, MOVE, SEARCH, AUTO DIMENSION, MIRROR, 360° ROTATE, ZOOM, GRID, PAN, LIBRARIES, LAYERS, CALCULATOR, WINDOWS, HATCH, SKETCH, TEXT, FONTS, SNAP, ELLIPSE, RUBBER BAND, AND MUCH MORE

USERS INCLUDE:-

B.T., BMW, British Rail, British Gas, Volkswagen, Design Studio, Northern Telecom, Universities, Architects, Designer, Engineers, Builders, Artists, Nixdorf, British Aerospace, etc.

By **P · I · N · R**
S · O · F · T · W · A · R · E

Tel: 937 4800
Studio 3, 5 Kensington Church
Street, London W8 4LD.

CUT PRINTING TIME

You don't have to wait to use your computer when printing!

With a CACHEBOX between your computer and printer, you'll be amazed at how fast you can get back to work! Whether you print 200 page reports or 2 page letters, the advanced features of the CACHEBOX will make any printing task quick and easy.

EASY TO USE — CACHEBOX sits neatly between your computer and printer (you don't need any extra cables), working automatically when you start to print. Its advanced features are available at the touch of a button. CACHEBOX even tests itself automatically every time you switch it on!

CAPACITY — CACHEBOX is available in either 256,000 or 512,000 character capacities. Enough for around 200 or 400 A4 pages!

MULTIPLE COPY FEATURE — simple push button control, giving up to 65,000 consecutive copies of any document, just like a photocopier. Each copy can be up to 400 A4 pages long (200 A4 pages with the 256K version).

COMPATIBLE with most computers, printers and plotters, including IBM and compatibles, HP, Sirius, Tandy, DEC, Sharp, Epson, Oki and many more!

OPTIONS: In addition to TWO memory capacities (256K and 512K), CACHEBOX is available with THREE different types of interface — parallel only, serial only or parallel and serial.



HOW IT WORKS — CACHEBOX automatically accepts data as quickly as your computer can send it (up to 20,000 characters per second). The data is stored in CACHEBOX memory, leaving you free to use your computer while CACHEBOX takes care of the printing. You can also store lengthy documents in CACHEBOX until you are ready to print them.

Parallel or Serial only: 256K — £198.00, 512K — £288.00. Parallel and Serial combined 256K — £238.00, 512K — £328.00

Prices exclude VAT

CIRTECH

CIRTECH (UK) LTD., Currie Road Industrial Estate, Galashiels, Selkirkshire, Scotland, TD1 2BP
Tel: 0896 57790 Telex: 265871 (MDNREF G) ATTN: B4:CPD001 Source Mailbox AAW555

I Didn't Get Where I Am Today By Taking On New Products.

**New
Business Frontiers
For Dealers.**

**The New Tava Flyer
— A Winner On The Move**



3-7 SEPTEMBER 1986
OLYMPIA LONDON
Sponsored by Personal Computer World
SEE US ON STAND NO. 2203

You Will Be Bowled Over By It's Features And Facilities.

The **Tava Flyer** is the most advanced IBM compatible portable on the market today.

And is the only true laptop with an integral 20MB Winchester disc drive. It offers the facilities, speed and processing power of a desk top PC – yet it tucks neatly into a brief case and weighs less than 15lbs.

COMPATIBILITY, PORTABILITY and POWER for the serious computer user.

- Integral 20MB Winchester disk drive with 6G shock resistance factor.
- Internal Modems.
- Coaxial connection to IBM Mainframes.
- Serial and Parallel ports.
- RGB as standard.
- M S DOS and CP/M operating systems.
- Weighs less than 15lbs.
- Back-lit screen.

A TELEPHONE CALL TODAY COULD OPEN UP NEW BUSINESS FRONTIERS FOR YOU.



The Tava Flyer is also available in floppy disk versions and is distributed throughout the UK and Europe by Computer Frontier (UK) Ltd.

IBM is a trademark of International Business Machines

COMPUTER FRONTIER



COMPUTER FRONTIER (U.K) LTD
BUSINESS & TECHNOLOGY CENTRE
BESSEMER DRIVE, STEVENAGE
HERTS SG1 2DX
TEL. (0438) 316561 TELEX 825824 BUSTEC GB
FAX 0438 310001

HELP STAMP OUT A. F. D. S.



That's right, *Acquired Financial Deficiency Syndrome* can strike anyone buying over-priced PC software. It can be caught quite simply by paying for products like Lotus 1-2-3™, dBase™ & WordStar™

Our message at NewStar is simple. We sell workalikes of major PC software packages that are tried and tested, and actually offer more performance..... *but at a fraction of the cost!*

The savings shown below are based on comparison with big-name functionally equivalent packages

NewWord

NewWord2 provides the functions of WordStar Professional™ for £69. It handles multiuser systems and paths. It has many extra features including un-delete, save format with document, conditional Mail Merge, yet it's fully WordStar file compatible..... *and more!*

Save over £200!

VP Planner

"Is a 1-2-3 clone with a multi-dimensional database"
- *Practical Computing.*

We couldn't put it better ourselves. For £99 you get a *de-facto* standard PC spreadsheet with access to countless libraries of templates and worksheets, plus extra features.

Save over £200!

VP Info

A dBase™ file compatible relational database with built-in one step compiler for only £99. Most dBaseIII™ commands and functions supported, but with true network capability *and faster!* Yet with *extra* relational, I/O, programming and display commands.

Save over £400!

NewWord3

Not just a clone, but a major advance. As the *New York Times* said:

"NewWord3 is the product WordStar2000™ should have been"

And latterly *Info World*:

"WordStar addicts will be delighted to see this updated work-alike"

So at only £249.....

Save over £200!

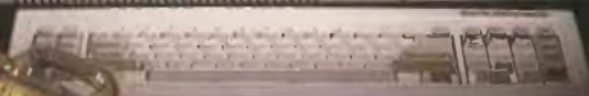
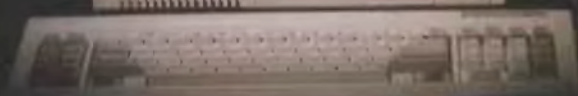


Software Limited
200 North Service Road
Brentwood, Essex
CM14 4SG
tel 0277-220573
tlx 995194 NEWSTA G
fax 0277 232637

How do we do it? Simple! We don't have fleets of executives in Porsches. We don't try and build a village in Olympia every time there's a show, and we don't have to keep recalling product that's riddled with bugs. We *do* have the most cost effective admin system in UK software distribution, and we *do* have close liason with authors, who tend to be individuals, not committees!

CAF

TURBO



PC-MARVEL SALIENT FEATURES

- 8088-2 CPU 4.77/8MHz
- 1MB ON BOARD CAPABILITY
- FDD CONTROLLER FOR 1.2MB/360KB FDD
- REAL TIME CLOCK ON BOARD
- MS-DOS 3.2, GW-BASIC & MANUAL
- XT/AT COMPATIBLE KEYBOARD

TURBO MASTER SALIENT FEATURES

- 80286-8 CPU 6/8 MHz
- 1MB ON BOARD CAPABILITY
- MS-DOS 3.2, GW-BASIC & MANUAL
- SPECIAL DESIGN HOUSING (SUPPORTS UP TO 5 DRIVES)
- XT/AT COMPATIBLE KEYBOARD

OUR SUPERIOR TURBO SYSTEMS ARE YOUR KEY
TO FURTHER **SUCCESS** IN THE COMPUTER
— MICRO COMPUTER BUSINESS

CAF COMPUTER CORPORATION

"AN INTERNATIONAL NAME FOR HIGH-QUALITY,
HIGH PERFORMANCE PERSONAL COMPUTER"

WE ARE SEEKING "AGGRESSIVE"
PARTNERS. SEE US AT THE
PCW SHOW, STAND 4203

12TH FL., NO. 51, CHUNG CHING S. ROAD, SEC. 2, TAIPEI, TAIWAN, R.O.C.

TEL: (02)392-2233 (30 LINES)

TLX: 14058 STXFTX

LOOK AT THESE LOW PRICES FOR TOP QUALITY BRITISH MADE 5.25" FLOPPY DISKS

5.25 Floppy Discs	Quantity	Orders	(prices per disk)
SS/DD 96TPI	single	10-99	100+
DS/DD 48TPI	£1.11	0.72	0.66
DS/DD 96TPI	£1.17	0.81	0.72
DS/QD 96TPI	£1.23	0.87	0.81

VAT included

Delivery free within mainland UK

First Class Post

Entirely British made with:-

★ HUB RINGS ★ ENVELOPES ★ LABELS

Every disk, every track and sector tested and certified equal to, or in excess of, every European and international standard.

STOP PRESS

3.25" DS/DD £28.75 per 10 Inc. of V.A.T.
and P&P and Plastic Library Case

THESE LOW, LOW PRICES FOR LIMITED PERIOD ONLY

OUR QUALITY GUARANTEED:-

Life time warranty against any manufacturing defect
Money refunded if not satisfied

HOW TO ORDER:—

CHEQUE OR POSTAL ORDER TO:—

LONGWORTH LTD

31 Bridge St, Newport, Gwent NP9 4BH

Tel: (0633) 52538

24 HOUR ANSWERING SERVICE

MULTIPLY COMPUTER PRODUCTIVITY with the MEGABUFFER



Intelligent plotter/printer data buffer and protocol converter. Releases staff and computer for more productive tasks than waiting. Reported time savings range from 2x to 50x.

Compatible with most computers, printers and plotters: IBM, AMSTRAD, HP, ACT, SHARP, TANDY, EPSON, OKI, QUME, APPLE, NEC and most others. Supports all combinations of serial and parallel interfaces (inc. X-ON/X-OFF) and even works where most other buffers don't. Has many facilities incl. pause, multiple copy, hex output and powerful self-test. EMPTY, 1/4, 1/2, 3/4 and FULL indication. Field-tested since 1983 and built to last.

64k £160 128k £216 256k £278 512k £388 1MB £556
UK delivery £3. Cables from £15. VAT extra.
Dealer and export enquiries welcome.

Designed and manufactured in Britain by
RINGDALE PERIPHERALS 11 Decoy Road,
Worthing, Sussex BN14 8ND Tel (0903) 213131

System Science

C COMPILERS

AZTEC	
AZTEC C/COMM-MSDOS, 8087, all mem., symbolic debug, ROM support	£325
AZTEC C/PPERS-ASM, link (MOS, DOS)	£145
AZTEC C/COMM ROM support, CP/M-80	£245
AZTEC C/PPERS ASM, link (CP/M-80)	£145
AZTEC C/AS-ASM, link (Apple Dos 3.2)	£145
AZTEC C/COMM-APPLE MAC, AMIGA	£325

LATTICE	
LATTICE C COMPILER ver 3- 8087, all mem. models	£295
LATTICE Screen Editor	£95
LATTICE C Sprite debugger	£125
LATTICE dbC-II Dbase library	£175
LATTICE dbC-III library	£175

DESMET C MS/PC-DOS, ASM, LINK, 8087	£125
D88 Fullscreen debugger	£55
MICROSOFT C ver 3	£325
all Intel mem mods, 8087 support	
C Compilers for CP/M-80	£call

RUN/C-PROFESSIONAL Interp.	£195
RUN/C-Interpreter excellent tutorial	£90
Living C-Interpreter PC & Apricot	£75
CROSS COMPILERS	£call
8085, 286, 6502, 6809, 68000 targets	

PROGRAMMER'S TOOLS AND C LIBRARIES

PHOENIX	
PLINK-86 overlay linker	£275
PMATE-86 programmers editor	£150
PRE-C Link utility	£275
PhorC- source lib, comms, dbase, screen etc	£295

GREENLEAF COMMUNICATIONS	£145
Ints, Ring Buff., Status & Control	
BASIC-C library (source)	£145
aid for conversion from Basic to C	
Essential Graphics Library	£175
Graphics for C- source, colour, EGA	£250
Vitamin C- Screen, print layout code	£125
dbase Tools for C- for dBASE III	£95
C to DBase functions for DBase files	£125
dbx translate to C from DBase II, III	£275
Windows for Data	£245

PANEL- entry screens- most languages	£225
C TREE- Faircom (source) B tree lib	£275
OTrieve- database library, many lang.	£195
Brieve/IN- Novell, PC-NET networks	£425
GREENLEAF GENERAL FUNCTIONS	£145
Dos, Disk, Video, Strings, Date, Keybd.	

LISP and PROLOG

PC-DOS, MS-DOS and CP/M-86	
MuLISP/MuSTAR a solid performer	£225
GC LISP for PC-DOS only, incl. 8087	£445
micro-PROLOG (uses only 128K)	£195
micro-PROLOG PROF. (full mem., wnd 1)	£345
APES for micro-PROLOG	£195
MuMATH/MuSIMP Symbolic maths	£275

PROLOG-1 interpreter	£295
ES/P Advisor- text animation	£595
SOFTWARE TOOLWORKS LISP/88	£45
CP/M-80	
MuLISP/MuSTAR with LISP editor etc	£190
SOFTWARE TOOLWORKS LISP/80	£45
micro-PROLOG	£95

LABORATORY MICRO SYSTEMS FORTH-83

PC-FORTH for PC-DOS	£125
8086 FORTH for MS-DOS and CP/M-86	£95
Software Floating point extensions	£95
8087 Floating point extensions	£95
also NATIVE CODE OPTIMISERS.	
METACOMPILERS	

PC-FORTH+ provides 32 bit pointers, B TREE index manager	£195
Advanced Colour Graphics (PC-FORTH only)	£125
Z 80 FORTH	£95

ASSEMBLERS and CROSS-ASSEMBLERS

PC-DOS, MS-DOS & CP/M-86	
Microsoft 8086 Macro Asm (SYMDEB & LINK)	£139
2500AD 8086 and linker (MS-DOS)	£89
DR Assembler Plus Tools	£185
Cross Assemblers	£call
68xx, 68000, Z80, 8080, 6502, 8048, 8051 etc	
Simulators- Z80, 8048, 8051 etc	£270

Visible Computer 8088 - Assembler Interpreter	£75
CP/M-80	
Microsoft MACRO-80	£185
2500AD Z80 Macro and linker (CP/M-80)	£89
DR Assembler PLUS	£185
Cross Assemblers	£call
8086, 68xx, 6502, 68000, 8048, 8051, 6301 etc	

BORLAND	
TURBO PASCAL ver 3	£50
TURBO PASCAL and 8087 support	£75
TURBO PROLOG	£70
TURBO TOOLBOX	£40
TURBO GRAPHICS TOOLBOX- PC-DOS only	£40
TURBO EDITOR TOOLBOX- PC-DOS only	£50
TURBO LIGHTNING	£60
Superkey	£50
Turbo Tutor	£35

FORTRAN/PASCAL/BASIC	
Microsoft FORTRAN-77	£275
Pro-FORTRAN (66)	£295
RM FORTRAN 77	£375
Microsoft FORTRAN-80 (CP/M-80)	£465
PRO-FORTRAN (66) (CP/M 80)	£295
PRO-PASCAL CP/M-80	£295
PRO-PASCAL MS-DOS	£295
Microsoft Pascal	£225
QUICK BASIC- Microsoft (PC-DOS only)	£75

COMMUNICATIONS, DISK & PRINT UTILITIES, etc.

CROSSTALK for IBM-PC, Apricot and CP/M-80	£155
MOVE-IT for MS-DOS and CP/M-80	£125
UNIFORM-PC read, write format CP/M disks	£65
CONVERT- IBM-PC, can add own formats	£89
PETER NORTON UTILITIES DISK	£79

FINAL WORD 2- new version, authoring, tech. writing etc powerful formatter	£275
MicroTEX- scientific typesetting	from £395
VENIX 86 System V or Version 7	from £850
MMICROSTAT- comprehensive statistics	£315

HSC PRO-68 CO-PROCESSOR	
For IBM-PC	from £1650
M68000 at 10 MHz in IBM slot	
CP/M-88 or OS/2 68K included	
512k or 1M memory, 2 serial ports	
installed in IBM option slot	

CCSM MUMPS	
-for IBM PC and MACINTOSH	
-flexible database language	
-ANSI Standard MUMPS	
-Full screen editor	
Single user £149	Multi-user £289

All prices are exclusive of VAT. Please add £3 p&p, plus VAT to your order

6-7 West Smithfield, London EC1A 9JX

Tel: 01-248 0962

B.T. GOLD 76: CJJ028



PC II — A COMPUTER FOR THOSE WITH MORE SENSE THAN MONEY



Once upon a time you needed more money than sense to buy the best PC. Now, with a little sense and a lot less money, you can buy an even better PC from OPUS — the remarkable new Turbo-speed PC II. At just £499 it's a generation ahead of any IBM-compatible you've ever seen.

With turbo-processing up to three times faster than the IBM PC/XT, outstanding compatibility and a quite amazing specification, the PC II is a new price and performance pacesetter.

It'll handle all leading software written for the IBM PC, it's built to strict American FCC standards and it's available with a host of expansion options which leave the competition standing — motherboard expansion to 1 Mb creating hard disk performance 384K RAM disk, 2nd floppy, Winchester and colour monitor options. You can even select the latest fully-licensed 3.2 versions of MsDos and GW Basic.

Just £499 now buys you a new generation of PC-compatible with an unbeatable specification.

THE PC II

- | | |
|--|--|
| Fully IBM compatible 16-bit micro | • 256K of RAM expandable on motherboard to 1Mb creating super fast 384K RAM disk |
| 4.77/8 MHz Turbo-processing | • 8 expansion slots |
| 360K floppy disk drive | • Parallel printer and joystick interfaces |
| High resolution monochrome monitor with tilt and swivel base | • Security lock |
| Quality AT-style U.K. spec. keyboard | • Real time clock/calendar with battery back-up |
| Highly compatible legal BIOS | • 150 watt U.L. approved power supply |

With all this and 12 months free warranty, a low-cost maintenance option and guaranteed 72-hour delivery, the PC II not only makes more sense it leaves you with a lot more of your money.

Call Opus now on **0737 65080** for full details of the amazing PC II — the IBM-compatible that's a generation ahead. Generous education and government discounts available. Dealer and export enquiries welcomed. Price exclusive of VAT and carriage.



0737 65080

Opus Supplies Ltd,
55 Ormside Way,
Holmethorpe Industrial Estate,
Redhill, SURREY RH1 2LW.

Opus.

IBM-PC is a trademark of International Business Machines Corp. MS-DOS is a trademark of Microsoft Corp.

Dynasty.

The Qume family of letter-quality printers is now into everybody's business.

As a world leader in letter quality printers for all business computer systems, ITT Qume has been building up its name for over a decade. For combined qualities of simplicity, value for money, compatibility and stamina its supremacy is incontestable. And now more than ever it is also Qume for choice. The family representatives here span the whole spectrum of applications.

Qume LaserTEN. Qume waited until they were perfectly ready before introducing a second generation laser, thus ensuring it would be a whole lot easier to install and operate. And be easily compatible, too. LaserTEN produces 10 pages per minute of true letter quality text — up to 10,000 per month with ease. And the graphics and text are easy on the eye.

Qume LetterPro Plus. Now professional quality printing is within reach of small businesses who thought they couldn't spare the money or the space for a daisy wheel

printer. This compact easy-to-live with and friendly printer trots along briskly at 45 cps and is equipped with an 8K buffer memory capable of handling up to 4 pages of text. Its reliability is tested to the equivalent of two years of virtually continuous use.

Qume Sprint 11-90 Plus. Letterpress quality at virtually the speed of dot matrix — that's the unique performance which makes this printer the choice of a wide range of busy companies. Yet the unbeatable 90 characters per second has been achieved with no sacrifice of reliability. A rating of 5500 hours MTBF is almost a year longer than most other daisy wheel manufacturers printers regardless of speed.

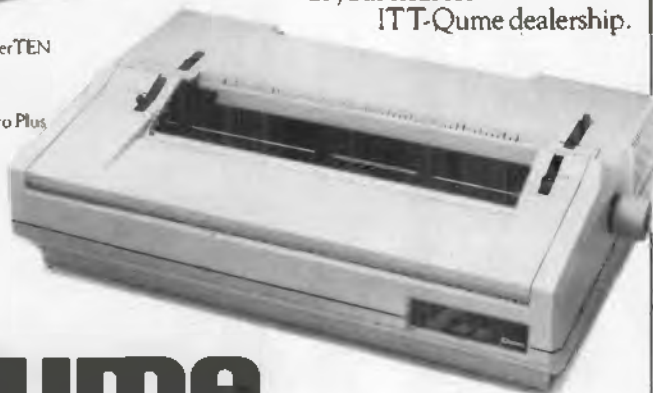
Meet the whole family of letter quality printers—which also includes the sprint 11-55 PLUS, 55-cps; the versatile Sprint 11 PLUS with 130 characters; the 11 PLUS wide-track; also the economical LetterPro 20 cps. So introduce yourself at your nearest ITT-Qume dealership.



▲ Qume LaserTEN



◀ Qume LetterPro Plus



Qume Sprint 11-90 Plus ▶

ITT Qume.

Qume Quality. Choice is just a part of it.

Qume (UK) Limited

Marketing and Sales Park Way, Newbury, Berkshire RG13 1EE Telephone: (0635) 31400 Telex: 846321 Telefax: (0635) 32852
Service and Training Centre Bridgewater Close, Reading, Berkshire RG3 1JT Telephone: (0734) 584646 Telex: 849706

A STAR IS BORN



Presenting the Digitask Turbo 286
Near perfect PC/AT® emulation without
the astronomical price (from £1499)

Call for details

Dealer enquiries welcome
Origin—Woodlands Hill, California, U.S.A.

DIGITASK

Unit M, Charlwoods Business Centre,
Charlwoods Rd, East Grinstead, W. Sussex RH19 2HH
Telephone (0342) 24631
Telex: 957418



ATARI ST

Power Without The Price!

FREE SOFTWARE

When you buy one of the new Atari ST computers from Silica Shop, you will receive a large and varied software package free of charge. This package covers several applications and comprises a total of nine titles. All ST's now have TOS/GEM on ROM, and the total list of free software is as follows:

- 1) GEM - DR Desktop environment with WIMP (in ROM)
- 2) TOS - Tramiel Operating System (in ROM)
- 3) 1st WORD - Word Processor by GST using the GEM environment and multiple windows
- 4) BASIC - Personal Basic by DR (with manual)
- 5) LOGO - Logo language by DR (with manual)
- 6) DOODLE - Simple paint/doodle drawing package (works on mono or colour systems)
- 7) MEGARIDS - Asteroids type game by Megamax
- 8) NEOCHROME - A powerful colour paint and graphics package (only useable with colour systems)
- 9) CP/M EMULATOR - Allows the use of DR's 286 CP/M software to run on any ST system

3rd PARTY SUPPORT

The power and potential of the ST range of computers is causing a flood of new software titles, peripherals and accessories from third party manufacturers. Titles range from word processing to spreadsheet programs, from graphics and games to database management - all with those easy drop-down menus and windows. With the list of companies producing ST software including dozens of top names, you can expect some first class titles for the new ST range. The following includes a selection of the third party manufacturers who have developed, or are working on, products for the ST range:

ARACUS	EXTENDED S/W	MICRO-ED INC	ROBINSON SYS
ACADEMY	FIDELITY	MICROPRO	SCARBOROUGH
ACCOLADE	FIRST BYTE	MICROPROSE	SIEMENS ON LINE
ACTIONSORT	FIRST PUBING	MICROPRO ENG	SM SOFTWARE
ACTIVISION	FLIP N FILE	MICROMAN	SOFTK
ADVENTURE INT	GLENTOP PANG	MILES COMP	SOFTLOG
AMTC	GST SYSTEMS	MIRACLE	SOFTWARE COMS
AMERICAN COVERS	HABA	MIRROSOFT	SECS
ANTHONY	HAYDEN	MOHARICH OEV	SOFTWARE PUNCH
ASHTON TATE	HPPO	MOSEAC	SOFTWARES
ATI	INSOFT	MULTIFORM	SORCINERUS
AUDIO LIGHT	INFOCOM	MULTIMATE	SPINNAKER
AZTEC	INSIGHT	OCEAN	SST SYSTEMS
BATTERIES INC	INSOFT	ODIN	STONEWARE
BAYVIEW	ISLAND LOGIC	OMNITREND	SUBLOGIC
BECKMEYER	KNOWLEDGEWARE	OS	SUNDATA SERVICES
BETTER WORKING	KUMA	OTHER VALLEY	SUNSHINE BOOKS
BLUE CHIP	LAZERSOFT	OCCI	SUPPLEMENTAL
BOSCH	LEHRNER	PAPERLOGIC	SYSTEMATICS
CASHLINK	LEVEL 9	PARADOX	TALENT
CHANG LABS	LIOMHEART	PENGWIN	TELARUM
CHETEN SYST	LONGMINSTER	PHILON	TK COMPUTER PRO
CHIPSORT	MANITRINK CORP	PLANNER	TRO EXPRESS
COMPUTE!	MAP COMPUTERS	PROGRESSIVE	TYNAGATE
CROSSBOW MUSIC	MARK OF UNICORN	PROSPERO	TYNOSFT
DATABEND	MAR WILLIAMS	PROVITY	UNISON
DATACODE SYS	MARTIN CONSU	PSION	WASON MICROCHIP
DATA SYSTEMS	MCGRAW HILL	PSYGNOSIS	WHITENDALE
DELTRON	MEGAMAX	QUICKVIEW SYS	WINDHAM CLASSICS
DOLBYTRUM PRESS	MEMOREA	RANBIRD	WORD OF GOD COM
DRAGON GROUP	NETACOMCO	RECENT	3LENT
DUPONT PUBLISH	NIGHTHORN	RISING STAR	
ELECTRONIC ARTS	MICRODEAL		
EXECOM			

520ST-M

NEW 512K 520ST-M KEYBOARD: The new 520ST-M keyboard costs only £346.96 (+VAT=£399) and is yet another price breakthrough for Atari Corporation. The keyboard now includes both an RF modulator and cable, allowing you to connect it to an ordinary domestic television set. In addition, the keyboard is supplied with 512K RAM, a mouse and a free set of 3 1/2" disks containing applications software. The TOS operating system and the GEM graphics package are now supplied on 192K ROM chips which are already installed in the keyboard. This means that the operating system will automatically boot in when you switch the power on. In addition to the keyboard, you will also need to purchase either a 1Mbyte disk drive (RRP £130+VAT) or a 1Mbyte disk drive (RRP £174+VAT). Either disk drive will provide you with fast information retrieval and a vast amount of storage space. If you prefer not to use your own TV set, you may connect your ST to a monitor. You may purchase the Atari SM124 monochrome monitor (RRP £130+VAT), or one of Atari's two Thomson colour monitors. Alternatively, you may choose one of the many third party colour monitors which are available.

NEW 1024K 520ST-M KEYBOARD: In addition to the standard 520ST-M, we have a new keyboard which we are calling the Atari 520ST-M+. The M+ is a 520ST-M keyboard which has been enhanced by a third party RAM upgrade to 1 megabyte of memory. The 520ST-M+ is available from Silica at a retail price of only £253.91 (+VAT=£289). This product will provide you with an alternative to the 1040ST-F, but at a lower price. Additionally, it features the advantage of the 520ST-M's built in modulator.

£347

1040ST-F

For the businessman and the more serious home user, Atari have introduced the 1040ST-F, a low cost powerhouse which can be introduced to a business environment as a stand-alone system, or can support a mainframe computer as a terminal. The new one megabyte 1040ST-F enhances Atari's value for money reputation in the marketplace as it is the first personal computer available with one megabyte of memory for less than £500. You can purchase the 1040ST-F as a monochrome or colour system. The price of the monochrome system is £799 (+VAT = £918.85), with the colour system at only £999 (+VAT = £1148.85). The new 1040ST-F not only features twice as much memory as the 520ST-M, but also includes a one megabyte double sided disk drive and mains transformer, both built into the console to give a compact and stylish unit with only one mains lead. The 1040ST-F is also supplied with a free software package. Unlike the 520ST-M, the 1040ST-F was manufactured solely with business use in mind and as such is supplied with a monitor. It does not include the RF modulator or lead. We now have stock of the 1040ST-F at all four branches of Silica Shop. Call into your nearest branch for a demonstration.

1-4 The Mews, Hatherley Road, Sidcup, Kent, DA14 4DX
117 Orpington High Street, Orpington, Kent, BR6 6LG
Lion House (1st floor), 227 Tottenham Court Rd, London, W1
Selfridges (1st floor), Oxford Street, London, W1A 1AB

£799

THE ATARI EXPLOSION!

If you read the specialist computer press, you will have noticed that there is one company which is getting a large slice of editorial space at the moment, that company is Atari Corporation. Atari have been making the news since the launch of their new 16/32 bit range of ST computers. Led by the powerful figure of Jack Tramiel and under the banner 'Power Without The Price', Atari are manufacturing new computers at unheard of prices, with the power to challenge firmly established market leaders. With the introduction of IBM compatibility, a CP/M emulator, a powerful networking system and a communications package for their new low cost powerhouses, it doesn't look as if it will be long before there is an explosion of the magnitude which will see Atari placed firmly besides such names as IBM and Olivetti in the personal computer marketplace. Read on for more details of what Atari are doing, and how they are pulling their 'Power Without The Price' computers beyond the reach of the competition.

FREE CP/M EMULATOR

This newly announced CP/M Emulation Package, will enable software written under Digital Research's 286 CP/M operating system to be run on the ST family of computers. There are several thousand applications written for CP/M in the UK alone, and several of the major CP/M software development houses may convert their programs to 3 1/2" disk format for the ST range. The CP/M emulation package is supplied FREE OF CHARGE by Silica Shop with all ST computers.

IBM COMPATIBILITY

To make the ST available to those businesses who currently run IBM systems and are looking for a low cost expansion method, Atari have announced a co-processing unit for ST computers. This processor will open the ST range to all IBM or IBM compatible software applications. The unit, which attaches to the ST computers via the DMA (Direct Memory Access) port, contains an Intel 8088 processor with 512K of RAM and will accept a 5 1/4" disk drive. In it's ST mode, the unit will also act as a second disk drive, offering the user an additional 500K of memory. The IBM co-processing unit should be available in late Summer 1986. If you would like to be informed when it is released, please complete and return the coupon below. We will send you further details as soon as we have them.

20Mbyte HARD DISK

The new Atari hard disk for the ST range has just been released. All ST computers already have a hard disk interface built into them so there is no external interface required. The memory size of the disk is a massive 20 megabytes (unformatted) with a data transfer rate of 1.33 Mbytes per second. At a price of £739 (+VAT=£849), the 5 1/4" hard disk offers massive storage with fast access at a very reasonable price.

NEW ST SOFTWARE PACKAGES

There are now hundreds of software packages which have been announced for the Atari ST range. Titles available now include DB Man, a DBase 3 clone as well as H & D Base, a DBase 2 clone. In addition, PC Intercomm is a VT100 emulator which enables you to use any ST keyboard as a terminal connected to a mainframe or mini. Other programs include a Lotus 1-2-3 clone (see paragraph below).

VIP PROFESSIONAL - LOTUS 1-2-3™ CLONE

This is probably the most impressive program to have been released so far for the ST range. VIP Professional is an extremely easy to use, integrated spreadsheet database and graphics program which is identical both in features and commands to Lotus 1-2-3™. The same spreadsheet analysis, information management and extraordinary business graphics are all combined in one easy to learn, affordable package. What's more, VIP Professional not only has all the features of 1-2-3™, you can also type the same commands to do the same things. Probably the most surprising feature of VIP Professional is not its total compatibility with Lotus 1-2-3™, nor its ease of use, but its price. Lotus 1-2-3™ for the IBM PC/AT costs £395 (+VAT=£454.25), whereas VIP Professional for the ST is a mere £169 (+VAT=£194.35). That's less than half the price! If you would like further details of VIP Professional, please return the coupon below.

SILICA SHOP

ATARI WE ARE THE UK's No1 ATARI SPECIALISTS ATARI

At Silica we have been successfully dedicated to Atari ever since their products first appeared on the UK market. We can attribute our success largely to the Atari specialisation which we practice and to the user back-up we provide. Rest assured that when you buy a piece of Atari hardware at Silica you will be fully supported. Our mailings giving news of software releases and developments will keep you up to date with the Atari market and our technical support team and sales staff are at the end of the telephone line to deal with your problems and supply your every need. With our specialist bias, we aim to keep stocks of all the available Atari hardware, software, peripherals and accessories. We also stock a wide range of Atari dedicated books and through us, the owners on our list can subscribe to several American Atari dedicated magazines. We can provide a full service to all Atari owners and are now firmly established as the UK's NUMBER ONE Atari specialists. Here are just some of the things we can offer to our customers.

- * FREE POST & PACKING ON MAIL ORDERS
- * FREE NEXT DAY DELIVERY
- * INFORMATION MAILING SERVICE
- * TECHNICAL SUPPORT TEAM
- * HIGHLY COMPETITIVE PRICES
- * AFTER SALES SUPPORT SERVICE
- * REPAIR SERVICE ON ATARI PRODUCTS

If you would like to be registered on our mailing list as an Atari computer owner, or as a person interested in buying an Atari machine, let us know. We will be pleased to keep you up to date with new Atari developments free of charge. So, return the coupon today and begin experiencing a specialist Atari service that is second to none.

SILICA HOTLINE **01-309 1111**

SILICA SHOP LTD, 1-4 The Mews, Hatherley Road, Sidcup, Kent, DA14 4DX
SEND FOR FREE ATARI ST LITERATURE

To: Silica Shop Ltd, Dept PCW 0986, 1-4 The Mews, Hatherley Road, Sidcup, Kent, DA14 4DX

PLEASE SEND ME FREE LITERATURE
ON THE NEW RANGE OF ATARI ST COMPUTERS

Mr/Mrs/Ms: _____ Initials: _____ Surname: _____

Address: _____

Do you already own a computer
If so, which one do you own?

Postcode: _____

COLOURJET

64 COLOUR EGA DUMP PROGRAM

IBM pc compatible
including character set

£569 suggested retail
price excl VAT

NOW 132 CHARACTERS/LINE COMPRESSED



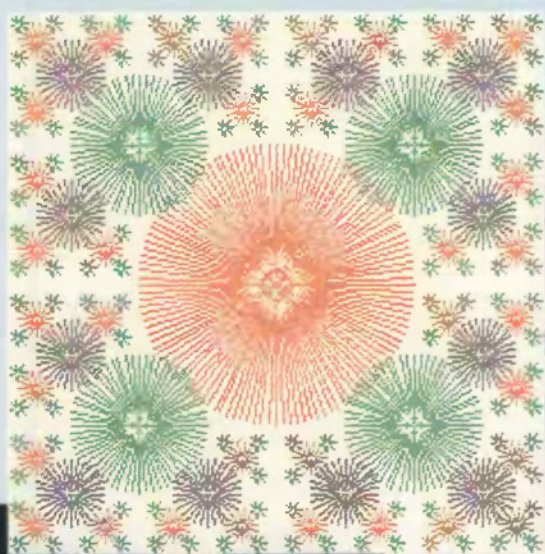
Features: videotext printing
Prints overhead transparencies
Options available:

- Buffered RS232 interface.
- Viewdata & RS232 interface.
- Apple II Interface.
- IBM PC dump.

UNIQUE FEATURE:
PRINTS ALL 16 LOW RES. COLOURS

Specifications:

640 dots/line & 1280 dots/line Hires mode.
84 dots/inch both axes.
Viewdata Printing (BBC MODE 7).
Friction feed rollpaper with single sheetfeed A4.
40 cps in full colour.
DOUBLE STRIKE MODE.
Ink cartridges, 4 million character life.



Virtually
silent



INTEGREX LTD.

Church Gresley, Burton-on-Trent, Staffs DE11 9PT
Tel: 0283 215432 Telex: 377106

Dealers, OEM & Educational
enquiries welcome

THE CENTRONICS PP-8 LASER PRINTER.



So much laser...

- 1 FULL YEARS WARRANTY • COMPLETE COMPATIBILITY WITH IBM PRO PRINTER IBM* PC PRINTER EPSON FX DIABLO 630 • LOW COST PER COPY
- 8 PAGES PER MINUTE A4 OR B4 SIZES • 300x300 DOTS PER INCH RESOLUTION
- EXPANDABLE RAM TO 1.5 MBYTE • PLUG IN INTERFACE • RANGE OF FONT CARDS
- NATIONWIDE SERVICE

...for so little.

£1995

Plus VAT

SOLE UK DISTRIBUTOR

MEKOM

Computer Products Limited

Head Office: Enfield Hall, Enfield Road, Edgbaston, Birmingham B15 1QA

Telephone 021-454 2288

Giltspur House, 6 Giltspur Street, London EC1A 9DE

Telephone 01-248 1711

850, Birchwood Boulevard, Birchwood, Warrington WA3 7QZ

Telephone 0925-821776

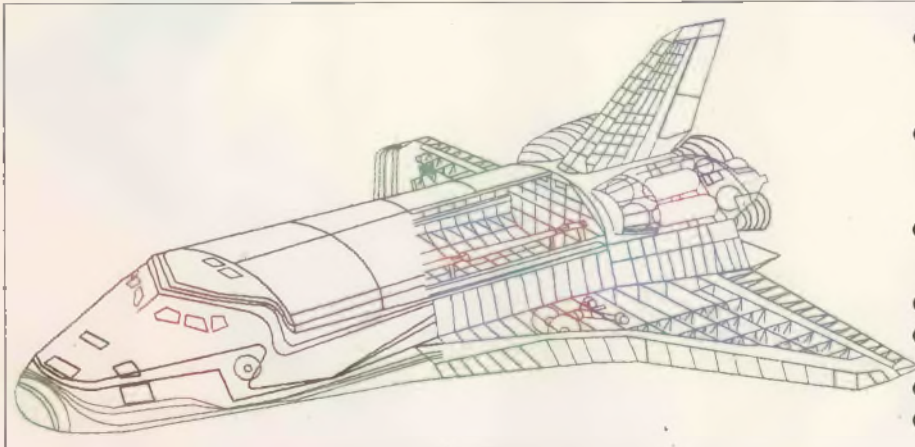
*IBM is a registered trade mark of International Business Machines.

MEKOM FIRST FOR LASER PRINTERS, FEEDERS AND ASSOCIATED SOFTWARE

For details of **5 day free trial offer**, please complete and return to:
Mekom Computer Products Limited
Enfield Hall, Enfield Road, Edgbaston, Birmingham B15 1QA.

Name _____
Position _____
Company _____
Address _____
Tel. No. _____

If you'd like to know why you need EOgraph, we'll draw you a picture.



- Replaces a plotter - EOgraph is a vector-to-raster converter providing high resolution output on a low-cost matrix printer.
- Intelligent printer interface - enables you to print year-end Lotus pie charts, for example, while returning your computer for more productive use in seconds.
- Frees your PC for normal use while printing - allows you to re-boot the PC into different programs.
- Spools mixed text and graphics.
- Supports Epson RX, FX, JX or compatibles.
- Mono and colour.
- End-user price: £595 + vat.

Until now, getting computer graphics from the screen to the printed page has been either painfully slow or expensive - or both.

EOgraph presents a new picture entirely.

An add-in board for the IBM PC and compatibles, EOgraph is a powerful vector-to-raster converter providing high resolution output on a low-cost matrix printer without the need for a plotter.

Additionally, the print spooler gives you a computer within a computer - freeing your PC for other tasks while your charts or drawings are being printed.

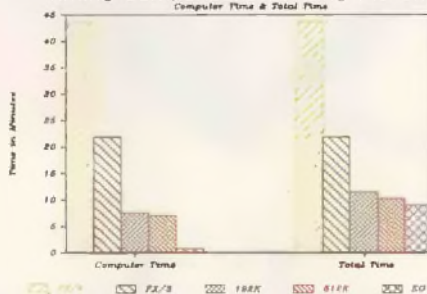
AutoCAD - THE PLOT QUICKENS. AutoCAD plot - produced on an A4 page on an Epson FX-80 printer in 6.3 minutes, computer free after 60 secs. Resolution 216 x 240!

Lotus users

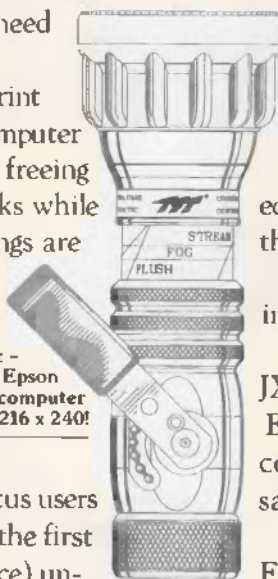
With EOgraph, Lotus users can now (perhaps for the first time in their experience) unlock the full graphics capabilities of Lotus 1-2-3 and Symphony.

Currently, a typical graph printed on an Epson FX in high

Timing Comparisons Printing Pie Chart



LOTUS IN A TRICE. Lotus 1-2-3 graph - produced on an A4 page on a Centronics Printstation 250 in 12 minutes 53 seconds, computer free after 65 seconds.



resolution 'quad' mode takes over one hour to print - with your PC tied up for most of it.

With the EOgraph installed, this same graph takes less than 10 minutes to print.

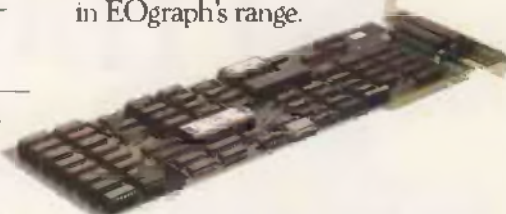
And frees your computer in about 45 seconds.

If connected to an Epson JX-80 or compatibles, the EOgraph will print graphs in colour, with comparable savings.

As an additional bonus, the EOgraph also acts as a spooler, storing a large quantity of text information, charts and graphs and printing them out on a first-in first-out basis.

AutoCAD users

With EOgraph, AutoCAD users can now use a dot-matrix printer as a plotter to get strike-off plots very quickly. And even with significant savings in time, print quality is never lost. Further advantage: long plots of up to 163.5 inches are comfortably within EOgraph's range.



That's EOgraph in outline. For the full picture, simply return the coupon. Or telephone Accent Computers on (0444) 412334.

Please send me full details on EOgraph and the name of my nearest Accent dealer.

Name _____

Address _____

Daytime tel. no. _____

Post to:
Accent Computers Limited, Imperial Buildings,
Muster Green, Haywards Heath,
West Sussex RH16 4AP Tel. (0444) 412334.

Accent COMPUTERS

EOgraph and all associated product names are registered trademarks of Eorcon Corporation. All other proprietary brand names mentioned belong to their companies of origin.

For more information, please contact:

Accent Computers Limited, Imperial Buildings, Muster Green, Haywards Heath, West Sussex RH16 4AP Tel. (0444) 412334.

Softset Computer Products Ltd., Softset House, Sym Gate Way, Great West Rd., Brentford, Middx. TW8 9DD. Tel. 01-568 8866. Telex 896396.

PCW 9186

MicroSight

The proven image capture package for your PC from Digithurst.



Digithurst **MicroSight** products are backed by the experience in real image analysis applications which makes the difference between capturing images by computer and **solving** your problem using image analysis methods.

We help you get **results** quickly and more efficiently.

MicroSight I - basic proven image input system for PC's

MicroSight RT - low cost real time image input card for IBM PC's, 512 x 512 resolution.

MicroSight II fast framestore which captures a 512 x 512 pixel image with 63 grey levels in 1/25 second.

From £985 + VAT

Digithurst have image capture solutions for:

- | | | |
|------------------------------------|----------------------------------|-------------------|
| ● Signmaking | ● Label making | ● Graphics Design |
| ● Metallurgy and Materials Science | ● Pharmaceutical research | ● Engraving |
| ● Particle sizing and counting | ● Quality control and inspection | ● Pattern cutting |
| ● Satellite picture processing | ● Semiconductor manufacturing | ● Cartography |

DIGITHURST

The Image Analysis People.

Digithurst, Leaden Hill, Orwell, Royston, Herts. SG8 5QH. Tel: Cambridge (0223) 208926

3" HITACHI DISK DRIVES

Suitable for use on the Amstrad 6128, 664 Tatung lenstien, BBC with DSS. 40 track, double density, 3ms track access time, unformatted capacity, single sided 250k; Double sided 500k, Shuggart interface. Plug compatible with 5 1/2 drive cables available for connection too:



Carriage (£2.00 plus VAT)

Amstrad £7.50 + VAT
BBC £10.00 + VAT
Tatung £10.00 + VAT
Res 640 x 200

HIGH RESOLUTION COLOUR MONITOR

Hitachi CM148P 14" cased. Box with manual. IBM PC compatible. Uncased monitors also available. Colour & Black + White From £18.50 + VAT

£175.00
plus VAT
Carriage £5+

PYRAMID 501 CP/M MICRO

4Mhz 280 machine with 64k and twin 80 track, half height, 5 1/4 drives, total 1.5mb with RS232 and centronic interfaces, S100 BUS. North Star Horizon software compatible, very compact unit. (Requires terminal).



Visa & Access
accepted

Available ONLY from:

£195.00
plus VAT
(carriage £10.00
plus VAT)

THE 16 BIT MSDOS SAMURAI S-16

Brand new surplus stock of this high quality machine which originally retailed at £2400.

- 8086 based (4.6MHz clock rate)
- 128K memory with parity
- twin half height 8" floppy disc drives (total 2.3MB formatted)
- 12" green phosphor monitor included
- ONE parallel & TWO serial interfaces included
- MSDOS Ver 1.25 & manuals included
- VICTOR/SIRIUS software format
- Manufactured by HITACHI to highest possible standards
- Much public domain software available
- 90 day full guarantee
- Plug in cards and IBM 3740 compatibility make this an ideal programmer's or engineer's machine

£399.00
plus VAT
(carriage £25.00
including VAT)
OR **£595.00**
plus VAT
with W.P. software
and Daisywheel
printer



COMPUTER APPRECIATION, 111 Northgate, Canterbury, Kent. (0227) 470512
MATMOS Ltd., 1 Church Street, Cuckfield, W. Sussex RH17 5JZ. (0444) 414484/454377



Many chips do not a sophisticated machine make, as Amstrad has proved. And, can it be true — Guy Kewney wins a software award? He reveals all in this month's news report.

It isn't luck, it's strategy

The Amstrad range is something no self-respecting technologist would touch with a barge-pole, right? Wrong!

The PCW is a very sophisticated piece of electronics. Look inside it, count the chips. Not a lot, are there? That doesn't make it simple, you dolts! That's what makes it clever.

Saying the Amstrad has 'only' a dozen chips is like saying it took Steve Cram

'only' three and three-quarter minutes to run a mile. Anybody can do it in 10 minutes.

If it were simple to build an old-fashioned machine like the Amstrad PCW, Tatung would have done it. Compare the Einstein with the PCW, and you'll see it isn't that simple. The number of chips inside the average IBM PC is a tribute to the amount of money people are prepared to pay for it, not to its cleverness.

Why the angry sermon, Guy (mutter the PCW editor)?

Answer: I've been reading micro magazines, and newspapers, on the subject of the 'new Amstrad PC', and they are all talking about

Amstrad as if it's just being pretty lucky — guessing right. Apricot, by contrast, is being written about as if it had just guessed wrong about the market, but was really a very much more sophisticated company. Technically, that is.

We read about how Apricot is 'obliged to drop its down-market products' because that is becoming a 'commodity market'.

By 'down-market' products, they mean the Rascals, the F series and the Portable.

These products went into exactly the same market that Amstrad is now supposed to be looking at with its new machine — the business market under £1000.

So why are people selling Apricot shares and buying Amstrad shares, if what Apricot is doing is clever and what Amstrad is doing is silly?

The difference is simple. Amstrad (based on past record) will succeed in producing something under £500, on which the company will make an unhealthily large profit. And it will work. Apricot, by contrast, never planned to do what it ended up doing.

Apricot started out importing games software for the Pet. Then it started selling business software (written by the company) for the Pet. Then it bought Pet-alike CompuThink machines from the States, to run that software faster.

Thus it expanded, by buying a bigger, faster machine (the Sirius) from the States. Just before Sirius crashed, it started building the thing in Scotland. And just before the Sirius market fell apart, it created a new Apricot market by producing a Sirius lookalike which was smaller and prettier.

There was no long-term planning involved, just the company leaping out of danger before the trees fell on it. And worse, in my opinion, was the fact that Apricot made machines that theoretically should have worked, but somehow never really did. More important, it couldn't get people to buy them in large quantities, and

so the profits were small.

Amstrad took its PCW range and aimed it very clearly at a market — people who wanted a computer for word processing, at £400. If Apricot could have built such a thing, it would have. The company looked at the idea, and dismissed it as impossible.

If Amstrad does launch a PC, then there are obvious questions that need to be asked. Will it run DOS? Is it at least as compatible as an Olivetti M24? What about plug-in cards? Copy-protected disks — will they work? And so on.

But nobody (with the exception of one or two hopelessly ignorant buffers) is thinking of asking whether Amstrad can produce the machine for the price, at a profit.

Million-dollar guy

Guess what! I've won a Five Million Dollar Software Award!

I know I have, in the past, been rude about micro awards of the kind promoted by this august magazine. Awards (I have argued) are simply a way to promote magazines, and shouldn't be taken seriously by the industry.

Naturally, my publisher has not altogether agreed with me. Neither have people in the industry who have won awards been grateful for my suggestion that they'd be lucky to survive them.

However, I have argued that what really matters is sales, not awards, and so Geoff Reiss, head of Abtex, was very excited to win an ICP Million Dollar Award for his Pertmaster program a year ago. 'This should please you, because it's based on sales,' he told me happily.

I am a horrible, negative person. I laughed. 'Who came around to measure your sales?' I asked.

So this year, Geoff decided to settle the matter once and for all. Enlisting me as his accomplice, he created a



The picture above isn't of our publisher, Tony Harris (right), sealing a deal to link PCW with Apple Computers. It's merely the presentation of an Apple Mac and assorted goodies to Roger Giddings. PCW, and especially our publisher, isn't renowned for generosity, but in this case we had no choice. Roger Giddings is gleefully receiving his prize for winning our recent competition to design and layout an article for PCW ('Graphic challenge', December 1985).

Mr Giddings, a registered osteopath, intends to use his prize in his business for accounts, reminders, word processing and perhaps production of small osteopathic texts. His wife and kids are keen on it too, and apparently the two-year-old is already getting into practice with MacPaint.

Mr Giddings previously owned a BBC Micro and then an IBM clone so is no beginner, but he does find the Macintosh surprisingly easy to use. There is only one complaint: he finds it hard to get exactly the software he wants.

new software company, Consoft. It invented a program, D.B.X.V. (the purpose of which we can't remember; I think it was a mainframe communications product, Geoff thinks it was a database) and filled in the ICP Awards form with this totally spurious information. We said it had sold over \$5 million worth in 12 months.

ICP wrote back to Consoft (did the name really not suggest caution?) and said: 'Congratulations! You've won an Award. Send a cheque to cover the plaque and the awards dinner, and come along.'

We didn't go. Geoff is well-known in the business. I have my photo printed here and there, too, and it occurred to us that we might not be welcome, posing as Stephen Adamson and Simon Aliss, directors of Consoft.

It turns out that you don't have to go to the dinner. It costs nearly £200 for two, and you have to send at least one person to collect the plaque. But if you can't go, then the plaque alone costs a mere £60 (plus tax).

Consoft doesn't have a cheque book. So Mr Aliss (or was it Mr Adamson) went out and bought £69 worth of postal orders — the cost of which will have to be fought over between Messrs Kewney and Reiss — and sent them to ICP.

I now have a handsome, wood-mounted iron or aluminium (can't really be sure which) plaque, which drowns on about how D.B.X.V. (correctly spelled, with full stops) 'having clearly evidenced its acceptability in the marketplace and its leadership as a proprietary software product in the past year,' has caused this award to be presented to Consoft Ltd.

Wicked, wasn't it?

I rang ICP. Actually, I didn't have to. ICP rang Mr Aliss, who quoted my phone number. I revealed that it wasn't Mr Aliss's phone number at all, and that I was far from happy about these mysterious phone calls he kept getting. I revealed that I was a freelance journalist.

'What steps,' I asked, 'do you take to ensure that the correct information reaches you?'

In the case of genuine software companies, they get the form signed by an accountant — either the company's auditors, or the financial director.

In our case, the quoted official is one LD 'Lazy Dog' Spencer. (Why Geoff Reiss

calls his mongrel Spencer I don't know, but he does). I have a delightful note from Consoft here, in which Mr Aliss, the managing director, speaks very highly of LD Spencer's contribution to the company.

'Mr Spencer,' he says, 'has been with us most of his working life, but of course has not been working at all during that time.' And he gives details of Mr Spencer's security operation: 'This involves running a microbotic, small-particle factory examination of all visitors,' which, it is later explained, 'consists of sticking his nose into the visitor's crotch.'

I suggested that the precautions taken were not, of themselves, sufficient to avoid double-dealing. I didn't mention LD Spencer.

ICP claimed that it had, several years ago, had the same thought. It had chased after all the people who had submitted claims to have sold more than a million dollars' worth of software, and investigated them.

'And we found that they were telling the truth,' said an ICP executive.

These awards shouldn't be mocked too much, just because some plausible conman managed to get through the system. In general, I think the system works.

When IBM claims to have sold over \$250 million worth of mainframe operating software in a year, I believe that its accountants have checked the figures and found them accurate. And the plaque (somewhere in IBM) which notes that IBM is a member of the £250 Million Dollar Club is probably a source of pride to the software division controller.

Furthermore, when the Awards were first dreamed up by Larry Welke, president, there was a genuine reason for them.

At the time, the mainframe industry agreed, generally, that software was pretty useless and should be given away.

Welke it was who collected a list of people who had actually made a good living — even more than a million dollars' worth of sales — out of software, and held the first Awards ceremony to prove his point.

But I'm afraid that I don't believe that an ICP plaque on the office wall proves anything at all about the quality of software a company tries to sell you.

I have to admit, as a post-



You might think that this is a £14 joystick from Spectravideo. Not so: it is (and I quote) the 'eagerly-awaited' Quickshot 2 Turbo.

Unique? Well, just listen to this: 'It now features ultra-sensitive, pin-sharp finger and thumb trigger buttons to blast away the latest joystick-killer games,' and it has 'red-hot features' which 'give a winning edge' — for example, 'the fiery red base is offset by the two cool, black hand-grips and four stabilising suckers to give extra control for those frantic ...

It's a joystick. It costs £14 (less 5p) and you can call Spectravideo on (01) 330 0101. Tell the company about your hot blood, demon reflexes, flickering, razor sharp eyes scanning the burning raster of death ...

script, that D.B.X.V. is, in many ways, a uniquely bug-free program, and certainly deserves its Award. And there can be no more up-to-the-minute design ...

Lotus on the horizon

Lotus (the company) is very relaxed about the fact that the company's founder, Mitch Kapor, has resigned from his job as chairman, and it even seems happy about his having signed no more than a one-year consultancy contract.

Mitch remains on the board of Lotus Development, and there need be no doubt that the company needs him. What isn't clear, is whether it realises how much.

I don't know Mitch well. I met him a few times before he became famous, and in those days he had the time (and the inclination) to spend

time with writers like me. These days he doesn't.

But the fact remains that he is an innovator, a man with ideas (a very rich one, too), and is quite certain to come up with something new and earthshaking.

Whether he turns it into commercial success or not, is not a matter for prediction; and you can quite understand why Lotus would try not to sound panic-stricken when it had to announce his departure. But still, there can be no doubt that Lotus will miss him.

On a far smaller scale, there are signs of something stirring at Lotus, with the recruitment of one of Britain's high-flyers, a young man called Chris Randles, to be product manager (in this country) of a new, still-secret product line.

The line is going to come out of the same stable as the puzzling TK!Solver, which Software Arts launched a year or so before Lotus

bought that company.

Software Arts no longer has its founders, Bricklin and Frankston (the men who invented VisiCalc), but it does have a nice little club of scientific and engineering experts.

Randles was very well-known in the micro business as marketing manager at Olivetti. If he thinks Lotus's new engineering and scientific product division is worth joining, I think the rest of us should rate it worth watching.

Acorn stagnant

There is a horrible lack of ambition at Acorn. Where is the machine of the future that we all know Olivetti and Hauser can dream up?

For the longer-term answer, watch the Acorn Risc Machine. For this year, the answer seems to be the cut-down Master.

It now seems that the cut-down Master which Acorn is probably going to launch next month is taking leaves out of the Amstrad book.

The original idea, long ago, was to take an expensive machine (the BBC B) and produce a cheap version (the Electron) to rival the Sinclair. It turned out to be a silly idea.

The idea today appears to be to take an expensive and old-fashioned micro, the Master, and produce a cheaper version with a built-in printer and disk for around £400 to rival the Amstrad PCW8256.

Acorn is currently trying to build three new ranges. There is the BBC range, the Olivetti schools machine, and the Acorn Risc Machine, ARM. On top of that, there's a plan to design a European educational micro, in competition (or cooperation) with French people like Thomson.

Educationists are terribly confused about what to think about it all.

For a start, they feel that the Amstrad is the way to go. Next, they feel that there are such a lot of BBC Micros in education, that that must be the correct route to follow. But in the end, they wonder whether both options might not be a dead end, and shouldn't education get into the MS-DOS world? But then (chewing fingernails) they wonder whether Olivetti's cut-down MS-DOS machine will be: a) cheap enough; and b) powerful enough.

None of this confusion arose in people's minds when the original BBC Micro was announced. The only doubts anybody had were: can it possibly be real; and surely nobody could build something so advanced? At that price?

These days, it has to be admitted that BBC Micro stuff doesn't look any cheaper than Nimbus stuff, which was always overpriced in order that schools could ask for their (standard) 50 per cent discount without feeling cheated, and without Research Machines going bust.

I want an excuse to cheer, Acorn, really I do.

Magic alignment

The Commodore disk drive, the 1541 or the 1570, can get out of alignment by trying to read non-existent parts of the disk. This is caused by copy-protected software, and the cure, normally, involves screwdrivers, test equipment and money.

By contrast, Robtech's solution is a program and a cleaning disk, which together are called the Magic Disk Kit.

Robtech claims it can sort out alignment problems the same way they got caused; by moving the head around and testing until it is correct.

Details available on (01) 847 4457, price £20.

Pop-up kick for Amstrad

The Sidekick lookalike for CPM machines, Write-Hand Man, is now available for the Amstrad machines.

The idea is that the program can 'pop up' at any time whatever you're doing, taking over the computer and dropping back out of sight when you've finished, leaving you running the original program without delays and interruptions.

The program is likely to be followed by rivals in the UK, but at the moment, it's the only one that I have a price and an agent for: £30 through HiSoft.

It provides a pocket calculator, a notebook, a phone book which can operate your auto-dial modem and dial your friends for you, an appointments diary, and a little trick to make single keys on the computer do several things at once — a keyboard macro driver.

Details on (0582) 696421.

Amstrad snaps

One of my favourite tricks with a Spectrum — taking a memory snapshot — is now possible with the Amstrad CPC range: the 464, the 664 and the 6128.

The company, Mirage Microcomputers, is the same company which produced the Spectrum device. The idea is the same. Simple, too: you press a button which freezes the Z80 and its

entire memory map, totally, and saves it all onto a tape or disk.

One possible use of this is to take a tape and produce a disk version. Equally exciting, you can take a game which you have been playing for hours, freeze it, and restart from that point again and again, without ever having to play the boring bits.

It's called the Imager and it costs £50.

Details on (0376) 48321.

After the generosity — a stable market

Micronet began July by offering free Prism modems to anyone who took out a year's Micronet subscription.

The offer shouldn't last long because it sounds like quite a good deal, and only about 5000 each of Spectrum and BBC modems were left to get rid of when Micronet launched it.

If there are none left, however, don't panic too much. You've only saved about £60, buying that subscription, and the modem is really not that exciting, doing nothing other than standard Prestel-style 1200/75.

However, the good news is that once these old Prism modems are disposed of (Prism was the company which was originally a commercial partner of Micronet, but went bust with vast stock excesses), the modem market should settle down a bit.

Don't expect all prices to come down, obviously, but at the same time, there won't be a rise in prices either. What will happen, once these very cheap things are disposed of, is that some modem makers who have been nervous about the low end of the market, will feel safer about investing in it.

Typical of the kind of thing I'm hearing of is the excited Modem House announcement of the VTX 711 interface, matched with the Boots-sold Voyager range.

Modem House is always getting into trouble for advertising modems and comms devices that aren't approved, without pointing this fact out. This doesn't make Keith Rose, head of Modem House, very popular



The glistening effect on this keyboard is not the oil spilled from that can, but a plastic sheath which fits neatly over the keys to protect the electronics from the oil. You've probably seen such things in restaurants and other such spill-prone places. Now you know where to get one: it's from Ceratech Electronics, it's called Viziflex Seals, and the phone number to call is (0420) 88674.

SURPLUS COMPUTER STOCKS

**MORGAN COMPUTER CO. DISPOSAL OF SURPLUS INVENTORY,
LIQUIDATED STOCK, DEMO & USED COMPUTER MERCHANDISE**

APRICOT

Apricot PC 256k 2 x 315	£495
Apricot PC 256k 2 x 720	£595
*Apricot Portable 256k	£395
*Apricot Portable 512k	£495
Apricot Xi 10 512k monitor	£995
Apricot F1	£350
*Colour monitor for PC Xi etc	£225
ACT 8510 dot matrix printer	£125
ACT 1550 132 col dot matrix	£150
Systematics Invoicing	£55
Systematics Sales Ledger	£55
Act F10 daisywheel printer	£350
*Lotus 1.2.3	£150
*Apricot 9 inch monitor	£70
Micro Modeller	£200
*Easy Junior accounts pack	£150
Fox & Geller dGraph	£50
File Transfer	£45
Everyman	£150
Calcmaster	£65

HEWLETT PACKARD

HP 150 complete (demo)	£995
*Twin floppies for HP 150	£595
HP 2601A daisywheel printer	£750
HP 110 Lapheld inc Lotus 123	£995
Acoustic hood 26764A	£100
HP83 Computer (demo)	£150
HP 7225 Plotter HP-IB	£225
HP 82905B RS232 printer	£250
HP 2674A thermal printer	£95
CP/M system for HP80 series	£100
Graphics Presentation Pac HP87	£55
Visicalc Plus	£45
ROM drawer	£50
*HP-IB cable, 1 metre	£25
Linear Programming Pac	£25
*Memo Maker HP150	£45
*Multiplan HP150	£100
*dBASE II HP150	£195
*Wordstar HP150	£100
*Basic HP150	£75
*Fortran HP150	£195
*Mailmerge HP150	£75

PRINTERS

*Ricoh RP1200N daisywheel	£195
*Brother M1109 RS232 & para	£175
Microline 83 dot matrix	£100
*Silver Reed EXP400 D/W RS232	£150
*Silver Reed EXP500 D/W RS232	£175
NEC Spinwriter 3550	£450
Triumph Adler 7020 RS232	£150
Diablo 630 inc tractor feed	£550
C lth 8600 dot matrix	£75
Commodore 1526 dot matrix	£125
TEC F10 parallel	£450
Toshiba P1351 NLQ dot matrix	£350
*Bit 24 printer for BBC	£15
Brother HR25	£350
Brother Sheet Feeder	£125
Brother HR35 daisywheel	£495
Qume 11/40 daisywheel	£450
*NEC 3550 Qume interface	£350
IDS Prism 132 dot matrix	£195
Sharp P6 dot matrix	£195
Commodore 4022p dot matrix	£95
MT 80 dot matrix printer	£65
Shinwa CP80 parallel dot matrix	£125
Brother HR1 daisywheel	£125
Vic 1525 graphics printer	£50
Juki 6100 Demo daisywheel	£225
Epson MX-80 mkIII F & T	£175

Part exchanges accepted.

PHILIPS

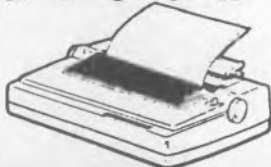
*P2012 64k 2 x 640k drives	£495
*P2010 64k 2 x 160k drives	£390
*10 mb upgrade inc controller	£495
Fitting extra	£35
*256k 16 bit/ MS-DOS upgrade	£200
Fitting extra	£25
*Technical Reference Manual	£35
*CP/M Reference Manual	£35
*Carrying case	£25
Printer cable	£15
*Cardbox database	£65
*Sorcim Supercalc spreadsheet	£75
*Dataman database	£65
1 year 24hrs on-site contract	£169
Ditto for P2010	£125
Demo P2012 boxed	£399
Demo P2010 boxed	£299

EPSON



EPSON PX-8 CP/M LAPHELD
C/w Portable Wordstar & Calcstar,
Basic, CP/M utilities, 64k
RAM, LCD display. (New) **£495**

RICOH!



RICOH 1200 DAISYWHL NEW
25cps, 10/12/15 pitch or proportional
spacing, parallel, self
test, opt s/feeder. **£195**

HONEYWELL

*L11 80 col. 120 cps para	£100
*L11 ditto including NLQ	£125
*L11 ditto IBM comp inc NLQ	£125
*L31 132 col including NLQ	£150
*S31 ditto serial	£150
Ribbons for above	£2

FLEA MARKET

PARTS ONLY, NO WARRANTY GIVEN	£5
Systematics s/ware for Apple	£35
Case modem X48/48	£35
Epson 400k d/sided drives	£25
Einstein	£95
Atari 400 16k	£15
Assorted B/W monitors std fit	£35
Olivetti DY 311/M1 daisywheel	£45
110v Nec Spinwriter	£250
*Omega cassette recorder	£15
Seikosha GP50 printer	£35
Decmate 2 inc screen & kbd	£450
Micro 5 terminal	£95
*Visicalc Atari 800	£25
Qume typewriter/printer	£95
Apple clone inc PSU	£75
*Apple Silentyper paper per roll	£3
ICL PC Twin 360k disk drives	£195

SHEET FEEDERS

Ziyad s/feeder for Qume	£100
*Ziyad s/feeder for Juki 6100	£125
*Ziyad s/feeder for Ricoh 1600	£150
*Ziyad s/feeder for Ricoh 1300	£125
*Ziyad s/feeder for Toshiba	£150
*Ziyad s/feeder for Panasonic	£150
*LQ electric s/feeder for NEC	£175
BDT 526 sheet feeder	£125
*Qume s/feeder for Ricoh1200	£170

SANYO

550 disk upgrade inc software	£75
*Sanyo 2000 64k 2x360k mon	£200
*CRT 36 green screen monitor	£65
*CRT 70 Hi res colour monitor	£225
Upgrade to 256k inc fitting	£30
*Pro Soft Gen A/C units set	£45

RAINBOW



DEC RAINBOW 64k DEMO
64k RAM, MS-DOS, CP/M, floor stand,
monitor, manuals, **£595**
Kbd, 3 mth warranty.

SANYO



MBC 555, 2 DISK DRIVES
128K, MS-DOS, Wordstar, Mailmerge,
Spellstar, Calcstar,
Reportstar. New (£999) **£350**

DEC

DEC Rainbow 100A 256k	£695
*DEC 64k RAM upgrade	£85
DEC Lotus 123 spreadsheet	£150
*dBASE II	£150
LQP02 daisywheel printer	£750

APPLE

Macintosh 128k inc software	£795
Fat Mac 512k inc software	£895
Apple II Europlus 48k cpu	£195
Apple disk drive	£135
Apple green monitor II	£55
*Apple III Z80 softcard inc disk	£95
Apple Quickfile II & III	£45
80 Column Text Card II only	£35
*Business Basic Apple III	£45
*Pascal Apple III	£75
*PFS File/PFS Report Apple III	£30
*Visidex Apple II Plus	£35
*Visifile Apple II Plus	£35
*Visitrend/Plot Apple II Plus	£35
*Apple Profile 5mb hard disk	£450
Multiplan for Mac	£75
Z80 card for Apple II	£45
MacProject	£75
MacChart	£55

IBM

IBM PC 64k, inc monitor & kbd	£895
IBM PC 576k complete	£1100
IBM XT 640k 10mb complete	£1450
IBM PC 256k 10mb complete	£1250
IBM ATE 512k 20mb colour	£2500
IBM Proprinter	£250
IBM Graphics Printer	£195
IBM SDLC card	£50
IBM AT serial cables	£35
IBM Async Comms card	£50
*AST Megapack clock card	£125
*AST Sixpak Inc 64k Sidekick	£295
Persyst Clock/Printer card	£65
IRMA board	£495
Pascal compiler, disc & man	£95
Mylex B & W / Colour card	£295
*Sanyo CRT 70 col Hi-Res mon	£225
*Intelligence Res PC Express	£350
Leadisk 10mb & 5mb backup	£500
*5250 card, cable, program	£395
*Open Access	£150
*Execuvision	£200
Write-It Multimate clone	£95
Calc-it 3D Spreadsheet	£95
*Keep-it database	£95
*Edit-it simple text editor	£35
*Peachtree Dec Manager	£90
*Easy Junior A/C package	£150
*Word Plus PC inc BQSS spell	£75
*Calcmaster	£75
*Fox & Geller Quickcode	£75
*Superterm 400	£95
Word Perfect vers 3.00	£225
*Visicalc IV	£65
Context MBA	£50
Framework integrated s/ware	£195
Cadplan	£550
Symphony integrated s/ware	£195
Hardware man Portable & XT	£50
Hardware manual PC	£50
Technical Reference	£35

EPSON

PX-8	£395
*PX Ramdisk 128k	£125
MX-100	£225
RS232 interface FX-80, RX-80	£20
*RS232 interface LQ-1500	£35
DX-5075 keyboard	£75

MISC

BBC model B with DFS	£295
BBC 6502 2nd processor	£195
BBC Torch 8 bit processor	£295
Superbrain inc software	£350
Commodore 8296 & 2 drives	£695
Televideo 1605 pc compatible	£595
Televideo 1605H ditto inc 10mb	£995
Atari 130 XE	£95
*PR1 acoustic coupler	£35
Digi-Co Prinz CP/M 2 x 320k	£150
Sord M203 inc mon & 2 drives	£150
Commodore 128	£195
Sinclair QL	£100
*Buzzbox modem inc PSU	£55
*Dacom Auto answer modem	£95
*Dacom Autodial modem	£125
*Dacom AA/AD V21/V23	£195
Osborne d/density grey case	£295
Wren 64k CP/M inc modem	£395
Ericsson portable inc printer	£1350
Kaypro 2000 inc software	£995
Kaypro 10 CP/M 10mb Software	£850

* 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)

"We want you to show how much our new £505 printer can produce in 60 seconds," said Epson. "Oh good," we thought, "a short-copy ad." Then they told us their EX800 could print 300 characters a second - and we were as happy as two ducks in a duvet factory. "Half a minute," I said, tapping out SOS messages on a calculator, "if you think we're writing all that, I'm a monkey's uncle." "Have a banana," they said. Hmph. Such sympathy. We were moved to tears. Anyway, here we are, faced with writing War and Peace Part One and completely on our own into the bargain. Well, not completely alone - after all, you're still reading, aren't you? Of course you are. You're not the sort of namby-pamby who's put off by a bit of eyestrain when there's half a chance of some decent writing, I can tell. You don't need any of those dreadful 'hi-tech' shots with lasers, grids and dry ice wafting all over the shop to grab your attention. The riff-raff might have cleared off already in search of those ads where big, busty women suggestively stroke some product or other under the headline 'Look at the big features on our new model', but have you? No, of course not. Nor are you impressed by any of those corny gimmicks that are just second-rate substitutes for the genuine interest that only the printed word can generate. After all, does 'Animal Farm' need a scratch-and-sniff card to make it live? Would 'Lady Chatterley's Lover' be any more interesting as a pop-up book? (Well, come to think of it ...) No, you read to improve yourself, to learn about the world around you - and even if you don't manage either here, at least there's a chance that you'll learn something or two about computer printers. This is Epson's ad, after all, so I really should tell you about the big features on their new model ... oops. What I mean is, the EX800 has a far greater list of specifications than any other printer in its price range (which is just as well for us, given the amount that we've got to write). As we said earlier, the EX800 costs only £505 (RRP exc. VAT) which just so happens to remind me of an extremely amusing and interesting fact about money. Now you really are going to learn something about the world! This could even be your big chance to improve yourself. All you have to do is casually drop this into conversation at parties, any time, and you'll have instant success! It's far easier than learning how to play the piano, after all. (You remember the ad I mean - 'They laughed when I sat down at the piano - someone had nicked the stool.' Yes, that one. What a load of old rubbish.) Anyway, where was I? Oh yes, this extremely amusing and interesting fact. Did you know - and not a lot of people do - that the unit of currency in Vietnam is the dong? It's true, it really is! Look it up if you don't believe me. And just this for a quirk of geography, it could have been the unit of currency here. Then even our innocent nursery rhymes would have turned out completely different, e.g.: 'Said Simple Simon to the pieman, "Let me taste your wares!" / Said the pieman unto Simon, "Show me first your wares, and you get the idea. We'd better get back to the printer before the Advertising Standards Authority cottons on. The most important feature of the EX800 has to be its speed. It whizzes along at 300 c.p.s. in letter-quality mode, but can manage an astonishing 300 c.p.s. in Elite draft. To give you an idea of how quick that is, we'll count up what we've written and then let you know how long the EX800 would have taken to get this far. Meanwhile, name that tune. Rumpty tummy tur-rumpty tummy tara, rumpty tummy tumpty tum, piddley piddley pom. No idea? Here! Rumpty tiddley, tumpty tiddley, rumpty tiddley tum. Rumpty tummy tumpty tum, rumpty pom. Yep, it's the Archers. And at the third stroke, the EX800 would have been printing for seven seconds ... beep ... beep ... beep. Here, hold on a minute. That means we have reached the bottom of the first page. Gordon Bennett, we're going to be here writing at this rate. Still, that's all the more reason to get on with it, I suppose. The new Epson EX800 is remarkably easy to use. The new Epson EX800 is remarkably easy to use. (Yes, that was repetition, as this is an important feature - and OK, it does use up a few more characters, but that's the whole point of making software commands. (Dragsville, Arizona.) The Epson EX800, on the other hand, has a 'Selectype' panel on the front. (Freaky City, Florida.) All you have to

from the wide - or to use a longer word, extensive - range of print options (N.B. there are 12 fonts) is push one or two of the eight backlit switches. Now that's what I call simple. It's far simpler than, say, balancing a packet of frozen faggots on your head, hopping up and on one leg, flapping your arms and shouting, "Yib hoy, snig floy, I am an inter-continental rissole," - and that's a dead cinch. In fact, I just did it right here in the office. There, I did it. It's wild! Come on, you have a go. It'll give you a bit of a break - and if you're reading this on it certainly ought to break the ice in your carriage. "But no, enough of all this frivolity," I you say. "Does this new EX800 have an integral push-feed tractor and short tear-off bar as standard, with the option of a cut sheet feeder also available?" Wow! What a question. Are you you're not in the computer printer business yourself? Hmm. You sound pretty clued-up to me. Well, the answer's yes. And before you start asking any more smarty-bottom questions, yes there is an optional colour unit available. For only an extra £55 (RRP exc. VAT), you, yes you, can print in seven, yes seven, glorious colours. Get your reports red! Give your accounts a purple patina!! Send blue suggestions to your business associates!!! Well, maybe not. Still, it's about time we had another character-count to see how far we've got. Any requests for music this time? Something grand and inspirational, perhaps, to lift our hearts and bear us on in triumph to the successful completion of our epic labour? Something that expresses fundamental optimism in the endless potential of the human spirit? You've got it. Here we go, here we go, here we go. Here we go, here we go, here we go-o. Here we go, here we go, here we go. Here we go-o, here we go. All together now, verse two - here we go, here we ... oh all right, we'll spare you the rest. The news is, the Epson EX800 would have got here in forty-five seconds. Just fifteen seconds to go! (I was always red-hot at maths.) I'd better stick in a couple more product benefits before I finally run out of space. The Epson EX800 has a very large ... err ... umm ... thingy. I mean what'sit. That is to say, a doodah. Oh very well, a large memory - an 8K buffer to be exact, with the option of an additional 32K also available. (The point of this is to free your computer for other tasks more quickly - but of course I'm forgetting again, you probably know that already.) The EX800 is IBM-compatible ... though why you aren't using an Epson computer I don't know. I mean, what's the point of us going on about how good Epsons are if people don't take a blind bit of notice?? Oh look, I'm sorry. Perhaps I wouldn't get so angry at having to mention a rival outfit if they had a name that took up a reasonable amount of space, but one that uses an abbreviation? That Is Truly Sickening. The final point to make is that the EX800 boasts the proverbial reliability of all Epson printers. Not that the word 'proverbial' means an awful lot, of course. Have you noticed how many proverbs actually contradict each other? There's 'Look before you leap' and 'He who hesitates is lost'. There's 'Many hands make light work' and 'Too many cooks spoil the broth'. Weird. It really is time some of these were brought up to date. How about 'Where there's a will, there's a lawyer'? Or 'A friend in need is a pest'? Yes, that's it. He who laughs last has no sense of humour, people who live in glass houses shouldn't take baths, a bird in the hand is better than one overhead, see a pin, pick it up - all day long you'll have a pin ... but I'm wandering again. What I should have said in the first place was that you can count the mistakes the EX800 makes on the fingers of one foot. But look, we're almost there. The coupon is looming up at last! And the great thing is, we've made it together. We've had our ups and downs, it's true, but you've stuck with us to the bitter end. Terrific. Can't you just feel that bond of comradeship, that deep empathy between us now? Of course you can. And now we've shared so much, we'd do anything for each other, I'm sure. For instance, if we asked you to fill in the coupon and send it to Epson, you'd do it for us, wouldn't you? What do you mean, no? To: Epson (U.K.) Limited, Dorland House, 388 High Road, Wembley, Middlesex HA9 6UH. (Telephone 01-902 8892) Please send me less information on your EX800 printer - quick.

Name _____ Company/Address _____
 _____ HPW2 Telephone: _____

EPSON



Now more widely available.



Remember us telling you about the Epson EX800, the printer that makes others in its price range look like snails on valium? Well, now they've brought out the EX1000, a printer that does everything the EX800 can, but which has a wider carriage to take paper for spreadsheets. You can get one for only £665 (RRP exc. VAT) - and you can get more information on both EX printers by cutting the coupon above.

PC BOOKS FROM

GLENTOP

PUBLISHERS ■ LIMITED

MS-DOS & PC-DOS on the IBM PC

Price: £6.95 ISBN 1 85181 060 9

MS-DOS & PC-DOS on the IBM PC tells you exactly what these two operating systems are, how they work, what they can do and how to use them. Now, even if you are totally unfamiliar with DOS, this guide lets you master the commands that will take care of disc 'housekeeping' tasks, allowing you to move on to more effective computing. The book comes complete with a section on the special considerations for hard-disc users and a summary of DOS commands. Topics covered include: getting started, preparing discs and formatting, accessing files, copying files, fundamental commands, batch files and DOS menus.

UNIX on the IBM PC

Price: £6.95 ISBN 1 85181 061 7

UNIX on the IBM PC is an easy-to-read guide that lets you keep pace with the latest development in IBM operating systems: the powerful and versatile UNIX. This book introduces you to the various advantages of UNIX, explaining commands, instructions and programming strategies. Complete with a full compendium of applications, it also explains how to customise UNIX to your needs – whether you're a business person, engineer, systems administrator, or other user. Topics covered include: file structure, editors, word processing and electronic mail.

Microsoft WORD on the IBM PC

Price: £6.95 ISBN 1 85181 062 5

Microsoft WORD on the IBM PC will help you undertake all your word processing tasks using the fast powerful Microsoft WORD. The book starts with an introduction to word processing and provides an explanation of the advantages of WORD's broad capabilities – especially the 'Mouse', WORD's special tool that can cut editing time in half. The book explains how to: use the editing screen, edit text, access command menus, search and replace, print documents, perform advanced functions such as type-setting, using multi-screen windows and creating multi-column documents.

Available from your local dealer. In case of difficulty contact: **GLENTOP PUBLISHERS LTD**
STANDFAST HOUSE, BATH PLACE, BARNET, HERTS EN5 5XE. TEL 01 441 4130

TRISOFT LTD 0629-3021

PROFESSIONAL ADVICE • LOW PRICES • HOTLINE SUPPORT • FAST SERVICE

HAYES AND COMPATIBLE MODEMS

Compliance with the Hayes 'AT' command protocols is becoming almost essential in order to fully utilise today's state of the art communications software, as well as to make use of the communications modules of integrated packages such as Smart, Open Access and Symphony. Trisoft can offer a complete range of Hayes and fully compatible modems: as follows –

HAYES SMARTMODEM 1200 The genuine article, offering 1200 Baud full Duplex and Auto Answer, Auto Dial facilities –
Price on application

STEEBEK MINIMO +2 Cost effective Hayes compatibility offering 300 Baud full Duplex, and 1200/75 Baud Viewdata, Auto Answer/Auto Dial – Price on application

STEEBEK QUATTRO State of the art Hayes compatibility offering: 300, 1200, 1200/75 + 2400 Baud full Duplex Auto Answer/Auto Dial, Error Correction and more –
P.O.A.

ALL THE ABOVE ARE FULLY BABT APPROVED FOR CONNECTION TO THE UK TELEPHONE NETWORK

CHIT CHAT – We consider Chit Chat by Sagesoft to be one of the best, fully featured communications packages currently available. Includes access to all types of on-line services including Prestel and Telecom Gold – £110.00 (includes free subscriptions to Telecom Gold and One to One worth £150.00)

APRICOT RAM BOARDS

256K £145

512K £235

SPECIAL OFFER

MICROCACHE – £120 TO ANYONE
BUYING A RAM BOARD



SAGE SUPERDEALS

	List Price	Our Price
Sage Payroll	195	145
Bookkeeper	295	199
Accountant	359	325
Financial Controller	995	695
Accountant Plus	695	425
C/C with modem	395	299

Please phone about Upgrades

If you require advice please call. All the above prices include full support from our Technical Department. We are authorised Sage Superdealers.
Dealer enquiries a must.

TRISOFT LTD

CROWN SQUARE, MATLOCK, DERBYSHIRE DE4 3AT. TEL: 0629 3021. TELEX: 8950511 ONEONE G (REF: 12977001).
TELECOM GOLD: 83 NTG 344. PRESTEL: 533544601

with his rivals.

However, the specification of the various Modem House packages now on the market is pretty comprehensive, covering machines that other people leave out, and offering a very wide range of auto-dial, bulletin board and other features. And the price hovers just above or below the £100 mark.

Details are available on (0392) 213355.

Micros on film

Honesty is the virtue of Computer Television, a company which makes videos on computing subjects. Not one of the people it showed its videos to thought they were brilliant, and when the company interviewed them, they said so. With remarkable candour, Computer Television reported their opinions accurately.

With one or two exceptions, the people who have bought or viewed these 'training' videos reported that the problem of training was very difficult. The exceptions were those who conceded, reluctantly, that the videos were OK, really, considering how hard the problems were to solve.

Having appeared on television myself, in some of the most forgettable sequences it is possible to imagine, I can sympathise with the producers.

The fact of the matter is that people *think* they understand what they see on video. And another fact, sad but true, is that most people are very bad at reading.

Technology Made Easy features highly professional presenters like Chris Searle, Tony Bastable and Anna Ford, reading fluently from porta-prompt-style equipment.

Having watched them, I have discovered that my

original fear of unfair bias towards certain manufacturers was irrelevant. The equipment featured is donated by certain companies, and I fear that this might lead to an emphasis on irrelevant hardware.

There is a bias, certainly; but the scripts that these presenters are reading from (with amazing sincerity, oratorical power and force) are so dull that the companies should pay to hide their names.

I'm absolutely sure that computers are not, inherently, dull things. But nothing on video that I've so far seen (or been involved in, actually) has been the breakthrough that the general-knowledge viewer will watch, and say: 'Aaaaah! Now I understand! How interesting.'

The latest two titles are *Selecting Business Software Part One*, and *Selecting Business Software Part Two*,

presented by Anna Ford. They cost £65 each. Details on (01) 631 1801.

You can't judge a book . . .

Well, well — a 'unique infrared connection between the keyboard and the main system unit,' on a 'revolutionary new laptop computer for under £1300' launched by United Disk Memories, otherwise known as UDM!

If I hadn't seen the label on this unique machine, I'm afraid I'd have mistaken it for the Quadram Datavue. That, too, has a cordless connection from keyboard to main unit (which caused me quite a bit of irritation when the keyboard didn't point direct at the pick-up spot). Once, it recognised the fact that I had let go a key which it hadn't noticed me press . . . but of course, the label



Does the future of computing lie with displays that can show bigger letters, or displays that can show more letters?

If the answer is bigger letters, then this Hercules Graphics Card Plus, with Fontman, must be a winner at £300.

Of course, it does more than simply print big characters on the screen. It also provides 25 fonts onscreen at once, so that programs like Microsoft Word, which can print out funny fonts, can now display them onscreen.

I don't get too excited about this, even though it does mean that you can do italics and Times and sans serif all at character-screen speed, together with graphics. The problem is this: the whole point of

seeing fonts as they are, is to give you a good idea of what you are going to print out.

Unfortunately, the size of these fonts will not be proportional to the size as printed out, so you'll have lines not lining up. So why do it?

The big characters look nice, but they aren't what it's all about. That's my opinion. Unfortunately I have only Bill Gates, head of Microsoft, as a back-up authority for the contrary view which suggests that what users will really be grateful for is not big characters, but paper-sized screens in 'portrait' mode, rather than 'landscape' mode.

Gates is speaking from experience when he says this. He has fitted his entire office in Belle Vue, Washington, with PCs displaying their stuff on enormous portrait-style screens, showing not 25 lines, but 60 lines.

He says: 'Before, I used electronic mail a bit. Now, we all use it a lot. There's a difference: I can read through my mail very fast, a page at a time, scanning it with my eyes in one sweep.'

The result is that Microsoft people are sending longer memos, with more facts in.

The point of having big fonts is not wasted on me. This Hercules thing has a method of varying the size of characters from four to 16 pixels high, and from eight to nine pixels wide.

The trouble is that, once you've done this on a 25-line screen, there isn't much room for information.

Human eyes are very, very good at scanning big sheets of paper for the words they want. If there are 80 columns and 25 lines, the scan is quickly done, but the information may be on the next page, or the one after that. On a 60-line screen, you can see at once that paragraph two and paragraph seven are pretty well repetitions. And you ignore the second one: if you wrote it, you delete it; if someone else wrote it, you dismiss them as a nerd.

On a big sheet of paper, of course, the big characters are sometimes necessary. The question arises: do we need them that big onscreen?

For desktop publishing, yes. You have to see how the text fits together. Unfortunately, desktop-publishing programs seem to be imagining that they'll work on a 66-line screen, not a 25-line screen.

It could get interesting. Hercules (in the States) is on (415) 540 6000 if you want to discuss it.

proves it must be a different machine, doesn't it?

No, it's the same machine all right, made in Japan and imported by UDM. If it had a legible LCD screen I might almost have liked it, because it does allow quite a lot of expansion, even including a proper monochrome or colour output to CRT. But once you've added a second disk drive, it's the size of a tank, or a Compaq.

UDM is also selling a full desktop computer, which the company says is the 'lowest ever price' for a PC-compatible. It's also the most cut-down version: by the time you've added two floppy disks, screen, keyboard and 640k, it costs £700.

'We are able to under-cut the opposition because we buy better,' is the message I have from marketing manager David Smith. 'We are buying in very large quantities,' he says.

I hope (for his sake) he's exaggerating. Details on (01) 281 2161.

No language barrier

Hard though it may be to believe, you can conduct a business with a vocabulary of 500 sentences.

Examples of necessary sentences, as provided by Primrose Publishing in the Tick Tack letter-writing kit, are:

'Settlement is now overdue, and we must ask you to let us have payment without further delay.' Or: 'These new prices come into effect immediately.' Or again: 'Please let us know if there is anything further we can do to help.'

The idea is translation. These 500 phrases are in English, and you construct your business letter by numbers — feed the numbers into the computer, ask for the letter in French, and bingo! '... le cheque est already dans la poste.' (Actually, I bet Primrose Publishing doesn't have

that useful phrase.)

It sounds ludicrous, I know, but so many people have failed to laugh at the joke when I told it at parties, that I've decided it must be worth trying.

There are 10 language packs; there are books; and there are programs for Apple, IBM, Sirius and BBC Micro computers. A single-language micro pack costs £150 (plus VAT) and a four-language pack goes for £295-plus. Each additional language costs £75 (plus).

Details on (0763) 82512, or use Telecom Gold 84:BSG107.

Oops — wrong number ...

They're very pleased, at the newsletter publishers of the Apricot File and the Victor/Sirius File, to have been mentioned recently in print. Unfortunately, the phone number which was printed is wrong.

As Dennis Jarrett put it: 'Thanks for the PCW mention, Guy. Sadly, the phone number you quoted is wrong — we're on (01) 833 3501. Any chance of a mini-fix sometime?'

Oops — wrong price

Very embarrassingly, readers have written to point out that PC Outline, the outline processor I reviewed in the June issue, is hardly a bargain at £169.

Indeed not, which is why New Star isn't asking £169 — it is asking £69 (typographical errors do happen occasionally).

If you're a subscriber to The Source, however, the program is available in a slightly more up-to-date version. You can download it from the IBM Special Interest Group pages.

In either event, if you use it, you must pay for it. PC Outline is not public domain, but shareware. Copying is the way the author distributes it, but payment is how he makes his living.

Do the Hoki-Koki

No compatibility problems on the IBM PC clone from Hoki-Koki computers. It uses a ROM BIOS which is not just functionally similar, but is actually identical to IBM's

own chip.

Anybody who calls his company Hoki-Koki Computers is obviously not out to make the same sober, sensible and responsible impression on his customers as somebody called International Business Machines, as Martin Langley readily conceded when I asked him.

'Credibility? No, you're right: we don't care,' he said cheerfully. 'We never claimed to be anything other than a small company near Heathrow, one of a dozen or so importers of very low-cost clones.'

And, of course, the only company who doesn't care about the possibility of being taken through every court in the country by IBM, for breach of copyright.

'Legally, the situation is that IBM can't sue,' said Langley optimistically. 'There was a recent EEC ruling on IBM's mainframes, where they required the company to publish details of the interface to the 370, because of their quasi-monopoly position.'

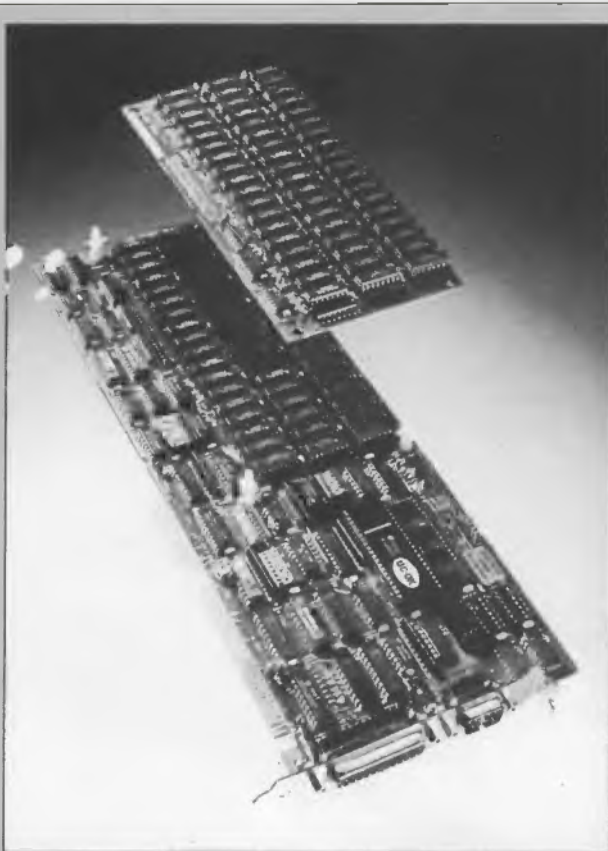
In the same way, argues Langley, the ROM BIOS is the standard interface for software to the IBM PC, and so IBM is not entitled to withhold it. 'IBM knows we're doing it, and they've said that our argument is wrong, but they aren't suing,' said Langley.

My own problem was getting him to persuade me that Hoki-Koki Computers is a real company. I know of a company called Can-Can Computers, run by the rather unconventional Terry Poole, founder of TABS. And I know of another clone importer called Control-Alt-Deli, run by Nigel Grant — another non-standard human.

'Oh, we're real all right,' said Langley. 'It's not a joke. We have two models: the 850, a PC clone at £850 with twin floppies, 256k, a screen and a keyboard; and the model 2000 is an AT lookalike with a 20Mbytes hard disk, a screen, a keyboard, a 360k floppy, and half a megabyte of memory, at £2000.'

The phone number I called Langley on is (01) 560 1970. I still haven't persuaded all my colleagues that this isn't an April Fool joke, but I'm starting to believe he does sell computers.

But then I believe anything. I even believe that Tim Challoner is entitled to call his company Inter-Orient



Another multi-function board, this time for the AT range of expensive micros. It goes up to 3Mbytes, includes at least one serial port, a parallel port and a 'games' port, and includes disk caching and RAM-disk software. Prices start at £539 for 512k, rising to £1140 for the full 3Mbytes.

This one is from Intelligence Research and is called Ramgate. But Intelligence Research has not moved to Margate or Ramsgate, but to Brighton (0323) 897469.



There are suddenly several games for the 'business' Amstrad, so, unsurprisingly, there are now joysticks for the PCW8256 and the 8512 as well.

For £25, Cascade Games will supply this one, which the company says is going to be compatible with games from Ocean, CP Software, CDS Software and Siren Software (though why you want a joystick to play chess is a bit beyond me). Don't be confused by the name John Lewis: that's the marketing director of Cascade Games, not the distributor. For distribution details, phone him on (0423) 525325.

Micros (IMC) even though some Chinese-looking people in Nice told me he wasn't. Let the lawyers sort it out, I say, and you're free to believe anything you like in the meantime.

Spectrum launch

Amstrad will be launching a new Sinclair machine at the PCW Show in September. Called the Spectrum 128+2, it will feature a built-in cassette recorder and an improved keyboard. This sounds like it will either be in an 'adjusted' QL casing or possibly in something like a CPC464 casing. The machine will sell for £149 plus VAT.

The rest of the Amstrad stand will be displaying the PCW8256 and the PCW8512. In addition, a typically secretive comment from the company revealed that 'a number of other Amstrad-branded products' would be on display. Whether or not this means the PC clone remains to be seen.

Quick DOS map

One problem with DOS shells — programs that try to simplify the chore of remembering all the DOS commands on IBM-family machines — is that they take time to examine a disk, to

find out what is on it.

A shell which has been used inside ICI for a year, as part of a complete set of hold-your-hand programs, is PC-Map, which shows what the disk looks like and eliminates some of the problems you can get with copying files onto floppy disks from hard disks.

Full details are available from Systems Workshop, which is now selling PC-Map to people outside ICI at the slightly high price of £49 plus VAT. But the interesting point about PC-Map is that it does have an 'instant load' feature which always keeps some knowledge of what the disk looks like. It makes it faster, apparently.

Modem power

Most modems plug into the mains. Some do it through your computer's power supply, some have their own. The Mektronic modem, however, uses so little power that it can drive itself like a telephone, from the BT-line power.

The modem costs £78.25, works at the Prestel-standard speed of 1200/75, and the company also supplies some BBC-based software for £10.

People without modems can obtain details on (061) 798 0803. People with modems (either 300/300 or Prestel-standard) can dial (061) 773 7739 (eight bits

data, no parity) teletype-standard.

Elan collapse

It was launched as the Elan and looked truly wonderful. It was a micro with millions of colours, millions of peripherals and expansion of memory.

Then it was late.

Then it had to change its name, because Elan (the company that really owned the name) objected to Elan (the new company that didn't) — so for a couple of weeks, it was called the Flan.

Then it was renamed Enterprise, and David Levy, one of the brains behind it, told me that we needn't worry about its shortage of money. 'Talk to the man running it, and he'll tell you that it costs nothing to run, and we can keep it going on a shoestring for a year or more.'

That was a year ago, and true to his word, the shoestring broke. The company died; the dream is over.

Lost in the dungeon

The original cult game, MUD (Multi-User Dungeon) at

Essex University is supposedly successfully transplanted to Telecom's Vax mainframe, and people who took out subscriptions are supposedly happy with what they did.

Supposedly, because Telecom's staff have been assuring me, since September last year, that I'd be the first to receive a trial subscription, 'just as soon as we think the standard we are offering is up to required levels.' I still find myself waiting for a trial subscription, and you can bet this is not because Telecom doesn't want me to know how good it is.

Meanwhile, Micronet has gone off in a huff and produced its own multi-user game. And Level 9, an adventure-game producer, has also gone out on its own, the product of which it hopes to launch in the Autumn.

Apparently Level 9's game, Avalon, is 'something like MUD, but on hardware with 100 times the effective power, and with at least ten thousand real locations and a thousand computer-controlled people to talk to.'

I'm not holding my breath, however. The Level 9 product is going to be marketed by... you guessed it — Telecom. **END**



The truly amazing, astounding, incredible and astonishing thing about Hewlett-Packard's new Portable Plus is not that its LCD is twice as readable as the old. Nor is it the fact that it has Lotus 1-2-3 and Microsoft Word built-in, in read-only chips.

The unbelievable news from HP is that it has slashed the price of the 512k version of the machine from £3061 to a more realistic £2699. So 256k of RAM now costs you £272 instead of the previous, whopping, £634. Amazing! Disks? What disks? You must mean that box (not included in the price) on the right. It uses the only Sony-specified 3½in disk in the world (everybody else spins them at a different speed, including Sony). It's nearly the same size as the computer. And with the Think-Jet printer, which is the same size as the disk, you have what HP calls a 'complete travelling computing system.'

We should get HP to open a brewery. Living in the past, the way this company does, it would obviously serve excellent draft ale from the wood at 10p per pint.

YANKEE DOODLES



Technology moves on to record-breaking speeds with the introduction of the world's fastest semiconductor — David Ahl sets this month's US news in motion.

Record-breaker

Scientists from AT&T Bell Laboratories and Cornell University have built the fastest semiconductor device ever demonstrated — a switch capable of turning on and off an electric signal in 5.8 picoseconds (5.8 trillionths of a second). The previous switching record for such devices was 8.5 picoseconds.

In the time it takes the new device to open or close, light — travelling at 186,282 miles per second — would travel only one-sixteenth of an inch (1.6mm). This speed rivals — and beats — a competing technology, the superconducting Josephson junction, which requires a supercooled environment of liquid helium (4.2 degrees Kelvin, or -268.8 degrees Centigrade) to operate. The new device achieved the 5.8 picosecond record at the temperature of liquid nitrogen (77 degrees K, or -196 degrees C). At room temperature (300 degrees K, or 27 degrees C), the switch operates at 10.2 picoseconds.

Circuit components in the new switch are as small as one-third of a micron. By combining submicron technology and exceptionally high-quality control of materials, the scientists have shown that features of that size can be integrated with larger elements to create ultra-high-speed circuits. Moreover, the submicron gate technology has very low power requirements, thus making it suitable for use in onboard satellite communications equipment, as well as computer microprocessors and memories.

Let's hear it!

Having read glowing reports of voice recognition by 'gee-

whiz' writers for years, many people became disillusioned and sceptical when the technology didn't live up to their expectations. Optimists became pessimists, and writers started to pan the technology.

Today, however, voice technology is blossoming. Those who said that it would never work are being proven wrong as innovative users find ways to make voice recognition both practical and profitable. Applications — for years limited to factory production lines and the machine shop floor — are finding their way into offices and laboratories.

For example, radiologists at New England Baptist Hospital dictate reports to a Kurzweil Voicetext system (KVS-PPC, \$6500) with a 1000-word vocabulary. The report appears on the screen of an IBM PC as it is being dictated; if a mistake is made, the radiologist is able to backtrack verbally and correct the error. Reports, which previously took days or weeks to be typed, are now done in a matter of minutes.

Robert Newman, a developer of interactive video systems, has put together a system called The Interactive Classroom (\$10,000 complete). It uses Introvoice boards with an Apple II, a VCR, a projection TV set and 30 transponder keypads made by Reactive Systems. In a school, the system might be used to show a short video segment on, say, geography, and then display a question with a menu of answers. The students use the keypads to answer the question; the teacher scans the answers on the Apple display, and uses voice commands to continue to the next segment, review the previous one, or display the student responses on the large screen.

Other voice systems are being used to sell insurance and recognise the responses of sales prospects, verify the identity of users of high-security computer systems, and analyse the speech patterns of whales, porpoises, and other animals.

Showdown

The semi-annual Consumer Electronics Show packed in

the usual 100,000-plus people with acres of nifty new products, industry experts speculating on the future of car telephones and computers, glitzy parties, and scantily-clad-centrefold girls.

Most experts are in agreement that the bottom of the home computer market was reached six months to a year ago. Things look much rosier now, and major store chains have been placing large orders. Atari looks like the big winner in 1986; Apple having all but bowed out of the home market, and Commodore is said to be in deep financial trouble. The Japanese have permanently shelved their plans to introduce MSX in the States. Amstrad has positioned its system as an office word processor, and the only other players are Video Technology and Franklin (both with Apple II work-alikes).

Atari's show stand was the size of a small building lot, one-third of which was filled with 24 smaller stands exhibiting the products of various software vendors.

Make It Move for the ST allows the user to use a paint program to generate and display graphics and animation sequences. Created by Avila Associates, the package features video transitions, zooms and fades; price, \$49.95.

New from Activision was Paintworks, a comprehensive paint program and graphics editor which includes options such as cut-and-paste, free-hand drawing, multi-level magnification, custom lettering and the use of clip art; price, \$69.95.

Batteries Included was showing a comprehensive line of software for the ST including Degas (a graphics editor), an enhanced version of Paper Clip (a word processor), and the Isgur Portfolio System (an investment management package).

In the area of hardware, Hippopotamus was showing a sensational video digitiser for the ST. With resolution of 320x250 and up to 16 grey levels, the digitiser can be used to print black and white images which can also be edited with Neochrome or Degas.

Commodore played it low-

key and didn't even have a stand on the floor. Instead, the company had a hotel suite where it handed out press kits with a glass of wine. The only thing 'new' is a repackaged C64 that will be priced somewhat lower than the current C64.

Random bits

Since the third quarter of 1985, sales of IBM PCs have been slipping, while the sales of PC-compatible makers have been on the rise.

Nevertheless, IBM still has nearly an 80 per cent market share followed by Compaq, Leading Edge, Epson, AT&T and NCR... Disappointing sales of AT&T's Unix PC have led the company to reposition the machine as a multi-user system rather than trying to continue to sell it as a powerful stand-alone desktop PC.

Personally, I still don't see much of a market for it... IBM, too, isn't selling nearly as many PC Convertible laptops as it anticipated, mainly because the machine is incompatible with many applications and Lotus 1-2-3 is not yet available for it...

Apple has entered into a 'technical collaboration' with the National Geographic Society and Lucasfilm (Star Wars, and so on) to explore the effective use of CDs and video discs in education... Peter Norton has released the Norton Commander, a mouse/menu/window-driven hard disk organiser...

Multibotics is finally shipping the Robotics Workshop, an interface between a Commodore 64 and motorised Capsela Construction Sets. The kit comes with six Capsela assemblies, infra-red sensors, a software disk, and an instruction manual with 50 experiments. Creating some controversy in the computer games field, Infocom has released Leather Goddess of Phobos, a humorous but 'naughty' spoof of a pulp science fiction novel of the 1930s. It has three levels of play: Tame, Suggestive and Lewd.

Quote of the month: 'Trying out software on typical computer users gets you back in touch with how complex it all is' — William Gates, Chairman, Microsoft.

END

TAXAN

TO FIND OUT MORE ABOUT THE TAXAN RANGE OF PRODUCTS, CALL US ON 0344 484646.

TO READ THIS MUCH, YOU CAN'T.
If you're a serious micro user
you need the Supervision III
high quality monitor from TAXAN.
Its picture quality is far
beyond anything a standard
resolution monitor can deliver
so it's easier to read (which
is just what you're doing now).
The Super High Contrast Tube
also gives you the most vivid
colours available on any monitor.
Of 4 text colours at the flick
of a switch.
Yet the TAXAN Supervision III
is actually less expensive than
any other comparable screen.
So when it comes to choosing
the right monitor, what could
be clearer?

TO READ THIS MUCH TEXT
YOU CAN USE ANY SCREEN

The new 1M

With a memory like we haven't for

Internal power supply.

Resolution: 640×400 pixel
monochrome or 320×200
with 16 colours,
640×200 with 4 colours.

TOS in ROM creates
a workspace of over
900K bytes.

94-key QWERTY keyboard
with numeric keypad
and cursor controls.

The price! Under £1
a Kb (excluding VAT)
including colour monitor.

An enormous 1024K RAM plus
a powerful Motorola 68000
processor running at 8MHz.

Port for mouse
or joysticks.

Monitor: 12" high-
resolution monochrome
or 14" colour.

Integral 1Mb
(unformatted)
double-sided
3½" disk drive.

Two-button
mouse.



Atari 1040STF

that you can be sure gotten a thing

The Atari 1040STF employs state of the art 16/32 bit technology. Yet its price is unbeatable.

The ST range of computers already has a large number of software programmes available, including word processors, spreadsheets and databases, as well as a variety of programming languages and specialist business packages.

The 1040STF will also run software written on several other popular operating systems, including CP/M.

It has a 1024K RAM, integral 1Mb (unformatted) double-sided 3½" disk drive, two-button mouse and built-in power supply.

The operating system is in ROM, leaving RAM free for applications. BASIC and LOGO programming languages complete the package.

With 12" monochrome monitor, we recommend it sells for £799 excluding VAT saving you at least £1600 against its nearest rival. The price of our 14" colour system is a remarkably low £999 excluding VAT.

As the American magazine 'Byte' commented, "for some time to come the 1040STF will be the clear leader in price/performance."

For the name of your nearest dealer, ring Teledata on 01-200 0200.

And that includes an unbeatable price

Experience the world of Atari at the
PCW Show. Level 1. 3-7 Sept'

 **ATARI**[®]
Power Without the Price™



**Your
Macintosh Centre
for
service with a
difference!**

CALLHAVEN COMPUTERS



Authorised Dealer

43 Fife Road Kingston-upon-Thames Surrey KT1 1SF
Tel: 01-549 5612



The Smart Name & Address Label, Letter & List Printing Program

A SOFTWARE BREAKTHROUGH

FEATURES

Enables you to compile, update and delete names and addresses (including telephone numbers, company details, comments & special codes)

PRINTS LABELS

- for Customers (etc) or Stock Items (1, 2 or 3 to view)
- up to 14 different label styles
- can print many of the same labels

PRINT LETTERS

- Personalised Letters (i.e. the same letter for different people)
- Allows two personal substitutions per letter (other than name and address)

PRINTS LISTS

- Name List
- Address List
- Telephone List

- Prints any of the above in any order for any group or subgroup.
- Versatile & easy to use.
- Ideal for office or home use.
- Stores up to 750 Information Cards on a floppy (360K) and 20,000 on a hard drive (10M8).

**All this
for
only**

£99

+VAT

Available from

**System
Requirements**

- IBM PC (or compatible)
- 256K memory (min)
- Colour or Monochrome monitor
- Any printer

**City
Software**

2-4 Chester Rents
Crancery Lane
London WC2A 1EG

(01) 404-5737
(01) 405-8582 (24 hours)
Telex 2-7486
Equity G

and most major software distributors

Make a name
for yourself.

Robin Software



**THE POWER OF APRICOT XEN IS ONLY
A PHONE CALL AWAY...
(0280) 816087**



... or visit our demonstration showroom and see the complete Apricot range including the latest, fastest and most powerful micro, the Apricot Xen-i, also the Xen multi-user system and the amazing new 800 cps laser printer.



FRASER
Associates Limited

**FREE SOFTWARE & TRAINING
WITH EVERY SYSTEM.**

Phone (0280) 816087 for more information.

- Impartial advice from trained consultants.
- On site training.
- On site servicing in fully equipped workshops.
- Complete After Sales telephone hotline support.
- Secondhand equipment available, trade-in welcome.

Bristle Hill, Buckingham MK18 1EZ Telephone (0280) 816087

apricot

EPSON

KAYPRO

Authorised
Sales & Service
Centre

LETTERS



Poor show

I have written to tell you why I shall not be attending this year's PCW Show. The reason, and believe me otherwise I would, is that I am aged only 12, and therefore will be excluded from the business hall. To me this is pointless — even Atari will be in Olympia 2. As for the 'game-crazed hooligan' type image surrounding children and computing, which is the obvious reason for the exclusion of children, although it *can* be true I don't think it is true in my case.

My main interests in computers are in programming and examining the market. The latter is the main reason for my subscription to PCW, being the only one. This is supplemented by the fact I only have in the way of games two adventures and Elite, and I read 'Screenplay' two issues later, if at all! I understand it is difficult to tell the difference between people like me and the formerly mentioned 'Arcade Addicts', but at least you have my reasons.
SK Legassick, Coventry

Rest easy; the Atari's feature lies between the two halls and is accessible to visitors from either. We look forward to seeing you there.

Survival shock

We are subscribers to, and avid readers of, PCW, and have always found your publication to be accurate and objective. It, therefore, came as rather a disappointment when we read the article ('The Right Stuff' in PCW's *Survival Guide*) by Surya, and found some significant and

material inaccuracies about our Vicom products.

The comparison table states: 'No index, inadequate contents page.' The Vicom manual for the Macintosh Level 2.1 that has been shipping since January 13, 1986 includes a table of contents listing over 100 sections and an index with over 275 entries. The user guide is extensive and complete. It is usable as a primer on communications (see chapter 2), as a guide to setting up and as a reference document.

The article continues: 'On the negative side, Vicom is virtually unusable without a Hayes-compatible modem (costing £250-£400).' The Vicom modem book contains set-up for the following modems that are *not* Hayes compatible: Tandata TM512; Tandata TM1400; Tandata TM110; Tandata TM200; Dacom 2123AD; Dacom 2123 AD-S; Dacom 2123GT; Thorn-EMI VX543; and a manual modem setting that works on non-autodial modems such as the Miracle WS2000.

Your reviewer seems to assume that while we have achieved ease of use we have been forced to sacrifice features and limit functionality. Again this is not correct. Vicom has advanced viewdata features such as colour text recognition for monochrome systems and transfer of viewdata graphics text to ASCII format. In TTY mode it has multi-tasking capability (perhaps the only Macintosh software to have this) as well as file transfer using both full XModem and MacBinary error correction. Also worthy of note is the full implementation of VT100/VT52, and a DataScope allowing analysis of signals in both hex and ASCII of line transmission.

The only comment that we agree with, having been placed by your reviewer as 'on the negative side', is that relating to Vicom not stripping our hard linefeeds so that services such as World Reporter appear with double-line spacing. This

was a conscious decision on our part and, given that less than one per cent of communications users would either be using World Reporter or find this a restriction, we stand by our decision.

We recognise that reviewers are entitled to their own viewpoint on subjective matters, but feel that the factual inaccuracies warrant correction by your magazine. Impressions once formed are difficult to reverse, but in the hope that readers of the review will also be readers of your monthly magazine, we request that you print this letter to set the matter straight.

**Brian M Morris, AM
Computer Technology,
London W8**

We're glad to set the record straight, sir. For some inexplicable reason, Surya based his review on a very early release of your product.

Our address is...

Thank you for the review of our Unix accounting software, the 2-12 Bookkeeper, by Jon Vogler in the June issue.

Mr Vogler is correct in saying that the weaknesses he identifies are now altered. In particular, 26 sales types (nine previously) are available, there is a look-up facility on account names, context-sensitive help has been added and operating system commands may optionally be run from the main menu.

Perhaps more importantly, however, is the interface to the TCM database and applications generator which is also reviewed. Both systems use the same file manager, MKFS, so that the supplier or user can build entire applications to produce input to our accounting system (via the 'post' utility), or to report on the data contained therein.

We have written a number of bespoke systems using this facility, and since only

the part specific to a client's particular requirement has to be unique, costs can be kept to manageable proportions.

Finally, it is possible that your readers may be interested in contacting us regarding our product, so our address and telephone number are given below.
Michael Street, Steam Radio Limited, 1 Perren Street, London NW5 3ED. Tel: (01) 267 2561

Electrons unite

I am starting a user group for Electron owners, and would be grateful if you could publish my full address so that potential members can contact me.

While based in Cheshire, I would welcome enquiries from anywhere, as the group will be postal. There are no fees, the idea being to encourage contact and help between members. The group will probably produce a cheap but informative newsletter to which members will contribute.

Finally, could I ask that enquirers enclose a stamped addressed envelope for a reply?

Thank you in anticipation.
**Michael O'Donnell, 5
Worthington Close, Runcorn,
Cheshire WA7 2QG**

Glad to be of service, Mr O'Donnell.

Arise, Sir Olive?

Mr Alan Sugar is reported to have told journalists that Sinclair makes computers for 11-year-olds. They may get bored after a year and stuff it under the bed, but there are always more 10-year-olds coming up.

The grown-ups will be upstairs, then, doing serious things on their Amstrad, while the little ones fool about downstairs on the Spectrum, and the teenagers mooch around betwixt and between. So much for Mr Sugar's vision of home computing.

Contrast Sir Clive, who provided in the QL an affordable computer that has



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: 0638 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
✓	20 telephone number storage
✓	V25bis dialling
✓	MNP error correction (T-LINK)

New added features - no extra cost

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.

something for all ages. As far as I am concerned it is the only true home computer for families with normal means. What a pity it was sunk by a disastrous launch, a hostile press and the reputation of its microdrives (which are in fact not that bad — and are shared with the One Per Desk).

If Mr Sugar persists in his refusal to take on and improve the QL, I fervently hope that someone else will show more imagination. Perhaps the QL owners should get together and start a company; that would be a real act of consumer sovereignty.

Philip J Stewart, St Cross College, Oxford

Try contacting Colin Hughes of Transform on (01) 658 6350. He is trying to set up a QL Suppliers' Group dedicated to reviving the machine.

Predatory pricing?

Dr Smart complains of the highly-priced Amstrad disks in the July issue. Well, even Alan Sugar admitted that they were overpriced, and pledged in the January issue (via Guy Kewney) to force them down to £3.

However, six months later, the situation remains unchanged with even Amsoft still charging £4.95. Perhaps Mr Sugar has some explaining to do.

David Rawlinson, Rotherham

Guy Kewney replies for Alan Sugar:

You're not the only one who'd like an explanation. Alan Sugar would probably like one — from his suppliers.

The problem seems to involve a simple trick by a Far East manufacturer to charge extra for the new, high-density disks on the Amstrad 512. It turns out they're the same disks as the old 256 model used. Sugar is trying to find an alternative source, and the alternative source is nervous about how long he will be selling 3in-disk machines.

The argument is not being conducted in my office, so I can't give day by day details. But you can be sure that if the high price of disks causes sales of the PCW8512 to flag, Alan Sugar will get a lot more excited

than you will.

On the other hand, if sales stay strong, Alan has other things to consider, which will cause him more lost sleep than making excessive profits on disks. Complain, by all means, but don't pretend to be astonished if nothing happens for another six months.

Nostra culpa

I was fascinated to read in the June issue of 'name and address withheld's difficulties, matching those depicted by Michael Haynes in your March issue.

My own little problem, although less serious, may be regarded as typical. Or perhaps not.

I am a purchaser of long standing of a computer magazine for which I have a high regard, obtaining it by regular order through a newsagent. This establishment changed hands a few months ago, since when there have been difficulties in supply. (We have our own troubles with wholesale distribution up here, which works OK if the retailer is prepared to go down and thump the counter at regular intervals. This the new folk seem too shy to do... they'll learn.)

The March issue of this magazine did not come to hand till the middle of March, but it contained a subscription offer, which I decided to take up, and sent off my cheque.

Result nil.

I have written: no reply.

I have telephoned, to be told by a sad voice that the company has been overwhelmed by the reaction to the offer, and not to expect an early response. Meanwhile my cheque has not been cleared from my account, and I have lost the April and May issues, having cancelled my previous order. I am very rarely near the city centre, and have only been able to buy the June issue as the result of a chance sighting.

It is difficult to believe that my original communication has gone missing, since earlier in the year my subscription to the London magazine was lost and had to be replaced. The joint probability of two such similar events occurring seems slight. And there is the matter of the lack of a reply to my follow-up letter.

This new issue of the

magazine contains another subscription offer. I have not responded to that since it begs the question of what to do about the existing cheque, and besides it includes an 'offer' for a wretched binder which I don't need. All I wish is to regain my previous status of 'regular reader'.

Perhaps you can assist with this since, after all, your own full employment must depend to a considerable degree on the punters like me getting their hands on your magazine. (As you must be aware by now, it is indeed PCW which has been the subject of this letter.)

Long may you continue to publish, but do please include me in.

PH Tanner, Glasgow

As you know by now, Mr Tanner, you are included in. We're truly sorry to all our new subscribers for the delay but we had the most astonishing response to our subscription offers. The backlog is completely cleared and requests are being dealt with promptly.

Inelegance lives

Albert Debono's letter, 'NewBrain Numbers', in the July issue of PCW struck a chord with me. His letter was neatly sandwiched, I assume by a skilful editor, between those from R Williams and C Figenbaum who both stressed the importance to them of computers as tools, rather than, on the one hand as technological wonders to be admired in their own right, or on the other hand, as vehicles for programs sophisticated beyond the needs or understanding of users.

Mr Debono contrasted two approaches to the use of computers to solve, for example, the puzzles in 'Numbers Count'. One approach knocked out in 10 minutes a Basic program which had a run time of eight hours; the other reduced run time to 10 minutes by the use of machine code, which took eight hours to develop. Consequently the overall time for the task was the same in each case. The same considerations might well apply to the difference between a first crude inelegant program in any language, and the final polished result: faster, more

economical in use of memory, and more user friendly.

The important point regarding use of computers as tools is, using the figures from Mr Debono's example, that in one case the user spends eight hours at the keyboard, in the other he spends 10 minutes there, and can use the eight hour run time more profitably for such activities as sleeping.

For the one-off task, give me the inelegant solution every time.

M Barret, Westbury, Wiltshire

Hard cheese

I bought your magazine for the first time in over a year of abstinence from computer publications.

I used to buy it (and others) when looking for a system to buy. I bought it recently to get a price guide because unforeseen financial circumstances have forced me into selling the system I have bought.

I was amazed/horrified to find that the cost of my system had almost halved, therefore meaning that I will have to sell my system (which is just one year old and in perfect condition) for less than half the price I paid for it.

The glossy ads you and other magazines carry fail to mention that their business asset can become a liability and no-one will be willing to take it off your hands for a reasonable price. One dealer offered me £300; I paid £2100.

My advice to anyone thinking of buying a system is to leave it for one year — you will be able to buy it for half the price. Better still, give it five years and they might pay you to take it. 'Horrified', London SW1

Silent, silent

I am having the greatest difficulty in locating a copy of the manual for a Texas Instruments SILENT 700 Thermal Printer.

My printer has developed an electronic fault; it is still perfect electro-mechanically.

I have applied to the Texas Company, who can not assist me, as the machine went out of production in 1975.

If any reader could help me in this matter, I would be very grateful and perfectly willing to pay.

CA Salter, Belfast

END



BANKS' STATEMENT

Awaking giant

With company profit margins being eaten into, IBM is preparing to wage legal war against cheap-and-nasty clone manufacturers. Martin Banks presents his findings.

You lot out there have inadvertently created something of a problem for poor old IBM. Among equal proportions of wailing and gnashing of teeth, the company has found that the pussycat of a personal computer industry it playfully pulled by the tail has turned into something of a tiger, and it still has hold.

When you lot out there decided that a largish grey box with a little silver badge on the front constituted a good computer and started buying it, IBM was very happy. To make sure that as many other manufacturers as possible became aware of Big Blue's presence as quickly as possible, the company even exploited its dependence on an outside supplier of operating software and made the PC an open architecture. Within reasonable limits, anyone else could come along and make a similar machine.

Not surprisingly, that is exactly what many of them did, with stunning success. Olivetti added PC-clone making to its existing typewriter and accounting machine business to become Europe's biggest supplier, while Compaq took off from ground zero like a ballistic missile. Unlike the missile, it has avoided both coming back to earth and going 'bang'.

The very success of these and many others has now started to hurt IBM where only IBM can hurt most — the huge black numbers at the bottom of the accounts. What is worse from the company's point of view is that the competition is getting nastier. The likes of Compaq and Olivetti at least play fair — better versions of the PC at competitive but realistic prices.

Now, however, there is increasing competition from Far East manufacturers who have the temerity to ship huge volumes of their clones to these fair shores at little more than cost price.

This poses several questions, many of which will be of direct interest to the average user, not least of which is whether it is actually fair, either to IBM or to the users. There are other questions that stem from this problem as well, such as what will IBM do about it.

This may sound as though I'm about to leap, sword of self-righteousness in hand, to the defence of IBM. I'm not sure that IBM would really feel the need for that, somehow. To defend the company, however, is also to defend the users, possibly against themselves. It wouldn't be the first time that I have written in these pages that the cost of systems has, if anything, to go up rather than down.

Computers are machines that require a certain amount of coddling and support to get the best from them. That, from the user's point of view, is something that comes from the people who made or supplied the system in the first place, and supplying support is, arguably, a moral duty.

Purchasing a PC from IBM or one of its dealers, or indeed buying one of the leading clones from the established names, will get the user this essential support. Certainly, the company won't always be able to solve your particular problems, but even *trying* to is supportive. Most supportive of all is the fact that the supplier has people available to even talk to you in the first place; that can be the single most expensive aspect of the whole subject.

Buying a cheap clone may look good on the balance sheet. A figure of £700 or £800 looks a lot healthier to the accountant-brained than £1500 or £2000. Cheap clones may even make sense to some larger users who have full support capabilities on site as a permanent fixture of their own, or those individuals who really do know their way round a circuit board with a soldering iron.

The majority of users are not going to fit into this category, however. They are buying computers, and especially PCs, to solve problems, and having the computer as one of the problems doesn't rate highly. No matter how well a clone is produced (and it has to be remembered that quality control in manufacturing is probably now more expensive than making the things in the first place), you can bet money on failures, faults and problems occurring. All will need more support than is likely to be available on the margins the supplier

will be making on having sold the box.

This would seem to beg the question of whether a cheap clone will actually represent the saving it appears to on paper. The answer, on general terms, would seem to me to be no, unless you really understand what you are letting yourself in for.

IBM's displeasure at these cheap clones has gone beyond being merely aggravated. Now, the company has decided to take some action. There are strong signs of legal action against some manufacturers, where close BIOS similarities have been noted. This is an area where IBM has successfully used the law for protection in the past. The company is also said to be planning more tenuous legal action on the basis that some clones, the AT ones in particular, look the same as the AT itself. This will make an interesting precedent if IBM succeeds with it.

More important to the user, however, are IBM's plans to make cloning increasingly difficult. There are a variety of ways that the company may approach this problem, ranging from security additions to the hardware, through to similar artefacts in the software.

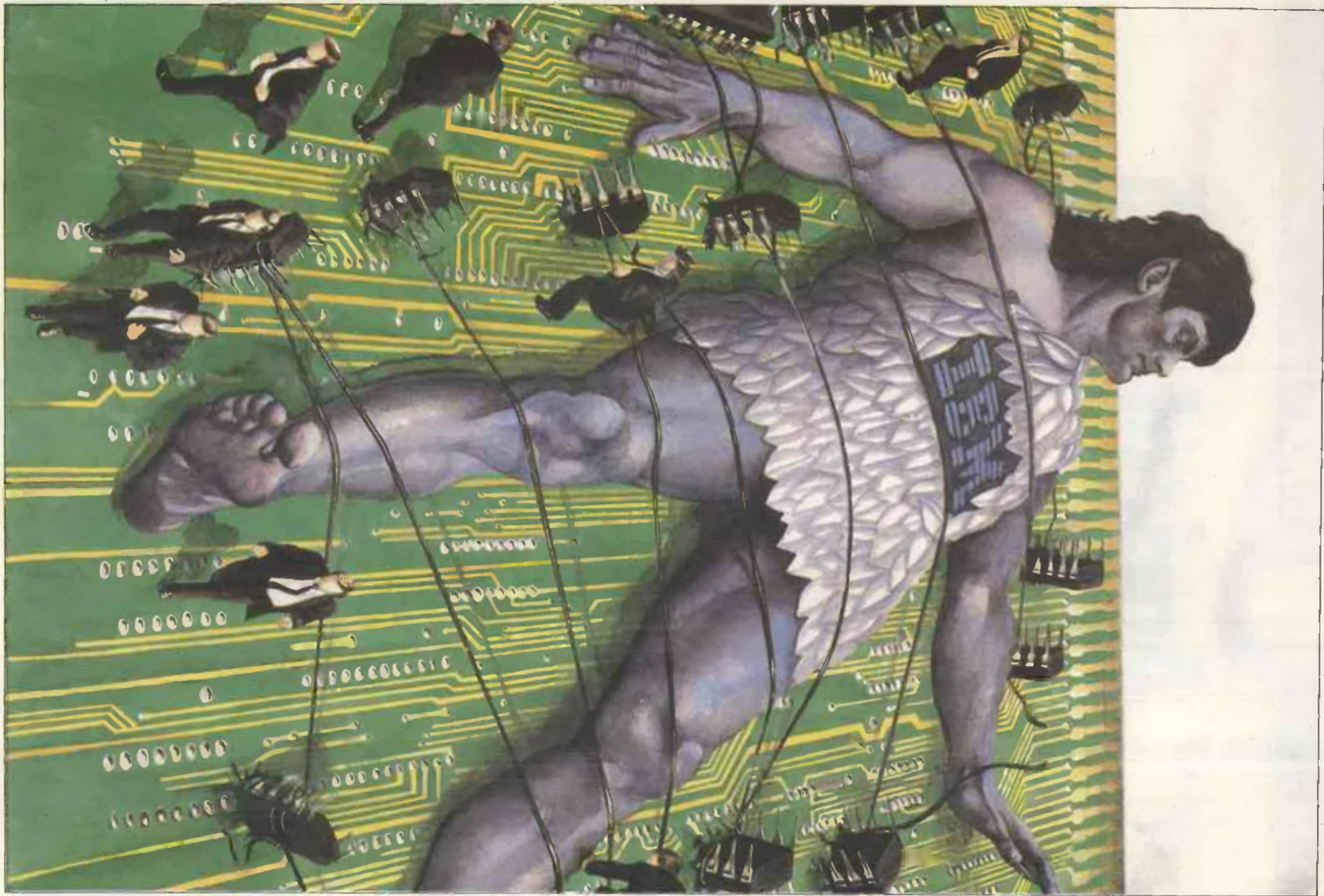
As the hardware architecture is based on Intel components, there is not too much scope for adding-in bits, even proprietary ones — that will really spook the competing hardware designers. There is some talk of IBM using something like the Intel KEYPROM as some form of IBM identifier, but it might be difficult to both make it work and make it work easily enough not to be more trouble than it's worth.

It seems more likely that the attack will come in the operating system area, perhaps making PC-DOS a bit more proprietary or getting software producers to write applications for proprietary additions to the system, such as the so far unsuccessful Top-View.

The real question then might become: Will the users let IBM change things too much? After all, the success of the clone-makers has been based on users liking the existing standard.

END

Illustration by David Mitcheson





BENCHTEST

Apricot XENi

Apricot's go-it-alone approach has proved a disastrous mistake with the sales flop of the portable, and poor sales for the PC and F-series machines. In a bid to defy defeat, Apricot has come up with the XENi, a fast and attractive PC/AT clone. Nick Walker evaluates the machine's chances.



Two years ago Apricot looked like the only UK computer company which could stand up to the growing dominance of IBM in the business market. Apricot machines made no pretence of IBM compatibility and because of this Apricot was able to incorporate recent technology into its machines. The Apricot PC, for example, was Apricot's answer to the successful IBM PC. With its 3.5in disks, compact design and superior specification, the Apricot outclassed the IBM in every department except one — applications. Nevertheless, the Apricot PC had sufficient of the major applications at its disposal, and hence sold well.

Two years on and things don't look so rosy. The Apricot portable machine was written-off as a failure, and the PC and F-series machines are not selling in any great numbers.

Apricot has recently announced plans which will, hopefully, pull it back into profitability. All the low-end machines are to be dropped, leaving only the XEN (Apricot's original competitor to the PC/AT) and the subject of this Benchtest, the Apricot XENi.

In some ways the XENi is an admission of defeat for Apricot. The XEN was a step closer to IBM compatibility for IBM but the XENi is an all-out PC/AT clone. The future of Apricot to a large extent rests on these two machines, and the XENi needs to be something special to stand out from the competition.

Hardware

Unlike the PC/AT and the majority of its compatibles, the XENi system box is of a size that could comfortably sit on a desk top. The external casing is exactly the same as that used on the original XEN, a very striking split-level design with a low-profile front panel. However, PC/AT compatibles need to be bulky in order to accommodate a decent number of expansion cards — so there will no doubt be a price to pay for this compact design. The keyboard and monitor continue the angular design of the system box, although both monochrome and colour monitors seem excessively large. All three units are finished in cream injection-moulded plastic.

Setting the system up is simple enough if you have a monochrome system, and it's a relief to discover the size of the system bears no resemblance to the oversized packaging. Part of the reason for the compact size of the XENi is that the power transformer is a large external unit about the size of a shoebox. Initially, I found the idea of an external power supply unappealing, but once it was under my desk I forgot all about it. Additionally it supplies power to both the system box and the monitor, allowing you to run the system off a single power socket.



To install one expansion card, six plastic covers must be removed

Purchasers of the colour XENi don't have things so easy. To set up a colour system it is necessary to remove the cover of the system box and install a colour graphics card. In addition to this you must disable the onboard video circuitry by moving a jumper. This wouldn't be too bad were it not for the position of the jumper block, underneath a memory expansion card. To do this you *must* use a pair of snipe-nose pliers, as trying to do it with fingers is practically impossible. Hopefully, prospective purchasers will be able to persuade their dealers to do it.

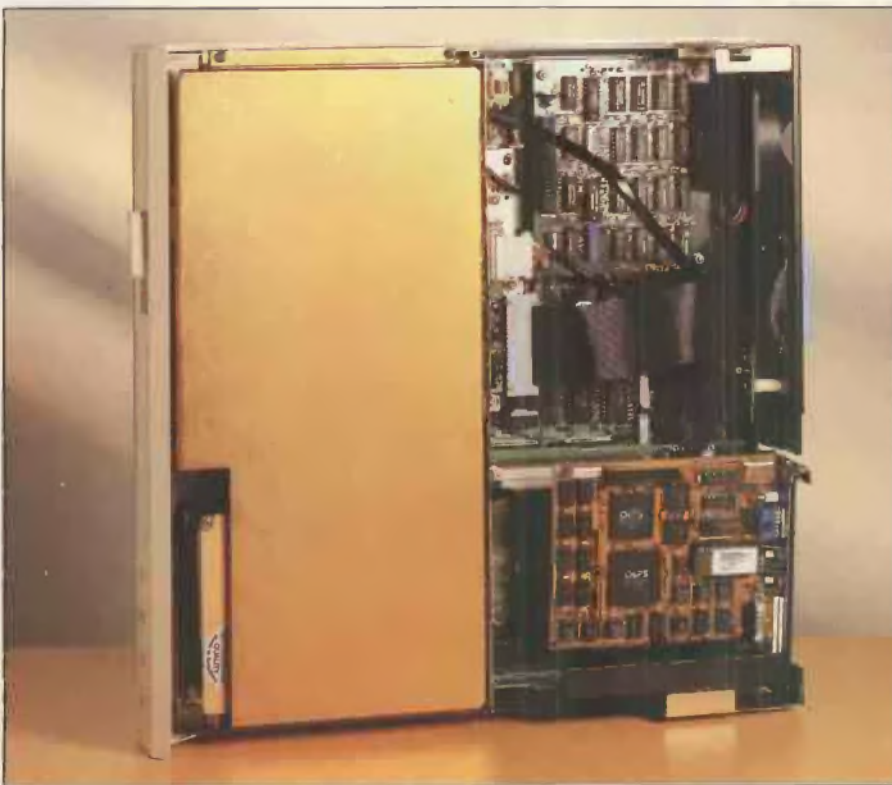
When PCW Benchtested the XEN (January 1986) I remember my colleagues being particularly worried about the flimsy quality of the casing. I am pleased to say that the casing is now very solid — no longer does the monitor wobble alarmingly when placed on top of the main system unit. This applies to both the XENi and the XEN.

The front panel houses a single 5.25in floppy disk drive, and because of the extra size of this, compared with the 3.5in drives on the XEN, it is not possible to have two internal floppy disk drives. A second external

drive is available which attaches to a port at the rear. To the right of the drive there are four LEDs labelled 'FD', 'HD', 'VOICE' and 'POWER' corresponding to floppy disk access, hard disk access, voice telephone call in progress and power. The hard disk lives just behind the front panel though it isn't visible from the outside.

The sides of the system unit are blank except for a small black reset button to the left. This performs a cold-reset, similar to switching the machine off and on but without danger to the hard disk. For the first four days of this review I was under the impression that the reset button didn't work, but all that is needed is to press it for a *sufficiently* long period. This is perhaps as well because there is some danger of this button being accidentally knocked.

The rear panel houses an on/off switch, a 15-way DC power socket, a parallel printer port, a 9-pin RS232 serial port, a 9-pin Apricot monitor port, a 9-pin IBM monochrome monitor port and the keyboard socket. To the left of the back panel there are six covers for expansion slots. Unfortunately these slots are for Apricot



The main PCB is large and occupies all the available floor space

XEN expansion cards which are inserted at 90 degrees to the IBM expansion cards that fit in the XENi. This means that to install just one IBM expansion card you have to remove all the covers. Incidentally while all the manufacturers are conforming to the 9-pin standard for RS232 serial, the PCW office has found it extremely difficult to find cables of this configuration for both modems and printers.

The top of the main system unit contains what looks like a useful hatch allowing you to add expansion cards without taking the top cover off. Unfortunately this suffers in the same way as the covers on the back; it's designed for Apricot expansion cards and is absolutely useless on the XENi. Getting inside is, however, extremely simple — you simply remove two screws at the rear and slide off the top cover and back panel.

The processor at the heart of the XENi is an 80286 (iAPX 286) running an impressive 10MHz. This is the fastest speed I've ever seen the 80286 driven at, and proves wrong the manufacturers who stated that it cannot be driven above 8MHz. For compatibility and timing critical programs the processor can be 'switched down' to run at both 8MHz and the old PC/AT speed of 6MHz. The Apricot XENi uses RAM with an access time of 120ns, which is faster than that on most PC/AT compatibles, so that the processor isn't held up waiting for RAM to get its act together. Even with this faster RAM it's necessary to introduce one wait-state



Two monitors are available for the XENi, a monochrome monitor and an EGA colour display — both are unusually large for their screen sizes

when running at 10MHz. On the base level XENi with a 20Mbytes hard disk the standard RAM is 1Mbyte; the 50Mbytes hard disk version comes with 2Mbytes of RAM. Internal RAM can be expanded to a maximum of 5Mbytes and an external expansion box can take the absolute maximum RAM to a hefty 11Mbytes. Thirty-two kbytes worth of ROM contains the BIOS, the boot-strap and the initial diagnostics.

The main PCB is large and occupies all of the available floor space within the system box. Normally most of this PCB is obscured by the floppy and hard disk drives, but I was fortunate enough to be shown a whole system board. The PCB is well-designed and tightly packed. A total of nine custom gate arrays are used to simulate functions that would normally require five additional cards on the PC/AT, namely Her-



The keyboard on the XEN shows the definite influence of IBM in its design



Once Bytten
31 BOWNESS ROAD
LONDON SE6 2DG
Phone Orders: 01-698 2911
(Callers by Appointment Only)

IT'S THE WAY WE SELL 'EM!

THAT MAKES ONCE BYTTEN DISCS THE BEST BUYS. TOP QUALITY FLOPPIES FROM TOP FLIGHT MANUFACTURERS. 100% ERROR FREE - LIFETIME GUARANTEE AND NO HIDDEN EXTRAS... WHAT YOU SEE IS WHAT YOU PAY.

5¼" SS/DD 96tpi (Suitable for all drives up to 80 tracks, single sided). All prices include envelopes - All discs have hub-rings. Price per disc

1+	10+	25+	50+	100+	500+	1000+
90p	80p	68p	65p	59p	55p	50p

5¼" DS/DD 96tpi (Suitable for all drives up to 80 tracks, single or double sided). All prices include envelopes - All discs have hub-rings. Price per disc

1+	10+	25+	50+	100+	500+	1000+
£1.05	95p	80p	76p	69p	65p	60p

3½" SS/DD (Suitable for all drives, single sided). Price per disc

1+	10+	25+	50+	100+	500+	1000+
£2.10	£1.85p	£1.72p	£1.67p	£1.62p	£1.55p	£1.50p

3½" OS/DD (Suitable for all drives, single or double sided). Price per disc

1+	10+	25+	50+	100+	500+	1000+
£2.75	£2.45	£2.35	£2.25	£2.10	£1.95	£1.85

DISC BOXES

5¼" 10 Capacity 1+ £1.50 10+ £1.25

5¼" 100 Capacity Locking 1+ £11.95 12+ £10.00

3½" 10 Capacity 1+ £1.50 10+ £1.25

EXTRA ENVELOPES 5¼"

10+ 9p 50+ 8p 100+ 7p 500+ 6p 1000+ 5p

LABELS

5¼" Label Sets (for 10 discs) inc. write-protects 1+ 35p 20+ 25p

3½" Label Sets (for 10 discs) 1+ 25p 20+ 20p

IMPORTANT NOTE:- Any order including 10 or more discs is POST FREE, otherwise please add £1.00.



**CHEQUES PAYABLE
 TO AMTEN LIMITED
 PLEASE**



Information Technology Centre



YOUR FIRST CHOICE FOR COMPUTER HARDWARE, SOFTWARE AND TRAINING

HARDWARE

PCW 8256/512



SOFTWARE

	£	ORR
SAGE		
Database	£69.99	£69.99
Accounts	£99.99	£79.99
Stock Invoicing	£69.99	£59.99
Popular account	£149.99	£129.99
AMSOFT		
Supercalc 2	£40.95	£44.95
Microfile/Microword	£48.95	£44.95
Newsword	£49.00	£44.95
CARTON		
Scratchpad 1	£69.99	£59.99
Cardbox	£69.99	£59.99
COMPROFT		
Delta	£99.00	£94.99

* MANY MORE TITLES AVAILABLE *

olivetti

DESCRIPTION

M24 BASE UNITS

single 360k diskette drive, 128k RAM

double 360k diskette drive, 128k RAM

10mb hard disk; 360k diskette drive,
 128k RAM

20Mb streaming tape, 640k RAM as standard,

360k diskette drive, bus converter

M24SP: 20Mb hard disk; 640k RAM, bus

converter, 360k diskette drive

CODE

£

(including VAT)

BU2451	937.75
BU2456	1039.37
BU2455	1637.48
BS12451(UK)	1960.75
BU2470	1854.36

DISPLAYS

Monochrome - amber

- white

- green

Colour

DSN2412A	150.72
DSN2412B	150.72
DSN2412V	150.72
DSN2412C	364.97

PRESTON ENTERPRISE CENTRE

SALTER STREET, OFF NORTH ROAD, PRESTON
 FOR MORE DETAILS, TELEPHONE
 PRESTON 0772 50747

Roundhill Computer Systems

Phoenix Development Tools

The new **PforCe** library from Phoenix is a multi-function library embracing windowing, pop-up menus, database, communications, user interface, DOS services, and many other utilities (all with full source). Excellent documentation and on-line help are included, at a price comparable to a library supporting just one of PforCe's function areas.

PDISK is a new disk-management utility which allows easy manipulation of complex DOS directory structures, and which includes an advanced backup and restore feature even faster than Fifth Generation's 'Fastback'.

We also stock all the other Phoenix software products, including the **Plink-86** overlay linkage editor, **Pfix-86 Plus** multi-window, symbolic, source-level debugger, and **Pfinish** execution profiler.

Lattice C Compilers / Utilities

With the release of the new version 3.10, the **Lattice C** compiler sets new standards for performance and facilities in the MS-DOS and PC-DOS environment. The library now has over 325 functions (described in a 500-page reference manual) providing compatibility with Xenix, Unix, and ANSI, and including support for DOS 3.1/3.2.

Roundhill supplies the **Lattice C** native compiler for the 8086/8087 family as well as 8086-based cross-compilers for Z80 and 68000. There are also Lattice cross-compilers for these targets running on VAX and UNIX host systems. We stock all the Lattice utilities, including screen editor, **C-Sprite** debugger, **dBC** file manager, and 'make' program. We also have many compatible libraries and tools from other vendors.

PANEL Screen Management

Roundhill's **PANEL** screen design aid, created and supported in the UK, is the leading screen manager running on a wide variety of operating systems, including DOS, Xenix, UNIX, iRMX, and Amiga.

Roundhill Computer Systems Limited
 Axholme, London Road,
 Marlborough, Wiltshire SN8 1LR

(0672) 54675

Please ask for our full catalogue.



BENCHTEST

cles monochrome graphics, disk drive controller, multi-function card with serial port, parallel port, a real-time clock and a mouse controller card. While the mouse controller card is perhaps a dubious claim, the PCB is certainly more powerful than any other PC/AT clone and has the economy of design to make it relatively cheap to produce.

Considering the density of chips I was pleasantly surprised to find the PCB did not get hot in use. In particular I was surprised to find the processor was not covered in the normal hefty heat-sink used on 80286 machines, and was left to be cooled by the small fan to the upper-right

'The processor is an 80286 (iAPX) running at an impressive 10MHz. This is the fastest speed I've ever seen the 80286 driven at, and proves wrong the manufacturers who stated that it cannot be driven above 8MHz.'

with the rest of the PCB.

The only other PCBs inside the machine were a piggy-back board adding an extra 512k of RAM to the 512k onboard, and a small 'kludge' board which I'm assured will shortly be replaced by a single chip.

There are three banks of jumpers on the PCB that will be of interest to users. The first, which is awkwardly located under the piggy-back RAM, enables and disables the onboard video, the serial port and the parallel port. Before installing an expansion card with any one of these functions it is necessary to disable its equivalent on the main PCB. The second jumper switches the video output between signals suitable for Apricot's 'paper white' monitor and a normal PC-type green screen monitor. The third set of jumpers set the processor speed between 6MHz, 8MHz and 10MHz. To be honest I would have much preferred all three of these jumpers to be replaced with software switches, or at least switches that don't require you to delve around inside the machine.

Expansion facilities, as I expected, are very limited. At the top right-hand corner of the board there is a removable 'cage' that can hold one IBM PC-type half-size expansion card

and two extended IBM PC/AT-type half-size expansion cards. This compares with the typically eight full-size expansion card slots on most AT clones. Even with half-cards I would recommend any cards you intend to use are tested in the machine before you buy them as it is a very tight fit, and certain cards that claim to be half-cards are too big. One of the expansion slots is occupied by an adaptor card that allows you to install the smaller Apricot-type expansion cards. Additional adaptors can be purchased from Apricot.

An external expansion box is available from Apricot which will take three PC or PC/AT-type cards and two Apricot cards. This is still less than the PC/AT, but is compensated for by the many built-in functions of the XENi.

To the front of the system unit there is a gold-coloured cowling that covers both a 5.25in switchable 360k/1.2Mbyte floppy disk drive and a 20Mbytes hard disk drive. Both these drives are of third-party manufacture; the hard disk is the same Panasonic Microscribe hard disk found on the XEN and is still the fastest hard disk installation I've come across. The 5.25in drive, however, is unusually slow. An external 5.25in 360k/1.2Mbyte drive is also available.

Three days into the review I was alarmed to boot-up the XENi and get an error-message to the effect that the hard-disk was corrupt. The next day was spent with an Apricot engineer who changed the hard disk three times and the main PCB once, all to no avail. Finally, the problem was narrowed down to a bug in the start-up ROM, which tries to boot off the hard disk before it has reached full-speed; pressing the reset button cures it. I was more than a little perturbed to hear that although Apricot knew of the problem and was in the process of correcting it, early XENis were shipped with this bug.

One novel feature of the XEN which is also available for the XENi is a telephone handset that attaches to the left-hand side of the keyboard. This is used with an internal auto-dial modem to provide a replacement for your desk telephone and can also be used for data communications. I've seen this working on the XEN but, unfortunately, the software was not quite ready for the XENi at the time of writing.

Two monitors are available for the XENi, a 'paper white' monochrome monitor, which for software purposes behaves like a Hercules display, and an EGA (Enhanced Graphics Adaptor) colour display. Both monitors are unusually large for their screen sizes. Ergonomically

both are nice to use because of an integral tilt-swivel mechanism and anti-glare coating on the screen. The EGA unit needs an expansion card to drive it, which though supplied by Apricot is, in fact, the Quadram half-height board. To my mind the EGA monitor at full brightness was still too dull, but others in the office disagreed and blamed it on me being too used to video game screens!

The keyboard connects to the rear of the system unit by a short coiled cable and a DIN plug. The short cable makes it impossible to place the keyboard anywhere but directly in front of the main system unit. Two legs at the rear of the keyboard tilt it at a suitable angle but, unfortunately,

'Expansion facilities are very limited. At the top right-hand corner of the board there is a removable 'cage' that can hold one IBM PC-type half-size expansion card and two extended IBM PC/AT-type half-size expansion cards.'

doing this lifts the keyboard in line with the 5.25in disk drive. Subsequently the only way to insert a floppy disk is to move the keyboard to the left of the system unit or risk bending the disk.

The F series from Apricot used an infra-red keyboard and on certain models had a voice control attachment. Both these features were almost universally disliked and happily both have been omitted on the XENi.

The keyboard consists of 102 keys arranged in five functional groups. The main qwerty section occupies most of the keyboard with editing keys to the right, and a numeric keypad to the far right.

Running along the top of the keyboard are the 10 function keys needed to be compatible with the PC/AT. I was particularly pleased to see that to the right of these, Apricot has continued to incorporate the six 'microscreen' function keys. Above these six keys there is a small LCD screen that can be programmed to show the function currently assigned to that key. Ever since its introduction on the Apricot PC I've always seen this as a very logical way of designing function keys. On the XENi the microscreen is also back-lit. Con-

SUCCESS CITY, APRICOTVILLE

(IBM, non-cricketers and clone owners read on for your two treats).

INFOSOFT AND OMRC

Throughout the civilized world, Apricot and Xen owners are crying out for support. INFOSOFT and OMRC have joined forces to provide the kind of service others can only marvel at.

Our brilliant, user-wonderful team of experts are dedicated to your hardware and software interests with many wonderful new products, free advice forever, money back guarantees, cheap disks and washing taken in on Mondays. Are we any different? Read on squire.

HARDWARE — RAM

We've got quite a name now for nice RAM cards. And it is a nice name too, Roger. Cheek! (A collect call will tell you what RAM is, or who Roger is or whatever you want to know about anything). We MAKE ram expansion for Xen i computers, for Xen computers, for all the Apricot computers. We make them as big as 2 megabytes or as wee as 128k. Marvellous? You just read it was.

Why do I need extra RAM for a Xen, we hear you howl. Well, with our freebie but truly marvellous RAMDRIVE software, you can make a ramdisk as big as 1 million bytes. And that's enough to win Mastermind. And it's all addressable by MSDOS. Pass? You'll regret it.

Running Xenix? You need more than 1mb of RAM for Xenix. Really. Particularly if you are into multi-tasking multi-users. Here are our very modest prices for our Xen i and Xen ramboards: for 2mb — £595, for 1.5mb — £495, for 1mb — £395, for 512kb — £290.

Our Apricot ram boards are an even better bet and super value £12kb — £160, 256kb — £120 and 128kb — £100. Worth buying for the software alone. And, unbelievably, we GIVE AWAY Microcosm's really super and mind-bogglingly clever memory management MICROCACHE and Quik screen accelerator with every board. This normally sells for nearly 225 quid. From us — FREE and worth every penny. (Cracks about this line on the back of a postage stamp please addressed to the Ministry of Information Technology).

But here's more good news. These widgets are MADE IN BRITAIN and guaranteed for 2 years. If they blow up (which they don't because we test them, then we test them again) not only do you NOT have to write to Taiwan but you can have your money back. Thrilled. You should be. Oh, and they're Apricot approved. Well, that's got to count for something.

MORE HARDWARE — Winchester

We do two kinds of hard disks for Apricots — those we put inside and those we put outside. The inside ones are 10 or 20mb. So are the outside ones. The outside ones go in a nice matching Apricot box with the added bonus that you get four or five extra slots as well. Enough to run extra RAM, the ACT modem, IEEE interfaces. Laws! Add-on 20mb winchesters are £895 and the 10mb ones are £825. Or you can just have the lovely expansion box. Or two boxes with extra packet tops. We know you can buy a container-load of IBM clones for this kind of money nowadays but if you need biggy upgrades for your Apricots you haven't a lot of choice. Sorry, master. We do the best we can.

Add-Ins are harder to price because we have to know if you want to sacrifice a floppy, or get a floppy upgraded to double-sided. And whether or not you want to boot off it. Or whether or not it will be embarrassing if we pick up your machine on Friday. You know. That sort of thing. So call us. PLEASE COLLECT. Some people don't take this sort of trouble. We do though. Try us first and last.

OTHER BITS

Got 1.6 boot roms in your portable or F. Want 3.1. We're the lads. Send only £29.95 and run everything you always wanted to. For another 25 quid we throw in Infoattack too. Feast your eyes below, or sideways. I don't know what this ad is going to look like.

SOFTWARE — Split

First in our all star line up, Split, a very very wonderful program which splits up your Winchester into lots of separate drives. (Ever had a Z: drive before?) What for, you cry? Well, it's jolly useful for one. Eliminates the need for sub-directories; does away with duplication of overlay files; saves backing up time; works with networks too. You can pack a whole lot more onto a Split winchester than you can otherwise. We can show fantastic savings of up to 6mb on a 20mb drive. Chaps say you can unprotect 123 with it. You can create multi-dos partitions without having to reformat the hard disk and dynamically expand them without loss of data. YOU get to choose the size of each drive.

You'll wonder how you ever managed before. Hype, hype. Better than Fairy Liquid and only £49.95. Do you realise that works out at about 2 quid a drive. Incredible. And they say we Brits are dead. Ha, we say, and Fi too. Thousand of happy customers. Millions of letters of testimonial still to be written. The chaps at Apricot File were SO THRILLED with this they made it one of their Deals for Readers after prolonged negotiation in the canal with a bottle of Jamieson's.

IBM owners: OK. We give in. You can have it too. If you've got DOS 2 or more and a winchester give us a call.

Transend

And now, before your very eyes, we launch Transend. Not just another comms program. A CHEAP comms program and one which is VERY CLEVER indeed. Like it will as happily talk to an IBM as it will to a Victor, or a Sirius or a clone or an Apricot. And it is superbly good at talking to MODEMS too. Email your salesman. Search Prestel. You can put hundreds and hundreds of phone numbers into it. You can control your secretary's computer from your own. Your secretary can read the letters on YOUR computer. Gosh.

You can find out the price of jello in San Francisco. Or the latest price for the yen. Or why Norman Tebbutt's hair is falling out. Transend rises above all the other unfriendly decrepit and over-priced comms packages. Full error checking. Understands DOS. FULL ON LINE SUPPORT FOREVER. CRAFTY PATCHES WRITTEN FREE. And by the time we've paid for this ad, we'll have Xmodem capability for the ACT internal modem too. Already it handles xmodem transfers with external modems. £49.95 for one disk; £64.95 for two, £79.95 for three and £14.95 for the piece of wire if you need it. You've got to tell us what computers you

want to hook up, you see. Mind readers, we're not. Compare our prices.

Don't understand any of this. Have no fear, we will explain all. Telephone us. Or even modem us. FREE. IDs etc. should appear somewhere on this page.

ProtektA

This is a vastly ingenious software protection package. Slaved for two thousand man years to make a program? Don't want it given away up the Portobello Road. Defy the pirates on Kowloon side. You need this one. But a, we're running out of space and b. only REAL PROGRAMMERS understand this one. So you've got to call. We get to pay for the call though and you will be astonished and amazed, distracted and thrilled.

Infoattack

Then there's this wonderful game for people who like to play with themselves at lunchtime. Horrid alien space craft, ghastly monsters. Music, drama. Eat your heart out, Bard. Only £29.95. Hours of fun for the Financial Director. Confuses the VAT man. Keeps the kids amused. Wizard for Apricot F1e, F1, F10 and Xen with colour monitor. The best game since sliced mutants.

HearsaY

Did you know you needed a professional level bulletin board? No office is complete without one. Get ahead of Lotus, ICI, Shell and General Motors. One of the many essential widgets not sold by Inmac. We set it up for you, or you can set it up for yourself. This is a BIG program and much too big to explain here. Starts at £195. Buy a copy now and get the D plates.

Scanners

You're nearly at the end. Congratulations. Your time wasn't wasted. Because now we tell you and the whole world about Scanners. What is it? The biggest collection of REALLY SUPER-GALACTIC FANTABULOUS utilities ever assembled on a single disk. All the old favourites written up at least once a week that you can't get anywhere. Well we've got them. And lots of new ones too.

There are over 100 files on this packed disk (not a byte wasted) doing things as elementary as telling you the time "It's nearly a quarter to three"; to showing you everything you always wanted to know about your sub-directories; to SWEEPING things out of sight; to Displaying files backwards; to speeding up your screen no end; to making a disk Library. Oh, it's wonderful and EVERYTHING WORKS. A big seller with health authorities — we haven't a clue why. ALL the things that should be in MSDOS and aren't. Call for more hyperbole. FREE. Scanners is only £39.95 — this works out at about half a pint a file.

Small print: P&P is about two quid; vat extra. Sorry. Dealers can call too, so can the Ministry of Defence. Lots off for huge orders.

Here's who to call:

collect — Simon: 0905 772773 or David: 0428 735255 Stephen: 0705 524805 (with a modem) or via Telecom Gold: 72:EPS007; or Easylink: 19014880; or Prestel: 4410692245; or Telex: 335540; or steam mail to INFOSOFT, FREEPOST, 17 Queen Street, DROITWICH WR9 7BR or even OMRC, FREEPOST, HINDHEAD, GU26 6BR. PS: Try us for your other software too. Or your next computer. We get money off...



BENCHTEST

sidering the size of the screen, back-lighting is unnecessary, but it does give a futuristic blue glow to the keyboard when used in a dark room.

The keyboard on the XENi shows the definite influence of IBM in its design. The XENi as you would expect is a total attempt to create a compatible PC/AT keyboard. In use the XENi arrangement works well and is reminiscent of the Keytronic arrangement found on many PC/AT clones. After using an IBM PC I particularly liked the independent cursor keys. The Num Lock, Scroll Lock and Caps Lock have built-in red LEDs which light when selected. One thing lets the keyboard down; placing the Esc key in the middle of the top row of keys on the numeric keypad is ludicrous.

I'm going to stop criticising the keyboards of micros as it nearly always boils down to a matter of personal preference. However, the XENi keyboard has a very light 'switchy' sort of feel to it. The J and F keys have little nodules on them to aid touch-typists.

Considering so much mouse-driven software is bundled with the XENi I was disappointed to discover that no mouse is included with the system. If you want an Apricot mouse it is available from Apricot at a similarly excessive price to that of other manufacturers' mice. This is possibly a blessing in disguise as the Apricot mouse is the worst mouse I have ever used anyway.

The problem is that Apricot has tried to combine the functions of a mouse with the functions of a trackball. To use it as a mouse you have to tip the unit up which makes it awkward and cumbersome to use. As a trackball it is far too small and sensitive. Rather than an Apricot mouse I'd recommend a Microsoft mouse which is far nicer to use and works with a greater range of software.

System software

In order to be compatible with the IBM PC/AT the XENi needs to run a version of the Microsoft operating system MS-DOS. The XENi is supplied with MS-DOS version 3.2 which is the standard 80286 version of the operating system as supplied with the PC/AT. While there is doubt that this is the logical choice for compatibility, it is often forgotten that this is really quite a disappointing version of MS-DOS. Although written especially for the 80286, MS-DOS 3.2 fails to take advantage of the more powerful processor commands or the extended RAM available on 286 machines. MS-DOS 4.0 will soon be available, although that version looks

no better.

MS-DOS 3.2 alone is not sufficient to ensure PC/AT compatibility. It is also necessary to produce a ROM that contains a functionally identical BIOS (Basic Input/Output System) as the PC/AT. Sensibly Apricot has not designed this ROM itself, but like so many others the company went to ROM BIOS experts Phoenix Software Inc. I used to be a little disappointed to see the Phoenix ROM BIOS message when booting up a machine, as it suggested that the manufacturer had insufficient

'The Apricot XENi isn't aimed at the cheap end of the market; it's a front-line competitor in the corporate market and as such is up against IBM and the rest.'

facilities to produce one itself. Now a Phoenix copyright message just reassures me as to compatibility.

The combination of MS-DOS and IBM's ROM BIOS limits addressable RAM on a PC compatible to 640k. I'm sure at the time of the IBM PC's design that this was considered more than adequate, but five years on it's a limit more and more users are coming up against. Chip designer Intel has designed a memory-management system for the PC and its clones to get over this 640k limit called 'Above Board'. The XENi includes this system of memory management as standard, so any application that uses 'Above Board' will use all the RAM available on the XENi. Alternatively there is a utility that lets the extra RAM be used as a RAM disk.

Apricot was one of the first manufacturers to take seriously the friendly windowing environments that attempted to make MS-DOS easier to

use. Rather than make a choice between the two major contenders, GEM from Digital Research and Windows from Microsoft, Apricot decided to offer GEM with low-end machines and Windows with high-end machines.

This seemed to me to be a very sensible decision. GEM is the more friendly of the two with greater use of graphics but offers no extra facilities to DOS. Windows is less friendly but has one overriding advantage — multi-tasking. This is the ability to run more than one program at the same time, which is no small achievement when you consider it is sitting on top of a stubbornly single-tasking operating system.

On less powerful machines such as the IBM PC, the ability to run more than one program at a time is no great advantage: the 8088 has enough trouble running one program at a time — let alone two or three. But on a powerful machine such as the XENi, multi-tasking becomes an extremely useful ability.

With the demise of Apricot's lower-end machines I expected Apricot to ditch GEM; not so — the XENi is shipped with both Windows and GEM. It is obvious that Apricot's hopes lie with Windows, but it's still nice to have GEM, as no clear winner of the windowing battle has yet emerged.

Microsoft has collaborated with Apricot and re-written parts of Windows to take advantage of the XENi 10MHz 80286 and the fast hard disk. The XENi implementation is the fastest I've ever seen, capable of running five processor-intensive tasks with no noticeable degradation in performance. Both Windows and GEM are capable of displaying more information than with an ordinary CGA (colour graphics adaptor) because of the higher resolution of Hercules and EGA.

Xenix, Microsoft's version of the Bell Labs' Unix operating system, is available for the XENi. The XENi implementation has been carried out by Logica and my brief look at it suggests that the company has done an excellent job. Xenix makes the XENi truly multi-user, multi-tasking, and takes advantage of the processor modes and RAM capabilities which can't at the moment be accessed by MS-DOS.

Xenix is not without its disadvantages however, as the conversion to Xenix requires a different disk organisation which means that your XENi will not be able to run MS-DOS at all. Also, while Xenix is no doubt powerful, its user interface is even more convoluted than MS-DOS and to my mind desperately needs a friendly front-end.

Benchmarks

BM1:	0.26
BM2	1.04
BM3	2.46
BM4	2.48
BM5	2.71
BM6	4.80
BM7	6.24
BM8	7.63
Average	3.45

All timings in seconds. For a full listing of the Benchmark programs, see page 185, January 1985 issue.



THEY'RE BOTH ANALYTICAL AND CALCULATING, BUT THE ONE ON THE LEFT COULD DO MORE FOR SMALL BUSINESSMEN THAN THE ONE ON THE RIGHT.

The Government may be committed to foster the long-term growth of Britain's small businesses.

But, in the short term, a Victor computer could do a lot more. VAT, invoicing, accounts, payroll, planning and typing to name but six.

You see, Victor computers are designed to help you run your business and free you to get on with expanding it.

Victor computers are IBM* compatible, to run any of the 2000 or more programs available. So you can choose precisely the

software best suited to what you want.

And Victor prices start at a soothing £1,199 all-in, not an overdraft-inducing £3,899.

So, the choice as to how to improve your business is yours.

The Victor PC. Or the PM.

For your nearest Victor dealer, call 01-200 0200 or send us the coupon.

VICTOR

Unit 1, The Valley Centre, High Wycombe, Bucks HP13 6EQ. Tel: 0494 450661.

P9-86

NAME

POSITION

COMPANY

TEL NO

ADDRESS

POSTCODE

WHEN TIME IS MONEY, WE'LL SAVE YOU BOTH



BENCHTEST

Applications software

The XENi is supplied with a range of applications written by Microsoft, to take advantage of the Windows environment. The full list is: Write, Paint, Terminal, Cardfile, Calendar, Notepad, Calc, Clock and Clipboard. It's a sad fact that these applications have never received the recognition they deserve, just because they are only available bundled with the Windows system. As they are written for Windows, all the applications are integrated in the same way as those on the Mac: you can copy a picture from Paint into the clipboard and then paste it into a Write document.

The most impressive of the bunch is Write, a graphical word processor which owes a lot of its design to Mac-Write. Text can be displayed in a number of fonts and point sizes, and pictures can be integrated into any document. All the usual word processor facilities are available from pull-down menus at the top of the screen. There is support for a wide range of printers and all printing is spooled off as a background task so

you can continue to use the system.

Being IBM compatible opens the greatest range of application programs ever available for a single architecture — provided, of course, that the machine is truly compatible. I tried many programs designed for the IBM PC, among them: Lotus 1-2-3, which ran and recognised the 'Above Board' memory; dBaseIII; WordStar 2000; PC Write and Symphony. In a determined effort to make the system crash I tried a number of commercial and public domain games. Microsoft's Flight Simulator crashed, as did two of the public domain games. Overall, though, the XENi rates very highly in the compatibility stakes.

A new version of Microsoft's GWBasic is included with the XENi. Version 3.2 offers Network facilities; improved I/O facilities; directory management; line clipping; windowing; event trapping; keyboard trapping; double precision transcendental and memory allocation. This all looks very good but I was more than a little disappointed to see that available memory for a program is still

limited to 60332 bytes.

In theory the entire range of Unix applications is available for a XENi running Xenix. Most of them, however, still require compiling onto an 80286 system and then transferring onto a suitable disk format for the XENi. My own experience of Unix applications suggests that the majority of them need a better user interface before they will make any significant impact on the business micro scene.

Documentation

The documentation with XENi consists of two ring-bound manuals. The first includes setting-up, system information and a description of GWBasic. The second manual is devoted to a description of Windows. Both manuals are very good, although it took me some effort to find this out as the indexes are ridiculously sparse. I was pleased to see sections introducing the most popular applications.

Prices

Two models of the XENi are available: the XENi HD with 1Mbyte of RAM and a 20Mbytes hard disk retails for £3499, while the XENi XD with 2Mbytes of RAM and a 50-Mbytes Winchester retails for £4449. Unless you already have an IBM-compatible monochrome monitor you will also need to purchase one of these. The Apricot Hercules compatible paper white monitor is £299 and the Apricot EGA colour monitor with adaptor card costs £1098.

Peripherals and expansions are priced as follows: 1Mbyte RAM £599; 80287 maths co-processor £299; XEN-Tel telephone and software £149; modem card for XEN-Tel £249; mouse £249; and IBM card compatible expansion box £199.

Conclusion

The Apricot XENi is a fast PC/AT clone in an extremely compact and good-looking box. However, by limiting expansion facilities and putting the equivalent of five IBM expansion cards on the motherboard, Apricot has, to my mind, slightly reduced the overall appeal of the machine.

The XENi is good value for money, if your requirements are for a fast PC/AT system with 'Above Board' memory management and Hercules monochrome graphics; otherwise it's a lot to pay for good looks and a little extra speed.

Stop press: At the time of going to press, Apricot informed me that the hard disk problem referred to in the 'Hardware' section of this review was caused by the company's incorrect formatting of the hard disk, not by a bug in the ROM.

END

In perspective

By turning the XENi into an all-out IBM PC/AT compatible, Apricot has joined a highly competitive market. If price is of paramount importance there are many Taiwanese and American clones which are considerably cheaper. Be careful, however, as many of these machines are of dubious quality and have limited support. My current favourite at the top end of the 'cheapies' is, surprisingly enough, British — the Victor 286, which works well, seems well-made but looks awful.

The Apricot XENi isn't aimed at the cheap end of the market; it's a front-line competitor in the corporate market and as such up against IBM, Hewlett-Packard, Compaq and the rest. I'd strongly recommend that a prospective XENi purchaser take a look at the Hewlett-Packard Vectra. The Vectra is built to an exceptional quality — it's fast, compact and has better expansion capability.

I can't see any reason to buy the XENi as a Xenix machine, since you would be paying for too much dedicated MS-DOS hardware. The Xenix option is best treated as a way of upgrading if you want to expand to a true multi-user system. The straight XENi would be a better buy if you want Xenix from the outset.

Technical specifications

Processor:	80286 running at 10MHz, hardware switchable to 8MHz and 6MHz
ROM:	32k
RAM:	1Mbyte
I/O:	Parallel printer, 9-pin serial port, external disk drive, Apricot monitor output, monochrome monitor output, keyboard and power sockets, three half-card IBM expansion slots
Keyboard:	102 keys including six microscreen keys
Display:	Optional white screen Hercules compatible or EGA colour
Mass storage:	20Mbytes hard disk and one 360/1.2Mbyte 5.25in floppy
Operating system:	MS-DOS 3.2 with Windows and GEM or Xenix
Bundled software:	Windows applications: Write, Paint, Terminal, Cardfile, Notepad, Calc, Clock and Clipboard

WE WON THE BRITISH TELECOM BUYLINES CONTRACT BY INCHES.

British Telecom is one of Europe's largest users of computer systems. A position that leaves them well equipped to judge floppy disks.

The decision for British Telecom BuyLines to become a Maxell main distributor and sell Maxell's discs alongside their own in the new British Telecom BuyLines Consumables and Accessories Catalogue was influenced in part by the fact that we make the widest range.

Every application and computer in the UK is matched by one of our disks. All of which British Telecom's BuyLines will be selling.

However, it wasn't just our width that impressed them. Our quality was also felt to be superior.

Not only do we exceed international standards but we also create new technology standards. It's part and parcel of the reason why we can guarantee our floppy disks forever.

As a benchmark of our quality many drive manufacturers use Maxell disks in their final tests of new equipment.

If something goes wrong they know it's the drive that's at fault, not the disk.

Other facts that helped to clinch the deal were our competitive prices and our UK factory which ensures both delivery and flexibility of stock.

We convinced British Telecom BuyLines that we were miles ahead of the competition.

Hopefully, it's a view that you now share.

maxell

THE NAME OTHER NAMES RELY ON.

FOR MORE INFORMATION ABOUT MAXELL PRODUCTS AND A FULL LIST OF DISTRIBUTORS TELEPHONE 0923 777171. TO ORDER MAXELL FLOPPY DISKS, OR FOR MORE INFORMATION ON THE FULL RANGE OF BRITISH TELECOM BUYLINES COMPUTER AND WORD PROCESSOR CONSUMABLES AND ACCESSORIES PHONE (NORTH) 021 236 6616. (SOUTH) 01 281 4427. FAX: 01 263 9568. TELEX: 263489 OR WRITE TO SALES OFFICE, BT BUYLINES, 10-18 MANOR GARDENS, LONDON N7 6JY

maxell is a trade mark of British Telecommunications plc



8"



5 1/4"



3 1/2"



3"



All Card

One of the frustrations of using the IBM PC is insufficient RAM. All Computers has set out to rectify this shortcoming with its innovative, plug-in RAM board. Peter Jackson evaluates whether the AllCard is all things to all PC users.

Amid the rash of competing 'standards' for extending the IBM PC's available memory space beyond 640k, Canadian company All Computers stands out. Its AllCard plug-in board doesn't conform to the Lotus/Intel/Microsoft specification, the AST/Digital Research/Ashton-Tate standard, or IBM's own XMA design; it can handle all of them, and is also built to cope with other new 'standards' as they emerge. It can provide up to five megabytes of RAM in one PC slot, or 10 megabytes in two slots, it can make more space available to PC-DOS without bank switching, and it can relocate RAM-resident packages like SideKick, Ready! and

Turbo Lightning above the megabyte line.

Oh, and it also throws in a serial port and a real-time clock/calendar. No one could accuse AllCard designer Mers Kutt of thinking small!

But the AllCard, Intel's Above Board, AST's RAMpage, Quadram's Liberty 2, and other such products only exist because IBM did think small. When the PC first emerged it had 16k RAM expandable to 64k and a cassette interface, and IBM had specified its memory map on the assumption that 10 x 64k — 640k — would be more than enough for all conceivable future uses of the machine. The remaining 384k of the

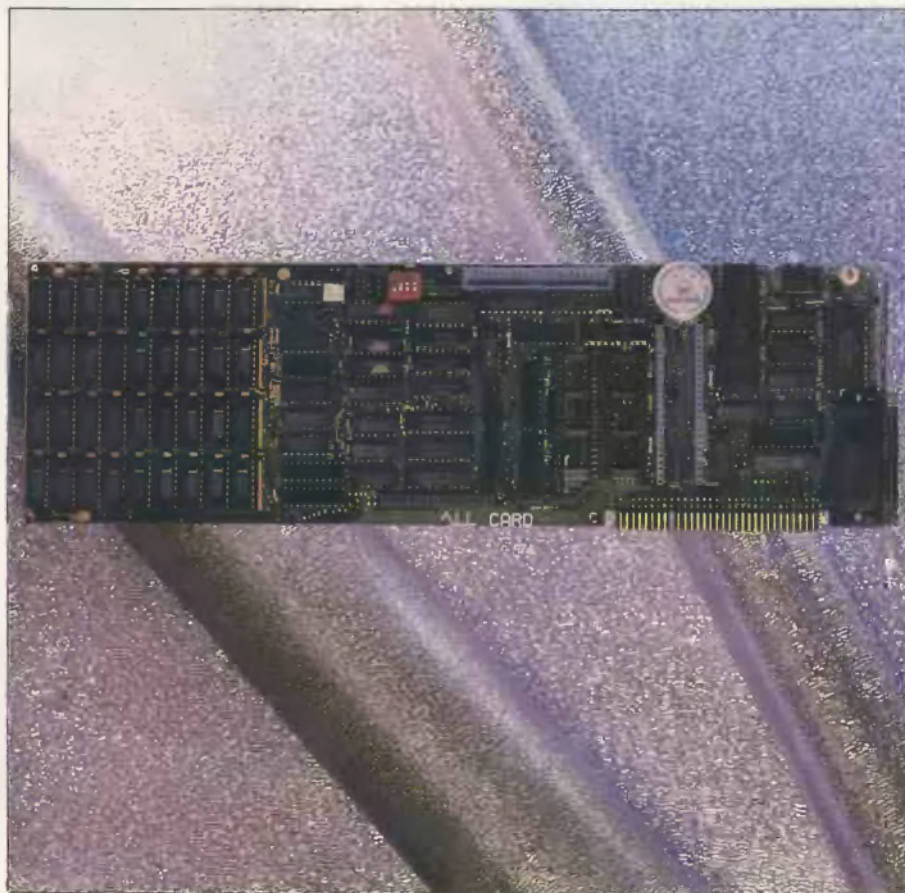
8088 processor's 1Mbyte of directly-addressable memory is reserved for system use, and contains things such as the ROM BIOS, the hard disk option ROM, and — most important of all — the video RAM.

But whatever IBM intended to put into that reserved space has never emerged, and in fact the majority of that 384k is empty and wasted on the PC.

Then last year Lotus, under pressure from the regiments of big-company 'power users' using 1-2-3 and Symphony to build enormous corporate spreadsheets, joined chip-maker Intel to produce a joint hardware and software specification to bypass the 640k limit. Microsoft joined in later, and the standard is now called the Lotus/Intel/Microsoft Expanded Memory System, or EMS. A competing standard, the Extended Expanded Memory System (EEMS), soon came out from AST, Digital Research, and Ashton-Tate, with the claim that it was a superset of EMS.

Both these specifications use bank switching to get round the 640k block, taking advantage of the 'holes' in the 8088's addressing space above 640k but below 1Mbyte. When a big RAM board is installed, PC-DOS driver software switches lumps of data from the RAM above the 1Mbyte mark into spare 'windows' between 640k and 1Mbyte. With EMS, for example, up to four 16k banks of data can be switched into separate 16k windows in the 8088's physical address space above 640k; the 8088 can access this data directly, even if it has come from a bank of RAM up at the 2Mbytes level.

With bank switching, though, there is no guarantee that the 16k page of data you want will be present in a window at the time you want it, which can slow down access to data stored in RAM above 1Mbyte. Also, the applications running on a system with EMS still have to run in less



than 640k and also store their integer variables below the 640k level, which can cause memory-full errors even when there is a megabyte or more spare on the expanded-memory board.

The AllCard takes a different approach. It sets out to give full memory management facilities to the PC, the same kind of memory management used in bigger computers like DEC's PDP-11 and VAX-11, allowing faster bank switching that is transparent to the user and the application software. We'll see how that works in practice later.

Installation

It is obvious on unpacking the board that the AllCard is different, although the banks of 256k RAM chips are familiar, as are the real-time clock with its battery and the serial port circuitry. But a big blue ribbon cable ending in a 40-pin dual-in-line plug comes out of the top edge of the board, and a piggy-back board at the connector end, next to two empty 40-pin sockets, holds the 48-pin custom CMOS memory management unit (MMU).

This design is explained by the way the MMU works; it has to intercept the 8088's memory addressing, and so needs to sit between the processor and its RAM. Installing the AllCard involves unplugging the 8088 on the PC's motherboard, plugging that chip (and the associated 8087 if fitted) into the AllCard's sockets, and then plugging the cable into the 8088 socket on the motherboard.

Once this is done, the MMU can intercept any 20-bit address put out by the 8088 and convert it into a 24-bit address where the top four bits are used to determine which area of memory is being addressed. Using an internal mapping table, any 4k of the 8088's logical address space — the 1Mbyte the processor can directly address — can be connected to any 4k of real memory in the 10Mbyte expanded RAM space controlled by the MMU.

Because of this mapping, the AllCard can also re-arrange the PC's memory layout below 1Mbyte. The video RAM, ROM BIOS, and the other bits of storage actually used in the top 384k of the PC's memory can be switched up to the very top of the memory map; in fact, the MMU can switch all the necessary addresses up to the top 72k of RAM, freeing a total 952k of RAM for applications under PC-DOS. Any application on the PC can use this 952k as long as it goes through the BIOS to write to video RAM, and is otherwise well-behaved. Unfortunately, various popular applications — notably Lotus 1-2-3 — write directly into video RAM for speed, and need modification before they will work with the MMU's revised 952k layout.

All Computers has seen this one coming, and has provided a set of simple patches for such ill-behaved programs. The AllPrep utility disk supplied with the board contains patches for 31 packages, including 1-2-3, Autocad, GEM, dBaseIII, Framework, Multimate and WordPerfect, complete with a menu-driven front end that actually performs the patching. The number of patches is increased periodically, depending on demand, and All Computers claims that it will modify your applications to run in the 952k PC-DOS environment — and add the patch to AllPrep — for free.

The other disk supplied with the board includes the driver and management software for the MMU system, and also has a pre-installation program to help the user configure the board before actually plugging it into a PC slot. The install program, now a common feature with PC expansion boards, displays the board graphically on the screen and describes its component parts, before asking questions about the particular machine's configuration and then graphically demonstrating how the jumpers and DIP switches on the board should be set.

After that, the only tricky part about installing the board is the switching of the 8088, and on the review board even this was simplified.

The rest of the installation is simply done by plugging the AllCard's cable into the newly-empty processor socket, and plugging the card into a spare expansion slot. The only problem is making sure the cable goes into the socket the right way round, but All Computer's documentation is thorough on this point. Then booting up the machine makes sure that the processor connection is working, and until the software configuration is done there is no sign that your PC has been expanded at all.

System software

The configuration software, All/MOS, is provided on a separate disk and comes in various sections. ALLMOS.SYS is the overall memory management driver; ALLDISK.SYS is a variable-size RAMdisk driver, defaulting to 360k; ALLEMM.SYS is a driver to handle the various expanded/extended memory specifications; and MLDRIIVER.SYS gives extended memory support for the MultiLink software network system also distributed in the UK by ICCT. These are the low-level packages that do the donkey work, and the rest of the software provided is made up of utilities to help installation, set the DOS memory size, set the clock and calendar, and examine the contents and usage of the entire extended memory map.

One of these utilities, ALLSIZE.EXE is the program that lets the user

push the top of PC-DOS user memory up above 640k. For any software at all, this line can be pushed up to 704k — the start of video RAM — and for well-behaved software, as we have seen, the line can be pushed up to a maximum of 952k. In fact, ALLSIZE will check how far up the line can go, and give you the maximum DOS user area.

All the drivers need to be installed in a CONFIG.SYS file, which is called at boot time by the PC. This is done using PC-DOS' DEVICE function; and once the drivers are installed, and the machine rebooted, the ALLMOS driver takes command to check the extended memory, configure the RAMdisk to the desired size (if required), and set the bank-switching window addresses for the expanded memory specification support. After that, using ALLSIZE sets the PC-DOS user space and you can carry on with using the system.

It is odd to use CHKDSK on the PC and see that 952k — or 888k with the 64k expanded memory window set — is available in RAM without the user having to do any more than boot the machine up. The RAMdisk is also transparent after boot time; it simply takes the drive letter after the last one you already have installed. For example, on my twin-floppy system, the RAMdisk was drive C.

Expansion

Further expansion is planned for the AllCard, including an 80286 version for the AT or AT-compatibles. But, unfortunately, various options for the board are not yet available in the UK. These include a piggy-back board holding another 4Mbytes of RAM, using the new 1Mbyte chips and allowing 5Mbytes to be fitted in a single slot; a daughter board that goes in an adjoining slot, and gives another 5Mbytes of RAM; and another board containing battery-backup circuitry. Using this last, the extended RAM contents can be protected against PC power failure.

Price

With 1Mbyte of RAM fitted, the AllCard with MMU costs exactly £1000 plus VAT.

Conclusion

There is no doubt that this type of product, with non-volatile multi-megabyte RAM spaces, could give smaller Winchesters a run for their money. They are faster, more reliable, and generally easier to handle. And AllCard's MMU technology means that the company can keep up with new developments in software as they occur, by updating the All/MOS driver software.

More information from: ICCT, Prince Rupert House, 64 Queen Street, London EC4R 1AD.

END



SCREENTEST

Microsoft Word 3

Microsoft's Word 3 is a hefty upgrade of an old favourite, but does its complexity compensate for the shortcomings of its predecessor?

Benjamin Woolley seeks satisfaction.

The launch of a new version of an old favourite always brings with it a mix of excitement and regret, pleasant surprises and disappointed expectations. While using a package over a period of months or years, most users compile a wish-list, a set of deep-felt desires that they hope the next version will fulfill. In the case of Word version 2, my wish-list was long. I wanted a built-in word counter, some form of outlining, proper windowing, a spelling-checker that could be used while editing, better print spooling ... A thesaurus would have been nice as well.

Needless to say, with the release of Word 3, my wish-list has lengthened rather than shortened. However, real improvements have been made; there's no doubt that what has sprung from the loins of Word 2 is a better product.

New features

When Word 2 was launched, it was a significant departure from the world of WordStar. WordStar used the not altogether satisfactory principle that blocks of text were identified and edited using markers. So, to underscore or delete a block, you had to put a special marker at its beginning and another special marker at its end. Also, once a block was deleted, that was that; there was no way of retrieving it. The main problem with this approach was its messiness; you spent your time fiddling with silly markers rather than fiddling with the text itself.

Word offers a much more sensible strategy — a kind of paint and pick system. You select the text you want to work on (using a mouse, if installed), which is highlighted in reverse video, and then make whatever changes you want to make. Furth-

ermore, selected text can be copied or deleted to an area of memory called the 'scrap', from where it can be brought back into the document, either at its original position or elsewhere. Using the 'glossary' facility it can even be given a name, and recalled later by typing in the name and pressing one of the function keys.

Word also has a much cleaner formatting system. Document formats can be stored separately from the documents themselves in a 'style' sheet, so, if you want to change a document's format, you simply attach it to a different style sheet. These types of facilities make the package exceptionally powerful and easy to use. From the start, Word looked like a winner.

One feature that's common to almost every new software release is the escalation in the number of disks and the size of the manuals. Word 3 comes on no fewer than six disks (four for Word itself, plus two for the tutorial) and three manuals (for usage, reference and printer installation).

Installation

Installation is a doddle, requiring only that you slide in the utilities disk, type 'set-up', answer a few prompts, and leave the rest to the software, which makes working copies of the appropriate files on another set of floppies or on the hard disk.

Thankfully, there's no copy protection — indeed, Microsoft hasn't even bothered to cover the write-protect notches on the master disks. This decision is to be applauded, not because it encourages piracy, but because it means users can organise their disks in a way that suits them rather than Microsoft.

In use

Word 3 is a superset of version 2, rather than a major rewrite. It uses the same screen design, the same system for selecting text, and the same Microsoft-style menu (two lines of options displayed at the bottom of the screen). It also runs at about the same speed which, on an AT clone like the Victor V286 used for this test, is good, with the screen scrolling at a smartish pace and operations like search/replace taking no more than a few seconds.

Most welcome is the outlining facility. Version 2.01 of Word came with an outline processor called Ready! bundled (reviewed in PCW, May 1986), but it wasn't an integral part of the program. Now, an outline facility has been built-in.

Outlining, for those yet to encounter it, is designed to help compile notes, structured hierarchically into headings and sub-headings. Each heading has a 'level' associated with it, and the levels are shown using indents. The main heading is at the first level, a sub-heading at the second (indented once), a sub-sub-heading at the third (indented twice), and so on. Levels can be hidden, so you can see the broad outline without being distracted by the detail. For example, by pressing the minus key on the numerical pad, you can 'collapse' a heading's sub-headings, so only the main heading is displayed. You can 'expand' an entire outline, so all headings are shown, by pressing the '*' key.

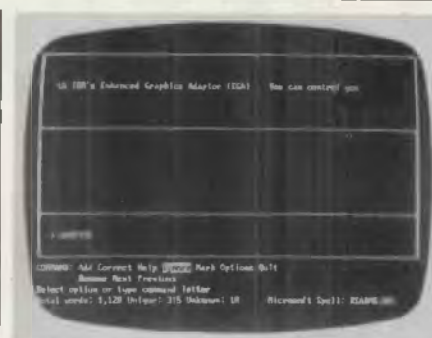
Thus far, Word 3's own outlining facility is the same as outline processors like Ready! and ThinkTank. However, being built into the word processor, it ceases to be something separate from the document being



The interactive Word tutorial



Multiple windows on a document



The spelling checker in action

edited. Instead of invoking the outline processor as you would any other program, you switch to an outline 'view', simply by pressing a function key. When this is done, Word attempts to turn the document being edited into an outline. How well it does this depends on the document's format. If it's a normal text format, the outline is simply a set of paragraphs marked as blocks of text (rather than headings). However, you can attach a style sheet that is able to distinguish a heading's level. To explain this, we need to divert to Word's formatting for a moment.

As with Word 2, one of the commands available from the menu is called 'Gallery'. By executing it, the screen is switched to a display that shows the format parameters of the style sheet attached to the document (assuming one has been attached). Each parameter is for a paragraph or 'division'. Paragraph formats concern a paragraph's typeface, positioning (whether it's aligned to the right or left column, centred, or justified) and line-spacing. Calling it a 'paragraph' format is a bit of a misnomer, as the format can apply to a whole document. It's called that to distinguish it from the parameters set by the 'division' format, which concerns page dimensions.

You can have a number of different paragraph and division formats in one style sheet, each identified by a 'variant number', a two-letter code which is used to invoke the format while editing, and a remark to remind the user of the format's use. The user chooses all three. The two-letter code is whatever you want it to be (perhaps 'CE' for a centred paragraph), but the variant is chosen from a list. When you have chosen the variant number, you then set the format parameters that will be associated with it. Some variant numbers, however, include preset parameters; these are for formats that will be used in contents and index lists (see below) and outlines.

By selecting a preset outline variant when compiling the paragraph formats in a style sheet, you can then give a paragraph an outline level while editing it. When you

switch to outline view, it will be indented accordingly. If this sounds horribly complicated, it is. One of the weaknesses of Word, versions 2 and 3, is that some of its more advanced facilities, especially the style sheets, demand a period of committed study. Some of this complexity is only to be expected in such a sophisticated package, but some, particularly the variant numbers, is needlessly confusing and could have been simplified. That's one item on the wish-list that remains.

This complexity unfortunately extends to the outline facility. Once the outline view of a document has been selected, there are two modes for manipulating it, called 'text edit' and 'outline edit'. You toggle between them by pressing a function key.

Basically, the distinction between the two is that in text edit mode you edit the text within each heading, while in outline edit mode you manipulate the outline itself. The reason for the distinction is sensible enough: when editing text, you shouldn't be able to accidentally alter the outline's structure. However, it can get confusing. In outline edit mode, the cursor keys take on a different function when moving through the outline. Up and down moves between headings at the same level while left and right move between headings at different levels. In text edit mode, the cursor keys behave normally. Headings can be expanded and collapsed in both modes, but only in outline edit mode if you're using the mouse.

Word will automatically number the headings in an outline, which can be useful. You can either use the standard numbering system (which uses a mix of Roman and Arabic numerals and alphabetic characters) or 'legal' notation (1., 1.1, 1.1.1, and so on). This is extremely handy for, say, numbering the headings in a report. Blocks of text are not numbered, nor are they indented, though for the purpose of collapsing and expanding headings, they have the same level as the preceding heading.

One of the strengths of Ready! was its simplicity; sadly, this simplicity hasn't found its way into Word's outlining. What with all the modes, the

style sheet variants and the different key functions, it's easy to end up in a mess. Nevertheless, it's an asset; no word processor should be without it.

Indexing

No sophisticated word processor should be without an indexing system either. Word 3 happily includes one, plus a contents compiling system. Both of these exploit a new character format — hidden text. Instead of formatting characters as bold, underlined, or whatever, you can declare them as 'hidden', whereupon they are either displayed on-screen with a dotted underline or, by changing one of the options using the 'Window' command, removed from the display altogether.

Hidden text is useful for adding notes and reminders within a document which aren't for printing. Most other processors already have a similar facility (WordStar 2000, for example), and it was noted in Word 2 for its absence. But it performs a double function, one which unfortunately reverts to the old WordStar style of marking text. When you edit a document, you select the window option for displaying hidden text. You then type, in hidden text mode, '.i.' before every block of text (usually a word) you want included in the index, or '.c.' if you want it included in the contents. The end of the block of text is marked with a hidden semicolon. The difference between index and contents is that the index table is sorted by entry, while the contents table is sorted by page number.

The system works very well. Like outlines, both index and contents can be organised into 'levels', so, in the index, you could have 'Word' as one entry with 'Outlining', 'Indexing' and 'Editing' as sub-entries. You do this by placing '.c.Word:' before the appropriate text. The colon indicates the level, and several colons will lower the level accordingly.

One of Word 2's most glaring omissions was the absence of facilities for dealing with tables — that has all changed. For a start, you can now select 'column' blocks. By pressing one of the function keys, the position of the cursor is assumed to be the top left-hand corner of a box,

and you can set the bottom right-hand corner by moving the pointer. For example, you could highlight a table set in the middle of the screen without having to select all the surrounding text on the same lines (not possible with Word 2).

When a block has been selected, calculations can be performed on any numbers within by pressing one of the function keys, with the result being put in the scrap for insertion elsewhere in the document. Blocks can also be sorted alphanumerically, in ascending or descending order.

The wish-list

The addition of outlining, indexing and table manipulation, all of them welcome extras, has made Word 3 substantially more sophisticated. Add to this some of the strengths of the original, like the ability to edit documents larger than memory by paging to and from disk, and Word 3 emerges as a formidable product.

But the wish-list is still there. Why, for example, is the windowing still so primitive? Although you can fit several documents, or several bits of the same document, on the screen at once by opening windows, and though the windows can be almost any rectangular shape, you still can't have any overlap, nor can you 'zoom' up a window to fill the screen temporarily.

Why is the word counter still bolted on like an optional extra? It's irritating having to save the document being edited and use the Library command (used to run DOS programs from within Word) every time you want to find out how much you've written (especially when you're paid by the word). And why can't a word's spelling be checked while editing a document? The spelling-checker may be good (it'll even manage phonetic matching to suggest alternative spellings), but it too is bolted on. And why isn't there any support for telecommunications? And though the hidden text facility is useful, why can't documents be separately annotated so you can keep track of their contents?

Documentation

Word 3's documentation is something of an improvement on its predecessor's. The addition of a manual on installing printers is useful, especially for those who want to use the MAKEPRD program (an update of Word 2's CONVPRD) to compile their own printer drivers. The number of printer drivers is ever growing. Word can even drive a laser printer or typesetting machine using the Postscript language.

Unlike other word processors,

SCREENTEST

Word can't, as the printer manual admits, compensate for printers which are unable to print bi-directionally with micro-justification. Word's print formatter isn't capable of making up for a printer's lack of intelligence, which is irritating for those with older, less sophisticated printers.

'The addition of outlining, indexing and table manipulation, all of them welcome extras, has made Word 3 substantially more sophisticated ...'

The user and reference manuals are nicely designed and written, and, given the awe-inspiring complexity of some of the facilities, walk you through the system at an easy pace.

Word 3 also has a tutorial, in two versions: one for use with the mouse; the other for keyboard only. Both have the up-front friendliness customary in software tutorials, but offer a good introduction to the system. What's more, the context-sensitive help within Word can be used to call up an appropriate lesson from the tutorial.

Price

Word 3 costs £425, and anyone who bought version 2 after 1 March 1986 can upgrade free; otherwise it's £60.

Conclusion

With more basic word processors now available for under £100, the value of packages like Word has to be seriously questioned. What do you get for those extra hundreds? Well, for a start, you get a marvelous text editor, thanks to the pick-and-paint selection system for editing blocks of text. You get a large 80,000-word dictionary (no thesaurus, though), a decent spelling-checker (let down by the fact that it's not integrated), mail-merge, footnoting and windowing. Now you get indexing, table manipulation and calculation facilities as well. And, perhaps best of all, you get outlining, the facility that word processing has been waiting for. That's quite a lot. But what you also get is complexity. For some it might be too much, an overwhelming cacophony of bells and whistles.

Packages can bear the weight of only so many extras before they become unwieldy. Word isn't quite unwieldy, but it's no lightweight rapier either. Since it doesn't support telecommunications and won't run under Microsoft's Windows (not properly, anyway), its future appears limited, and Microsoft is likely to sink further development effort into the Windows word processor, Write.

But for those who are sticking with PC-DOS, and who need a lot of word processing power, the new version of Word must be a top contender. It may lack elegance, but it packs plenty of punch. **END**



We have more of what it takes, for even less.

New Low Prices
On Tandy 1000
Personal Computers

The Tandy 1000 System With
DeskMate™ Software Plus
Monochrome Monitor
From £795.00 Ex. VAT

The Tandy 1000 is a value for money business computer designed so you can really get to grips with it from day one. If you're wanting to take the first step into computers, the fact that the Tandy 1000 is IBM compatible won't necessarily mean a lot. What will mean something is that with the Tandy 1000 you'll get an aggressively-priced personal computer that will run many leading business software packages to improve the efficiency of your business.

So, no matter what you're computing requirement, we have a system to support it. Our system prices start from just £795.00 Ex. VAT for a 256K twin-drive Tandy 1000 with monochrome monitor.

If your needs are greater and you require more storage space and faster response, then perhaps you should meet the 256K Tandy 1000HD, which includes a 10-megabyte built-in hard disk and monochrome monitor all for



£1195.00 Ex. VAT. And finally for those who require more memory, more hard disk space and generally more "everything" there is the Tandy 1000 with a "built-in" 20-megabyte hard disk, 640K of memory and monochrome monitor for just £1995.00 Ex. VAT.

If you already think our prices are good, then you may be even more impressed when you realise that we also include our integrated business software package called DeskMate. You'll get word processing for those letters and reports, spreadsheet analysis, electronic filing, telecommunications, a calendar and electronic mail.

We can also provide an alternative to the monochrome monitor, a colour monitor system for an additional £200.00. If you're seeking greater efficiency and fast results in the running of your business, perhaps it's time you put the Tandy 1000 to work for you.

TANDY®
COMPUTERS

The range that's clearly superior

Tandy Corporation (Branch UK), Tandy Centre, Leamore Lane, Bloxwich, Walsall. WS2 7PS Tel: 0922 477778

Available from
Tandy
Stores

For further information dial the operator and ask for
Freefone Tandy Computers
Available from Tandy Stores, Dealers and AT Computerworld.
*IBM TM Of International Business Machines

Available from
COMPUTER
WORLD
Stores



BENCHTEST

Quad and Sprite Compact

Comart's Quad and Jarogate's Sprite Compact represent a new breed of multi-user machine where price is no longer a prohibitive factor. The Quad boasts ease of installation while the Sprite is proud of its performance. Peter Jackson assesses their worth.



There have always been problems for people selling and using multi-user micro systems, much more practical ones than the initial question of whether to go for a multi-user-single-processor or network solution.

For the seller of the systems, the trouble has been configuring the machinery to fit the customer's needs. Multi-user systems often involve putting together components from different manufacturers, and somehow making them work under the control of software from yet another supplier. Dealers often find themselves spending more time than they like on system integration, installation, and hand-holding during the inevitable teething troubles of a lashed-together multi-user system.

For the user, the problems are normally those of expense — paying the dealer for all that extra time and hardware — and keeping all those disparate lumps of machinery and software working together.

Quad

Enter Comart, one of the old-timers in UK multi-user systems, claiming a solution to all those difficulties with its new Quad machine. The Quad, as its name suggests, is designed from the start as a four-user machine and will sell complete with four terminals running under multi-tasking Concurrent DOS for just under £5000. But more importantly, it is intended to be a plug-in-and-go system for both dealers and users. The dealers, Comart claims, will be able to sell the Quad like any single-user system without the integration and installation problem. And users, says the company, will be able to buy and install themselves a cheap solution to their multi-user business needs, with the confidence that it will work and keep on working.

Comart's dealers and customers will hope the company is right.

Background

Comart started life as a distributor of North Star Horizon micros in the UK, and eventually branched out into selling its own UK-built multi-user system, the Communicator. The Communicator, based on the S100 bus like the very-similar Horizon, let several users share a single Z80 processor and a hard disk; sharing a Z80 might sound strange and slow now, but Comart was following multi-user pioneer Altos in this design.

The company did well in selling the Communicator to large companies and organisations such as British Telecom and Government departments, and got itself on the Government's CCTA-approved list for official hardware purchases. But more public attention was paid when Comart bought up the Byte Shop



The Comart Workstation heritage is revealed on the Quad's back panel.



Seven standard DB25 connectors serve the Sprite's serial connectors

chain of retail stores, and set about expanding it further across the country.

The Communicator moved up into the 16-bit market, and then the company came up with a neat, small, networking workstation called, logically, the Workstation, and built around the 80186 processor with Concurrent DOS — the direct ancestor of the Quad.

Comart the company is now part of the publicly-quoted Kode Group, following founder David Broad's sell-out last year, and the Byte Shops have since been sold off to a third party. The Quad represents Comart's attempt to break out into mass-market multi-user sales, while satisfying its traditional market in the larger business.

Hardware

The Quad is outwardly similar to the earlier network workstation, and is in fact based on the same chassis and casing. The box is remarkably small, at around 12insx14ins, and takes up little room on any desk. Even so, Comart is keen to sell the Quad with a neat extra stand allowing the system unit to be stood upright on the floor beside the desk, and in fact the new Quad logo on the front panel has 'Comart Quad' written in two orthogonal directions so it can be read in either configuration.

Comart is keen to distinguish the Quad from traditional single-user PCs, and even asked us politely not to photograph the box flat on a desk with a monitor on top of it and a keyboard in front. Unfortunately, due to lack of space, we couldn't comply with that request.

Looking at the front panel of the system, in the forbidden horizontal position, the only visible features are two standard half-height disk drives to the left and a locking key below the cooling grille, power indicator, and logo to the right. On the review model the upper of the two drives was a 20Mbytes Winchester unit, while the lower was a 720k, 5.25in floppy drive. It is more conventional to put the floppy drive above the Winchester in such configurations, but once again the set-up provided is more logical with the system unit standing upright; then the floppy is on the left.

On the back panel the Workstation heritage is even clearer. Like the previous machine, there is a large fan in the centre of the panel and standard DB25 connectors for a parallel printer, modem, and serial printer along the bottom. The main differences are in the power outlets and in the other I/O connectors. The Workstation has one mains power input and two outputs, while the Quad only has one of each, and where the Workstation has

BENCHTEST

two D-type connectors for different types of monochrome and colour monitors, the Quad has four large DIN sockets for the standard four terminals. On both machines, the bottom connector row is completed by a DB-9 socket for wiring-in Comart's network. This network is a proprietary design, running under Digital Research's DR-Net operating software.

On the right-hand side of the case is a hardware reset button, something I always look for on a machine after the less than satisfactory Ctrl-Alt-Del of the IBM PC.

Getting inside the Quad is not what you could call straightforward. Taking out two screws allowed the simple removal of the top panel of the box, only to reveal a blank black metal plate covered in screws with unidentifiable purposes. Eventually, after removing a total of 15 screws, the metal support frame for the disk drives and power supply was separated from the plastic moulded outside case. This was a nerve-racking procedure since it was not clear which screws to take out next, and with unfamiliar machines it is all too easy to release a power supply transformer to drop onto delicate circuitry below. Comart's documentation for the Workstation — given to me since the Quad's book was not finished — says that even something as simple as memory expansion requires a trip to the dealer to open the case; I'm not surprised.

However, there was enough room to take a look at the electronics built into the base of the Quad's box.

The main circuit board fills the whole area of the base, and has some unusual features. The rear part is conventional enough, with the circuitry to drive the total of eight interfaces, seven serial and one parallel. The four DIN sockets for the terminals connect up to a staid and reliable Zilog Z80A SIO chip, and other SIOs and a PIO from the same family crop up behind the other I/O connectors. The network interface uses two more Z80A chips, this time CTCs, and all of this might give the impression that the Quad is an 8-bit machine. But at the front side of the board the now-familiar shape of an Intel chip-carrier belies that impression. The chip-carrier, a large square package with its own aluminium heat sink bolted on top, holds an Intel 80186 processor running at 10MHz.

The 80186, or iAPX186 to give its official number, was the first upgrade to the 8086 and simply integrates around 10 typical 8086 peripheral chips onto the processor chip. The main advantage of this is speed, since the 186 does not waste time in



The Quad's WY-30 terminal



The Sprite's 'traditional' WY-50 unit

communicating with its peripheral circuits over conventional wiring; and chip count, since one chip can now replace up to 11 in a typical computer board.

However, the 186 has been rather skipped over since the launch of the IBM PC/AT with its 80286 chip. The 286 does all that the 186 does, but adds such things as protected mode memory management and built-in low-level operating system kernel routines. Even those machines that did use the 186, notably Mad Computer's Mad-1 (aka Goupil G-4) and ABS Computers' Orb, either have switched already or are due to switch up to the 286.

However, the 186 is fast, cheap, and runs all 8088/8086 machine code unchanged. As we shall see, Comart feels that the Quad does not need any more power than the 186 to drive it.

The most unusual feature of the board is a large empty space on it, with no components and precious few circuit tracks, just under the disk drives. This seems to indicate that the Quad's design is a development of an earlier board, presumably the Workstation. My guess is that the space was used on the earlier board for video circuitry, now no longer needed thanks to the Quad's use of terminals.



The Quad's keyboard is crowded, an odd design, and uncomfortable to use



The Sprite Compact's keyboard is more solid and better designed

Also unusual is the division of the system's standard 1Mbyte of RAM into two discrete blocks on either side of the 186. Normally, all the memory in a micro is concentrated in one bank to minimise the circuitry needed for address decoding and refresh. Once again it looks like a legacy of an earlier design; the Workstation's maximum RAM capacity was 512k using the same 256kbit chips as used in the Quad.

The floppy disk controller, based on Western Digital hardware, is on the main board while the hard disk controller is on a separate card mounted vertically in the only expansion connector at the dead centre of the motherboard.

The floppy and hard disk drives are standard half-height units, the former with a capacity of 720k — but capable of reading IBM-format 360k disks — and the latter holding 20Mbytes. The drives, like the power supply box, are bolted beneath a metal frame and the whole lump of electromechanical hardware eventually lifts up to reveal the electronic hardware beneath. This frame has a flat metal top that sits just underneath the top panel of the Quad in its desktop configuration, and the top panel is also a solid sheet of metal, very strong compared with the plastic of the rest of the case. This was obviously intended to support a heavy colour monitor on the original Workstation, but is not necessary on the terminal-based Quad. Still, it gives the case a pleasing solidity and the Quad's compactness makes moving it around feel like lifting an enormous volume from a set of encyclopaedias.

Perhaps because of its development from an earlier design, the Quad's electronics are clean and finished despite the fact that the review machine was clearly labelled Pilot Prod. That, short for pilot production run, means that the machine was one level up from hand-finished prototype and was one of an early batch off the production line for final testing. Using the existing Workstation casing meant that everything on the machine looked finished even when it wasn't — as we shall see later.

Installation

Ease of installation and set-up is one of Comart's chosen selling points for the Quad, and to start with it does seem simple. Set the box on the desk or on its floor stand, plug the terminals into the big and carefully-labelled 8-pin DIN sockets on the rear panel, and turn the key in the lock to power-on.

With the review machine and its terminals, though, there were some initial problems. Firstly, the Quad's firmware wasn't finished, and as a result the machine could not boot

from its hard disk and needed a special start-up floppy disk complete with several batch files to get the system up and running properly. The firmware, in two ROMs on the motherboard, was version 7 on the review box and will be updated by the time you read this. Incidentally, the labels on the ROMs seemed to show that Quad was not the original name for the system, since they and their screen displays had 'Delta' written all over them.

Secondly, it turned out that the terminals were not configured correctly to plug straight in and go. This brings us to the perennial problems of the RS232 'standard', too big a subject to go into here and in fact one of the major problems in systems integration in the past. However, at least the terminals provided with the Quad made it relatively easy to get things sorted out.

The terminals had Comart's name on the front panel but were in fact WY-30 models from Wyse Technology, based in San Jose in California but making its products in Taiwan. At review time Comart was in the process of deciding which terminals to bundle with the Quad, with a choice between the WY-30s and a new terminal from UK-based Newbury Data. After final meetings, the company decided to go with the Wyse products.

The WY-30 has an innovative design, insofar as terminals can ever be described as innovative. The 12in screen is remarkably flat and square in the corners, improving on definition and keeping resolution practically constant across the whole screen area whatever the setting of the front-mounted brightness control. There is an ingenious spring-loaded pillar at the rear to keep the screen tilted at the right angle for use on various heights of desk, and although there is no swivel stand the screen itself rests on the desktop and can easily be turned in any direction.

The only drawback to the WY-30, for someone not expert in the vagaries and peculiarities of every terminal on the market, is its keyboard. This is a lightweight, small, and crowded board with a fragile, spongy feel I am beginning to associate with Taiwanese keyboards. The layout is peculiar too, for those used to the IBM PC style. The caps lock key is in a very odd position to the left of the space bar, and is not illuminated — although a screen status line tells you if it has been hit in error. At the other end of the space bar is the backslash key — vital in MS-DOS and now in Concurrent DOS too — which is almost impossible to hit easily in this position. Then the cursor keys are in an inconvenient inverted 'T' just to the right of the backslash. Strangest of all, the backspace key has been moved one place to the left

from its normal position at the top right to make room for the SetUp key which sets the terminal configuration — something you only ever have to do once for each terminal. Odd, and somewhat uncomfortable to use.

But the SetUp key does have useful functions. Holding down Shift and pressing SetUp brings up two reverse-video lines at the top and bottom of the screen, used to set the operating parameters. Instructions are on the top line, and a menu of options at the bottom. Selecting one of the options with the left and right cursor keys highlights it, and hitting the space bar steps through the possible values for that option. More lines of options can be scrolled up with the up and down cursor keys, covering everything including function key definitions, screen attributes including a black on green display, and all the interface specifications.

So when the terminal first plugged into the Quad's Terminal 0 socket failed to communicate, a quick scan through SetUp with a Comart crib sheet got the thing correctly aligned. Once this configuration has been done it is stored in non-volatile RAM, and automatically set up at each power-on.

The only other confusing thing about the terminal was that the two serial ports on its rear were labelled Modem and AUX rather than something helpful like Computer. If you need to know, Modem is the one to use, running at 9600 baud with two stop bits and no parity or handshaking, and with FDX mode set. Easy with the crib sheet.

Finally, turning on the key on the Quad's front panel called up the Delta V7 firmware, which booted up the floppy, which fired up and configured the hard disk, and finally Concurrent DOS could load after much 'to-ing and fro-ing' between the floppy and hard drives.

System software

Digital Research's Concurrent DOS is one of those ideas whose time never seems to have truly come, although when it first emerged four years ago as Concurrent CP/M-86 it seemed the answer to every micro user's prayer. You could keep four programs actually running simultaneously on one machine, switching from one screen display to another as required with a couple of keystrokes. You could download data from a modem while word processing, and search a database for an address without losing your place in your letter.

Or at least, you could do those things if you had the memory and the storage space. The trouble with Concurrent CP/M-86 was that it took up 192k of user RAM for itself at a time when 256k of RAM on an IBM PC was considered a lot, and also needed a lot of disk space. In fact, to



BENCHTEST

run it properly you needed at least 512k of RAM and a hard disk, and not many people had those then.

Worse, the name associated the product with CP/M-86, which was once — believe it or not — considered a serious competitor for PC-DOS/MS-DOS but made no impact in the post-IBM world.

Since those early days, Concurrent has gone through various versions. Version 3.1 included screen windowing, so that the multiple tasks running could all be on the screen at the same time, and also added a 'PC-Mode' which allowed a limited number of standard MS-DOS software packages to run as tasks under Concurrent. However, the PC-Mode of Concurrent 3.1 did not allow the hierarchical directories of MS-DOS 2.0 and above to be used.

So when Version 4.1 emerged last year, no-one was surprised to find that PC-DOS compatibility had been improved. Hierarchical directories were now allowed, and MS-DOS directories and files could be accessed directly under Concurrent. If you wanted to run an MS-DOS program, you just typed its name at the A: prompt and Concurrent did the rest.

In addition, multi-user Concurrent was available early and seemed to work, and was picked up by many OEMs wanting to get into the burgeoning two-to-eight-user system market. In the UK, those OEMs include ICL, Comart, and Jarogate.

That history lesson is to explain why Concurrent DOS is on the Quad — and on the Jarogate Sprite Compact reviewed below — and also to explain why it was a disappointment to discover Concurrent DOS Version 4.1 running on the review machine from Comart. For in June this year, Digital Research finally released Concurrent DOS Version 5.0, also called Concurrent XM, and this was slated for the Quad. But Digital Research held up shipment of the package to its OEMs to fix some bugs, and at review time Concurrent XM just wasn't properly available on the machine. The Sprite Compact, as we shall see later, did have a beta-test version of Concurrent XM running, modified by Jarogate as the OEM to get it going on the machine, but even so the finished version of the operating system was not finally on the market even at press time.

Which was a shame, since Concurrent XM — for eXtended Memory — is the first micro operating system outside Unix and its clones to handle extended and expanded memory up to 8Mbytes. To do this, Concurrent XM uses the Enhanced Extended Memory Specification (EEMS) bank-switching technique backed by Digit-

Research itself, board makers AST and Quadram, and database software giant Ashton-Tate. EEMS is a superset of the original Lotus-Intel-Microsoft specification embodied in the Intel Above Board, and is claimed to be compatible with it.

Bank switching is explained in more detail in the AICard review on page 138, but — briefly — the technique has so far meant that suitably-modified PC application programs can access memory above the 1Mbyte addressing limit of the PC's 8088 microprocessor, giving more space for the kind of enormous spreadsheets that Lotus users seem so keen on, as well as for larger database files in RAM for fast searching.

However, the advantage of putting the bank-switching control into the operating system rather than the application is that unmodified applications can run in an expanded-memory environment — and, for the user, extra megabytes of memory mean better performance and more space for each task running on the machine.

This is particularly true in the multi-user Concurrent environment, where each user on the system can have four tasks active at a time. For a four-user system that means 16 possible tasks running alongside Concurrent itself, and with the operating system taking a hefty 160k or so of RAM, there is not that much room in a 1Mbyte system for the other tasks to run in.

A full examination of Concurrent XM and its way of working will appear in a forthcoming issue. However, Concurrent 4.1 has not received much coverage since its launch, and it is worth taking a look at some of its features.

First, its IBM compatibility has been improved so that it can run CP/M-86 programs such as Digital Research's own compilers alongside standard PC-DOS applications such as Lotus 1-2-3, dBaseIII and Multiplan, each having its own RAM partition. Then the user can organise files either under CP/M's user number system or under MS-DOS' hierarchical directory system, although these two systems cannot be used on a single floppy or hard disk partition. Concurrent also now includes commands and functions that mimic all MS-DOS directory commands, pathnames and other features, meaning that MS-DOS users can now use Concurrent without realising it, just by using the familiar MS-DOS commands. The only thing that might give the game away is that Concurrent sometimes requires you to insert spaces in commands where MS-DOS doesn't care.

And one useful feature unique to Concurrent is the mapping of disk drive names to directories. For instance, a simple command can tell the system that disk drive B: is simply another name for Directory\WordStar (the 'Y' is mandatory in Concurrent). Then a user can 'log onto' drive B: and will only have access to files in that directory. In fact, the Quad's hard disk was not partitioned at all; it was just one big MS-DOS partition called drive A:, with drives B: and C: just pointing at separate directories. The floppy disk drive is always drive F:, as on every other Comart system.

Other differences in Concurrent 4.1 are the inclusion of various utility programs, including a file front-end, called File Manager; a rudimentary text processor called DR Edix; a simple card index storage and retrieval package called Cardfile; and a print spooler/manager called Printer Manager.

But the main feature is still that four CP/M-86 or MS-DOS programs can be co-resident in the machine's memory, running simultaneously.

In use

Running Concurrent DOS on the Quad is far from satisfactory so far. The unfinished firmware and low-level software on the review machine meant that each terminal on the system could not really access the four 'virtual consoles' normally accessible inside Concurrent. Well, they could, but it was invisible. The trouble with cursor-addressed terminals compared with memory-mapped video is screen repainting, which is slow and needs doing every time something changes on the screen. On a terminal hooked up to the review Quad, you could switch consoles by holding down the Home key and hitting 0, 1, 2 or 3 on the numeric keypad. But the screen is not repainted when you do, which can cause some interesting effects with, say, the Sensible Solution database package suddenly apparently appearing underneath WordStar, and taking over the screen completely as soon as it ordered a screen repaint.

Again, one thing missing from the Quad implementation was Concurrent's information-packed status line, which normally tells users which virtual console they are in, which program they are running in that partition, and other useful stuff. Comart's marketing manager David Biggins assured me that this, along with the screen repaint, would be fixed by the official launch date. The Quad status line should theoretically contain, reading left to right: the current time; the current date; the task running in the current console; the current console number; the current

printer number; the current user area on the disk, if it is formatted for CP/M-86; the network node identification, if a network is running; a possible warning that a floppy disk in the system is in use and should not be removed; and indicators of the current status of Concurrent's ^S, ^P, and ^O switches, governing scrolling, typewriter mode, and whether a console has a screen display or not.

By keeping an eye on its market, Comart has tried to make it simple to build menu-driven front-ends for the machine. Using Comart's XSSP command shell interpreter and the MENU builder program, the system manager or dealer can set up menus that will let untrained staff use certain functions, but seal them off from Concurrent's command level with password protection. And two other Comart-supplied programs, SYSUTIL and DISKUTIL, aim to make life easier for the user. SYSUTIL lets users set the parameters of the entire system, from printer port baud rates to disk drive names across a network, while DISKUTIL drives Concurrent's worryingly-powerful PIP command without the user knowing that that is what is going on.

Applications software

The review machine came with three software packages to demonstrate the major business application areas. There was WordStar for the word processor, SuperCalc2 for the spreadsheet, and O'Hanlon's Sensible Solution programmable database. All of these worked as expected on a cursor-addressed terminal — that is, slower than you might like but adequately. In terms of sheer processing speed and disk access the Quad is a fast machine, but this advantage is lessened by the snail-like speed of screen painting.

As for other applications software, it is better not to go overboard on the MS-DOS compatibility. Running Concurrent DOS on an IBM PC lets you run almost all IBM-compatible software in one of its partitions, but that is because the screen memory is in the same place as it is for PC-DOS, and those packages that write directly into it for speed can still do so. On the Quad, using cursor-addressed terminals, any package that writes direct to screen memory will not work. And that includes things like 1-2-3 and Word Perfect.

It is worth noting that the three applications on the review machine were all CP/M-86 versions of programs originally written for the cursor-addressed CP/M world rather than for the memory-mapped MS-DOS world.

Expansion

Any expansion of the Quad has to be done using Comart's networking hardware and Digital Research's DR-

Technical specifications: Quad

Processor:	Intel 80186, 10Mhz
RAM:	1Mbyte
Mass storage:	One 20Mbytes Winchester, one 720k floppy
Keyboard:	83 keys, on WY-30 terminal
Display:	80 x 25, on WY-30 terminal
I/O:	Six serial ports, one parallel port, one network port
Operating system:	Concurrent DOS v4.1 (later v5.0)
Bundled software:	System utilities and menu system

Net software. Quad system units can be daisy-chained using the extra power outlet on the back of the box, or distributed around a building at the end of the network cables, and each unit can have its own four terminals under Concurrent.

As it stands, any disk drive and any printer on the networked system is accessible from any terminal, with protection to stop one user shutting down a system unit while files are open on its disk drives, and to stop the removal of floppies being accessed from another terminal. On top of that, each terminal's extra AUX port can have its own printer, which is also accessible from any part of the network.

As for the Quad box itself, there is not much that can be done by way of expansion. There is no more room for memory expansion — unless the blank area on the motherboard is filled suddenly — and replacing the 186 with the 286 is by no means a simple chip swap. The only simple upgrade would be a bigger hard disk drive, and I would not be surprised to see a 40Mbytes unit in the Quad within a few months.

Still, with the system limited to four users and no more, apart from networking, the 186 and a megabyte should be enough for most users.

Documentation

There was no Quad-specific documentation available at press-time, but looking at the Workstation manual it seems as though Comart does a solid job. There are examples, diagrams, colour-coded sections, multiple indexes, and a reference section, all produced in professional, glossy, ring-binder style.

Benchmarks: Quad

BM1	0.6
BM2	2.3
BM3	4.3
BM4	4.5
BM5	5.2
BM6	9.5
BM7	14.4
BM8	11.1

All timings in seconds. For a full listing of the Benchmark programs, see page 185, January 1985 issue.

Price

Price had not been fixed, but should be under £5000.

Conclusion

The Comart Quad is a small, solid, neat multi-user system that works as advertised — or will when the final version of the system software is available. And Concurrent DOS 4.1 is now a mature operating system which, with a megabyte of RAM and a fast hard disk, has performance and space enough to show what it can do.

After checking the availability of applications software on the machine, the Quad is worth a look. At its sub-£5000 price including a 20Mbytes Winchester and four terminals, it could be worth more than that.

Sprite Compact

If Comart is selling the Quad on ease of setting-up and price, Jarogate is selling its Sprite Compact on performance and price. Like the Quad, it runs Concurrent DOS and comes with 1Mbyte of RAM and a 20Mbytes Winchester drive alongside a single floppy unit. But, unlike the Quad, the processor is a full 80286 running at 8MHz, and the terminals hooked up to the system unit are connected at 38,400 baud rather than the 9600 baud of the Quad's ports.

And also, unlike the Quad, the Sprite is based on the S100 bus (see the HM Systems' Minstrel 4 Benchtest in the July issue) giving easier expansion to more users, more memory, and other add-ons.

But most interesting of all, the Sprite Compact came in with a beta-test version of Concurrent DOS 5.0, or Concurrent XM, the expanded memory version of the original discussed in the Comart review.

Background

Jarogate, based in Surbiton, was formed in 1979 as a systems house but soon switched to distributing Cromemco systems from the US. Cromemco, named after the Crocker Memorial hall of residence at Stanford University in California, was one of the pioneers of S100 microcomputer systems.

Soon Jarogate started designing



BENCHTEST

its own S100 boards, and putting them into Cromemco chassis with the Jarogate badge on the front; and it worked closely with Digital Research on multi-processor and networking operating systems. Some of the DR-Net networking software was actually written by Jarogate R&D staff.

The Sprite range, launched in late 1984, was the company's first venture into completely self-manufactured systems inside self-manufactured casings. The Compact is the bottom end of that range, and Jarogate is going for the lucrative two-to-eight-user market with the machine.

Hardware

The Compact's case is the same as that of the entire Sprite range, not surprising since the design is dictated by the demands of the S100 bus structure. Rather than go for the tower style of S100 machines like the Minstrel, Jarogate has produced a long, low case much deeper than it is wide. In fact, the front panel is about the same width as the Quad and a bit lower, but about twice as deep.

Opening the case is simple; removing two screws allows you to take off the front panel, and unscrewing two more on the rear panel releases the entire top half of the case to reveal the interior structure.

The front half of the machine is taken up with the disk drives, which in this case are a full-height 20Mbytes Winchester and a half-height 5.25in floppy drive storing 790k in Sprite format, but able to read IBM PC format disks when they are inserted. There is room in the case for a second half-height floppy, but the front panel has no slot for one and it looks as though Jarogate feels it is not necessary.

Behind the drives is a neat black metal case holding the switched-mode power supply, fitting across the whole width of the case. And behind that is the S100 motherboard and card cage, which can take five standard S100 boards mounted horizontally. There are two cooling fans on the left-hand side, one blowing through the card cage and the other blowing over the power supply; that might seem like overkill, but as with all S100 systems Jarogate does not really know what high-power boards will be plugged in and is playing safe.

The overall internal design is tidy and modular, with all the elements clearly separate and easy to replace if required.

On the review machine, four of the five S100 slots were filled. The 1Mbyte RAM board was at the bot-

tom, with the 80286 processor board above that, an eight-channel serial interface board above that, and the hard and floppy disk controller board at the top of the stack. The top slot was free for expansion in this configuration, although Jarogate's preferred option is another eight-channel serial board allowing 16 users to hook up to the machine if required.

On the back panel, seven standard DB25 connectors bring the serial channels out to the outside world, and the only other connections — apart from the blanking plates sealing off the unused serial possibilities — are the mains power input socket and a DB-15 connector designed for Jarogate's implementation of Ethernet networking. The Ethernet control-

'The Quad and the Sprite Compact represent a new breed of multi-user machine; cheaper, smaller, and easier to set up.'

ler hardware is included on the OWI disk controller board in the system.

As befits a machine built up from established components from an established company, the Compact's electronics are clean and neat. The case, in a rather rough and crude but very solid plastic, and the disk drives — the floppy from Toshiba and the Winchester from Rodime — are the only elements that show signs of cost-cutting. Full-height Winchesters, for engineering reasons, are cheaper than the half-height units that are more common these days, and the Toshiba drive is one of the more rudimentary floppy units with an irritating door mechanism.

Installation

Thanks to some pre-configuration by Jarogate, there was no problem with setting up the Compact. Just plugging the terminals into the serial ports and turning the terminals on before the machine was enough to get the system running.

After a long configuration period, with various drivers and files called in from the Winchester, the usual Concurrent log-on message appears on both terminals although one of them has to be in the labelled master terminal port on the back panel. The message comes up proudly stating Version 5.0; but Jarogate's own message below gives its own copyright date and an ominous 'Up to 2Mb; Beta XX based'. The final Concurrent XM will handle up to 8Mbytes rather

than the current 2Mbytes limit on the Compact, and the Beta means that the system is still under final user test.

It is already apparent at this stage that the screens are much faster than the Quad's. The screens supplied with the Compact are also from Wyse Technology, but are the bigger WY-50 models, and are hooked up to the system box at 38,400 baud rather than the Quad's 9600 baud.

This means that screen repaint is very much faster on the Compact, four times as fast to be exact, and this makes software like WordStar seem to rocket along. Of course, the 8MHz 80286 also helps in giving this impression.

Like the WY-30s on the Quad, the WY-50s are neat units but rather more traditional in design than the smaller terminals. There is a separate screen stand on which the 12in amber screen, noticeably more curved than the screen on the WY-30, swivels and tilts. The keyboard too is more conventional, with the Delete key in its rightful place at the top right and a row of 16 function keys across the top of the board. In fact, the keyboard is a bigger, more solid board with a better feel to it.

The set-up of the terminals is exactly the same as that for the Quad's WY-30s, which is as you would expect for products from the same manufacturer.

System software

Jarogate will be supplying Concurrent XM with its standard 1Mbyte Sprites, and it will be necessary with expanded systems using the company's new SPXM S100 board. This board holds up to 4Mbytes of extra RAM, and will be built into the new Sprite XM systems in its 2Mbytes incarnation, while existing users can upgrade by adding the SPXM board and a memory-management board.

The SPXM board is compatible with the Lotus-Intel-Microsoft expanded memory specification, and thus will work with Concurrent XM which uses the AST-Digital Research-Ashton-Tate superset, EEMS.

Apart from the extra hardware, the only thing a user will notice about Concurrent XM running in expanded memory is that there is more room for multiple tasks running on each terminal, giving better performance than with earlier implementations.

There are, however, some other improvements in Concurrent Version 5.0 over Version 4.1. The Unix redirection feature has been added, which means that the output from one file can be directed to be the input to another file. Command-line editing and recall has also been included, mimicking MS-DOS with

Control-X recalling the previous command from a cyclic buffer, and making it possible to recall the previous five commands by repeating the Control-X key combination. The backspace and Delete keys can be used to insert and delete text in these recalled commands. Better MS-DOS compatibility has been added in batch files too, with equivalents to the MS-DOS batch commands SHIFT, FOR, GOTO and IF.

For the user though, the performance improvements are likely to be more important. The directory searching has been speeded up to give faster file access, and various Concurrent commands have now been included in the main part of the operating system rather than being called in from disk when required. These new 'intrinsic' commands include TYPE, to list a file; ERA, to erase one; REN, to rename one; MKDIR, or MD, to create an MS-DOS-type directory; RMDIR, or RD, to remove one; CHDIR, or CD, to switch from one directory to another; SYSDISK; and PATH. New commands have also been added at this level, including a copy of the MS-DOS SET command, a BANK command that can stop programs from residing in extended memory above 1Mbyte, a SUSPEND command, and an AUX command to set the default auxiliary device.

Some of the Concurrent utilities have also been improved, including FSET, GENCCPM, SYSTAT, PIP, BATCH, CHSET, and SPCONFIG, but according to Jarogate, Concurrent 4.1 utilities must not be mixed with the new ones.

In Jarogate's implementation, the status line missing from the Quad is there, with a different layout to Com-

Benchmarks: Sprite

BM1	0.4
BM2	1.5
BM3	2.8
BM4	2.9
BM5	3.3
BM6	6.0
BM7	9.2
BM8	7.0

All timings in seconds. For a full listing of the Benchmark programs, see page 185, January 1985 issue.

art's scheduled line. But the major things are there, including the user number, virtual console number, current task running, and the time of day. And Jarogate has also managed to implement the virtual console switching that the Quad is waiting for on each terminal, although to be fair to Comart, Jarogate has had that working on various other of its systems in the past.

On the compact, the first four function keys on each WY-50 keyboard switch between the four virtual consoles of that terminal. The actual console numbers that appear at the top of the screen are consecutive, with the master terminal having consoles 0 to 3, the second having 4 to 7, and so on.

Jarogate has also enhanced Concurrent in other ways, including the addition of directory hashing for MS-DOS disks, dynamic detection of expanded memory and configuration for XM use if the expansion board is fitted, 10 logical partitions on hard disks, and faster screen I/O using the new block functions contained in Concurrent XM.

In use

The extra processor power of the Sprite Compact, combined with its much faster screen repaint, give an impression of high power and high speed. The selection of software on the review machine was once again all CP/M-86 format, but this time including the top-selling Pegasus multi-user accounting system alongside WordStar and SuperCalc. According to Robin Tracey, Jarogate's managing director, there is now a rush of software designed specifically for Concurrent now that it has the right hardware to run on, and he says that although there is a limit on the PC software you can buy and run, most of the stuff you can't run is single-user and thus not what you bought the Sprite for.

The machine worked well and unobtrusively, although there were some odd squealing noises from the Winchester and the two fans were as loud as a single IBM PC one. At least the long terminal leads meant that the system unit could be hidden away under a table somewhere. There is no special way of mounting the Sprite box in any position but flat on the table or floor.

Documentation

Once again, the only documentation supplied with the Sprite Compact was Digital Research's good Concurrent DOS manual along with some technical notes on changes in Version 5.0 compared with Version 4.1. However, we had expressed to Jarogate that we were particularly interested in Concurrent, and there must be extensive user documentation available on the Sprite range as a whole. At press time, I had not had a chance to see any.

Price

The Sprite Compact as reviewed, with 1Mbyte of RAM, one 20Mbytes Winchester and one 790k floppy, and eight serial ports, will sell for £3995. This price includes one WY-50 terminal.

Conclusion

The Sprite Compact is a low-priced, high-performance multi-user system that is integrated well with the Concurrent DOS operating system. Jarogate deserves credit for wringing Concurrent XM out of Digital Research in the UK before it wanted to release the product, and more credit for being ready with a compatible expanded memory board.

The performance of the Sprite Compact is excellent, making Concurrent look very good, and if the software you want is available in CP/M format or in non-memory-mapped MS-DOS format, then the Compact is worth just as much of a look as the Quad. **END**

Technical specifications: Sprite Compact

Processor:	Intel 80286, 8MHz
RAM:	1Mbyte, expandable to 4Mbytes
Mass storage:	One 20Mbytes Winchester, one 790k floppy
Keyboard:	101 keys, on WY-50 terminal
Display:	80 x 25-plus status line, on WY-50 terminal
I/O:	Eight serial ports, one Ethernet port

In perspective

There is no doubt that there is a market for two-to-eight-user systems, where users want to share files and central system resources. But the cost has often been prohibitive, and users are frequently pushed towards buying Unix or Xenix and abandoning existing software, or into expensive network options.

The Quad and the Sprite Compact represent a new breed of multi-user machine; cheaper, smaller, and easier to set up. The problem will be the dealers, who make large margins on the integration, installation, training and hand-holding on current multi-user machines. There could be some resistance to selling systems aimed to cut that margin out, systems that could be sold by box-shifters with little comeback.

But it depends on customer demand. If customers want cheap and simple multi-user systems, the dealers will sell them. Then the only problem is an application software one, but Concurrent DOS has survived despite a software shortage in the past. The extra MS-DOS compatibility can only help, even if some major packages won't run in a serial terminal environment.



TNS Commscase

Have case, will travel. It's all there, but how well does it work?

Nick Walker looks at the portable office on the move.

Imagine a lapheld computer with the power of a mainframe, a high-resolution colour screen and instant access to a vast collection of information via an in-built modem. It's a popular dream of the future of micros and one that is rapidly approaching reality as lapheld computers now encompass the power of an IBM PC/AT complete with hard disk. Screen technology is, however, currently the most limiting factor, but with the availability of back-lit LCDs and electroluminescent displays, progress is being made in this area too. The internal modem is no problem, but it can only be used where a BT phone line is available, which is

presently the major drawback for the lapheld concept.

However, with the success of the cellular telephone, it is now possible to use a telephone line practically anywhere in the world, and at a relatively low cost. Although the cellular system is fine for voice use, vagaries in the system make data transmission very difficult. Enter the Commscase from TNS. This is the first system I've seen that successfully overcomes the problems of cellular communications.

Cellular comms

To understand the problems associated with cellular data communica-

tions, it is necessary to understand how the cellular system operates.

Cellular radio is so-called because the system divides the country up into a series of cells, each of which is served by its own base station. Depending on the number of users and terrain, these base stations are placed between 0.5 and 20 miles apart. A cellular telephone is simply a radio transmitter that communicates with these base stations. The base station then switches the radio signals onto the ordinary telephone network via a central control centre. Each system has a relatively low-powered transmitter compared with the high-power transmitters needed for the traditional radio telephone.

The use of low-powered transmitters has one major benefit: the same radio channels can be used again and again up and down the country. Because of this, it has been estimated that the current cellular system could support 500,000 users with plenty of room for expansion. The old radio-telephone system was rated at about 10,000 users.

In order to use a cellular telephone it is necessary to have a system that handles the switch between one cell and an adjoining one, as the signal becomes weaker the further it has to travel. This is known as the hand-off. Even stationary units need to have this ability as the movement of surrounding traffic or even atmospheric conditions can affect which base station is giving the strongest signal.

When a cellular telephone is switched on it scans a total of 21 control channels, each of which corresponds to a base station. Typically it will find only two or three suitable channels and lock on to the strongest one. It then transmits its identification number, power output and a host of other information that enables the control centre to track the phone and, of course, create a bill.

Once a call has been initiated, the control centre monitors the strength of the transmission from a number of surrounding base stations. When the signal fades on the current base station, the control switches it to the



nearest cell with the strongest signal. This is done by using the voice channel to send a 'retune' command to the cellular telephone, to which the telephone responds by quickly switching off the channel, returning and switching on again. This hand-off process takes about 300 milliseconds and can occur up to five times per minute. The effect is totally unnoticeable in a voice transmission but would be disastrous were it to occur during data transmission.

Commscase

The Commscase from TNS comes in two basic models. The cheapest consists of an NEC 8051 lapheld computer, a 40-column Epson printer, a cellular telephone with mobile power transmitter, a 1200 baud modem and a sizeable rechargeable battery pack. The second model is basically the same except the NEC and the printer are replaced by a Data General One (DG One) lapheld micro. The DG One is an IBM-compatible lapheld with an internal disk drive, whereas the NEC uses a proprietary system with word processor and comms software in ROM.

Both systems are contained in a hard-plastic Samsonite suitcase. At about 30lbs the complete system is very much in the luggable class and is easily carried from car to office or from car to home. Anyone considering carrying the system much further would be well-advised to take a body-building course before purchase. The case is divided into two by what amounts to a huge false bottom. The phone, computer and printer are all that's visible on opening the case, but underneath the false bottom hides the modem, a large battery pack and an even larger mobile cellular transmitter.

The system comes complete with a mains recharger. Typically the batteries will need recharging after eight hours' use but it very much depends on how the system is used, as heavy use of the cellular bits will drain the batteries very quickly. An overnight recharge will bring the batteries back up to full charge. A cigar lighter adaptor is available to power the system when in a car.

All the intelligence to enable data communications on a cellular system is contained within the modem. The computer can run any comms package you like and the cellular telephone is very much a standard unit.

The modem is a 1200 baud auto-dial, auto-answer unit conforming to the V21 and V23 standards. This modem acts like any other in so much as it codes outgoing data for transmission via radio or telephone lines and decodes incoming data into a form the computer can understand.

The intelligence comes when the modem is switched into cellular mode. For outgoing information, the

modem has a buffer memory that stores the data until it can be safely transmitted. Outgoing information is stored in this buffer until the modem has confirmation that it has been correctly received. If transmission occurred during a re-tune command, the modem simply transmits again.

For incoming information, the modem uses an error-detection system based on the parity of information sent. Any errors found result in an automatic request for re-transmission from the source. Although this system works, at times the number of repeat requests is so great that the information appears on the lapheld's screen slower than an old teletype (less than 110 baud).

To overcome the problem of slowness, TNS has included in the price of the Commscase a subscription to a service called Cellcom. This is a link into the British Telecom PSS network especially designed for use from cellular data comms set-up. The difference between Cellcom and a normal system is that Cellcom adds a much larger amount of error-checking information to every block of data. This enables the modem to not only check the block of data for errors, but in the vast majority of cases it can also correct it (error correction).

Using this system means transmitting a large amount of redundant data, but the reduction in re-transmission makes it worthwhile. The overall effect is to make 1200 baud communications with error correction equivalent to about 300 baud on a normal system. However, this 300 baud throughput is constant whereas the error-detection system fluctuates between 1200 baud and less than 100 baud.

In use

In order to give the Commscase a thorough trial, I placed it on the back seat of my car and used it while driving around Central London. The Central London cellular telephone system is by far the busiest area in the system, and has recently had its number of base stations doubled in an attempt to cope with the volume of calls. An additional obstacle is London's density of buildings which means it is rare to be in a direct line of a base station, so the strongest signal could well 'bounce off' a passing bus. The telephone copes with all this by regularly switching cells, even when the unit is stationary. If the Commscase can cope with Central London, it can probably cope with anything.

My initial problem was nothing to do with the cellular system — I could not get the NEC lapheld to even recognise it had a modem attached. One hour, two modems and two battery packs later I rang NEC in desperation. Apparently there is a bug in

the communications ROM that appears very, very occasionally, which can easily be cured by switching the machine on and off. I had pressed the cold-reset button many times but not once had I switched the unit off; sure enough, after switching the unit off and on, I made contact with the modem. A poignant reminder of the power of the ultimate reset-button — the on/off switch.

After solving the NEC problem I dialled the Cellcom service and got straight in. There is a small menu of seven items upon entering Cellcom which consists of six popular services available via PSS and an exit down to the PSS command line. The seven menu items are: Private computer systems; Telex; BT Gold; One-to-one; Stock Exchange; Hazardous Chemical (that's a popular PSS service?) and the PSS command line.

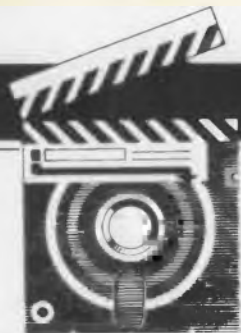
As I absolutely hate the PSS command line and always get the commands wrong, I plumped for the easy option and selected Telecom Gold. (As an aside, when is BT going to do something about PSS? It's such a useful service but about as friendly as the notorious New York cab driver.) After leaving a message on BT Gold and scanning through a newsletter I logged off, all without a single glitch. Most of the time the information keeps flowing constantly but not particularly fast: about once every five minutes there will be a delay of about 10 seconds. Other than this it worked perfectly.

After this I decided to try and access Telecom Gold direct. Using this, the system plods along very slowly and at times does nothing for up to half a minute — very occasionally there is a burst of high-speed data. This seems to be a result of using the system while on the move; when stationary, things are much better.

As the ultimate test of the system I once again logged onto the Cellcom system and headed for a nearby half-mile tunnel. Through the tunnel the system hung on grimly, not receiving data, but still hanging on. Out the other side and there was a spurge of garbage and then sadly a 'Carrier lost' message. Nine out of ten for effort.

Conclusion

At £2200 for the NEC model and at least £3900 for the DG One, you need a healthy bank account and a good reason for launching into the area of cellular data communications. If, however, you need a cellular data system and need it now, the TNS Commscase is available and it works. For the rest of us, the price of cellular phones is coming down, the price of laphelds is still coming down and the price of modems is coming down. In addition, all three are getting smaller. Personally I'll wait. **END**



SCREENTEST

Omnis 3 Plus

Omnis 3 Plus is an easy to use, powerful system for the Apple Macintosh which enables the development of sophisticated systems.

Kathy Lang takes a closer look.

Max file size	160Mb
Max no fields	120
Max digits	11
Special disk format?	
Link to ASCII files?	YV
Fixed rec structure?	Y
Amend rec structure?	CD
Link data files?	Y
No sort fields	9
Max key length (chars, fields)	79,1
Data validation	G
Unique keys	OP
Store calculated data	IN,BA
Store selection criteria	M
>1 criterion/field?	Y
Browsing methods	AF
Reference Manual+	****
Reference Card+	****
Hot-line?	F
Max record size (chars)	ML
Max field size	79
Max prime key length	
File size fixed?	Y
Data types	N,C,D,T,L,F
Fixed record length	Y
stored?	
No data files open	12
No keys	12
Subsidiary indexes kept up-to-date?	UTD
Screen formatting	P
Report formatting	P,D
Totals & statistics	T+ST
Combining criteria	A,D
Wild-code selection?	SW
Interaction methods	M+C,LT
Tutorial guide+	****
Online Help+	***

For a full explanation of abbreviations, see 'Database dossier', page 188, January 1985 issue

Fig 1 Features and constraints

The Omnis family of data management packages has been established in the market longer than most, and is among the handful of database products from British suppliers to have gained wide acceptance. In its earliest form, it was a 'flat-file' (one set of data handled at a time) package for the Apple; since then, it has been implemented on a variety of systems, but until recently under the UCSD-p operating system. The extent to which that system was less popular than CP/M, and its subsequently virtual eclipse on business systems by MS-DOS/PC-DOS, account in large part for the rather low profile that Omnis may have had in the business market. Nevertheless, since the release of Omnis 3, a powerful package capable of handling up to 12 data files at a time, the package has been steadily gaining ground on conventional business systems, its popularity due in large part to the reputation of its suppliers, Blyth Software, for

providing good support both to dealers and to end users.

Last year, as a natural progression from the Apple, Omnis 3 was released for the Macintosh, and has proved a substantial success in the US as well as here, being regarded by many as the most powerful database system available for the Mac. There is now a version of Omnis 3 for the IBM PC running under PC-DOS, and an upgrade of the Mac version, called Omnis 3 Plus, has just been released. Here I shall concentrate on the new Mac version, with occasional mentions for the IBM PC release.

Omnis 3 Plus applications consist of two kinds of file: one or more data files holding the information, and one or more library files storing the 'blueprint' for the data and its processing, including data file formats, entry screen layouts and report specifications.

The package is unusual in allowing

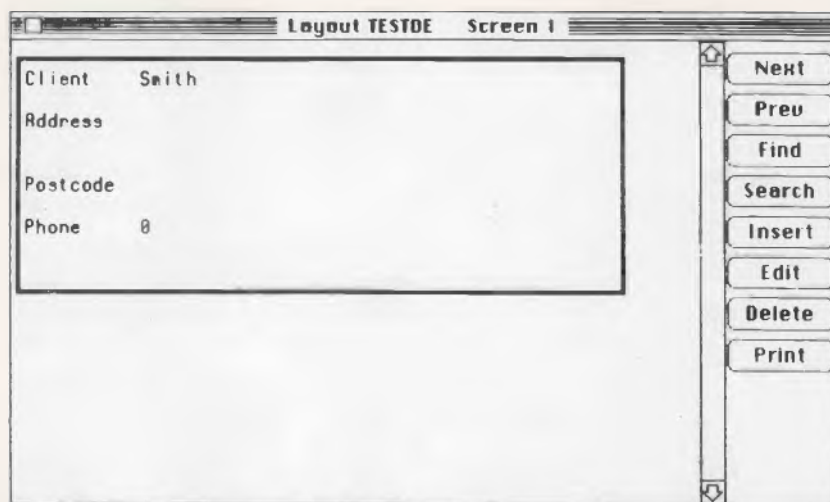


Fig 2 Default menu options on data entry screen

very large files (up to 160Mbytes on the Mac) that can span more than one disk. Up to 12 data files can be linked in an application, though this limit can only be reached if you do not need to use indexes to retrieve records directly other than through file linkages — the limit of 12 is on the total of file linkages and indexes in one application. (More generous limits apply to the IBM PC version.)

It is possible to use Omnis 3 Plus in its 'native' mode, and in that form you have the full facilities of the package available, but they are not specially tuned to your requirements. You can also exploit Omnis 3 Plus's rather unusual approach to building tailored applications. This essentially involves modifying the basic features so that they operate in a way specific to a particular application. Especially on the Mac, where the package exploits to the full the features that make the Mac so easy to use, this approach makes it possible for relatively inexperienced users to build powerful systems, without as great an investment in learning as is necessary with many of the packages that use a full command language.

Omnis 3 Plus is essentially a menu-driven package; a basic set of menus is provided, but you can also construct your own. Throughout, the package is driven in the usual Mac fashion, making full use of the mouse but with keyboard equivalents for the most frequently used functions.

For some people, the fact that Omnis 3 Plus is copy-protected will be a drawback. The approach used is unusual, however; the package is normally loaded either from a working copy of the system disk or from the hard disk, and the validity of your original system disk is checked only occasionally — 'three or four times a month' according to the manual. This should diminish the chances of failure in this area causing serious problems.

Constraints

The main features and constraints of Omnis 3 Plus are shown in Fig 1. Apart from the limit to 12 files plus indexes in one application, the other noticeable constraint is the limit to 79 characters for text fields. In this latest version of Omnis, however, it is now possible to link several character fields together, so that they work as one for data entry, with word-wrap from one to the next. Each field would still, however, need to be mentioned explicitly in a search.

File creation & indexing

The first step in creating a file is to set up a format for it. This includes naming fields and defining their lengths and types, specifying indexes and file connections. At this stage,

Fig 3 Tailored data entry screen showing subset of main options

you must estimate the final size of the file (though it is possible to expand this later); Omnis 3 Plus then sets up a file area large enough to hold the total records envisaged, to avoid the danger of running out of

'Omnis 3 provides a good compromise between ease of use and powerful facilities ...'

space later at a critical moment. The second phase involves creating one or more entry formats for the data file.

Data entry & updating

Data is entered interactively through entry formats. These are created through a paint-a-screen process, in which you may create a maximum of 12 screens for an entry format, including references to up to 12 files, and a maximum of 120 fields. If the format spans several screens, you can scroll through them using the Mac slider and scroll bars.

The normal case is for one record from each file to be displayed in an entry layout. In some circumstances, you might want to display several records from one file, perhaps to show all the records about the children of a household, alongside a single record containing information such as the address and other data which is the same for each child. To cope with this situation, Omnis 3 Plus provides a temporary array, stored in memory only, into which a group of records can be read before display, and from which the file can be updated after editing.

Omnis 3 Plus provides a wide range of attributes to be used with data entry fields. These include the ability to attach a message to a field, to calculate its value, to supply a default value, to protect its contents from deletion, and to make a field invisible or display only. An indexed field can be checked to ensure unique values; other kinds of data validation are also possible, through checking features that are also attached to the entry format. Putting these checks on at this stage, rather than on the file format specification,

Fig 4 Defining the file format



SCREENTEST

Records can be selected and sorted, with the specifications being

'(Omnis 3) has been steadily gaining ground on conventional business systems...'

included in the report specification, or entered when the report is produced.

Selection & sorting

Direct record retrieval is possible through any indexed field when en-

tering or amending data. To select one or a group of records on other fields, you must set up a search specification first. This allows field comparisons using relational operators (greater than, less than, and so on) and checks for text fields starting with or containing specified characters. Each pair of tests can be combined with AND (both must be satisfied) or OR (either condition must be met), but you cannot use brackets to change the order of evaluation, so you have to be careful to get the tests in the right order. This search specification can be used to select records for amendment or display through entry formats, or for display, printing or storage in a disk file when allied to a report specification.

When individual records are retrieved through an index, the 'next' and 'previous' commands allow you to browse through the file in the order of that file. For reports, you can choose to sort on up to nine fields, with sub-totals at each level if you wish; sort order may be ascending or descending, and for text fields may use either the current file values, or upper-case conversions of

does oblige you to repeat the checks if you have more than one entry layout that can update a particular file.

To locate records for amendment, you have several options. An indexed field can be used to locate a record in two ways. You can invoke the Find option from a menu, and then enter a value in an indexed field. Or you can designate an indexed field as 'Autofind' when the data entry layout is defined; in that case, when editing records, Omnis 3 Plus will automatically put the cursor on that field and retrieve the record matching the value you enter, without having to invoke the menu option explicitly. If you want to edit a record or a group of records using a search on fields that are not indexed, you can use the general selection mechanism to set up a search format and then invoke it from a menu.

Records can also be updated in a batch, by modifying the commands available at data entry to give repeated modification of all or selected records.

Screen display

The entry layouts used to permit data entry can also be used to display individual records. In addition, any report can be sent to the screen as an alternative to the printer, and it is this method that you would use to show *ad hoc* lists of selected records and fields.

Reports

A frequent criticism of earlier versions of Omnis 3 was the awkwardness of the reporting facilities. In the new version, these features have received a major revamp, and reports are now much easier to set up, as well as providing a good range of features.

A report specification defines, mainly using paint-a-screen methods, the layout of a report, which may be up to 240 columns (40 fields) wide by 240 specification lines long (the length of the report itself depends, of course, on the number of records included). The record specification can be repeated across the page, to allow you to set up label formats. The information may be drawn from up to 12 files; where the data file contains abbreviations for common items (such as M for male or DP for Data Processing Department) you can set up a look-up file containing full captions for the abbreviations. The full range of Mac fonts can be used.

If your needs are simple, there are default formats allowing either one record per line or one field per line. These can be used to print reports about all fields in a file, or a range of adjacent fields.

BM1	Time to add one new record	3 secs
BM2	Time to select record by primary key	2 secs
BM3	Time to select record by secondary key	2 secs
BM4	Time to access 20 records from 1000 sequentially on three-character field (same field as in BM2 key)	3 secs/3 secs
BM5	Time to access record using wild-code	3 secs/3 secs
BM6	Time to index 1000 records on three-character field	5 mins+
BM7	Time to sort 1000 records on five-character field	NT
BM8	Time to calculate on one field per record and store result in record	10 mins 20 secs+
BM9	Time to total three fields over 1000 records	4 mins 45 secs+
BM10	Time to add one new field to each of 1000 records	12 mins 45 secs

Time to import a file of 1000 records: 10 mins 35 secs

Notes: NT = Not tested; NP = Not Possible; += including scrolling, calculated for 200 records

Where two times are given, first is access to first record, second is access to each subsequent record

Fig 5 Benchmark times recorded on a Mac/F

Fig 6 Defining a field in an entry screen

them (useful where people have been inconsistent about data entry). The precise sort order of text fields also depends on whether they are defined as character (in which case the ASCII sort sequence is used, with, for instance, all capital letters sorted before all lower-case letters) or national (using the national character set defined in the Macintosh system file, and letters are sorted in order ignoring the distinction between upper and lower case).

Calculations

Fields can be calculated on data entry, or in reports, using field values and constants; a good range of functions is provided in addition to the usual arithmetic operators.

Multiple files

Links are set up between files when the files are created. Direct linkage is possible where the connection is to be one-to-one (a record in the 'parent' file relates to one, and one only, record in the 'child' file) or one-to-many (where one 'parent' record may be linked to one or more 'child' records). Where several records in the 'parent' file may be linked to several records in the 'child' file, you must create a link file, with connections to both parent and child. In that case, though, only two true data files are involved. Omnis 3 Plus needs three files to make the connection, and all three count towards the max-

imum of 12 files/indexes allowed in one application.

Tailoring

Omnis 3 Plus takes an unusual approach to producing tailored applications. The method is to allow you to modify the basic features of



Fig 7 Defining your own pull-down menus

the package; for example, you can restrict users to a subset of the possible options on data entry, and modify permitted options to include facilities specific to the application. Fig 2 shows the default set of options, while Fig 3 shows those for a tailored application.

You can create menus to allow less experienced users to access particular functions direct. Included in the

additional statements that you can enter are simple conditional expressions, and the ability to test flags for the result of preceding operations. Memory variables are not supplied directly, but you can use a data file to contain temporary fields, and arrange for them to be read into memory before an entry layout is processed.

Security & housekeeping

Basic housekeeping tasks, such as file reorganisation and re-indexing, can be carried out within Omnis 3 Plus. Files can be protected with passwords, and these can be encrypted — not as universal a feature as you might hope!

Links with outside

Omnis 3 Plus allows the import and export of files in six different formats, from the DIF format used by many spreadsheets, to simple ASCII formats using commas or carriage returns to delimit the records.

User image

Omnis 3 Plus is well integrated into the Mac approach, using the mouse and pull-down menus, and allowing you to modify menus and the operation of user commands. For particularly common functions, such as Insert during data amendment, you can use a key sequence instead of invoking a menu option. Screen and report formats are created by paint-a-screen methods, and the mouse is a big help in this kind of task. The 'temporary array', used when displaying several records from the same file in data entry, I found rather difficult to come to grips with.

Omnis 3 Plus's features are described clearly in the documentation — the tutorial manual, which does a thorough job of teaching about the basic features, and a reference manual. This begins with an account of the overall approach used by Omnis 3 Plus, a welcome but unusual inclusion, and then explains the operation of each feature in detail. The distribution disks include a representative set of examples.

Conclusion

Omnis 3 Plus provides a good compromise between ease of use and powerful facilities: the approach of providing a standard set of features which can be modified as your needs and understanding grow has a lot to recommend it. The Mac lends itself to implementing the approach in a helpful way.

The constraints of the Omnis 3 Plus approach mean that its facilities will fall short of those needed by some system developers, but for others, and still more for ordinary users wanting to build quite sophisticated applications, Omnis 3 Plus is well worth a close look. **END**

Summary

Supplier:	Blyth Computers Ltd
Telephone:	(0728) 3011
Cost:	£445
System:	Macintosh
Version reviewed:	Macintosh
Type:	N.S
Features:	Up to 12 data files in one application, fixed length records. Powerful data entry and reporting features, tailoring of features to provide simple but powerful application development including user menus. Closely integrated with Mac features.
Drawbacks:	Combined limit of 12 data and index files. Need to store search sequences.
Ease of use:	Good: well-designed menus, use of mouse in designing screens, initial features used as-is or tailored.

Package Cost (£) Summary

MacLion	379	Powerful relational system for Mac, using icons, menus and mouse, and allowing system developers to use them through complex Leo programming language. Simple to use at basic level. Most suited to compact records holding mostly numeric data or dates.
Paradox	550	Table-based system for IBM PC; many similarities to 1-2-3. Tables can be related. Good querying and reporting, powerful command language. Keeps data in memory if possible: speed on larger tables should be checked. Easy to use at basic, menu-driven level.
Omnis 3 Plus	445	Probably the most powerful data management system for the Mac. Allows development of sophisticated systems using simple methods, well-integrated with Mac approach. Permits 12 data files open, fixed-length records. Powerful screen layout and reporting.

Fig 8 Comparison of similar data management packages

End of term report

George R Bedford updates us on the Government-backed programme to put the UK in the lead in Information Technology.

About four years ago the Japanese announced their fifth-generation computer project. The intention was to produce computers capable of making decisions on data presented to them, in order to use logic and relationships to make deductions. Panic resulted in the West, as many countries visualised the Japanese dominating the computer industry as they have done with integrated circuits. In the UK, a committee headed by Mr John Alvey was set up to consider how the UK should respond. This committee recommended that the UK too should start a fifth-generation project: without this, it was considered that the UK IT industry would have little chance of competing in the 1990s. In 1983 Government support was forthcoming, and our non-interventionist Tory Government decided to become involved. The Alvey programme was born with the brief to spend £350 million over five years.

Projects

The report identified four main research areas, with a fifth touched on later. In addition, funds were allocated for so-called demonstrator projects that were intended to provide real test beds for the technologies being developed. The original topics were: VLSI — Very Large Scale Integration (more powerful chips); software engineering — software methodologies (making software more a science than an art); IKBS — Intelligent Knowledge Based Systems (so-called expert systems); and MMI — Man/Machine Interface (how people interact with computers).

The fifth topic was Architectures — computer organisation.

Two topics which were not tackled, although some would have liked their inclusion, were Storage Technology and Communications.

There is a strong case for arguing that the next generation of micros will be characterised by the vast storage capacities they will have due to the development of optical storage techniques. Similarly, networks of many kinds are becoming realities and their impact cannot be ignored.

VLSI

It was realised that the fifth-generation computer would require much higher performance computing than is possible with currently available chip technology. This is a massive field of research and in fact illustrates one of the Alvey programme's problems — even with £350 million and restricting the topics to be covered, educated guesses have had to be made.

The Alvey programme is also integrated — if the high-speed computers envisaged do not materialise, then other parts of the programme cease to be feasible — or have to use technologies developed elsewhere. Accordingly for VLSI (all these acronyms add to the problem of understanding what these projects are about) the work is concentrated on silicon technology. No resources were allocated to some types of semiconductors, computers or even the much-publicised possibilities of biological materials.

The VLSI programme provides for technology to be developed which increases the density of circuits that can be placed on a given piece of silicon. As circuit elements get smaller, processing speed increases and power dissipation (the amount by which chips heat up) decreases.

The UK electronics component industry as a whole missed out on the massive growth of the 'silicon chip' industry, with most UK companies involved in production of more specialised chips. Inmos is the only UK volume chip maker and has had a chequered and well-publicised history (but that's another story).

We are moving into an era where it is more and more economic to produce chips tailored to an application. Of course, general-purpose chips will keep their importance but chip development costs are likely to fall. The effects of successful developments in this part of the project will be seen more in dedicated speech or image processing chips rather than in terms of new microprocessors or higher-density RAM chips.

The other part of the VLSI prog-

ramme is a related CAD (Computer Aided Design) programme. As the density of chips increase, it becomes more and more important to be able to automate the design process.

As with other parts of the project, the investment in VLSI ducks the question of how does a company, even if it has the technology, get into the markets to exploit the technology against entrenched competitors?

Software engineering

A great deal of resistance exists against 'software engineering'. One of the situations all software people run into is the 'Oh no, not again' problem. You have written something similar before — do you take the previous code and rehack it, or start from scratch? Many programmers seem to believe that 100 per cent reliable software is impossible and therefore shy away from systematic and rigorous testing — they put a system in and hope that the user finds the problems.

Software engineering is a set of ideas intended to improve software: specification, reliability, quality reusability, and the prediction of development timescales.

It is clear that these things are extremely important to the future of the IT industry and to software firms themselves. If you know how much it's going to cost to develop and what it will do, you can make better commercial judgments.

The Alvey project software engineering section includes a number of research projects and a major development thrust, IPSE (Integrated Project Support Environment).

Initially, Unix is being used as the basis for the development of such a system, although the plan is to end up with an environment that is independent of programming language and operating systems.

Again, another problem is illustrated. A US-produced operating system has been chosen rather than a UK one such as Tripos or Mirage. Unix was the safe choice, of course, and popular with academics, although it has not taken off yet for business systems. A strong IT indus-

try inevitably requires strength in all major areas, and therefore the Alvey selective approach may leave advanced sectors high and dry without supporting IT technologies at the necessary level.

IKBS

IKBS is aimed at opening a whole new range of problems for computing to tackle. Using conventional programming techniques, the problem to be solved has to be totally described in a formal way. By analysing the problem appropriately, the program that follows results more easily. Bugs arise whenever the logic is not fully worked out and the case never planned for occurs.

The IKBS programme is concerned with, in the jargon, 'symbolic processing'. To get a good idea of what's involved, take a look at the programming language Prolog. It allows relationships between things to be specified in a simple one-to-one way — 'Jim is (father of) Henry' — with the more complex relationships being built up from the simpler ones. The language is designed to handle relationships.

The IKBS programme has also involved major demonstrator projects and the formation of clubs. These are meant to set up links across the narrow topics being researched. The clubs set up are:

Knowledge-based systems:

- Expert systems
- Intelligent front ends
- Intelligent computer-aided instruction

Logic-based environment:

- Declarative languages
- Inference and knowledge representation

Declarative architecture:

- Parallel architecture
- Intelligent database systems

Speech and natural language:

- Natural language

Vision:

- Image interpretation

It will be clear that the IKBS programme is the key to the programme, with the other parts of it directed to make the implementation of whatever is developed feasible on real systems.

The IKBS field is thought to be short of manpower to allow the application of techniques outside of research and academia. The future of Alvey II is to some extent already being pre-empted by claims that everyone knew it would take at least 10 years before IKBS would have any significant impact on industry. Therefore, the five-year programme must be followed if this impact is to occur.

This seems to suggest some doubts. Surely, once the tools and

knowledge are available and have been demonstrated (that is, by the demonstrator programs themselves) industry will see it in its own interest to develop IKBS? However, we can hope that the present Government will react negatively to 'institutionalised' research, which is more research in an area simply because past research has gone into that area, and not on the merits of the potential outcome. No-one had to do an Alvey programme to convince all the microcomputer companies in the US in the middle seventies that there was potential in micros. Of course, it could be argued that it would have been necessary to convince the big boys of the industry at that time — IBM, ICL, DEC, and so on. One wonders whether it's in the nature of the established companies to get really involved in radical fields unless a bunch of smaller companies have already shown the way.

Man/Machine Interface

This part of the programme has been split into four distinct areas without too many links between them. They are: the human interface (HI); speech processing (SP); image processing (IP); and display technologies (DT)

HI — When running programs on your micro, you will know how the display they produce and how you work with it varies significantly. On many games, for example, it is clear very quickly what you have to do — which button for fire, which one to move the cursor up, and so on, and the manual may be a simple sheet. Some of the business programs have multiple volumes of the massive IBM-style boxed tomes; some programs are learnt very quickly while some are not. Independent of the type of program HI is concerned with, is how to design programs to make them easier to use and understand. Of course, there is another approach to this problem — improve the user's general level of understanding. Nevertheless, whatever your level of understanding, improving the human interface of programs is a non-trivial job.

There is no doubt that once we learn how to present the HI, the whole computer industry will benefit.

SP — The speech programme is concerned with both input and output. We are probably all familiar with the current standard of output which is readily recognisable as machine-generated with an American accent. The belief that future products may be speech-driven gave SP a priority as an enabling technology. Personally, I would rather see more effort going into handwriting recognition and the ability to directly input with cursive script: can you imagine working in an office where people are continually talking into machines to get their reports typed (or entering

programs or any text) — pass the headache and throat pills! Topics were identified for research which, in a way, illustrate the current limitations of speech technology. These were: Output — intelligibility, acceptable stress and intonation, and selectable accents including male and female voice; and Input — high reliability, even in hostile environments (like an office where everyone else is talking), continuous speech, the ability to work with different accents, able to attune itself to different speakers, and a built-in vocabulary in excess of 1000 words.

Displays — It is clear that current screens are not ideal. The Alvey programme calls for an A4-sized flat screen display which is touch-sensitive. One wonders how many other organisations ranging down in size from IBM and AT&T have set their research labs the same target. If they build-in touch-sensitivity with a high enough resolution, then the device would be my ideal written input terminal.

Image processing — Turning images into truly computer-usable data is an enormous task, but one with potential massive commercial rewards to those successful. Equipment is available for the typical PC which will allow a video picture to be displayed on its high-resolution graphics screen. However, even doing simple things like deciphering the serial number printed on the side of a box is no mean feat. Also it is clear, from the analogy with human vision, that the data processing needed is not entirely of the 100 per cent logic type. Inference and deduction also figure.

In other words, the two areas are: high-speed computing to work on the data; and intelligent software to see the wood from the trees. Examples of markets identified are: visual inspection (such a tedious task for people); bin picking; robotics; medical applications; and remote sensing.

Architecture

Computer architecture is concerned with the way things are organised, rather than with the individual implementations of hardware or software. The Apple II has a very simple architecture — everything revolves around a 6502 processor. The IBM PC has a single microprocessor, but it also uses DMA (direct memory access) processors and an optional, additional processor, the 8087, dedicated to numeric work.

Computer architectures were an add-on to the original project, and projects were looked at in terms of the other main area.

The keyword in the Alvey look at future architectures is 'parallelism'. This means organising the computer's resources so that jobs can be running simultaneously — in parallel.

It ceases to be feasible to make computers more and more powerful by just increasing the power of the central processor. The 6502 processor used in the Apple II or the BBC Micro runs at 1MHz (although faster versions are now available), the Motorola 68000 microprocessor runs at 10MHz, while the VAX processor runs at 40MHz. It isn't possible to just crank up the speed; the parallel approach is all about increasing power by adding more and more processors.

Unfortunately, with conventional micros this isn't easy: the processor must be designed with parallelism in mind — enter the Transputer from Inmos, supported by the Occam programming language. The key architecture project is called Flagship and involves a prototype large Transputer array as a parallel computing test bed. Inmos is now shipping Transputers, and we will soon start to see concrete results emerging. If the Transputer is the way forward, and many people besides Inmos are betting on it, the centre of gravity for micro development will suddenly be the UK rather than the US or Japan.

Demonstrators

The demonstrator projects have been allocated 10 per cent of the overall budget and are meant to act as test beds for the key parts of the technologies being developed. 'Pull-through' is the phrase used for the encouraging effects these projects are meant to have — a method of smoothing the way to exploitation of the work done.

Large companies were invited to put up proposals and a short list of seven was evaluated in detail. Four were finally selected as follows:

Design To Product Demonstrator The concept is a system for designing small mechanical parts from which design information can be directly transferred to automatic manufacturing equipment. It is really futuristic: the engineer sits at his terminal, and sketches a part to be produced. The system helps him by interpreting his instructions. He presses the 'go' button and a robot and machinery spring to life, absorb his design and produce the part. It is part of the 'flexible manufacturing' approach that the Government is so keen on. In the past, efficient volume production lines were inflexible and were designed to produce a single article. In the future, they will be able to efficiently produce small numbers of different articles. The actual demonstrator project doesn't go that far, but that's the aim.

There seems to be no indication that discussions have taken place on the implications of this kind of tech-

Total spent:	£350M
Government	£200M
Industry	£150M
Program start and duration	1983 Five years
Number of companies participating	60+
Number of projects	241+

Fig 1 Alvey overview

nology coming to fruition. As you will see from the next two demonstrators, three out of four will result in almost total displacement of human workers — in factories (design to product), in bureaucracy, and professions (DHSS) and offices (speech input word processor). Perhaps we will all be able to retire at 40? You may have thought that the IT jobs crisis mongers were going over the top, but these demonstrators are meant to produce commercial systems for the 1990s.

ICL/DHSS demonstrator This demonstrator is intended to show how fifth-generation computers can help in large organisations. Instead of reading and trying to interpret regulations, 'decision support systems' are to be used; no doubt a short step follows to 'decision-making systems'. One wonders if computer-based decisions will be more consistent than human ones. Does 'fuzzy logic' and machine inference imply that two computers, with a different set of cases providing their experience, over a period, will make different decisions?

The project will look at Supplementary Benefit payments. If fifth-generation systems put more people on the dole, it is surely appropriate that they help dole out benefits.

Speech input word processor and workstation The aim is for systems that can accept speech and display it as text on the screen ready for editing and printing. A substantial market lead is to be developed, giving, it is hoped, a world leadership position. The industrial participant is Plessey — not well-known for typewriters, word processors, printers or computers.

The project is ambitious: a large vocabulary with the computer understanding the English language sufficiently well to identify ambiguous words by context; and a desktop fifth-generation computer.

As indicated above, I would prefer to have a flat screen to write on, rather than talk all day to a machine. But Alvey seems to think that's what our future office worker ought to do! (If you compare the speed of speech with the speed of writing, you can understand why — Ed)

Mobile information systems demonstrator This project is really

aimed at increasing the efficiency of our transport system. Via terminals fitted to vehicles, you will be able to get local traffic information and route guidance while the boss can know where everyone is. Also included is a 'mobile electronic office' project — Alvey reckons that £1.7 billion can be saved by use of traffic-responsive route guidance systems.

Conclusion

How does one evaluate such a massive and diverse programme? A severe case of national 'NIH' syndrome (Not Invented Here)? A plot by the devious Japanese to divert all our best brains while they clean up in the here and now? A symptom of almost a racial UK problem — great inventors but lousy exploiters (at least in this century, not in the last?) Another Concorde? A plot to get hold of most of the Government's IT budget by the big companies? One wonders if the planned object — this fifth-generation computer — is really desirable, never mind attainable.

The comparison has been made with Concorde, but one major difference stands out. Many of the research projects and technologies being developed stand up in their own right. If the fifth-generation computer *à la* Alvey turns out to be a kind of quest for the Holy Grail, then the individual bits — improved VLSI technology, software engineering, speech recognition, and so on, could well be exploited in their own right. Exploitation will remain the key. A lot of background manoeuvring has gone into 'Intellectual Property Rights' (IPR): in other words, who ends up owning the software ideas or techniques of the technical solutions that come out of the various projects?

In purely academic research the end result is normally the publication of results — and their exploitation is up to anyone. Although much public money has gone into Alvey, the IPRs will belong to the participants of each project. If they do not exploit them, then it's unlikely that anyone else will be able to — they wouldn't even know what was developed.

Large, British IT companies have not shown themselves very able to exploit new technology. Will Alvey just result in a lot of valid research, ideas and potential world-beating products gathering dust on the shelf at GEC, Plessey, Ferranti, STC and the other large Alvey participants?

The Alvey Newsletter and other publications, including the annual reports and project posters, are available from Alvey News, IEE, PO Box 8, Southgate House, Stevenage, Herts SG1 1HP.

END

MOVE UP TO TODAY'S RAZOR...



The combination of the latest blade technology and a unique razor design from Wilkinson Sword delivers the ultimate **Profile** shaving experience.

In a recent survey* we tested **Profile** Swivel and **Profile** Fixed razors amongst users of the major competitive brands* – over 60% preferred Wilkinson Sword **Profile**

AND GET £1 BACK ON YESTERDAY'S

Now here's your chance to try the Wilkinson Sword **Profile** Swivel or **Profile** Fixed shaving system and get £1 back in exchange for your old razor.

Promoter: Wilkinson Sword Ltd.,
Langley Hall, Station Road,
Langley, Slough, SL3 8BZ.

Simply purchase a Wilkinson Sword **Profile** Fixed or Swivel razor and return the backing card together with your old razor handle (handle and blade system only – see qualifying rules) to the address below by 30th November, 1986 and we will send you £1.



Profile®



* Independent Research January 1986

To: Move Up to Today's Razor,
Wilkinson Sword, P.O. Box 581,
Birmingham, B6 7ER.

I enclose a **Profile** Razor backing card from **Profile** Fixed ☐ or **Profile** Swivel ☐ (please tick) and my old razor handle in exchange for £1.

Name: _____

Address: _____

Qualifying Rules ★ Claims must be accompanied by a Wilkinson Sword **Profile** razor backing card. ★ Claims will only be accepted if they are made on one of these special forms. ★ Claims will only be accepted if accompanied by an old razor. ★ This offer does not apply to disposable razors. ★ Offer only open to U.K. residents. ★ Only one claim per person. ★ Wilkinson Sword reserves the right to reject any claim which it believes is not in accordance with the terms of this consumer promotion. ★ Please allow 28 days for delivery. ★ Offer closes 30th November, 1986.

THE 9th PCW SHOW

On with the show

Roll up, roll up for the best computer show in town. Olympia is the stage for the 9th PCW Show, which promises to be an information-packed event. See you there!



It's showtime again and this year looks like being even better than ever. The Personal Computer World Show is absolutely unique in that it really does offer something for everyone. Whether you are a business buyer, a hobbyist, a teacher or a DP professional, you will find plenty to interest you at the 1986 PCW Show. Make a note in your diary that the show is open to the public from September 5-7. Trade, professional and business visitors may also come along on the 3rd and 4th. As usual, the show will be held at Kensington Olympia, with the business exhibition in Olympia Two and the general exhibition in the adjacent National Hall.

Features

The PCW Show isn't just an exhibition of computer companies and their wares, it is also a chance for PCW readers to meet the editorial team, to get their questions answered by experts and to visit the special interest features. It also happens to be one of the best annual meeting places for the personal computer trade, especially on the first two days.

Among the special interest features in the business hall we have a full scale 'desktop publishing set-up' in action. Everything from data capture, through image digitising, page make-up and final printing will be demonstrated on a continuous basis. In fact the show news, which goes to every exhibitor daily, will be produced here. This feature is being run by a team from Bristol Office Machines and Clue Computing using Hewlett Packard equipment.

Over in the National Hall, Boots (yes, the chemist) will be showing the top twenty games on a wall-sized screen. The Amateur Computer Club will have its usual corner, packed to the gills with enthusiastic amateurs all willing to talk shop. PCW staff will



'I'm not really interested in computers — I'm just lonely.'

be on hand to answer your queries and to generally get to know you. Don't be afraid to go up to the PCW booth and chat; that's exactly what we'll be there for. PCW Online will be running and you will be able to see for yourself the potential of this tremendous system. You may even want to chew over ideas you have for articles or programming features. You'll be more than welcome, we promise.

Of course, there's much more. Back in Olympia Two, the Open University will be showing films of expert systems in action, solving real business problems. We have experts from the NCC and its Federation of Micro Systems Centres offering advice and guidance on your computer-related business problems. And Aslib will be there too, showing you how to access and use online information services.

Atari

We've talked about the National Hall and Olympia Two but there's an area between them which could almost be billed the Atari Hall. This huge area will be open to all visitors to the show and will be, in effect, a village

full of companies, 80 in all, who are supporting the Atari product range. Of course, sitting in the centre will be Atari itself.

The choice

The PCW Show is the one event in Britain where you can see every conceivable type of personal computer from the smallest, cheapest games machine to the most expensive multi-user departmental system. The same goes for software. If you are wondering what hardware/software combination to buy, then you are unlikely to find another exhibition which allows you to examine so many options. PCW is very proud of its show because we see it as a genuine service to our readers.

For those who want to look at the tried and tested products, they'll be there in force. Those who are more turned on by leading edge developments will not be disappointed either. If last year's show is anything to go by, a high proportion of exhibitors use the PCW Show as an excuse to launch their newest and most exciting products. In fact, we hear rumours of a particularly good value for money PC clone from an exceedingly well-known British personal computer company. Of course we can't say who, or give you any product details. It would be fair, though, to suggest that this particular product will probably blow your socks off!

Are you interested in educational computing? The education community is gathered together in its own village up on the gallery of the National Hall. This saves a trek round the entire show winking out the relevant booths.

We look forward to seeing you there.

A definitive list of exhibitors was not available at the time of going to press, and the index below contains editorial entries which arrived before our press deadlines. You are advised to consult the Show catalogue for a full list of all the companies represented.

PCW Show information

Dates:	3-7 September 1986 (3rd and 4th are Trade, Business and Professional visitors only) (5th to 7th open to all)
Location:	Olympia, London
Times:	10am-7pm daily (Sunday till 5pm)
Tickets:	Advance registration, contact PCW Show, Ticket Office, 11 Manchester Square, London, W1M 5AB. Telephone: (01) 487 5831. Please enclose your cheque or postal order made payable to Montbuild Ltd if appropriate.
Travel:	Nearest underground station The Olympia Centre via Earls Court on the District or Piccadilly lines for special PCW trains throughout the show. You can also catch trains direct to Olympia from the south and the Midlands.

THE 9th PCW SHOW

OLYMPIA 2

Advance Electronics Limited

Advance has recently extended its range of AC power conditioners to include the electronically-controlled BSC series. The BSC is a significant advance in power-conditioning technology and will be launched at the PCW Show.

Ajwad Ltd

The Ajwad-AT Turboplus will be demonstrated at the PCW Show. This multi-station system is built around four custom chips which replace around 97 ICs. Also on display will be the Ajwad Speed Card, enhanced graphic adaptor cards, monitors and a D-link card — the most cost-effective, easy-to-use LAN for the IBM PC/XT/AT.

American Research Corporation UK

ARC UK has a line of IBM-compatible PCs of exceptional and proven ability at prices that are well below the market leader. The company will be launching *The World*, a £499 IBM PC/XT compatible transportable, at the show, which boasts excellent expansion capabilities.

Apricot User

Apricot User is designed to cater specifically for owners and users of Apricots. It offers its readers advice on new applications, peripherals and add-ons, information on how to get the best from their machine, and the latest news affecting the Apricot market. Issues and subscription details will be available on the stand.

British Telecom

Telephones, answering machines and accessories will be on display on

the British Telecom booth. Particular emphasis will be placed on the *Kingfisher answerphone*, with its remote control and 'message memo' facilities. Make sure you see the advanced *Venue 24* telephone and the popular, low cost *Freeway* cordless phone.

Budgie Office Products Ltd

Budgie has become established as a supplier of quality computer support furniture. All units are finished in the same cream laminate and all are compatible in terms of height and dimensions. Other items of interest include units to control the air and atmosphere of the office/home.

Cherry Electrical Products Limited

Cherry will be showing its *A3 Graphics Tablet* which can be used to provide digitising input to most PCs. The Cherry digitiser comes complete with pen, puck, power supply and interface lead ready to plug in and use.

Cherry will also be displaying its standard range of IBM-compatible keyboards.

Comart Computers Ltd

Comart will give the first public showing of its new *Quad* (reviewed in this issue) — a high-powered, low-price, multi-user system that requires no configuration. A 20-terminal system will be on show, as well as the facilities for linking IBM PCs and ATs or compatibles into a *Quad* network.

Computer Bookshops Ltd

An extensive range of books about the Amstrad machines will be the highlight of CBL's stand at the show, covering *Locoscript*, *WordStar*, *Supercalc*, *CP/M+*, *dBasell*, *Mallard Basic* and *GSX*.

Don't miss the bargain bookshelf

where damaged returns are sold off at truly ridiculous prices!

Computer Frontier (UK) Ltd

Crossing the frontier will be the *Tava Flyer*, one of Europe's top-selling IBM-compatible portables. The *Tava Flyer* is the only briefcase computer offering 20Mbytes of integral Winchester disk storage, and providing the power and processing capability of a desktop PC with a full specification keyboard.

Computer Terminal Services

CTS is the only independent Qume third-party maintenance company operating in the UK, and was appointed from over 2000 companies. Service can be offered on a 'time and material' basis or on 'return to depot'.

The company has been approved by many other manufacturers, such as Epson, Tulip, Wenger and Siemens, and service of the very highest standard is assured.

Connexions

Connexions is now established as the No 1 manufacturer and supplier of computer cables, data switches, interfaces, testers and protectors. Featured at the show will be the increasingly popular moulded cable range and the best-selling range of data switches.

Cumana Limited

Cumana will be exhibiting its new series of floppy disk drives incorporating improved design features and emphasising a commitment to safety and reliability.

Astron Card memory devices will be demonstrated in OEM and micro applications, illustrating the ease with which they may be adopted by industrial or home users alike.

C/WP Computers

C/WP will be showing its new range of *Cortex* low-cost computers, compatible with all industry standards. The 286 is fast and suitable for network servers while the *Plus* is perfect for office/educational use.

Also on sale at the stand will be accessories such as disk boxes, stationery and cleaning kits, from £3 incl VAT.

Data Tech GmbH

Data Tech will be exhibiting its range of German-made disks as well as new hardware accessories at the show.

Direct Technology Ltd

On display will be Direct Technology's award-winning software package *Automator mi*, billed as the first software robot for personal computers. This unique piece of British software will be of special interest to anyone involved with the micro/mainframe environment, remote data capture or interactive training.



Atari will be holding court in its own huge, well-attended arena

Durell Software

Durell Software will be releasing two new games at the show, *Thanatos* and *Chain Reaction*, as well as showing previews of *Sigma 7*, *The Vikings* and *Saboteur 11*. These sophisticated arcade-type games feature the brilliant graphics associated with Durell, together with many new programming techniques.

Formica Limited

The *Static Master* dissipative pad is the solution to the problems of user-generated static discharges into microprocessor-controlled equipment. It comes in two sizes and colours and is placed under the equipment. By touching the pad before using the computer, any harmful static is drained away safely via an earthing lead.

Haba Systems Ltd

Haba Systems Ltd is showing *Window*, a window-based word processor for MS-DOS PCs which allows the editing of up to four documents at once, and also the *Habaword* word processor for the Macintosh which allows multiple column editing of both text and graphics.

Iansyst

Fluent typing is an essential skill in the computer world, so why not take a look at Iankey's *Typing Tutor* packages? And for programmers Iansyst will be introducing its new *Variables In Context Analyst And Reporter*, or *VICAR* for short.

KGB Micros

KGB will be showing the latest version of *Autocad*, the worldwide, best-selling computer-aided drawing system, and is able to provide a full range of services including installation, consulting and training for the engineer, designer or architect.

The company is also an authorised dealer for IBM and Compaq machines.

Kewill Systems PLC

Kewill is the author of, and will be demonstrating its latest release, Version 3.20 of *Micross*, the manufacturing system software which can be linked to *Micross CAD/CAM*, *Micross Ease* and the *Omicron* range of accounting software. The new *Micross CAD 2D* design and draughting system will also be on show.

Lez Peranto Limited

Lez Peranto Limited will be launching its Spectrum 48k home study kit for the international language *Esperanto* which celebrates its centenary next year. An audio and a computer cassette provide an introduction to this 'No exceptions' model language which should preface all language study.

Lightning Distribution Ltd

This leading national distribution company with its own chain of shops will be showing a broad selection from its product range. The entire Amstrad range will be there, along with leading games and business



A solution for every business problem will be exhibited by Apricot

software. Sinclair's 128k Spectrum will be there and, for the musically inclined, some Casio keyboards.

Maxell (UK) Ltd

Maxell will be launching two new products to coincide with the PCW Show. They are the *MF2-HD* large capacity 3½in floppy and the 2½in ultramini.

Maxell will also be heavily promoting its new 6.5Mbytes 5¼in disk.

Merlin Gerin

Europe's largest manufacturer of uninterruptible power supplies will be showing the *Micropac PC* which protects micros from programming errors and corruption caused by power supply fluctuations.

Merlin Gerin will also be showing its full range of line conditioners (up to 5000VA) and uninterruptible power supplies (up to 4000kVA).

Microdealer International Ltd

Microdealer will be using the PCW Show to further underline the excellent service and high-quality products upon which the company has built its reputation.

Overseas retailers, in particular, will be encouraged to visit the Microdealer stand.

Micro Decision

Micro Decision is a VNU publication designed to provide information guidance to business and professional users, and first-time buyers. Experts on the stand will be available to give advice and direction to business visitors.

Microguard Computer Power

The Microguard range of computer power protection equipment includes CVT line conditioners and uninterruptible power supplies (UPS) up to 10kVA.

If mains power is a problem the company can offer ex-stock or customised equipment and a full survey

and advisory service.

MicroPro

MicroPro's *WordStar* is widely accepted as the industry standard for word processing software packages. The company now caters for most sectors of the market and a wide variety of operating systems. These include *WordStar 2000*, *WordStar 2000 Plus*, *WordStar Professional*, *WordStar Easy*, *Pocket WordStar* and *Superscript*.

Miracle Technology (UK) Ltd

Miracle Technology, the award-winning modem manufacturer, will be launching its new Hayes-compatible, fully upgradable, internal modem for the IBC PC and clones.

A new data comms video will also be on show, and visitors to the stand will have a chance to win the new *WS4000* modem.

MPE

Forth experts MPE will be exhibiting Forth products, as well as new software. Launched at the PCW Show will be *Modular Forth*, which offers separate compilation, modules, multi-tasking and floating point.

A large range of target cross-compilers will be on display as well as the well-known *Workforth* package — ideal for those new to the language.

Neutral Ltd

Neutral will be launching a low-cost, point of sale terminal for retailers at the show. The *Neutral Essex* features 256k of battery-backed RAM, two displays, a printer, serial and network interfaces and, of course, a cash drawer. It retails for £1650 excl VAT.

Olivetti

Olivetti will be showing its extensive range of PCs including the AT-compatible *M28*, the 10MHz 8086-based *M24SP*, the best-selling *M24* and the new, compact *M19*. The PCs

THE 9th PCW SHOW

will be demonstrated along with printers, applications and utility software, comms products and 10-Net.

Olympic Systems Limited

OSL will be exhibiting the OSL progressive business package for small and medium-sized businesses. The *Cordata PC/XT* comprises a complete integrated accounts package, word processing and a full spreadsheet. The company will also be showing a *Cordata LP300* laser printer, together with a range of *Cordata* desktop and portable computers.

PC Magazine

PC Magazine is the independent guide to IBM personal computers, offering its readers news, information, advice, tests and tips. Issues and subscription details will be available on the stand.

PC Week

PC Week is designed to cater for the professional personal computer user. *PC Week's* editorial focuses on a variety of topics, from hardware and software launches to the latest marketing and financial trends. Issues and subscription details will be available on the stand.

Personal Computer World

Personal Computer World magazine will be giving advice on buying and using business software. The stand will feature five of the top PCs running different types of software each day. Help cards pertaining to software shown will be available. Issues and subscriptions details will also be available.

Philips Consumer Electronics

This year at the show Philips will be exhibiting its 7500 series of monochrome monitors — now acclaimed as the most popular 12in mono sets available. In addition the company will be showing its colour range, which includes the new CM8873 EGA composite high-resolution monitor.

Pitman Publishing Limited

This year Pitman will be offering an even wider range of best-selling and important new titles for all areas of interest. The company also distributes books for Sams, Ashton-Tate and Sunshine and is proud to be able to offer a comprehensive range for home and business computing, electronics and communications.

Praybourn Limited

A comprehensive range of computer luggage and dust covers, together with the facility to have your company logo screen-printed on them, will be on display at the Praybourn stand. Details are available from stand personnel.

Prospero Software Ltd

Prospero Software will be showing for the first time *Pro Fortran-77* for the 8086. This is a complete ANSI



There's something for everyone — come along and enjoy yourself!

Fortran-77 standard language compiler for the 8086 family of processors under MS-DOS, including the IBM PC, XT and AT as well as compatibles.

The company will also be showing its complete range of Pascal and Fortran compilers covering Z80, 8086 and 68000 machines.

Psion Limited

The *Psion Organiser II* range of powerful hand-held computers and the new networking version of *Xchange*, Psion's integrated suite of business applications software, will be the key attraction on Psion's stand. The *Psion Organiser II* has built-in personal planning features and is suitable for personal, business and corporate applications.

Qume

Making their exhibition debut at the PCW Show will be the *QVT 101 Plus* and the *QVT 119 Plus* terminals which are designed with the emphasis on user-friendliness. The *QVT* range includes DEC-compatible ANSI terminals and general-purpose ASCII terminals. Also on display will be *Qume's LaserTEN* laser printer and the *Qume Sprint 12/45* daisywheel printer.

Research Machines Limited

Expanding British micro manufacturer Research Machines will be featuring its 16-bit *Nimbus* offering businessmen AT performance at PC prices.

The company will be demonstrating the latest, faster and easier to use *Nimbus* network supporting up to 64 stations, as well as *Microsoft Windows* with laser printer output.

Satellite Computing Limited

Satellite will be showing its range of software products including specialised packages for the ICL One Per Desk. New products include an enhanced version of the best-selling *Action Diary* as well as *BTI*, which offers direct communications between OPD and mainframe from within a Basic program.

Sentinel Software

Sentinel Software, spearheading the transition towards integrated software packages, will be exhibiting an exciting and powerful range of products from WordPerfect Corporation.

Sportscene Specialist Press Ltd

Keep your eyes peeled for *Microscope*, the microcomputer trade's weekly newspaper; *MacUser*, which reviews more new Macintosh products than any existing magazine in the UK; and *Your Sinclair*, the fastest growing magazine in the Sinclair market.

Victor Technologies UK Ltd

Victor will be showing PC and AT compatible machines. A recent test of the *VPC2* described it as 'just about the cheapest from a famous name'. Also on the stand will be *Coherent*, a third generation...

Walters International Ltd

Walters International Ltd, one of the leading IBM-compatible manufacturers, will be showing its popular PC/XT and AT-compatible models, plus the Walters varied range of add-on compatible equipment. New products on show include the *Walters PC/XT compatible portable micro* and the *Walters Turbo Board PC*.

The logo for AZ Computers features a large, stylized 'AZ' in a bold, red, blocky font. The letters are composed of several horizontal and vertical segments, giving it a geometric, almost pixelated appearance. Below the 'AZ' is the word 'COMPUTERS' in a smaller, red, sans-serif font, with wide letter spacing.

AZ COMPUTERS

The People Who brought you the UK's first sub £500 IBM compatible PC

**FOR ALL YOUR
HARDWARE NEEDS**

WE'RE THE CHEAPEST

**Call us on
08926 65606**

AZ COMPUTERS, UNIT 1, 5 MILLBROOK IND. EST.
CROWBOROUGH, E. SUSSEX TN6 3DU TEL: (08926) 65606

stair

A pedigree in
precision engineering



DPX-2000

A2 SIZE DRAFTING PLOTTER

For more information

Roland DG Ltd

983 Great West Road
Brentford, Middx.

Telephone: 01-568 4578

Telex: 934470 Roland G

Fax: 01-847 1528



See us on
STAND 741

DES 86

23-26 SEPT.
NEC
BIRMINGHAM

Roland DG

Introducing the NL-10 near letter quality printer

Friction and tractor feed comes as standard as with all Star printers. The rear mounted, fully adjustable tractor unit is designed to handle reverse paper feed.

Semi automatic paper loading has, until now, only been available on the most expensive printers. It is standard on the NL-10. Single sheets of paper can be fed automatically through to the top of the sheet, by selecting the "paper feed control".

Short form tear off eliminates paper wastage. The rear mounted tractor feed allows a clean tear off even without perforations.

The optional cut sheet feeder - for high volume work.

An easy load ribbon cartridge clips into place and, by rotating the ribbon knob, drops into position - no more inky fingers!

Print speed in draft mode is 120 characters per second, a typical A4 page would print in approximately 60 seconds. Near letter quality is 30cps which is ideal for formal documents and correspondence.

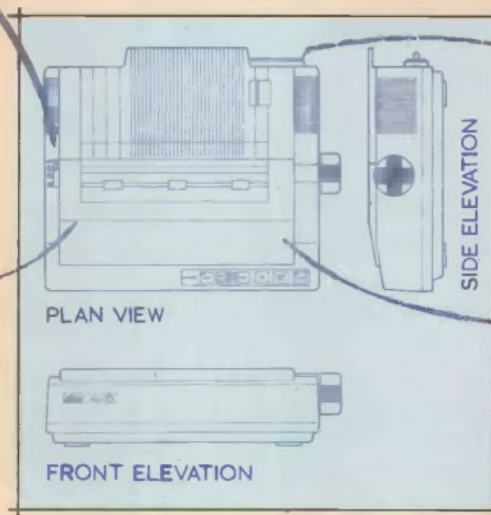
The front control panel covers many of the facilities that have in the past had to be set by dip switches such as print pitch, letter quality, font selection, etc. The controls on the printer can be set to override any software control codes - even for one off documents. Different fonts, pitch, and letter quality modes can be selected when your software is unable to support such commands.

The interface cartridge is a simple plug in unit, held with a "coin screw". It ensures adaptability and total compatibility with virtually all computers because the cartridge contains the printer operating system.

Easy access dip switches are located just under the printer top cover - setting up the printer takes only seconds. All frequently used changes are now covered by the new control panel.

The 5K text buffer - equivalent to around 2.5 pages of text - frees the host computer to get on with other work.

Headline printing can be double width, double height or quadruple width, quadruple height in all fonts.



The NL-10 is the latest exceptional quality dot matrix printer from Star.

All Star machines offer the speed, high quality and reliability you would expect from a manufacturer with over thirty five years proven expertise in micro precision technology - today's modern cameras, watches, and VCRs depend upon Star's skills for much of their ultra-high precision components.

Of course, the Star range is PC compatible and backed by a fully trained dealer network.

If you would like more details about the new Star NL-10 and the complete Star printer range simply ring - 0272 217777 for an information pack at any time of the day or night.

Ring - 0272 217777 for more information (24 hour manned switchboard).

Star Micronics U.K. Ltd. Craven House, 40 Uxbridge Road, Ealing, London W5 2BS. Telephone: 01-840 1800.
A division of Star Micronics Co., Ltd., Japan.



COMPUTER TOO SLOW? DON'T GET MAD-GET MICROCACHE

For as little as £125 our **MICROCACHE** software package breathes new life into your system. **MICROCACHE** instantly puts your disk drives and screen into overdrive (your printer too for another £70). It is available for most machines.

Microcosm Research first invented **Silicon Disk** (the original 'RAM-disk'). A simple enough concept, but tedious to use effectively. **MICROCACHE** is very different, doing all the work for you - no more copying files to and fro. It turbocharges your disk drives **automatically**. Using anything from 32K to 4M bytes of RAM, it ties together processor, disks and screen into a fast, powerful and intelligent system, cutting down mechanical activity and, most important, cutting the time the job takes.

Go for the **Printer Buffer** option as well, and you can whistle through print runs at many times normal speed. Characters are rushed into **MICROCACHE**'s buffers, allowing you to get on with your next task while printing continues. It is faster, more flexible and less expensive than most hardware buffers. (Printer buffer on its own - £95).

MICROCACHE also features a **Screen Accelerator**. This improves many programs with sluggish displays. Screen Accelerator and Silicon Disk are included absolutely **FREE** with **MICROCACHE**.

Experts, trade journals and thousands of users agree: **MICROCACHE** puts "RAM disks" and hardware printer buffers in the shade. According to a recent magazine review, "**MICROCACHE makes the system run like the wind**". Need we say more?

Can you afford to wait? Send for your copy now!



Microcosm Research Ltd
26 Danbury St
London N1 8JU
Tel: 01-226 9092

THE DAISYWHEEL IS DEAD. LONG LIVE THE DAISYWHEEL.

Some seem to think the day of the daisywheel is over. The dot matrix printer, they say, is faster, quieter and more reliable.

You're looking at the printer that proves them wrong.

The Juki 6500 is a super-high-quality daisywheel specifically designed for continuous office use. It produces superbly clear, crisp, Full Letter Quality print at the amazing speed of 60cps. Its stylish appearance conceals a rugged and robust design with an outstanding capacity for sheer hard work.

It has all the features you'd expect from a printer based directly on the best-selling Juki 6200/6300 series. It uses the same standard DIABLO* 96-character daisywheel and hytype II multistrike ribbon, both available everywhere. It comes complete with dual interface "dip-switch" (Centronics* parallel and RS-232C serial), international power supply unit and 3K buffer memory. Optional equipment includes a cut sheet feeder and buffer memory expansion to a full 15K.

The JUKI 6500.
In the age of the dot matrix,
a daisywheel is king.



JUKI
Technology true to type

* DIABLO is a trade mark of Diablo Systems Inc.
* CENTRONICS is a trade mark of Centronics Data Computer Corp.

JUKI (EUROPE) GMBH

Eiffestraße 74 · 2000 Hamburg 26 · F.R. Germany
Tel.: (0 40) 2 51 20 71-73 · Telex: 2 163 061 (JKID) · Fax.: (0 40) 2 51 27 24

Sole distributor:



**Micro
Peripherals Ltd**

Intec Unit 3, Hassocks Wood, Wade Road, Basingstoke,
Hants, RG 24 ONE. Tel.: (0256) 47 3232 (32 lines)
Telex: 859669 MICRO PG, Facsimile: (0256) 46 1570

THE 9th PCW SHOW

What Micro?

What Micro? is a monthly buyers' guide for personal computing covering the business area of the market. Each issue incorporates a classified buyers' guide providing specific details on over 500 products.

OLYMPIA UPPER LEVEL

Atari

The World of Atari on the upper level of Olympia will emphasise the use and versatility of the ST range of machines. Ranged around the company's own stand, on which a number of different machines will be demonstrated, will be more than eighty software houses, suppliers of peripherals and dealers. They will be showing the full range of uses for the machines from home entertainment to sophisticated business applications including accounting, graphics, text processing and systems for several key vertical markets.

NATIONAL

Activision (UK) Limited

Activision will be unveiling *Howard the Duck*, based on the film of the comic strip star, and *Labyrinth*, based on the George Lucas/Jim Henson film starring David Bowie. The company will also be launching Infocom's *Moonmist*.

Addictive Games Ltd

Probably best-known for its *Football Manager* game, this year Addictive is launching a whole new series of products for home machines. These include a 3-D graphics game called *Kirel* for the Spectrum; an original arcade game called *Arac* for the Commodore 64; and a strategy game based on American football for the Spectrum called *Head Coach*.

Alligata Software

The PCW Show will see the first release of *Cirus II Chess* for Sinclair machines. Two versions are available: the 48k 'Reference'; and the 128k enhanced version with 3-D graphics.

Amstrad Consumer Electronics

Once again Amstrad has taken a large site in the National Hall and will be exhibiting a most exciting range of home and business computers, among which will be the PCW8256, a machine which has transformed the computer industry over the last year. This machine has become an international best-seller and has won Amstrad a dominant position in the worldwide home and small business computer markets.

ANCO

Anco will be showing the *Voice Master*, a unique product with three powerful parts: Speech Digitiser,

Speech Recognition and Musical Harp. *Voice Master* is available for CBM64/128, Atari, Apple and IBM computers. Also on show will be software for all home micros with special emphasis on the Atari ST and the C16/Plus 4.

BBC Software

BBC Software's stand will feature a wide range of educational and general software as well as computer books. For bargain hunters a range of software will be on sale at discounts of up to 75 per cent.

Experts will be on hand to demonstrate programs and give advice.

Bernard Babani (Publishing) Ltd

Babani's has something for everyone. On show will be the finest and most comprehensive range of computer books available, covering practically every home computer and most aspects of computing. Babani's books are famous for their fantastic value, with prices ranging from £1.75 — £5.95.

Visit the stand and pick up your free 1987 catalogue.

Britannia Software Ltd

Britannia Software covers the whole spectrum of the computer market and has become well-known for its ROM board for the Amstrad, as well as for software games such as Bruce Forsyth's *Play Your Cards Right*. The company will be launching four new products at the show. These will be the *Britstick*, a hand-held joystick; *Super ROMPLUS*; *Dempsey & Makepeace*; and an accounts package called *B-Accounts*.

CDS Software

CDS Software will be demonstrating its new addition to the Colossus

range — *Colossus Chess 4.0* and *Steve Davis Snooker*.

The CDS budget label, Blue Ribbon Software, will be demonstrating its new ranges for the Electron, MSX, C16 and Plus 4 computers.

Cheetah Marketing Ltd

Cheetah Marketing will be using the stage of the PCW Show to release an exciting new range of peripherals for the home computer industry. On show will be the *Mach 1* joystick, complete with metal shaft and microswitches, *AmDrum*, sound samplers, Midi interfaces and an incredible new musical keyboard.

CJB Microcomputers

This company specialises in printers and printer utility software, and a large range of quality printers from Canon and Juki will be on sale. A unique and powerful sideways RAM Information system called *Inform* will also be on show as well as over 40 Near Letter Quality fonts.

Columbia Computer Products

Columbia Computer Products, part of Columbia Ribbon Manufacturing, will feature a selection of compatible and original products together with some exclusive consumable items. VDU filters, diskette storage and cleaning products will be on sale, and a monitor stand suitable for home and business use will be launched at the show.

Commтел Ltd

Commтел-X is a complete micro-computer communications package. The Amstrad PCW pack includes a BT-approved multi-speed, auto-dial/auto-answer modem, an interface, *Comms+* software, a manual and a lead. *Comms+* supports all electronic



Never mind the crowds — see the quality of the exhibitors

THE 9th PCW SHOW

mail systems and is available for the IBM PC as well as other micros.

CRL Group PLC

Established software house CRL will be previewing its exciting software releases for the Christmas period. Of particular interest will be details of three of the most exciting space adventures yet developed which take the myth of Tau Ceti three steps further. The first title for release, *Cyborg*, will receive its first public viewing at the Show.

Domark

Remember the board game *Trivial Pursuit*; well, now there's a computer version. Priced at £14.95 and available for the Spectrum, Commodore 64, Amstrad and the BBC, Domark is satisfied that the computer version matches the standard of the board game, as well as using sound and graphics. Advance orders already exceed 40,000 in the UK.

Dynamics Marketing Ltd

Dynamics Marketing will be exhibiting its top-selling *Competition Pro 5000 joystick* which has now been modified with an all-microswitch action for a more positive response, and is for use with Amstrad, Atari, Commodore, MSX and Sinclair Spectrum machines with interface. Also on show will be an all-transparent version of the *Competition Pro 5000 joystick*.

Elite Systems Ltd

Following the tremendous success of coin-op hits such as *Commando*, *Ghosts 'n' Goblins* and *Bombjack*, Elite has signed up a heavyweight schedule of coin-op licences from arcade giants such as Namco, Atari and Capcom.

Unveiled at the show will be the classic Atari coin-op game *Paperboy*. In addition the Christmas line-up will be previewed which includes the public debut of *The New Scooby Doo*.

Encyclopaedia Britannica

The world's greatest encyclopaedia has been made even more accessible and easier to understand. *Britannica* makes you think. Unlike other encyclopaedias it challenges you with its virtually unlimited depth and scope. For an adult who believes in continuing education, it's a constant source of inspiration and encouragement.

Firebird

Firebird, part of British Telecom's Telecomsoft, will be launching several new games at the show, among them *The Hive*, a Gold game for Spectrum and Amstrad machines which features a swarm of bees determined to take over the world.

The newly re-launched *Silver Range* — now priced at just £1.99 — will also be on display.

First Software Limited

First Software will be exhibiting dBasell for the Amstrad, Commodore 128, Atari and Tatung machines at the low-cost price of £119. New software titles will also be on display.

A special launch for the show will be First's free, new magazine, as yet untitled, covering the company's products, an industry overview and some topical hardware/software articles.

Gargoyle Games Ltd

The Gargoyle stand will be launching its new arcade label — FIL, Faster Than Light. FIL features fast, original

arcade action using Gargoyle's new animation technique known as 'Lasermation'. Lasermation is designed to produce vivid, detailed, high-speed images. On show will be two FIL titles: *Shockaway Rider* and *Lightforce*.

Glentop Publishers Ltd

Glentop Publishers will be exhibiting its full range of technical and computer books together with its list of software titles. New products on display will include a series on the Atari ST covering basic Logo Gem and programming. However, the focal point on the stand will be the launch of a major new series on the Amstrad.

Gremlin Graphics

Gremlin's Christmas products will be exhibited on the stand. These include *Avenger*, the second game in the *Way of the Tiger* series; *Footballer of the Year*, a strategy game; *Trailblazer*, a stunning space romp; and *Future Knight*.

Gremlin's utility label — Discovery — will also be on show and includes an advanced music utility for the Amstrad CPC range called EMU.

Hewson Consultants

Hewson, the leading name in games software, looks set to cause a big stir at the PCW Show. All the signs are that the splash made by *Uridium*, *Quazatron* and *Pyracurse* in recent months will be continued. *Alleykat* for the C64 and *City Slicker* for the Spectrum and Amstrad machines are among the goodies promised.

Instep Intl Freight

Instep ships more than 40 per cent of all the computer software leaving the UK. The company will be unveiling its new overnight delivery service to Europe, which will complement the company's existing overnight Scandinavian service.

Instep will be happy to give advice to existing and prospective software or hardware exporters.

ISA-Gold

Come and talk shop with ISA-Gold, the UK's largest distributor of computer supplies. There's simply no need to shop around as all of the famous, original brand names will be featured with some very special, exclusive offers. Access or Barclaycard welcome.

Level 9

Level 9 is a family business, celebrating its 5th birthday at the PCW Show. The company was started in 1981 with just £50 and a Nascom kit-computer. Now Level 9 sells over 100 products, covering 11 home micros, and is widely regarded as the top adventure-software writer in the UK.

Lightwave Leisure Ltd

Lightwave's own brand product range is all of the highest quality, UK



A show not to miss. Come early, stay late

manufactured and individually tested prior to finishing in distinctive informative packaging. Look out for the company's computer cables, accessories, designer dust covers and anti-glare screens. New products include a twin port joystick interface for the Amstrad.

Linear Graphics

Linear Graphics will be exhibiting the *Plotmate* range of plotters and associated software. The *Plotmate* range is compatible with all leading micros which run on a wide range of linear graphics and third-party software. Also on show will be *Linscan*, a high-resolution optical scanner which fits onto all *Plotmate* models.

Llamasoft

Jeff Minter, Llamasoft's hairy proprietor and programmer, will be at the stand to meet you. So will *Iridis Alpha*, Jeff's latest game for the C64, plus new conversions of *Laserzone* and *Matrix* for the CBM 16. Jeff's light synthesisers will have to be seen to be believed, and he will perform *Atari ST Colourspace* to a classic rock accompaniment.

Magnam Products International Ltd

Magnam manufactures a range of polypropylene software cases, which provide well-designed prestige packaging of a quality appreciated by retailers and public alike. As sole UK distributor for the KCS power cartridge (RRP £39.95) the company is now able to supply this much praised Commodore peripheral.

Martech

Martech will be consolidating its position as one of the country's leading software houses when it unveils its exciting range of new games for autumn and Christmas 1986. The Martech Arcade will allow visitors the opportunity to try each game for themselves. The stand will also feature an exciting judo display.

Mastertronic Ltd

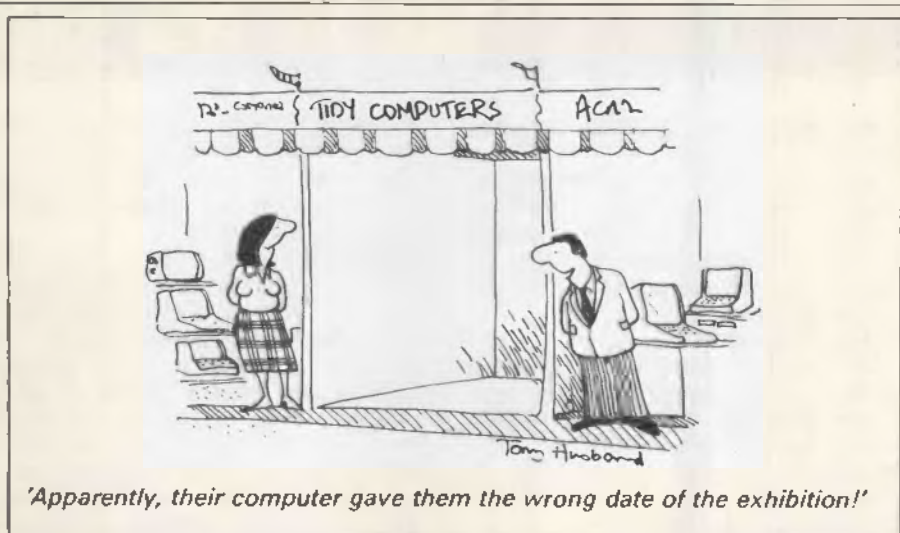
Mastertronic Ltd will be looking to the future with a view to diversify within the electronics field. A few hints as to what to expect from the company will be given at the show, as well as the company's latest quality releases.

Melbourne House Publishers Ltd

Melbourne House has maintained a relentless flow of chart-busting games releases, culminating in the blistering *Fist II: The Legend Continues*. All the hits of '86 plus classics from the past, books and software, will be up for grabs on the stand. And there'll be hot news of forthcoming games — *Asterix*, *Inspector Gadget* and *Throne of Fire* — as well as new book titles.

Microdealer UK

A wide selection of new software titles from the world's premier software houses will reinforce the company's Number One position in the UK market-place as a distributor, while peripherals for all makes of



popular computers will be on show. The company's friendly staff will be on hand to advise and help.

Mikro-Gen

Mikro-Gen, one of the UK's oldest-established software houses, plans a number of major launches at the PCW Show. These games include: *Stainless Steel*, featuring hero Ricky Steel; *Frost Byte*, featuring an animated liquorice allsort; and *SAS Strike Force*, which will be on constant demonstration.

A Mikro-Gen team will be on hand to offer help and strategy hints.

Micro Media Computer Supplies

Micro Media is a rapidly expanding company with a comprehensive range of computer supplies, catering for the home, school and business market. The company carries a large range of printer ribbons with the most popular brands in various colours and types.

For unrepeatable prices, just for the show, don't miss Micro Media.

Micronet

Following Micronet's purchase of substantial stocks of modems, the company will be issuing them free to members subscribing for one year in advance to both Micronet and Prestel. The modems available are the *VTX5000* for the 48k Sinclair Spectrum and the modem *2000* for the BBC.

Mirrorsoft Ltd

In addition to previewing its range of new arcade games for the home computer market and for machines such as the Mac and IBM PC, Mirrorsoft will be showing exciting, new implementations of its *Fleet Street Editor* and *Fleet Street Publisher* products — particularly for the Amstrad PCW and Atari ST.

Newsfield Publications

Come along and meet the publishers of the best-selling magazines for the Spectrum, Commodore and Amstrad machines, *Crash*, *Zzap! 64* and *Amtix* respectively. And, who knows, you may even be lucky enough to meet one of John Minson's famous shirts!

Mail order subscriptions can also be made on the stand with T-shirts,

caps, binders and posters for sale.

NewStar Software

NewStar Software will be demonstrating and selling its complete new catalogue range at the PCW Show, with its online order processing system on the stand. Major applications software packages are available for the IBM PC and compatibles at prices that are approx 25 per cent of the major brands.

The Ocean Group

The Ocean Group is currently developing software for the 68000 market, and for IBM-compatibles and Amstrad PCW machines.

The company plans to have many new releases on display at the show, including a range of action-and-excitement games such as *Miami Vice* and TV-inspired frolics such as *It's a Knockout*.

Odin Computer Graphics Ltd

In its first appearance at the PCW Show, Odin will be showing its new games of 'different' designs, including: the highly-acclaimed *Nodes of Yesod*; *ICUPS*, a space fantasy; *Mission AD*; and *Heartland*.

These games are launched in conjunction with marketing company Telecomsoft.

Opus Supplies Ltd

Opus will be launching its new *PCI* range of turbo-speed IBM-compatibles at the show. Many items from the four-model range will be on display, and there will be special show offers such as the Opus daisy-wheel printer package, Winchester and floppy drive upgrades, and the extensive Apollo computer desking range.

Opus will also be exhibiting its selection of products for the IBM PC market.

Orpheus

This year introduces the new face of Orpheus. A department created to increase the already successful track record of rollovers and conversion has been increased to cover C64, Amstrad, Spectrum, MSX and Atari ST formats.

Palace Software

Following the success of Palace Soft-

THE 9th PCW SHOW

ware's hit games, *Cauldron* and *Cauldron II — The Pumpkin Strikes Back*, the company will be previewing its latest release, *The Sacred Armour of Antiriad* which comes with a superb comic. The game will be available for Spectrum, Amstrad and Commodore 64 computers.

Palan Electronics

Palan Electronics will be exhibiting a comprehensive range of home computer hardware, peripherals and software. Special offers include *Neos Mouse* and *Cheese* for the CBM 64/128. Visit the stand for details of a free-to-enter competition.

Personal Computer World

Come and meet the PCW editorial team who will be on hand to answer your questions and discuss any contributions you might want to make to the magazine. Back issues will be on sale on the stand, and special show competitions and features are being run. PCW Online, the exciting new electronic information system, will be up and running on the stand.

Piranha

Piranha, an important new entertainment software label, is launching its first titles at the show. On the stand meet the genetic infantryman, *Rogue Trooper*, the cult character from the top-selling comic *2000AD*, and bizarre characters from the new TV show *Trap Door* in a graphic adventure. See Piranha in the tank and on the screen — software with teeth.

Precision Software

Software and peripherals for the Commodore Amiga will be the centrepiece of Precision Software's presentation at the PCW Show. Software for the Commodore 64 and 128 will also be available. Leading the field is *Superbase*, the company's own database, closely followed by *Logistix*, a well-established integrated package.

PST Ltd

PST is a specialist export trading house with worldwide markets for computer hardware and peripherals (trade only). The company welcomes all UK and overseas companies (wholesalers, distributors and manufacturers) to discuss the purchase or disposal of computer and related products, and can offer many products at below cost price.

RAM Electronics

RAM Electronics will be launching four new peripherals at the show; a combined printer interface-RAM word processor and joystick interface; a multi-function music machine (for the Spectrum); a Centronics comms interface; and a joystick interface (for the PCW8256).

Robtek Ltd

Robtek, the leading European utility specialists, has three exciting new products for launch at the show: the

CBM 64/128 fast load cartridge; the Amstrad 664/6128 turbo freeze cartridge; and the Atari ST real time clock cartridge. All three products cost under £40 each.

Rockfort Products

Rockfort Products is the main supplier of Rockfort disk storage systems. The company successfully introduced its range of disk storage boxes at the 1984 PCW Show, and since then Rockfort-labelled diskettes have been made available at competitive prices. The company will also be exhibiting the BBC Master 128k, Centronics printers, Samson data binders and other accessories.

Romantic Robot UK Ltd

Romantic Robot's best-selling product since last year has been the first in the company's series of multi-purpose interfaces, the *Multiface One* for the ZX Spectrum. The PCW Show will see the launch of *Multiface Two* for the Amstrad 464/664/6128 computers. On the software side four new titles for the Amstrad and Spectrum micros will be launched.

Sagesoft

Sagesoft's full range of business and accounting software will be on view at the PCW Show. This will include the *Sage* accounting software for the Amstrad, which features invoicing, accounting and payroll facilities.

The award-winning data communications package, *Chit-Chat*, will also be available for those interested in networking.

Sanyo

At this year's show Sanyo will be showing a versatile and extensive range of personal computers. Included in the range is the company's recently launched *MBC990* series which offers unequalled speed and power, and the leading *MBC555* at £1190 with a free £1000 worth of software. Also on display will be the high specification *MBC775* and the *MBC885*.

Sinclair Research

News for Sinclair fans is that a new computer called the *Spectrum 128+2* will be launched at the show. Featuring a built-in cassette recorder and an improved keyboard, the *Spectrum 128+2* will retail for £149 plus VAT. The new Spectrum embodies all the engineering and reliability factors which have come to be associated with Amstrad.

Sunshine Books

Sunshine Books will be selling its new range of computer titles for owners of Amstrad, Amiga, Atari ST, Apple Mac and IBM PC machines, together with the company's best-selling C language tutorial.

Visitors to the stand can also enjoy money-off subscriptions to *Popular Computing Weekly*.

Tasman Software

Tasman Software has gained an enviable reputation for producing high-quality word processing software and related products. A cross-section of the company's products, including recent releases, will be on display. Tasman Software products are available for the Amstrad 8256/8512, the Amstrad CPC computers, the 48k and 128k Spectrum and Commodore, MSX and QL Machines.

Technology Research Ltd

All Technology Research's products will be offered at a special price at the show. These include a super Beta interface for the Spectrum, a Delta disk interface for the QL and a Gamma disk interface and memory pack for the Amstrad PCW8256. Come and talk to the experts and don't miss the bargains.

Transform Ltd

Established over four years ago Transform has developed a range of business software for the Spectrum and QL computers. The company's most popular product is the *Micro-drive Storage Box*. Transform also stocks a wide range of printers and accessories, many of which will be available on the stand.

Tynesoft

Tynesoft will be showing its exciting new range of software for the Atari 800, Atari ST, MSX, Amstrad, C16, Plus 4, BBC, Electron and Spectrum machines and will be showing for the first time its amazing value packs — 10 separate tapes at an unbelievable price.

US Gold

The theme of US Gold's stand will be 'arcade action'. Games such as *Gauntlet*, *Xevious*, *Breakthru* and *Express Raider* will all be on show. *The Masters of the Universe* is another successful licence signed by the company with Mattel Inc, and the solution to the question 'Who is the Infiltrator?' will be answered at the show.

Videk Ltd

Videk is rapidly establishing itself among market leaders in the field of computer cables, and the PCW Show signals the launch of the company's new catalogue to penetrate markets both at home and abroad. On offer will be the company's entire range of cables, connectors and disks for both home and business computing.

WHS Distributors

WHS Distributors will be presenting its follow-up to Mosaic's best-selling *Secret Diary of Adrian Mole* called *The Growing Pains of Adrian Mole*. Plus there will be an opportunity to win a sheep in a competition based on *The Archers*. There will also be a range of books, educational and business software.

END



SWITCH ON TO THE WORLD'S FIRST PLUG-IN-AND-GO MULTI-USER COMPUTER



EASY TO SET UP, EASY TO USE 4 USER COMPUTER

Setting up the new Comart quad is simplicity itself. Just take it out of its box, plug it in and go. What's more, it's the smallest ever multi-user business system with the smallest ever price tag. And it's as easy to use as a PC.

4 USERS – 4 SIMULTANEOUS TASKS

The quad lets you switch tasks with a single keystroke. Ditto for all four users. And with its 10MHz processor with a full megabyte of Ram, built-in networking and 20Mb of hard disk, you can be sure it's quick enough to cope. The quad is a technical marvel, and Comart have the back-up to match. While our sister company, Kode Services, provides one of Britain's largest nationwide field service and maintenance operations.



FOURMIDABLE SOFTWARE AND PERIPHERALS

The quad operates on Concurrent Dos and runs a wealth of software: Pegasus, Wordstar, Supercalc and literally thousands of others. Modems and printers are well catered for. In addition to four screens you can run up to six printers. And if you've got PCs the Comart 'PCLAN' is a cunning way of networking them with quads at around the price of additional quad terminals.



The quad has shattered the price barrier. And the competition no doubt. Anything comparable costs around twice as much. Yes, twice as much. And if that's turned you off other multi-user computers, fill in the coupon and switch on to the new Comart quad. Or call us now on (0480) 215005.

**FOUR ONLY
£4995**

+ VAT

4 USER COMPUTER
(complete with terminals)
and stand

**comart
quad**

The afordable 4-user computer

To: Comart Computers Ltd,
Little End Road, Eaton Socon,
St Neots, Huntingdon,
Cambridgeshire PE19 3JG



Please send me more information on the Comart quad.

I am an end user ☐ Dealer ☐ (Tick applicable)

Name _____

Position _____

Company _____

Address _____

Tel. _____ PCW 86 9

One lump, or two...

Subroutines have an important part to play in structured programming. Mike James discusses their implementation in computer languages.

This is part three of a six-part series on programming methods and the creation of programs. Parts one and two appeared in the July and August issues, copies of which are available from PCW Back Issues.

One of the most powerful ideas in modern programming is the use of subroutines to reduce a difficult, if not impossible, problem to a number of smaller, more manageable, problems. The use of subroutines in this way is one of the central tenets of all programming methods, but there are still programmers who think of subroutines as merely an easy way of repeating some standard action without having to write the necessary lines of code each time.

Part of the reason for this is that a number of high-level languages do not provide very good facilities for subroutine creation and use. For example, the Basic subroutine is a crude shadow of the earlier Fortran subroutine and even enhanced versions of Basic, such as BBC Basic and QL Super Basic, leave a lot to be desired when it comes to the provision of subroutine-like facilities.

Basic is not alone in its neglect of the subroutine, but it is perhaps the most important in that it is the best and most used teaching language available. For a programmer to think that the Basic subroutine, or even the BBC Basic procedure, is a reasonable

example of the species is a frightening situation that occurs all too often. In this article the broader idea of a subroutine or module is discussed along with some of the ways that this idea has been implemented in other languages.

The granular program

A program is a list of instructions and any useful program is likely to be a very long list of instructions! When we first started to write programs, this idea of creating a long list of instructions was the only theoretical guideline available and many assembly language programs were, and still are, written as a monolithic block of code. You can write such programs using traditional structured programming methods, and as long as you avoid transferring control around the program in a haphazard way using direct jumps or GOTOs, the result will be well-structured and fairly easy to understand. However, if you take a program that has been written in this way and try to make sense of it, you will discover that it has an additional structure that its programmer may not have been aware of.

When you examine any list of instructions you will usually discover that various parts of it are dedicated to performing particular identifiable jobs. In other words, even if a program has been written as one long list

of instructions, it still has a 'granular' structure composed of a number of sublists, each of which deals with a particular task. If you look more closely at the program you will see that each of the sublists is composed of a number of sublists, and so on — that is, the granular structure of a program is hierarchical. The program performs a particular task as a number of distinct subtasks, which are themselves in turn composed of a number of subtasks, and so on. The important thing to notice is that this hierarchical granular structure is a natural property of programs rather like the atomic nature of matter.

Avoiding big programs

Given that programs have a granular structure, it seems reasonable to make use of such a structure. By making the granules clear and explicit you are working with the natural structure of the program rather than ignoring it.

However, there is a much more important reason for taking account of the granular structure of programs. Most programmers start out by writing short 10-20 line exercises. When you are first learning to program, such tiny programs are hard enough because you have to think about the details of the language as well as the correct algorithm. After a little practice such short programs become easy and the time is right to tackle something larger. The only trouble is that there is no general recognition of the fact that large programs need a completely different writing technique to small programs. Indeed, large programs present a wholly new type of problem to the construction of program snippets.

The reason for this is simply the limitation of human memory. When writing a short program you can, usually, keep it all in your head. When writing a large program, you can at first keep it all in your head but eventually there comes a time when you have written more lines than your memory span can encompass, and from then on it's all down

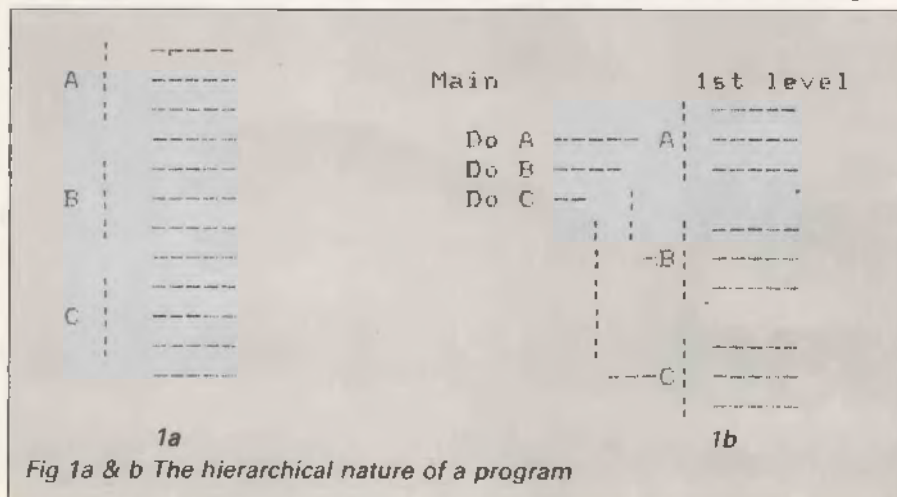
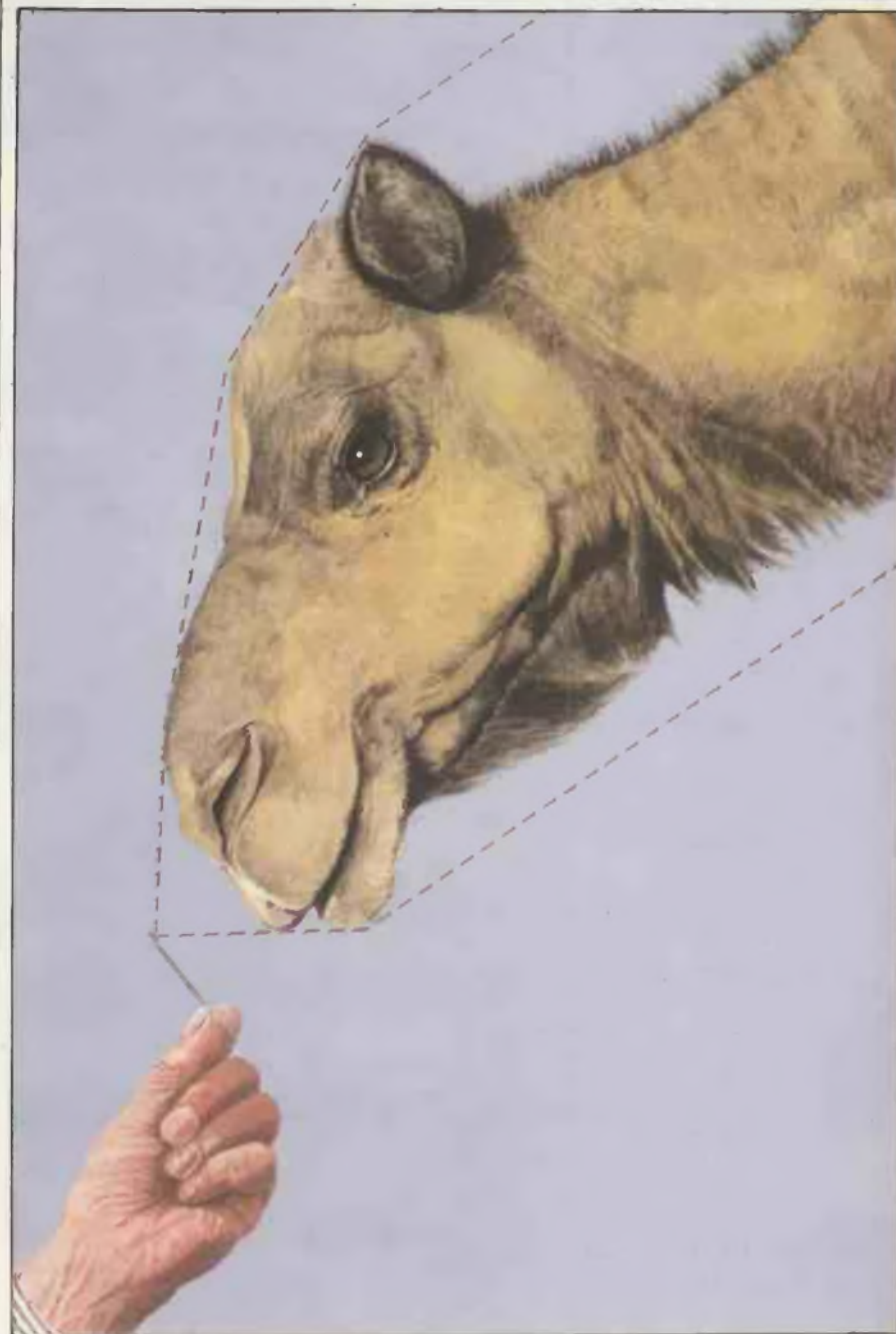


Fig 1a & b The hierarchical nature of a program



hill. You can write large programs by brute force and a super-human effort to remember everything, but the alternative, rather more intelligent, method is much less effort.

The key to the easy and successful writing of large programs is not to write them at all! From the discussion in the previous section you should by now be convinced that a large program is in fact made up of a collection of smaller functional units, each dealing with a particular sub-task. Rather than write a single large program it is much easier to write a number of smaller units or modules, each one small enough to hold in your memory, and then use these to construct the complete program. This programming method is usually known as *modular programming* and the most successful programming method in use today is known as *modular structured programming* indicating the combined use of modu-

lar construction and well-structured code within each module.

The hierarchy

It's not just that programs are granular that is important, it's that they are composed of a hierarchy of grains — that is, each program is made up of modules and each module is made up of modules, and so on: not quite *ad infinitum* but down to modules that can accomplish their task using only a few statements from the language in use.

Programs are even easier to understand and to write if this hierarchy can be made explicit, so that a single level of the hierarchy can be seen in one go without the distraction of being able to see smaller modules at other levels. For example, if you look at the first program in Fig 1, you can see that it is made up of three modules A, B and C, and that these modules are used in turn one after the

other. However, in a real program you would not find this quite so easy to see because the lines of code that make up the definition of each module might extend over a number of pages.

A much better organisation that accurately reflects the hierarchical nature of the program can be seen in the second layout in Fig 1. Using this layout you can look at the topmost level of the hierarchy — the main program — and immediately see the coarse structure of the program without being distracted by the details of the other levels. Of course, in a real program each of the modules at the next level would be composed of references to modules at other levels, and so on.

This hierarchical layout implies that whatever programming language is being used provides the facility to give a name to a collection of statements, and to cause them to be executed simply by using that name. What is surprising is that not all high-level languages are that sophisticated. For example, the only facility that Basic offers for this sort of organisation is the GOSUB and RETURN commands and this limits the Basic programmer to naming modules according to the line number they start at, and it encourages the bad habit of thinking of a sub-routine call as a transfer of control similar to a GOTO. If you think of a GOSUB as nothing more than a fancy form of the GOTO instruction, there is the temptation to follow the flow of control in the same way and so lose any advantage that an explicitly hierarchical structure gives you. For example, the flow of control in the main program in Fig 1b is simplicity itself — it is just the default flow of control — Do A, Do B and then Do C — but if you follow the transfers to the modules in the next level, it is amazingly complicated — GOSUB A:RETURN:GOSUB B:RETURN:GOSUB C:RETURN — see Fig 2.

And, of course, if you are persistent enough to follow each transfer down through all the levels of a hierarchy, not only do you immediately lose the benefit of this sort of organisation, it is actually worse! The important point is that, in the main, a program should be understood and written at one level of the hierarchy at a time and the temptation to jump between levels should be resisted.

Top down programming

If you are going to create a program with an explicitly hierarchical structure, then you might as well make use of this to guide you while the program is in the formative stages. In particular there is a programming method called 'stepwise refinement' that is particularly good at exploiting

SETTING THE STANDARD

TRISOFT LTD 0629-3021

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 and NORTH STAR.

► SOFTWARE

DBASE III PLUS	£335
LOTUS 1-2-3	£247
FRAMEWORK 2	£325
SUPERCALC 3	£175
WORDSTAR 2000	£245
DATAEASE	P.O.A.
REFLEX	£69
MULTIMATE	£210
MS WORD 3	£279
WORDCRAFT	£335
WORD PERFECT	£265
WORDSTAR PROF	£219
MULTIPLAN 2	£145
VP PLANNER	£78
OPEN ACCESS	£295
SMART 3	P.O.A.
SYMPHONY	£345
DOMINO	£375
LATTICE C	£275
MS C COMPILER	£265
PEGASUS	P.O.A.
MULTISOFT	P.O.A.

► BOARDS

INTEL ABOVE BOARD FROM	£395
RAMPAGE	P.O.A.
AST SIX PAK PLUS 384K	£245
AST 5251 MOD. 11	£599
HERCULES MONO	£175
HERCULES COLOUR	£115
TECMAR IEEE 488	£299
AST EGA	£245
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
CALCOMP 1043 A0 PLOTTER	£7643
HP LASER JET	£2185
HP LASER JET +	£2885
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

► ACCOUNTING SOLUTIONS FROM TRISOFT

As authorised dealers for the best known and respected accounting software houses, we feel that we are uniquely qualified to offer computerised accounting systems to a wide range of companies whose requirements may differ markedly. Our in-house accounting expertise and competitive pricing policy provide a combination of support and financial realism which is difficult to beat.

► Trisoft Ltd. are authorised dealers for SAGE, PEGASUS, MULTISOFT and MULTIPAC accounting software.

► PEGASUS, MULTI-USER and XENIX systems.

► MULTISOFT, XENIX systems.

► APRICOT (including XEN), OLIVETTI and NORTH STAR hardware.

► Unrivalled Prices.

► 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.

► SAGE SUPERDEALS

	List Price	Our Price
BOOKKEEPER	£295	£195
ACCOUNTANT	£495	£325
ACCOUNTANT PLUS	£695	£435
FINANCIAL		
CONTROLLER	£995	£625
PAYROLL	£195	£145

Upgrades and maintenance available, please call.



► Example systems:-

APRICOT XI HD, 10 MB HARD DISK, 1 x 720K FLOPPY, 512K RAM, KEYBOARD, 9" MONITOR, MS-DOS, 4 x PEGASUS MODULES £1895.00

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

► PROFESSIONAL CAD SYSTEM

OLIVETTI M24 SP (640K RAM, 20 MB HDU, MONO MONITOR, KEYBOARD AND MS-DOS), AUTOCAD WITH ADE-1/2, 10 MHZ 8087 CO-PROCESSOR, CALCOMP 2200 DIGITIZER, CALCOMP AO 1043 PLOTTER, FREE ON-SITE INSTALLATION AND THREE MONTHS ON-SITE WARRANTY £12995.00

► COMMUNICATIONS

We supply the complete range of HAYES and STEEBEK (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.

► UNLOCK

- For LOTUS and other protected products
- Copies the system disk to the hard disk and then removes the protection.
- Allows any number of non-protected archival back-ups to be made.
- Allows you to run programs without the system disk in the floppy drive.
- Average UNLOCK time 3 minutes. £95.00

► HARDWARE

APRICOT XI, XN AND XEN-I RANGE. OLIVETTI M24 20 MB, M24 SP, M28 NORTH STAR DIMENSION

- 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

CROWN SQUARE, MATLOCK, DERBYSHIRE DE4 3AT

TELEPHONE (0629) 3021, TELEX 8950511 ONEONE G (please quote ref-TRISOFT.)

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

PROGRAMMING

the hierarchy. In stepwise refinement you first concentrate on defining the topmost level in terms of calls to subroutines that are to be fully implemented at a later date. For example, if you want to implement a program to play a game of noughts and crosses, the usual problem is getting started, but using stepwise refinement the main program can be written almost at once —

```
GOSUB setup
LOOP  GOSUB play—X
      GOSUB play—O
      IF NOT WIN THEN GOTO
      LOOP
      GOSUB end—game
```

You might think that writing the main program hasn't made much progress but you would be wrong! The problem is now broken down into a number of sub-problems, each of which can be tackled independently and further split down into sub-sub-problems. A more important gain is that now the overall structure of the program is revealed to be a conditional loop — in effect the main program says 'keep playing until somebody wins and then report who won.'

The next stage of the refinement is to fill in the details of the subroutines used at the topmost level, and so on, down to the lowest level in the hierarchy. Because of the way that stepwise refinement works down the hierarchy it is known as a *top down method*, and hence the complete name of the most successful programming method we know is Top Down Modular Structured Programming, or just TDMSP for short! It is possible to attack problems in other ways than top down. For example, for some projects a bottom-up approach is justified (although this is rarely efficient). In reality most programs are constructed by a more flexible moving around the hierarchy than pure theory would suggest. It is usual for a programmer to identify particular 'difficult paths' down through the hierarchy and work on those first.

In the case of the noughts and crosses programs, for example, it is very likely that very little attention would be given at first to the human player's move and more time and priority would be accorded to the part of the hierarchy concerned with the machine's move. There still is a lot of work to be done in researching exactly how programmers exploit a program's hierarchy, but there is no doubt that good programmers do it mainly top down!

Interaction

If dividing a large program up into

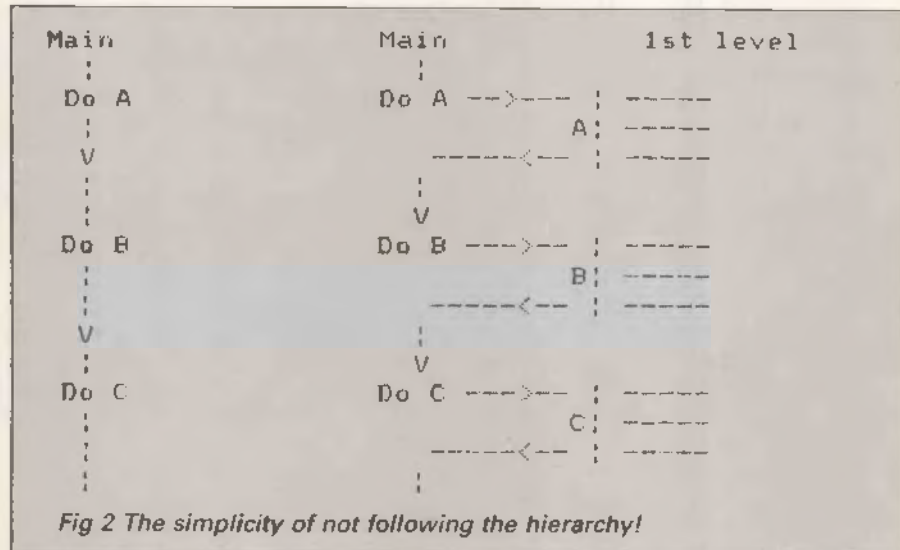


Fig 2 The simplicity of not following the hierarchy!

smaller pieces is going to make it easier to write, then it is essential that each small piece can be written without reference to the rest. If this is not the case, then you cannot concentrate on a section of program small enough to hold in your head

Inside information: expressions and functions

All the real work of a program is performed by the evaluation of expressions. The most common example of an expression is the arithmetic expression (that is, simple arithmetic) but there are also other types of expression.

An expression is simply a recipe for working out a result by combining various data values. In this sense every expression $2*3+4*5$ is equivalent to the program — Step 1: multiply 2 by 3. Step 2: multiply 4 by 5. Step 3: add the results of step 1 and step 2 together. (Some primitive programming languages — most assemblers, for example — do not support expressions and as a result all calculation has to be done a step at a time.)

In the same way that a program can be divided down into smaller subroutines, an expression can be broken down into smaller units of calculation called functions. For example, the calculation of $\sin(x)$ is quite involved but you can use it in an expression by simply writing the function $\text{SIN}(X)$. When the computer encounters a function in an expression it essentially executes a subroutine that returns a single value — the result of the function. Thus functions are a special restricted form of subroutine that return one, and only one, value as a result so that they can be used as part of an expression.

because you have to keep track of the rest of the program, even though you are only working on one small subroutine. This is the principle of non-interaction, and real subroutines, especially Basic subroutines, do not come anywhere near obeying it! For example, if you are writing a Basic subroutine, then you have to be aware of the names of all the variables and line numbers already used in the rest of the program. As a program gets bigger this burden of remembering variable names and line numbers increases to the point where a mistake is almost certain, and mistakes of this sort are almost impossible to find because they cause apparently perfect subroutines to stop working.

Of course, a complete application of the principle of independence is equally undesirable. The reason for this is that to make a program work as a whole, subroutines have to interact. They have to receive data from other subroutines, process it and then pass the results on, and this means they affect each other and even in an ideal world subroutines cannot be written without reference to one another. The point is that there are wanted and unwanted interactions between subroutines. Unwanted interactions are often called *side effects*, and a good subroutine facility should make it possible to write subroutines without having to worry about the chance of side effects.

Before discussing methods of controlling interactions it is worth classifying the type of variables that a subroutine may use. Some of the variables used by a subroutine are for its own internal use and have nothing to do with any variables used in other subroutines. Other variables are used to transfer data into or out of a subroutine and these constitute the 'glue' that joins subroutines

together to form a complete program.

Visibility and scope

The first step to minimising side effects between subroutines is to make sure that every subroutine has its own set of internal variables that have nothing to do with any variables of the same name in other subroutines.

This idea will be strange to many Basic programmers because in Basic each variable that you use in a subroutine is available or *visible* in every other subroutine. Variables that are visible from any point in a program are called *global* variables. In other languages and in some dialects of Basic it is possible to define variables that are only visible within a given subroutine. Such variables are called *local* variables and it is clear that whenever possible all internal variables should be defined as local.

As well as global and local variables there are other ways in which the visibility of a variable can be restricted. In particular, it is possible to make use of the hierarchy of subroutines to define the *scope* of a variable. The scope of a variable is just the range of subroutines from which it is visible.

In many languages a hierarchical scope rule is used, and this just corresponds to variables that are defined in a subroutine being visible from every subroutine lower in the hierarchy. For example, if subroutine 1000 defines a variable TOTAL, then this variable will be visible and hence available in any subroutines that are called by subroutine 1000 but not from subroutines that call subroutine 1000. This hierarchical scope is useful because it automatically follows

the flow of data up and down the hierarchy. A variable that is only defined in a lower level cannot be used to transfer data to and from higher levels, only to and from lower levels. The combination of scope rules and local variables can be used successfully to control side effects between subroutines while ensuring that information that has to pass between them does. Most of this is of academic interest to the Basic programmer because all Basic variables are global, but in languages such as Pascal and Modula (and QL Super-Basic!) hierarchical scope is the norm.

Existence

The existence of variables is another strange idea to most Basic programmers because in Basic, once you define a variable, it exists until the program comes to an end. However, this is a rather simple approach to the existence of variables. For example, in Pascal a variable that is defined in a subroutine (Pascal subroutines are called procedures) exists only for as long as the subroutine is being executed.

This fits in with the hierarchical scope rule because when a variable isn't visible it no longer exists and hence doesn't use any storage, but it also has one or two additional consequences. In particular, if the variables that a subroutine defines come in and out of existence as the subroutine is used, it cannot accumulate information.

For example, in Basic (and in Fortran) you can use a variable to count the number of times that a subroutine has been used by including a statement of the sort USE=USE+1 at the start. But in languages such as

Pascal this doesn't work because the variable USE would be destroyed each time the subroutine came to an end. In other words, in Pascal a subroutine's internal variables are considered to be temporary or scratch storage.

Parameters

The best known method of passing information into and out of subroutines is the use of *parameters*. Parameters are the ultimate way of restricting the way that subroutines can interact. If we assume that all variables are local to the subroutine in which they are used, then parameters are just a way of establishing contact between particular variables in different subroutines. For example, if you have written a subroutine that will print a number of blank lines —

```
FOR I=1 TO N
  PRINT
NEXT I
RETURN
```

then I is clearly an internal variable and N is an input variable that determines the number of blank lines printed. Without the use of parameters any subroutine that uses this blank line printer has to set the variable N to an appropriate value, but it may already be using some other variable, COUNT say, for this purpose. Using parameters this difficulty over naming doesn't arise, because if N is defined to be a parameter at the start of the subroutine (using BBC Basic)

```
DEF PROCblank(N)
  rest of subroutine
ENDPROC
```

then the connection between COUNT and N can be made when the subroutine is called —

```
PROCblank (COUNT)
```

In this case the value stored in COUNT is used to initialise N before the subroutine is executed. This is a one-time transfer, and after this the variables COUNT and N are completely independent — that is, changing the value of N within the subroutine will not change the value stored in COUNT. This sort of parameter is called a *value parameter* and it is clearly good for getting information into a subroutine but useless for getting it out.

There is a second and slightly more complicated sort of parameter called a *variable parameter*. In this case the connection between the two variables is made for the duration of the subroutine's execution and so, for example, changing the value of N would then change the value of COUNT. Clearly, variable parameters can be used to transfer information into and out of a subroutine.

Next month: On Errors

END

Creative challenge 3

Write a program, in your own dialect of Basic, that will draw a person's face using rectangles for all the features. Then change it so that all of the features are drawn with circles. Remember to make use of the hierarchy.

Answer to creative challenge 2

Most programmers overreact to the sort of problem that involves 'connectedness'. If you are only interested in answering a question about whether town A is connected to town B without any details of how they are connected, then there is no need to create a data structure to represent a map of how they are connected. Instead all you need to model is the fact that each pair of towns is either connected or not connected, and this can be done using an array of zeros and ones — that is, a '1' in C(I,J) means that town I is connected to town J and a '0' would mean that they were not connected!

How such a matrix is constructed is not really part of the problem set in creative challenge 2, but you could either work out which pairs of towns are connected by hand or by repeatedly squaring a matrix of nearest neighbour connections. (If A is a matrix of direct connections, Aⁿ is a matrix of nth order connections.) The important point about this example is that it is important not to over-model or over-represent reality. The data structure that you use should be the simplest that will do the job.



TANDON - SPECIAL OFFER FOR LIMITED PERIOD

Technology Computers (UK) Ltd.

Presenting the Tandon range of PC/AT Compatible



PC RANGE	Description	Price	PC RANGE	Description	Price
Tandon PC1	PC Compatible with 1080, 2 x 360Kbyte floppy disk drives	£1,195.00	Tandon PCA	AT Compatible	£1,195.00
	256Kbytes main memory. Parallel printer port. 14" high resolution monochrome monitor. English keyboard.			Intel 80286 1 x 1 2Mbyte Random Access Memory	
	MS-DOS 2.11. Operating System. QW-BASIC Language.			512Kbyte main memory	
Tandon PC2	XT-Compatible	£1,295.00	Tandon PCA	14" high resolution monochrome monitor. English keyboard.	
	Same configuration as PC1 except 1 x 360Kbyte floppy disk drive			MS-DOS 3.11 QW-BASIC Language. Operating System	
Tandon PC3	Same configuration as PC2 except 1 x 10Mbyte Winchester hard disk drive	£1,495.00	Tandon PCA	Same configuration as PCA except additional 10Mbyte Winchester hard disk drive	£1,995.00
Tandon PC4	Same configuration as PC3 except 20Mbyte Winchester hard disk drive	£1,695.00	Tandon PCA	Same configuration as PCA except additional 20Mbyte Winchester hard disk drive and includes printer serial card	£2,195.00

OPTIONS

286 RAM Board	To add to PCA system	£775.00	Colour Option	Additional charge for colour monitor and adaptor card	£795.00
PC1 Serial Card	To add a serial card to PC1 system (£65.00)			Added to monochrome system price	
PCA Parallel Card	To add both serial and parallel & Serial Card ports to PCA system	£95.00	BusinessCard	A simple plug-in card to add a 21 Mbyte Winchester disk drive to an IBM PC or PC compatible	£775.00

The above prices include FREE GEM Collection with Setup/Menu OR EPSON GSKR PRINTER ON DISCOUNT - 640 Kbyte storage memory upgrade.

Free 6 month on site guarantee with extended guarantee option

SOFTWARE

Base II	£245	PSS Writer (w/printer)	£110
Base III PLUS	£355	Pison Exchange Suite	£295
FrameWork II	£340	Q & A	NEW £195
GEM Collection	£99	Ready	NEW £65
GEM Draw	£99	Reflex	£70
GEM Graph	NEW £120	Smart System III	NEW £950
GEM Worksheet	NEW £99		
Lotus 1-2-3 ver 2	£265	Sage Accountants Plus	£465

MS-DOS 2.11	£250	Sage Accountants	£345
MS-DOS 3.11	£275	Sage Bookkeeper	£199
MS Windows	£75	Summa Mouse	£55

MS Word III	NEW £295	SuperProject Plus	NEW £295
Mathematical Advantage	£250	VP Planner	£79
Mathematical 2	NEW £180	Word Perfect 4.1	£295
Open Access	£295	Wordstar 2000 ver 2	NEW £290

Paradox	£400	Wordstar Professional	£241
---------	------	-----------------------	------

PRINTERS

EPSON FX85	£130
EPSON FX80B	£424
EPSON RX100	£1041
EPSON LX80 - TACTON	£213
EPSON DX100	£307
EPSON LX1500 - 1	£375
CANON 1030A	£291
CANON A55	£350
CANON JASEP	£1,999
JUN E100	£249
JUN 6200	£340
JUN 5510	£249
BROTHER HP35	£779

Wide range software/hardware packages and printers. At very competitive prices. Please telephone with particular requirements. Technology Computer Ltd, 39 Stammers Crescent, Luton, Beds LU2 2LJ. 0528 5822131. (0442) 50065. ALL PRICES EXCLUSIVE OF VAT + CARRIAGE

MICROCOMPUTER HARDWARE SUPPLIES

COMPUTERS

THE AMAZING AMIGA with Hi Res Col Mon Mouse 1475.00
Integral 3.5" Drive Kickstart, Workbench & Tutor 1675.00
AMIGA as above plus external 3.5" Drive 479.00
Amstrad PCW8256 Word Processor System 379.00
Atari 1040STF with 1MB drive, Mouse & Col Mon 810.00

Atari 1040STF with 1MB drive, Mouse & Mon 648.00
Atari 520STM 512KB with TV D-P 295.00
BBC Master 128 389.00
Bondwell 34 PC 640K RAM, Twin Drives & Monitor 599.00

Bondwell 36XT with 20 Mb Winchester 999.00
Commodore Business Pack 1280 + 1900 + MPS1000 + Microclerk 742.00
Commodore 128D inc. built in 1571 disk drive + 1900M mon 495.00
Commodore 128D inc. built in 1571 disk drive 412.00
Commodore 128 + 1570 disk drive 345.00
Commodore 128 Compendium C2N/Music Maker etc. 230.00
Commodore 128 207.00
Commodore 64 Compendium Pack 160.00

PRINTERS

Citizen MSP10 160cps & NLO 277.00
Citizen 1200 Dot Mat, Trac., 120cps & NLO 167.00
Commodore MPS1000 Dot Matrix 100cps & NLO 219.00
Fric/Trac 136.00
Epson LX80 Dot Matrix & NLO 199.00
Okimate 20 Ribbon Transfer Colour Printer for PCW8256 159.00
Quendata DWP1120 Daisywheel 18cps 139.00
Star NL10 with C64 128 Intert 120cps & NLO 222.00

MONITORS

Atari SM124 Mono High Res 115.00
Commodore 1901 Col 14" 229.00
Commodore 1900 Green 12" 120.00
Microvitec 1451 Col RGB 14" Med Res 223.00
Philips B500 Col. Comp 14" Std Res 176.00
Philips BM7502 Green 12" 69.00

DISK DRIVES

Atari 20Mb Hard Disk 699.00
Atari 10Mb Disk Drive 154.00
Atari 5.5Mb Disk Drive 115.00
Commodore 1571 216.00
Commodore 1541 Disk Drive 136.00
Cumana CD80IS Dual Disk Drive for BBC 265.00
Cumana CS40US Dual Disk Drive for BBC 145.00
Opus Challenger 213.92
Opus 58020 Dual Disk Drive for BBC 254.18

ACCESSORIES

Centronics Interf for C64 128 8K Buffer & Graphics 51.30
Centronics Interf for C64 128 26.04
Surge Protector 13amp Plug 10.39
Printer Ribbons - You name it P.O.A.

BUSINESS SOFTWARE

Degas Picture Drawer for Atari ST 34.00
OR Draw for Amstrad PCW8256 43.43
OR PASCAL for Amstrad PCW8256 43.43
Interword ROM for BBC 45.00

Microclerk Accounts Package for Commodore 128 85.00
Microclerk Purchase Ledger for Commodore 128 85.00
Microclerk Sales Ledger for Commodore 128 85.00

Pocket Wordstar Deluxe for Amstrad PCW8256 59.00
Sage Popular Stock Inv. for Amstrad PCW8256 61.28
Sage Popular Accounts Plus, Amstrad PCW8256 61.28

Superbase 128 130.43
Supercalc II Spreadsheet for Amstrad PCW8256 72.00

Superscript 128 49.00
VistaWrite Classic 128 64.00
VistaWrite Classic 128 73.00

DISKS (Examples)

5.25" SS/DD Goldstar (10) 7.75
5.25" DS/DD Xerox (10) 16.25
5.25" DS/DD Goldstar (10) 28.00
3" DS for Amstrad (10) 35.50

DELTA PI PROCESS INTERFACE FOR COMMODORE 64/128
8 Analogue Inputs (12 bit) & 32 Digital Input/Output lines £199.00
All prices exclude VAT. DELIVERY: 4 day £7 + VAT. 2 day £10 + VAT.
Software and small items FREE. Make cheques payable to:-

Delta Pi Software Ltd

8 BRUSWARP LANE, WHITBY, N. YORKSHIRE YO21 1NO. Tel. 0947 600065 (9am-7pm)
Please contact us for many other products not listed

VISION COMPUTER PRODUCTS

Unit 15, Suttons Industrial Park, London Road, Reading
TEL: 0734 668668

We would like to pass on our expertise gained from recent research into Taiwanese suppliers. Quality products specially selected for performance and reliability to give you **unrivalled value**. Our machines are NOT built down to a price.

TURBO XT/F

- 256K RAM on 640K board (8087 socket)
- 8088-2 processor 4.77/8 MHz (s/w switchable)
- 360K FDD
- 20 M Byte Fast (40 ms) HDD
- 135 Watt PSU
- AT Style 84 key Keyboard with LED
- 1.7 times faster than IBM/XT
- Multi I/O card (serial/parallel/clock)
- 12 months free warranty
- HGC equivalent mono graphics
- 14" green or amber hi-res screen
- Tilt and Swivel stand
- MS DOS 3.1

£1260

Add £240 for CGA with 14" Tilt and Swivel Screen
Add £555 for EGA with 14" Tilt and Swivel Screen
Also full range of cards and disks

SUPERB TURBO XT/XF

- 640K RAM motherhood (8087 socket)
- 8MHz 80186 processor
- 360K FDD
- 20 MByte Fast (40ms) HDD
- 135 Watt PSU
- AT style 84 key keyboard with LED
- 4.7 times faster than IBM/XT
- Multi I/O card (serial/parallel/clock)
- 12 months free warranty
- HGC equivalent mono graphics
- 14" green or amber hi-res screen
- Tilt and Swivel stand
- MS DOS 3.1

£1510

Phone or write for full details. Leasing terms available.
OEM and major account enquiries welcome - we will quote to your precise requirements.

YOU NEEDN'T PAY MORE - YOU SHOULDN'T PAY LESS

IBM XT/AT are registered trade marks of the IBM corporation

A game of skill?

In the fourth part of his AI series, David Levy examines the ability of machines to emulate human thought processes in the sphere of game-playing.

Writing programs to play 'intelligent' games such as poker, bridge and backgammon is one of the oldest subjects within the field of Artificial Intelligence. As early as the dawn of the computer era, articles appeared in learned journals suggesting how a computer might be programmed to play a sensible game of chess, and in the intervening decades we have witnessed the creation of game-playing programs that can perform better than almost all human players, and in some cases even better than the human world champion. (A backgammon program written by Hans Berliner at Carnegie-Mellon University, Pittsburgh, won a match against World Champion Luigi Villa, and more than one Othello program has proved too strong for the human World Champion.)

Apart from being great fun and an interesting challenge, there is a sound scientific reason for programming strategy games. If the computer can be made to model or improve upon human thought processes in this particular area of intellectual endeavour, then in some sense we have a genuinely intelligent machine. Writing strategy game-playing programs has long been such a popular subject that there's already a rich literature. Some of you may remember, for example, my earlier series in PCW, which was later published in book form.

Algorithmic games

There are some simple games that can be played perfectly by algorithmic means. An algorithm is a method or device which guarantees to find the solution to a problem if a solution exists, and a relatively simple algorithm has been shown to play a perfect game of Nim.

Nim is seen in various forms, but the fundamental idea is always the same. There are a number of piles of objects, usually matches, and a number of objects in each pile. A popular starting configuration has four piles of matches with one, three, five and seven matches in the piles.

The two players move in turn, and

a move consists of taking one or more matches from any pile. The player who removes the last match of all loses the game.

The algorithm to play this game perfectly requires noting the number of matches in each pile in binary, and then adding each column of binary digits in decimal. If the decimal totals in all the columns are even, then the player who must move next will lose the game (if both sides play perfectly). For example, the configuration one, three, five, seven when expressed in binary is:

1	=	1
3	=	11
5	=	101
7	=	111
total		224

So, in this starting configuration, the player who moves first should lose.

Let's see how this works in practice. We'll assume that the computer moves second and that we begin the game by taking three matches from the pile with seven. This leaves piles with one, three, five and four matches respectively:

1	=	1
3	=	11
5	=	101
4	=	100
total		213

The program knows that the second and third columns have odd totals, and in order to make them both even, it needs to change one of the 1s to a 0 in each of these two columns. By removing all the matches from the pile of three, the program can achieve this goal and leave the following situation:

1	=	1
5	=	101
4	=	100
total		202

This total is entirely made up of even digits, so again we are in a losing situation. If we now try taking three matches from the pile of five,

we leave piles with one, two and four matches:

1	=	1
2	=	10
4	=	100
total		111

The program can now try every possible move and examine the binary totals for each of the resulting situations. It soon finds that by removing one match from the pile of four, it leaves piles with one, two and three matches, for which the binary representations (1, 10 and 11) add up to 22 — both digits even!

What happens if we now take one match from the pile of two, leaving piles with one, one and three matches?

1	=	1
1	=	1
3	=	11
total		13

The only way for the program to leave a situation in which each of the binary columns has an even decimal total, would be to remove all three matches from the pile of three. This would leave two piles, each with one match in each pile, and after we took one of these matches the program would be forced to take the other one and lose the game. We can see that this situation is an exceptional case, so we must modify the algorithm slightly. We add the rule that if it's possible to do so, leave a situation in which there's an odd number of piles of matches with one match in each pile — the player who moves next must lose the game.

Using heuristics

Most games of any serious interest can't be solved with a Nim-like algorithm. Good players use a number of heuristics (rules of thumb) to help them make sensible decisions.

In bridge, for example, it's fairly well-known that when defending against a no-trump contract, it's usually best to lead the fourth highest card of your longest suit. This



heuristic can be written into any bridge program quite easily, and the program will then know as much about leading against a no-trump contract as 90 per cent or more of the world's bridge players.

One way to program heuristics is to convert them into a scoring function. We'll use noughts and crosses as an example, and will show how a simple tree-searching program works in practice.

A	B	C
D	E	F
G	H	I

This is the starting configuration, in which all nine spaces are vacant. You'll realise that there are eight possible winning lines: ABC, DEF, GHI, ADG, BEH, CFI, AEI and CEG. In order to win the game, it's necessary for the program to get a full line of

its own symbol before we get a line full of ours. Let's assume that the program is X and that we are O.

A simple scoring function which works quite well for selecting the first move is to count the number of 'winnable' lines. We define a line as being winnable by one player if that line includes at least one of his own symbols and none of his opponent's. Let's see how this scoring function assesses the three essentially different first moves (omitting reflections).

If the program plays first it can go in A, B or E (all other moves are equivalent to one of these). Putting an X in space A creates three winnable lines: ABC, AEI and ADG. Putting an X in space B creates two winnable lines: ABC and BEH. Putting an X in E creates four winnable lines: AEI, CEG, BEH and DEF. Therefore, the scores produced by our simple scoring function for the

moves A, B and E would be three, two and four respectively. Move E has the highest score so that this is the move that our program would make, and, as we all know, this move to the central space is the best way to start the game.

Unfortunately, this scoring function is too primitive to be useful for playing a whole game (if you don't believe me, try it for yourself). There are two reasons for this: firstly, it takes no account of the opponent's possibilities; and secondly, it doesn't consider lines with more than one space occupied by the same player. We need to modify the scoring function so that both these factors are taken into consideration.

In order to make allowances for the opponent's winnable lines, the scoring function could simply add one point for each of the program's own winnable lines, and subtract one point for each of the opponent's winnable lines. Let's see how this works out in the following situation:

A	B	C
D	O	F
G	H	I

The opponent has moved first and placed an O in the central space. The program must now decide whether to put its X in space A or space B (again, all other moves are merely reflections of A or B).

If the program plays in space A, the scoring function computes:
number of own winnable lines=2 (ABC, ADG)
number of opponent's winnable lines=3 (BEH, DEF, CEG)
total score=2-3=-1

If the program plays in space B, the scoring function computes:
number of own winnable lines=1 (ABC)

number of opponent's winnable lines=3 (AEI, CEG, DEF)
total score=1-3=-2

so, the scoring function indicates a better score for the program (-1) if it puts its X in space A than the score it would get for putting the X in space B (-2). The program would, therefore, play (correctly) in space A.

The other features which must be added to the scoring function cater for lines with two or three spaces occupied by the symbols of one player. Other things being equal, a winnable line with two Xs is more useful to the program than a winnable line with only one X, and a line with three Xs is the most useful line of all. In order to allow for the fact that some winnable lines are more valuable than others, we assign to these lines a numerical weighting which hopefully reflects their relative importance. Let's try values of two and three for winnable lines with two and

CALL US AND WE'LL TELL YOU WHERE TO BUY A CHEAPER PC!



It's true that someone, somewhere will always produce something 20% cheaper, that's 40% worse! At Digitask we don't sacrifice quality. As one of the first manufacturers of PC compatibles, endorsed by major PC user groups, we have a reputation to protect.

The combination of quality and real value for money has made Digitask the only sensible choice.

- ★ Free software with every system purchased!
(Word processor, Spreadsheet, Filer, Communications & Utility)
- ★ One year *full* warranty

DIGITASK TURBO PC

STARTER System	£449
FULL FEATURE System	£695
PREMIERE 10MB System	£899
BUSINESS PRO 20MB System	£975

DIGITASK

Tel: (0342) 24631
Telex: 957418



Digitask Business Systems Ltd, Unit M, Charlwoods Business Centre, Charlwoods Road, East Grinstead, West Sussex RH19 2HH

Prices do not include VAT and Carriage

CUB'S COLOURFUL MASTER PIECE



Acorn's BBC Master Series bring exciting new levels of sophistication to a proven family of micro computers. Unfortunately, not all monitors on the market can do justice to the Master Series' colour display capabilities.

That's why more BBC users choose a Microvitec CUB colour monitor than any other – because every model in the CUB family is a masterpiece of high performance British design. The clarity, depth of colour and rock steady image seen on a CUB display allows the user to exploit graphics and text to the full – just ask for a demonstration of a CUB alongside someone else's monitor and you'll be totally convinced.

In the meantime, the picture above amply demonstrates why a CUB is a delight to the eye in more ways than one.

Model	Resolution	Screen	Bandwidth	Application
1431/DS4	Standard 452(H) x 550(V)	–	18 MHz	Education, Home, Colour graphics use
1451/DS4	Medium 653(H) x 550(V)	Anti-glare	18 MHz	80 column, text-processing, High quality graphics.
1441/DS4	High 895(H) x 550(V)	Anti-glare	18 MHz	High-resolution graphics and text applications.

Available with tilt and swivel option. Also available are Microvitec's range of popular BBC compatible metal cabinet monitors 1431/MS4, 1451/MS4, 1441/MS4.

TOUCH SCREEN OPERATION

Touchtech 501, designed for operation with all CUB metal cabinet monitors – the ultimate in user friendliness.



BBC COMPATIBLE

For free, full colour brochure contact



MICROVITEC
cub
COLOUR MONITORS



Futures Way, Bolling Road, Bradford BD4 7TU, West Yorkshire.
Tel: (0274) 390011/726500. Telex: 517717 MVITEC G.

Available from High Street Computer Retailers and branches of W. H. Smith, Boots, John Lewis Partnership, Laskus and Currys.

ARTIFICIAL INTELLIGENCE

three spaces occupied by Os or Xs. The scoring function then becomes:
 (number of winnable lines with one X — number with one O)
 + 2x(number of winnable lines with two Xs — number with two Os)
 + 3x(number of lines with three Xs — number with three Os)

I make no claim for this being the best possible scoring function, but it will do for this discussion. Let's see how this scoring function works in conjunction with a simple tree search.

Searching a one-ply tree

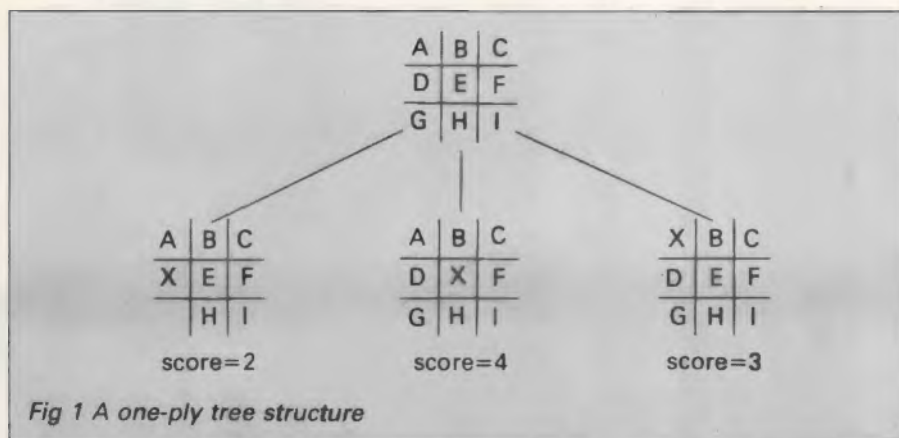
Most strategy game-playing situations may be represented by a tree structure (see Fig 1).

Here we see a simple 'one-ply' tree. The number of ply, or half-moves, indicates how deeply we're going to search the tree — in other words, how far ahead we're going to analyse. Applying our scoring function to each of the three positions that can arise at a depth of one-ply, we find scores of two, four and three, and so the program would choose to play in the centre for the maximum possible score.

Making a move based only on a one-ply search is rather unlikely to lead to good play, so programs will often search to a much greater depth. The world's strongest chess and Othello programs can sometimes search to a depth of 15-ply or more along certain variations! Let's now see how a program would conduct a two-ply search.

Searching a two-ply tree

Fig 2 is just part of the two-ply tree, and includes only the replies to the program's move at D. We can see that the opponent has a choice of five different replies, with scores of -1, 0, -1, 0 and -2. We have seen



that when considering the moves which lead to situations at a depth of one-ply, the program tries to maximise its score (it chose a move which scored four in preference to ones which scored two and three). But when considering the situation from its opponent's point of view, the program knows that the opponent will always try to minimise the score. For this reason, if the program were to open the game by playing its X in space D, the opponent would appear to do best by playing his O in space E (which scores -2), rather than in C or A (which each score -1), or in B or F (which each score 0).

The program always assumes that its opponent will make the best possible moves, so it assigns to its own move D a score of -2. This is called the 'backed-up' score, since it's obtained by carrying the best score for the opponent back up the game tree. In a similar way the program will determine the backed-up scores for its moves to A and E, which turn out to be -1 and +1 respectively, and it will then decide to make its first move in the space E since this move has the maximum

backed-up score (+1) while the backed up scores for A and D are -1 and -2 respectively.

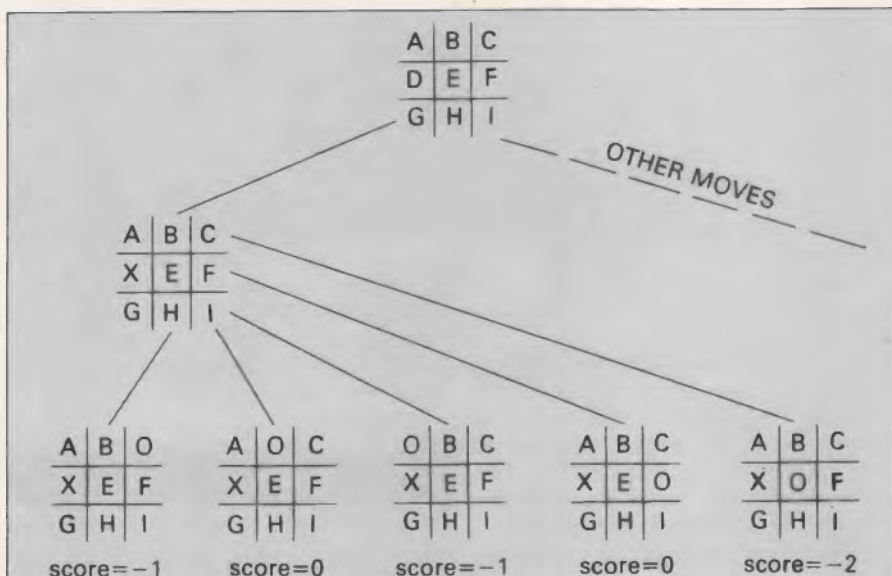
This process of choosing the maximum of the minima (of the maxima of the minima of the ...) is known as the 'minimax' method, and is the underlying principle of all tree-searching programs that are designed to play games. In fact, there's a simple modification to the minimax method which guarantees to make the same move but with only a tiny fraction of the computation required for minimax. This is known as the 'alpha-beta' algorithm, and works on the basis that if the program discovers a move which refutes its opponent's previous move, it need look for no more refutations — one is enough.

Conclusion

Using a scoring function in conjunction with a deep enough tree search usually enables a program to play its chosen game rather well. As the depth of search increases, the quality of the program's play usually increases, and it isn't difficult to see that if the program were able to search the game tree right to the end of the game, it would always play perfectly. In noughts and crosses this isn't such a difficult task, since the total number of possible different games can be measured in tens of thousands. A program searching the whole of the game tree could employ the simplest scoring function of all, which would assign scores of +1, 0 and -1 to positions that were won, drawn or lost.

In contrast, the game of chess is so rich in its possibilities that the total number of positions of the whole game tree is greater than the number of atoms in the universe, which explains why it's rather unlikely that a computer program will ever play perfect chess.

Bibliography — Levy, DNL (1983): *Computer Gamesmanship*, Century, London. **END**





SCREENTEST

Vitamin C & PforCe

Vitamin C and PforCe are IBM PC library packages whose database, windowing, menu and screen utilities greatly improve the presentation of software applications. Mike Liardet checks them out.

Remember the adage that there are only seven fundamentally different plots for a novel? Similarly, there are only a handful of fundamentally different software components needed to create the greater part of most applications software. It's a surprising fact that even highly diverse applications have many component methods and procedures in common. For example, nearly all software packages include menus, screen layouts, user input validation, file interaction, error recovery, and so on.

Good programmers have long recognised this fact, and if they specialise in one programming language, then over the years they will painstakingly assemble their own suite of favourite utilities. These will then be of general use for whatever programming projects may come their way.

It takes a long time to develop a comprehensive suite of utility software, and with the realities of project deadlines, it's unlikely that the programmer will ever have time to fully polish and document it. Moreover, there is always that frustrating feeling of 're-inventing the wheel': for example, a new data conversion routine must be written several times a day.

With the recent release of a number of so-called library packages, it's now possible for even a novice programmer to have perhaps two man-years' worth of solid utility development under his belt. These library packages all cost less than one or two days of a programmer's fees, yet contain a huge range of valuable application facilities, with full documentation and demonstration programs. For most of them, the complete source code is provided, and the software can be used on any number of applications without any

royalties payable.

Pascal and C are the current favourite programming languages for the 'library business'. Both languages lend themselves to the structured programming technique, which can make best use of libraries. In this article, I'll take a close look at two C libraries: Vitamin C from Creative Programming Consultants and PforCe from Phoenix Computer Products Corporation. Although there are many other worthy systems, I have chosen these two because of the breadth of facilities of the former and the simplicity of the latter. Also, both systems give the programmer the opportunity to create windowed applications, and this is probably the most interesting feature offered by library software.

Using library software

The user of library software must be competent at programming in the programming language that they support. The facilities can be thought of as lying somewhere between third-generation software (that is, ordinary high-level programming languages) and fourth (application generators, and so on) — a kind of 3.5th generation. Of course, fourth-generation software can sometimes be used without any programming expertise, but it's considerably less flexible.

Library software is available only for languages which need to be 'compiled'. In contrast to interpreted languages, the source code for compiled languages can't be executed as soon as it's written, but must first be compiled (using a compiler, such as Lattice C), then 'linked' (using a linker, such as Microsoft Link).

The linking process does more than just blend the object files created by

the compiler — it can also handle library files. This is where the library packages come in. A library file is actually a collection of object files all bundled together into a single file, purely for convenience. As libraries are frequently built out of over 100 object files, the convenience of specifying a single filename instead of a hundred is quite considerable.

Most programming languages are supplied not only with the compiler program, but also with a library file incorporating facilities to handle basic file operations, trigonometric functions, and so on. (Many of these library facilities are not optional extras, but are an essential part of the programming language.) When the program contains a statement to open a file or compute the cosine of a number, it is actually calling upon utilities present in the library file supplied with the programming language.

The presence of another library (for example, PforCe or Vitamin C) alongside the existing one merely adds to the range of facilities available, effectively extending the scope of the programming language. With PforCe and/or Vitamin C present, the program can create multiple windows onscreen, organise prompts, or validate a screen full of user input — all with just a few short commands in the source code, and the nitty-gritty details for performing these operations are all handled by the library.

Vitamin C

The C programming language rather lends itself to puns, and Creative Programming Consultants of Texas was clearly unable to resist yet another one. Vitamin C enables the programmer to

quickly develop high-quality interactive screen layouts and windows.

Vitamin C is supplied with ready-built libraries for either Microsoft, Lattice or Computer Innovations compilers on the IBM PC (and compatibles). The complete source code is provided. It's almost all standard C, with a few lines of assembler. It should not be too difficult to recompile it for other compilers, or even transport it to another hardware environment.

In addition to the manual there are four disks containing library files, executable and source code for various demonstrations, and short example programs for every function in the library. As I have already mentioned, there's also the source code for all the library functions as well. The review copy was for Lattice C and comes with four libraries, one for each of the four different memory models used by Lattice. (This means that whichever way you use Lattice C, one of the libraries will be appropriate.)

Vitamin C's forte is in providing windowing and superb screen design and input validation facilities. It's also possible to build on these facilities to implement Macintosh-style pull-down menus, and one of the demonstration programs shows how this can be done.

Documentation

Programmer utility software is notorious for appalling manuals, but in this respect Vitamin C is pure delight. The manual is divided into a tutorial and reference section, along with some technical notes.

The tutorial gently introduces all the concepts, with code fragments and coding tips. Not unreasonably, it assumes some prior familiarity with C, but it also takes the trouble to elaborate when referring to some of C's more cryptic constructs. For the C novice, it includes a bibliography of some of the better C books.

The reference section is a complete alphabetical list of all the functions provided, presented in Unix-fashion with a synopsis, description, diagnostics and notes (usually none) for each function. The write-up for each function also includes a 10-20 line program to illustrate its use. All these example programs are included on the disk, so there's no need to type them in to try them out.

The technical notes give more details on a variety of topics, such as how to handle different display attributes, recompilation for other compilers, and so on.

About the only blemish in the Vitamin C manual is that there's no mention of any of the technical notes on the contents page. I had quite a laborious time creating batch files to recompile the system before I came across a reference to a special facility to help with this problem, in the technical reference section. Neither is there an index, but with an alphabetical refer-

```

xatget(7,3,name,"XXXXXXXXXX",NULL,
      "Enter name.",
      "NAME",
      vc.dflt,vc.dflt);

xatget(10,3,date,"99/99/99",valdate,
      "Enter date of birth in MM/DD/YY format.",
      "DATE",
      vc.dflt,vc.dflt);

xatget(13,3,phone,"(9999)999-9999",NULL,
      "Enter phone number.",
      "PHONE",
      vc.green+vc.bold+vc.blink,vc.brown+vc.bold);

xatget(13,68,salary,"$60,000.00",NULL,
      "Enter salary.",
      "SALARY",
      vc.dflt,vc.dflt);

readgets();

```

Fig 1 Forms layout with Vitamin C

ence section this would be largely superfluous.

Screen layouts and input validation

Many computer applications require the user to fill in the computer equivalent of a form. Initially, the form is displayed on the screen as a number of prompts with a blank space at the side of each, ready for the user to key-in the details. Then the user must key in the responses to 'fill in the form', and the program must check that these responses make sense.

A good half of the Vitamin C library is devoted to facilities to help with the programming of forms. Suppose we have to program a personal details form; the prompts might include Name, Date of birth, Phone number, Salary, and so on. It's quite possible to implement this kind of thing in an *ad hoc* fashion with:

```

Display "What's the name?"
Get user's response (hopefully a name)
If it's not right, ask again.
Display "What's the date of birth?"
Get user's response (hopefully a sensible date)
If it's not right, ask again.
... and so on.

```

This approach has been responsible for many abysmal applications, where typically it's impossible to abandon a sequence of questions or go back and change a previous response, or get further information on the current question. Vitamin C allows the programmer to use this very simple-minded approach, but overcomes all these difficulties. For example, the code in Fig 1 sets up all the validation and screen prompts, and so on, before doing any input; then the final 'readgets' function call organises the entire interaction with the user. Each 'xatgets' call (an Extended Get input At specified screen location) deals with one specific piece of user input (called a field) and specifies, in order:

- the position on the screen to 'get' the information from the user — for example row 13, column 3 in the first

call. This is where his response will appear.

- the character array in which to return the resulting user input to the program — for example: name, date, phone number or salary. Character arrays are always used — even for numeric fields. C's sscanf function can subsequently be used to convert numeric text into a number.

- the validation to be carried out. Vitamin C provides a rich variety of validation alternatives. The four given in the example are: accept up to 10 characters, converting the first to upper case; accept up to six digits separated by two '/'s; accept up to 11 digits separated by '(', ')' and '-'; and accept a financial figure with two decimal places, commas automatically inserted with the digits displayed from right to left as they are entered (like on a pocket calculator). Where the validation specifier includes special characters like the '/', ')' and '-' above, then these are set up on the screen for the user and do not need to be entered, and neither can they be deleted or changed — the cursor just skips over them.

- an additional special validation procedure. Whereas 99/99/99 will ensure that the user enters a numeric month, day and year, extra validation is required to detect invalid input like 34/29/72. The xatget call to set up a date uses Vitamin C's 'validate', a date validation routine, but the programmer can also supply any special-purpose validation procedures if necessary. (Incidentally, all Vitamin C's date software operates on the US month/day/year format, but as all the source code is provided, it's relatively easy to modify it to cope with the UK date convention.)

- an extra status-line message which appears during the user input — for example, 'Enter name', 'Enter phone number', and so on. This is the prompt for the user, displayed only when that particular field is being entered.

- the help text to be shown if the user presses the Help key. Notice that only a keyword (NAME, DATE, and so on) is supplied in the xatget call, although for



SCREENTEST

each keyword there could be several pages of help information. As help text is usually fairly verbose, Vitamin C allows it to be created, freely typed, in an ordinary text file. When it's finally displayed, Vitamin C automatically re-formats it if necessary.

A fragment of the help text file for this example might look like Fig 2. The '@@'s identify the keywords to be used in the xatget calls. A utility program can read this help text file, and create an index file which records, for each keyword, the location of its corresponding piece of help text. During initialisation of the program, only the index file need be read into memory (using a Vitamin C facility), the bulk of the help text remaining on disk. This methodology also ensures that the help text can be maintained without changing the program itself.

● the display mode to be used while the user is dealing with that field, and the display mode when he is dealing with another field. For example, the phone number is a lurid green, bold and blinking when the user is entering it, but otherwise it is brown and bold. All the other fields use the more sober default display attributes.

The readgets function does all the work for user input; the xatget calls merely set up the information for it to use. (Incidentally, there are simpler versions of xatget, where display attributes and help, and so on, are set up automatically and do not need to be specified.) Readgets allows the user to move backwards and forwards through any of the fields, change information previously entered, and get help. The IBM's left and right arrow keys move the cursor a character at a time within a field, whereas the up and down arrows move the cursor to the previous or next fields. Other keys, such as Home and End are also operative. The programmer can easily redefine the keyboard usage for non-IBM hardware, or change the key usage on the IBM with special Vitamin C function calls.

While readgets is waiting for user input, it can execute another function. This creates the illusion of concurrent processing, as if the system were doing two things at once, but the second function cannot normally be interrupted by the first. A useful second function would be one to display the time on the screen. Vitamin C

has a number of time facilities in any case, so it's relatively easy to write a function to access the system clock and display the time at some fixed position on the screen. Once this function has been installed for readgets, it will keep the time up-to-date no matter how long the user takes to enter information for readgets. Since a time display function executes virtually instantaneously, there's no need to worry about it being interrupted by a user's key press. One of the demonstration programs shows how a non-instantaneous activity, such as reading a file, can be performed simultaneously with getting user input.

Windows

Vitamin C's other major facility is a range of windowing utilities. Many readers will be familiar with the windowing concept introduced on the Apple Macintosh and subsequently to become available on the IBM PC with Digital Research's GEM and Microsoft Windows. Vitamin C's windows are not quite as elegant as some of these products, but they are still highly presentable and considerably easier for the programmer to work with.

The simplest way to create a window is to use the 'wopen' function:

```
wopen(4,15,16,55,"I'm a window!!")
```

This causes a window to be displayed as a box with the top-left corner at row four column 15 and the bottom-right corner at row 16 column 55. The title 'I'm a window!!' is displayed in the top line of the box. The window is initially empty, and overlays whatever previously occupied that part of the screen. The previous screen image is restored once the window is closed or moved; therefore the window on the screen can be thought of as a sheet of paper on a desk, temporarily obscuring whatever is beneath it. Incidentally, Vitamin C's terms 'open' and 'close' are somewhat unfortunate in the context of windows — the terminology is

derived from analogous operations on disk files and has no connection with opening and closing real windows!

A window can be made to hold more information than its actual physical display area. Such a window can be created by using an 'extended-open' function:

```
wxopen(4,15,16,55,
```

```
"I'm a window!!",ctrl,30,90)
```

This creates an identical window to the one above, except instead of only being able to write information to the area visible within the box, it's possible to write information anywhere within a 30 by 90 virtual screen. Of course, only about a quarter of this information can be seen at any given moment, but the focus of the window can be changed. This happens automatically when information is written into it: Vitamin C ensures that the current cursor position is always visible in the window, and it's also possible to use a scroll function to scroll the virtual screen area up, down, left or right.

The 'ctrl' information in the above wxopen call may be used to specify different border types for the window, or even whether or not borders should be present. Windows can also be moved or resized under user control, but sometimes this is not desirable and ctrl can be used to disable this feature.

Finally, it's possible to gain some appreciation of the power of Vitamin C from Fig 3. This shows a demonstration application with a multiple window layout including a form comprising nine different fields, all of which are fully validated: text, phone number, date, special codes, financial, and so on. There's context-sensitive help, a clock and date which is continuously updated during the user input, and a summary of the session is given once the user input is complete. This demonstration was generated with just 180 sparsely-written lines of code (excluding comments). Much of the code is concerned with initialisation and termination, so the actual meat of the system was developed with considerably less effort than that.

PforCe

Phoenix Computer Products Corporation should already be well-known to many programmers as the manufacturer of a number of program development aids: Pmate (an editor), Pfix (a debugger) and Plink (a linker). With a convention that all its product names must have the 'P' prefix, Phoenix is now presenting the tortuously-named C library: PforCe.

PforCe is supplied with six to eight (depending on version) IBM PC disks, a manual so large that it's split into two volumes, and a reference card.

```
@@NAME ....etc...
```

```
The name of the subject can be up to 10 letters. Whatever you type for the first one will be converted to upper case.
```

```
@@DATE
```

```
The subjects date of birth must be entered in the form...
```

```
....etc...
```

Fig 2 Help text for use with 'xatget' in Vitamin C

Borland introduces the library of affordable quality software for your IBM PC or compatible

At Borland our philosophy is best described in four words: **Quality, Speed, Power and Price**. Two of our products were recently nominated for a "British Micro Award". One, Sidekick, received a "British Micro Award". In the United Kingdom, Borland products are now available at your local dealer or through Softsel (01) 568 8866, P & P Micro Distributors (0706) 217744, Altor Ltd (041) 226 4211 and First Software (0256) 463344.

If you use a PC – choose Borland software.



Pascal Programming:

Turbo Pascal £69.95

High-speed Pascal compiler and integrated programming environment.

Turbo Tutor £29.95

Basic through advanced Turbo Pascal programming concepts and techniques.

Turbo Graphics Toolbox £49.95

High-resolution graphics for Turbo Pascal.

Turbo Editor Toolbox £49.95

Word processor construction set for Turbo Pascal.

Turbo GamesWorks £49.95

Chess, Bridge and Go-Moku in Turbo Pascal.

Turbo Database Toolbox £49.95

Complete library of database routines for Turbo Pascal.



Business Productivity:

Reflex: the Analyst £99.95 Nominee British Micro Award!
The analytical database manager.

Reflex Workshop £69.95 (Available August 15th, 1986)
25 different Reflex applications.

Sidekick £69.95 British Micro Award!

Complete desk-top management. Includes notepad, calculator, telephone dialer and more.

Superkey £69.95

Cuts down keystrokes and encrypts files for confidentiality.

Traveling Sidekick £69.95

Professional time-management binder, includes software that works with Sidekick.



Artificial Intelligence:

Turbo Prolog £69.95

High-speed compiler for the Artificial Intelligence language, Prolog.



Electronic Reference:

Turbo Lightning £69.95

Electronic reference work access system. Includes on-line spelling checker, Random House Dictionary and Thesaurus.

Lightning WordWizard £49.95 (Available August 15, 1986)

Turbo-Lightning's technical reference manual and applications.



Don't **SUBSCRIBE** **NOW!**

Subscribe at the 1986 Personal Computer World Show.

Visit the PCW team on stand 2014, 1503, or 1400 and
subscribe to the No 1 personal computer magazine in the UK –
Personal Computer World – The best in the business.



3-7 SEPTEMBER 1986
OLYMPIA LONDON

Sponsored by Personal Computer World
3rd-4th Business and Trade days only.

Be there, subscribe there.

ZIM is the first micro product to take full advantage of significant new developments in DB research—the highly acclaimed Entry-Relationship Model of data.

ZIM is a fully integrated Fourth Generation application development system. It puts mainframe power, speed and flexibility on your microcomputer. ZIM is a complete application development tool. It features an easily mastered command language using English sentences.

ZIM is an exceptionally powerful DBMS. It combines the function of database manager, programming language, data dictionary, report writer and forms facility.

The system is fast, efficient, well-documented, free of arbitrary limitations and provides the user with the ability to develop solutions to all information management applications.

ZIM is, without doubt, the most successful migration of mainframe ideas and needs to a micro.

The ZIM advantage:

- Powerful database structures.
- English-like command interface.
- Application portability: PC-DOS, MS-DOS, UNIX 3 & 5, XENIX VERSIONS 3 & 5 for the AT, QNX, NOVELL, MICROVAX & VAX 780.
- Integrated data dictionary.
- Multi-user, full transaction processing control.
- Report writer.
- Variable length fields.
- Quality product support.
- Unlimited files, records, fields, database, relationships database size.
- Networking, Novell and QNX.
- Unique optional compiler/runtime system.

- C Language interface.
- Full application development facilities.
- Forms painter and manager.
- Retrieval optimizer.
- Application complexity constrained only by hardware limits.

I'd like to know more about ZIM. Please send me details.

Name: _____

Company: _____

Position: _____

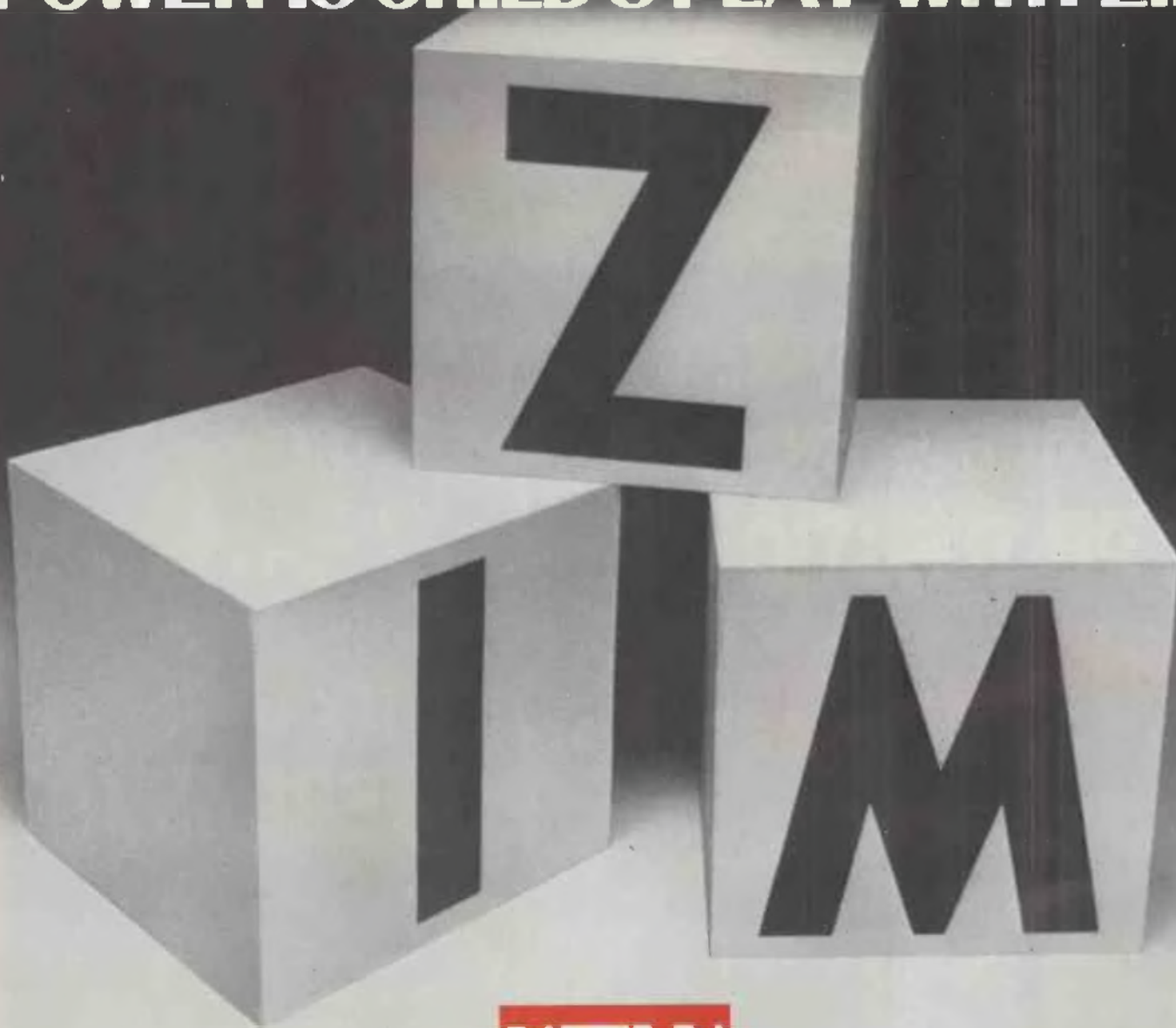
Address: _____

Tel. No: _____

PCW9-86

Xitan Ltd., Xitan House, 27 Salisbury Road, Totton,
Southampton SO4 3HX. Tel. No. (0703) 871211.

GIVING YOUR PC MAINFRAME POWER IS CHILD'S PLAY WITH ZIM



XITAN

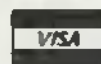
CAPITOL COMPUTER PRODUCTS

A Member of the Capitol Marketing Services Ltd Group of Companies

AMSTRAD CPC6128 / PCW 8256 / PCW 8512 SOFTWARE

SAGESOFT		AMSOFT	
Accounts	89.00	Microfile/	Combined
Accounts Plus	129.00	Microword	Business Package
Invoicing	59.00	Nominal Ledger	Purchase Ledger
Payroll	59.00	SuperCalc II	43.00
Popular Combo	129.00		
Super Combo	169.00	HISOFT	
Magic Filler	59.00	Pascal 80	The Torch
Retrieve	59.00	Devpac 80	The Knife
		Hisoft Compiler	35.00
QUEST			
Cash Trader	99.00	DUSTCOVERS	
Cash Trader		6128 Dustcover set	6.95
with analyser	129.00	8265 Dustcover set	8.95
		DISCS	each
		Amsoft 3" CF2	3.69
			box of ten
			36.95
MICROPRO			
Pocket Wordstar	45.00	8256 GAMES	
		3D Clock Chess	19.95
		Colossus 4 Chess	15.95
		Bridge	19.95
		Blackstar	13.50
		SAS Raid	13.50
		Balman	13.50
DIGITAL RESEARCH			
DR Draw	45.00		
DR Graph	45.00		
CAXTON			
Brainstorm	43.00		
Smart Key	43.00		
Cardbox			

CAPITOL COMPUTER PRODUCTS,
Unit F3, RAILWAY TRIANGLE, FARLINGTON,
PORTSMOUTH, HANTS PO6 1TG
TEL. HOTLINE 0705 380531



Please supply the following

Name

Address

Post Code Tel.

All Prices include VAT and Postage

Dealer Enquiries Welcome

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



Fig 3 An application implemented with Vitamin C

Four versions are available, for the Lattice, Microsoft, Wizard and Computer Innovations C compilers, all on the IBM PC. All memory models are supported for each of these compilers. Like Vitamin C and many other libraries, all the source code is included so it shouldn't prove too difficult to recompile it for use with other compilers. A significant amount of the system is written in assembler, so it would probably be quite difficult to transfer it to anything other than another Intel processor machine.

PforCe offers the C programmer around 400 function utilities to help with the implementation of windows, menus, databases, screen layouts and user input, plus a whole host of low-level system utilities such as communications and directory handling. In addition to the source code and libraries for all this, the disks contain a number of demonstration and utility programs.

Documentation

The quantity of documentation is quite considerable and is divided into two manuals: one introductory and tutorial; and the other for reference. There is also a reference card and a unique and valuable feature, namely a memory-resident facility to provide help with all the PforCe functions.

The memory-resident help is available at the touch of a special key, at any time — for example, while you are using an editor to create a PforCe program. It was written with PforCe's own menu, windowing and database facilities. The help facility presents an alphabetical list of topics, and then whichever one you pick, a run-down of all the relevant functions is given (see Fig 4). More information on these functions can then be picked up from the reference manual, which is organised in alphabetical order of function name.

That's the theory anyway, but, for some reason, the program regularly crashed my system (but it worked satisfactorily on a true IBM PC). Undoubtedly this problem was caused by the complexities of being memory-resident, so should not be

SCREENTEST

construed as a poor advertisement for the rest of the code which is comprised of some of the PforCe library. Certainly, a fully operational facility such as this is a more than welcome adjunct to the documentation, as it solves the problem of trying to remember 400 function names!

The tutorial and introductory manual gives the necessary information for installing the software, and gives a run-down on the accompanying demonstration programs. Unfortunately, it lacks an overview of the system; as PforCe has such breadth this is particularly missed, making it very difficult to get a feel for the (considerable) scope of the product. The tutorial material focuses on the six demonstration programs which run through PforCe's windowing, menu, input validation and database



Fig 4 Memory-resident help for PforCe

capabilities. The source code for all the demonstrations is printed in the manual and available on disk.

The reference manual gives a complete alphabetical run-down on all 400 functions, and also has some information on the various utilities. The function names are all prefixed with a mnemonic for their general area of application (window function names start with 'Wnd', record operations with 'Rec', and so on), so this makes it easier to locate the right one.

Windows and input validation

Like Vitamin C, PforCe has a comprehensive range of functions for manipulating windows and for handling input validation. The functions provided by PforCe are different, but the

end result is much the same; some PforCe windows can be seen in Fig 5. As I have already dealt with this topic in Vitamin C, I'll say no more here, and concentrate instead on the extra facilities of PforCe.

Menus

Although it's possible to engineer Vitamin C's windows into pop-up menus, and so on, unlike PforCe, the facility is not really built-in to the library.

With PforCe it's very simple to create menus: for example, the code to handle a pop-up menu is given in Fig 7. After specifying the location at which the menu is to pop up, along with its size and display attributes, the actual display and user interaction with the menu is handled by the 'pumedt' call. This handles everything, and restores the screen once the user has made a choice. Notice that only the actual text of the choices need be specified in the program: pumedt arranges the layout, and then returns the position in the list of the user's selection.

There are several styles of menu available, the pop-up being just one. A 'pick list' works in a similar fashion but the list of options may be larger



Fig 5 PforCe windows

than the display menu window, and it isn't wiped out after the user's selection is made. Most menus work by using the arrow keys to move the cursor to the desired option, but it's also possible to allow numeric selection of menu options, or alphabetical. Some of the possible menus available from PforCe, including the pop-up one I created above, are shown in Fig 6.

Database

PforCe has some powerful database facilities which are a natural counterpart to its screen input/user validation functions. Many applications combine all the various fields in a screen and store the information, as entered, in a record in a disk file. Frequently it is subsequently necessary to access that information, perhaps searching on the basis of a keyword, and then use it, change it,



SCREENTEST

or even delete it. Ordinary C file input and output functions are not especially helpful for this kind of activity, and PforCe fills the gap.

The most basic PforCe database functions allow for an empty one to be created, then records to be added, changed or deleted. The records are identified not by their absolute location in the file, but by a 'handle' — actually a C long integer. The main implication of this is that all the records can be of different sizes, and indeed can be changed in size at any time. Their handle is not affected by these operations (but it's very likely that their location is). Normally, records can't grow to more than 2000 bytes, but there are special facilities (extended records) which can handle record sizes up to 1Mbyte. The entire database can grow to 100Mbytes, which should be rather more than



Fig 6 PforCe menu styles

'Vitamin C is easy to get to grips with, and is very modestly priced. With an excellent manual, it should prove an excellent introduction to library software.'

enough for most users' Winchester.

Database software can be very sensitive to unstoppable user actions — unexpectedly turning the computer off, for example. Even PforCe can't stop that happening, but it does provide a number of safety functions to reduce the chances of damage if the user, or hardware, misbehaves. The problem stems from a feature of the operating system, which accepts

a command to write on the disk but does not always do it immediately. PforCe can force the 'write' to take place whenever the database is vulnerable, and the programmer can control the way this is used.

PforCe implements keyed access to the database information using a well-known technique called B-trees (Balanced trees). It isn't necessary to understand the internal workings of B-trees to use them; a B-tree can simply be thought of as an association list — linking keys with record handles.

Any number of B-trees can be created within a database, but all keys within a single B-tree must be the same type and size. The most important B-tree functions enable a key and record handle to be added to the B-tree, then for the record handle to be subsequently recovered on presentation of the key alone. With

PforCe the programmer has the option to create B-trees with multiple copies of a key, and this complicates the retrieval coding, but there's a PforCe function to indicate whether a B-tree has any multiple keys. Finally, it isn't essential for a B-tree to reside in the database file it's referring to, so databases can cross-reference one another.

Conclusion

Both PforCe and Vitamin C offer facilities to greatly improve the presentation of software applications. Neither of them could be used by an unskilled user, but in the hands of competent programmers, they will undoubtedly result in applications developed more quickly and to a much higher standard than would normally be possible. In any case, they only

'PforCe is probably the most comprehensive library package currently available... with over 400 functions in its library — five times as many as Vitamin C.'

need to save a few man-days on a project to pay for themselves.

PforCe is probably the most comprehensive library package currently available. In comparison with Vitamin C, which itself has a fair amount on offer, PforCe has over 400 functions in its library — five times as many as Vitamin C. In fact a number of very valuable functions have escaped mention here, for example: communications, DOS access, error recovery, keyboard handling, printer, string, date and time facilities, and many more. Not surprisingly, these 400 functions do take some time to learn, and the tutorial is perhaps not as helpful as it could be. But the ability to call upon sophisticated database, windowing, menu and screen utilities — all within one integrated library — should be quite irresistible.

Vitamin C is easy to get to grips with, and is very modestly priced. With an excellent manual it should prove an excellent introduction to library software. It can be highly recommended for any application needing window or screen facilities.

Vitamin C costs £140+VAT and is available from Grey Matter, tel: (0364) 53499. PforCe costs £425+VAT and is available from MCP Microsystems, tel: (051) 426 4178.

END

```
static char *pumary[] = { /* Choices for Menu */
    "Choice 0", "Choice 1", "Choice 2", "Choice 3", "Choice 4",
    "Choice 5", "Choice 6", NULLPTR };

...etc...

/* initialise a pop-up menu */
h_pum = pumlist(5, 1, 3, 4);

/* give it a title */
pumtitle( h_pum, "Popup Demo");

/* " ==> " symbol to point at user's selection */
pumsetarrow( " ==> ", VA_NORMAL );

/* display the menu and get the user's selection */
rc = pumedt( h_pum, &choice, _pumary );

/* check what the user did */
if ( rc == RC_ENTER ) /* if a choice was made */
    mads( h_ma, "\r\n You chose %d\r\n", choice );
else /* user hit <Esc> or something */
    mads( h_ma, "\r\nNo choice made\r\n" );

...etc...
```

Fig 7 Using PforCe to create a pop-up menu



dGE



HI-RES GRAPHICS ON-SCREEN

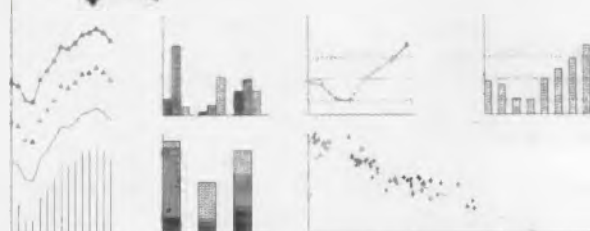
DIRECT from

dBASE (II & III) programs

The data base Graphics Extension (dGE) adds 28 new functions to dBASE, allowing you for the first time to generate hi-res graphs and charts on-screen directly from dBASE programs.



dGE-2 for dBASE II **£90** + VAT
 dGE-3 for dBASE III **£120** + VAT
 dGE-3C for CLIPPER **£150** + VAT



BITS PER SECOND LTD

17 Guildford Road, Brighton BN1 3LU
Telephone (0273) 727119

PC-AT COMPATIBLES AT REALISTIC PRICES!

We have selected the **Tandon** range of PC compatible computers because we believe they offer the best price/performance/reliability combination on the market.

For example:

TANDON PCA 20 our price **£1,795.00**
 20M Hard disc 1.2M Floppy 512k RAM —
 14" high resolution Monochrome monitor
 * * 6 months on site warranty included * *

Please write or phone for details of other machines from TANDON. We are also Appointed dealers for ASHTON-TATE, MULTISOFT ACCOUNTS, Gemini Computer systems (80-Bus and the new 68000 based multi-user CHALLENGER systems).

Our speciality is in supplying complete business or engineering solutions and tailoring them to your specific needs.

Above prices do not include VAT or Carriage.

COMPTON ELECTRONICS
 (Computer Systems Developments)
 Ilford
ILMINSTER
 Somerset TA19 9EB

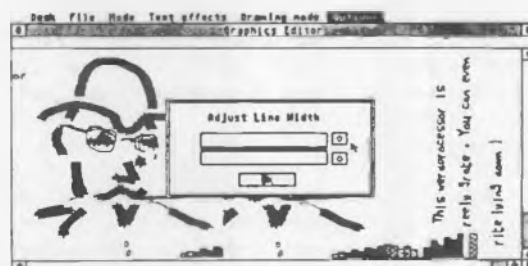
Telephone Ilminster (04605) 4781

BOFFIN FROM SOFTWARE PUNCH

All-in-one text and graphics word processor for only:

99.00 POUNDS + VAT

- *built in graphics editor
- *words and pictures on screen together
- *intelligent printer routine
- *cut and paste function
- *wordstar key stroke capability



Click on the arrows to change the line thickness.

FROM SOFTWARE PUNCH, 38 ULLET ROAD, LIVERPOOL L17 · 3BP
 TEL OR FAX: 051 · 734 · 5827

for the Atari 520 & 1040 ST
SEE EDITORIAL THIS ISSUE

On the right lines

Before you go 'online', make sure you thoroughly investigate your requirements — only then can you make the most of the information at your disposal. Robert Hollier offers some practical advice for getting started, while Owen Linderholm draws some conclusions for PCW Online.

The recent arrival of PCW Online has added yet more glitter to the rapidly expanding world of online information. There are now thousands of databases all waiting for you to load your comms software, dial-up with your modem, type in that password you carefully filed somewhere, and start exploiting these wonderful sources of knowledge.

But beware! With so much useful information just a few keystrokes and phone calls away, it's only too tempting to let your enthusiasm run away with you. Unless you think carefully, you might end up with a rueful expression on your face and, worse, a large hole burnt in your pocket.

Caution

The history of online databases reinforces the need for caution. After all, the first online databases were simply the computerised equivalents of already published abstracts which summarised the contents of scientific articles and papers. These so-called bibliographic databases still dominate the online world, but unless you are carrying out specialised research, the information on these databases might be inappropriate.

If you decide that you do want to access such databases, then decide exactly what information you hope to retrieve. If you want general information, then you would be better off taking a stroll down to your local library and consulting the shelves in the reference section. There are only two good reasons for searching this kind of database. The first is if you suspect that the information you seek is so up-to-date that it will not yet be available in printed form, but will probably have been loaded onto an electronic database.

The second and major reason is if you are seeking the kind of information that you simply cannot get by running your finger down a printed index. For example, you might want to locate an article on chickens and contact lenses (there is such an article and it does not make very

pleasant reading).

It is when you are trying to combine such disparate or such precise concepts that the power of the computer comes into its own: the computer can track down references in seconds that would take many hours of manual searching.

Finally, do not forget that all a bibliographic database provides is a summary of the original article, and that you will still need to find that original yourself.

Professional researchers judge such bibliographic databases to be an invaluable resource, but other people will find them staid and unexciting. Many of these same people are nonetheless fascinated by the idea of electronic publishing, a buzzword whose day has come. Electronic publishing refers both to the trend towards full-text databases and to the supply of information which is only available online.

Information which is only online is often business data, such as financial reports or the latest share prices, and it is the fact of such exclusivity that allows the suppliers to charge such a high price. Such exclusive databases are often targeted at very narrow markets. Good examples are Data-solve's Magic and Pergamon Infoline's Maid, two databases currently in hot competition for the custom of marketing executives. In this case the users are also paying high prices for the convenience factor: no-one had previously thought of collecting together the information which these databases provide.

Why go online?

Your first task is to define your motives for going online and plan accordingly. Some sort of thinking ahead is necessary because the whole business is so expensive. Of course, I am not suggesting that you will need to grovel at your bank manager's feet before you go online, but online information access can sometimes resemble a game of *Monopoly* played with your money.

Where does all your money go? After buying some comms software and a modem, the next outlay is your phone bill. All the time that you are online you are paying BT for the privilege of using a line either to dial direct to a host computer or to connect you to the nearest node of PSS. The latter option means that you might need to take out a network password and then pay rental plus a charge according to the amount of data you transmit.

Databases are loaded onto a 'host' mainframe computer. Some hosts (generally the smaller ones) will demand an up-front subscription before you can log-on. All hosts will impose what are known as connect time charges, based on the time you spend logged-on and these will vary according to which database you are in. You will also probably be charged for each record that you display or download to disk.

Prepare yourself!

There are two pieces of advice here. The first is, do not add to this expense by your own stupidity! There are people who log-off from a database but then forget to disconnect their modem as well. Most, but not all, modems automatically disconnect you if no data has been sent for a while, but BT will very happily charge you in the meantime.

Secondly, shop around. This can only be done after you have conceived some sort of plan. All online users have to solve a tricky equation, working out what they want to do online and what is ultimately the cheapest possible way of doing it.

This will entail research. For example, most of the larger host computers can be accessed in a variety of ways and one of these ways will be the cheapest one for you. Working out which one that is might depend upon how much searching you want to do or even which part of the country you live in. In order to attract your custom some hosts offer special arrangements: Dialog, for example,

will provide you with a PSS password and pay your PSS bills. However, since a few databases are loaded onto more than one host, you might find that the database you wanted to access on Dialog is available elsewhere at a different connect time charge. The permutations are almost endless and the solution will depend upon you knowing what you want to do.

One non-financial problem: you will discover that the mechanics of getting online can be a messy and frustrating business. Things happen or do not happen for no apparent reason and your screen is either blank or covered in peculiar garbage.

Much of this frustration springs from the need somewhere along the way to rely on the telephone network which, after all, was never designed to carry computer traffic and sometimes seems determined to remind you of that fact.

You can minimise these problems by choosing a reputable comms package and modem. Most important, make sure that your modem is going to work with your software. You will face more choices here: do you want to transmit at 300 baud or 1200 or 1200/75? There is a reasonably straightforward trade-off here between a modem's price and speed: but the lesson is generally

you get what you pay for.

When it comes to the software you will have to decide if you are content with teletype emulation (which will allow your micro to receive ASCII text from a remote mainframe) or do you want Prestel emulation as well? These are only the most obvious criteria for making a choice.

A final point is to try to assess the degree of support you can expect from the manufacturer: using comms software and a modem means coping with the vagaries of the phone network, a fact which might make you much more dependent on a help desk than if, say, you had bought a database package. Some online hosts, incidentally, have excellent help desks which will not only provide information about that host's databases but also try to sort out your equipment problems.

The last problem you will face is becoming familiar with the commands you need to know in order to carry out a search on a particular host. In my opinion, this problem is exaggerated since there are never that many commands anyway. The advantage of choosing one of the bigger hosts is that you can search hundreds of databases using the same small set of commands. There have been variously successful efforts to implement user-friendly front ends to host computers which allow you to carry out a search without needing to know anything about a host's search language or even its databases; unfortunately, this approach also removes much of the user's flexibility and control as well as the excitement of refining your search and registering 'hits'.

New horizons

The excitement should not be overlooked. To my mind there are few more thrilling sights than the message sent to you from a computer in London or Rome or California, welcoming you to vast, electronic stores of knowledge. But do remember that if one of your hands on the keyboard can explore these wonders, the other hand should keep a tight grip on your wallet.

A final tip. If all this talk of expenditure depresses you, visit the reference section of your local library. The larger public libraries have lost their rather fusty image; many of them contain not only the reference books and journals which will help you avoid unnecessary online work but computer terminals as well, with access to various databases (Prestel and World Reporter are the favourites). And, since public libraries are legally obliged to provide their services free of charge, you should be able to persuade the well-trained library staff to give you a free expert demonstration. **END**

Finding your way around PCW Online

Robert Hollier's article outlines the pitfalls and problems of accessing online databases succinctly. It would be useless to pretend that his advice doesn't apply to PCW Online. In particular, as with all online databases, the time it takes to find what you are looking for can sometimes seem far too long and thus far too expensive; nevertheless, the article refers to major online databases that have powerful search commands.

For the moment, because of the ageing Dialog software and our agreements with TTNS, PCW Online only has a menu system designed to lead you to the particular piece of text you want. This actually works out faster than searching for keywords in most cases, as well as making the system easy to understand. The other thing to remember is that PCW Online does not make a charge for the information provided, other than normal collect charges. Many consider that commercial information databases charge exorbitant rates for access to information — World Reporter, for example, charges over one pound a minute whereas PCW Online costs only three and a half pence a minute.

The important thing when accessing PCW Online, as mentioned in the article, is to plan ahead. Look for things under the sections in which they would appear in the magazine: machine reviews are stored under Benchtests, for example. Some products may fit in more than one category and if you can't find the required piece of text, try looking in the next most likely place. If you want to know about Benchmarks and they aren't given in the text, then remember to look under the 'Benchmarks' heading. There shouldn't be too much difficulty as long as you remember how things are structured in PCW itself, and look in the most likely places.

The Back Issues index is a good place to look to find out if there is a review covering what you are looking for. This will also show the heading under which the review will appear in the database.

Other sections of PCW Online are more likely to be interesting places in which to nose around rather than from which to extract information. PCW Exchange, the noticeboard system, should be a good place to exchange messages and gossip with people who share common interests. PCW Programs consist of two sections: public domain software and Program File. The former area will contain public domain software for various machines and brief descriptions of the programs. Program File programs are not in the public domain but hold listings previously published in PCW magazine. Any commercial exploitation of these must be with the permission of the original author.

The real way to keep costs low is to work out what you want to do before you log-on. Write all the messages and mail you will want to send and save them as ASCII files from your word processor, for example. Then when you go online, all you'll need to do is transmit the files rather than type all the information in while you are paying for being connected to the database. Similarly, don't read material online but save it to disk to be browsed through later at your leisure.

If your communications software doesn't let you save your online activity, then you will need to make use of the XMIT command. Use one of these methods to save mail messages, and so on, and then read them after you've logged out. Don't forget to delete unwanted files because you are charged for file storage on the system as well as online time.

Finally, have fun exploring it all!!



SCREENTEST

Atari ST word processors

Word processing is an essential ingredient of a business micro's sales success. Andrew Bennett provides a comparative review of six competitively-priced word processors for the Atari ST series.

One of the very first types of program that becomes available for a new business micro is usually the word processor. The Atari ST series was announced just over 12 months ago and the number of word processors available for it has grown ever since.

In this review I shall be looking at a number of these word processors from the point of view of the ST owner who wants to do serious word processing, and from the point of view of the newcomer who is trying to decide whether the ST is the machine for him. Although the processors reviewed here were tested on a 520ST with operating system in ROM, all of them will work with the 520ST with system still on disk or with the new 1040ST, and their word and page capacity will alter accordingly.

Two speed comparison tests were used to assess performance; the same 23.5k document was used for both. The first test (Move to End) is the time taken to move from the start to the end of the document, and the second test (Search) is the time taken to search through the document for a string that only occurs once at the end.

These timings are important since they give some indication of the overall speed of the word processors under consideration.

The Final Word

The Final Word from Mark of the Unicorn arrives in a large library set-style box. The program is supplied on two disks and is supported by several manuals, a 10-section tutorial guide and a leaflet explaining how the program should be set up on the ST.

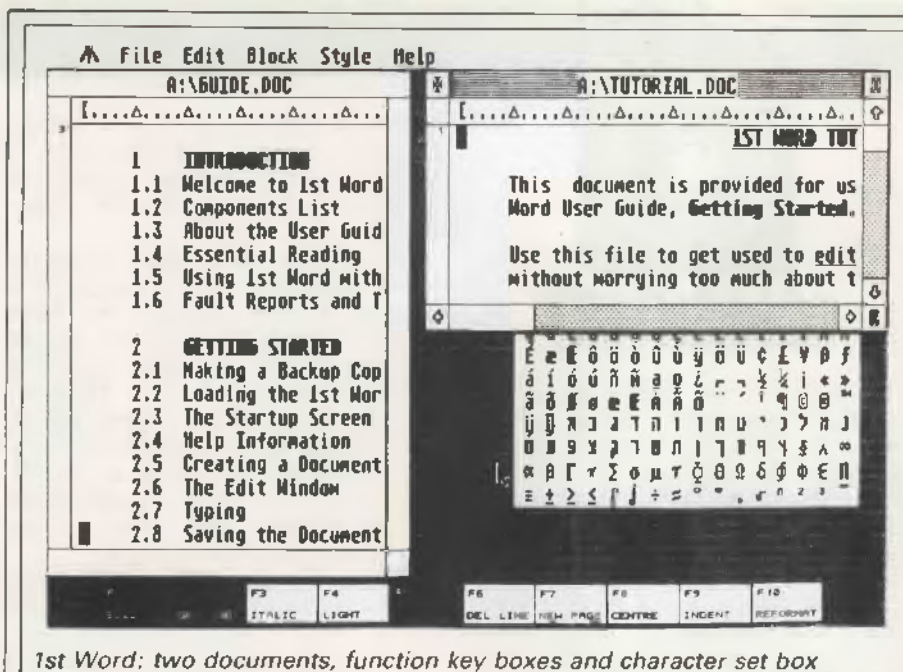
The program started life on the IBM PC, and this is reflected in the manuals which make no reference to the ST or GEM; the setting-up leaflet is the only part of the documentation that mentions the ST. This tells the user to ignore references to the AI prompt and that the program doesn't use the ST's mouse.

In fact, The Final Word makes no use of GEM whatsoever. The text is displayed in much the same way as STWriter and movement around the document is achieved using the cursor keys and a seemingly endless selection of movement commands. The movement commands include movement by word, a number of words, paragraph and line. Movement can be either forwards or backwards and is always completed in the blink of an eye. When a control key command is issued, it is usually accompanied by a menu which appears at the top of the screen, giving the various choices from that

command. The selection is then made by pressing the choice's first letter. Pressing the Help key presents you with a help menu from which you can gain help on almost any aspect of the program.

Formatting and other embedded printer and word processor commands are displayed in the document and, therefore, Final Word cannot be described as a WYSIWYG ('What You See Is What You Get') word processor. Printer commands include the usual bold and other text types, while the word processor commands include some unusual ones not found on the other processors reviewed here. Along with the usual headers and footers, Final Word lets you choose words and phrases which the program will include in the index. Paragraph and chapter headings can also be included in a table of contents. The program also supports footers. The program does all three of these fully automatically, thereby taking the pain out of producing long documents or books.

Text blocks are chosen by marking both ends in a similar fashion to STWriter. Blocks deleted by mistake can easily be brought back to life with a press of the UNDO key. If you stop typing for a set length of time, Final Word will save what you have just typed or changed to disk. This



1st Word: two documents, function key boxes and character set box

feature, while sometimes annoying, means that should there be a power cut, only the last couple of words from your document will be lost.

Final Word is not for those who simply want to use a word processor for letters and the occasional report, but it will prove invaluable to anyone writing a thesis or a book.

1st Word

When Digital Research could not get GEM Write ready in time for Atari's needs, Atari was forced to look elsewhere for a free word processor to include with the 520ST package. GST was brought in to write a word processor based upon the C source code editor, but with the extra features usually associated with word processing. I include a look at 1st Word version 1.06 here as a comparison against the others. 1st Word has gone through two public versions, 1.01 and 1.06. Version 1.06 is faster and 1.01's bugs have been eradicated. Version 1.06 is not being sent out to those with version 1.01, but must be collected from your friendly neighbourhood dealer.

1st Word is supplied with a 44-page manual, a tutorial guide and printer drivers for the more common printers on one disk. Also included is a document instructing you how to install other printer drivers of your choice. Since it is free, the disk is unprotected and can be backed up as many times as you wish.

Full use of the GEM interface is made, with pull-down menus and the mouse playing a large role in preparing documents. A document is shown in its own window with the usual vertical and horizontal slider bars. Vertical text movement is possible using either the cursor keys or by moving the vertical slider; the horizontal bar allowing documents up to 160 characters wide. Along the

bottom of the screen, the various function key definitions are shown in small boxes. These can be used by either pressing the required function key or by clicking the mouse in the appropriate box. Unfortunately the definitions cannot be user defined.

1st Word gives very much a WYSIWYG ('What You See Is What You Get') system. Different text styles, including super and subscripts, are supported and are displayed onscreen as they will appear when printed out. The style can be selected either from the style menu, or by using one of the function keys. The function key boxes also show the current state of the various function key settings. Right and left justification are also supported. Justification is done as the text is entered, but paragraphs must be reformatted each time text in a paragraph is added or deleted. This can be both annoying and time-consuming.

All block operations, such as mov-

ing and copying, are achieved by drawing around the block with the mouse. If the block is larger than one screen full then the block start and finish must be marked using options from one of the menus. Block operations in version 1.06 are faster than in version 1.01, but could still do with being faster.

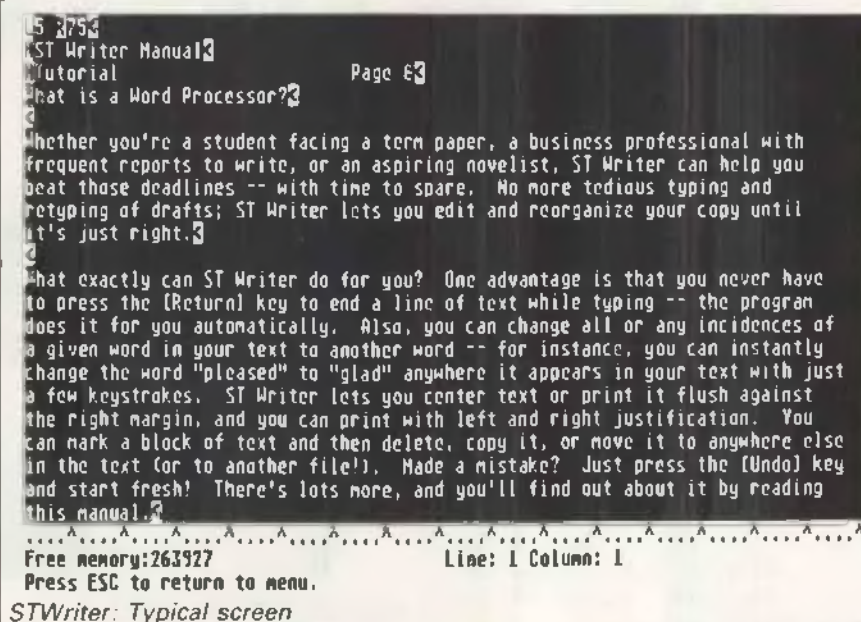
One unique feature of 1st Word is its font table which is displayed behind the text windows. When the user requires a character from the Atari character set which is not on the keyboard, he can select that character from the table. A simple click on the required character inserts it in the document at the cursor position.

1st Word supports up to four different documents on the screen at once with each document occupying its own window. Block operations are allowed between documents, allowing merging of text from several sources into one document. Merge is also available separately, which inserts text from a document held on disk into the current document.

Although 1st Word saves documents in its own format, which includes page settings and embedded control codes, it can also be used to edit ASCII files. This means that it can be used to edit source files for various languages (including Basic) before they are loaded into their respective interpreters or compiled.

One of the available menus is 'help'. The options on the various menus are listed here. Selecting one of these gives a small dialogue containing enough information to jog the memory or help a first-time user. Extra help can also be selected giving the corresponding help dialogue whenever an option is selected from a menu. Luckily this can be turned off when the user has learnt how to use 1st Word.

One annoying aspect of 1st Word is that it does not have a 'save and



STWriter: Typical screen

continue' option. It assumes that when you save a file, you have finished with it. This means that if, for safety's sake, you save a document, you must then re-load it to continue working.

Overall Atari has probably got as good as, or better a word processor than GEM Write would have been. The only feature that GEM Write might have supported that 1st word doesn't, is the ability to paste in graphics and diagrams.

STWriter

STWriter is a conversion for the ST of the AtariWriter word processor, which is available for the 8-bit Atari computers. It was originally given away free by Atari as a stop-gap before 1st Word was available. It can still be obtained from dealers and clubs for the price of a blank disk. The 34-page manual, a simple tutorial, a quick reference guide and a function key template are also provided.

STWriter doesn't use any of the facilities of GEM or the mouse. Text movement is achieved by means of the cursor keys. Scrolling and general text movement are much faster than with any of the other word processors reviewed here. The number of available bytes remaining is displayed along the bottom of the screen along with the current line and column number. Strangely the current line number is the line number on the screen, not the line number in the document.

When STWriter is run, a simple menu is displayed which gives the user the opportunity to perform various disk operations including formatting and printing a directory. The most interesting option for Atari 8-bit owners is the ability to transfer files from the older machines to the ST using an Atari 850 interface and an RS232 cable. Unfortunately, STWriter doesn't save files in ASCII format; therefore, files cannot be transferred using STWriter and then edited using another processor or used as source code.

Text style and other formatting codes are displayed in the text as special reversed characters. Various text formatting commands, such as line length, are set up at the beginning of the document, but can be changed in the middle so that special formatting requirements can be met. A print preview is possible where the document is printed to the screen instead of the printer. This shows the document exactly as it will be printed, but without the various text styles which only appear on the printed version.

SCREENTEST

Commands are issued using the function keys and various control keys. As with 1st Word, it is not possible to redefine the function keys. The Undo key can be used to restore text that has been accidentally deleted; up to 20,000 characters can be rescued in this way.

Simple mail-merging is supported, but the various address and other information must be entered by hand. The STWriter manual states that mail-merge information can come from certain databases, but makes no mention of which ST databases are supported by STWriter.

STWriter and ASCII files can easily be merged with the document in memory. Whenever STWriter loads a file that is not in STWriter format, it converts it into its own format.

Blocks of text are selected by pressing shifted-F5 at the start and end of the block. Another press of F5 then moves the block into a buffer from where it can be pasted back elsewhere into the document.

STWriter is an excellent program which would look good on any other than a WIMP micro. It should appeal to those who don't like mice and windows, but other users will probably prefer 1st Word.

Boffin

Boffin from Software Punch of Liver-

pool is a word processor with a built-in graphics editor. For £99, Boffin is supplied with a 42-page manual and a couple of demonstration documents.

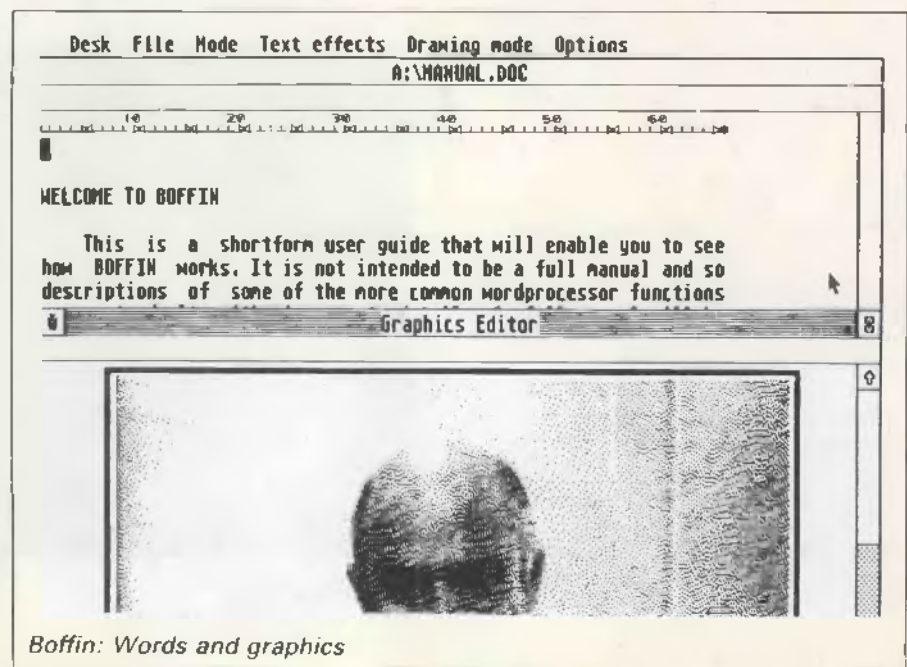
Boffin only allows one document to be viewed at once, although it is possible to merge documents from disk via the insert text option. As text is typed in, it is formatted according to various settings both on the ruler bar at the top of the screen and in various menu options. Right justification can easily be turned on or off. The usual text effects are supported and are shown on the screen as they will appear when printed out.

Double-line spacing is provided as a menu option and even operates on the screen. It is also possible to have some paragraphs double-spaced and some left as normal single-spaced.

Printer codes for the various text types are set up in a full screen dialogue. Every setting can consist of up to three codes which are sent to the printer to invoke the required text type or mode. These settings can be saved to disk for use every time a document is printed out.

Boffin includes the rather unique facility to restart a document from the last saved version. This is faster than quitting and reloading the text, but the saving in time is minimal.

Blocks of text in Boffin are selected using the mouse. The block of text is selected in reverse video and can be selected forwards or backwards, upwards or downwards. This makes selection of text much more flexible than with either STWriter or 1st Word, but HabaWriter uses much the same method. Blocks that cannot be contained in one screen can be selected by marking both ends of the block by use of the mouse button



and the Shift key together.

Boffin only provides onscreen help in the form of a single dialogue which gives details of the various function key settings. Function keys can be used with the control and Alt keys to give different results. Boffin also supports WordStar control key combinations to give some compatibility with early systems. Unfortunately these aren't listed next to their menu equivalents, which would have acted as a useful reminder.

Boffin allows text to be printed to disk and Software Punch promises a print spooler which will allow background printing. Although Software Punch is the only manufacturer to mention software spoolers in its documentation, third-party spoolers give all the word processors for the ST the ability of background printing.

Boffin allows graphics and text to be freely mixed in the same document, although text and graphics cannot occupy the same line. When a graphics image is inserted into the text, a special formatting line is inserted at the graphics' start point. This line begins with an Atari symbol and includes the name of the graphics file and the number of text lines that the image will occupy. The various graphics images are inserted into the text whenever the user isn't scrolling through the document; this means that scrolling is made as fast as possible. This mode can be turned off, and only a pattern is shown in the graphics area of the document to show how much space is occupied by the image. This allows the user to concentrate on formatting text.

Perhaps Boffin's most outstanding feature is its built-in graphics editor. Although this is invoked from a menu option within Boffin, it operates separately from Boffin and other than for convenience's sake might as well be a separate program. The editor has a large range of drawing features, all of which are selected from menus and controlled with the mouse. Drawing modes include free-hand, circle, box, and frame. Lines can be of various widths, and objects such as circles and boxes can be filled with a multitude of patterns. Using the editor, it is even possible to produce simple pie charts and bar graphs, simply by entering the various values for each segment or bar and the label for each value. Boffin then draws the pie chart or graph in whatever size is chosen with the mouse.

The Boffin graphics editor also supports text in a selection of fonts, and fonts can be designed using the separate font editor. Text can be in the usual styles and in over 20 different sizes. Text can also be rotated by 90 degrees at a time. Images can be imported from other programs including Doodle and Degas. When the picture is completed, it must be first

saved to disk and then loaded back into the Boffin word processor. Unfortunately, there is no method for simply pasting the prepared image straight into the document without first saving it to disk. Software Punch suggests that various graphics images can be prepared using the editor, from simple pictures to fully-labelled diagrams and charts.

1st Word+

As well as upgrading 1st Word, GST has been working on an expanded version called (not surprisingly) 1st Word+. 1st Word+ will be supplied with a printed manual and will cost in the region of £99.

1st Word+ has all the features of its smaller cousin and looks very much the same except for the addition of a couple of new menus. Operations such as return and delete have also been added to the function key strip at the bottom of the screen. A caps lock box has also been added to show when caps lock is on. As with 1st Word, the function key box and the newly added boxes can also be used by clicking on them with the mouse. The save problem has also been solved with the addition of a new 'Save and Resume' option on the file menu.

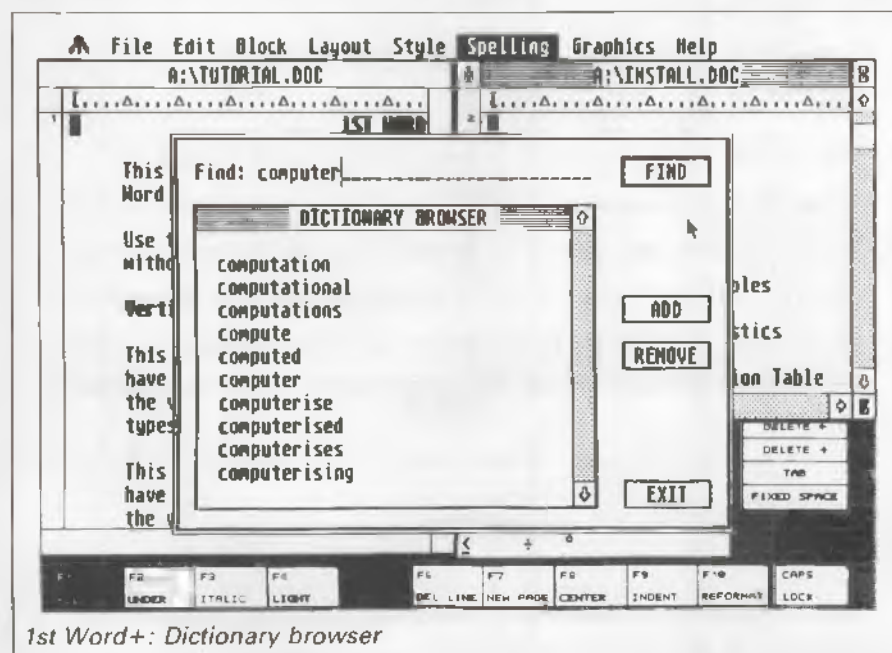
A new statistics option gives a dialogue showing the page count and line count, the number of bytes used in memory and on disk, and a word count. Word count is one of the most obvious omissions from 1st Word and it is nice to see it implemented here, although it is not constantly displayed onscreen.

Movement through the document and block operations are now much faster. The find command has been improved with the vertical bar now showing the position in the document as the search progresses.

Perhaps the two most major additions to 1st Word+ over 1st Word are the built-in 35,000+ word spell-checker, and the ability to bring in graphics and diagrams from other programs.

The spell-checker's dictionary isn't resident in memory all the time, but is only loaded when required. This gives extra memory for documents should the spell-checker not be permanently required. Memory limitations in the early 520STs with disk operating systems means that the spell-checker can only be used with the 520ST with ROMed OS or with the newer 520STM and 1040STs. Loading the dictionary takes about three quarters of a minute. Once the dictionary is loaded, spell-checking a document couldn't be easier. Every time the ESC key is pressed, the spell-checker moves the cursor to the next word that it doesn't know. The word can then be edited as normal, or can be added to the dictionary. The dictionary size is not fixed and therefore its only constraints are available disk and memory space. The correct spelling can also be looked up using the dictionary's browse facility. The ESC key is pressed again and the cursor moves to the next unknown word, and so on, until the entire document has been spell-checked. Other than the initial loading time, there is no noticeable time delay while the spell-checker checks the document. When the spell-check is over, the dictionary can be cleared from memory, thus freeing the memory used for the document. Words which have been added to the spell-checker are only saved onto disk when the dictionary is thrown away, or when the user leaves 1st Word+.

To merge graphics, 1st Word+ is first placed in graphics mode. On a hi-res screen this makes the text only eight pixels high as opposed to the usual 16, to keep the text and



1st Word+: Dictionary browser



SCREENTEST

graphics in the same perspective when the document is printed out.

GST provides a very useful desk accessory called Snapshot which can grab a portion of the screen and save it in the company's own format, as well as Doodle or Neochrome formats. This means that pictures and diagrams can be taken from programs that do not normally support GST's graphics format. Snapshot can also be used to transfer pictures to NEO and Doodle format with as little a fuss as possible.

A separate program, which can be used with either 1st Word or 1st Word+, is 1st Mail. 1st Mail is included in the 1st Word+ package, but can be bought separately for use with 1st Word. 1st Mail allows mail-merging on 1st Word and 1st Word+ letters. 1st Mail takes its input from data files produced by any one of three best-selling ST database programs.

1st Word and 1st Word+ save files in exactly the same file format, and so GST must be hoping that most people will see 1st Word+ as the ideal upgrade if they need something more powerful than the free 1st Word. Whether 1st Word+ has £99 worth of extra facilities must be considered, but with spell-checkers costing upwards of £40 for the ST, 1st Word+ represents good value for money.

GST will also be releasing another update of 1st Word which will include some of the facilities of 1st Word+, such as faster text movement, but will not include 1st Word+'s advanced graphics and spell-checking facilities.

Habawriter

Habawriter from Haba costs £74.95

and is supplied with a 52-page manual.

In use Habawriter looks very much like 1st Word or 1st Word+. At the top of the current window are displayed the current line, page and character numbers, along with a format line which shows the position of the cursor, left and right margins and tab settings. The latest version of Habawriter also provides a word count facility.

As many as six documents can be open at any one time. A new window can either be opened from the file menu or by clicking on a clear space on the screen. Whenever Habawriter needs to take time to do an operation, a large clock face is displayed in the current window. A single hand on this face shows how much longer the operation will take.

Text is formatted as it is entered. Whenever text is added or deleted from a paragraph or the paragraph is reformatted, Habawriter will hyphenate words which are too long to stay on the current line. Habawriter places the hyphen at a position in the word called the hot zone, which is a certain number of characters from the right-hand margin, and is set using one of the menu dialogues. The hyphen can either be placed where Habawriter suggests, or the user can either move the hyphen within the word, or choose for the word to be moved to the next line. The other

word processors reviewed here do not offer hyphenation, but move a long word onto the next line whenever text is reformatted. Having to continually define hyphenation marks can slow work down considerably.

Block selection is provided with the mouse. A block can be selected either forwards or backwards, in much the same way as Boffin. Tabs, returns and other formatting symbols can be represented on the screen or can be turned off to achieve a more WYSIWYG appearance.

Whenever a block of text is deleted or copied, it is placed in a clipboard buffer. This buffer can be viewed at any time and holds the block until another block operation. The clipboard can also be saved, allowing deleted text to be reinserted even after the system has been rebooted.

Habawriter is supplied with Diablo and Epson printer drivers which must be edited to provide other drivers. Habawriter can print whole documents or just selected pages.

When Habawriter first became available, it was the first ST word processor to use GEM; now, however, there are several such programs. Habawriter offers very little over the free 1st Word. To be worth £74.95 and to compete with the likes of Boffin and 1st Word+, future versions of Habawriter will have to include a graphics facility or built-in spell-checker. With both of these, it could once again be out in front in the ST word processor race.

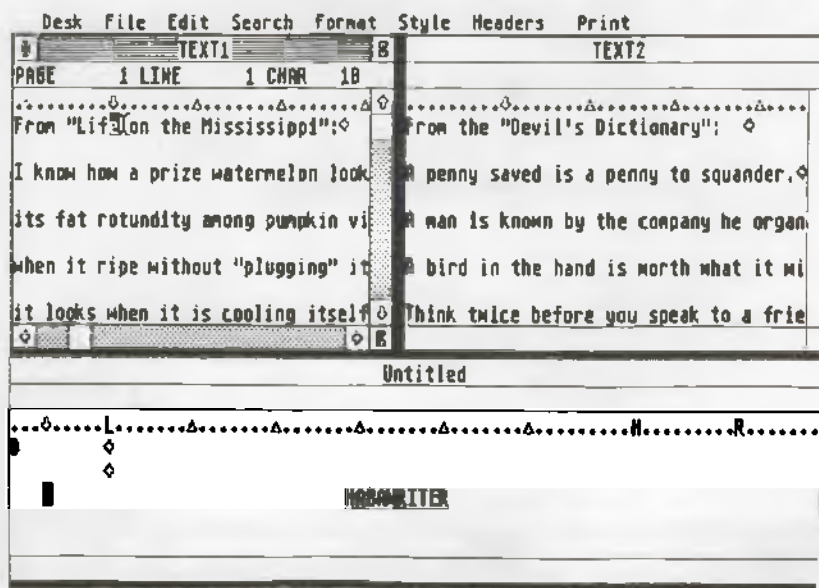
Conclusion

1st Word and Habawriter are both excellent programs that are easy to use, and use the mouse to the full. Unfortunately, Atari has pulled the rug from under Haba by giving the excellent 1st Word away with the ST. For those of you who don't like windows, desktops and mice, there is the fast and straightforward STWriter.

Boffin and 1st Word+ must compete for the market as far as graphics are concerned. Boffin with its powerful built-in graphics editor should be a plus for those who want to design their own charts and diagrams. 1st Word+, with its graphics facilities and built-in spell-checker probably has the edge over Boffin, but both should be viewed first-hand before parting with your £99.

The Final Word might not use the mouse or GEM, but it is by far the most powerful of the programs looked at here. It is, however, much more difficult to get to grips with, but its power will reward the serious user who perseveres.

END



Habawriter: Three documents onscreen

PRINTER PRICES SLASHED



Opus have slashed the cost of quality daisywheel printing. Now you can equip your IBM PC or compatible with a high-quality, ready-to-run printer system from an astonishing £799 + VAT — saving up to £1,000 on comparable hardware.

No rival printer system offers you so much:

- **QUME SPRINT LETTER-QUALITY DAISYWHEEL PRINTER** — comparable with the Sprint 11/40 and available in a choice of 37 or 50 cps models.
- **IBM COMPATIBLE RS232C SERIAL INTERFACE** — complete with all connection cables and a device driver for printer compatibility with wordprocessor and application programs.
- **DUAL-BIN SHEET FEEDER** — sophisticated, electronically-controlled dual-bin sheet feeder.

£799

+VAT

☎ 0737 65080

This unbeatable Opus offer even includes guaranteed 72-hour **FREE** delivery and a full 12-month warranty! Call Opus now on •0737 65080• for full details of our sensational daisywheel printer systems. Generous dealer, education and government discounts available.

Opus Supplies Ltd,
55 Ormside Way,
Holmethorpe Industrial Estate,
Redhill, SURREY RH1 2LW.

Opus.

Qume is a registered trademark of Qume Corporation. IBM is a registered trademark of International Business Machines Corporation.



The 'Fifth Generation' of computing assumes that face-to-face communication between man and machine is possible. Read all about it in this month's book review.



Smart thinking

Title: Supercomputers of Today and Tomorrow

The Parallel Processing Revolution

Author: Richard A Jenkins

Publisher: Tab Books/John Wiley (paperback)

Price: £13.30

Half a dozen years from now, the Japanese plan to have up and running a mind-boggling computer you sit and talk to, discussing your problems face-to-interface. Humming with parallel-processing clout, it'll out-smart everyone.

It is a bold initiative, easily ridiculed, but no-one underestimates Tokyo's 'supercomputing' resolve.

Their 'Fifth Generation' behemoth

should be able to follow spoken instructions with a vocabulary of 10,000 words (not just Japanese ones, presumably). It is also going after image-processing to rival the human eye and, says Japan, it will increase the speed of present 'thinking' machines by a factor of 10,000 (give or take).

Japan's Fifth Generation computers will 'reason' from a memory of machine-coded knowledge far greater than anything feasible today — a memory calling on tens of thousands of inference rules, governing 100 million objects. They'll use chips with 10 million transistors, some 16 times the current maximum density.

When these plans were first outlined (five years ago), both the US and Europe got the wind up good and proper. If the Japanese can crack

AI with anything like the gusto they set about consumer electronics, the new dawn of 21st-century information technology will start (and could finish) with the rising sun.

Many sober-sided analysts still reckon that America has the edge on research into high-performance computing and the development of AI systems. But they'd also have to add that this could quickly change. Big dollars are now determined to see that it does not.

Britain, too, has the DTI's Alvey Directorate trying to coordinate our 'Fifth Generation' research effort — high on expertise, if less than world-class on funding.

No-one has the foggiest how it will all turn out, but it is of continually absorbing interest to speculate around who'll get the upper hand

with state-of-the-art computers in the next decade or so (plenty far enough into a bewildering, fast-moving future).

That's what Richard Jenkins does here. He begins with a summary of computers' electronic (and mechanical) ancestry, takes a quick squint at what the likes of today's Cray 2 can do, then gazes at the implications of parallel-processing supercomputers to come — without going haywire into sci-fi excess.

Not only does he know his super-computing onions, but he is an experienced journalist who can put it across with rare flair and a refreshingly sane balance. Mr Jenkins has done a very good job with that most notoriously tricky question for computer books: *whatever will they think of next?*

World sorted out — latest

Title: *Liberating Technology*
Steps towards a benevolent society
Author: John Graves
Publisher: Peter Owen
Price: £12.50

John Graves, on the other hand, tends to get carried away. It is easily done, once you begin to muse on where smarter and smarter machines may be taking us. I see a need for a desktop accessory on all word processors used by crystal ball-gazers. It'd sit in the background (like Spotlight or Sidekick) and every now and again, or at the end of every chapter, it'd go *Bing-Bong!* **WARNING — Are you sticking to the facts or wandering off into half-cock philosophy?**

Mr Graves perceives that the IT revolution is gathering pace and an economy dominated by automated production looms. No argument about that. He then asserts that we can't go on with our present economic and social structures, but needn't be gloomy, and mustn't be uncritical-ly optimistic.

All right, but steady on. What has now got to come is an 'axiological revolution' and a reorientation in values and a new set of concepts and ...

Bing-Bong! WARNING ...

'This book is dedicated to the idea that we do have a choice, that we can, if we choose, direct (the effects of new technology) in ways that could emancipate us all and create a better world ...'

Bing-Bong! Here we go.

Just look at this whopper of an all-embracing, pompous and smugly contentious sentence:

'We should regard information technology not as a saviour but as a potential liberating force that will

free humanity from toil, rescue us from a routine and humdrum existence, promote greater social justice, and work towards abolishing the condition of alienation which has been the by-product of our industrial culture, whereby we have become entrapped and dependent on an impersonal, harsh, blindly rational economic system that denies us control over our work and lives, and shows scant regard for anything but the pursuit of profit.'

You can perhaps try to hold forth like that if you're Wittgenstein (though he knew when to pipe down, too). If you're a lecturer in Economics and Political Thought, who tutors a bit for the Open University, there's the ever-present risk that you'll sound as if you are, and do.

'If we establish a clear, cogent, value-orientated conception of technology, if we nurture the shifts in attitudes hinted at above, and if we implement modern technology according to these criteria, we can transcend scarcity. We can break the fetters that have constrained our lives and constricted our humanity ...'

But still no cure for baldness, it seems, no means for turning base metal into gold, banishing warts, discovering Shangri-La, or just shutting up bores who think they know it all.

Give sandwich to robot

Title: *An Adventure in Programming Techniques*
Author: David Mitchell
Publisher: Addison-Wesley
Price: £12.95 (paperback)

Every time I see Douglas Adams staggering about with another boxful of goodies for his designer Mac, or trying to decide between a Porsche or a Ferrari, it strikes me afresh that I may be in the wrong business. *The Hitchhiker's Guide To The Galaxy* is, I still think, Douglas's masterpiece and hard to top as a ridiculous, but compulsively absorbing interactive waste of time — or what David Mitchell here calls a CFG, Computerised Fantasy Game.

Mr Mitchell would perhaps not agree, since he doesn't mention *Hitchhiker*, even though he's clearly an Infocom fan and hooked on the likes of *Zork*, *Deadline* and *Enchanter*.

Adventure games, they're sometimes called (after the 1970s original for the DEC) but good CFGs are heady stuff these days and make tough demands of the author's fictional skills as well as programming expertise. They typically take months, if not years, to devise.

David Mitchell sees CFGs as a handy means of expanding your programming skills way beyond a modest fluency in Basic and having a lot of fun in the process. So he leads us by the hand through natural language processing, the design of interactive user interfaces, program modularisation and design techniques — the lot.

It sounds hard going and it is, but this is a lively and ingenious book, provided you're a dab hand at top-down design and program design language, or pseudocode, or you could be in for sleepless nights. The idea is not to make yourself rich from commercial exploitation, merely to keep yourself out of mischief and to learn as you play.

It's desirable (if not strictly necessary) to have an IBM PC or clone to get the best from this book, and to have the patience of Job and a very silly sense of humour.

OK, gang, let's go ...

Title: *How To Write a Computer Manual*
A Handbook of Software Documentation
Author: Jonathan Price
Publisher: Benjamin/Cummings
Price: Not available

'In many areas of the computer world, an unfriendly tone is almost traditional,' says Mr Price (although heck, fellers, I guess he'd want us to call him Jonty).

Jonty, by contrast, is a real pal — one of the guys. The big idea, he says, is to relate to people, you know? 'Don't beat up the reader,' he says. 'Recognize that readers are different — from you and from each other.'

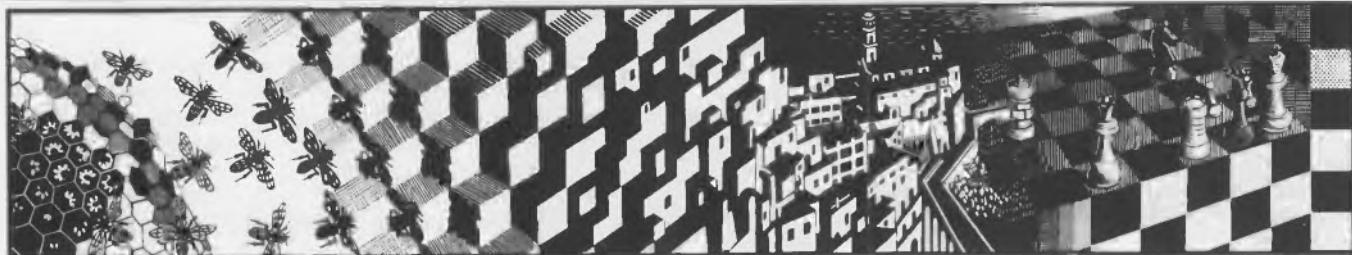
Oh yeah? Sure they are, says Jonty. And another thing. Check your facts, OK? Accuracy — it's kind of a key to success, the way Jonty sees it at this moment in time. That and focusing on the basics, keeping things light, figuring out what you need when, stuff like that. 'Ask the questions real users have,' says he, 'plus plenty of your own.'

Assuming you know some guys who can come up with some software, writing the manual should be a snap after you've taken on board what Jonty says. His book is for everyone, I guess, and not just the half-witted. If you have a little trouble in life with concepts like — well, like up and down or hot and cold or left and right — this book could maybe straighten you out.

There'll be some smart-alecs, people who can read and write and so on, who can get along just fine without it.

END

SCREENPLAY



Not content with flying into enemy headquarters and photographing secret documents, Stephen Applebaum then treks across Africa and takes a robot into the sewers. All in the name of fun, though, as he reviews this month's games for the Commodore 64/128.



Sky high

Title: Infiltrator
Computer: Commodore 64/128
Supplier: Mindscape
Format: Disk
Price: N/A

'Screenplay' has always tried to cover the best in games software, a policy which has inevitably led to it being dominated by products from the US; unfortunately, in the UK we have few companies with the mettle to fend off the likes of Mindscape, Electronic Arts, Sierra On-Line *et al.* We do have Magnetic Scrolls, whose talented programmers have given us the excellent Pawn, but it is an exception in Blighty.

Mindscape is a good example of why we lag behind in the games stakes, and also why I tend to look towards the US for material for 'Screenplay'.

Over the past few months, Mindscape has provided us with some of the best games ever seen in PCW. *Deja Vu* and *Balance Of Power* are two thoroughbreds from the Mindscape stable which caused something of a stir when featured here. It would be unfair to its competitors to suggest that Mindscape is a paragon without its aberrations — it certainly isn't. Dolphin's *Rune*, a bizarre computerised puzzle that puts the player in the role of a dolphin, must hang about the company's neck like the proverbial albatross.

Whereas *Deja Vu* and *Balance Of*

Power were designed for the Macintosh, the beneficiaries of *Infiltrator*, Mindscape's latest offering, are Commodore 64 users.

Infiltrator is far removed from anything else we've yet seen from Mindscape, being closer to the arcade zap-'em games of old than the mind-blowing strategy bias of its previous classics. Nonetheless, *Infiltrator* maintains the exceptionally high standards that Mindscape has set for itself, and if there's any justice in this world, the game should become yet another milestone in the development of games software; not because it offers anything radically new, but because it does what it does with almost unparalleled finesse.

Infiltrator is a helicopter simulator in which you are the pilot, Johnny McGibbits. Your mission is to fly into The Country (Libya?) and infiltrate the Mad Leader's (Gadaffi?) headquarters. There you must photograph secret documents before flying back to base. Enemy aircraft try to prevent you reaching The Country, as do other *Infiltrators* who have cracked under the strain of their work. Both adversaries are as deadly as each other, and must be destroyed if you're to complete your mission.

If I were asked to name a game similar in style to *Infiltrator*, I would say Ariolasoft's *Sky Fox*, as the displays are similar in that they both have very detailed cockpit displays and external views.

Unfortunately I tend to be rather inept when it comes to playing flight

simulations and especially ones like *Infiltrator* where, just as you think you've mastered the flight controls, you're shot out of the sky. This means I was unable to complete even one of the game's three missions and get a good idea of what the game's ground phase is like; that is, the part where you search the Mad Leader's HQ for the secret plans. But even if you don't reach this latter stage, *Infiltrator* provides enough surprises to keep you going for quite a while.

Inside the cockpit of the Gizmo DHX-1 are 20 controls that must be watched carefully if you're to take off safely and, hopefully, complete the mission. The main control panel, the one directly in front of the pilot, contains: an air speed indicator; an incoming missile warning light; an RPM indicator; an artificial horizon; a directional compass; a whisper mode indicator; a turbo booster indicator; an altimeter; and an ADF (Automatic Direction Finder).

Above the main console are a battery temperature gauge; several warning lights; and an oil temperature gauge. Below the console are various flashing lights to tell you that you've armed one or more of the aircraft's attack systems, which include cannons and heat-seeking missiles.

If anything can be termed easy and accessible in *Infiltrator*, it's the take-off phase. There's no runway and the only way is straight up, so initially there's very little to do in the way of piloting the DHX-1.

Even so, Mindscape has tried to

imitate some of the characteristics of a real-life helicopter. For instance, before take-off is possible, you must switch on the batteries, initialise the main computer and communication systems, and turn on the ignition. Then, when the revs reach 2000+ rpm, you pull back on the stick and you're away.

Once in the air, pressing '**' activates the onboard communication systems. Typing 'A' on the keyboard selects the ADF which allows you to tap in a heading, enabling the computer to guide you to the enemy HQ.

The DHX-1's communication system is vital to the success of your mission: with it, you can send and receive messages from other aircraft, and even dupe them into believing you're a friend by using the correct password. All other aircraft understand just three phases: REQUEST ID; INFILTRATOR (ID to a friend); and

OVERLOAD (ID to an enemy). When an aircraft comes into view you press '**' to activate the DHX-1's communication system, and request the other pilot's ID.

Depending on his reply, you should, after a few plays, be able to figure out whether he is friend or foe, and give the correct response. Using the wrong password results in a dog-fight to the death, usually yours.

During an air duel, you have heat-seeking missiles and cannons at your disposal. However, each must be activated via the keyboard, which means that while you're fiddling about trying to find the correct button to press, the enemy is merrily taking accurate pot shots at you. I only once managed to shoot down another aircraft.

Also onboard the DHX-1 is a tactical computer which gives you your

heading and status, both of which become increasingly more important as you progress deeper into enemy territory.

As I mentioned earlier I was unable to reach the ground phase of *Infiltrator*, mainly because I'm not very good at this kind of game, so I can't report on what happens when you touch down behind enemy lines. My expectations are high.

Infiltrator is one of the best examples of the flight simulation/shoot-em-up genre I've encountered. The graphics are quite stunning and the detail is impeccable — perhaps too good, in fact.

I should stress that *Infiltrator* is not for impatient players: it takes some time before you really get into it. But if you don't mind restarting from scratch every time you are shot down, *Infiltrator* is definitely worth persevering with.



Into Africa

Title: Heart of Africa
Computer: Commodore 64/128
Supplier: Electronic Arts
Format: Disk
Price: N/A

Some time ago Electronic Arts created a game called *Seven Cities Of Gold*, where the idea was to guide a small fleet of ships on a voyage of discovery. During the journey you'd encounter natives of varying temperament, caches of gold, and be required to meet many different challenges. Now, in a similar vein, Electronic Arts has produced *Heart Of Africa* — not to be confused with *Out of Africa* — where you take the part of a 19th-century explorer wandering around the African continent.

Heart of Africa begins in January 1890, just outside Cairo, where you've been dropped by a steamer. In your possession is 10 weeks' worth of food and \$250, neither of which is enough to get you very far on your trek. Therefore, prior to setting off around Africa, you must enter Cairo and stock up on provisions and equipment.

Displaywise, *Heart Of Africa* is something of an oddity because of the way it zooms in and out of a scene. The overall playing area is



very small, taking up only a minimal part of the screen. While wandering about in the wilderness, your explorer character is represented by a stick-man, idly walking over a yellow background interspersed with trees, mountains, villages, lakes and more.

When he enters a village, the view enlarges and he takes on the form of what I think is supposed to be an Indiana Jones-type character, though to me he looks more like Mr Ben. In this greatly magnified scene our hero can be guided into huts, the interiors of which zoom into the foreground to display their occupants and contents.

To the left of the main playing area are four icons representing a compass, a diary, a 'what should I do now?' menu, and an inventory option that allows you to carry any one of your possessions. On the right-hand side are various snippets of detail such as how many weeks' rations you have left, how much money you're carrying and what you're holding (that is, the item selected from the inventory).

Meanwhile, back in Cairo, trade can only be carried out in one of several specially-marked huts; these are distinguished from ordinary huts by the markings on their exterior. Some even have signs on their facade to tell you what they sell. Inside one of these huts stands a lone



trader who points his finger and nods his head. Bumping into him generally results in you being thrown out of his establishment. To trade, you select the icon representing your inventory and press 'fire' on the joystick; the result is the appearance of various goods. In the early stages you can pick up food, a gun, a whip, a map, a machette and even a canoe.

A gun became my prize possession because if you wield it inside a hut, the trader panics and offers you anything you want — free. Some traders don't have any wares but give you bags of silver, just to get rid of you. There's a price to pay, however, and sometimes you find yourself on the wrong end of an arrow from a disgruntled salesman. I found it best to take the chance, as the arrows fly so slowly, they're easily avoided.

In one of the huts in Cairo is a little man who will take you to almost any port in Africa, provided you're willing to pay. This can be a good way to start your journey, as it allows you to choose whether you want to start in the north, south, east or west region.

I mentioned earlier that you can buy a map in Cairo. Maps are useful, particularly those in *Heart Of Africa*, because they show in detail the area in which you're situated.

Travelling by canoe is a good way to save time and food, although there are hazards involved. Dotted

SCREENPLAY

along many of Africa's great rivers are vast waterfalls which, if you don't walk around them, can fling you out of your craft and into the water, depriving you of everything you've gathered up until that point.

If you're lucky, you might come across a cache of treasure left by an unfortunate explorer like yourself. There might even come a time where you find it impossible to carry any more, and have to resort to burying

your own treasure. There should be little need for that, as you must return to Cairo at frequent intervals to collect money wired to you from home.

Making your food last until you reach a village is one of the biggest headaches in Heart Of Africa. When you run out, your character is capable of little more than an excruciatingly slow plod which becomes tiresome, and generally prompted

me to restart the adventure. The plodding is quite fun to see in the enlarged character, but after a while becomes somewhat irksome.

Heart Of Africa is a splendid follow-up to Seven Cities Of Gold, a game which it surpasses in interest and authenticity. The fact that all the places encountered on the expedition are real and recognisable makes the game fun and, at the same time, educational. Highly recommended.



Method in the madness

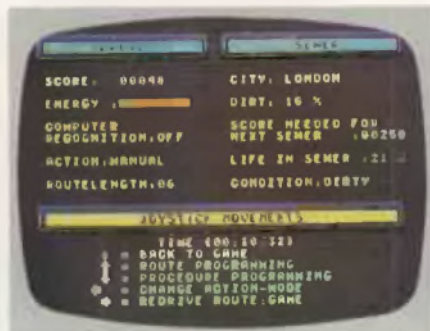
Title: Floyd The Droid
Computer: Commodore 64/128
Supplier: Ariolasoft
Format: Cassette
Price: £9.95

If there's one thing that 'Screenplay' can definitely not be accused of, it's lack of variety. So far we've run the gauntlet of enemy aircraft and trekked across torrid deserts in Africa. Now we take you on the journey to end all journeys — a trip down through the fetid depths of some of the world's most famous cities' sewers. Sounds nice, eh?!

This rather bizarre idea is the basis of Floyd the Droid, a game in which you have to guide Floyd, a programmable robot (PROBOT), around various sewage systems, clearing them of undesirables, the likes of which include rats, bats, alligators, and even the odd escaped criminal. How quickly and efficiently Floyd executes his duties depends on how well you program him.

Floyd (who is not pink) works in three modes: manual, half-automatic, and fully automatic. When the game begins, Floyd is in manual mode. This gives you full control, allowing you to manoeuvre him around the London sewers in search of anything that might be clogging up the works.

While Floyd motors about the various conduits open to him, the player is treated to a plan view of his movements. When he meets something, however, the picture switches



to an enlarged side-on view. This is the important phase, because it's where our heroic exterminator really gets into his stride: he snuffs out anything that moves, or looks as if it might. He uses various methods of execution — a laser, a mechanised grabber and his feet.

Within his memory, Floyd has a series of programs which tell him how to deal with different pests. In manual mode, his ability to select a program himself is switched off, and you have to tell him which one to use so that he can deal with a rat or a bat, or whatever the nuisance encountered might be. When the time comes to select a program, Floyd, who looks like a stilted R2-D2, turns his 'head' and opens his visor, revealing a small VDU. Pressing on the fire button of your joystick allows you to flick through the programs stored in his memory and stop at the appropriate one.

When Floyd operates in automatic mode, he selects the correct procedure himself, relieving you of much of the work.

The aim of Floyd the Droid is to enable you to set up your own procedures via a special programming screen, and try to clear each sewer in as short a time as possible. In other words, Floyd the Droid is a kind of pungent Chipwits that's not only humorous, but also gives you good practice in the basic logic behind programming.

The programming part of Floyd the Droid allows you to instruct the PROBOT how to kill a specific opponent: rats must be jumped on, as must alligators, and bats must be



shot. Different procedures have to be designed in accordance with the characteristics of the individual creatures.

Procedures are designed by selecting a number of procedure steps. These might tell Floyd to move so many steps to the right or left, jump, turn, fire his laser, or whatever. Together, these instructions make up a procedure, or an overall pattern of movement, which should be enough to combat an opponent. To see the result of the procedure in action, the programming section has a test option which shows Floyd going through his paces in the right-hand corner of the screen. Even with this option, however, there's nothing to say that he'll be successful when faced with a real obstacle.

As well as his special repertoire of death, Floyd also has a special trick up his crankshaft for scaring bats. These creatures tend to hang out at tunnel intersections, but can be frightened in flight by a loud noise. When he reaches a junction, therefore, Floyd shouts 'Boo!' in the hope of sending them into a frenzy. Sometimes it works, sometimes it doesn't.

The graphics throughout Floyd the Droid are reasonably good, especially those depicting the PROBOT. The characters used to represent the bats, rats and other assorted nasties, on the other hand, leave a lot to be desired.

Overall, Floyd the Droid is an interesting, if rather odd, piece of software. Probably its best use is as a simple introduction to programming logic. Well worth a look, if only as a software curio. **END**

DON'T MISS THESE AMAZING UPGRADE BARGAINS FROM OPUS

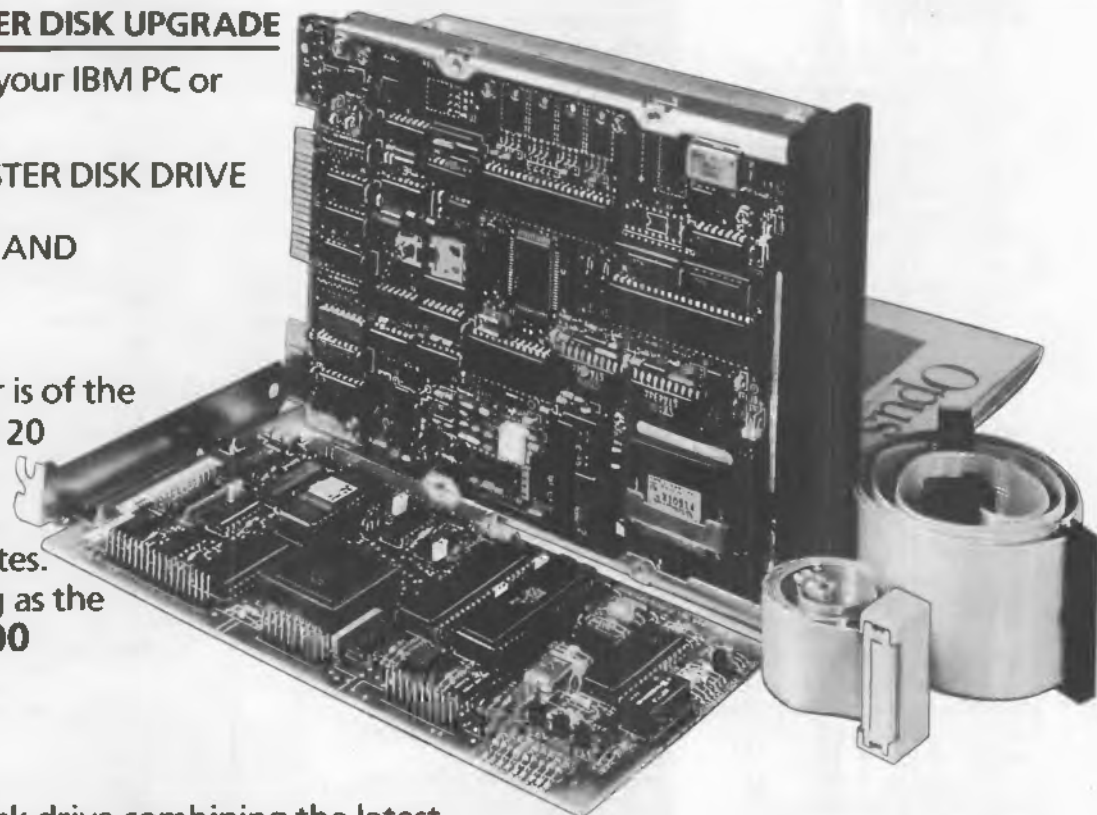
Check out these superb upgrade offers from Opus. We guarantee you won't find better quality, we know you can't find better prices.

20 MEGABYTE WINCHESTER DISK UPGRADE

All you'll need to upgrade your IBM PC or compatible.

- ▶ 20 MEGABYTE WINCHESTER DISK DRIVE
- ▶ CONTROLLER CARD
- ▶ ALL NECESSARY CABLES AND INSTALLATION KIT
- ▶ INSTRUCTION MANUAL

Our half-height Winchester is of the very latest design, offering 20 Megabytes of additional on-line storage, equivalent to around 57 floppy diskettes. Our price is just as stunning as the performance, only **£349.00**



IBM PC UPGRADE

360K half-height floppy disk drive combining the latest technology with low power consumption for just **£79.95**

80-87 5 Mhz MATHS CO-PROCESSOR

Only **£99.00**

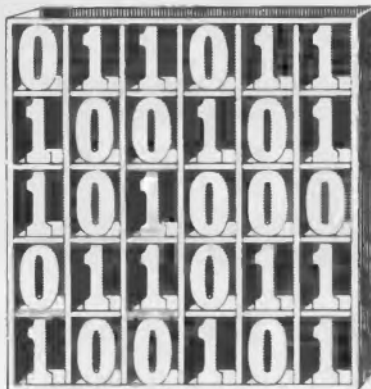
NEC 256K D RAM CHIPS 150ns

ROCK BOTTOM PRICES

We offer fast, guaranteed 72-hour delivery, generous discounts on multiple orders and unbeatable government, education and dealer prices. Call Opus now on **0737-65080** for full details. Access/Visa cards welcomed. Prices exclude VAT and carriage

Opus Supplies Ltd,
55 Ormside Way,
Holmethorpe Industrial Estate,
Redhill, SURREY RH1 2LW.

Opus.



David Barrow presents more documented machine code routines and useful information for the assembly language programmer. If you have a good routine, an improvement or conversion of one already printed, or just a helpful programming hint, then send it in and share it with other programmers. Subroutines for any of the popular processors and computers are welcome but please include full documentation. All published code will be paid for. Send your contributions to SubSet, PCW, 32-34 Broadwick Street, London W1A 2HG.

DATASHEET FORMAT

You will notice a few changes in the format of SubSet datasheets this month.

The main improvement is that the line width has been increased from 64 to 72 characters, allowing for labels of up to eight characters, and the longer operands and object codes of 68000 and 8086.

The wider format also gives scope for more descriptive section headings in the documentation — 68000 programmers will know whether stack usage is

in bytes or words, and top-flight Z80 coders like John Hardman will now cease to confuse clock cycles (that is, time states) with machine cycles.

One change that is long overdue — according to an erstwhile frequent contributor who wishes to remain anonymous — is the standardisation of the Action section. This is now renamed 'Structure' and gives (where possible) a language-independent formal description. Braces enclose iterative clauses (FOR, UNTIL, WHILE) and square brackets enclose the selective process (IF) with the vertical bar separating 'then' and 'else'.

6809 BYTE QUEUES

QPUT and QTAK (datasheet one) from Stephen Smith of Bromham, near Chippenham, are straightforward queue manipulation routines.

Queues are first-in, first-out (FIFO) data structures, and need pointers to both the next write and next read locations. Data is inserted at the queue's tail and read from the head of the queue. This has the unseemly effect of the head chasing its tail through all memory, unless a control system is imposed to loop both head and tail back to the start of queue memory when the allotted maximum extent is reached. Such control causes the effect known as 'wraparound'

where the lowest address byte is logically consecutive to the highest address byte — an effect that occurs automatically on 256-byte chunks of memory situated on a single page of memory and indexed by a single byte. Since the size of queues accessed by QPUT and QTAK does not necessarily correspond to this fortuitous circumstance, the head or tail index needs to be adjusted modulo QMAX whenever a queue read or write occurs.

The routines work only on byte data with maximum queue extent of 255 bytes, but the method is applicable to larger queues. This would entail using 16-bit indices and, perhaps, utilising the Y register as a pointer for transferring data strings between the queue and some other area of memory.

DATASHEET 1

```

:CALL: QPUT      Write one byte to a wraparound queue structure,
                  adjusting pointers, or return queue full information.
:CALL: QTAK      Read one byte from a wraparound queue structure,
                  adjusting pointers, or return queue empty information.

:CONCEPT       (System & language independent description)
:Data Structure  Wraparound queue.      Element size: 1 byte.
                  Header information: (1) Number of free bytes.
                  (2) Tail index (write index).
```

```

(3) Head index (read index).
Other information: Maximum queue size.
:Prog. Structure (For write, with read alternatives in parentheses.)
                  IF queue is full (empty)
                  {
                    set full (empty) flag.
                  }
                  IF tail (head) index > maximum queue extent
                  {
                    reset tail (head) index to lowest queue address.
                  }
                  write (read) indexed element.
                  increment tail (head) index.
                  decrement (increment) free byte count.
                  clear full (empty) flag.
                  }

:SYSTEM           (System implementation requirements)
:Processor        6809
:Hardware need    Queue in RAM.
:Software need    None.

:PROGRAM          (Specific coding and operation details)
:Input state      QPUT: X addresses queue header information.
                  A contains byte to be written to queue.
                  QTAK: X addresses queue header information.
                  Queue must be initialised or active.
                  Queue format: byte 0,X: no. of free bytes.
                              1,X: tail index (1 to QMAX).
                              2,X: head index (1 to QMAX).
                              3,X to QMAX+2,X: queue data bytes.
:Output state     QPUT: Z=0: Byte written. Queue indices updated.
                  X addresses written byte.
                  B = queue index to written byte.
                  A is unchanged.
                  Z=1: Queue full. A, B, X & queue unchanged.
                  QTAK: Z=0: A = byte read. Queue indices updated.
                  X addresses read byte.
                  B = queue index to read byte.
                  Z=1: Queue empty. A, B, X & queue unchanged.
:Miscellaneous    None (except uninitialised queue structure).
:Register need    A B X CC
:Location need    Not specific.
:Program Bytes    56 (QPUT: 27; QTAK: 29).
:Stack Bytes      None.
:Clock Cycles     QPUT: 57 (+7 if wraparound occurs). 12 if queue full.
                  QTAK: 59 (+7 if wraparound occurs). 14 if queue empty.

:SUBSET CLASS     (Environmental hazard guide)
:***** 2         Discreet: NO      Interruptable: YES    Promable: YES
                  Reentrant: YES    Relocatable: YES      Robust: YES

QMAX EQU nn      ;Single byte maximum queue size.

QPUT LDB ,X       ;Test number of free bytes      E684
      BEQ QPUTEND ;and exit, Z=1, if none free.    27 16
      LDB #QMAX   ;Else get max queue bytes      C6 nn
      CMPB 1,X    ;compare with tail index,      E101
      BNE QPUTTAIL ;skip if not at max extent,    26 02
      CLR 1,X     ;else wraparound to start.      6F01

QPUTTAIL INC 1,X  ;Add 1 to tail index.            6C01
      LDB 1,X     ;Get tail index and re-index    E681
      DECB       ;pre-update position.           5A
      DEC ,X      ;Subtract 1 from free bytes.    6A84
      LEAX 3,X    ;Address queue data lowest byte 3003
      ARX         ;add index to tail and         3A
      STA ,X      ;write byte to queue tail.      A784
      ANDCC #SFB  ;Clear Z to show write success. 1C FB

QPUTEND RTS      ;Exit QPUT.                     39

QTAK LDB ,X       ;Test number of free bytes      E684
      CMPB #QMAX  ;against maximum number       C1 nn
```



```

BEQ QTAKEAD ;and exit, Z=1, if all free. 27 16
LOB #MAX ;Else get max queue bytes 06 nn
CMPB 2,X ;compare with head index, E102
BNE QTAKEAD ;skip if not at max extent, 26 02
CLR 2,X ;else wraparound to start. 6F02

:
QTAKEAD INC 2,X ;Add 1 to head index. 6C02
LOB 2,X ;Get head index and re-index E602
DECB ;pre-update position. 5A
INC ,X ;Add 1 to free bytes. 6C04
LEAX 3,X ;Address queue data lowest byte 3003
ABX ;add index to head and 3A
LOA ,X ;read byte from queue head. A6B4
ANDCC #5FB ;Clear Z to show read success. 1C F8

:
QTAKEAD RTS ;Exit QTAKEAD. 39

```

68000 CHARACTER ROTATION

CHROT68K (datasheet two) from Roger Thomas of Lindfield, Sussex, rotates an eight by eight bit-matrix (eight consecutive bytes) anticlockwise through 90°. The matrix is assumed to represent a character dot pattern, so the routine would be useful in many graphics applications.

At 74 bytes the routine seems large — although, taking only 2536 clock cycles, it's much quicker than the 38-byte 68000 character transposition given in July. Nevertheless, it would still take some two-thirds of a second to rotate all monochromatic characters on an 80-character by 25-line display with a CPU running at 8MHz. With slower clock speeds, larger character

matrices and colour displays, this form of character rotation could be unacceptably slow for changes to more than a handful of characters.

One problem with the 68000 is that shifts and rotations of memory can only be carried out on word-length data. Roger's solution is to transfer the eight matrix bytes from source to stack workspace through data registers using the 'MOVEP' instruction. 'MOVEP.L Dn,\$00(A7)' writes the four bytes of register, not to four consecutive bytes, but to four consecutive words above the User Stack Pointer A7.

CHROT68K uses the USP dynamically to address each byte for rotation, and is above the stack workspace on exit from SRCLOOP. Consequently, it should not be used in any environment where interrupts use the USP, since some or all of the source data will be overwritten.

DATASHEET 2

```

:CALL: CHROT68K Rotate an 8-bit by 8-bit character matrix, stored
as eight contiguous bytes, by 90° anticlockwise.

:CONCEPT (System & language independent description)
:Structure move 8-byte source to workspace.
destination = source.
FOR each destination byte (7 to 0)
<
FOR each workspace byte (0 to 7).
<
shift left workspace byte.
rotate left destination byte.
>
>

:SYSTEM (System implementation requirements)
:Processor 68000 series.
:Hardware need 8 bytes matrix RAM.
:Software need None.

:PROGRAM (Specific coding and operation details)
:Input state A0 addresses 8-byte source matrix (lowest address).
:Output state Matrix rotated 90° anticlockwise.
CCR changed. All other registers unchanged.
Interrupt could cause overwrite of stack workspace.
:Misuse Errors None.
:Register need A0 CCR
:Location need Not specific.
:Program Bytes 74
:Stack Bytes (A7): 32
:Clock Cycles 2536 (68000 timing).

:SUBSET CLASS (Environmental hazard guide)
:--W-- 2 Discreet: NO Interruptible: NO Promable: YES
Reentrant: NO Relocatable: YES Robust: NO

MOVE.L (A0)+,D0 ;Get source bytes 0-3 2018
MOVE.L (A0)+,D1 ;and source bytes 4-7 2218
SUBA.L #16,A7 ;Clear 8-word stack 9FFC 0000 0010
MOVEP.L D0,$00(A7) ;workspace & store the 01CF 0000
ADDA.L #8,A7 ;8 bytes to hi-order DFFC 0000 0008
MOVEP.L D1,$00(A7) ;bytes of 8 consecutive 03CF 0000

```

```

SUBA.L #8,A7 ;words above USP. 9FFC 0000 0000
MOVE.W #7,D0 ;8 result bytes count. 103C 0007

:
DESTLOOP MOVE.W #7,D2 ;8 source bytes count. 343C 0007

:
SRCLOOP ROXL (A7)+ ;Left shift (word) next E5DF
ROXL.B #1,D1 ;position source bits E311
DECA D2,SRCLOOP ;via X to D1(7-0). 51CA FFFA

:
SUBA.L #16,A7 ;Reset USP to source. 9FFC 0000 0010
MOVE.B D1,-(A0) ;Store result byte of 8 1101
DECA D0,DESTLOOP ;same place source bits. 51C8 FFEA

:
ADDA.L #16,A7 ;Tidy USP workspace. DFFC 0000 0010
MOVEM.L (A7)+,D0 D2/A0 ;restore working regs. 4CDF 0107
RTS ;Exit, matrix rotated. 4E75

```

6809 CHARACTER ROTATION

CHROT689 (datasheet three) is yet another character rotation for 6809-based machines. The last one (CHROT in December 1985) performed an anticlockwise rotation of 90° in 48 bytes and 1544 clock cycles. CHROT689, from Roger Fine of Edgware, does a clockwise

rotation in only 36 bytes and 971 cycles.

Roger achieves the extra speed by cutting the result loop iterations down from eight to four and computing two result bytes in each pass. This ingenious method utilises two inner loops which remove all need for resetting the source pointer: the first loop auto-increments the pointer to the end of matrix RAM and the second auto-decrements it back to the start.

DATASHEET 3

```

:CALL: CHROT689 Rotate an 8-bit by 8-bit character matrix, stored
as eight contiguous bytes, by 90° clockwise.

:CONCEPT (System & language independent description)
:Structure FOR each result word (3 to 0)
<
FOR each source byte (0 to 7)
<
shift right source byte.
rotate right result word lo-byte.
>
FOR each source byte (7 to 0)
<
shift right source byte.
rotate left result word hi-byte.
>
move 4-word result to source.
>

:SYSTEM (System implementation requirements)
:Processor 6809
:Hardware need 8 bytes matrix RAM.
:Software need None.

:PROGRAM (Specific coding and operation details)
:Input state U addresses 8-byte source matrix (lowest address).
:Output state Matrix rotated 90° clockwise.
CC changed. All other registers unchanged.
:Misuse Errors None.
:Register need U CC
:Location need Not specific.
:Program Bytes 36
:Stack Bytes (S): 14
:Clock Cycles 971

:SUBSET CLASS (Environmental hazard guide)
:--W-- 2 Discreet: NO Interruptible: YES Promable: YES
Reentrant: YES Relocatable: YES Robust: YES

CHROT689 PSWS X,Y,D ;Save working registers. 3436
LDX #5FFFC ;Set 4-word result count. 0E FFFC

WORDLOOP LOD #50180 ;Set terminator bits in A & B. CC 0180

LOWLOOP LSR ,U ;Moving up through source, get 64C0
ROTB ;next even-number bit from each 56
BCC LOWLOOP ;byte to B. Loop till terminator. 24 FB

HIGHLOOP LSR ,U ;Moving down through source, get 64C2
ROLA ;next odd-number bit from each 49
BCC HIGHLOOP ;byte to A. Loop till terminator. 24 FB

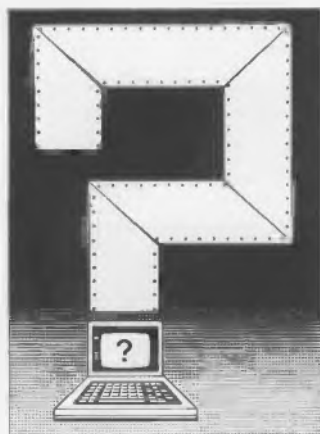
PSHS D ;Save result word to stack. 3406
LEAX 1,X ;repeat for 4 result words. 3001
BNE WORDLOOP ; 26 ED

LEAU 6,U ;Set U-stack to receive lowest 3346
PULS X,Y,D ;3 words and transfer back to 3536
PSHU X,Y,D ;matrix RAM using pull/push. 3636
PULS D ;Get highest result word and 3506
STD 6,U ;store back to matrix RAM. ED46
PULS X,Y,D,PC ;Restore registers & exit. 3586

```


COMPUTER ANSWERS

Simon Goodwin takes his toolkit to your problems. The address to write to is Computer Answers, PCW, 32-34 Broadwick Street, London W1A 2HG.



Computer Answers is PCW's help column. We offer advice about all kinds of specific hardware and software problems through the pages of the magazine. We also welcome further information in response to published queries.

Brother knows best

I am using a QL with a Brother EP44 printer. It works reasonably well with Quill and Archive, the word processor and database packages, but I am unable to install the printer to work in SuperBasic, either for printing or listing.

Secondly, with both Quill and Archive, the EP44 will not print the exclamation mark or the 'less than' and 'greater than' signs. And, finally, I experience problems with the addressing of envelopes. On ordinary white envelopes the print from the thermal ribbon just isn't good enough, and I can't find special envelopes, or even labels, with the necessary shiny surface. Can you help?

Leslie Fahidy, Horley, Surrey

Two possible problems are suggested. Your EP44 expects information to be sent at a rate of 1200 baud. Quill and Archive read the rate of transmission from the 'installation' file, but you must set it yourself in SuperBasic, using the 'BAUD' command.

When you turn on the QL, SuperBasic assumes a speed of 9600 baud. This is eight times too quick for your

printer, so you'll need to type the command 'BAUD 1200' to slow things down before the printer can be used.

Secondly, your printer expects two 'invisible' character-codes at the end of each line. These are called Carriage Return, or CR, and Line Feed, LF. As the names suggest, one is meant to cause the return of the printing 'carriage' to the left margin, while the other causes the printer to wind the paper on a line. These operations are usually performed together by a computer printer, so some computers only transmit the CR at the end of a line; if you change the setting of the 'New Line' switch inside the printer you can get an automatic LF whenever a CR is received. Most printers print a line at a time (for extra speed), so you won't get any results unless the correct codes are sent at the end of a line.

QL SuperBasic is unusual in that it transmits just a line feed at the end of each line. This confuses many printers, so you can tell the computer to convert the LFs into CR codes, automatically. You do this by opening your SuperBasic printer channel to the device SER1 C rather than SER1. Of course, your printer expects a CR and a LF, so you'll need to adjust the 'New Line' switch so that it can get by with just a CR.

This change should get SuperBasic printing happily, but you'll have to re-install Quill and Archive to send just a CR — not CR, LF — at the end of each line, or they'll print double-spaced results. You must specify CR on its own in response to the question 'End of Line Code?' when you run the relevant installation program.

You can get exclamation marks out of the EP44 with another installation trick. Use the 'Translate 2' facility to convert each exclamation mark into a full stop, a back space code and an apostrophe. The printer will then produce exclamation marks by superimposing two 'normal' characters, just as you would if you have a portable typewriter with no exclamation-mark key. The character code '8' tells the printer to step back a space, so the entire translation

option would look like this:

Translate2: "!,",8,""

The characters that are explicitly specified must be preceded by inverted commas, to distinguish them from ASCII codes such as 8, the code for back space. I don't believe the EP44 can produce greater and less than signs directly, but you may be able to build them up from other characters in a similar way.

The envelope problem is baffling. I'd like to hear from any readers who have found glossy envelopes that work well with thermal printers; I'll then publish the details in a future column. In the meantime I can only suggest you resort to hand-written envelopes, and console yourself with the fact that people usually open machine-addressed letters last!

Colour by numbers

I am puzzled by frequent references in reviews of new hardware to colour palettes of 4096 different 'shades' generated from the three primary colours, red, green and blue. I can see that 4096 is the cube of 16, which implies that each colour may be included in the mixture in 16 different ways, but it is difficult to see how anything like as many as 4096 different shades could be created.

If we represent the intensity of red, green and blue on a scale from 0 to 15 as (R,G,B) then certain consequences follow. (0,0,0) would of course be black, but what is the difference in 'colour' (as opposed to brightness) between (1,1,1), (8,8,8) and (15,15,15)? Surely all three would just be plain white, because they contain equal proportions of all three primary colours? Am I missing some vital distinction?

Keith Matthews, Peterston, Cardiff

Each spot on a TV or monitor display has two different properties — colour and brightness, or 'chrominance' and

'luminance' in the jargon. A 'black and white' TV set ignores the chrominance information, and uses the luminance data to produce a varying pattern of black, white and shades of grey. In your example, (1,1,1) would give a very dark grey picture, (8,8,8) would give medium grey and (15,15,15) would give bright white.

A black and white display can only work in shades of grey, but a colour display can independently vary the intensity of each primary colour at every point on the screen. Even with a single, primary 'colour', different intensities appear to the eye to have different 'colours'. When you mix colours together this is even more evident.

For instance, a low-intensity combination of green and red primary colours appears brown, while higher intensities appear buttercup-yellow. Add a little blue, and the colour you see becomes paler and more like the yellow of a lemon.

What we call 'colour' is really a combination of the effect of luminance and chrominance — which is why the special terms exist. The eye uses separate sensors ('rods' and 'cones') to perceive each component, but the brain muddles the results together to give a composite 'colour'.

It's worth bearing in mind that most systems offering 4096 colours restrict you to a smaller range — typically 256 colours, chosen from the 4096 — on any given display. The reason is that 12 bits are needed to store a colour chosen from 4096 (four bits for each primary colour). If you only use eight bits — in effect, a code for one of 256 colours chosen from the full range — you reduce the amount of memory needed to store a picture and speed up access to the display memory; most computers are happier working with 8-bit values than they are with 12 bits.

Special timing tricks can be used to change the palette of colours part way down the screen (giving several areas, each with an independent range of 256 colours), but in practice just 256 well-chosen colours can give results comparable to a

TV picture, as long as you use a fine enough resolution.

Extra colours have two main uses in computer graphics. They allow subtle 'shading' effects which give a picture an illusion of depth and make it appear to be lit from outside. They also allow 'anti-aliasing' — intermediate colours can be used at the junction between one component of a picture and its background, blurring diagonal edges slightly and hiding the jagged 'step' pattern which would otherwise appear.

Inside the Oric

Where can I find hardware information about the Oric 1 micro? I can identify some 85 per cent of the integrated circuits present, mainly thanks to *Radio Spares* and *Maplin* catalogues, but I have two main problems: I need to identify the remaining ICs, and trace the system bus.

I would be very grateful if you could point me in the right direction.
GA Channell, Rushden, Northants

You need a copy of the *Oric Advanced User Guide*, published by Adder, tel: (0223) 861912. It costs £9.95, and you should be able to order a copy from your local bookseller. The book explains the inner workings of the Oric's hardware and software; it includes a full circuit diagram which should save you the problem of tracing the system bus from the circuit board. Most of the information in the book refers specifically to the Oric Atmos, a 'cleaned-up' version of the Oric 1, but the differences — listed in the guide — are relatively few.

Printer interfacing

I recently purchased a second-hand Anadex DP 8000 printer, which I wish to use with my Spectrum computer. I realise I shall have to purchase an interface, and am considering buying a Centronics which could also be of use if I obtain a different computer in the future. What are the likely snags? What do I need?
W Briggs, Cheylesmore, Coventry

In general, you can't use a Spectrum Centronics

interface with any other computer. Each brand of computer has its own set of signals, on a specific type of connector with an individual pattern of connections. There are only two common types of printer. Serial printers expect characters to be transmitted down a few wires, one bit at a time, while parallel printers use more wires — generally arranged in a 'ribbon' — and transmit seven or eight bits simultaneously.

Parallel connections are faster and more reliable; they're also usually cheaper for the maker of the printer. However, they're basically one-way links. Serial connections are two-way, so an interface designed to transmit characters to a printer can also be used to read information into a computer from a modem (telephone interface) or another computer. Serial interfaces can run at many different speeds, while parallel ones just send characters as requested by the recipient.

You can also buy interfaces dedicated to converting serial information to parallel form or vice versa. You don't say whether your printer expects serial or parallel data, but you should obviously buy an appropriate interface. Parallel interfaces are generally much easier to wire up, especially one type of plug which is almost universal at the printer end — an 'amphenol' type. Serial printers usually expect a 25-way 'D-type' plug, but arrangements vary, especially on cheap models.

If you need a serial interface, the ZX Interface 1 is a good bet; it uses a 9-pin D-type plug at the computer end, but leads for this are widely available. The Interface 1 also contains a fast network handler and a microdrive controller, but not the drive.

There are two sorts of Spectrum parallel interface. The computer uses non-standard internal codes to represent keywords and colour information, so you need special software to convert or ignore the codes.

Cheap interfaces, such as the Tasman, tel: (0532) 438301 and Kempston 'S', tel: (0234) 856633, require you to load a short routine from cassette before you use the interface; this is inconvenient and may make it hard to use the interface with commercial software.

For an extra £10 or so you can buy the software in ROM, built into the interface

so that you can access it at any time. Euroelectronics, tel: (01) 658 6350 was the first on the market with one of these — the ZX LPRINT, now in its third incarnation — and Kempston followed suit with its interface 'E', reportedly designed by the same engineer.

All of these systems will divert the Spectrum's LLIST and LPRINT commands to your new printer, but you will probably have trouble getting COPY to work. Each type of printer uses different codes to indicate high-resolution graphics, and I know of no device specifically compatible with the Anadex DP-8000. If you need COPY you should bear this in mind before choosing a printer — non-standard codes make many obscure brands of hardware less of a bargain than they might seem.

Amstrad connections

Being the owner of an Amstrad PCW8256 and an Apple II+, both of which run CP/M, I wonder if there is any way of getting the two computers to communicate, so that I can run my Apple CP/M software on the Amstrad. Would I be able to print output from the Apple on the Amstrad printer?
AJ Rozwadowski, Swindon, Wiltshire

I use an Amstrad PCW8256 at home for word processing tasks. However, I regularly travel and would like to write material while I am away from home. The solution would be to use a portable PC, and on my return replay the material into the Amstrad. I should welcome your advice.
Dr Garry Hunt, Raynes Park, London

I am considering using an Amstrad word processor to facilitate the printing of my PhD thesis. The dot-matrix printer will be adequate for the preparation stage, but the final printout will require a daisywheel to achieve the required standard. Is there likely to be a problem with the difference of control characters? What would be the best way to minimise any extra work involved?
MJ Carter, Yeovil, Somerset

All of these problems can be cured with the Amstrad serial interface card, the CPS-8256. This lets you transfer information to and from

Amstrad disks via an RS232 interface. The text should be in standard ASCII form, without any 'control' characters, as these are unlikely to be interpreted in the same way by machines at both ends of the line.

Only the latest version of the Locoscript software — version 1.2 — will allow you to handle standard ASCII files, so you will need an upgrade if your version predates this. Upgrades are available free from Amstrad: send the company your old Locoscript disk with a covering letter.

Daisywheel printers will not allow the range of changes in pitch and emphasis that you can get with Amstrad's own printer. Even if the equivalent function is available, the control codes are almost certain to be different.

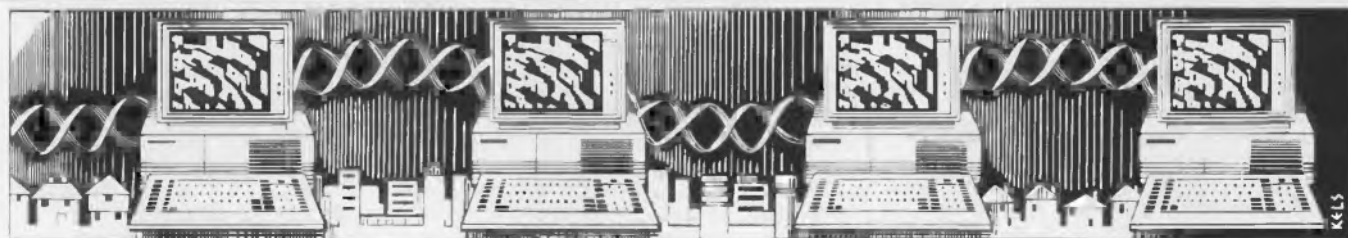
The answer is to use an alternative word processor, such as New Word or Pocket WordStar, to add printer-specific codes. Check that the package supports all of the features of your chosen printer. You'll have to change all the formatting, but at least you won't need to re-type the main text. You'd probably have to re-format the document to use a different typestyle anyway.

You'll also need an RS232 interface at the other end of the link; these are available as options on almost all daisywheel printers, and built-in to most portable computers. Plug-in RS232 cards for the Apple II are widely available; input and output can be diverted to use the card with PR and IN, as for any other Apple peripheral card.

Your choice of portable computer will depend mainly upon your budget and the amount of text you need to store; the cheapest, lightest machines will only hold a few thousand words before you have to save the text onto disk or tape. Most have a cassette interface, but you may find that Epson tape cartridges or disks are easier to use and more reliable. Try to get a system that will run on widely-available batteries, so that you're not at the mercy of foreign mains power.

RS232 links are not simple to set up, unless you've had a little practice and you know the details of both ends of the link. Unless you're sure you know what you're doing, I suggest you get the firm that supplies your interface to demonstrate it working as you want it — it'll save a lot of hassle.

END



Room with a view

Peter Tootill looks at the changing face of information technology centres.

A number of locally-based public and semi-public viewdata systems have appeared in the last couple of years which are run, in the main, by ITeCs and local authorities. They have various aims; local authorities consider them as part of their general publicity and information function while ITeCs have a different emphasis.

ITeCs (Information Technology Centres) are centres for training in information technology. The first one was started in Notting Dale, West London, in 1980 by a group of people who were concerned about unemployment and social problems. They saw an opportunity for new technology to make a contribution to the solution of these problems. The centre was funded from a variety of sources including the local authority. The aims of the centre were threefold:

- (1) to provide training in information technology for young people;
- (2) to offer open access to IT resources to the local community; and
- (3) to create local employment by launching small enterprises in the IT sector, offering new products and services, and generating income to support the general work of the ITeC.

There are now about 170 ITeCs based on the Notting Dale pattern in the UK.

No formal qualifications are expected from trainees and the training is orientated towards the practical rather than theoretical. Funds for the ITeCs come mostly from the Manpower Services Commission in the form of payments for facilities provided to YTS trainees. Other sources include local government, business and the EEC, as well as the income generated by the ITeCs' own enterprises.

One of the first problems encountered by the ITeC tutors was a lack of teaching materials relating to Information Technology. Furthermore, what does exist becomes out of date very quickly. It was therefore clear that a lot of the materials would have

to be prepared by the ITeCs themselves, even at the risk of duplicating effort.

At this time, a number of the people at Notting Dale had become interested in viewdata systems (such as Prestel). Chris Webb, one of the founders of the Notting Dale ITeC, thought that viewdata systems could be used to solve some of these problems. However, it was felt that, for their purposes, the emphasis needed to be on local, rather than nationally-based systems. This would have the added advantage of enabling candidates to be trained in the operation and use of viewdata systems and also enable ITeCs to develop contacts with local people and businesses.

An early obstacle was the cost of the hardware and software needed to run viewdata systems. A micro-based system called 'Hey Presto' had already been developed at Notting Dale, which later evolved into 'CommuniTel'. Fortunately, a grant was obtained from the European Social Fund which covered the installation of 120 CommuniTel systems and the ITeCs' 'Training Materials Network' was launched.

CommuniTel is a viewdata system that runs on a BBC Micro with a couple of disk drives. It can store up to 250 frames of information on each drive.

One advantage of a viewdata system is that, being based on simple menus, it is relatively easy to use for those unfamiliar with online systems. In fact, the viewdata method has even been applied to some of the teaching modules which are not used online at all. For example, there are viewdata-bases explaining the use and care of disk drives for those new to computers, computer repairs and the principles of seven-segment displays. Other modules are text-based or programs, usually designed to run on BBC Micros. Software has been written that enables circuit diagrams to be reproduced. Most of these

modules are available to any ITeC, simply by calling the relevant CommuniTel system and downloading them.

Each ITeC now plays a role in a nationally coordinated system for the development of training packages. Duplication is avoided by easy access to each other's materials through the viewdata systems; indeed, two or more ITeCs can cooperate on the development of a training package even though they may be separated by a distance of hundreds of miles. The system is coordinated by a central body based at Notting Dale called the Information Technology Consultancy Unit (ITCU).

The ITCU maintains a central online database which stores a range of training materials as well as details of the ITeCs and information about their specialisations. The aim is to achieve a distributed database of training materials which is well-indexed, giving ITeCs access to each other's materials in a structured way.

The Training Materials Database has developed from its original concept over the past year. It has started to carry information such as reviews of hardware and software, requests for help from ITeCs, a teleconference for supervisors, and features and articles contributed by ITeCs on information technology.

Another spin-off from the viewdata systems has been that they have turned out to be a useful means of recruiting trainees. They have also provided business contacts for sponsors and now carry advertising. Basildon ITeC claims to have carried the first electronic ad for a solicitor!

The system as a whole is now pushing at the boundaries of available technology, at least at a price that the organisations can afford. The ITCU is looking at ways of speeding-up data transfer, providing multi-user and multi-tasking systems, and so on. In keeping with its desire to be at the forefront of IT training and development, the ITCU is looking at pa-

rallel processing and the Transputer as possible avenues for advances in this area.

Around 120 ITeCs are now using the network, with about 50 already running their own viewdata systems. Many more are actively seeking to set up their own databases in the near future. Most of the systems have certain areas available for public access; these will probably include details of the ITeC, local information, advertising, and the like. A list of the ITeC systems currently available is given below and you are welcome to call them, but you are asked to keep your visit short if you are not calling from another ITeC. This is to avoid the systems being tied up by visitors when the ITeCs themselves may be needing to contact them.

MacTel

With the tremendous growth in the number of bulletin board systems running in the UK, a number have started to specialise, usually because the sysop has a particular interest. This parallels the American experience, where boards for writers, doctors, musicians and others can be found, as well as the more obvious topics such as particular micros, languages or software products.

In the UK I doubt that there are enough writers or musicians around who have access to a micro and modem to support specialisations of

this nature, except that the medical BBS 'Clinical Notes Online', run by IRCS, seems to have been well-received.

However, machine and language special interest sections on BBSs are very popular. There are even one or two boards aimed very specifically at particular topics. An example is MacTel which is for Macintosh users.

MacTel enables Mac users to contact each other to discuss problems, exchange hints and to have access to a large body of public domain software. MacTel has developed considerably from the early days when it was started by Paul Beaumont who ran TBBS Nottingham until he bought a Macintosh. Now MacTel offers a wide range of services. As well as the usual message and download areas, there is a lot of Mac-related news gathered from a number of sources including contacts at Apple, CompuServe and other US systems. There are also other services that you would not normally expect from a simple bulletin board. There is, for example, a postal service with around 60 postal packs of public domain software. There are also regular meetings for those within reach of Nottingham.

In addition to the main HQ MacTel system, there are two other nodes: MacTel Sheffield and a second Nottingham system called MacTel Phoenix. MacTel HQ runs on a 512k Macintosh served by an 11Mbyte

Corvus drive and uses a WS3000 modem to provide access at 300/300, 1200/1200 and 1200/75 bits/sec (V21, V22 and V23). Most of the message and extensive news areas are available to all callers, as are about six of the 20 or more download sections. The rest of the system is for subscribers only. The emphasis is on ease of use, especially for novices, and a starter pack is available for Mac users at only £5 which contains instructions and software which can be used to call MacTel. The system is funded partly from subscriptions and partly by sponsorship from Apple UK, Second City Systems and Vistec.

As well as the above, MacTel is about to launch a magazine for Mac users which will be available by post and from a number of Apple dealers. For more details, call one of the MacTel systems or send an SAE to MacTel at 15 Elm Tree Ave, West Bridgford, Nottingham NG2 7JU.

The phone numbers are:
MacTel HQ (0602) 817 696 (V21, 22, 23)
MacTel Sheffield (0742) 350 319 (V21, 23)
MacTel Phoenix (0602) 289 683 (V21, 22)

All are 24-hour systems.

If you run a BBS or other online system and think the details would be of interest to our readers, send them to Peter Tootill at PCW, together with a voice telephone number if possible.

UK public online systems

Number	Name	Location	M-F times	W/E Times	Rates\$	Notes
(0001)885 634	DUBBS-Dublin	Dublin	9pm-8am	24	3	Bell 13.30-16.30 Wed
(01)200 3439	Airtel - TBBS	London	24	24	3/1275	Pilots area
(01)200 7577	TBBS London NW	London	24	24	3	TBBS, Tandy Users Group
(01)248 5747	Prestel	London	24	24	3	No graphics on this number
(01)262 1629	TBBS Capital	London	24	24	3	
(01)346 7150	Marctel	London	24	24	3/1275	FBBS system.
(01)348 9400	TBBS London	London	24	24	3	
(01)399 2136	M6-Net	London	n/a	Sun. 5pm-10pm	3	One of longest running BBS
(01)429 3047	OSI	London	24 Ring back	24 Ring back	3	
(01)450 9764	TechnoLine	London	24	24	1275v	Commercial
(01)452 1500	Techno-line 2	London	evenings	24	1275v	Commercial
(01)455 5380	NMBBS London	London	24	24	3/1275	
(01)542 3772	NBBS Wimbledon	London	N/A	sat 7am-mon 8am	3/1275	
(01)542 4977	TBBS Ravoreed	London	24	24	3-24	
(01)638 2034	CyberZone	London	24	24	3	
(01)658 6942	Tynet	London	24	24	3	
(01)679 1888	Distel	London	24	24	3	Display Electronics - Commercial
(01)679 6183	Distel	London	24	24	3/1275	Display Electronics - Commercial
(01)735 6153	Brixton ITeC	London	24	24	1275	
(01)853 3965	Assylum	London	24	24	3	Writers and comms areas
(01)883 5290	NBBS London	London	9am-8am	24	3/1275	
(01)888 8894	Snome at home	London	24	24	1275v	
(01)927 5820	OwlTel	London	24	24	1275v	
(01)941 4285	Metrotel	London	24	24	1275v	
(01)954 9847	Dark Crystal	London	24	24	3/1275	
(01)960 4742	ITCU Exchange & Mart	London	24	24	1275v	ITeCs central system
(01)968 7402	Communitel	London	24	24	1275v	

OUR PRICES CAN'T BE BEATEN!



You can't buy **olivetti** cheaper!

M24, 256K RAM, 2 x 360K Floppy Drives £1,399
M24, 640K RAM, 20MB NEC Hard Disk Unit, 360K Floppy Drive £1,849
M24, 256K RAM, 10 MB Olivetti Hard Disk Unit, 360K Floppy Drive £2,095
M24 SP, 640K RAM, 20 MB Olivetti Hard Disk, 360K Floppy Drives 7 Slot Bus Converter £2,210
M19, 256K RAM, 2 x 360K Floppy Drives £1,164
M19, 256K RAM, 10 MB Olivetti Hard Disk, 1 x 360K Floppy Drive £1,629

This is only a selection of our extensive range of hardware and software.

**WE'LL
MATCH ANY
GENUINE
QUOTE!**

**IF YOU CAN SHOW US
A LOWER, GENUINE QUOTE,
WE PROMISE TO MATCH IT!**

**12-MONTH
NO-QUIBBLE
WARRANTY!**

**A FULL 12-MONTH
NO-QUIBBLE WARRANTY
ON ALL OUR PRODUCTS!**

**THE
PAP
PROMISE**

**IT'S OUR REPUTATION FOR
SERVICE & RELIABILITY THAT
MADE US ONE OF OLIVETTI'S
OLDEST AND LARGEST DEALERS**

- All systems listed include Mono Screen, Keyboard, MS DOS, GW Basic and installation manuals.
- Please add £240 for colour monitor on M24 and SP. Add £158 for colour monitor on M19.
- All prices quoted exclude VAT and Delivery Charge.

So before you buy, give PAP a try!

**COMPARE OUR PRICES,
THEN BUY WITH CONFIDENCE!**

(For a little extra, we also offer full training & support and nationwide on-site maintenance)

PAP

PAP Distribution, The Sion, Crown Glass Place, Nailsea, Bristol, Avon BS19 2EP.
(0272) 856502

NETWORKS

(011985) 3322	Hackney BBS	Hackney	24	24	1275v	
(011986) 4360	Health data	London	24	24	1275v	
(0204) 43082	Bolton BBS	Bolton	8pm-8am	24	3-24	8am-8pm on ring back
(0206) 862 354	Pete's Place	Colchester	24	24	3	
(021) 430 3761	CBABBS	Birmingham	24 (not Thurs)	24	3	
(0222) 461 824	Capital Data Line	Cardiff	24	24	3	Computer repair company
(0222) 464 725	Cardiff ITeC	Cardiff	24	24	1275v	
(0223) 243 642	Acorn BBS	Cambridge	24	24	1275v	
(0224) 641 585	ABERDEEN ITEC	Aberdeen	24	24	1275v	
(0224) 781 919	Aberdeen Commodore	Aberdeen	24	24	3	Commodore 64 based
(0247) 455 162	SBBS 11 (Irish Man)	Ireland	9pm-11pm r/b + 11pm-9am		3/1275	rates are daily
(0258) 54 494	TBBS Blandford	Dorset	24	24	3	Blandford Computers
(0268) 22 177	BITEC	Basildon	24	24	1275v	
(0268) 25 122	BITEC	Basildon	24	24	3	
(0268) 710 637	RICBBS	Basildon	5pm-10pm	24	3	
(0295) 720 812	Bloxam	Bloxham	10pm-1am	10pm-1am	3	
(0376) 518 818	REACT	Essex	24	24	3	
(0384) 635 336	West Midlands	Stourport	6pm-8am	6pm-8am	3	TBBS
(0392) 53 116	CBBS South West	Exeter	24	24	3/1275	
(0394) 276 306	BABBS-I Felixstow	Felixstow	24	24	3	
(0395) 272 611	CFC	Exmouth	24	24	3	John Burden
(0401) 50 745	MBBS Leconfield	Leconfield	24	24	3	Martin Taylor
(0429) 234 346	On-Line System	Hartlepool	24	24	1275v	Hartlepool Computer Services
(0443) 733 343	M6BBS Mid Glamorgan	Ferndale	6pm-1am	6pm-1am	3	was on 755298
(0482).....	Haaret	Hull	6pm-8am	24	3	Radio Haas
(0482) 859 169	Forum-80	Hull	7pm-11pm	1pm-11pm	3	Midnight-8am Bell 103(UK's first BBS)
(0483) 573 337	Fido Comulink 1	Guildford	24	24	3/1275	Multi-user (see C/link 2)
(0483) 573 338	Fido Comulink 2	Guildford	24	24	3-24	Bell tones on this number
(04862) 25 174	PBBS-'Adult' BBS	Mitcham	24	24	3/1275	
(0492) 49 194	Cyarutel	Colwyn Bay	24	24	1275	
(0506) 38 526	Livingstone BBS	Livingstone	24	24	3	
(051) 428 8924	Liverpool Mailbox	Liverpool	24	24	3/12	Britain's first 24 hr system
(051) 737 1882	Matrix	Liverpool	24	24	3/1275	Subscribers only (was Manchester)
(0524) 60 399	CNOL	Lancaster	24	24	3	Clinical BBS for medics
(0534) 39 389	Jersey Fido	Jersey	24	24	3	
(0592) 860 313	JMBBS Astrad BBS	Fife	9.30pm-8am	9.30pm-8am	3	Sponsored by John Menzies
(0767) 50511	CBBS Gainingay	Nr Sandy	24	24	3	
(0707) 52 242	RSGB	London	24	24	1275v	
(0604) 20 441	Norview	Northants	24	24	1275v	
(061) 494 6938	Fido TeePee link	Manchester	10pm-9am	10pm-9am	3/12/24	New number in Feb86
(0625) 33 703	Telemac 15	Macclesfield	24	24	3/1275	
(0698) 884 804	SABBS	Larkhall	24	24	3	Atari based system
(0702) 54 6373	C.View Rochford	Kent	24	24	1275v	
(0702) 552 941	Maptel	Southend	24	24	3	Commercial system
(0705) 524 805	Gosport Apricot BBS	Gosport	24	24	3/1275	3
(0705) 736 025	BBS09	Portsmouth	7pm-10pm Wed	10am-10pm Sun		7 bits even parity
(0752) 364 059	Haunting Thunder	Plymouth	2am-6am???	???	3/1275	Fido
(0762) 333 872	PBBS-1 Portadown	N.Ireland	10pm-1am R/B	10pm-1am R/B	3	
(0782) 265 078	Stoke ITeC	Stoke	24	24	1275v	
(0784) 65 794	Staines BBS	Staines	24	24	3/1275	7 bits even parity
(0792) 203 953	FBBS Swansea	Swansea	24	24	3	
(0874) 711 147	Communitree	Brecon	24	24	3	
(0883) 844 164	LABBS	Surrey	24	24	3/1275	The Prisoner - 2 lines
(0895) 420 164	CBBS(London NW)	West Drayton	24	24	3	
(0895) 52 685	London West Tech	Uxbridge	24	24	3/1275	TBBS
(0903) 212 552	Lasermail Fido	Worthing	24	24	3/1275	Subscribers (12/24 coming?)
(0908) 668 398	Key-board	M.Keynes	8pm-8am except Tue and Thurs		12h	Micron - Spectrum system
(0923) 676 644	SBBS - Watford	Watford	9pm-11pm plus	+11pm-6am	3/1275	Times are daily
(0936) 77 025	NBBS Cheshire	Sandbach	24	24	3/1275	

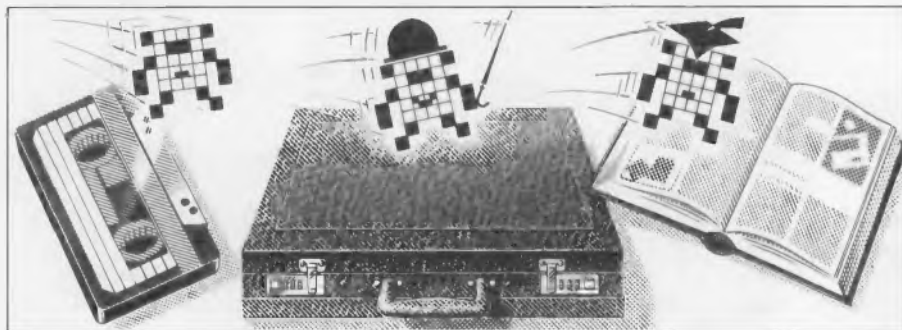
† Notes on rates:

=====

3 = 300 (V.21) 1275 = 1200/75 (V.23) v = Viewdata format
12 = 1200/1200 (V.22) 24 = 2400/2400 (V.22bis) h = half duplex
3-12 = V.21, V.23, V.22 3-24 = V.21, V.23, V.22, V.22bis

END

PROGRAM FILE



Games



Scientific/mathematic



Business



Toolkit/utilities



Educational/Computer
Aided Learning

*Owen Linderholm selects the best of readers' programs.
For details on submitting your own, see the end of
this section.*

There's a good chance that many readers will be turning up at Olympia for the PCW Show (3-7 September). The PCW staff have 'volunteered' to be available to talk to the public, so if anyone has anything to discuss about 'Program File' I'll be happy to talk to you, if only for a short while. More seriously, I would welcome people's comments on the content, style and direction of 'Program File'.

One thing I must ask you not to do is bring program submissions along with you. We don't return to the office after the show, and there's no sensible or convenient way of storing programs at the show, so please just send programs to the PCW office in the normal way.

Amstrad/QL programs

On the subject of dealing with programs, I must apologise to people who have sent in QL programs. Don't worry — I have received them, but the office QL has disappeared and it's taking quite some time to get a replacement from the new owners of the machine, Amstrad. However, there are now signs that Amstrad is going to let us have a PCW8256 for longer than two weeks soon; this may extend to a QL as well.

The reason for these problems is that despite appearances, PCW isn't wealthy enough to splash out on every single computer under the sun. We generally have machines on loan, and if they look like being important or successful, we try to get them on long-term loan for evaluating programs for 'Program File' or reviewing software. In the early, heady days of home computing, companies like Sinclair and Commodore weren't averse to giving us machines, but now we tend to get nasty-sounding legal loan agreements along with the machines. This explains our difficulty in evaluating some of the programs that come in. To compensate, when I've had the chance to try out the QL

and PCW8256 programs, I'll do a 'Program File' heavily biased toward these machines.

In November 1985, 'Program File' published a program called Amsquill for the Amstrad CPC machines by Justin Moffitt. I recently received a letter from Justin explaining that he had an advanced version ready. As this will be primarily of interest to people who have already typed-in the original, I have arranged that anyone who is interested can get a listing and instructions from him. The address is: Amstrad Amsquill Advanced, c/o Justin Moffitt, 24 Dromara Park, Lisburn, Northern Ireland BT28 1PX. You must include an SAE.

Room for improvement

I have recently received suggestions as to how 'Program File' could be improved. The most common request is for us to supply cassette and disk versions of programs for a fee. Several magazines do this, but they are all machine-specific titles — they only need to make one cassette or disk which holds all the programs. Unfortunately, PCW would have to make separate cassettes or disks for all the different machines for which we publish programs. The administrative and machine costs of doing this are just too much: we wouldn't be able to supply the programs at an even vaguely reasonable price.

Programs will, however, be available from PCW Online. I'll try to make sure, where possible, that these are in both machine or language format and ASCII. This will make it easier for people to convert programs to other machines or even run them directly. If anyone has suggestions about how to improve the PCW Online service or has any public domain software that they would like to upload, please let me know and I'll organise it.

At the moment, I seem to be receiving different kinds of programs in

'fits and starts', which means that 'Program File' is starting to look less varied than it used to. For example, I didn't receive a single BBC program that I thought worth using this month. Also, over the past couple of months, well over 20 versions of the Mandelbrot Set have been sent in. Initially I turned them down because I felt that this was a topic that had already been adequately covered elsewhere, but the huge numbers of these programs I have received has prompted me to publish one. I will wait for a good, simple and clear one for any machine, and then I'll feature it. (I'm writing this well in advance of the cover date, and will have received over a month's worth of programs by the time you read this, so don't set about writing a program for the Mandelbrot Set immediately.)

I would like to stress that I am interested in all kinds of programs as long as they are novel, interesting and well-written. Please continue to improve the standards of documentation, since one of the purposes of 'Program File' is to help increase other people's understanding of programming. We are receiving fewer educational programs than I would like, so that is one area where experimentation would be welcome. Please remember, however, that teaching is a difficult profession, and educational programs don't work unless a lot of attention has been given to them.

This month's programs

This month's listings are a rather mixed bag. The Program of the Month is in Turbo Pascal for any machine that can run it (or even other Pascals). It is once again by Mark Needham who, at his current rate, will be able to make a full-time living out of 'Program File'. The program is a version of Micro Prolog but it does lack a few features, especially list processing. Nevertheless,

PROGRAM FILE

it's a good introduction to Micro Prolog and also to the difficult field of writing programming languages.

The next program, for the Commodore 64, covers a topic which several readers' programs have covered previously, but none have been as comprehensive and well-researched as this one. The program produces a table of tape recorder counter readings for different playing times along a cassette, in 15-second intervals. It takes into account different makes of cassette and the fact that cassette recorders all differ physically from each other. The program can be applied to any form of cassette, even videotape; this should make it easier to keep track of large video or cassette libraries as well as com-

puter programs on cassette.

As newer machines enter the market and the users of older ones become more experienced, languages other than Basic are being used more often; the next program is an example of that. It's written in C for an Atari ST. Unfortunately, as it's a game and relies heavily on graphics, it probably won't convert to other machines.

The program is a version of Breakout. It has one unusual feature in that the bat doesn't always hit the ball correctly when you move it very fast towards the ball, but I found that this made the game more interesting. As it's mouse-controlled, the bat moves vertically as well as horizontally.

The next item isn't really a program but an extended 'Bludner'. The Memotech MTX PANEL fill utility in the June issue has been improved by Harrie Wijnands.

Another minor bludner I will mention here occurred in Mark Needham's 6402 emulator (PCW, July). On page 198, about halfway down, there's a CASE statement. One of the options is missing — it should be a space between single quotes.

Tips this month include an IRQ interrupt for the Commodore 64 and an auto-run program for the PCW8256.

Remember: all submissions to Program File should be accompanied by a stamped, addressed envelope.

BLUDNERS

In the June issue, a segment of code was inadvertently omitted from the

```

10 REM *****
20 REM *** The following additions and changes are for the Electron ***
30 REM *****
40 REM Ensure line numbers match with main program
50
420 LDA #227:LDX #181:JSR @xbyte
760 \ line not needed for Electron
770 \ line not needed for Electron
2000 IF J&C>52185 + J&C<DIV256 + C&MOD256 PRINT "Checksum error":END
2400 IF /P&res("Print any codes") PROC@p@code
2800 DEF P&h(j) = P&block("P&BC") + "-" + P&block("C&B" + (j-2))
2810 :
4000 DEFPROC@p@code
4010 ON Z&R&R DO P&O2&A60
4020 VDU1&6
4030 P&X3 10
4040 FOR I=0 TO 10
4050 asc=65-20:ich=126-20:1
4060 PRINT:font@1(1)TAB(15)"On a Func = "CHR$(asc) or VDU "ich
4070 IF I<10 PRINTTAB(16)"Off a Func = "CHR$(asc+1) or VDU "ich+1 or VDU 18E"
4080 NEXT I
4090 P&X3
4100 ENDPROC
    
```

Fig 1

program BBC Fonts in 'Program File'. This code allows the program to work with the Acorn Electron. The necessary modifications are given in Fig 1.

There are a few corrections to be made to the Amstrad PCW8256 program 'Touch-Typing' in 'Program File', PCW June. These are shown in Fig 2.

```

3840 change 'handfull' to 'handful'
3950 English readers should change 'tyre' to 'tyre'
5080 change 'de' to 'ed' in two places
5150 change '9/10' to '9/10'
5170 change '5.00' to '5.00'
5180 change '701' to '620'
    
```

Fig 2

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.

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 of the Month

Turbo Pascal LOGIPROG

by Mark Needham

LOGIPROG is a cut-down version of Micro Prolog, a language that is now becoming available for some of the more popular home micros. The only major differences between Micro Prolog and LOGIPROG are the omission of an editor and lists in variables. LOGIPROG was written on a 256k IBM Portable in Turbo Pascal. None of the special IBM goodies are used, so the program should run on any MS-DOS machine.

If you want to read about Prolog, I recommend *Learning Micro Prolog* by Tom Conlon. I used this book as a reference while writing LOGIPROG, and all the examples that don't use lists should work.

To run LOGIPROG, type the program in and compile it to disk. To run the program, type LOGIPROG. A one-line heading and the prompt '&' will appear; the LOGIPROG interpreter is now ready to be used.

Prolog is a language unlike any of the current languages in that facts and questions are entered in an almost English form. For example: `eats(John fish)` — specifies the fact that John eats fish
`talks(Jim)` — specifies the fact that

Jim talks
`travels-between(Fred Birmingham London)` — Fred travels from Birmingham to London

The first word (usually a verb) is called a 'predicate' and the words in the brackets are called 'arguments'. The first three examples are examples of facts which can be entered into the LOGIPROG database. Facts come in three forms, depending on the number of arguments:

Prefix: these facts have three arguments and can only be written in one format — for example, `travels-from-to(Fred London Glasgow)`

Infix: these facts have two arguments and can be written in two different formats — for example, `eats(John fish)` and `John eats fish`

Postfix: these facts have only one argument, and like Infix facts can be written in two formats — `talks(Jim)` and `Jim talks`

As well as straightforward facts, rules can be entered into the LOGIPROG database. To specify the rule that John is healthy if John eats fish, the rule below can be used:
`healthy(John) if eats(John fish)` or `John healthy if John eats fish`

Upper and lower case words are different. For example, 'John' is not the same as 'john'.

Adding facts and rules to Logiprog

To add facts and rules to the database, use the ADD command:

`add(eats(John fish))` or `add(John eats fish)`
`add(talks(Jim))` or `add(Jim talks)`

As the order of facts or rules in the database can affect the outcome of a result, the ADD command has an optional parameter which specifies where the fact or rule will be placed. For example, if the database already contains the above 'eats' fact, and a new 'eats' fact needs to be entered before it, type:

`add 1 (eats(Fred bread))`

Listing the database contents

To list the entire database enter ... list or list all

To list only the eats facts and rules enter ... list eats

When the facts and rules are listed, all those with the same predicate will be lumped together. The order of the individual facts and rules for each predicate are listed in the order in which they were entered, or positioned using the optional parameter in the ADD command. If the above three rules were entered, the list would look like this:

Fred eats bread
John eats fish

Jim talks

Deleting facts and rules from LOGIPROG

Deleting facts and rules can be done in several ways. The DELETE command can delete one occurrence of a predicate. The KILL command can delete all occurrences of a predicate or all the facts in the current database. For example:

To delete the first eats fact or rule enter ... delete eats 1

To delete all eats facts and rules enter ... kill eats

To delete the whole database enter ... kill all

Loading and saving the database

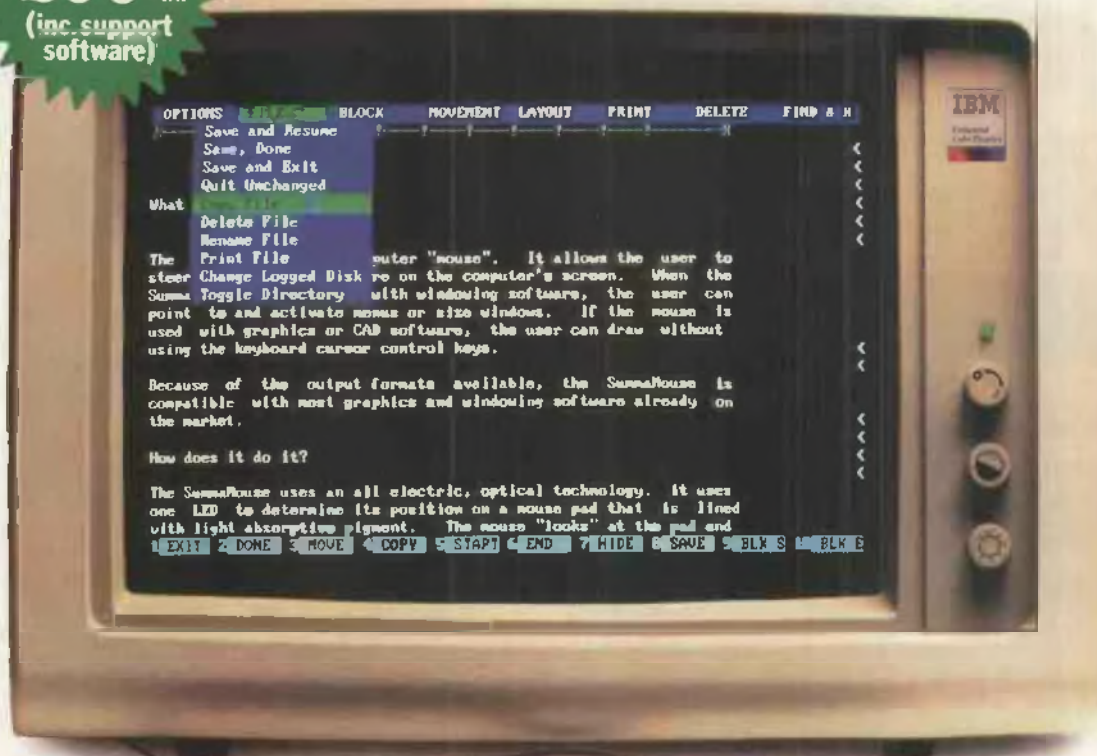
To save all the facts and rules currently in memory, use the SAVE command. The only parameter required is the filename. To load a database, use the LOAD command.



"It's the most human business computer yet. You try getting it to work lunch times and all Friday afternoon."

Choose SummaMouse and you can pick any program.

£99 +VAT
(inc. support software)



Using all electronic, optical technology, SummaMouse is simply the best choice, and easily the best buy, in mouse systems today.

Quick, accurate and reliable – it runs rings round mechanical mice – SummaMouse does more than provide beginners with almost instant computer proficiency:

SummaMouse Support Software enables you to operate *any* program you wish.

Press and hold down the centre button. A menu appears at the top of the screen. Move the cursor to the item you wish to select and

you get a pull-down or pop-up menu containing options. Now move the cursor to the required option, release the button – and that's it.

SummaMouse software comes complete with example menus for Wordstar and Lotus 123. Straightforward set-up routines are provided with an excellent manual and any word-processor or text editor can be used to prepare menus for all other application programs.

Price of the whole SummaMouse package? It can only frighten other mice: Just £99 + vat.



For more information, please contact:

Summagraphics Limited,
3/4 Winchcombe Road,
Newbury, Berkshire RG14 5QY.
Tel (0635) 32257 Telex 848750 SUMMUK G.

Accent Computers Limited,
Imperial Buildings, Muster Green,
Haywards Heath, West Sussex RH16 4AP.
Tel. (0444) 412314.

First Software,
Intec 1, Wade Road, Basingstoke, Hants RG24 0NE.
Tel. (0256) 463144. Telex 848927

P & P Micro Distributors Ltd.,
Todd Hall Road, Carrs Industrial Estate,
Haslingden, Rossendale, Lancs BB4 5HU.
Tel. (0706) 217744.

Rapid Winners,
Rapid House, Denmark Street, High Wycombe,
Bucks HP13 2ER Tel. (0494) 450270. Telex 837931.

Softset Computer Products Ltd.,
Softset House, Syon Gate Way, Great West Road,
Brentford, Middx TW8 9DD.
Tel. 01-568 8866. Telex 896396



Summagraphics®

SummaMouse is a registered trade mark of Summagraphics Corporation.

MICROMART

Tandon

BIG NAME - LOWEST PRICE

IBM COMPATIBLES
PCX 10 the TANDON XT. 10 MEGABYTE.
£1,079.00

PC	the TANDON PC. Twin 360K	£965
PCX 20	the TANDON XT. 20 Megabyte	£1247
PCA	the TANDON AT. One 1.2 Meg.	£1497
PCA20	the TANDON AT. 20 Megabyte	£1664
PCA 30	the TANDON AT. 30 Megabyte	£2081
PCA 40	the TANDON AT. 40 Megabyte	£2498

All complete with TANDON high resolution 14" monitors and GW basic, MS-DOS, manuals and six months on site maintenance.
Colour graphics monitors plus £259.00
PC range come with 256k ram & 360k floppy
PCA range come with 512k ram & 1.2mb floppy
PHONE FOR LATEST PRICES
All prices + vat. Carriage + £10.00
Printers — software available.

ACCESS COMPUTERS
2 ROSE YARD, MAIDSTONE, KENT ME14 1HN
Phone: (0622) 58356

COMMODORE PET OWNERS

If you've got a 2001, 3000, 4000 or 8000 series computer we have boards to upgrade your computer's memory, Basic, or screen display. And, of course, our free catalogue lists hundreds of PET programs, from word processors to games.

PET PRINTERS — HALF PRICE

We have a limited quantity of brand new Commodore 1361 printers for sale at under half price. Possibly the best dot-matrix printers that Commodore ever made, they offer 150cps, full PET graphics, friction or tractor feed, 132 columns, etc etc. All you need to connect one to your PET is an IEEE cable — no expensive interfaces required! The recommended retail is £525 plus VAT, but a special purchase allows us to offer them at only £249 plus VAT while stocks last.

Contact SUPERSOFT for all your Commodore PET software and hardware requirements (we have a large stock of reconditioned computers, printers, and disk drives). If we can't supply it, it probably doesn't exist!

SUPERSOFT

Winchester House, Canning Road, Wealdstone, Harrow
Telephone: 01-861 1166

CASSETTES — DISKS

BEST PRICES — TOP QUALITY

CASSETTES — Complete with labels, Inlay Cards and Cases. Priced per box of 10

	10-50	50-100	100+
C5	£3.30	£3.00	£2.80
C10	£3.40	£3.20	£2.90
C15	£3.70	£3.30	£3.00
C30	£4.70	£4.00	£3.70
C60	£5.30	£4.80	£4.50
C90	£7.00	£6.50	£6.30

Top brand Disks — BASF, Control Data. Priced per box of 10

	10-50	50-100	100+
5 1/4 SF-DD	£12.00	£11.80	£11.80
5 1/4 OS-DD	£15.00	£14.50	£14.00
5 1/4 OS-QD	£18.00	£17.50	£17.00
Price each	10-50	50-100	100+
3 1/2 SF-DD	£2.50	£2.45	£2.35
3 1/2 OS-QD	£3.30	£3.25	£3.20

Indicate quantity required in boxes. No more to pay.
Prices include VAT and postage UK only.
Cheque/PO enclosed for £

NAME
ADDRESS

**PROFESSIONAL
MAGNETICS LTD**

Cassette House
319 Hunstet Road
Leeds LS10 3TY
Freepost Tel: (0532) 709066

PROGRAM FILE

The load also requires the filename and will first check that the files are on disk. To keep the program as short as possible there's no filename validation, so be careful to use only legal filenames.

Other commands

To end the program, type **BYE**. If you have entered facts or rules but have not saved them, you will be asked if you want to finish or not. To see the current status of the database, type **STATUS** or **STAT**.

Variables in LOGIPROG

It's useful in rules to put variables instead of words or numbers:
x healthy if x eats fish — this rule applies to anyone eating fish

Variables are **x,x1,x2 ... x9,y,y1 ... y9,z,z1 ... z9, X,X1 ... X9,Y,Y1 ... Y9,Z,Z1 ... Z9**. Again, notice that **x** and **X** are different variables. Variables can be undefined or contain a numeric value or a text string.

Special predefined predicates

There are several predefined predicates that can be placed as conditions in the rules. These predicates *must* be in upper case.

SUM(x y z) — this predicate can be used to check that the first two arguments add up to the third, or if one of the arguments is undefined, it will be calculated and always be true. For example:

SUM(1 2 3) returns true

SUM(10 -1 11) returns false

if **x** is undefined **SUM(1 2 x)** makes **x=3**

if **y=20** and **x** is undefined **SUM(x 1 y)** makes **x=19**

TIMES(x y z) — like the **SUM** command, **TIMES** can be used to check that the first and second arguments multiplied together make the third, or if one of the arguments is undefined,

it will be calculated. For example:

TIMES(10 0.5 5) returns true

TIMES(12 2 6) returns false

if **x1** is undefined **TIMES(2 x1 12)** makes **x1=6**

if **y2=10** and **z** is undefined **TIMES(2 y2 z)** makes **z=20**

P() & **PP()** — these two functions are like **PRINT** in Basic. Everything between the brackets will be printed. Any variables will be substituted with their values. The only difference between **P** and **PP** is that **PP** does a **CR LF** after it, **P** does not. Both return true. For example:

if **x=Fred** **P(hello x)** would display **hello Fred**

R(x) — like the **INPUT** routine in Basic, this will get a value from the keyboard and assign it to the specified variable. Like **PP** & **P**, this always returns true.

x LESS y — this returns true if the value of **x** is less than **y**, otherwise it returns false. Both arguments must have a value, or an error will occur. For example:

10 LESS 20 returns true

if **x** is **12** **x LESS 10** returns false

x EQ y — this function has two modes. If both **x** and **y** have values, the function will return true if **x=y**, and false if **x ≠ y**. If one of the arguments is an undefined variable, that variable will be assigned the value of the other argument and true will be returned. For example:

Fred EQ fred returns false (upper and lower case)

if **x** is undefined **x EQ 100** makes **x = 100**

x INT — this returns true if **x** is an integer, false if not. For example:

20.2 INT returns false

if **y1=12** **y1 INT** returns true

x INT y — like the **INT()** function in Basic, this assigns the second argument with the integer value of the first. This always returns true. For ex-



PROGRAM FILE

ample:

if z2 is 5.4 z2 INT z3 makes z3=5
20.1 INT z makes z=20

Local variables and recursive rules

The values contained in the variables are local to each rule. When a new rule has to be processed, all the currently-defined variables are put on the variable stack and all variables are cleared out. This allows rules to have themselves as one of their conditions and LOGIPROG to work recursively. The only problem is that recursive rules need a lot of memory, and too many recursive calls will cause an OUT OF MEMORY error or the program to crash, so be careful.

Asking LOGIPROG questions

There are two ways of getting information from LOGIPROG.

(1) IS questions: this command will search the current database and check that the conditions specified can be confirmed or not. If all conditions can be met it will return YES, if not it will return NO. If a fact cannot be confirmed, LOGIPROG assumes that fact is false. For example, using the three facts defined so far:
IS(Fred eats bread) returns YES
IS(John talks) returns NO
IS(Fred eats bread & Jim talks) returns YES

Notice in the last example the '&'. This means that both the first condition and the second condition must be true for the whole to be true.

(2) WHICH questions: this is more useful than the IS question as LOGIPROG will return answers that fit the conditions specified. For example, again using the three defined facts:
which(x: x eats bread) — this is saying 'find all replacements for x where x eats bread'

LOGIPROG returns:

Fred

No (more) answers

which(z1 z2 : z1 eats z2) — this is saying 'find all replacements for z1 and z2 where z1 eats z2'

LOGIPROG returns:

Fred bread

John fish

No (more) answers

To make the answer more readable, a sentence can be specified:
which(y is eaten by x : x eats y) returns

bread is eaten by Fred

fish is eaten by John

No (more) answers

It doesn't matter which variables you use, as all variables are local to each rule; only the values of the variables are passed from one rule to the next.

More than one condition can be specified in both the IS and WHICH questions.

LOGIPROG example database

Add all the following facts and rules into LOGIPROG using the ADD command. If you make a mistake, use the DELETE command to erase the fact and retype it.

Fred normal-rate 1.50

Jim normal-rate 1.25

Helen normal-rate 1.28

Sam normal-rate 1.30

Fred overtime-rate 2.50

Jim overtime-rate 1.80

Helen overtime-rate 2.20

Sam overtime-rate 1.70

Fred age 25

Jim age 70

Helen age 21

Same age 45

z1 retired if z1 age z2 & 64 LESS z2

x normal-hours y if PP(Enter hours worked by x) & R(y)

x overtime-hours y if PP(Enter overtime worked by x) & R(y)

X greater-than Y if not X LESS Y & not X EQ Y

x wages-is y if x normal-hours z1 & x normal-rate z2 & TIMES(z1 z2 z3) &

x overtime-hours z4 & x overtime-rate z5 &

TIMES(z4 z5 z6) & SUM(z6 z3 y)

As you can see, the last rule is far too long to fit on one line. To overcome this, you can press Return after entering every condition. LOGIPROG counts the number of opening and closing brackets and only finishes the input when the number of opening brackets equals the number of closing brackets.

Also notice the NOTs in the greater-than rule. The NOT reverses the result of the condition.

Now you can interrogate the database.

(1) Who is retired?

which (z : z retired)

(2) Whose normal rate is greater than 1.30?

which(x1 : x1 normal-rate y & y greater-than 1.30)

(3) What is Fred wage?

which(X : Fred wages-is X)

```

program LOGIPROG;  ( Simplified version of MICRO PROLOG in TURBO PASCAL. )

type
  Modes      = (Prefix,Infix,Postfix);  ( Define 3 types of fact )
  SearchMode = (None,Which,Is);        ( Define Search modes )
  StrSize    = string(80);              ( Define normal & long strings )
  LongStr    = string(255);
  PtrTypes   = (Undefined,VarPtr,NumPtr,TextPtr);  ( Define Argument Types )
  ArgDef     = record
    AType : PtrTypes;  ( The Argument Type )
    AVal  : Real;      ( Numeric Value )
    APtr  : Integer;   ( Pointer to Text )
  end;
  
```

MICROMART

LASER FAZER

Phase in up to 9 PCs to share a laser printer with SIMULTANEOUS ACCESS for all users.



AUTOMATICALLY SHARE 1 PRINTER

- SELECT A SPECIFIC PRINTER OR CONTENT FOR MULTIPLE PRINTERS
- STORE DATA IN 512K OR ONE MEGABYTE BUFFERS
- INTERFACE WITH SERIAL OR PARALLEL PORTS

The Series 700 Print Masters are printer-control units with up to one megabyte common pool buffers. The Print Masters allow users to share, select and/or contend for printers easily and economically, without switching cables. Their internal buffering system allows simultaneous, high-speed input from all computers, thus freeing the computers for other tasks.

Each Print Master features a standard 512K common pool buffer, with up to one megabyte of buffer optionally available. All connected users may simultaneously input data to this common buffer. The entire buffer memory is available to one user or can be divided as required between all users, maximizing buffer allocation.

A)Line Dataspeed Devices Ltd.

3 Auburn Road, Blaby, Leicester LE8 3DR
☎ 0533-778724

Tandon

PCX20 £1495

including free:

640k memory
Mono graphics card
Mouse + interface
Gem Desktop

For further details call

REWSE
CONSULTANTS

2-10 Whitchurch Road
Pangbourne, Berks RG8 7BP
07357 4120

FAITH ACCOUNTANCY SOFTWARE

(£20 per month no minimum hire period)

Send £20 + VAT for disk(s), p&p etc and you will receive NOMINAL/SALES, PURCHASE ledgers, INVOICING, STOCK CONTROL, ESTIMATING, DATA ANALYSIS, JOB COSTING, LETTER WRITER etc and later PAYROLL. This software incorporates 6 years work. It is self-tutoring with no need to pre-define account structure. The BALANCE SHEET/P&L account etc are immediately updated as transactions are entered. Should you like the system it invoices you £20+ VAT each month. NOW AVAILABLE for Apple/IBM/Sirius/Victor. (Trade enquiries welcome.)

NEW TO COMPUTERS?

For £2.750 we supply all necessary hardware and give 1/2 day training/consultancy each week for 3 months in the use of the above software.

NEW and SECONd-HAND hardware supplied by us comes with FAITH. ANY NEW SOFTWARE SUPPLIED @ LIST - 20%. SECONd HAND SOFTWARE @ LIST - 50%.

IMMEDIATE CASH FOR MOST BUSINESS HARDWARE. Good selection second hand SIRIUS/VICTORS available.

CONSULTANCY / TRAINING / BESPOKE SOFTWARE / ACCOUNTANCY / WORD PROCESSING / MAILSHOTS / EXPORT SERVICE etc.

Please ask. No task too small - even CV's.

(Demonstrations etc by appointment)

PCS LTD

96 Oldfield Rd, Hampton, Middx TW12 2HR

01/941 1447

THE CRACKER

The spreadsheet designed for normal people who make mistakes. Instant error detection and easy correction. Yes, this is a special feature. It means that what you do is right, first time, most times. For Businessmen, Engineers, Scientists and most simpletons. Including graphics.

From £44 + £2pp + VAT, CPM-280, CPM-86, MPM-86, CCPM-86, MSDOS, PCDOS.

DISASSEMBLERS, 280, 8086

Powerful practical file based disassemblers. Produces error messages, full listings and cross-reference tables. The 16-bit version suitable for whole 8086 family and 8087. This version can handle .CMD, .COM and .EXE files also ROMS. £80+VAT, CPM-280, CPM-86, MPM-86, CCPM-86, MSDOS, PCDOS.

TRANSLATOR 8080/280 TO 8086

This is a single pass translator designed to allow you to get your 280 source code into an 8086 form easily. It has no real size limit and works fast. Data areas handled intelligently. Output for popular assemblers. An easy way to learn 8086 assembly language.

£80+VAT CPM-280, CPM-86, MPM-86, CCPM-86, MSDOS, PCDOS.

Software Technology Ltd

P.O. BOX 724 HARBORNE, BIRMINGHAM, B17 9EZ
TEL. 0621 76527

KINGSLEY ENTERPRISES

Specialists in all kinds of floppy diskettes
Mail Order Prices Exclusive of Postage and VAT

Disk prices per box of 10	1 box	2-4	5-9	10+
3.5" 5" ONLY				
SS/DD 135	20.00	18.00	17.50	17.00
DS/DD 135	29.50	27.00	26.25	25.50
3.5" NASHUA				
SS/DD 135	20.00	18.00	17.50	17.00
DS/DD 135	25.63	23.06	22.42	21.78
5.25" NASHUA				
SS/DD 48	9.38	8.44	8.20	7.97
DS/DD 48	10.63	9.56	9.30	9.03
DS/DD 96	12.38	11.14	10.83	10.52
DS/DD 96	13.13	11.81	11.48	11.16
DS/DD 96	23.75	21.38	20.78	20.19
5.25" DYSAN				
SS/DD 48	13.25	11.93	11.59	11.20
DS/DD 48	18.25	16.43	15.97	15.51
SS/DD 96	18.25	16.43	15.97	15.51
DS/DD 96	21.88	19.69	19.14	18.59

POSTAGE per DISK ORDER: FREE C1 C2 £2.50-10
8", Hard sector and Pre-formatted diskettes also available eg: DEC RX50 Format.

5.25" NASHUA SS/DD 48 16.00 14.40 14.40 13.60
BULK PACKED plain label diskettes available in multiples of 50:

	50	100	500	1000
5.25" NASHUA SS/DD 48	33.75	60.75	295.31	573.75
DS/DD 48	40.63	73.13	355.47	690.63
SS/DD 96	46.25	83.75	404.68	786.25
DS/DD 96	48.75	87.75	426.56	828.75

For best prices on 400 Software/250 Book Titles & 1000 Peripherals

Please Phone:

KINGSLEY ENTERPRISES

87 Whitefield Road, Stockton Heath, Warrington WA4 6NB
Tel: (0925) 64207 (24-Hour Dial-a-Disk)

PROGRAM FILE

```

end;
FactType = record
    Negative : boolean; ( True if NOT infix )
    SentNode : Modes; ( Mode Prefix, Infix, PostFix )
    Predicate : integer; ( Ptr to Predicate Text )
    ArgInfo : array[1..3] of ArgDef; ( Argument Info )
    RulePtr : integer ( Ptr to Next Condition )
end;

StackType = record
    VarNum : integer; ( Variable Number )
    VarDetails : ArgDef ( Variable Contents Info )
end;

CondArray = array[1..15] of FactType; ( Conditions array definition )
CharDef = record CDef : char end; ( Record for files )
OutModes = (Screen, Stack);

const
    VarChars = 'xyzXYZ'; (Variables x x1..x9 y y1..y9 z z1..z9 X X1..X9 etc )
    ArgNums : array[Prefix .. Postfix] of integer = (3,2,1);

var
    NextFact, NextCond, Loop, ErNum, BrackOn, PredPtr, ArgPtr,
    LastSpecial, SUMPtr, TIMESPtr, INTPtr, LESSPtr, EQPtr, PPTr,
    PPTr, RPtr, StackPtr, NumOfConds : integer;
    ProgExit, GlobEr, Change : boolean;
    CurStr, WhchStr, CurFileName : LongStr;
    ER : array[1..20] of strfield;
    NewSent : FactType;
    NewArg : ArgDef;
    NewFile : Text; ( File type definitions )
    SentFile : file of FactType;
    CharFile : file of CharDef;
    CharRec : CharDef;
    StackVar : StackType; ( Used for Variables on Stack )
    Conds : CondArray;
    Variables : array[0..60] of ArgDef;
    Facts : array[1..200] of FactType; ( User Entered Facts )
    Conditions : array[1..200] of FactType; ( & Their Conditions )
    Preds : array[1..4000] of char; ( Predicates defined )
    Args : array[1..4000] of char; ( Arguments defined )
    VarStack : array[1..400] of StackType; ( Variable Stack )

PROCEDURE ClearVariables; ( As it says - This clears all variables out )
var loop : integer;
begin for loop := 0 to 60 do Variables[loop].AType := Undefined end;

PROCEDURE PushStackis : StackType; ( Place data on the stack (MAX 400) )
begin
    VarStack[StackPtr] := s; StackPtr := succ(StackPtr);
    If StackPtr > 399 then begin GlobEr := true; ErNum := 7 end
end;

PROCEDURE Spaces(n : integer; var s : strfield); ( Pad string with spaces )
var loop : integer;
begin s[0] := chr(n); for loop := 1 to n do s[loop] := ' ' end;

PROCEDURE InitData; ( Set up all pointers and initial values )

PROCEDURE SavePred(w : Strfield); ( Save a special Predicate )
begin
    for loop := 1 to length(w) do
        begin Preda[PredPtr] := w[loop]; PredPtr := succ(PredPtr) end
    end;

begin
    writeln('LogProg - Logic Programming by Mark Needham (June 1986)');
    writeln;
    Change := false;
    CurFileName := '';
    PredPtr := 1; ( Pointer to next free space in Predicate list )
    ArgPtr := 1; ( Pointer to Argument list )
    NextFact := 1; ( Next free Fact in Facts )
    NextCond := 1; ( Next free condition )
    ClearVariables; ( Clear out all variable details )

    ER[1] := 'Syntax Error'; ( Set up Error messages (ErNum) )
    ER[2] := 'Unknown Command';
    ER[3] := 'Number or ( after "add" expected';
    ER[4] := 'Unknown Predicate';
    ER[5] := 'Fact Not Found';
    ER[6] := 'File Not Found';
    ER[7] := 'Out of Memory';
    ER[8] := 'Too Many Unknowns';

    SUMPtr := PredPtr; ( SUM(x y z) used for Addition & Subtraction )
    TIMESPtr := PredPtr; ( TIMES(x y z) used for multiplication & division )
    SavePred('TIMES');
    INTPtr := PredPtr; ( INT(x) used to check an integer )
    SavePred('INT');
    LESSPtr := PredPtr; ( < x INT y makes y the integer value of x )
    EQPtr := PredPtr; ( < x EQ y checks x=y or sets var to other var )
    SavePred('EQ');
    PPTr := PredPtr; ( P(text x) displays text and values )
    PPTr := PredPtr; ( PP(text x) displays text and values + CR LF )
    RPtr := PredPtr; ( R(x) read value for x from keyboard )
    SavePred('R');
    LastSpecial := PredPtr; ( Start of user defined Predicates )
end;

FUNCTION GetYesOrNo(n : Strfield) : boolean; ( Wait for a 'Y' or 'N' )
var ch : char;
begin
    writeln; (Yes or (No) ? );
    repeat read(kbd, ch); ch := UpCase(ch) until (ch = 'Y') or (ch = 'N');
    writeln; GetYesOrNo := (ch = 'Y');
end;

FUNCTION CheckCh(ch : char) : boolean;
begin CheckCh := ((ch = ' ') or (ch = '(') or (ch = ')')) end;

FUNCTION CheckForVar(x : strfield) : boolean;
begin
    CheckForVar := ((length(x)=1) and (pos(x, VarChars)>0)) or
        ((length(x)=2) and (pos(x[1], VarChars)>0) and
            (pos(x[2], '123456789'>0));
end;

FUNCTION CheckForReal(x : strfield) : boolean;
var n : real; ner : integer;

```


PROGRAM FILE

```

begin val(x,n,ner): CheckForReal := (ner = 0) end;

FUNCTION ConvVarToNum(x : strfield) : Integer; ( Convert Variable > 0..59 )
var t : integer;
begin
  t := (pos(x[1],VarChars)-1)*10; if length(x)=2 then t := t + (ord(x[2])-48);
  ConvVarToNum := t
end;

FUNCTION ConvNumToVar(n : integer) : Strfield; ( Opposite of last )
var t : strfield;
begin
  t := VarChars; t := t[(n div 10)+1];
  if (n mod 10) < 0 then t := t + chr(48 + (n mod 10));
  ConvNumToVar := t
end;

FUNCTION ConvToReal(x : strfield) : real; var n : real; ner : integer;
begin val(x,n,ner); ConvToReal := n end;

FUNCTION StripSpace(St : LongStr) : LongStr;
begin
  while (St[1] = ' ' and (length(St) > 0)) do delete(St,1,1);
  if St <> '' then
    while (St[ord(St[0])] = ' ') do St[0] := chr(pred(ord(St[0])));
  StripSpace := St
end;

FUNCTION ReadFromTerm : LongStr;
var InpStr,TempStr : LongStr; ch : integer;

FUNCTION CheckBrackets : boolean; ( Make sure brackets balance )
begin
  BrackOn := 0;
  for ch := 1 to length(InpStr) do
    case InpStr[ch] of
      '(' : BrackOn := succ(BrackOn);
      ')' : BrackOn := pred(BrackOn);
    end;
  CheckBrackets := (BrackOn = 0)
end;

PROCEDURE StripMulti(a : strfield); ( Get rid of spaces near brackets )
begin
  ch := pos(a,InpStr);
  while ch > 0 do begin delete(InpStr,ch,1); ch := pos(a,InpStr) end
end;

begin ( ReadFromTerm function )
  InpStr := ''; BrackOn := 0;
  repeat
    repeat
      if BrackOn <> 0 then write(BrackOn) else write(' ');
      write(' '); readln(TempStr);
      TempStr := TempStr + ' '; InpStr := InpStr + TempStr
    until CheckBrackets;
    InpStr := StripSpace(InpStr);
    until InpStr <> ''; StripMulti(' '); StripMulti(' ');
    ch := pos(' ',InpStr);
    while ch > 0 do begin delete(InpStr,succ(ch),1); ch := pos(' ',InpStr) end;
  ReadFromTerm := StripSpace(InpStr)
end;

FUNCTION ToUpper(St : LongStr) : LongStr; ( Convert string to Upper case )
var i : integer;
begin for i := 1 to length(St) do St[i] := UpCase(St[i]); ToUpper := St end;

FUNCTION OverSpacesIt : LongStr; ( Delete leading spaces )
begin
  while it[1] = ' ' and (length(it) > 0) do delete(it,1,1); OverSpaces:=it
end;

PROCEDURE skip(n : integer); begin if n > 0 then delete(ComStr,1,n) end;

FUNCTION GetUpToChar(check : char) : strfield; ( Extract string from front )
var t : strfield; x : integer;
begin
  t := ''; x := 1;
  while (ComStr[x] <> check) and (x < length(ComStr)) do
    begin t := t + ComStr[x]; x := succ(x) end;
  if x = length(ComStr) then ComStr := '' else skip(pred(x));
  GetUpToChar := t
end;

FUNCTION GetPredNum(w : LongStr) : integer; ( Return Predicate number )
var loop,ch : integer; Found,ok : boolean; ( Value 0 if not already known )
begin
  loop := 1; Found := false;
  while not(Found) and (loop < PredPtr) do
    begin
      ok := true;
      for ch:=1 to length(w) do if Preds[loop+pred(ch)] <> w[ch] then ok:=false;
      if ok then Found := true
      else
        repeat loop := succ(loop) until Preds[loop]=' '; loop := succ(loop)
      end
    end;
  if Found then GetPredNum := loop else GetPredNum := 0
end;

FUNCTION GetArgNum(w : LongStr) : integer; ( Return Arg Number for string )
var loop,ch : integer; Found,ok : boolean; ( Return 0 if unknown )
begin
  loop := 1; Found := false;
  while not(Found) and (loop < ArgPtr) do
    begin
      ok := true;
      for ch:=1 to length(w) do if Args[loop+pred(ch)] <> w[ch] then ok := false;
      if ok then Found := true
      else
        repeat loop := succ(loop) until Args[loop]=' '; loop := succ(loop)
      end
    end;
  if Found then GetArgNum := loop else GetArgNum := 0
end;

FUNCTION SaveArg(w : LongStr) : integer; ( Save new Argument and return )
var Found,ok : boolean; ( its location )
  Ptr,ch : integer;

```

MICROMART

SECOND HAND SYSTEMS BUYING/SELLING

APRICOT, APPLE, IBM, SIRIUS, OLIVETTI,
TELEVIDEO ...

We buy and sell all types of computer
equipment from Micros to Mainframes

XEN

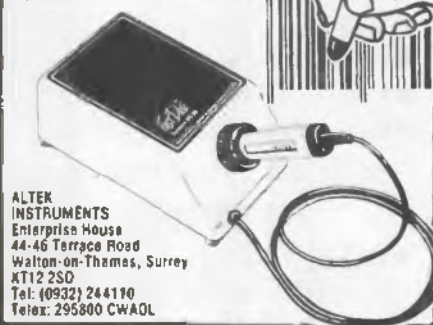
**SPECIAL INTRODUCTORY OFFERS
AND PART EXCHANGE AVAILABLE
FULL APRICOT DEALER
INSTALLATION AND
SUPPORT**

Call:
**Cromwell Business
Computers**

BARNWELL HOUSE, BARNWELL DRIVE
CAMBRIDGE CB5 8UJ
Tel: (0223) 241446 Telex: 817847

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.



ALTER
INSTRUMENTS
Enterprise House
44-46 Terrace Road
Walton-on-Thames, Surrey
KT12 2SD
Tel: (0932) 244190
Telex: 295800 CWAOL

S P I D E R 2 REAL-TIME CONTROL FOR THE BBC MICRO



SPIDER 2 is a RAM/ROM combination
which uses none of the BBC's
memory, so BASIC programs are
unaffected. THE BBC B+ is fully
supported and we supply a complete
range of digital analogue and serial
interfaces for use with SPIDER using
the 1MHz bus. Ask now for details.

WATCH THE SPIDER!

- Powerful new BASIC commands for invoking
PRGs from the User Port, Serial Port or the
Keyboard.
- 8 independent countdown timers.
- Easy to install with no soldering.
- Comprehensive manual supplied.

New SPIDER 2 features

- Special keywords for controlling the Serial Port
- Professional implementation of Foreground/
Background processing.
- Reaction timing and pulse trains accurate to 0.1
milliseconds.

from £65 including VAT

PAUL FRAY LTD.

Willowcroft, Histon Road, Cambridge CB4 3JD
Telephone: (0223) 66629

Now available
for the BBC
Master

MICROMART

ALL TYPES OF BUSINESS COMPUTERS AND PERIPHERALS

from micros to mainframes

Bought, sold and
exchanged.

For fast efficient service
call Phill Rose on
Nottingham (0602) 787833.
and (0860) 370093

**DELOSTAR
ELECTRONICS LTD**
PO Box 36, West PDO
Nottingham NG7 4DN

BASIC PROGRAMMERS YOU CAN NOW TAP THE POWER OF PCDOS

Call routines for:-

- Fast memory mapped printing
- Wild card search for files
- Get disk space
- Printer status
- Keyboard scan codes & status

PLUS MANY, MANY MORE

ONLY £75

Write: G. Baker & Associates, 30
Yale Court, London NW6 1JG.

WANTED FOR CASH!! ALL TYPES OF COMPUTER EQUIPMENT

ATARI, AMSTRAD, BBC, COM 64,
APRICOT, IBM PC, etc, etc

**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
BN11 5NB
Tel: (0903) 40509 24 hours

PROGRAM FILE

```

begin
  w := w + 1; Found := false;
  if ArgPtr < 1 then begin loop := GetArgNum(w); Found := (loop < 0) end;
  if Found then SaveArg := loop
  else
    begin
      SaveArg := ArgPtr;
      for loop := 1 to length(w) do
        begin Args(ArgPtr) := w[loop]; ArgPtr := succ(ArgPtr) end
      end
    end;

PROCEDURE GetParam(t : LongStr); ( Convert t to 1..3 Arguments and the )
var p,a1,a2,a3,w1,w2,w3 : LongStr; ( predicate and Mode )
    loop : integer; ch : char; SpecialPred : boolean;

FUNCTION SavePred(w : LongStr) : integer; ( Save the predicate and )
var Found,ok : boolean; ( return its location )
    Ptr,ch : integer;
begin
  w := w + 1; Found := false;
  if PredPtr < 1 then
    begin loop := GetPredNum(w); Found := (loop < 0) end;
  if Found then SavePred := loop
  else
    begin
      SavePred := PredPtr;
      for loop := 1 to length(w) do
        begin Preds(PredPtr) := w[loop]; PredPtr := succ(PredPtr) end
      end
    end;

PROCEDURE SaveArgument(x : LongStr);
begin
  if CheckForVar(x) then
    begin NewArg.AType := VarPtr; NewArg.APtr := ConvVarToNum(x) end
  else
    if CheckForReal(x) then
      begin NewArg.AType := NumPtr; NewArg.AVal := ConvToReal(x) end
    else
      begin NewArg.AType := TextPtr; NewArg.APtr := SaveArg(x) end
    end;

FUNCTION GetWord : LongStr; ( Get next word from t )
var c : integer; ch : char;
begin
  c := 0;
  repeat c := succ(c); ch := t[c]; until (c=length(t)) or CheckCh(ch);
  if (c=length(t)) and not(CheckCh(ch)) then begin GetWord:=t; t := '' end
  else
    begin
      GetWord := copy(t,1,pred(c)); delete(t,1,c); t := OverSpaces(t)
    end
  end;

begin
  w1 := ''; w2 := ''; w3 := ''; a1 := ''; a2 := ''; a3 := '';
  SpecialPred := false;
  with NewSent do
    begin
      Negative := false; ( Clear negative flag (NOT) )
      for loop := 1 to 3 do
        begin ArgInfo[loop].AType := Undefined; ArgInfo[loop].APtr := 0 end;
      RulePtr := 0
    end;
    if pos('!',t) < 0 then ( Check for syntax mode )
      begin
        p := StripSpace(GetWord); ( Get predicate )
        if Tripper(p) = 'NOT' then
          begin NewSent.Negative := true; p := GetWord end;
        t := OverSpaces(t);

        if (p = 'P') or (p = 'PP') or (p = 'R') then
          begin
            a1 := copy(t,1,pred(pos('!',t))); if a1='' then a1:= ' ';
            NewSent.SentMode := PostFix; SpecialPred := true
          end
        else
          ( Get Arguments and determine mode )
          begin
            a1 := GetWord; a2 := GetWord; a3 := GetWord;
            if (a1<>'') and (a2<>'') and (a3<>'') then NewSent.SentMode := PreFix
            else
              if (a1<>'') and (a2<>'') then NewSent.SentMode := InFix
              else
                if a1<>'') then NewSent.SentMode := PostFix else ErNum := 1
            end
          end
        end
      else
        begin
          w1 := GetWord; ( get words then decide what mode )
          if ToUpper(w1) = 'NOT' then
            begin NewSent.Negative := true; w1 := GetWord end;
          w2 := GetWord; w3 := GetWord;
          if (w1<>'') and (w2<>'') and (w3<>'') then
            begin p := w2; a1 := w1; a2 := w3; NewSent.SentMode := InFix end
          else
            if (w1<>'') and (w2<>'') then
              begin p := w2; a1 := w1; NewSent.SentMode := PostFix end
            else ErNum := 1
          end
        end;
      if ErNum = 0 then
        begin
          NewSent.Predicate := SavePred(p);
          if SpecialPred then
            begin NewArg.AType := TextPtr; NewArg.APtr := SaveArg(a1) end
          else SaveArgument(a1);
          NewSent.ArgInfo[1] := NewArg;
          if a2<>'') then begin SaveArgument(a2); NewSent.ArgInfo[2] := NewArg end;
          if a3<>'') then begin SaveArgument(a3); NewSent.ArgInfo[3] := NewArg end;
        end
      end;

FUNCTION GetWord : LongStr; ( get next word from CoeStr )
var c : integer; ch : char;
begin
  c := 0;
  repeat c := succ(c); ch := CoeStr[c];
  until (c = length(CoeStr)) or CheckCh(ch);
  if (c = length(CoeStr)) and not(CheckCh(ch)) then
    begin GetWord := CoeStr; CoeStr := '' end
  else
    begin
      GetWord := copy(CoeStr,1,pred(c));

```


PROGRAM FILE

```

delete(ConStr,1,c); ConStr := OverSpaces(ConStr)
end;
end;

PROCEDURE DoAdd; ( Add a new Fact to the database )
var num : strfield;
    c,n,ner,CondPtr,ExtraPtr : integer;
    temp,ConStr,ExtraStr : LongStr;

PROCEDURE AddOnEnd;
begin Facts[NextFact] := NewSent; NextFact := succ(NextFact) end;

begin
    Change := true; skip(3); ( skip over ADD )
    num := StripSpace(GetUpToChar('(')); ( Get an optional number for the )
    if ConStr = '' then ErNum := 1 ( Location of the new Fact )
    else
        begin
            ner := 0; if num = '' then n := 0 else val(num,n,ner);
            if ner <> 0 then ErNum := 3
            else
                begin
                    skip(1); ( skip over '(' )
                    CondPtr := pos('IF',Upper(ConStr)); ( Check for start of conds )
                    if CondPtr <> 0 then
                        begin
                            ConStr := copy(ConStr,CondPtr,255);
                            ConStr := copy(ConStr,1,pred(CondPtr));
                        end;
                    GetParams(OverSpaces(ConStr));
                    if CondPtr <> 0 then NewSent.RulePtr := NextCond;
                    if n = 0 then AddOnEnd
                    else
                        begin
                            ( find position for new Fact if not on end )
                            c := 0;
                            repeat
                                c := succ(c);
                                if Facts[c].Predicate = NewSent.Predicate then n := pred(n)
                                until (n = 0) or (c = NextFact);
                                if c = NextFact then AddOnEnd
                                else
                                    begin
                                        ( move all down to make room )
                                        for loop := NextFact downto c do Facts[succ(loop)] := Facts[loop];
                                        Facts[c] := NewSent; NextFact := succ(NextFact)
                                    end
                                end;
                            end;
                            if CondPtr <> 0 then
                                begin
                                    repeat
                                        ConStr := OverSpaces(ConStr); temp := GetWord; ( skip IF or & )
                                        ExtraPtr := pos('&',ConStr);
                                        if ExtraPtr <> 0 then ( add all conditions )
                                            begin ( to condition array )
                                                ConStr := copy(ConStr,ExtraPtr,255);
                                                ConStr := copy(ConStr,1,pred(ExtraPtr));
                                            end;
                                        GetParams(OverSpaces(ConStr));
                                        if ExtraPtr <> 0 then NewSent.RulePtr := succ(NextCond);
                                        Conditions[NextCond] := NewSent; NextCond := succ(NextCond)
                                    until ExtraPtr = 0
                                end
                            end;
                        end;
                    end;
                end;
            end;
        end;

FUNCTION RetPred(n : integer) : LongStr; ( Return Predicate string )
var t : LongStr;
begin
    t := ''; repeat t := t + Preds[n]; n := succ(n) until Preds[n] = ''; RetPred := t
end;

FUNCTION RetArg(n : integer) : LongStr; ( Return Argument string )
var t : LongStr;
begin
    t := ''; while Args[n] <> '$' do begin t := t + Args[n]; n := succ(n) end; RetArg := t
end;

FUNCTION Display(x : ArgDef) : LongStr; ( Display Argument's Value )
var s : strfield;
begin
    case x.ArgDef of
        Undefined : Display := 'UNDEFINED';
        VarPtr : Display := ConvNumToVar(x.ArgDef);
        NumPtr : begin str(x.Aval,10,2,s); Display := StripSpace(s) end;
        TextPtr : Display := RetArg(x.ArgDef);
    end
end;

PROCEDURE List; ( List all or specified Facts )
var test : integer; t : LongStr;

FUNCTION Displayit(x : FactType) : LongStr;
var NegStr : strfield;
begin
    with x do
        begin
            if Negative then NegStr := 'NOT' else NegStr := '';
            case SentMode of
                Prefix : Displayit := NegStr + RetPred(Predicate) + ' ' +
                    Display(ArgInfo(1)) + ' ' +
                    Display(ArgInfo(2)) + ' ' + Display(ArgInfo(3)) + ' ';
                InFix : Displayit := NegStr + Display(ArgInfo(1)) + ' ' +
                    RetPred(Predicate) + ' ' + Display(ArgInfo(2));
                PostFix : Displayit := NegStr + Display(ArgInfo(1)) + ' ' +
                    RetPred(Predicate)
            end
        end
    end;

PROCEDURE Spaces(n : integer);
var loop : integer; begin for loop := 1 to n do write(' ') end;

PROCEDURE DoList;
var rule,ln,TempPred : integer; l : LongStr; TempInfo : ArgDef;
begin
    for loop := 1 to pred(NextFact) do
        if Facts[loop].Predicate = test then
            begin
                l := Displayit(Facts[loop]); write(l); ln := length(l);
                if Facts[loop].RulePtr <> 0 then
                    begin
                        write(' if '); rule := Facts[loop].RulePtr;

```

MICROMART

LYNX USER GROUP

See our
stand at the
PCW Show

IMPORTANT ANNOUNCEMENT

All copyrights relating to the LYNX computer are now held within the Group. All dealers, distributors and users should get in touch with LUG.

Tel: 01-907-3406

New interfaces coming:-

EPROM BLOWER + MULTI-USER PORT

BIG RAM EXPANSION - up to 512K

Demonstrations of very fast video handling and weather satellite displays

- PCW SHOW STAND No. 3000/8 -

dB Report Writer™ FOR dBASE II and dBASE III

Totally flexible formatting for business forms and reports. Columnar, row, page per record, mailing label, and other arrangements. Page sizes up to 250 printer columns by 112 lines.

Position fields visually - just move them around on the screen. Separate field names from data. Erase unwanted fields. Change field names, widths, and formats. Add multi-line headers and footers. When the report on the screen looks exactly as it should, just "Print". What you see is what you get!

Powerful, plain English query, with AND, OR, full selection rules, and parenthesisation.

Multi-level sort, with subtotals, averages, counts, and more.

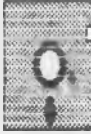
Report definitions can be saved for later use and modification, and still work even after a file STRUCTURE is MODIFIED. Reports can be run in batch mode without user intervention.

Field names, data, totals, headers, and footers can be printed in italics, underlined, bold or combinations.

Complete, on-line, context sensitive HELP. Fully-indexed User's Guide. Tutorial with sample file and reports.

JUST
£80 + VAT

For IBM® and compatible personal computers, DOS 2.0 or above. 256KB required. Supports any printer.



SOFTALK LTD.

10 CHAYTON TERRACE NORTH, STANLEY, Co. DURHAM, DH9 6AY
0207-284415

LOW!LOW!LOW!LOW! LOWEST PRICES

ATARI 520ST £560 + VAT

ATARI 1040STF £680 + VAT

BBC MASTER 128 £390 + VAT

AMSTRAD PCW 8256

£370 + VAT

EPSON TAXI PC (IBM Compat)

from £775 + VAT

APRICOT F1 (incl Monitor)

£550 + VAT

NEW

our own IBM compatible with
legal bios and MS Dos.

1 years warranty FROM £495.

RING US NOW

1st CHOICE DISCOUNT MICROS

TEL: 01-992 2512

43 CHATSWORTH Gdns, LONDON W3 9LP

DOES YOUR PROJECT NEED A SOFTWARE DEVELOPER?

Robert Cain, BSC Software Developer, has resources to take projects from specifications to testing using Pascal or ADA programming languages.

Robert Cain,
42 Deben Rd, Colchester,
Essex CO4 3UZ England
Tel 0206 868553

DISCOUNT PRINTERS BY MAIL

EPSON	STAR
LX80.....£195	NL10.....£225
FX85.....£340	SG10.....£195
FX105.....£435	SG15.....£293
LQ800.....£460	SD10.....£293
LQ1000.....£625	SD15.....£363
LQ1500.....£785	SR10.....£360
SQ2000.....£1380	SR15.....£430

BROTHER	TOSHIBA
M1409.....£300	P321.....£450
M1509.....£395	P351.....£750
HR25.....£599	
HR35.....£699	
TWIN WRITER	
.....£1045	

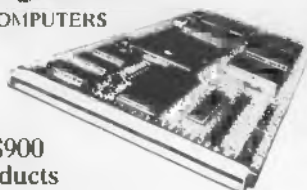
This is just a selection of the large range available. Phone for details.

0204-594790 ALL PRICES EXCLUDE VAT
0860-617152 DELIVERY £7.00 ON ANY PRINTER

BELMONT BUSINESS SERVICES
THE BOWERY, HORROCKS FOLD, BELMONT RD, BOLTON.



TDS900
FORTH COMPUTERS



Build
the TDS900
into products

- * Card computer. Up to 54K RAM, 8K ROM
- * C-MOS for low power
- * High level language. Compiled and fast. Use assembler and interrupts as needed
- * Easy connection with serial and parallel channels, A/D, D/A converters, triacs, printers, keyboards and displays

Triangle Digital Services Ltd
100a Wood Street, London E17 3HX
Telephone: 01-520 0442 Telex: 262284 (Ref M0775)

PROGRAM FILE

```

repeat
  TempPred := Conditions(Rule).Predicate;
  TempInfo := Conditions(Rule).ArgInfo[1];
  if TempPred = PPTr then write('P'), Display(TempInfo, ' ');
  else
    if TempPred = PPTr then write('PP'), Display(TempInfo, ' ');
    else
      if TempPred = RPTr then write('R'), Display(TempInfo, ' ');
      else write(Display(Conditions(Rule)));
      Rule := Conditions(Rule).RulePtr;
      if rule (>) 0 then begin write(' '); spaces(10+4) end
      until Rule = 0;
      writeln
    end else writeln
  end;
end;

begin ( List Procedure )
  if NextFact = 1 then begin writeln('No Facts'); writeln end
  else
    begin
      skip(5);
      if (ConStr<>'') and (Topper(ConStr)<>'ALL') then
        begin
          test := GetPredNum(ConStr+' ');
          if test<>0 then DoList else ErNum := 4;
          writeln
        end
      else
        begin
          test := LastSpecial;
          repeat
            DoList; writeln; repeat test := succ(test) until Preds[test] = 0;
            test := succ(test)
          until test = PredPtr
        end
      end
    end
  end;

PROCEDURE DoPrint(t : LongStr; SorS : OutModes);
var w : LongStr; lastptr, wptr, loop, er : Integer; ExtraSpace : boolean;
begin
  t := t + ' '; ExtraSpace := false; wptr := 0; lastPtr := 1;
  while wptr < length(t) do
    begin
      repeat wptr := succ(wptr) until t[wptr] = ' ';
      w := copy(t, lastptr, wptr-lastptr);
      wptr := succ(wptr); lastPtr := wptr;
      if ExtraSpace and (SorS = Screen) then write(' ');
      if CheckForVar(w) then
        case SorS of
          Screen : write(Display(Variables(ConVarToNum(w))));
          Stack : begin
            StackVar.VarNum := ConVarToNum(w);
            StackVar.VarDetails := Variables[ConVarToNum(w)];
            PushStack(StackVar)
          end
        end
      end { Case }
    end
  begin
    if w[1] = chr(255) then ( Got to pass back a text argument )
    begin
      StackVar.VarNum := ord(w[2]);
      StackVar.VarDetails.AType := TextPtr;
      StackVar.VarDetails.AVal := 0;
      val(copy(w,3,255), StackVar.VarDetails.APtr, er);
      PushStack(StackVar)
    end
    else
      if w[1] = chr(254) then ( Got to pass back a numeric argument )
      begin
        StackVar.VarNum := ord(w[2]);
        StackVar.VarDetails.AType := NumPtr;
        val(copy(w,3,255), StackVar.VarDetails.AVal, er);
        StackVar.VarDetails.APtr := 0; PushStack(StackVar)
      end
    end
    if SorS = Screen then
      for loop := 1 to length(w) do if w[loop] <> ' ' then write(w[loop])
    end;
    ExtraSpace := true
  end
end;

( Main Evaluate Routine ( Imbellevably recursive ) )

FUNCTION Eval(EvalType : SearchMode; TestCond : CondArray;
  StartCond, num : Integer) : boolean;

var Sloop, CondPtr,
  CPtr, count, PredVal : Integer; FFound, Fail : boolean; Value : Real;
  PassVars : array[1..33] of ArgDef; TempArray : CondArray;

PROCEDURE PushVars; var loop : Integer; ( Put vars with value on stack )
begin
  StackVar.VarNum := -1; PushStack(StackVar);
  for loop := 0 to 60 do
    if Variables[loop].AType <> Indefed then
      begin
        StackVar.VarNum := loop; StackVar.VarDetails := Variables[loop];
        PushStack(StackVar);
      end
    end
  end;

PROCEDURE PullVars; ( Get all variables off stack up to a -1 )
begin
  ClearVariables; StackPtr := pred(StackPtr);
  while VarStack[StackPtr].VarNum <> -1 do
    begin
      with VarStack[StackPtr] do Variables[VarNum] := VarDetails;
      StackPtr := pred(StackPtr)
    end
  end
  ( The FindFact function call the Eval function )

FUNCTION FindFact(Sptr : Integer; s : FactType) : boolean;
var c : FactType; FindOk : boolean;

FUNCTION CheckArgin : Integer) : boolean;
begin
  case c.ArgInfo[1].AType of
    VarPtr : CheckArg := true;

```


PROGRAM FILE

```

NumPtr : CheckArg := (c.ArgInfoIn).Aval = s.ArgInfoIn.Aval;
TextPtr : CheckArg := (c.ArgInfoIn).APtr = s.ArgInfoIn.APtr;
end;
end;

PROCEDURE PassValuesBack;
begin
  for loop := 1 to 3 do with s.ArgInfo[loop] do
    if AType = VarPtr then Variables[APtr] := PassVars[loop];
  end;
end;

PROCEDURE EvalNewRule; ( evaluate a new condition list (complicated) )
var loop : integer;
begin
  PushVars; ClearVariables; ( push all known variables )
  condPtr := 0; CPtr := c.RulePtr;
  repeat
    condPtr := succ(condPtr);
    TempArray[condPtr] := Conditions[CPtr];
    CPtr := Conditions[CPtr].RulePtr;
  until CPtr = 0;
  for loop := 1 to 3 do with c.ArgInfo[loop] do
    if (AType = VarPtr) and (s.ArgInfo[loop].AType <> VarPtr)
    then Variables[APtr] := s.ArgInfo[loop];
  end;
  FindOk := Eval(None, TempArray, 1, condPtr);
  for loop := 1 to 3 do with c.ArgInfo[loop] do
    if AType = VarPtr then PassVars[loop] := Variables[APtr];
    else PassVars[loop] := c.ArgInfo[loop];
  end;
  PullVars; PassValuesBack;
end;

begin ( FindFact function )
  FindOk := false; c := Facts[SPtr];
  if (c.Predicate) and (c.SentMode = s.SentMode) then
  begin
    for loop := 1 to 3 do PassVars[loop] := c.ArgInfo[loop];

    case s.SentMode of
      Prefix : FindOk := ((c.ArgInfo[1].AType = s.ArgInfo[1].AType) and
        CheckArg(1)) or (c.ArgInfo[1].AType = VarPtr) or
        (s.ArgInfo[1].AType = VarPtr) and
        ((c.ArgInfo[2].AType = s.ArgInfo[2].AType) and
        CheckArg(2)) or (c.ArgInfo[2].AType = VarPtr) or
        (s.ArgInfo[2].AType = VarPtr) and
        ((c.ArgInfo[3].AType = s.ArgInfo[3].AType) and
        CheckArg(3)) or (c.ArgInfo[3].AType = VarPtr) or
        (s.ArgInfo[3].AType = VarPtr);
      Infix : FindOk := ((c.ArgInfo[1].AType = s.ArgInfo[1].AType) and
        CheckArg(1)) or (c.ArgInfo[1].AType = VarPtr) or
        (s.ArgInfo[1].AType = VarPtr) and
        ((c.ArgInfo[2].AType = s.ArgInfo[2].AType) and
        CheckArg(2)) or (c.ArgInfo[2].AType = VarPtr) or
        (s.ArgInfo[2].AType = VarPtr);
      Postfix : FindOk := ((c.ArgInfo[1].AType = s.ArgInfo[1].AType) and
        CheckArg(1)) or (c.ArgInfo[1].AType = VarPtr) or
        (s.ArgInfo[1].AType = VarPtr);
    end;
    if FindOk then
      begin if c.RulePtr <> 0 then EvalNewRule else PassValuesBack end;
    end;
    FindFact := FindOk;
  end;
end;

FUNCTION AnyUnknown(CondInfo : FactType) : integer;
var t, loop : integer;
begin
  t := 0; ( More than one unknown causes an error )
  with CondInfo do
    for loop := 1 to ArgNums[SentMode] do
      if ArgInfo[loop].AType = VarPtr then
        begin
          if t=0 then t:=loop else begin GlobErr:=true; ErNum:=8 end;
        end;
      AnyUnknown := t;
    end;
end;

PROCEDURE SetVar(x : integer; v : real);
begin Variables[x].AType := NumPtr; Variables[x].Aval := v end;

FUNCTION DoSUM(CondInfo : FactType) : boolean; ( SUM function )
begin
  if AnyUnknown(CondInfo) = 0 then
    with CondInfo do
      DoSum := (abs(ArgInfo[1].Aval+ArgInfo[2].Aval-ArgInfo[3].Aval) < 0.005);
    end;
  else
    begin
      with CondInfo do
        case AnyUnknown(CondInfo) of
          1 : SetVar(ArgInfo[1].APtr, ArgInfo[3].Aval-ArgInfo[2].Aval);
          2 : SetVar(ArgInfo[2].APtr, ArgInfo[3].Aval-ArgInfo[1].Aval);
          3 : SetVar(ArgInfo[3].APtr, ArgInfo[1].Aval+ArgInfo[2].Aval);
        end;
      DoSum := true;
    end;
  end;
end;

FUNCTION DoTIMES(CondInfo : FactType) : boolean; ( TIMES function )
begin
  if AnyUnknown(CondInfo) = 0 then
    with CondInfo do
      DoTIMES := (abs(ArgInfo[1].Aval*ArgInfo[2].Aval-ArgInfo[3].Aval) < 0.005);
    end;
  else
    begin
      with CondInfo do
        case AnyUnknown(CondInfo) of
          1 : SetVar(ArgInfo[1].APtr, ArgInfo[3].Aval/ArgInfo[2].Aval);
          2 : SetVar(ArgInfo[2].APtr, ArgInfo[3].Aval/ArgInfo[1].Aval);
          3 : SetVar(ArgInfo[3].APtr, ArgInfo[1].Aval*ArgInfo[2].Aval);
        end;
      DoTIMES := true;
    end;
  end;
end;

FUNCTION DoINT(CondInfo : FactType) : boolean; ( INT function )
begin
  with CondInfo do
    case SentMode of
      Infix : if ArgInfo[2].AType = VarPtr then
        begin
          DoInt := true;
          Variables[ArgInfo[2].APtr].AType := NumPtr;
          Variables[ArgInfo[2].APtr].Aval := Int(ArgInfo[1].Aval);
        end;
    end;
  end;
end;

```

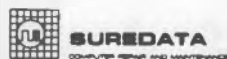
MICROMART

ABC
01 519 8460
**MICRO
MAINTENANCE
FAST!**
COMPUTER SERVICE
ENGINEERING

SPECTRUM REPAIRS

SPECTRUM 16/48	£18.95
SPECTRUM PLUS	£18.95
INTERFACE 1	£18.95
INTERFACE 2	£18.95
MICRODRIVE	£18.95
MEMORY UPGRADE	£34.00
QL PHONE FOR PRICE COMMODORE 64	

THE PRICES SHOWN ARE FULLY INCLUSIVE OF PARTS, LABOUR, RETURN POSTAGE, INSURANCE AND 3 MONTH GUARANTEE. SEND ITEM WITH CHEQUE AND DESCRIPTION OF FAULT TO:



45 WYCHWOOD AVENUE, Dpt. PCW
CANONS PARK, EDGWARE
MIDDX HA8 8TG
Telephone: 01-951 0124

TELEX?

**GENUINE TELEX ON
YOUR MICROCOMPUTER
SAVES TIME — SAVES MONEY**

'BACKGROUND' OPERATION

SINGLE- OR MULTI-USER

FROM £1400 + VAT

AVAILABLE FOR MOST MICROS

CONTACT THE SPECIALISTS:

**TELEX
2000
(0474)
328728**

**E1, SPRINGHEAD RD
ENTERPRISE PARK
GRAVESEND, KENT
DA11 8HH**



ThetaComm Computers Ltd.

**LOWEST PRICES ON
olivetti**

Phone for quote now
● 24 hour delivery available

M24 ● ANY COMBINATION

- 640 K - Green/Amber/B/W/Colour monitor
- 7 Slot Bus - MSDOS inc GW Basic
- Keyboard both types
- Olivetti std. 18 function keys cursor pad
- IBM std - IBM format

M28 ● ANY COMBINATION

- Ram - Mono/Colour monitors
- Keyboard - MSDOS 3.1 inc.

PRINTERS

- Can quote on your choice of printer manufacturer
- and can advice

SOFTWARE

- Excellent prices
- Can advise on all your computer needs.
- Maintenance available

ThetaComm - We always deliver what we promise

- Also 20mb hard disks (NEC-Seagate-Tandon) + Western digital controller card and cables for an incredible £425
- Christie TS1000 Tape Backup + s/w £770
- Dataflex Internal modem (Long slot) + s/w £280

PHONE 0342 25600/0342-315327 NOW!
WE ALWAYS DELIVER WHAT WE PROMISE

APL Systems Ltd

"THE COMPLETE SERVICE"

CONSULTANCY-SYSTEMS DESIGN-PROGRAMMING
HARDWARE/SOFTWARE SUPPLIES-TRAINING

Tandon

**LOW-PRICE TOP-QUALITY
IBM COMPATIBLES**

PCX 20 - THE TANDON XT 20 MB HARD DISK
256K RAM - 360K FLOPPY £1,590

PCA 20 - THE TANDON AT 20 MB HARD DISK
512K RAM - 1.2MB FLOPPY £2,530

TANDON BUSINESS CARD - £695

PHONE FOR COMPLETE TANDON PRICE LIST

ALL PRICES EX. VAT - CARRIAGE EXTRA

144 LYNTON ROAD, LONDON W3 9HH
01-992 4694

```

end;
PostFix : if AnyUnknown(CondInfo)=1 then begin GlobEr:=true; ErNum:=8 end
else DoINT := (ArgInfo[1].Aval * int(ArgInfo[1].Aval))
end;
end;
FUNCTION DoLESS(CondInfo : FactType) : boolean; ( LESS function )
begin
if AnyUnknown(CondInfo)>0 then begin GlobEr:=true; ErNum:=8 end
else with CondInfo do
begin
if (ArgInfo[1].AType = VarPtr) or (ArgInfo[2].AType = VarPtr) then
begin GlobEr := true; ErNum := 8 end
else DoLESS := (ArgInfo[1].Aval < ArgInfo[2].Aval)
end
end;
end;
FUNCTION DoEQ(CondInfo : FactType) : boolean; ( EQ function )
begin
DoEQ := true;
if AnyUnknown(CondInfo) = 0 then
with CondInfo do
DoEQ := (ArgInfo[1].AType = ArgInfo[2].AType) and
((ArgInfo[1].AType = NumPtr) and
(ArgInfo[1].Aval = ArgInfo[2].Aval)) or
((ArgInfo[1].AType = TextPtr) and
(ArgInfo[1].APtr = ArgInfo[2].APtr))
else
with CondInfo do
case AnyUnknown(CondInfo) of
1 : Variables[ArgInfo[1].APtr] := ArgInfo[2];
2 : Variables[ArgInfo[2].APtr] := ArgInfo[1]
end
end;
end;
PROCEDURE DoInput(CondInfo : FactType); ( Get value from keyboard )
var UserIn : strfield; VarNumber : Integer;
begin
VarNum := ConvVarToNum(RetArg(CondInfo,ArgInfo[1].APtr));
with Variables[VarNum] do
begin
readln(UserIn);
if CheckForReal(UserIn) then
begin AType := NumPtr; val(UserIn,AVal,er) end
else
begin AType := TextPtr; APtr := SaveArg(UserIn) end
end
end;
end;
PROCEDURE DoReserved(x : FactType); ( Perform a special function )
begin
PredVal := x.Predicate;
if PredVal = SUMPtr then Fail := not(DoSUM(x));
if PredVal = TIMESPtr then Fail := not(DoTIMES(x));
if PredVal = INTPtr then Fail := not(DoINT(x));
if PredVal = LESSPtr then Fail := not(DoLESS(x));
if PredVal = EQPtr then Fail := not(DoEQ(x));
if PredVal = PPtr then DoPrint(RetArg(x,ArgInfo[1].APtr),Screen);
if PredVal = PPPtr then
begin DoPrint(RetArg(x,ArgInfo[1].APtr),Screen); writeln end;
if PredVal = APtr then DoInput(x);
if x.Negative then Fail := not(Fail)
end;
end;
PROCEDURE EvalWhich(Depth : Integer); ( Don't ask how this works ! )
var OldStack,rptr,Mainloop,ConditionNum,A,ArgVarPtr : Integer;
EvalFound,Update : boolean; TempStr,TempWhichStr,CirV : strfield;
OldCond : FactType; TempVars : array[1..100] of StackType;
SwapVars : array[0..63] of Integer;
PROCEDURE ConvertVars; ( change variables into real values )
begin
for loop := 1 to 3 do
with TestCond[Depth].ArgInfo[loop] do
if (AType = VarPtr) and (Variables[APtr].AType <> Undefined) then
TestCond[Depth].ArgInfo[loop] := Variables[APtr]
end;
end;
FUNCTION CheckKnownArgs(x,y : FactType) : boolean; var loop : Integer;
begin
CheckKnownArgs := true;
for loop := 1 to ArgNum(x.SentMode) do with x.ArgInfo[loop] do
if y.ArgInfo[loop].AType = AType then
case AType of
TextPtr : if APtr <> y.ArgInfo[loop].APtr then CheckKnownArgs := false;
NumPtr : if AVal <> y.ArgInfo[loop].Aval then CheckKnownArgs := false
end
end;
end;
begin
if TestCond[Depth].Predicate < LastSpecial then
begin
OldCond := TestCond[Depth];
ConvertVars; Fail := false; ( Evaluate a special predicate )
DoReserved(TestCond[Depth]); ( E.g. SUM(1 2 x) )
if not(Fail) then
begin
if Depth = num then
begin
DoPrint(WhichStr,Stack); StackVar.VarNum := -1;
PushStack(StackVar)
end
else EvalWhich(succ(Depth)) ( If not last Condition do the next )
end;
TestCond[Depth] := OldCond
end
else
begin ( Evaluate Normal fact )
EvalFound := false;
for Mainloop := 1 to pred(NextFact) do ( Check all defined facts )
begin
Spaces(40,CirV);
if Depth = 1 then ClearVariables ( For first Cond clear all Vars )
else for loop := 0 to 59 do
if Variables[loop].AType = Undefined then CirV(succ(loop)) := 'x'
else CirV(succ(loop)) := ' ';
Update := false;
if (Facts[Mainloop].Predicate = TestCond[Depth].Predicate) and
(Facts[Mainloop].SentMode = TestCond[Depth].SentMode) and
CheckKnownArgs(TestCond[Depth],Facts[Mainloop]) then
begin

```


PROGRAM FILE

```

if Facts[Mainloop].RulePtr <> 0 then ( Check a rule type fact )
begin
  OldCond := TestCond[Depth]; ConvertVars;
  ConditionNum := 1; rptr := Facts[Mainloop].RulePtr;
  while rptr <> 0 do
  begin
    ConditionNum := succ(ConditionNum);
    TempArray[ConditionNum] := Conditions[rptr];
    rptr := Conditions[rptr].RulePtr;
  end;
  for loop := 0 to 63 do SwapVars[loop] := -1;
  TempWhichStr := WhichStr; WhichStr := '';
  PushVars; ClearVariables;
  for loop := 1 to ArgNums[Facts[Mainloop].SentModel] do
  with Facts[Mainloop].ArgInfo[loop] do
  begin
    ArgVarPtr := TestCond[Depth].ArgInfo[loop].Aptr;
    case AType of
      VarPtr : begin
        WhichStr := WhichStr + ConvNumtoVar(Aptr) + ' ';
        if TestCond[Depth].ArgInfo[loop].AType = VarPtr then
          SwapVars[Aptr] := ArgVarPtr
        else
          Variables[Aptr] := TestCond[Depth].ArgInfo[loop]
        end;
      TextPtr: begin
        Str(Aptr,TempStr);
        WhichStr := WhichStr+chr(255)+chr(60+loop)+
          TempStr+ ' ';
        SwapVars[60+loop] := ArgVarPtr;
      end;
      NumPtr : begin
        Str(Aval,TempStr);
        WhichStr := WhichStr+chr(254)+chr(60+loop)+
          TempStr+ ' ';
        SwapVars[60+loop] := ArgVarPtr;
      end
    end
  end;
end;

OldStack := StackPtr;
EvalFound := Eval(Which,TempArray,2,ConditionNum);
for loop := 0 to pred(StackPtr - OldStack) do
  TempVars[succ(loop)] := VarStack[OldStack+loop];
  WhichStr := TempWhichStr; StackPtr := OldStack;
  PullVars; OldStack := 1;
  while TempVars[OldStack].VarNum <> -2 do
  begin
    EvalFound := false;
    while TempVars[OldStack].VarNum <> -1 do
      with TempVars[OldStack] do
      begin
        Variables[SwapVars[VarNum]] := VarDetails;
        OldStack := succ(OldStack); EvalFound := true;
      end;
    end;
    OldStack := succ(OldStack); ( Skip -1 )
    if EvalFound then
      begin
        if Depth = num then
          begin
            DoPrint(WhichStr,Stack);
            StackVar.VarNum:=1; PushStack(StackVar)
          end
        else EvalWhich(succ(Depth))
        end
      end;
    TestCond[Depth] := OldCond
  end
  else ( Evaluate a fact without conditions )
  begin
    OldCond := TestCond[Depth]; ConvertVars; ( Remember initial fact )
    if FindFact(Mainloop,TestCond[Depth]) then
      begin
        if TestCond[Depth].Negative then EvalFound := true
        else
          begin
            if Depth = num then
              begin DoPrint(WhichStr,Stack); Update := true end
            else EvalWhich(succ(Depth))
            end
          end;
        TestCond[Depth] := OldCond; ( Restore fact with variables )
        if (Depth = num) and Update then
          begin
            StackVar.VarNum := -1; PushStack(StackVar)
          end
        end
      end
    end;
    if Depth < 1 then
      for loop := 0 to 59 do if Chr(succ(loop)) = 'x' then
        Variables[loop].AType := Undefined
      end; ( End of FOR loop )
    if TestCond[Depth].Negative then
      begin
        if not(EvalFound) then
          if Depth = num then
            begin
              DoPrint(WhichStr,Stack);
              StackVar.VarNum := -1; PushStack(StackVar)
            end
          else EvalWhich(succ(Depth))
          end
        end
      end;
    if Depth = StartCond then
      begin StackVar.VarNum := -2; PushStack(StackVar) end
    end; ( End of EvalWhich )
  begin ( Start of Eval )
    if EvalType <> Which then
      begin
        count := 1; Fail := false;
        repeat
          if (TestCond[count].Predicate <> RPtr) and
            (TestCond[count].Predicate <> PPtr) and
            (TestCond[count].Predicate <> PPPr) then
            for loop := 1 to 3 do
              with TestCond[count].ArgInfo[loop] do
                if (AType = VarPtr) and (Variables[Aptr].AType <> Undefined) then
                  TestCond[count].ArgInfo[loop] := Variables[Aptr];
              end
            end
          if TestCond[count].Predicate < LastSpecial then
            DoReserved[TestCond[count]]
          else

```

MICROMART



APPLE COMPUTER —

Best in the North West

The Power of

APPLEWORKS

The Book we have all been waiting for! Learn how to get the best from this superb program

Complete with comprehensive Data Diskette

£29.95 inc VAT plus £2 p&p

MouseWrite — more than a Mouse

Mouse Driven Word processing similar to the Macintosh. Divides screen into two windows. Supports UniDisk 3.5 and Imagewriter II Colour

Alternative Keyboard moves available. Extremely fast in use

£89.95 plus VAT

HOLDENS

COMPUTER SERVICES

191-195 Marsh Lane — Preston PR1 8NL
Tel: 0772 571321

ALL IN STOCK

SPECIALISTS BBC

S. P. ELECTRONICS

Amstrad 6128 Green	£299.00	Colour	£399.00
Amstrad 8256			£450.00
Amstrad 8512			£573
BBCB			£299.00
BBC B+DFS			£350.00
CPA 80 Printer (inc. cable)			£199.00
Disc Operating System BBC			£96.00
Full Cumana range			From £89.00
ACORN 1770 DFS			£49.95
G3 WHO RTTY PROGRAM (TAPE)			£7.50
G3 WHO RTTY PROGRAM (EPROM VERSION)			£20.00
Circuit board for RTTY decoder Mk.3 (inc. instructions)			£7.00
CANON Dot Matrix 160cps NLQ			£299.00
Joysticks (paid sell centering + analogue)			From £17.95
Printer Cable (Centronics)			£12.90
Speech Synthesis			£55.00
Disc Doctor			£33.00
WORDWISE Word Processor			£32.00
Cumana CD800S 40/80 psu			£289.00

ACORN APPROVED DEALERS

FULL REPAIR SERVICE AVAILABLE

Wide selection of software, books, leads, plugs, etc.

SAE for full list. All available Mail Order

All prices apply while stocks last — carriage extra

48 Linby Road, Hucknall, Notts.

NG15 7TS

Tel: 0602 640377

All prices include VAT

Amstrad-PCW 8256

STANDARD 5 1/4" ADD ON DISK DRIVES

100% CPM SOFTWARE AND LOGOSCRIPT COMPATIBILITY USING LOW COST FLOPPIES

EASILY INSTALLED

— INCLUDING FORMAT SOFTWARE

TYPE 1	TYPE 2
DOUBLE SIDED	DOUBLE SIDED
40 TRACK 360K	80 TRACK 720K

£177.50

£207.25

PC/MSDOS <=> CPM TRANSFER UTILITY

ALLOWS 360K DRIVE TO READ AND WRITE

IBM FILES, READ ONLY WITH 720K

£23.50

ENQUIRIES FOR SOFTWARE FOR OTHER

DISK FORMATS

DEALER ENQUIRIES WELCOME

PRICES INCLUDE P+P AND V.A.T



BOX LTD

22 HENDRED ST, OXON OX4 2ED

TEL: (0865) 717968

DISCOUNT AMSTRAD & APRICOT

COMPUTERS	ex. vat	inc. vat
BBC 128k Master Series	400.00	480.00
Amstrad CPC 6128 green scm	251.00	288.65
Amstrad CPC 6128 o/s scm	331.00	380.45
Amstrad PCW 6256	383.00	440.45
Amstrad PCW 8512	483.00	555.45
Apricot FD 2720K + monitor	185.00	202.75
Apricot HD 10meg + monitor	1000.00	1150.00
AMSTRAD PERIPHERALS		
Amstrad RS232 Interface	46.00	46.00
Amstrad RS232 Parallel Int.	52.00	59.80
Amstrad FD1 Disk Drive (6128)	95.00	87.75
Amstrad FD2 Disk Drive (8256)	120.00	136.00
Amstrad DL2 con lead for FD1	6.50	7.48
Amstrad DD1 Disk Drive + int (CPC464)	121.00	152.95
Amstrad 6128 Mod/Pwr Supply	25.00	26.75
AMSTRAD SOFTWARE Please state 6128 or 8256 when ordering		
Amstrad Payroll (8256/512 only)	38.00	43.70
Sage Payroll	52.00	59.80
Camsoft/Sage Accounts	70.00	80.50
Camsoft stock/invsales	70.00	80.50
Camsoft/Sage Accounts plus	100.00	115.00
Sage Combo (Pay + Acc)	100.00	115.00
Sage Super Combo		
(Pay + Acc + Inv + stock)	130.00	149.50
Cambase (8256/512 only)	36.00	43.70
Sage Retrive Database	50.00	57.50
Optonones DMS-80 Database	70.00	80.50
Carton Cartbox	80.00	92.00
Camsoft Delta	90.00	102.00
Amstrad Supercalc 2 spreadsheet	38.00	43.70
Cracker Spreadsheet + graphics	38.00	43.70
Superwriter	43.00	49.70
Amstrad Newword + Spell Plus	50.00	56.70
Superwriter/Supercalc2	70.00	77.00
Carton's Touch N Go	20.00	23.00
Carton's Brainstorm	38.00	43.70
Locoscript or SC2 or Newword Audio Tutor	7.50	8.63
Turbo Pascal	55.00	63.25
Turbo Tutor	28.00	32.20
3-D Clock Chess (8256/512 only)	15.00	17.25
PRINTERS		
Epson LX80	195.00	224.25
Amstrad DMP2000	135.00	155.25
Brother M1509	280.00	327.00
MODEMS		
Ex. vat	inc. vat	
Highgate + Comstar	120.00	138.00
Highgate + AMS interface + Viewdata	160.00	184.00
Highgate + int + viewdata + E-Mail	190.00	218.50

All prices INCLUDE carriage and are C.W.O. Del U.K.
(C.O.D. on request)

DISCOUNT DISKS & RIBBONS

PRINTER RIBBONS	1	3-5	6-9	10+
Hyton Fabric	4.37	3.62	3.16	2.97
ACT Writer 10/12 NEC PC6023	7.46	6.56	5.92	5.73
ACT Writer 20/C Itoh 8600	4.00	3.34	2.70	2.51
ACT Wr 30/Hytype 11/TEC F10-40	6.33	5.46	4.69	4.59
Amstrad PCW6256/Selko SP1000A	6.56	5.68	5.16	4.96
Amstrad DMP2000	6.10	5.35	4.69	4.59
Epson LX80 original	3.45	3.11	2.70	2.45
Epson LX80	3.70	3.34	2.62	2.51
Epson MX80/FX80/RX80	5.18	4.26	3.62	3.43
Epson MX100/FX100	4.60	3.68	3.16	2.97
Epson LX1500	3.60	3.22	2.93	2.76
Kaga Takan/Canon	2.53	1.84	1.38	1.20
Microline Buz23/3A/83/Sharp P3	4.49	3.57	2.93	2.62
Microline 64	3.80	3.05	2.53	2.36
Sekosha GP80/100/250	9.20	7.65	7.15	7.00
Sekosha SP1000A original	4.80	4.80	3.28	3.08
Shinwa CP80M/F90/Com 4023				
Tandy/Sin Corona DMP2000				
Facit 4510/11	5.90	6.04	5.46	5.27
Tandy 4000A/20	4.37	3.62	3.11	2.93
Singlestrike/Multistrike				
ACT Wr 30/Hytype 11/TEC F10-40 MS	3.45	2.58	2.13	2.04
Brother HR15/25 SS Corr	1.68	2.76	2.36	2.16
Brother HR15/25 MS	4.26	3.34	2.93	2.74
Datsystap 2000/Dume 7/8/11 MS	4.26	3.34	2.93	2.74
BMI 820/Juk 6100/Bi HR1 SS Corr	2.53	1.71	1.38	1.27
IBM 820/Juk 6100/Bi HR1 MS	3.45	2.76	2.30	2.19
Shinwa CP80 MS	5.06	4.14	3.62	3.27

DISKS per box of 10				
ALL Parrot disks packed in library box - Unbranded loose tape 60p/10	10.54	9.64	8.20	8.85
Unbranded DSDD 48k (10/10 box)	11.73	11.15	10.70	10.35
Unbranded DSDD 96k (10/10 box)	14.03	13.23	12.71	12.31
Memorex DSDD 48k	20.70	18.39	16.79	17.60
Memorex DSDD 96k	23.92	22.43	21.74	21.05
Parrot DSDD 48k	18.40	17.25	16.68	15.53
Parrot DSDD 96k	21.85	19.55	18.98	17.83
Sony DM-D4440 3.5" DSDD	29.95	29.50	29.00	28.00
3.5" DSDD (Sony Unbranded)	24.15	22.43	20.70	19.55
3.5" DS-DD (Sony Unbranded)	27.50	27.00	26.50	25.00
Amsoft CP2 3" Disks	36.50	36.00	35.50	35.00

RIBBONS & DISKS PRICES INCLUDE CARRIAGE & VAT

JOHN HOLMES COMPUTERS
FULBECK, GRANTHAM, Lincs
TEL: (0400) 72818
OFFICIAL GOVERNMENT & EDUCATIONAL ORDERS WELCOME

FAIR TRADE

(Equipment Brokers)

**BUY AND SUPPLY
ALL MAKES AND
MODELS OF USED
COMPUTER EQUIPMENT**

**TELEPHONE
0832 72174**

**FOUR WINDS, OUNDLE ROAD,
LOWER GLAPTHORN, OUNDLE
PETERBOROUGH PE8 5BE.**

PROGRAM FILE

```

begin
  Sloop := 1; FFound := false;
  repeat
    FFound := FindFact(Sloop, TestCond(count));
    Sloop := succ(Sloop);
  until (Sloop = NextFact) or FFound or GlobEr;
  if TestCond(count).Negative then FFound := not(FFound);
  if FFound = false then Fail := true;
end;
count := succ(count);
until (count > num) or Fail or GlobEr;
end
else EvalWhich(StartCond);
Eval := not(Fail);
end; ( End of Eval )

PROCEDURE GetConditions; var ExtraPtr, c : integer; CondStr, temp : LongStr;
begin
  CondStr := ComStr; c := 0; GlobEr := false;
  repeat
    CondStr := OverSpaces(CondStr);
    if c > 0 then temp := GetWord; ( skip IF or & )
    ExtraPtr := pos(';', CondStr); ( move all conditions into test array )
    if ExtraPtr < 0 then
      begin
        CondStr := copy(CondStr, ExtraPtr, 255);
        ComStr := copy(ComStr, 1, pred(ExtraPtr));
      end;
    GetParams(OverSpaces(CondStr));
    if ExtraPtr < 0 then NewSent.RulePtr := succ(NextCond);
    c := succ(c); Conds[c] := NewSent;
  until ExtraPtr = 0;
  NumOfConds := c;
end;

PROCEDURE DoIS; var Result : boolean; ( This IS function )
begin
  ClearVariables; skip(3); ( skip IS( ) )
  GetConditions; StackPtr := 1; ( Initialise Variable Stack Pointer )
  Result := Eval(1, Conds, 1, NumOfConds); ( Do it )
  if not(GlobEr) then
    begin if Result then writeln('YES') else writeln('NO'); writeln end
  end;

PROCEDURE DoWhich; var p : integer; Result, FoundVar : boolean;
begin
  ClearVariables; skip(6); ( skip over WHICH( ) )
  p := pos(':', ComStr);
  if p = 0 then ErNum := 1
  else
    begin
      WhichStr := copy(ComStr, 1, pred(p)); ComStr := copy(ComStr, succ(p), 255);
      GetConditions; StackPtr := 4; Result := Eval(Which, Conds, 1, NumOfConds);
      if Not(GlobEr) then
        begin
          StackPtr := 1;
          while VarStack(StackPtr).VarNum < -2 do
            begin
              FoundVar := false;
              while VarStack(StackPtr).VarNum < -1 do
                with VarStack(StackPtr) do
                  begin
                    Variables(VarNum) := VarDetails; StackPtr := succ(StackPtr);
                    FoundVar := true;
                  end;
                StackPtr := succ(StackPtr); ( Skip -1 )
              if FoundVar then begin DoPrint(WhichStr, Screen); writeln end
            end;
            writeln('No (more) answers'); writeln
          end
        end
      end;

PROCEDURE DelPred(c : integer);
begin
  if c < pred(NextFact) then
    for loop:=c to pred(NextFact) do Facts[loop]:=Facts[succ(loop)];
    NextFact := pred(NextFact);
  end;

PROCEDURE Delete;
var PredName : LongStr; c, PredNum, n, ner : integer;
begin
  Change := true; skip(7); PredName := GetUpToChar(' ');
  if ComStr = '' then ErNum := 1
  else
    begin
      ComStr := StripSpace(ComStr); val(ComStr, n, ner);
      if ner < 0 then ErNum := 1
      else
        begin
          PredNum := GetPredNum(PredName);
          if PredNum = 0 then ErNum := 4
          else
            begin
              c := 1;
              repeat
                if Facts[c].Predicate = PredNum then n := pred(n);
                if n < 0 then c := succ(c);
                until (n = 0) or (c = NextFact);
                if n < 0 then ErNum := 5 else DelPred(c);
              end
            end
          end
        end;

PROCEDURE Kill;
var PredNum, p : integer;
begin
  skip(5);
  if ComStr = '' then ErNum := 1
  else
    begin
      if ToUpper(ComStr) = 'ALL' then
        begin
          if GetYesOrNo('Kill All Facts') then
            begin
              PredPtr := LastSpecial; ArgPtr := 1; NextFact := 1; NextCond := 1;
              Change := false;
            end
          end
        end
      end
    end
  end

```


PROGRAM FILE

```

else
begin
  PredNum := GetPredNum(ComStr);
  If PredNum = 0 then ErNum := 4
  else
    if GetYesOrNo('Kill ' + ComStr) then
    begin
      Change := true;
      for p := 1 to pred(NextFact) do
        if Facts[p].Predicate = PredNum then
          begin DelPred(p); p := pred(p) end
    end
  end; writeln
end;
end;

PROCEDURE SaveData; ( saves current data. E.g. SAVE PAYROLL )
begin
  skip(5);
  if ComStr = '' then ErNum := 1
  else
  begin
    write('Saving ', ComStr); CurFileName := ToUpper(ComStr);
    Assign(NuFile, ComStr + '.txt');
    rewrite(NuFile);
    writeln(NuFile, PredPtr);    writeln(NuFile, ArgPtr);
    writeln(NuFile, NextFact);   writeln(NuFile, NextCond);
    writeln(NuFile, LastSpecial); close(NuFile);
    if NextFact > 1 then
    begin
      assign(SentFile, ComStr + '.sent'); rewrite(SentFile); seek(SentFile, 0);
      for loop := 1 to pred(NextFact) do write(SentFile, Facts[loop]);
      close(SentFile);
      assign(SentFile, ComStr + '.cond'); rewrite(SentFile); seek(SentFile, 0);
      for loop := 1 to pred(NextCond) do write(SentFile, Conditions[loop]);
      close(SentFile);
      assign(CharFile, ComStr + '.arg'); rewrite(CharFile); seek(CharFile, 0);
      for loop := 1 to pred(ArgPtr) do
        begin CharRec.Cdef := Args[loop]; write(CharFile, CharRec) end;
      close(CharFile);
      assign(CharFile, ComStr + '.prd'); rewrite(CharFile); seek(CharFile, 0);
      for loop := 1 to pred(PredPtr) do
        begin CharRec.Cdef := Preds[loop]; write(CharFile, CharRec) end;
      close(CharFile);
    end;
    writeln; writeln; Change := false ( Reset change flag )
  end
end;

PROCEDURE LoadData; ( Load a set of Facts from disk. E.g. LOAD PAYROLL )
begin
  if Change then Change := GetYesOrNo('Current Data NOT Saved - Abort');
  if not(Change) then
  begin
    skip(5);
    if ComStr = '' then ErNum := 1
    else
    begin
      Assign(NuFile, ComStr + '.txt'); CurFileName := ToUpper(ComStr);
      (1) reset(NuFile) (1);
      if IOResult <> 0 then begin ErNum := 6; CurFileName := end
      else
      begin
        write('Loading ', ComStr);
        readln(NuFile, PredPtr);   readln(NuFile, ArgPtr);
        readln(NuFile, NextFact); readln(NuFile, NextCond);
        readln(NuFile, LastSpecial); close(NuFile);
        if NextFact > 1 then
        begin
          assign(SentFile, ComStr + '.sent'); reset(SentFile); seek(SentFile, 0);
          for loop := 1 to pred(NextFact) do read(SentFile, Facts[loop]);
          close(SentFile);
          assign(SentFile, ComStr + '.cond'); reset(SentFile); seek(SentFile, 0);
          for loop := 1 to pred(NextCond) do read(SentFile, Conditions[loop]);
          close(SentFile);
          assign(CharFile, ComStr + '.arg'); reset(CharFile); seek(CharFile, 0);
          for loop := 1 to pred(ArgPtr) do
            begin read(CharFile, CharRec); Args[loop] := CharRec.Cdef end;
            close(CharFile);
          assign(CharFile, ComStr + '.prd'); reset(CharFile); seek(CharFile, 0);
          for loop := 1 to pred(PredPtr) do
            begin read(CharFile, CharRec); Preds[loop] := CharRec.Cdef end;
            close(CharFile);
          end;
          writeln; writeln; Change := false ( Reset Change made flag )
        end
      end
    end
  end;

PROCEDURE DoStatus;
begin
  writeln('CURRENT DATABASE STATUS'); writeln;
  if CurFileName <> '' then writeln('Current Data File Name ... ', CurFileName);
  writeln('Number of Facts ..... ', pred(NextFact));
  writeln('Number of Conditions ..... ', pred(NextCond));
  writeln('Predicate Space Used ..... ', pred(PredPtr), ' bytes');
  writeln('Argument Space Used ..... ', pred(ArgPtr), ' bytes');
  writeln('Changes Made ..... ', Change); writeln;
end;

PROCEDURE DoExit;
begin
  if not(Change) then ProgExit := true
  else ProgExit := GetYesOrNo('Changes Made - Finish')
end;

PROCEDURE ProcessFact;
var PreiPart : strfield; PredNum : integer; conds : Condaarray; ok : boolean;

FUNCTION GetChars(n : integer) : strfield;
begin GetChars := ToUpper(copy(ComStr, 1, n)) end;

begin ( these are the main commands the program knows )
  ErNum := 0;
  if GetChars(3) = 'BYE' then DoExit else
  if GetChars(3) = 'ADD' then DoAdd else
  if GetChars(4) = 'LIST' then List else
  if GetChars(4) = 'DELETE' then Delete else
  if GetChars(4) = 'KILL' then Kill else
  if GetChars(4) = 'SAVE' then SaveData else
  if GetChars(4) = 'LOAD' then LoadData else

```

MICROMART

AMSTRAD PCW 8256 HANDYMAN

The program designed for the small business and the sole trader. For the shopkeeper, repair service man, garage owner, newsagents, small hotel owners, video rental shop, club steward, landlord etc etc etc

Simple ledger accounts to keep track of your customers, suppliers or even your department finances along with your own accounts.

Production of statements

Credit control

Balance analysis - giving instant financial picture

Envelope addressing

Record search

Ability to group sets of accounts together

Telephone/Mail lists

Now you can start to utilise the power of computers for your own business without any complex jargon or useless reports, with this no nonsense piece of software.

ALL THIS FOR ONLY £44.95

From D. M. Durkin, 4 Elm Avenue,
Blackhall Rocks, Hartlepool, Cleveland
TS27 4AJ.

B & S COMPUTING (NOTTM) LTD

55 CEDAR AVENUE, LONG EATON
NOTTINGHAM NG10 3JQ

TELEPHONE: (0602) 736273

PRINTERS

EPSON FX 85col, 160cps+32rps NLO	£329
MANN. TALLY MT80+ 80 Col, 100 cps	£161
MANN. TALLY MT85, 80c, 180cps+45cps NLO	£299
JUKI 6100 DAISYWHEEL 20cps	£252
MP DAISYWHEEL JUNIOR 14cps	£149

MONITORS

PHILIPS BM7502 HIRES GREEN	£63
PHILIPS BM7522 HIRES AMBER	£74
PHILIPS CM8501 STD RES RGB	£174
PHILIPS CM8533 MED RES RGB	£239
PHILIPS CF1114 TV/MONITOR	£169

3M DISCS

744/0 SSD 48TDI (BOXED IN 10'S)	£11
745/0 DSD 48TDI (BOXED IN 10'S)	£13
747/0 DSD 96TDI (BOXED IN 10'S)	£17

PLEASE ADD £8.50 CARRIAGE TO PRINTERS
AND MONITORS. £1.50 CARRIAGE TO DISCS
PLEASE ADD 15% VAT TO ALL PRICES
PRICES CORRECT AT TIME OF GOING TO PRESS
PRICES ARE SUBJECT TO
CHANGE WITHOUT PRIOR NOTIFICATION

CABLES UNLIMITED

PARALLEL PRINTER CABLES

IBM PC and Compatibles 6ft. flex (standard)	£15.00
IBM PC and Compatibles 6ft. flex (moulded)	£20.00
Olivetti IBM Compatible 6 ft. flex (with long screws)	£16.00
Victor, Sirius, Apricot, Wang - 6 ft. Ribbon Cable	£12.00
Victor, Sirius, Apricot, Wang - 6 ft. flex	£16.00
BBC, Apple II+ & IIe, Atari & Epson - 6 ft. Ribbon Cable	£9.50
Amstrad - 6 ft. Ribbon Cable	£12.50

SERIAL PRINTER/EXTENSION CABLES

Serial 25D M/M 6 ft. with hood cover	£12.00
Serial 25D F/F 6 ft. with hood cover	£13.00
Serial 25D M/F 6 ft. with hood cover (IBM, Atari)	£13.00
Serial Printer Cable for Apple IIc - 6 ft. flex	£9.00
Serial Printer Cable for BBC, Torch, Commodore - 6 ft. flex	£9.00
Serial Printer Cable for Macintosh - 6 ft. flex	£13.00

ABOVE PRICES ARE EXCLUDING POSTAGE AND VAT.
KEYZONE LTD.

U14, Acton Business Centre, School Road, Park Royal,
London NW10 Tel: 01-965 1684/1804. Telex 8813271.

MICROMART

COMPUTER REPAIRS

- COMPUTERS (Business & Personal)
- DISK DRIVES (5¼", 8", 3", 3½")
- WINCHESTERS
- MONITORS, VDUs, PRINTERS
- IBM PC and APPLEBOARDS
- IBM POWER SUPPLIES
- XEBEC CONTROLLERS
- Fixed repair charges
- 3 months warranty on repaired part

A.N. ELECTRONIC & COMPUTER SERVICES LTD

1308 North Lane, Aldershot, Hants
Tel: Aldershot (0252) 25608

Repair Centre appointments
welcomed

DISK-OUNT DISKS
FROM
MONAS OVERSEAS UK LTD
UNIT 34, CANNON WORKSHOPS
CANNON DRIVE, WEST INDIA DOCK
LONDON E14 9SU. Tel: (01) 987 3213

EVEN LOWER
SONY PRICES

LOOK AT
THESE 3½" PRICES?
PRICES PER BOX OF
10 DISKS (£) — POST FREE (IN UK)

EVEN LOWER
SONY PRICES

	1	2-5	6-9	10+
SONY (Branded)				
SS/DD	23.00	21.00	20.00	19.00
DS/DD	29.50	29.00	28.50	28.00
PLAIN LABEL (In Lib Box)				
SS/DD	18.00	17.00	16.00	15.00
DS/DD	25.50	24.50	23.50	22.50

BARGAIN SONY BULK PRICES ALSO AVAILABLE

CALL US FOR OTHER BARGAINS ON 5¼"

MAXELL — DYSON — NASHUA — FUJI



ALL PRICES EX VAT
(SUBJECT TO AVAILABILITY)



IF YOU LIVE IN

SWEDEN

FOR ALL SMALL OFFICE AND
HOME COMPUTERS

INCLUDING SINCLAIR, ATARI &
AMSTRAD

SEND TO:

NIMAX

DROTNING KRISTNAS VÄG 13
114 28 STOCKHOLM, SWEDEN

08/102703

PROGRAM FILE

```

if GetChars(2) = 'IS' then DoIS else
if GetChars(5) = 'WHICH' then DoWhich else
if GetChars(4) = 'STAT' then DoStatus else
begin
  PredNum := GetWord; PredNum := GetPredNum(PredNum+1);
  if PredNum = 0 then ErNum := 2
  else
  begin
    conds(1).Predicate := PredNum;
    conds(1).SentMode := PostFix;
    if CheckForVar(ConStr) then ErNum := 1
    else
    with conds(1).ArgInfo(1) do
    begin
      if CheckForReal(ConStr) then
      begin AType := NumPtr; AVal := ConvToReal(ConStr) end
      else
      begin AType := TextPtr; APtr := SaveArg(ConStr) end;
      conds(1).ArgInfo(2).AType := Undefined;
      conds(1).ArgInfo(3).AType := Undefined;
      ClearVariables; ok := Eval(Is,conds,1,1)
    end
  end
end;
if ErNum <> 0 then begin writeln(ER(ErNum)); writeln end
end;

begin
  ( MAIN SECTION OF CODE )
  ProgExit := false;
  InitData; ( Set up all pointers )
  repeat
    repeat
      ConStr := ReadFromTerm; ( Get input from keyboard )
      if BrackOn <> 0 then writeln(ER(1)) ( Too many closing brackets ! )
      until BrackOn = 0;
      writeln;
      GlobEr := false; ErNum := 0;
      ProcessFact ( Process User's input )
    until ProgExit
  end.

```



Amstrad PCW8256 AUTO.COM

by CP Vickerstaff

This short utility program prompts for a disk to be inserted. It then makes a directory of all the Basic programs on the disk, and lists them onscreen eight at a time with the option of running any of those listed. It can be set up to boot automatically from switch-on.

To do this, make a working disk with CP/M, BASIC, DIR, ERASE, SUBMIT, PIP and any other utilities you regularly use. Run BASIC and enter the program listed; save this as

AUTO.COM. Next, copy RPED.BAS to your working disk and run it under Basic. Select the new file option and enter PROFILE.SUB as the filename; type in the second program as shown. Exit RPED and you are ready to go. Remove the disk, reset the computer and try it out. You can then copy any Basic programs to this disk, and when you boot the disk, a couple of key presses will get any of these programs up and running.

```

PROGRAM : AUTO.COM
10 RESET:OPTION FILES "A":CLEAR:DIR a(64)
20 asc=CHR$(27);cls=esc+"E"+esc;"H";rns=esc+"p";rof=esc+"r"
30 DEF FNlocate(x,y)=esc+"Y"+CHR$(x+32)+CHR$(y+32)
40 DEF FNcvt(Title)=STRING$(100-LEN(Title)+1," ")+"Title";Title=FNcvt(Title)
50 PRINT esc;"H";cls;FNcvt("BASIC AUTO LOAD");
60 PRINT FNlocate(0,2);FNcvt("Insert program disc");
70 PRINT FNlocate(0,3);FNcvt("and press space");
80 GOSUB 270
90 PRINT FNlocate(0,2);STRING$(90," ");
100 PRINT FNlocate(0,4);SPACE$(90);
110 FOR i=1 TO 64:asc=FNcvt("A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q,R,S,T,U,V,W,X,Y,Z,0-9,*,^,&,@,~,.,:;,<,>,=,~,`",i);rof=
120 NEXT i:IF asc THEN RUN
130 FOR i=1 TO 64 STEP 8:rof=
140 FOR k=0 TO 10:PRINT FNlocate(35,k+7);rof;SPACE$(21);rof=NEXT
150 PRINT FNlocate(35,7);rof;esc;"H";rof=
160 PRINT FNlocate(35,8);" PRESS "
170 i=1:FOR j=0 TO 7:rof=
180 IF i+j>20 THEN j=0:rof=
190 PRINT FNlocate(35,9+j);j=1;rof= "LEFTTAB=J,INSTR(asc,i+j),";
200 NEXT
210 IF x+y<4 THEN PRINT FNlocate(0,2);FNcvt("Press RETURN to continue list");
220 GOSUB 270
230 IF y=1 AND x=0 AND v=0 THEN PRINT cls;esc;"loading";asc(x+y+1);RUN as
240 IF asc(CHR$(13)) THEN 220
250 NEXT
260 RUN
270 WHILE asc="" OR asc=KEY$:VEND
280 asc="" WHILE asc="" OR asc=KEY$:VEND
290 VVAL(asc):RETURN
PROGRAM 2 PROFILE.SUB
basic.com auto.com

```


PROGRAM FILE



Commodore 64 Tape Counter Calculator

by AP Sutton

This program calculates the relationship between time elapsed from the start of a tape and the counter reading for most types of tape recorders, including video. Instructions for using the program are included within it. Printer output for tables is set to channel four.

The heart of the program is the solution of the simultaneous equations based on time elapsed and counter reading. The generalised form is:

$$\text{TIME} = \alpha + K * K + \beta + \gamma$$

where K is the counter reading.

The routines used are as follows:

Lines 8000-8090: open storage/retrieval files

Lines 8100-8150: reads the error channel and flags if a file exists, and so on.

Line 2130: a keyboard input routine.

Lines 2820-2868: get data from a file.

Lines 9600-9710: hold machine code data to install an ON ERROR routine. It's called by SYS 49264, line-to-go to. SYS 49315 turns it off.

Lines 500-590: handle any errors that do occur.

Lines 2300-2390: main routine.

```

10 GOSUB1000:GOSUB800
20 GOTO2600
500 REM ERROR TRAP DESTINATION -EN=ERROR (128=BREAK),LN=LINE NO.
510 IF DN<1 THEN CLOSE2
515 CLOSE4:CLOSE15:SYS65511:REM ABORT ALL FILES
520 IF EN=128 OR EN=30 THEN 2600
525 GOSUB1050:PRINT"AN ERROR HAS OCCURRED "
527 IF EN<15 THEN 600
530 EHS(5)="DISK DRIVE"
540 IF DN=4 THEN EHS(5)="PRINTER"
550 EHS(5)=EHS(5)+" NOT CONNECTED"
560 EN=5:GOSUB1700:GOSUB1450
590 GOTO 2600
600 REM
660 PRINT"AT LINE":LN
670 SYS 49315:REM RESTORE NORMAL VECTORS
680 POKE 781,ER:SYS42042:REM PRINT ERROR DESCRIPTION
690 END
800 REM ERROR TRAP MACHINE CODE DATA (NON ESSENTIAL ROUTINE)
805 PRINT"WRITING MACHINE CODE ....."
810 AD=49154:AF=AD+178:KE=1
820 LN=9590:LN=10:HL=9710
850 DEFNN(N)=(CH+N*(XAND1))AND255
860 LN=LN+LN
870 X=0:CH=0:N=LN:CH=FNN(N)
880 FORX=1TO16
890 READN:CH=FNN(N):IF K THENPOKEAD,N
900 AD=AD+1:IFAD>AFTHENE=0
910 NEXT:PRINT"AT LINE":LN
920 READN:IF(N=CH)AND(AD=AF)THENB50
930 IF(AD=AF)AND(LN=HL)THENPRINT"OK":GOTO970
940 IF(AD=AF)THENPRINT"TOO FEW LINES":END
950 PRINT"CHECKSUM ERROR IN LINE"
960 PRINT256*(PEEK(64))+PEEK(63):STOP
970 SYS49264:500:REM SET UP ERROR TRAP, DESTINATION=LINE 500
980 RETURN
999 END
1000 REM SET-UP
1010 DIM K(2),T(2),DK(2),DT(2),ENS(17)
1030 DEF FNT(K)=AL*K*K+BE*K
1040 D1=0:KES="":HF=0:CT=1:DG=4
1050 CHS=CHR$113
1060 DVS="D":DISK=0:DV=DI:RNS=".S.W":FIS=".TAPES":IMAX=50
1070 DIMHS(5),NAS(IMAX),AIMAX(1),BIMAX(1),DIMAX(1),LIMAX(1)
1072 FORK=0TO9:READHS(X):NEXT
1074 FORK=0TO17:READENS(X):NEXT
1099 RETURN
1100 REM A TO AS,LENGTH A1,DECIMAL D1
1105 FZS="0000000000":IF A1<0THENFZS=" "
1110 AZ=INT(A):AY=INT(A-AZ)*10 D1+.5)
1115 IF D1=0 THEN AZ=INT(A+.5)
1120 AZS=MID$(STR$(AZ),2):AYS=MID$(STR$(AY),2)
1130 IF D1<0 THEN AZS=AZS+"-",AYS
1140 AS=RIGHT$(FZS+AZS,A1)
1150 RETURN
1160 REM CLEAR BUFFER
1170 GET AS:IFAS<" "THEN1170
1180 RETURN
1200 REM TIME TO COUNTER AS STRING
1210 GOSUB1660:A=K
1220 IF A>DN THEN A=DN:GOTO 1220
1230 IF A<-.5 THEN A=A+DN
1240 D1=0:A1=DG:GOSUB1100:AS=RIGHT$1 "A1.6)
1250 RETURN
1300 REM PRINT LINE Y DOWN,Z ACROSS
1310 A1=-2:A=Y/10:D1=0:GOSUB1100
1320 PRINT4,A1:"X "
1330 FORZ=0TO9
1340 T=(Y+Z)*60:GOSUB1200
1350 PRINT4,A1:
1360 NEXT Z:PRINT4," "
1370 T=(Y+10)*60:GOSUB1660:X1=K:T-600:GOSUB1660:T1=ABS(K1-K)/600
1380 FORZ=1TO3
1390 A=T1*2*15:A1=-4:D1=0:GOSUB1100
1400 PRINT4,A1:
1410 NEXT Z
1420 PRINT4," "
1430 RETURN
1450 REM WAIT

```

MICROMART

ALADDINK

RIBBON RE-INKING PRICES

Printer	Price
AMSTRAD DMP2000	£ 2.00
AMSTRAD PCW8256	£ 1.90
BROTHER M1009	£ 1.35
CANON 1080	£ 1.80
COMMODORE 4023	£ 1.75
EPSON FX80	£ 1.50
EPSON LX80	£ 1.30
KAGA TAXAN KP810	£ 1.80
SEIKOSHA GP50S	£ 2.05
SHINWA 4023	£ 1.75
SILVER REED EX44	£ 1.95
SMITH CORONA D200	£ 2.15

If you used fabric printer ribbon is not on this list, send it with one third of normal retail price.

ALADDINK, (Dept PW), 4 Hurkur Crescent, Eyemouth, Berwickshire, TD14 5AP. Tel: (0390) 50965

PC-AT COMPATIBLES AT REALISTIC PRICES!

We have selected the TANDON range of PC compatible computers because we believe they offer the best price/performance/reliability combination on the market.

For example:
TANDON PCA 20 our price £1,795.00
(20M Hard disc - 1.2M Floppy - 512k RAM)
*** 6 months on site warranty included ***

Please write or phone for details of other machines from TANDON. We are also Appointed dealers for ASHTON-TATE, MULTISOFT ACCOUNTS, Gemini Computer systems (80-Bus and the new 68000 based multi-user CHALLENGER systems).

Our speciality is in supplying complete business or engineering solutions and tailoring them to your specific needs.

Above prices do not include VAT or Carriage.

COMPTON ELECTRONICS
(Computer Systems Developments)
Ilford
ILMINSTER
Somerset TA19 9EB
Telephone Ilminster (04605) 4781

R p&h electronics Ltd

COMPUTER BOOKS

SEND OR TELEPHONE FOR A FREE COPY OF OUR COMPUTER BOOK CATALOGUE - A WIDE COMPREHENSIVE LIST WHICH COVERS MOST BUSINESS, EDUCATION AND HOME COMPUTERS.

BOTH OF OUR MICRO CENTRES STOCK AND SERVICE THE FOLLOWING SYSTEMS AND PERIPHERALS - AT THE LOWEST PRICES -

COMMODORE, AMSTRAD, ACORN, MSX - SYSTEMS
EPSON, TALLY, TAXAN, JUKI - PRINTERS
PHILIPS, MICROVITEC, TAXAN - MONITORS
CUMANA, PACE, OPUS - DISC DRIVES
IN ADDITION TO A WIDE RANGE OF SOFTWARE, ACCESSORIES, UTILITIES AND CONSUMABLES.

ACCESS/BARCLAYCARD/VISA ORDERS WELCOME
CREDIT FACILITIES instant credit up to £1,000, deposits 10%

5 THE PARADE - YATELEY - HANTS - TEL: 0252 877222
22/24 GUILDFORD RD - BAGSHOT - SURREY - TEL: 0276 74533
24 HOUR HOT LINE 0252 878107

HSV COMPUTER SERVICES LIMITED

COMPUTER SUPPLIES
AT LOW LOW PRICES!

DISKETTES
(BOXED IN 10s)

StorageMaster

LIFETIME GUARANTEE

3 1/2" SS/DD 135 TPI 80 TRACK	£24.95
DS/DD 135 TPI 80 TRACK	£32.95
5 1/4" SS/DD 48 TPI 40 TRACK	£12.95
DS/DD 48 TPI 40 TRACK	£16.95
SS/DD 96 TPI 80 TRACK	£17.95
DS/DD 96 TPI 80 TRACK	£19.95

UNBRANDED
5 YEAR GUARANTEE

3 1/2" SS/DD 135 TPI	£22.50
DS/DD 135 TPI	£28.95
5 1/4" SS/DD 48 TPI	£8.95
DS/DD 48 TPI	£9.95

DISKETTE STORAGE
BOXES

PRICE EACH

30 x 5 1/4" HINGED LID	£5.50
70 x 5 1/4" HINGED LID LOCKABLE	£10.50
100 x 5 1/4" HINGED LID LOCKABLE	£13.95
40 x 3 1/2" HINGED LID LOCKABLE	£9.95

CONTINUOUS STATIONERY

9 1/2" x 11" 60 GSM Micro-Perf all edges

250	£2.95
500	£4.95
1000	£8.95
2000	£14.95

True A4 90 GSM Micro-Perf all edges

250	£5.25
500	£6.75
1000	£14.98

Labels 3.5" x 1.5" (1 across)

500	£2.95
1000	£4.95
2000	£9.50

Labels 4.0" x 1.5" (1 across)

500	£3.25
1000	£5.50
2000	£10.50

Labels 4.0" x 1.5" (2 across)

500	£3.75
1000	£6.50
2000	£11.95

PRINTER RIBONS

CANON PW1080A	Each £3.25
Epson FX/LX/MX/RX80	£3.25
Juki 6100 S/S	£1.75
Juki 6100 M/S	£2.75
Mannesmann Tally	
MT80/80+	£4.75
OK Microline 80/82/83	£1.75
Seikosa GP80	£2.75
Shimwa CP80	£4.75
TAXAN KAGA	£3.25
Walters VM80	£4.75

ALL OUR
PRICES INCLUDE
CARRIAGE AND VAT —
NO EXTRA'S TO PAY!



HSV COMPUTER SERVICES LIMITED,
40/42 New Market Square, Basingstoke,
Hants RG21 1HS (0256 463507)

HSV

PROGRAM FILE

```

1455 RR=23:CC=5:GOSUB1800:PRINT"( PRESS SPACE TO CONTINUE "
1460 GETAS:IFA3="" THEN 1460
1470 GOSUB1550
1480 IFEX=-1 THEN 1460
1485 GOSUB160
1490 RETURN
1500 REM NOMINAL LENGTH
1510 TS="ENTER NOMINAL LENGTH (5-240MINS):":TI$=""
1515 GOSUB2100
1520 NL=INT(VAL(TS))
1530 IF NL<5 OR NL>240 THEN EM=1:GOSUB1700:GOTO 1510
1540 RETURN
1550 REM SCAN KEY
1555 EX=-1
1560 FOR XX=1 TO LEN(KE$)
1570 (FA$=HID$IKES,XX,1):THENEX=XX:XX=99
1580 NEXT
1590 RETURN
1600 REM FORM TABLE
1610 FOR Y=0 TO NL STEP 10
1620 IF (Y/60)=INT(Y/60) THEN PRINTC4." "
1630 GOSUB1300
1640 NEXT Y
1650 RETURN
1660 REM TIME T (SECS) TO COUNTER K
1665 IF AL=0 THEN K=T/BE:RETURN
1670 IF AL>0 THEN 1695
1675 IF (BE*BE+4*AL*T)<0 THEN ER=1:RETURN
1685 K=(50R(BE*BE+4*AL*T)-BE)/2/AL
1690 RETURN
1700 REM ERROR PRINT
1710 RR=22:CC=0:GOSUB1800:PRINTMS(0);
1720 RR=22:CC=19-LEN(EM$):GOSUB1800:PRINTMS(EM);
1740 RETURN
1750 REM CLEAR MESSAGES
1760 CC=0:FOR RR=20 TO 23:GOSUB1800
1770 PRINTMS(0);
1780 NEXT
1790 RETURN
1800 REM PRINT AT COOL,ROW ROUTINE
1810 POKE/82,CC:POKE/81,RR:POKE/83,48:SYS$5520:RETURN
1850 REM SCREEN CLEAR
1860 PRINT CHR$(147);:RETURN
1900 REM DEVICE
1920 TS="TAPE OR DISK ?":TI$=DV$4"
1930 GOSUB2100
1933 NS=LEN(TS,1)
1935 (PNS="D" THENDV$="D"):DV=B:RETURN
1940 (PNS="T" THENDV$="T"):DV=1:RETURN
1945 GOTO 1920
1950 REM TITLE
1952 GOSUB1850:PRINT:PRINT" "
1954 LI$=""
1956 PRINT" "
1958 PRINT" "
1960 RETURN
2000 REM OBTAIN COUNTER INPUT
2005 N=3:GOSUB1950
2007 PRINTTAB(19-LEN(MA$):POI)/2;MA$(POI)
2009 PRINT" LENGTH "NL:"MINS":TAB(27);DG:"DIGITS"
2010 FOR X=0 TO 2
2012 GOSUB1750
2020 TS="COUNTER READING"+STR$(X+1)+": "
2025 K(X)=VAL(NS)
2030 IF K(X)<0 OR K(X)>DN-1 THEN EM=1:GOSUB1700:GOTO 2020
2035 RR=7+4*X:CC=5:GOSUB1800:PRINT TS;NS
2040 GOSUB1750
2050 TS=" TIME (HH.MM.SS) "
2060 IF ER=0 THEN EM=2:GOSUB1700:GOTO 2050
2065 RR=0+4*X:CC=5:GOSUB1800:PRINTTS;NS
2070 NEXT X
2080 GOSUB1750:RETURN
2100 REM INPUT ROUTINE
2110 RR=21:CC=2:GOSUB1800:PRINTTS:" "
2120 CC=LEN(TS)+3:GOSUB1800
2130 OPEN1,0:INPUT1,NS:CLOSE1:PRINT
2140 IFNS="" THENNS=""
2150 RETURN
2200 REM DECODE HH.MM.SS
2210 ER=0:IF LEN(NS)<4 THEN ER=1:RETURN
2220 NS$=RIGHT(NS,2):IF NS$<"00" OR NS$>"59" THEN ER=1:RETURN
2230 NS$=MID$(NS,4,2):IF NS$<"00" OR NS$>"59" THEN ER=1:RETURN
2240 NS$=MID$(NS,1,2):IF NS$<"00" OR NS$>"23" THEN ER=1:RETURN
2250 N=VAL(NS$)+60*VAL(MS$)+3600*VAL(HH$)
2260 RETURN
2300 REM COMPUTE FACTORS
2310 ER=0:FORX=0TO2
2320 DK(X)=X*(X+1)*(X+1)+3*(X+2)
2330 UT(X)=T(X)-T((X+1)+3*(X+2))
2335 IF DK(X)=0 OR DT(X)=0 THEN ER=1
2340 NEXT
2345 IF ER=0 THEN RETURN
2350 AL=(DK(0)*DT(1)-DK(1)*DT(0))/(DK(0)*DK(1)-DK(2))
2360 DE=DT(0)/DK(0)-AL*(DK(0)+DK(1))
2370 IF (AL=0)AND(BE=0) THEN ER=1
2390 RETURN
2400 REM COUNTER DIGITS
2405 RR=21:CC=2:GOSUB1800
2410 TS="NUMBER OF COUNTER DIGITS (2-5) "
2415 GOSUB2100
2420 DG=INT(VAL(NS)):IFDG<2 OR DG>5 THENEM=1:GOSUB1700:GOTO 2405
2430 DN=10:DG:REM = POWER
2440 RETURN
2450 REM MAKE CURRENT TAPE
2455 EM=0:GOSUB1700:KE$="VN":GOSUB1460:KE$=""
2460 IFEX=1 THEN CT=PO
2465 IFCT=-1 THEN RETURN
2470 DG=D(CT):CN$=MA$(CT):AL=A(CT):BE=B(CT):NL=L(CT):DN=D(CT)
2480 RETURN
2500 REM TITLE PRINT
2520 TS="COUNTER/TIME TABLE FOR "+CN$
2530 PRINTC4,SPC(140-LEN(TS))/2;TS
2540 TS="ADD"
2550 IF BE<0 THEN TS="SUBT"
2560 PRINTC4,SPC(67);"FOR SECS "
2570 PRINTC4,"MINS "
2580 PRINTC4," "
2590 RETURN
2600 REM MAIN MENU
2610 GOSUB1850:RR=3:CC=5:GOSUB1800
2620 PRINT"TAPE COUNTER / TIME CALCULATOR"
2630 RR=RR+1:GOSUB1800
2635 PRINT" "

```


PROGRAM FILE

```

2640 PRINT:PRINT
2650 FORK=0 TO 9:PRINT"      "(MUSIX):NEXT
2660 GOSUB1100
2705 N=FREE(0):T15="9"
2710 T5="ENTER CHOICE 10-91":GOSUB2100
2720 N=INTVAL(N5)
2730 IF N5="0" OR N5="9" OR LEN(N5)<1 THEN T15=N5+"      ":GOTO2710
2760 ON(N+1)GOSUB2700,2900,3000,3100,3400,3600,3700,4100,4200,4500
2770 GOTO2600
2780 GOSUB1050
2701 SYS49315:REM DELETE ERROR TRAP
2782 END
2800 REM FILE NAME
2805 F15=LEFT$(F15+"      ",12)
2810 R15=10:CC=0:GOSUB1000
2820 T5="      FILE NAME ? "(T15=F15+"      "
2830 GOSUB2100
2835 F15=LEFT$(N5+"      ",12)
2850 RETURN
2860 REM GET FROM DEVICE
2862 N5=""
2864 GET#2,A5:IF A5=CHR$(13) THEN RETURN
2866 N5=N5+A5:IF ST=0 THEN 2864
2868 RETURN
2870 REM LOAD ERROR
2875 EM=14
2880 GOSUB1700:GOSUB1450:GOSUB2000
2890 RETURN
2900 REM LOAD
2910 N=1:GOSUB1950:GOSUB1900:PO=0
2915 P1=PO:GOSUB3200:IF ER<>0 THEN ER=0:RETURN
2920 R15="      S,R":GOSUB2000
2930 SE=0:GOSUB3000:IF ER=-1 THEN 2995
2932 F15=5:GOSUB1750
2934 P1=PO:GOSUB3200:IF ER<>0 THEN ER=0:GOTO 2995
2935 E15(5)="LOADING NO."*STR$(N1):GOSUB1700
2936 GOSUB2800:N15(PO)=N5:IF ST<>0 THEN 2870
2938 GOSUB2800:A(PO)=VAL(N5):IF ST<>0 THEN 2870
2940 GOSUB2800:B(PO)=VAL(N5):IF ST<>0 THEN 2870
2942 GET#2,A5:IF A5=CHR$(13) THEN 2870
2944 GET#2,A5:IF A5=CHR$(13) THEN 2870
2946 GET#2,A5:IF A5=CHR$(13) THEN 2870
2948 R15=N1
2950 IF ST=0 THEN 2934
2965 GOSUB2000
2990 RETURN
3000 REM SAVE
3010 N=2:GOSUB1950
3015 IF N=0 THEN EM=9:GOSUB1700:GOTO 1450
3020 GOSUB1900
3030 R15="      S,R":GOSUB2000
3035 SE=1:REM SECONDARY ADDRESS
3040 GOSUB3000:IF ER=-1 THEN 3095
3045 EM=17:GOSUB1750:GOSUB1700
3050 FORKX=0 TO MAX
3055 IF D(KX)=0 THEN 3070
3060 PRINT#2,N15(KX):CR$;A1(KX):CR$;B1(KX):CR$;CHR$(L(KX)):CR$;D1(KX)
3070 NEXT KX
3085 GOSUB2000
3090 RETURN
3100 REM NEW TAPE
3110 N=3:GOSUB1950:P1=0:GOSUB3200:IF ER<>0 THEN ER=0:RETURN
3115 R15=10:CC=10:GOSUB1000
3120 PRINT"ENTER TAPE NAME (TITLE) - "(CHR$(13)+CHR$(13)+":GOSUB2130
3130 N15(10)=LEFT$(N5,30)
3140 N=3:GOSUB1950
3150 GOSUB1500:L(PO)=N1
3160 N=3:GOSUB1950
3165 GOSUB2400
3170 GOSUB2000:GOSUB2300
3175 IF ER=0 THEN 3190
3180 EM=3:GOSUB1700:KE$="YN":GOSUB1450:KE$=""
3184 IPEX=1 THEN 3170
3186 D(PO)=0:RETURN
3190 A(PO)=AL:B(PO)=BE:N1=N1+1:D(PO)=0:GOSUB2450
3195 RETURN
3200 REM FIND SPARE PLACE IN FILE
3210 ER=9:IF N1=MAX THEN ER=4:GOSUB1700:GOSUB1450:ER=1:RETURN
3220 FORKX=1 TO MAX
3230 IF D(KX)=0 THEN N1=KX:KX=MAX+10:ER=0
3240 NEXT KX
3245 RETURN
3250 REM LIST 10 TYPES
3255 TO=0:P1=PO:FOR KX=0 TO 9
3260 IF P1=MAX THEN KX=10:GOTO 3280
3265 IF D(P1)=0 THEN P1=P1+1:GOTO 3260
3270 LT(KX)=P1:PRINTXX="      N15(P1):TAB(27):D(P1):TAB(31)
3272 A=LT(P1):A1=3:D1=0:GOSUB1100:PRINT"      ":A5
3275 TO=TO+1:P1=P1+1
3280 NEXT KX
3290 RETURN
3300 REM SELECT FROM LIST
3310 KE$=LEFT$( "0123456789",TD+1)
3320 EM=7:GOSUB1700:GOSUB1450
3330 KE$=""
3340 RETURN
3400 REM CHOOSE CURRENT TYPE
3410 P1=1:TD=11
3415 IF TD=10 THEN RETURN
3420 PO=P1+1:N=4:GOSUB3500
3430 IF N=0 THEN EM=6:GOSUB1700:GOSUB1450:RETURN
3435 GOSUB3250
3440 IF TD=0 THEN RETURN
3445 GOSUB3300
3450 IF EX=1 THEN 3415
3460 CT=LT(1):EX=21
3470 EM(5)="TYPE"+STR$(EX-21)+" SELECTED":EM=5:GOSUB1700:GOSUB1450
3480 RETURN
3500 REM SELECT TITLE
3510 GOSUB1950
3520 PRINT"---TAPE NAME---      DIGITS  LENGTH"
3530 PRINT"      NO      (MINS)"
3540 RETURN
3600 REM DELETE
3610 P1=1:TD=11
3615 PO=P1+1:IF TD=10 THEN RETURN
3620 N=5:GOSUB3500
3630 IF N=0 THEN EM=6:GOSUB1700:GOSUB1450:RETURN
3635 GOSUB3250
3640 IF TD=0 THEN RETURN
3645 GOSUB3300
3650 IF EX=1 THEN 3615
3660 EY=EX:EM(5)="CONFIRM DELETE TYPE NO"+STR$(EY-21)+" (Y/N)"

```

MICROMART

JANUS DISKETTES

- ★ Independently rated as U.S. market leaders - the professionals' choice
- ★ Highest available quality at low direct ex-factory prices
- ★ Unconditional lifetime guarantee
- ★ Certified 100% error free

Prices per box of 10 excluding VAT

5 1/4" SS/DD	£ 8.85
DS/DD	£ 9.95
DS/QD	£11.99
1.5Mb IBM AT	£18.36
3 1/2" SS/DD	£16.90
DS/DD	£19.10

POST FREE - C.W.O.
Quantity prices on request.

Export, Government and dealer enquiries invited.



RAYNAR GROUP, est. 1959
Chichester, W. Sussex, PO20 7BB
Tel (0243) 512106
Telex: 946240 CWEASY G/19004875

MS-DOS FLEX UNIFLEX OS-9 OS-9/68K CROSS ASSEMBLERS

A suite of cross assemblers supporting the following devices:

1802 1805 6303 6502 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.

MICRO SPARES OF RUGBY

CARRIAGE FREE	HARDWARE	CARRIAGE FREE	
AMSTRAD 6120 green	£249.00	AMSTRAD DMP2000	£129.00
AMSTRAD 6120 colour	£329.00	AMSTRAD FDInc. lead	£ 89.90
AMSTRAD PCWB256	£399.00	COMMODORE 1280	£355.00
AMSTRAD PCWB612	£489.00	COMMODORE PC1020	£99.00
MONITOR WALL SWIVEL BKT	£ 17.26	QUENDATA D.W. PRINTER	£169.95

POST FREE	SOFTWARE	POST FREE
SAGE PERSONAL	CAISSOFT INTEGRATED	£130.40
ACCOUNTS	ACC	£ 42.61
SAGE POPULAR	CRACKER 2	£ 43.44
ACCOUNTS	SUPERCALC 2	
SAGE MAGIC FILER		

POST FREE	RIBBONS	POST FREE
AMSTRAD DMP200	£ 5.17	AMSTRAD PCW RANGE £ 5.17
EPSON MX80	£ 2.12	EPSON MX180 £ 4.84

MOST RIBBONS AVAILABLE PLEASE PHONE FOR LATEST PRICES

ATHENA 5.25"			
SSDD 40p 474001	9.90	8.50	7.40
DSDD 40p 477501	10.90	9.90	8.90
DSDD 80p 478001	13.90	12.90	11.90
MAXELL 5.25"			
SSDD 40p MD1D	15.90	14.90	13.90
DSDD 40p MD2D	18.90	17.90	16.90
DSDD 80p MD2D	22.90	21.90	19.90
VERBATIM 5.25"			
SSDD 40p MD55-01	14.90	13.90	12.90
DSDD 40p MD55-01	16.90	15.90	14.90
DSDD 80p MD57-01	18.90	15.90	14.90
DSDD 40p MD250-01	14.90	13.90	12.90
SONY 3 1/2"			
SSDD D3440	19.90	18.90	17.90
DSDD D4440	29.90	28.90	27.90
AMSTRAD 3"			
CF2 for single head dr.	32.00	31.00	30.00

All discs boxed in 10's Maxell prices include plastic library box.
Official Government & Educational orders welcome.

All prices include postage and postage. Please add VAT at 15%.

RUGBY MICRO SPARES 30, OXFORD ST., RUGBY
WARWICKSHIRE CV21 3NF. Ph. 0788 71643

MICROMART

ATHANA DISKETTES

THE BEST DISKETTE THAT MONEY CAN BUY!

LIFETIME WARRANTY Certified Error Free



8.00"

SSDD £1.48 — DSDD £2.08
YOU KNOW US BY NOW

BUT JUST IN CASE YOU DON'T, WE ARE THE PEOPLE THAT MAKE THE DISKETTE FAVOURED BY MAJOR SOFTWARE COMPANIES AND OEM'S, AND THAT INCLUDES SOME OF THE BIGGEST NAMES IN THE INDUSTRY COMPANIES WHOSE NAMES ARE HOUSEHOLD NAMES AROUND THE WORLD. ATHANA DISKETTES ARE GOOD SO GOOD THAT A LOT OF MAJOR SOFTWARE PUBLISHERS, COMPUTER MARKETERS INSIST ON THEM



5.25"

SSDD £0.99 48 TPI DSDD £1.09 48 TPI
£1.12 96 TPI £1.34 96 TPI

ATHANA DISKETTES ARE SOLD IN THREE PACKAGING CONFIGURATIONS — POLYBAGS OF 25, STANDARD PACKAGE OF 10, AND PLASTIC LIBRARY CASE OF TEN ALL COME WITH SLEEVE, REINFORCED HUBS, USER ID LABELS, AND WRITE PROTECT TABS PRICES ARE SLIGHTLY HIGHER IF PURCHASED IN STANDARD PACKAGING OR IN PLASTIC LIBRARY CASE



3.50"
SSDD £2.20 — DSDD £2.80
WHEN MEMORIES ARE WORTH
KEEPING... IT'S

ATHANA DISKETTES!

ATHANA DISKETTES ARE MANUFACTURED BY OUR PARENT COMPANY IN LOS ANGELES UNDER THE MOST STRINGENT QUALITY PROCEDURES. THEY WORK TIME AFTER TIME, EVERY TIME! AFTER ALL WHEN A MAJOR SOFTWARE COMPANY OF DEM PUT THEIR NAME ON A DISKETTE, THEY CANNOT AFFORD TO TAKE CHANCES.

"AT'S" THAT WORK!

THAT'S RIGHT, HIGH DENSITY DISKS FOR THE IBM "AT" AND COMPATIBLES, THAT WORK, EVERY TIME, ALL THE TIME
£35.00 — PACKAGE OF 10

COLOURED DISKETTES

ATHANA DISKETTES ARE ALSO AVAILABLE IN LIGHT BLUE, DARK BLUE, RED, SILVER AND YELLOW AT A SMALL 10% UP-CHARGE MINIMUM ORDER 50

HOW TO ORDER — 0-800-525585

FOR FAST SERVICE CALL OUR TOLL FREE NUMBER ABOVE AND USE YOUR ACCESS CARD, OR CHEQUE IN ADVANCE. WE ALSO ACCEPT PURCHASERS ORDERS FROM GOVERNMENT DEPARTMENTS SHIPMENT IS NORMALLY WITHIN 24 HOURS AND WE OFFER A MONEY BACK GUARANTEE. ALL PRICES ARE PLUS VAT. QUANTITIES OF 50 DISKETTES OR MORE ARE SHIPPED FREIGHT ALLOWED FOR ORDERS LESS THAN 50 ALLOW £2.00 FOR POSTAGE AND PACKING.

FOR ORDERS & DEALER INQUIRIES:
0-800-525585



Athana International Ltd

470 LONDON ROAD, SLOUGH, BERKS
SL3 8QY ENGLAND TEL (0753) 682923
OR TELEX 847185 FAX (0273) 40990

PROGRAM FILE

```

3665 KM=5:GOSUB1700:KES="YN ":GOSUB1460
3670 ON EX GOTO 3675,3620,3615
3675 D(LT(EY-2)):0:NK=NF-1:GOTO 3620
3700 REM PRINT TAPE
3710 N=6:GOSUB1950
3720 IF CT=-1 THEN KM=11:GOSUB1700:GOSUB1450:KRETURN
3730 IF D(CT)=0 THEN 3720
3735 GOSUB2470:GOSUB1750
3740 KM=12:GOSUB1700:GOSUB1450
3750 DM=4:OPEN4:DW,7:REM PRINT CHANNEL
3752 GOSUB1750:EM=13:GOSUB1700
3755 PRINT4:GOSUB2500:GOSUB1600
3760 PRINT4:CLOSE4:DW=DV
3790 RETURN
3800 REM SHOW CURRENT TYPE
3810 PRINT" TAPE NAME :- "CON$
3820 PRINT" NOMINAL LENGTH :- "NML:" MINS"
3830 PRINT" NO. OF COUNTER DIGITS :- "DG
3840 RETURN
3900 REM SECS SE TO HH.MM.SS NF$
3910 SE=INT(SE*.5):NH=INT(SE/3600)
3915 IF NH>23THENNH=NH-24:SE=SE-24*3600:GOTO3915
3920 NH=INT((SE-3600*NH)/60)
3930 NS=SE-3600*NH-60*NM
3940 NF$=CHR$(48+INT(NH/10))+CHR$(48+(NH-10*INT(NH/10)))+": "
3950 NF$=NF$+CHR$(48+INT(NH/10))+CHR$(48+(NH-10*INT(NH/10)))+": "
3960 NF$=NF$+CHR$(48+INT(NS/10))+CHR$(48+(NS-10*INT(NS/10)))+": "
3970 RETURN
4000 REM CALCULATE 1ST COUNTER
4010 GOSUB1950:IF CT=-1 THEN KM=11:GOSUB1700:GOSUB1450:RETURN
4015 GOSUB2470:GOSUB3600:T1$=" ":GOSUB4300
4020 T$="START TIME (HH.MM.SS)":GOSUB2100:GOSUB2200
4030 IF ER<>0 THEN EM=2:GOSUB1700:T1$=NS:GOTO4020
4040 SE=N:GOSUB1750:GOSUB3900:T$=NF$
4042 T=SE:IF SE>N*60 THEN T=0
4044 GOSUB4330:GOSUB1200:T1$=RIGHT$(A$.6):T$="START COUNTER READING"
4046 GOSUB2100:K=VAL(NS)
4048 IF K<0 OR K>DN-1 THEN EM=1:GOSUB1700:T1$=NS:GOTO4046
4050 T=INT(K):IF T<0 OR T>60*NL THEN K=-1:GOTO4046
4052 TD=SE-T
4054 A=K:A$=DG:D1=0:GOSUB1100:CA$=RIGHT$( " "A$.6):GOSUB4330
4055 RETURN
4060 REM REPEAT 7
4065 EM=15
4070 K$="R ":GOSUB1750:GOSUB1700:GOSUB1450
4075 RETURN
4100 REM TIME TO COUNTER
4110 N=7:GOSUB4000:IF CT=-1 THEN RETURN
4115 T1$=" ":GOSUB1750
4120 T$="SECOND TIME (HH.MM.SS)":GOSUB2100:GOSUB2200
4125 IF ER<>0 THEN EM=2:GOSUB1700:T1$=NS:GOTO4120
4130 SE=N:GOSUB3900:T$=NF$
4135 T=SE-TD
4140 IF T<0 THEN T=T+24*3600
4145 IF T>N*60 THEN EM=1:GOSUB1700:T1$=T$:GOTO4120
4150 GOSUB1200:CB$=A$:GOSUB4000:GOSUB4330:GOSUB1750
4155 GOSUB4060
4165 K$=" ":ON EX GOTO 4115,4170
4170 RETURN
4200 REM COUNTER TO TIME
4210 N=8:GOSUB4000:IF CT=-1 THEN RETURN
4215 T1$=" ":GOSUB1750
4220 T$="SECOND COUNTER READING":GOSUB2100:K=VAL(NS)
4225 IF K<0 OR K>DN-1 THEN EM=1:GOSUB1700:T1$=NS:GOTO4220
4230 T=INT(K):IF T<0 OR T>60*NL THEN K=-1:GOTO4225
4240 SE=T+TD:GOSUB3900:T$=NF$
4245 A=K:A$=DG:D1=0:GOSUB1100:CB$=RIGHT$( " "A$.6):GOSUB4000:GOSUB4330
4250 GOSUB4060
4260 K$=" ":ON EX GOTO 4215,4265
4265 RETURN
4300 REM CLEAR TIME/COUNT DISPLAY
4310 TA$=" ":CA$=" ":TB$=" ":CB$=" ":TR$=" ":CR$=" "
4320 RETURN
4330 REM PRINT TIME/COUNT
4340 RR=0:CC=0:GOSUB1000
4350 PRINT" --TIME-- COUNTER"
4360 PRINT" (1) ":TA$: " ":CA$
4370 PRINT" (2) ":TB$: " ":CB$:PRINT
4380 PRINT" DIFF= ":TR$: " ":CR$
4390 RETURN
4400 REM COMPUTE DIFFERENCE
4410 NS=TA$:GOSUB2200:T7=N
4412 NS=TB$:GOSUB2200:T8=ABS(N-T7)
4414 IF T8>2*3600 THEN T8=ABS(T8-2*3600)
4416 SE=T8:GOSUB3900:TR$=NF$
4418 A=ABS(VAL(CA$)-VAL(CB$)):A1=DG:D1=0:GOSUB1100:CR$=RIGHT$( " "A$.6)
4420 RETURN
4500 REM INSTRUCTIONS
4510 N=9:GOSUB1950
4520 PRINT"MOST TAPE RECORDERS, INCLUDING VIDEO AND";
4530 PRINT"CASSETTE DATA RECORDERS, HAVE A COUNTER";
4540 PRINT"WHICH IS LINKED TO ONE OF THE SPOOLS.";
4550 PRINT"THE RATE AT WHICH THE SPOOL TURNS";
4560 PRINT"DEPENDS ON HOW MUCH TAPE IS WOUND ON IT";
4570 PRINT"AND SO THE COUNTER IS NOT EASILY RELATED";
4580 PRINT"TO HOW MANY MINUTES' WORTH OF TAPK HAVE";
4590 PRINT"BEEN USED.":PRINT
4600 PRINT"THIS PROGRAM WILL WORK OUT THE RELATION-";
4610 PRINT"SHIP AND CAN DISPLAY TIMES/COUNTER";
4620 PRINT"READINGS. IT WILL ALSO PRINT A TABLE";
4630 PRINT"THAT CAN BE USED TO FIND OUT HOW LONG ";
4640 PRINT"THE GAP IS BETWEEN TWO COUNTER READINGS.";
4650 GOSUB1450:GOSUB1950
4660 PRINT"THE PROGRAM REQUIRES THREE COUNTER";
4670 PRINT"READINGS AND THE TIMES AT WHICH THOSE";
4680 PRINT"READINGS OCCURRED. IT IS ESSENTIAL THAT";
4690 PRINT"THE COUNTER IS AT ZERO WHEN THE TAPE IS";
4700 PRINT"FULLY RE-WOUND BUT IT IS NOT NECESSARY";
4710 PRINT"FOR THE FIRST TIME/READING TO BE AT THE";
4720 PRINT"START OF THE TAPE.":PRINT
4730 PRINT"TIMINGS ARE IN THE FORM HH.MM.SS WHERE";
4740 PRINT" H = HOURS, M = MINUTES, S = SECONDS";
4750 PRINT"AND CAN BE 'TIME OF DAY' OR TIME-ELAPSED";
4760 PRINT"USING A STOP WATCH.";
4770 PRINT"IT IS BEST TO USE READINGS SEPARATED BY";
4780 PRINT"AS BIG A GAP AS POSSIBLE TO IMPROVE THE";
4790 PRINT"ACCURACY. E.G. HALF HOUR GAPS ON A 3HR";
4800 PRINT"TAPE - 2MIN GAPS ON A C15.";
4810 GOSUB1450:GOSUB1950
4820 PRINT"FOR EXAMPLE, WITH A FOUR DIGIT COUNTER";
4830 PRINT"AND A 4 HOUR VIDEO TAPE THE FOLLOWING";
4840 PRINT"READINGS WERE TAKEN:-":PRINT

```


MICROMART

```

4850 PRINT" TIME 19.31.23 COUNTER 1732"
4860 PRINT" 20.01.18 3194"
4870 PRINT" 20.30.14 4445":PRINT
4880 PRINT"THE TIMES WERE 'TIME OF DAY' AND WERE"
4890 PRINT"NOTED AS THE COUNTER JUST MOVED ON TO A"
4900 PRINT"READING." :PRINT"IF A STOP-WATCH HAD BEEN USED, THE FIRST":
4910 PRINT"TIME WOULD HAVE BEEN 00.00.00 AND THE"
4920 PRINT"SECOND 00.29.55 AND SO ON." :GOSUB1450:GOSUB1950
4930 PRINT"ENTERING THE COUNTER/TIME DETAILS WILL"
4940 PRINT"ADD TO A FILE OF TAPE TYPES THAT CAN BE"
4950 PRINT"EDITED AND SAVED TO DISK OR TAPE FOR"
4960 PRINT"LATER RECALL." :PRINT"ONE OF THE TAPE TYPES IS SELECTED AS THE":
4970 PRINT"CURRENT TYPE WHICH IS THE SUBJECT OF"
4980 PRINT"CALCULATIONS AND TABLE PRINTING."
4990 PRINT"THE TABLE IS USED TO LOOK UP A COUNTER"
5000 PRINT"READING, GIVEN A TIME FROM THE START UP"
5010 PRINT"THE TAPE." :PRINT"A TABLE HAS ROWS OF TEN COUNTERS"
5020 PRINT"READINGS - I.E. ONE READING PER MINUTE"
5030 PRINT"- AND HENCE TEN MINUTES PER ROW."
5040 PRINT"A SIDEWAYS EXTENSION TO THE ROW GIVES"
5050 PRINT"THE COUNTS FOR 15.30 AND 45 SECONDS"
5060 PRINT"WITHIN THAT ROW." :GOSUB1450:GOSUB1950
5070 PRINT" A TYPICAL TABLE LOOKS LIKE THIS - ":PRINT
5080 PRINT"MINS --0 ---1 ---3 ---4 ---5.....":PRINT
5090 PRINT" 0X 0000 0070 0139 0207 0274....."
5100 PRINT" 1X 0650 0722 0843 0903 0962....."
5110 PRINT" 2X 1250 1306 1362 1417 ..... "
5120 PRINT" 3X 1790 1841 1892.....":PRINT
5130 PRINT"SO THAT A READING OF 1892 IS 33 MINUTES"
5140 PRINT"INTO THE TAPE. ALSO, IF ONE ITEM ENDS"
5150 PRINT"AT READING 1306 AND ANOTHER STARTS AT"
5160 PRINT"1692 THERE IS A GAP OF 11 MINUTES." :PRINT
5170 PRINT"THE PRINTER MUST BE SET TO PRINT AT"
5180 PRINT"LEAST 80 CHARACTERS TO A LINE." :GOSUB1450
5190 RETURN
5199 STOP
5200 REM OPEN FILE
5205 FLS="" :DW=DV:IFDV<>DI THEN#020
5210 FLS RW#
5215 OPENIS.DI.15."10":SE=2
5220 ER=0:OPEN2.DV.SE.FLS+FL#
5230 IFDV=DI THENGOSUB8100
5240 IFV<0 THEN RETURN
5245 IF M>63 THEN PRINT#1,"UJ":KEY$="" :GOSUB1450:GOSUB200:RETURN
5250 EM=10:GOSUB1700:KEY$="" RA=:GOSUB1450:KEY$="" :GOSUB8300
5255 ON EX GOTO 8090,0060,0065
5260 EMI$)="REPLACE":FL$="SCR":GOTO 8070
5265 EMI$)="APPEND":FL$="S.A"
5270 EMI$)="CONFIRM ":"EM$(5)" {Y/N}"
5275 EM=5:GOSUB1700:KEY$="" :GOSUB1450
5280 KEY$="" :GOSUB1750:ON EX GOTO 8080,8090,8090
5285 IF FL$<"SCR" THEN 8015
5290 OPENIS.DI.15."80":"FI=CLOSE$:GO100010
5295 ER=-1:RETURN
5300 REM DISK STATUS
5305 IF DV<DI THEN RETURN
5310 ER=0:INPUTE15,M,N,S,T,S
5312 IFM<20THEN RETURN
5318 R=20-CC=9:GOSUB1800:PRINT"ERROR =" :MS
5340 ER=-1
5350 RETURN
5360 REM CLOSE FILE
5370 CLOSE2:IFDV<B THENCLOSE15
5380 RETURN
5390 DATA"0. END"
5400 DATA"1. LOAD TAPE TYPES"
5410 DATA"2. SAVE TAPE TYPES"
5420 DATA"3. ENTER NEW TYPE"
5430 DATA"4. SELECT CURRENT TYPE"
5440 DATA"5. DELETE TAPE TYPE"
5450 DATA"6. PRINT TABLE"
5460 DATA"7. CALCULATE COUNTER"
5470 DATA"8. CALCULATE TIME"
5480 DATA"9. INSTRUCTIONS"
5490 DATA"" :REM 37 SPACES
5500 DATA"-- OUT OF RANGE --"
5510 DATA"-- FORMAT ERROR --"
5520 DATA"UNUSABLE INPUT - RE-TRY? (Y/N)"
5530 DATA"FILE SPACE EXHAUSTED"
5540 DATA"???"
5550 DATA"NO TAPES ON FILE"
5560 DATA"SELECT NUMBER OR"
5570 DATA"MAKE CURRENT TYPE" (Y/N)"
5580 DATA"NO DATA TO SAVE"
5590 DATA"APPEND (A), REPLACE (R) OR"
5600 DATA"NO CURRENT TYPE"
5610 DATA"POSITION PAPER IN PRINTER AND"
5620 DATA"PRINTING"
5630 DATA"LOAD ERROR"
5640 DATA"REPEAT (R) LINE 2 OR"
5650 DATA"LOADING"
5660 DATA"SAVING"
5670 DATA0.140.41.139.227.237.246.76.70.65.02.72.138.72.152.199
5680 DATA10.168.185.10.192.133.69.105.11.192.133.70.32.231.176.104.31
5690 DATA170.104.133.98.134.99.162.144.50.32.73.186.466.71.164.72.0
5700 DATA76.215.187.32.237.246.208.1.24.96.169.0.160.1.32.14.133
5710 DATA192.165.50.166.57.160.0.32.14.192.162.246.154.173.0.192.286
5720 DATA133.20.173.1.192.133.21.32.19.166.144.32.32.197.168.165.120
5730 DATA203.201.63.20.0.250.120.169.255.133.145.88.76.177.167.32.253.35
5740 DATA174.32.138.173.32.247.183.32.19.166.176.6.32.163.192.76.164
5750 DATA227.168.165.20.141.0.192.165.21.141.1.192.120.169.192.141.250
5760 DATA1.3.141.41.3.169.60.141.0.3.169.53.141.40.3.89.0
5770 DATAY6.120.162.3.188.2.192.109.6.192.153.0.3.202.15.244.252
5780 DATA00.96.0.0.0.0.0.0.0.0.0.0.0.0.0.0.254
5790 REM ***** NOTES *****
5800 REM * S1 = RESERVED VARIABLE STATUS
5810 REM * VALUE BECOMES 64 AT END OF FILE
5820 REM *****
5830 REM * MACHINE CODE IS OPTIONAL BUTSIMULATES 'ON ERROR GOTO'
5840 REM * THE STOP KEY CAUSES A BREAK WITH ERROR NO 120

```

A B COMPUTERS AND ELECTRONICS

**173 Thornbury Road,
Isleworth, Middx TW7 4QG
Phone: 01-568 7149**

Tlx: 946240 EARY TO 192008215

- Authorised IBM-PC Compatible dealers for: Business Systems. NEC:- Main unit 128KB main memory: 2 X 720KB disk-drives, including IBM Compatible Card. £1210, and NEC 10MB Main unit: 128KB main memory with 2 X720KB disk-drives £1640 and colour tilt/swivel 14" monitor £540, green tilt/swivel 14" monitor £230.

黃牙黃粉黃

- 20MB IBM Compatible. Made in Taiwan with all-Japanese components, with green taxan monitor, £1500. All IBM and MSDOS software are available.

张其成讲读

- Atari all types including 1040 STM with colour monitor £1148, Atari 520STM with colour monitor £917. Atari 520 with mono monitor £667. Atari disk-drive SF354, £149.25. 3.5" disks at £3.00 each all prices inclusive of VAT.

◆◆◆◆◆

- Commodore 128D, £495. Commodore 64 pack, including cassette-recorder, music-keyboard, colour 1901 monitor, £295 Commodore graph-pad for technical-drawing. (All models) £59.50. Also Commodore Amiga.

普魯士精神

- Acorn BBC Master 128 £450. Dual USF disk-drives. £345, Mouse £79, and all other soft-and hardware available.

◆◆◆◆◆

- Amstrad 8512 £565 Amstrad 8256
£439.

Graphpad for technical drawing, (all models) £127.50, 64k memory expansion unit, 49 pounds.
Graphics light-pen £29.95.
Modem and software £239.95.

- **Monitors:** all types including Philips Colour Monitor. £299. Philips Green monitor £89, Atari colour monitor £399.

書畫藝術

- **Printers:** Epson LK80 £280, Citizen £1200 £199, Juki 5510 £229, Juki 6100 £299, Juki 2200 typewriter/printer £275.

◆◆◆◆◆

Goods are available on mailorder, and American Express cardholders are welcome. Full training and technical support given to our customers.

Repair service
also available

MICROMART

MCS

292 London Rd, Westcliff-on-Sea Essex

ATARI SPECIALIST

1040 STF Mono System Call for PRICE
1040 STF Colour System Call for PRICE
520 STM Systems Call for PRICE
5MM 804 Dotmatrix Printer £199
SH 204 20 Meg Hard Disc £849

EPSON

LX86 NLQ Printer £299
FX85 NLQ 160 CPS Printer £499
FX105 wide 160 CPS Printer £499

**ALL PRICES INCLUDE
VAT AND DELIVERY**



**0702
332554**



BEST UK SOFTWARE PRICES?

Buy from TriSoft Ltd., the specialist software company
formed by microcomputer consultants.
★ Over 400 leading software packages
★ Independent advice in making your choice.
★ Professional staff + network of consultants
★ Most formats. All programs latest versions

**SAGE ACCOUNTANT £325
ACCOUNTANT PLUS £435**

	List Price	Our Price		List Price	Our Price
dBase II	395	245	DMS Delta 4	495	345
Wordstar Prof	399	219	Superproject plus	495	345
Lotus 1-2-3	395	247	Supercalc 3V2.1	360	175
dBase III plus	595	335	MS word	400	265
Framework 2	550	325	Open access	395	235

The prices quoted are for IBM only. For other formats please enquire.
Please phone or write for our comprehensive price list.

PLEASE SEE PAGES 82 and 123 FOR OUR MAIN ADVERTS

TriSoft Ltd

Crown Square, Maltlock, Derbyshire DE4 3AT
Tel: 0529-3021 (6 lines)
Telex: 8950511 ONEONE G

RHYTHM KING

Digital drum machine for
Commodore 64 and
Commodore 128,
cartridge & software only
£39.95

*Phone for more details
and credit card orders.*

SUPERSOFT

Winchester House, Canning Road,
Wealdstone, Harrow, Middx. HA3 7SJ
Telephone: 01-861 1166

PROGRAM FILE



Atari ST Super Breakout

by Robert Shelton

This program was written in Lattice C but should be reasonably easy to convert to other versions that run on the Atari ST. The game itself is mouse-driven and works with a black and white monitor only, although enterprising programmers should be able to get it to run on colour systems.

The source code listing should be typed in and saved onto the compiler disk which should also hold the files OSBIND.H and GEMLIB.H. The program can then be compiled as normal. After compilation the .BIN file should be transferred to the linker disk, which should also have files CLIB.BIN, GEMLIB.BIN and GLIB.BIN. A link control file should be produced,

consisting of the following:

INPUT STARTUP.BIN
INPUT *
LIBRARY CLIB.BIN
LIBRARY GEMLIB.BIN
LIBRARY GLIB.BIN

The program can then be linked using the control file.

To run the program with other C compilers, if the Line-A routines are implemented, then it should only be necessary to change int variables to long variables and short variables to int variables. If the Line-A routines aren't implemented, then it will be necessary to replace the bat and ball drawing routines with ones from the GEM libraries.

```

/* Atari ST - Super Breakout
   For the SM124 Monitor
   By Robert Shelton
*/

#include "osbind.h" /* Include COMPILER */
#include "gemlib.h" /* Libraries off disc */

#define ADDR(a) ((long)a)>>16,((long)a)&0xffff /* Macro for WORD_SET */

short workin[10]={1,1,1,1,1,1,1,1,1,1},workout[57]; /* GEN Variables */
handle,dummy; /* For WORKSTATION */

int mainwindow, scorewindow; /* Window handles */

char *windows[]={ /* Window names */
    { "Super Breakout", "High Scores" } };

char hiscores[11][12]={ /* Hi-score names */
    { "ATARI ST", "ATARI ST", "ATARI ST",
      "ATARI ST", "ATARI ST", "ATARI ST",
      "ATARI ST", "ATARI ST", "ATARI ST",
      "ATARI ST", "ATARI ST" } };

int hiscores[11]={ /* Hi-scores */
    { 500,450,400,350,300,250,200,150,100,50 } };

char characters[]="z04ABCDEF0HIJKLMNOPQRSTUVWXYZ"; /* Characters for
name entry */
char *strings[]={ /* Dialogue box */
    { "Bat Size", "Small", "Large",
      "Lives", "3 Lives", "5 Lives",
      "Start", "End" } };

OBJECT dialogue[]={ /* Dialogue box */
    { -1,1,4,G_BOX,NONE,NORMAL,0x21100,301,52,304,313,
      2,5,5,G_BOX,NONE,NORMAL,0xff1100,30,16,229,36,
      3,6,8,G_BOX,NONE,NORMAL,0xf1100,30,68,229,40,
      4,9,11,G_BOX,NONE,NORMAL,0xf1100,30,132,229,40,
      0,12,13,G_BOX,NONE,NORMAL,0xf1100,30,196,229,40,
      1,-1,-1,G_STRING,NONE,NORMAL,0,50,10,128,16,
      7,-1,-1,G_STRING,NONE,NORMAL,0,70,0,92,16,
      0,-1,-1,G_BUTTON,SELECTABLE|RBUTTON,SELECTED,0,16,24,64,10,
      2,-1,-1,G_BUTTON,SELECTABLE|RBUTTON,NORMAL,0,151,24,64,10,
      10,-1,-1,G_STRING,NONE,NORMAL,0,86,0,56,16,
      11,-1,-1,G_BUTTON,SELECTABLE|RBUTTON,SELECTED,0,16,24,72,10,
      3,-1,-1,G_BUTTON,SELECTABLE|RBUTTON,NORMAL,0,141,24,72,10,
      13,-1,-1,G_BUTTON,SELECTABLE|EXIT|DEFAULT,NORMAL,0,16,16,56,10,
      4,-1,-1,G_BUTTON,SELECTABLE|EXIT|LAST08,NORMAL,0,157,16,56,10
    } };

short box[4],button,cousex,mousey;

short ball[]={0,0,0,1,0, /* Graphic definition */
    0,0x0000,0,0x07e0,0,0x1ff0,0,0x3ffc, /* of the ball shape */
    0,0x3fcc,0,0x7f00,0,0x7f00,0,0x7ede,
    0,0x7f00,0,0x7ffe,0,0x7ffe,0,0x3ffc,
    0,0x3ffc,0,0x1ff0,0,0x07e0,0,0x0000 };

ballsave[0]; /* Buffer for screen */

int numlives, /* Number of lives */
ballspeed,ballsp,ballyp, /* Ball variables */
ballxv,ballyv,ballover,balls,
speed,score,numbricks,redraw,pasa, /* Game variables */
oldxp1,oldyp,oldxp2,oldpw, /* Bat variables */
newxp1,newyp,newxp2,newpw,ewxp,
finished=0, /* Return to desktop */
erase,brickx1,brickx2,brickx3,brickx4; /* Game variables */

char endgame[]="Game Over";
sound[10]={0,0,1,0,7,62,0,16,11,120,12,4,13,0,255,0 };
bricks[10][7];

/* -----

```


MICROMART

100% IBM compatible PC £585 ex VAT

20MB 250K memory, hard drive, double diskette

20MB as above, 1 drive £975

Other models from £485

20MB with Sage financial controller
Only £1,575

Ferranti PC 860 £950

Ferranti PC 860 XT £1,225

Ferranti PC 860 AT £2,898

Bondwell portable

512K memory, 720 disk drive, Fully IBM compatible.

Introductory offer price £945

RAP (£1,250)

Sage Software

Phone for best prices

Disks 40-3 1/2 in Library box £85

VAT and carriage extra

COMPUTER FACILITIES

(A Springall Ltd)
2 Kings Highway, London SE18 2NJ
Tel: 01-854 5313

Amstrad, B.B.C.,

Atari, QL, + +

**** THE UPGRADE ****

The computer pixels are not the same as on the monitor! You need HIGH RESOLUTION to see text and graphics properly.

Chroma 1--£310 plus V.A.T.

Full details from:

Chromagraphica 135, Cliff Road,
Hornsea, N. Humberside.
HU18 1JB

Tel: 04012 4699

TRADE ENQUIRIES WELCOME.

DECCAFAX VIEWDATA PLINTH VP1 COMPLETE PRESTEL PLINTH

Includes 1200/75 Modem, CPU, PSU,
Numeric Keypad and
Monitor Turntable.
Printer, Keyboard and
Cassette Sockets.

Colour monitor output TTL 75 ohm.

New, in Makers original packing

£19.95

Also available VP3 (RS 232)

£15.95

Prices include VAT, add £5 for
carriage

**M.E.M., 166 MANEY HILL ROAD,
SUTTON COLDFIELD, WEST
MIDLANDS, B72 1JW.
TEL 021-354 7375**

PROGRAM FILE

```

setfill(2,8,0); /* Draw countdown box */
drawbox(304,184,336,216);

for(count=0;count<5;count++) /* Countdown */
{
    sprintf(string,"Tid".5-count);
    v_gtext(handle,316,200,string);
    dosound(1,255);
    for(delay=0;delay<32767;delay++);
}

setfill(2,8,1); /* Erase countdown box */
drawbox(304,184,336,216);

a_sprite(ballxp,ballyp,ball,ballsave); /* Draw ball */
ballover=0; speed=1;

while(!ballover) /* Until ball lost */
{
    moveball(); /* Move the ball */
    movebat(); /* Move the bat */
    zbox(37); /* Wait for screen */

    a_color(1); /* Remove bat and ball */
    a_unspr(ballsave);
    a_line(oldspl,oldyp,oldsp2,oldyp);

    if(erase) /* Erase brick? */
    {
        drawbox(brickx1,brickyl,brickx2,brickyl); /* YES */
        erase=0;
    }

    a_color(0); /* Draw bat and ball */
    a_line(newsp1,newyp,newsp2,newyp);
    a_sprite(ballxp,ballyp,ball,ballsave);

    oldxp=newxp; oldsp2=newsp2; oldyp=newyp; /* Update bat */
    oldpw=newpw;
}

a_unspr(ballsave); /* Remove ball */

}

setfill(2,8,0); /* Draw endgame box */
drawbox(276,184,336,216);
v_gtext(handle,286,200,endgame);

for(count=0;count<9;count++) /* Wait */
{
    for(delay=0;delay<32767;delay++);
}

sort(scores); /* Sort scores */
v_show_c(handle);

/* ----- */

moveball() /* Move the ball */
{
    int bricks,brickyl;

    ballxp=ballxp+(ballxv); /* Move ball */
    ballyp=ballyp+(ballyv*speed);

    if(ballxp<24 || ballxp>616) /* Hit sides? */
    {
        ballxv=-ballxv; /* Alter direction */
        dosound(4,128);
    }

    if(ballyp<40) /* Hit top? */
    {
        ballyv=-ballyv; /* Alter direction */
        if(newpw==maxpw) newpw=maxpw/2; /* Shrink bat */
        dosound(10,128);
        ballyp=40;
        pass=0; /* Ball can hit bricks */
    }

    if(ballyp>400) ballover=1; /* Ball lost? */

    if(ballxp<newxp && (ballyp>8)&&newyp) /* Hit bat? */
    {
        if(ballxp>newxp1 && ballxp<newxp2)
        {
            dosound(8,128);
            ballyv=-ballyv;
            if(ballxp<(newxp1+newxp/2)) ballxv=(-1); /* Calculate return */
            if(ballxp<(newxp1+newxp/4)) ballxv=(-2); /* Speed of ball */
            if(ballxp<(newxp1+newxp/3)) ballxv=(-3);
            if(ballxp<(newxp1+newxp/2)) ballxv=-1;
            if(ballxp<(newxp1+3*newxp/4)) ballxv=2;
            if(ballxp<(newxp1+7*newxp/8)) ballxv=3;
            if(redraw) drawbricks(); /* Redraw bricks? */
            pass=0;
        }
    }

    bricks=(ballxp-32)/32; brickyl=(ballyp-88)/16; /* See if hit brick */

    if(!pass && brickyl<6 && brickyl>(-1) && bricks[brickx][brickyl]
        && bricks[10 && bricks>(-1))
    {
        addscore(6-brickyl);

        if(speed==1 && brickyl<4) speed=2; /* Speed brick? */
        if(brickyl<2 && speed==4) speed=3;
        if(brickyl<1) speed=4;

        erase=1;
        brickx1=32+32*bricks; brickx2=brickx1+32; /* Notify routine to */
        brickyl=88+16*brickyl; brickyl2=brickyl+16; /* erase brick */

        numbricks--;
        if(numbricks==0) redraw=1; /* One brick less */
        bricks[brickx][brickyl]=0; /* Redraw? */

        ballyv=(-ballyv);
        pass=1;
    }
}

```


PROGRAM FILE

```

dosound(1+brick*255);
}

/* ----- */

movebat() /* Routine to move bat */
{
    vq_sound(handle,&button,&soundmix,&soundmix); /* Locate sound */
    newyp=newy; /* Scale Y position */
    if(newyp<290) newyp=290;
    if(newyp>390) newyp=390;
    newxp=newx; /* Scale X position */
    if(newxp<24) newxp=24;
    if(newxp>(640-24-newp)) newxp=(640-24-newp);
    newp2=newxp+newp;
}

/* ----- */

drawfield() /* Routine to draw walls */
{
    wind_close(scorewindow); /* Shut windows */
    wind_close(mainwindow);
    v_hide_c(handle);
    setfill(2,0,1); /* Clear screen */
    drawbox(0,0,639,399);
    setfill(2,9,1); /* Draw perimeter */
    drawbox(0,16,640,32);
    drawbox(0,32,16,400);
    drawbox(624,32,640,400);
}

/* ----- */

addscore(x) /* Update score */
int x;
{
    score=score+x; /* Add points */
    printf("%s\b%5d",score); /* Print score */
}

/* ----- */

dosound(tone,length) /* Beep! */
int tone,length;
{
    sound(3)=tone; /* Set tone & length */
    sound(9)=length;
    abios(32,sound); /* Perform sound */
}

/* ----- */

drawbricks() /* Routine to draw bricks */
{
    int x,y;

    for(y=0;y<6;y++) /* Loop to draw bricks */
    {
        setfill(2,y+1,1); /* Set fill pattern */
        for(x=0;x<16;x++)
        {
            drawbox(32+x*32,68+y*16,64+x*32,104+y*16); /* Draw brick */
            bricks[x][y]=1; /* Brick in position */
        }
    }

    redraw=0; numenters=100;
    setfill(2,0,1);
}

/* ----- */

sortscores() /* Routine to sort scores */
{
    int count,position;

    for(position=0;position<10;position++) /* Sort scores into order */
    {
        if(xscore>hscores[position])
        {
            for(count=10;count>position;count--)
            {
                hscores[count]=hscores[count-1];
                movescore(hscores[count-1],hscores[count-1]);
            }
            getname(position); /* If hi-score get name */
            hscore=hscores[position]=score;
            position=10;
        }
    }
}

/* ----- */

getname(name) /* Routine to get name */
int name;
{
    int letter,number,more=0;
    char buffer(2);

    setfill(2,0,0); /* Clear name box */
    drawbox(32,160,600,232);
    setfill(2,0,1);
    drawbox(34,170,600,230);

    vst_effects(handle,0);
    setfill(2,0,0);
    for(number=0;number<28;number++) /* Draw alphabet */
    {
        drawbox(41+number*20,164,58+number*20,216);
        buffer[0]=characters[number];
        buffer[1]=0;
        v_text(handle,46+number*20,200,buffer);
    }

    for(letter=0;letter<11;letter++)
    {
        hscore[name][letter]=0;
    }
}

```

MICROMART

IBM PC RM NIMBUS AMSTRAD
PCW8256 ACORN BBC APRICOT

THE COMPLEAT BUSINESS TUTOR

An 80 page Manual and disc which will help you to master those business topics which are essential ingredients for business success. Written by professionals who have supplied computer based business training packages to over 250 colleges and training organisations, the **Compleat Business Tutor** contains notes, worked and suggested examples with answers and linked menu driven programs which can also be used for many other applications. The Critical Path analysis program for example, will print out a Bar Chart and the full analysis for projects containing up to 100 activities. Topics include:

- * Stock Control Theory
- * Regression & Forecasting
- * Financial Ratio Analysis
- * Depreciation Techniques
- * Stock Valuation Methods
- * Critical PATH Analysis
- * Standard Costing & Variances
- * Discounted Cash Flow
- * Marginal Costing & Break Even
- * Linear Programming

All programs are written in Basic, and contain Hard Copy options using Epson compatible printers.

Send £5.00 inclusive VAT & p.p. (refundable with order) for a sample chapter and disc program to test compatibility and to convince yourself that this is the best business training package available. Please specify micro.

Full price £49.50 inc VAT and p.p. (overseas £49.50 inc s/h)

HARRISON MACEY LTD, 209 SILVER ROAD,
NORWICH NR3 4TL (0603-487597)

DESMET C COMPILER

Lower Prices — More Performance!

DeSmet C Starter

- o Compiler, linker, assembler, librarian and standard function library £85

DeSmet C Programmer

- o Starter Package plus full screen editor and 8087 function library £125

DeSmet C Enhanced

- o Programmer Package plus profiler (IBM and Apricot only) and O88 source level debugger £165

DeSmet C Professional

- o Enhanced Package plus large memory model support (32 bit pointers) £200

Write or ring now for full details. Available for IBM PC XT AT and compatibles, Apricot PC X/86/16 series, Silus/Victor 9000, Sanyo MBC RM Nimbus, Apple Macintosh and others.

DOS Link MS compiler object modules	£45	Linker & lib	£65
IBM Serial port driver	£55	IBM BASIC & type graphics	£40
IBM Hercules graphics routines	£55	IBM Calculator	£30
Apricot GSX driver	£25	Linker & lib	£130

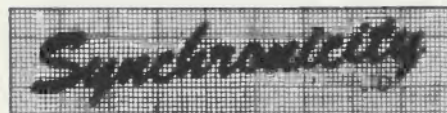
and many other graphics, database, communications, math scientific and general purpose function libraries

mlh
technology

14 Burgamot Lane Comberbach
Cheshire CW9 6PB. Tel: 0606-891146

Prices exclude £5 p&p and VAT

MICROMART



1 SHELTON STREET, LONDON WC2H 9DG

**DATABASE
PROGRAMMING**

**d Base II / d Base III
Informix & C**

Regd. Trademarks: Ashton Tate, RDS Inc.

**FULL ACCOUNTS, STOCK OR
TIME - MAILING - BROKING -
MATCH & RETRIEVE - ETC**

01-240 3118

APPLICATIONS · TRAINING · SUPPORT

SUPPORT · ANALYSIS · PROGRAMMING

ANALYSIS · PROGRAMMING · TRAINING

SQUALLTREE PUBLISHERS

- Promotional material
- Instruction manuals
- Information sheets
- Product sheets
- News letters

**NEW Laser printer
Desktop Publishing**

**For
Information
(0634) 683119**

!!! FREE SOFTWARE !!!

Yes a free copy of TEXTComp with any full copy of TSEasy or TTEasy.

TEXTComp £17.00

This useful utility will calculate the readability of text from its sentence construction and display the number of lines and words used.

TSEasy £37.00

This powerful typesetting utility can typeset text from any good Word Processor or Text Editor. Here are two of its user-controlled features:

- Auto-Hyphen: automatically uses a hyphen in a long word at the end of a sentence.
- Adjustable column width from 30 to 80 columns.

TTEasy £27.00

This easy to use Touch-Typing Tutor will gradually take you from typing with two fingers to typing with both hands, without looking at the keyboard. It prints a picture of the keyboard on the screen, and a sentence from one of four exercises for you to copy, as you touch a key it will flash on the screen.

All these programs are very easy to use and require no knowledge of DOS! A demonstration disk is available containing all three programs for £5.

All prices include VAT/P&P in EUROPE

*** For IBM PC or compatible only. ***

D.P.H. COMPUTING CONSULTANTS

38 Willowtree Road,
Altrincham, Cheshire, WA14 2EB.
Telephone: (061) 941-1680

PROGRAM FILE

```
drawbox(272,240,368,272); /* Draw name box */
vst_effects(handle,0);
v_show_c(handle,0);
letter=0;

while(!score) /* Enter name */
{ /* Wait for no button */
    while(button!=0)
    {
        vq_mouse(handle,&button,&mousex,&mousey);
        while(mousex<41 || mousex>598 || mousey<184 || mousey>216 || button!=1)
        {
            vq_mouse(handle,&button,&mousex,&mousey);
        }

        number=(mousex-41)/20;

        if(letter<10 && number!=0 && number!=2) /* Add letter to name */
        {
            buffer[0]=characters[number];
            buffer[1]=0;
            v_gtext(handle,281+letter*0.264,buffer);
            hiscores[name][letter]=characters[number];
            letter++;
        }

        if(!letter && number==0) /* Delete letter */
        {
            buffer[0]=32; buffer[1]=0;
            v_gtext(handle,272+letter*0.264,buffer);
            hiscores[name][letter]=32;
            letter--;
        }

        if(number==27) /* End name */
        {
            score=1;
        }

        while(button!=0) /* Wait for no button */
        {
            vq_mouse(handle,&button,&mousex,&mousey);
        }
        v_hide_c(handle);
    }

    /* ----- */

    setfill(x,y,z) /* Routine to set fills */
    int x,y,z;
    {
        vsf_interior(handle,x);
        vsf_style(handle,y);
        vsf_color(handle,z);
    }

    /* ----- */

    drawbox(x1,y1,x2,y2) /* Routine to draw box */
    int x1,y1,x2,y2;
    {
        box[0]=x1; box[1]=y1;
        box[2]=x2; box[3]=y2;
        v_bar(handle,box);
    }

    /* ----- */

    clearmain() /* Routine to clear */
    { /* main window */
        setfill(2,0,0);
        drawbox(17,36,622,382);
    }

    /* ----- */

    clearscore() /* Routine to clear */
    { /* hi-score window */
        setfill(2,0,0);
        drawbox(34,83,265,317);
    }

    /* ----- */

    drawscores() /* Routine to print */
    { /* high scores */
        int count;
        char buffer[256];

        for(count=0;count<10;count++)
        {
            sprintf(buffer,"%16s %04d",hiscores[count],hiscores[count]);

            if(count==0) vst_effects(handle,1);
            else vst_effects(handle,0);

            v_gtext(handle,59,120+count*16,buffer);

            sprintf(buffer,"%16s %04d","Previous score",score);
            v_gtext(handle,59,296,buffer);
        }

        /* ----- */

        prepare_forms() /* Routine to prepare */
        { /* dialogue box for use */
            dialogue[5].ob_spec=(long)windows[0];
            dialogue[6].ob_spec=(long)strings[0];
            dialogue[7].ob_spec=(long)strings[1];
            dialogue[8].ob_spec=(long)strings[2];
            dialogue[9].ob_spec=(long)strings[3];
            dialogue[10].ob_spec=(long)strings[4];
            dialogue[11].ob_spec=(long)strings[5];
            dialogue[12].ob_spec=(long)strings[6];
            dialogue[13].ob_spec=(long)strings[7];
        }
    }
}
```


PROGRAM FILE



Memotech MTX PANEL Fill Amendment by Harrie Wijnands

This listing gives some changes and refer to that for instructions and use. improvements to the utility published The marked portions of the listing in 'Program File', PCW June. Please are the important changes.

```
10 CODE
4007 IMPFIL: LD DE,#FAF0      ;point to where we are
4008 LD (#FAF2),DE           ;change stack limit
4009 LD (#FAF6),DE           ;change panel expand bytes
4012 LD HL,FILL ;point to the start
4015 LD BC,#29 ;how many bytes to move
4018 LDIR ;move them !
401A LD A,#C3 ;set up jump to fill
401C LD (#FA9E),A
401F RET
4020 FILL: LD A,(#FD7D) ;was the last character a "F" ?
4023 CP "F"
4025 RET NZ ;if not return
4026 RST 28 ;print "Fill" and get bytes
4027 DB #AB
4028 DB "Fill",#EC ;last byte has bit 7 set
402C PUSH BC ;save the start address on stack
402D RST 28 ;print "To" and get bytes
402E DB #AB
402F DB "T",#EF ;last byte has bit 7 set
4031 PUSH BC ;save the end address on stack
4032 RST 28 ;print "With" and get byte
4033 DB #AB
4034 DB "With",#EB ;last byte has bit 7 set
4038 LD A,C ;fetch the byte into A
4039 POP HL ;get the end address
403A POP DE ;get the start address
403B AND A ;clear carry flag
403C SBC HL,DE ;calculate how many bytes
403E RET C ;don't fill if end address below start address
403F LD (DE),A ;fill the first byte
4040 RET Z ;only one byte to fill if zero length
4041 LD B,H ;set up length in BC
4042 LD C,L
4043 LD H,D ;set up start address in HL
4044 LD L,E
4045 INC DE ;point to the next byte with DE
4046 LDIR ;fill the rest
4048 RET
```

Symbols:
FILL 4020 IMPFIL 4007



Commodore 64 OLD Routine

by Andy Lunness

This short program provides an OLD it. If you accidentally delete a prog- command to recover Basic programs ram, type SYS 49152 and it should once they have been accidentally reappear. NEWed. To use it, load it in and run

```
10 X=49152
20 READ A:IFA=-1 THEN 1000
30 POKE X,A:X=X+1:GOTO 20
40 DATA 165,43,164,44,133,34,132,35,166
50 DATA 3,200,122,34,208,251,200,152,24
60 DATA 101,34,160,0,145,43,165,35,105
70 DATA 0,200,145,43,136,162,3,230,34
80 DATA 208,2,230,35,172,34,208,244,20
90 DATA 208,243,165,34,105,02,133,45
100 DATA 165,35,105,0,133,46,96,-1
1000 PRINT"TYPE SYS 49152 TO RECOVER
A BASIC PROGRAM."
```

MICROMART

COMPETITIVE COMPUTER SUPPLIES

TOP BRANDS - LOWEST PRICES

SAME DAY DESPATCH - Panic Deliveries within M25 area

		Prices per box (£)		
		1-4	5-9	10+
5.25" DISKS	Bored 10's			
Datalife 525	S/Size D Dens	12.50	12.25	12.00
Datalife 550	D/Size D Dens	15.75	15.50	15.25
Datalife 557	D/Size Q Dens	20.95	19.95	19.45
Datalife HD	D/Size H Dens	34.95	34.00	32.95
Dysan 104/1D	S/Size D Dens	14.50	14.00	13.50
Dysan 104/2D	D/Size D Dens	10.75	10.25	10.00
Dysan 204/2D	D/Size Q Dens	24.75	24.25	23.50
Dysan UHR 110/2D	H/Size H Dens	38.45	37.55	36.50
5.25" DISK BOXES & ACCESSORIES		1-4	5-9	10+
Rexel Lockable Box 40 Cap		13.35	12.95	12.50
Rexel Lockable Box 80 Cap		16.30	15.75	15.20
5.25" Head Clean Kit with fluid		14.90	14.50	14.00
Disk Mailers, strong board (10)		5.20	4.70	4.25
Disk Labels 5 colours (per 100)		5.50	5.00	4.50
PAPER & LABELS		1-4	5-9	10+
11" x 9.5" 1 pt 60g 2000 sheets		11.00	10.50	10.00
11" x 9.5" 1 pt 70g 2000 sheets		12.00	11.50	11.00
11" x 9.5" 2 pt MCR 1000 sheets		18.00	17.40	16.80
89mm x 36.1 on web 2000		11.05	10.55	10.05
102mm x 36.1 on web 2000		12.00	11.45	10.90
102mm x 36.2 on web 2000 9.5"		11.05	10.55	10.05
102mm x 49.2 on web 2000 9.5"		12.00	11.45	10.90
FABRIC RIBBONS (per Ribbon)		3+	12+	36+
Anadex 9500/9600	262	5.30	4.90	4.55
Brother HR15	224	2.85	2.60	2.45
Canon PW1156/1080	223	2.75	2.55	2.35
Centronics 150/152	328	2.15	2.00	1.85
Diablo Hytype II	205	2.20	2.05	1.90
Epson LX80	454	2.50	2.30	2.15
Epson MX/RX/FX 80	273	2.70	2.45	2.30
Epson 100 Series	320	3.75	3.45	3.20
Epson LQ1500	409	4.00	3.65	3.40
Mannesman				
MT100/110	351	3.75	3.45	3.20
OKI M80/824/83A	66	1.05	.95	.90
OKI Microline 84	87	2.70	2.50	2.30
Taxan Kaga KP810	223	2.75	2.54	2.35
MULTISTRIKE				
RIBBONS (Per Ribbon)		6+	12+	36+
Brother HR1	562MS	2.30	2.10	1.95
Brother HR15/25	696MS	2.05	2.05	2.45
Diablo Hytype II	567MS	1.70	1.60	1.45
Juki 6100	562MS	2.30	2.10	1.95
Dume Sprint I	570MS	1.35	1.25	1.15
Dume Sprint IV	664MS	2.25	2.05	1.95
Dume Letterpro 20	665HM	1.40	1.30	1.20
Ricoh 1300/1600	691MS	1.80	1.65	1.55
ADD CARRIAGE WHEN VAT AT 15.00%				
Postage per Order - Disks		2.50	2.00	2.50
Postage per Order - Disk				
Boxes		2.50	3.50	4.50
Postage per Order - Ribbons		1.50	3.00	5.00
Carriage per box - Paper		3.50	CALL	CALL
Carriage per box - Labels		2.00	CALL	CALL

Contact us for Disks, Printer Stands & Acoustic Hoods

Telephone your order - anytime

0689 39319

COMPETITIVE COMPUTER

SUPPLIES

FREEPOST ORPINGTON

KENT BR6 9BR

WHATEVER YOU WANT TO BUY... GIVE COMPETITIVE A TRY

WIN SHARES IN A GOLDMINE! WHEN YOU BUY 3M DISKETTES



Write or telephone for the best 3M prices and you will receive one entry form for every 10-box of 3M diskettes you order from

CAROUSEL TAPES
3 PARK PARADE
STONEHOUSE
GLOS GL10 2DB
Tel 045382-2151

Closing date for entries
30 September 1986

MICROMART

MICROMART

MICROMART

BS-MAIL

MAILING LIST SOFTWARE £130
KEEP YOUR OWN MAILING LIST WITH
THE VERSATILE BS-MAIL SOFTWARE

- Up to 90000 address capacity
- Up to 99 contacts for each company address
- Automatic check for duplicates
- 5 classifications for each addressee
- Print on labels or use for mailmerge letters
- Instant printouts — no waiting whilst your computer sorts
- Printout order by County/Post Town or Postcode
- Colour or Mono monitor
- Sample disk available

For Details Contact:

BECK SYSTEMS
148 POTASH ROAD
BILLERICAY, ESSEX, CM11 1HQ
02774 3156



COMPUTER AIDED DESIGN

You Can Afford It With ACURITE

We can provide:

Technical computing expertise and engineering design — all integrated in an innovative and disciplined environment.

Computer Aided Design (CAD) experience, linked with extensive technical knowledge can help you to fulfill the increasing demands of current technological developments.

Technical software and hardware support are backed up by on-site training. We would be happy to provide you with your own CAD set-up or the services of our in-house, highly competitive system on an hourly rate basis.

We cater for all aspects of Engineering design, including printed circuit and artwork, producing high quality, accurate and detailed drawings for Architectural and Construction Engineering, Building Contractors and Manufacturing Industries.

Also Business Software, Word Processing, Data Management, Spreadsheets, Bar Charts and Multi-Colour Presentations.

If you are thinking about increasing your efficiency, or quality of design — DON'T BE SHY — contact us for a price you can afford.

Contact Dr. Leo Aldeen on Bentley (0420) 23686
Acurite Ltd., Westport House, Bentley, Farnham,
GU10 5HY.

ACCOUNTS + PAYROLL

For Commodore 64, 128,
8000 Series
and Plus 4

Very comprehensive but easy
to use.

Available on 21 days approval.

Also contract programming

ELECTRONIC AIDS (Tewkes) Ltd

62 High Street,
Evesham, Worcs. WR11 4HG
Telephone: 0386 49339

THE BEST PRICES IN THE MARKET AND EXCELLENT SERVICE ON THE FOLLOWING.

Computers

Amstrad, Sanyo, BBC, Atari, Olivetti,
Kaypro

Printers

Epson, Juki, Taxan, Canon, Brother

Monitors

Phillips, Taxan, Mitsubishi

PHONE 01-803 7074
and 01-807 7577

Amson Computing
6 Rays Road, Edmonton
London N18 2NX

hi density for 3M diskettes

20 Dibden Lodge Close,
Hythe, Southampton, SO4 6AY

5.25" (boxes of 10)	£
744D-O SSD48tpi	15.00
745-O DSD48tpi	17.00
746-O SSD96tpi	20.00
747-O DSD96tpi	22.00
3.5" (boxes of 10)	
SS 96tpi	28.00
DS 96tpi	36.00

UK Carriage £1 per Order
Overseas Carriage at Cost

All prices Exclude V.A.T.

CAREY ELECTRONICS computing and communications

MICRO COMPUTER SYSTEMS AND WORD PROCESSORS

HELP! for the Smaller Business — Whatever your requirements — From a 13 Amp plug to a Word-Processor or a complete Microcomputer System, we are able to supply suitable equipment from the following Manufacturers:

ACORN AMSTRAD APRICOT ROBOCOM
EPSON I.B.M. SANYO TORCH
Installation Service Available

To Expand or improve your existing system we can supply:
MONITORS PRINTERS PRINTER BUFFERS
PLOTTERS MODEMS DISK DRIVES

We are also able to advise on suitable equipment for:
ELECTRONIC MAIL SYSTEMS and VIEWDATA
(Prestel) for TRAVEL AGENTS —
FARMERS — STOCK-BROKERS etc.

It's AFTER the SALE, that SERVICE counts!!

Free Delivery U.K. Mainland.

We can be contacted on:-
Friston-on-Sea (02556) 6993 (9am to 9pm)
Telecom Gold (DealerLink) 72: DTB 10177
Prestel Mailbox: 919 993 903

Telex: 265871 MONREF G (Quoting Ref. 72:DTB 10177)

Acorn, Amstrad, Apricot, Epson, IBM, Prestel,
Sanyo and Torch are all Registered Trade Marks. Robocom

COMPUTER EXCHANGE

A better way to buy or sell used computer
equipment.

We are a National Used Computer Agency who
bring together buyers and sellers of all types of
computers and peripherals.

We deal with personal and business machines,
including, Apricot, IBM, DEC, Epson, Apple
and the BBC.

There is no charge without sale and then only a
modest 10% of the selling price. If you are
looking for a particular type of machine that is
not currently on offer we will include you on our
lists at no charge. Send s.a.e. for current list.

5A THE BALCONY, QUEENS ARCADE
LEEDS LS1 6LF

Or ask for John White on 0532 435583
Callers at our shop premises in Leeds City Centre
are welcome 9am to 5.30pm Monday to Friday

USED COMPUTER AGENCY



CAN YOU TAKE THE PRESSURE?

COULD YOU MAKE A MILLION?

CAN YOU AVOID BANKRUPTCY?

THE TRADE

A FAST MOVING BUSINESS GAME
FOR UP TO 4 PLAYERS, WHERE

BUYING AND SELLING
COMMODITIES CAN MAKE OR
BREAK YOUR FORTUNE -
THE TRADE PLAY IT AND
TAKE THE RISK.

IBM PC + COMPATIBLES
GREENCO, THE WILLOWS
BALSALL STREET, BALSALL COMMON,
WARWICKSHIRE CV7 7AS
TELEPHONE: (0676) 33395

£20
INCLUDES
POSTAGE &
PACKING

UCSD p-System User Group

USUS(UK) the user group
for p-System users

Regular Newsletter.
Extensive software library
containing over 30 volumes
of source code
Biannual conference.

for more information contact:
Membership Secretary
P.O. Box 448
Chelmsford
Essex CM2 8QB

MICROMART MICROMART MICROMART

DUST COVERS (MADE OF PROOFED NYLON)

OLIVETTI M24 dust covers

Monoscreen	£8.50
Colourscreen	£9.50

IBM

IBM PC	£8.50
IBM AT	£9.50

APRICOT dust covers

Apricot XEN with 10" monitor	£8.50
Apricot PC or Xi with 9" monitor	£7.00
Apricot PC or Xi with 12" monitor	£8.50
Apricot XEN with 12" green monitor	£8.50
Apricot XEN with 12" white monitor	£8.50

ATARI 1040

Monoscreen	£7.50
Colourscreen	£8.50

Including free cover for Mouse

LARGE RANGE OF COVERS FOR OTHER BUSINESS MACHINES ALSO AVAILABLE. PLEASE ENQUIRE

Matching covers for Printers

Large range of printer covers also available which match the computer covers, e.g. Brother Canon, Epson, Juki, Olivetti, Riceman, etc. From £4.50

BBD COMPUTER DUST COVERS

The Standish Centre,
Cross Street, Standish, Wigan, WNG 0HQ.
Tel: (0257) 422968 Trade enquiries welcome

ASHDALE COMPUTERS

WOKINGHAM OFFICE 0734 793907
LONDON OFFICE 01-368 6250

PERIPHERALS FOR IBM/XT AT AND COMPATIBLES

Hard Disk drive upgrades PC/XT,
AT and Compatibles (internals)

20mb-BC/XT	£395
14mb-BC/XT	£775
20mb-AT (without controller)	£285

IBM PC/XT COMPATIBLE INTERFACE CARD

Multifunction cards with 0K ram	£99
Multifunction card with 384k ram	£149
Colour graphic card (Japanese)	£79
Monochrome graphics card (Japanese)	£99

Ram chips 54k (9 chips) 150NS	£9
128K Piggyback (9 chips) 150NS 4AT	£35
256K (9 chips) 150NS	£29
ALSO Memory cards	CALL FOR PRICE

Prices Exclusive of CARRIAGE AND V.A.T.

SEX PROBLEMS?

Solve all your RS232 sex problems with our universal cable. Plug and socket at both ends of the one metre cable.

Price £25

PRINTER CONNECTION PROBLEM?

SOLUTION 1

CONVERTER: SERIAL TO PARALLEL £59.95
(inc VAT, p&p)

For owners of computers with RS232 outputs who wish to drive centronics printers. Add £25 for additional ways

SOLUTION 2

DATA SWITCH: 4-WAY SERIAL £59.95
(inc VAT, p&p)

For owners of computers with RS232 outputs who wish to talk to four different devices without swapping leads

SOLUTION 3

DATA SWITCH: 2-WAY PARALLEL £59.95
(inc VAT, p&p)

For computer owners who wish to drive more than one centronics printer. Add £25 for additional ways. Reverse also possible at same price.

SOLUTION 5

CONVERTER: PARALLEL TO SERIAL £59.95
(inc VAT, p&p)

For owners of computers with centronics outputs who wish to drive serial printers. Add £25 for additional ways.

Please enquire about our range of software for the NewBrain and also our low-cost Computer Cables. All the above prices include VAT, postage and packing in EUROPE. For other solutions, watch this space, or contact us at:

TYEPRO LIMITED
30 Camplin Road, CAMBRIDGE CB4 2NG
Tel: 0223 322394 (24 hour service)



DISCS -- DISCS -- DISCS -- DISCS BRITAINS LOWEST PRICES NOW EVEN LOWER

FOR
FULLY CERTIFIED & GUARANTEED
COMPUTER DISKS
MONEY BACK IF NOT SATISFIED
FREE DELIVERY

PRICES PER DISK EXCLUDING VAT

	10	50	100	500
5 1/4" SSDD	0.69	0.65	0.57	0.55
5 1/4" DSDD	0.75	0.70	0.62	0.59
5 1/4" DSDD	0.99	0.95	0.85	0.79
3 1/2" SSDD	1.79	1.60	1.49	1.39
3 1/2" DSDD	1.99	1.85	1.79	1.69
3" CF2	2.99	2.69	2.55	2.50
3" CF2DD	4.99	4.80	4.65	4.59

ALL DISKS HAVE HUB RINGS SLEEVES & LABELS. 3" DISKS BRANDED. LARGE QTY DISCOUNTS AVAILABLE. PLEASE DO NOT FORGET TO ADD 15% VAT CHEQUES/P.O. TO

CASSETTE SHOP

29 DENMARK STREET, BRISTOL AVON

BS1 5DQ TEL: 0272 846218

GOVT & EDUCATIONAL AUTHORITIES
ORDERS WELCOME

DISK COPYING/FORMATTING/ FILE TRANSFER

WE CAN TRANSFER YOUR DATA BETWEEN
OVER 1000 DIFFERENT MICROS, MINIS AND
MAINFRAMES VIA FLOPPY DISK OR
MAGNETIC TAPE.

FORMATS INCLUDE:

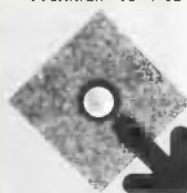
CPM, CPM86, MSDOS, PCDOS, UNIX, XENIX,
IDRIS, TAR, RT11, MDOS, IBM BEF, ISIS,
FLEX, OS9, VICTOR-SIRIUS, TORCH, ACORN,
AMSTRAD, APPLE, MISC. TYPESETTING/
WORD PROCESSING

*OVERNIGHT SERVICE - most formats returned by
next day's Post

*£10.00 + VAT per copy

(Blank disks not included)

*DISCOUNT for BULK



**A.L. DOWNLOADING
SERVICES**

166 PORTOBELLO ROAD

LONDON W11 2EB

TELEPHONE 01-727 8722

TECHNO TYPE

Technotype have now developed an
easy to understand program, called
Techset, to allow you to typeset on
your WP. You can produce any type of
setting, from Ads to Books at very low
prices. Techset can be used on most WPs
and can be learnt in a very short time.

We offer full training on the Amstrad
8256 - using Techset.

At Technotype we have a range of
over 500 typefaces and facilities for
reading hundreds of different types
of floppy discs.

For more information contact us at:
Technotype Ltd, 17-18 Floral Street,
London WC2E 9DS. Tel: 836 9922/3.

STOCK CLEARANCE

- ★ ITT EXTRA SINGLE DRIVE
- ★ HITACHI KEYBOARD
- ★ HITACHI MPE 16002
- ★ 2MITACHE MONITORS
- ★ 2 DISKS 5 1/4"

OFFERS INVITED

PHONE 0245 359955
General Gurantee Company,
Friars House,
6 Parkway,
Chelmsford CM2 0YS

BOUGHT YOUR MICRO? LEARN HOW TO REALLY USE IT

BRUNDEAN LTD

Have a range of self instruction
courses in computer languages
including source code disks.
The courses sell for £25 each.
The languages covered include
Pascal Fortran and C.

For more information contact:

01-675 1105
JACOBS WELL MUSE
GEORGE STREET,
LONDON W.1.

AMSTRAD DEALS

PCW8256 £389+VAT PCW8512 £489+VAT

10% OFF ALL PCW 8256 SOFTWARE e.g.

Sage Accounts£89.99

Sage Plus£134.99

Sage Super Combo179.99

Sage Database£62.99

Wordstar.....£44.99

Supercalc.....£44.99

Chit Chat E/Mail.....£62.99

Chit Chat View Data.....£62.99

AMSTRAD TRAINING — Locoscript, Accounts,
Database, etc from £35+VAT per day

OTHER P.C. DEALS

IBM Compatibles from £499+VAT

Good discounts on P.C. Software

— ring for details

P.C. Training Courses from £55+VAT per day

JOSIE TURNER BUSINESS CENTRE LTD
15 SOUTHGATE PRECINCT
SLEAFORD, Lincs, NG34 7PD
Tel 0529 304622 (24 hours)



PC SOFTWARE: OVER

50% DISCOUNT!

WHY PAY MORE?

WORDSTAR 2000	215 RRP	465 -53%!
MULTIMATE ADV	235 RRP	495 -52%!
SMART	375 RRP	695 -46%!
WORDSTAR PRO	215 RRP	399 -46%!
WORDSTAR 2000 PLUS	299 RRP	549 -45%!
DBASE III PLUS	330 RRP	595 -44%!
XCHANGE	275 RRP	495 -44%!
FRAMEWORK II	320 RRP	550 -41%!
SUPERCALC 4	235 RRP	396 -40%!
DBASE II	237 RRP	395 -40%!
LOTUS 1-2-3	242 RRP	395 -38%!
SYMPHONY	340 RRP	550 -38%!
WORD PERFECT	269 RRP	425 -36%!
JAVELIN	386 RRP	595 -35%!
CLIPPER	422 RRP	650 -35%!
VOLKSWRITER 3	211 RRP	325 -35%!
DB COMPILER	310 RRP	463 -33%!
WORD	265 RRP	400 -33%!
OPEN ACCESS	275 RRP	395 -30%!
WORDCRAFT	332 RRP	475 -30%!
TOTAL PROJ MANAGER	276 RRP	395 -30%!
CBASIC COMPILER	276 RRP	395 -30%!
QUADBOARD 384K	290 RRP	398 -27%!
DATAEASE	POA NOW AVAILABLE!	
DATABASE MANAGER 2	180 RRP	245 -26%!
MILESTONE	168 RRP	225 -25%!
HERCULES COLOUR	98 RRP	128 -23%!
HERCULES MONO	159 RRP	199 -20%!
CLIP	102 RRP	120 -15%!

- Most popular business micros supported!
 - Fast delivery!
 - Quantity discounts!
 - Credit accounts available!
 - Government & overseas orders welcomed!
 - Customised software & consultancy service!
- (IBM-PC prices shown exclude VAT and are correct at time of going to press)

Call us NOW on 0480 53044 for further details!

Call us NOW on 0480 413122 and save money!

Elite Computer Systems

UNIT 2 · HALCYON COURT · ST MARGARET'S WAY
HUNTINGDON · CAMBS PE18 6DG

The Superlative BLOPROM-RS

- ★ For micros with an RS 232 port.
- ★ Fully intelligent uP based unit.
- ★ Baud rates: 300, 1200, 2400, 4800, 9600.
- ★ EPROM types: 2516-32-64, 2716-32-64-128-256-512, 513, 2732A-64A-128A
- ★ Functions: CHECK, READ, BLOW, VERIFY, CRC (RAM/EPROM)
- ★ Programming modes: SMART, FAST and EXTRA FAST

Special Features:

- ★ Reverse device protection
- ★ System activity indicator LED
- ★ Safe break Panic Button
- ★ 110V/60Hz option

£189.⁹⁵



The price is the surprise
incl. cable and disc (choice) for IBM-PC, BBC, Apple, QL, Spectrum

User Notes incl. short Microsoft Basic prog. for screen prompts etc.
Dhobi-1 Mains operated EPROM eraser £18.95
Dhobi-2 as Dhobi-1, but with automatic timer £22.95

More! CAMEL PRODUCTS More!

BB-PROM 29.95 • Q-PROM 69.95 • Q-CART 5.95 • Q-CENT 26.04 • BB-CENT CABLE 8.65 • PROM-64 34.75 • 64-CART 5.95 • ROM-SP 29.95 • PROMER-SP 29.95 • PROMER-81S 24.95 • BLOPROM-SP 89.95 • CRAMIC-SP 89.95 • PRINT-SP 31.25 • POLYPRINT 44.95 • PIO-SP 18.50 • NIKE SP/AT81 17.35 • MEMIC-81 29.95 • PROMER-81 24.95 • PIO-81 14.95

★ NEW ★

QE-32 replacement ROM for Q-PROM/27256. £14.95 •
★ BB PROM32 for 27256 pgm/g on BBC £29.95

U.K. 15% VAT extra, P&P free. Europe p&p 5%. Overseas P&P + 10%, no VAT

Cambridge Microelectronics Ltd.

One Milton Rd.,

CAMBRIDGE CB4 1UY.

TEL: (0223) 314814

TLX: 81574 CML

CML is a MAPCON Approved Consultancy.

We convert your ideas into products, ON SCHEDULE, ON BUDGET, ON TIME.

PROTECT YOUR COMPUTER AGAINST SPIKES AND POWER SURGES

FOR JUST £48 INCLUDING P&P AND VAT

BY USING **FILTAN** SPIKE SUPPRESSOR AND R F FILTER

A small price to pay to safeguard your valuable data and expensive equipment - also used for telex and telephone systems worldwide.

- High Energy Absorption
- Instantaneous Response
- R.F. Filtering
- Plug in/plug out no hard wiring



MANY SATISFIED CUSTOMERS

Send a cheque or phone your Access/Barclaycard No. to Kevin Hepburn on 0462-36111



CROTAN ELECTRONICS LTD

New Bridge House 33 Wilbury Way,
Hitchin, Herts. SG4 0TW England
Tel: (0462) 36111 Telex: 825244
Cable: Stable Hitchin

TRANSACTION FILE

Your chance to buy, sell or swap equipment.

AND ONE

● **PERSONAL COMPUTER WORLD.** Complete October '81 to April '86. Approx 55 copies. Also complete runs 'Popular Computer Weekly', 'Personal Computer News', 'Your Computer'. Sell/exchange WHY. Farnborough (Kent) 55444.

● **AMSTRAD PCW 8256.** Unused with Wordstar, ten unused discs, plus literature. £400 inclusive. Would exchange for good electronic typewriter, N C Briggs, Auehnbrack, Tynron, Thornhill, Dumfriesshire DG3 4LF.

● **IBM PC/XT. 512Kb.** Enhanced colour monitor. 10Mb H/disk, 360Kb floppy, monochrome, and printer card. Software: Multiplan, DBase 2, Supercalc, Basic A, Wordstar, DOS2 and more. £1500 ono. (Hertford) 54830 (Eves).

● **PORTABLE IBM COMPATIBLE.** Quadram/Datavue 25. 1.4Mbytes, 1x5 1/4" 360K, RAM disk, Backlit LCD, battery. 6 mths old with new Quadmodern. Total cost £2,650. Sell for £1750. Owner going abroad. Tel: (01) 340 0376 Denis.

● **SANYO MBC 555-S.** RS232C, 256K RAM upgrade, MSDOS 2.11. Full range of software. Six months old. Philips monitor, Daisywheel printer. Complete £900 or will divide. (Eves) (0734) 775303.

● **APPLE II+.** Original software with manuals: Metacrafts Forth, Applesoft compiler. £38 each. Graphics Magician, Audex sound editor, pinball construction set, flight simulator. £14 each. Games £4. Tel: (0969) 23462 (Eves).

● **EPSON ZX10 and EPSON FX-80 printer.** Twin 320K disk drives, CP/M, Basic, Wordpro, spread sheet and manuals. Hardly used. Private sale. Offers Tel: (01) 337 5663 after 6.30pm.

● **AMSTRAD 464.** Green screen monitor, disc drive, joystick, word processor and over £200 of software. Sell

for only £225. Tel: (05827) 69152.

● **DAISY WHEEL PRINTER TRIUMPH ADLER TRD170S.** 17 CPS, 132 column width. Single sheet or continuous stationery, in as new condition. Cost over £600, will accept £350. Tel: (0734) 478274 (Eves).

● **PRINTER BUFFER ACULAB.** 64K serial or parallel input and output. Bypass and output hold buttons. As new condition. Cost over £300. Will accept £150. Tel: (0734) 478278 (Eves).

● **ACT SIRIUS MEMORY EXPANSION BOARD 128K.** Can be further expanded to 512K by addition of chips only. Cost £200. Will accept £85. Tel: (0734) 478274 (Eves).

● **CIFER PORTABLE. 64K.** CP/M 2.2. 2 x 800K 5 1/4" d/ drives and 9" green monitor built in. Wordstar, Supercalc 2, etc. Software, carrying case, manuals, spare discs. £600 o.n.o. (Dover) (0304) 205964 Eves.

● **APPLE IIe.** Detached keyboard, 2 d/drives, 80 column + 64K card, RGB video, available 19" rack mounted, software, manuals. £650 ono. Tel: (01) 200 9222 (anytime).

● **APPLE II+.** Detached keyboard, £250, twin disk drives plus card £150. RGB video £50, or £400 the lot plus manuals and software. Tel: (01) 200 9222 (anytime).

● **SC84 CP/M COMPUTER BUILT ON EUROCARDS.** In 19 inch cased frame with twin 80T disc drives, complete with monitor, Centronics printer and software. £450. Contact Phil on (021) 429 4621 Eves and w/es.

● **COMMODORE MODEL 1520 PRINTER PLOTTER.** Brand new and unused £55. Old type C2N £7. Tel: (01) 749 1454.

● **BBCB/TORCH Z80 small business computer.** 800K disk drive and monitor plus perfect business software. £600. EPSON RX-80 F/T Dot-

Matrix printer. As new £180. Tel: Durham (0385) 62357.

● **APRICOT P.C. 256 K RAM, 2 x 315K drives. 9" high-res monitor.** Supercalc, Superwriter, Superplaner, MS-DOS, Basic, Graphics, manuals, Wordstar, cables. Fourteen months old. Hardly used. Perfect condition. £975. Tel: (01) 908 4631. Could deliver.

● **IBM-XT. 256K RAM, 10Mb hard disk, 360K floppy, PC-DOS.** Intelligence research, high speed board with utility software. £800. Tel: (Woking) 67920.

● **IBM-XT. 256K RAM, 10 Mb hard disk, 360K floppy.** Software: Wordstar, Cardbox, Pluxplan, PC-DOS. £800. Tel: (Woking) 67920.

● **THREE GOOD ICL 6402 TERMINALS FOR SALE.** All unused, 80 column mono, compatible with almost everything, keyboards included. Cost £480 each. Best offer. Craigie, (0993) 850030, Eves.

● **ATARI 520ST.** Complete package, monochrome monitor, 1 megabyte diskdrive, keyboard, mouse, wordprocessors, database and game. Worth £860. Sell for £760 ono. Tel: (Huddersfield) 546756. Note the package includes a 1 megabyte diskdrive.

● **SEVERAL BBC OS1.2.** As new, £170. Dragon 32K+ASU £40. Modem Dacom 2123 £130. Some Nascom Boards, Carriage extra. Phil Watson, 101 Village Road, Bromham, Bedford. Tel: (Oakley) 2867.

● **IBM AND COMPATIBLES.** Sirius disk full of DOS utilities. Solves most file problems, includes Copy Q, Del Q, Move etc. £15.00, or SAE for catalogue. M. Palaci, 122 Kilburn High Road, London, NW6 4HY.

● **MOUNTAIN HARDWARE CLOCK CALENDAR CARD FOR APPLE II.** Hardly used, perfect working order £110 ono. Including user disk. Tel: (0222) 485641. Leave message for James Stevens.

● **GEMINI GALAXY 2. 512K.**

Onboard 2 x DSDD drives, runs CPM80 and 86 Microline 82A printer £1000. 20MB Winchester. P.S.U. and controller £300. The lot £1200. SVC included. Tel: (0462) 679663 after 5pm.

● **SANYO MBC 256K, 800K and 200K drive, serial port, IBM card, Amber screen, Epson Printer, Modem and £3000 software.** Realistic offers to Keith on (061) 226 4423.

● **FOR SALE.** Apricot PC duo 720K and F1 micro with 12" MONITOR. Purchased October 1985 for research project. Offers at £1100 and £800. Tel: Geoff Gee on Marlow (06284) 71011.

● **APPLE IIe.** Twin disks, 80 column, serial, parallel, comms. Cards, Nightingale modem, monitor II, T.V. modulator, Multiplan, Easifile etc. £600. Littlehampton (0903) 725766.

● **APRICOT PC. 256K RAM, 2 x 720K drives, 9" monitor, MS-DOS 2.0, CP/M-86, MSBasic, Supercalc, Superplaner, Superwriter, some games, carrying cases, 30 blank floppies.** £1250 o.n.o. Tel: (0509) 414418 (Leics.)

● **BBC MICRO.** ADFS, double density DFS, 80 track drive giving 640K storage, 32K sideways RAM, speech system, CPU & keyboard case, joysticks, books, etc. £425. Tel: Wickford (034744) 4838 Eves.

● **TWO SHUGART 801 8 INCH FLOPPY DISK DRIVES.** In good quality cabinet with power supply. Would suit hardware enthusiast etc. Tel: Redditch (0527) 402557 £150 o.n.o.

● **HEWLETT PACKARD 87 SCIENTIFIC & ENGINEERING MICRO.** Little used, excellent condition. Built in screen. Very powerful graph plotting facilities. 86 compatible. £600 o.n.o. Tel: Julian (0656) 56515.

● **COMMODORE SX64 PORTABLE. 64K, built-in disk drive and colour**

monitor. Little used. £285. Tel: (0803) 522202. Eves: 554075.

● **IBM COMPATIBLE. 640K RAM, 2 x 360K disks, colour monitor, printer card.** Includes Lotus 1-2-3, Wordstar and Database III £1850. Also brand new WL with project planner, decision maker, B.C.P.L., Forth, Lisp, Graph QL, Chess. £290. (0724) 762962.

● **IBM PC UPGRADES.** Many parts to upgrade your IBM PC. Hard disks fitted and cards for memory etc. Good prices. Tel: (0252) 62275 after 6.30pm.

● **ZVM 122-3, 12 INCH AMBER MONITOR.** Used one year. In perfect condition, returning to Canada and must sell. £65. Tel: (01) 435 5594 after 6.00pm. Simmons, London.

● **BBC B.** With colour monitor, twin DS/DD 40/80 track drives, Watford or Acorn DFS, AMX mouse, 48K ROM-RAM card. Loads ROM software, Acorn speech, Eprom blower, £575. Contact Chris (04427) 2657 anytime. TURBO PASCAL AND "C" UTILITIES LIBRARIES WANTED/ EXCHANGE. dBASEII tutor £25, 500W conditioner £60, QED+ £50, open access V1.03 £120, Casio PB700 4K RAM £60. IBM PC utilities wanted. (0723) 361528.

● **NASCOM 2. 64K.** Kenilworth case, ROMblower NAS/6. EXT F FXT, Basic, loads software, manuals, Centronics, parallel. V.g.c. £100 o.n.o. Tel: (0536) 790094 after 6.30pm.

● **APRICOT PC. 2 x 315K, 256KB.** S/call 2, S/writer, MSBasic compiler. Further 640KB board also available plus other software. £850 with 256KB. £1000 with 896KB. Tel: (0580) 80372 (Eves), (0860) 360787 days.

● **SHARP MZ-731.** Plus external RS232C, printer plus comms with own PSU. 7 Basics, Forth, Fortran, Pascal, utilities, manual, books, mags, etc. £180

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 £2.50. 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 £2.50 for the following Transaction File ad.

TRANSACTION FILE

o.n.o. Tel: after 6pm weekdays (061) 789 5445. Mr Lee.
 ● BBC MODEL B. Acorn DFS, with twin 40/80 track 800K drives, good condition. Also software, books, magazines. £525 o.n.o. Tel: David, (0902) 49655.
 ● IBM PC WORDPROCESSING SOFTWARE MULTIMEDIA UK VERSION 3.30. £170. Also Osborne 01 computer, complete with CPM, Supercalc II, Wordstar, dBASEII and Disk Doctor £200 o.n.o. Tel: Richard (01) 845 5078. Private sale.
 ● ATARI 520ST. Boxed as new. Plus 1MB drive, 10 disks, printer cable. O.S. on ROM. Bargain at £600. Telford (0952) 49537.
 ● CBM 64. C2N, software, including Hobbit. Magazine, all as new. Hardly used, one year old. Forced to sell, £150 o.n.o. Tel: (01) 703 2593 (Eves) or (01) 638 3599 x 263 (day). Ask for Mark Kirby.
 ● PLOTTER A3. Roland DXY100R for Apple or BBC,

including cable and software. Can be demonstrated. Almost new, £250. Tel: (01) 840 1188 office hours. Mr Sanders.
 ● SIRIUS 2.4 MB. Latest MS-DOS 2.11, Wordstar, Supercalc 2, dBASE II, plus loads of quality software, plus fast 132 col ACT printer. Offers near £1100. Tel: (0753) 883686 Eves.
 ● AMSTRAD CPC6128. Green screen and DMP2000 printer with MP2 modulator and cassette. Plus £200+ worth of software. D.R. draw, Masterfile etc. Also books and mags. £495 o.n.o. Tel: (0279) 58574.
 ● APPLE II PLUS. 64K, 4 d/drives, Visicalc, Visidex, Easywriter, full TABS accounting programs. All manuals, plus 80 column card. £500 o.n.o. Tel: (01) 952 1591 Eves.
 ● HEWLETT PACKARD 9826 COMPUTERS. With extra 512K memory, RGB board, Basic ROM board, complete with all original manuals and 2671G printers with HP1B interface cables. Tel:

(0952) 727328 or 727049.
 ● APRICOT F1. Plus monochrome monitor. Including Supercalc, Superwriter, Superplanner, Wordstar, d-BASE II and Pascal compiler. Good as new, £550 o.n.o. Tel: (01) 946 6637 Eves.
 ● GATEWAY USERS GROUP. A new club for owners of Apricot F1/F1e and "portable" machines. Send S.A.E. for information to 85 Edna Road, Raynes Park, London, SW20 8BS.
 ● TORCH Z80 SECOND PROCESSOR. Cased with manuals, utilities, BBC Basic, Tree etc. Wordstar, DBase 2, Scalz 2, £140. Bryant, Liverpool, (051) 724 3438 anytime.
 ● APRICOT SOFTWARE. Save £1000, fully integrated accountant package. Including sales ledger, nominal ledger, purchase ledger, invoicing, stock control, payroll, data analysis. Brand new and unregistered £600. Tel: (02774) 4258 (Essex). SINCLAIR QL.

Programs, manual, spare microdrives, complete, boxed as new. £100 o.n.o. Tel: (0742) 305502. Ridiculously good bargain.
 ● HYPERION PORTABLE. Twin disks, 256K RAM, MS-DOS, Lotus 1-2-3, Aladin database, Basic, serial and parallel ports. Including Centronics 80 column, Dot-Matrix serial printer. All for £800. Tel: (0580) 892496 Eves and w/es.
 ● TEC F10-40 DAISYWHEEL PRINTER. Parallel interface, 40 CPS, wide carriage, friction and tractor feed, manual, cable, spare daisywheels and ribbons. £400 o.n.o. Tel: (0452) 415676.
 ● APPLE II + 48K COMPATIBLE. Single disk drive, Z80 card, printer interface, colour card, 80 col card, joystick, disks, manuals, software. £290 o.n.o. Tel: Swanley (0322) 60918.
 ● PLOTTER ROLAND DXY880 A3 SIZE. Virtually unused. Complete with

documentation, H.P. compatible. Demonstration possible with Smartwork and Autocad. £450. Tel: (Guildford) 506042.
 ● FOR IBM OR HIGHLY COMPATIBLE PC. Full feature Comms software £67. BABT modem £95. Free Autodial/Autoanswer. VAT extra. Tel: George on (01) 876 1670 for details.
 ● COMMODORE C64. 1541 disk drive, cassette unit, printer interface, programming books and software. First reasonable offer accepted for a quick sale. Tel: East Grinstead (03242) 311689 Eves and w/es.
 ● AMSTRAD CONVERTER. Modifies CPC Basic programs to run on PCW. Simple to use - automatic operation. Tape £14, disk £19. Tel: (061) 439 4841 or write: 38 South Parade, Bramhall, Stockport.
 ● HP41C. Quad memory module, time module. Recently overhauled by Hewlett Packard. £15. Tel: Bradford (0274) 880600.

MICROCHESS

Kevin O'Connell reports on some surprises at the Fifth World Computer Chess Championship in Cologne.

The Fifth World Computer Chess Championship was played in Cologne, June 11-15. The event attracted 23 entries (more than ever before) and they spanned a greater range of hardware than in previous championships - from substantially more than £10,000,000 down to about £70.

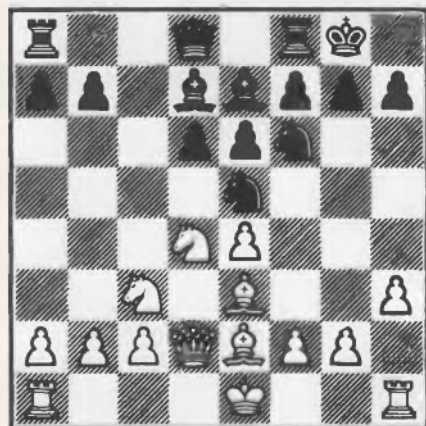
The standard expectation was that Hitech would win. This was reinforced in the second round, when Hitech won the fine game which follows, while the reigning champion (and second seed) Cray Blitz was trounced by the unfancied Bobby. However, in the last round Hitech went astray against Cray Blitz, lost a pawn and was ground down in the ending. That final-round upset gave Cray Blitz the best tie-break score

and the title of world champion for an unprecedented second term.

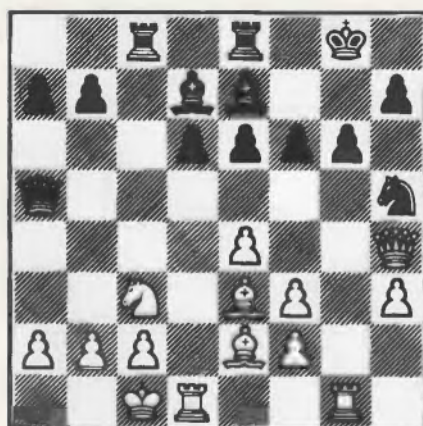
Final results were: 1-4 Cray Blitz (USA), Hitech (USA), Bebe (USA), Sun Phoenix (Canada) 4 out of 5; 5-10 Rebel (Holland), Bobby (Germany), Plymate (Sweden), Mephisto (Germany), Dutch (Holland), Nona (Holland), 3; 11-13 Advance (England), Lachex (USA), Ostrich (Canada) 2½; 14-17 Schach (Germany), Cyrus (England), Vaxchess (England), Chat (Germany) 2; 18-20 BCP (England), Enterprise (Denmark), Awit (Canada); 21-22 Rex (USA), Shess (Holland) 1; 23 Kempelen Atari (Hungary) 0.

White: Hitech. Black: Schach 2.7. Opening: Sicilian Defence.

1 e2-e4 c7-c5



Chessboard 1



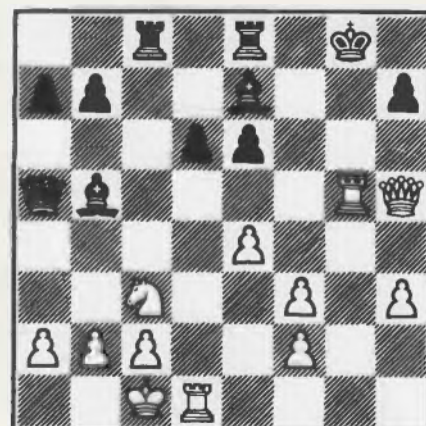
Chessboard 2

2 Ng1-f3 d7-d6
 3 Bf1-c4 e7-e6
 4 d2-d4 c5xd4
 5 Nf3xd4 Ng8-f6
 6 Nb1-c3 Bf8-e7
 7 Bc1-e3 Nb8-d7
 8 Qd1-d2 Nd7-e5
 9 Bc4-d3 0-0
 10 h2-h3

If White were a human playing against a computer, I would be certain that this move was played with the intention of following up with Nd4-f3; as it is, I find it hard to credit that a computer program could really institute such a subjective plan.

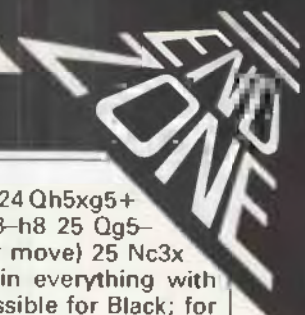
10 ... Bc8-d7
 11 Nd4-f3 Ne5xf3+

Hitech suggested 11 ... Ne5-c6 as



Chessboard 3

MICROCHESS



being better, and I agree.

12	g2xf3	Qd8-a5
13	0-0-0	Ra8-c8
14	Rh1-g1	

Hitech spent most of its time examining Kc1-b1, but then when it got down to 7 or 8-ply it switched to the text move which is very much stronger.

14	...	Rf8-e8
15	Be3-h6	g7-g6
16	Bh6-g5	Qa5-c5
17	Qd2-f4	Nf6-h5
18	Qf4-h4	f7-f6

18 ... Be7xg5 19 Rg1xg5 — this move also gives White a tremendous attack.

19	Bg5-e3	Qc5-a5
20	Be2-b5!	

A pretty example of 'interference' — blocking the fifth rank and interfering with the black queen's defence of the knight.

20	...	Bd7xb5
21	Qh4xh5	g6-g5
22	Be3xg5!	f6xg5
23	Rg1xg5+	
23	...	Kg8-h8

Or 23... Be7xg5 24 Qh5xg5+ Kg8-f7 (24 ... Kg8-h8 25 Qg5-f6+ and mate next move) 25 Nc3x b5, threatening to win everything with Nb5xd6+, is impossible for Black; for example, 25 ... e6-e5 26 Nb5xd6+ Kf7-e6 27 Qg5-f5+ Ke6-e7 28 Qf5-f7+ Ke7-d8 29 Nd6xb7 mate.

24	Rd1-gl!	1-0
	(Black resigns)	

There is no adequate defence against the threat of 25 Qh5xh7+ followed by 26 Rg5-h5 mate, since 24 ... Be7xg5 25 Qh5xg5 Rc8-c7 26 Qg5-f6+ Rc7-g7 27 Qf6xg7 is also mate.

NUMBERS COUNT

Mike Mudge tackles divisor functions first posed by M Rumsey.

Definition of the Divisor Function: $s(n)$ Given any positive integer, n , $s(n)$ is defined to be the sum of all of the positive integers which divide exactly (no remainder) into n .

For example, $s(98) = 1 + 2 + 7 + 14 + 49 + 98 = 171$

$s(p) = p + 1$ where p is any prime number, which by definition is only divisible by itself and one.

In *Eureka*, volume 26, page 12, 1963, M Rumsey asked for solutions of the equation $s(q) + s(r) = s(q + r)$... (i)

We now present a survey of some results relating to this equation.

Result A if $q + r$ is prime, the only solution of (i) is: $s(1) + s(2) = s(3)$, that is, $1 + 3 = 4$.

Result B If $q + r = p^2$, where p is a prime, then q is prime and $r = 2^n k^2$, where n and k are odd integers (or conversely, since (i) is symmetrical in q and r).

The case $k = 1$ leads to solutions when $p = 2^n - 1$ (that is, a Mersenne Prime — see for instance *A Concise Introduction to the Theory of Numbers* by Alan Baker, CUP 1986, for a detailed discussion of these particular primes provided that $q = p^2 - 2^n$ is also prime. Such solutions occur for $n = 2, 3, 5, 7, 13$ and 19 . Among the values of n for which the question is, to the best of the author's knowledge, still open are 31, 61, 89, 107, 127, 607, 1279, 4253, 9941 and 11213.

There are no solutions to (i) under result B if k contains a factor which leaves remainder 3 when divided by 14.

The case $k = 5$ has been shown to yield no solutions except possibly when $n = 189, 249, 501, 509, 521, 573, 585, 605, 621, 809, 845, 861, 873,$

969 ...

The case $k = 7$ yields for: $n = 1$ the solution: $s(5231) + s(98) = s(5329)$ — that is, $5232 + 171 = 5403$.

$n = 2$ the solution: $s(213977) + s(392) = s(214369)$ — that is, $213978 + 855 = 214833$ more easily displayed as $s(213977) + s(2^{3.7^2}) = s(463^2)$, the next values of n in doubt being 31, 33, 103, 115, 121, 123, 159, 169, 225, 255 ...

The case $k = 11$ yields for: $n=1$ the solution:

$s(24407) + s(2.11^2) = s(157^2)$
 $n = 13$ the solution;
 $s(1410646926617) + s(2^{13.11^2}) = s(1187707^2)$, the next values of n which are in doubt being 21, 45, 57, 67, 141, 145, 153, 163, 177, 193 ...

The case $k = 13$ has no known solutions. However, those values of n which are still in doubt commence 53, 55, 79, 91, 149, 163, 175, 187, 229, 277 ...

Other known solutions under result B include:

$s(155015849) + s(2^{5.19^2}) = s(12451^2)$
 $s(1193399) + s(2.5^4) = s(1093^2)$
 $s(229405235369) + s(2^{9.5^4}) = s(478963^2)$
 $s(2676857975009) + s(2^{9.7^4}) = s(1636111^2)$

For $n = 1$ and k , prime solutions are known for $k = 53, 137, 193$ & 277 , while for $n = 3$ with $k = 313$ & 421 ; also, for $n = 5$ with $k = 97, 107, 131, 149$ & 257 yield solutions.

Result C If $g + r = p^3$, where p is a prime, the solutions known to the author are $s(2) = s(6) = s(8)$ — that is, $(1+2) = (1+2+3+6) = (1+2+4+8)$; also $s(11638687) + s(2^{2.13.1123}) = s(2227^3)$.

Readers are invited to write a program to evaluate the divisor function: $s(n)$, ideally where n is either input

as a general length integer or in terms of its prime factors; investigate solutions of Rumsey's equation (i) above, recovering some (or all!) of the given results, hopefully with some new ones; investigate a somewhat similar equation due to Leo Moser:

$m s(m) = n s(n) \dots$ (ii) where m and n are two unequal positive integers.

Note that $m = 12$ and $n = 14$ is a solution which in turn leads to an infinity of further solutions $m = 12q$ and $n = 14q$ where q and 42 have no common factor.

Attempts at the above may be submitted to: Mike Mudge, 'Square Acre', Stourbridge Road, Penn, nr Wolverhampton, Staffordshire WV4 5NF, tel: (0902) 892141 by 1 December 1986.

It would be appreciated if such submissions could contain a brief summary of results obtained and thoughts relating to the problem, in a form suitable for future publication in PCW. These submissions will be judged using suitably vague criteria, and a prize will be awarded to the 'best' contribution received by the closing date.

Please note that submissions can only be returned if a suitable stamped addressed envelope is provided.

Expanded reviews of previous problems, together with, subject to the approval of the contributor, copies of detailed programs from the winning entry may also be requested. In the interests of efficiency, readers are encouraged to contact the prize-winner directly.

Mike Mudge welcomes correspondence on any subject within the

NUMBERS COUNT

areas of number theory and computationally-related mathematics, particularly containing suggested subject areas for future Numbers Count articles, and will endeavour to reply to all letters.

Markoff Numbers

This problem (PCW, March) proved inexplicably popular; an extreme solution involving a triple with elements of 95, 59 and 36 digits respectively was produced by an Apricot F1e in South East London using Fortran.

A Tandy Model 4P in Sydney, Australia yielded an ordered list of Markoff numbers up to 99999999.

Several regular contributors gave this problem a lot of attention, having found it to be 'fascinating', 'challenging' and readily amenable to programming in Basic or indeed any other high-level language.

This month's winner, after considerable thought, is John Scholes, of 79 Dryden Court, Renfrew Road, London SE11 4NH who used MIX/C ('a cheap C compiler') on an IBM PC. John follows a theoretical study with

full program listings and a print-out of all Markoff Triples less than 10^{12} , there being 152 of them. His approach to the 'related Diophantine equation' yielded only eight solutions in an 18-hour search, the largest unknown found being 59. This was improved upon by several other contributors; indeed, one run of over 135 hours yielded two new solutions, (3,3,4,6,42,87) and (2,13,39,97,99).

There is still scope for an efficient search algorithm:

$$5(p^2 + q^2 + r^2 + s^2 + t^2)^2 - 7(p^4 + q^4 + r^4 + s^4 + t^4) = 90pqrst.$$

LEISURE LINES

Brain-teasers courtesy of JJ Clessa.

My wife went shopping last Saturday and bought three items from successive shops. At each shop, the item she bought cost threequarters of the money she had in her purse at the time. She came home with 10p only. How much did she have in her purse at the outset?

Prize puzzle

This will get the micros whirring.

To multiply 77 by 23, you put the single digit '1' before and after the answer 1771.

To multiply 91 by 32, you put the single digit '2' before and after the 91 to give the answer 2912.

To multiply 411 by 83, you put the single digit '3' before and after the 411 to give the answer 34113.

What is the smallest number that

you could multiply by 29 using this method, and what would be the single digit which you would use?

Answers on postcards or backs of envelopes only, please, to reach PCW, Leisure Lines Prize Puzzle September, 32-34 Broadwick Street, London W1A 2HE, no later than 30 September 1986.

June prize puzzle

Almost 200 entries this month — denoting a rather easy problem. Quite a cosmopolitan bunch, though, including entries from France, Belgium, Portugal, Italy, Norway, Sweden, Holland, Greece, Zambia, Malta and Pakistan, plus a letter from Switzerland (which we accepted since the writer said that the Lausanne Post Office 'wouldn't let him send a card!')

We were rather fascinated by a card from Mr Wesencraft of London who claimed that he had a 'truly wonderful proof' that the sum of the first four digits of any answer must be 10 but, unfortunately, his postcard was too small to contain it!

We certainly don't know of this proof but it sounds plausible, and certainly holds for the three answers we have which are:

54748 (the smallest)

92727

93084

The winning entry, drawn at random, came from Brian & Gaynor Steer of Slough.

Congratulations both of you — your prize (one only) is on its way. Meanwhile, to all the also-rans — keep puzzling.

ACC NEWS

A look at computer clubs up and down the country, with Rupert Steele.

Even older than the personal computer itself is the hobby computing movement; indeed, the Amateur Computer Club first met in 1972, and early discussions concerned the ACC's own design of central processor, the 'weeny bitter'. This was a 2-bit machine assembled laboriously from huge numbers of discrete logic chips. (If anybody out there actually has one of these still working, I'd be very glad to hear from them.) Since then, of course, the technology has taken off, and with it the hobby movement.

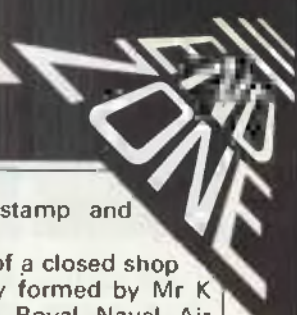
As well as over three hundred 'public' clubs nationwide, many schools and workplaces have their own computer clubs.

The Association of Computer Clubs grew out of this mass of clubs, as a forum for them to get together to arrange space at exhibitions and, more recently, to participate in cheaper insurance schemes. The Association also makes available a list of people who are prepared to give talks at computer clubs. For more details of the ACC's services, see the end of this column.

Many computer clubs close down over August when many of the members are away, and there is little point in meeting. So, by September, everybody is ready to go with the Autumn programme. One such club is OPeCC, the Oxford Personal Computer Club. This is a pretty old club;

it was formed when the original OPEC was still a force to be reckoned with. The club meets on the first and third Wednesday of each month at 7.30pm in the Donnington Community Centre, Townsend Square, Oxford. The programme kicks off on 17 September with the Annual General Meeting. Further information is available from N Goodwin of 57 Catherine Street, Oxford, tel: (0865) 244914 or F Cameron of 12 Norreys Avenue, tel: (0865) 240058.

Further south, I have had a note from the Brighton, Hove and District Computer Club which has a new secretary, George Shears, whose address is 19 Beach Green, Shoreham-by-Sea, Sussex BN4 5YG,



or call (0273) 463111. George also sent me a copy of a most interesting newsletter, with lots of fancy type-faces produced on a dot-matrix printer. Forthcoming meetings include a session on View/ViewStore on 20 August, and one on 1 October on 'Information Retrieval and Storage'. The Brighton & Hove club, unlike others, takes its holiday in September.

Another Amstrad user club has contacted me. Mr Sugar has clearly created a growth area in the amateur club business, as well as for his own electronics firm! The club is called ANWUC (Amstrad North West Users' Club). It meets in the Manchester area every Wednesday from 1pm until 10pm. There is an online service available at 300/300, 1200/75 and various other protocols (all 8 bits, no parity, 1 stop bit). The sysop is Terry Thompson and he can be contacted on (061) 494 6938 for further information. Club membership is £5pa or 50p a meeting. Details of the club, which also supplies a monthly newsletter, are available from the secretary, P Clarke, ANWUC, 41 Millwall Close, Gorton, Manchester M18 8LL, or you can call (092575) 5262.

And yet another Amstrad club in the Manchester area is the Manchester Amstrad User Club. This group has some 85-plus members and meets every Monday evening at the Openshaw Technical College, Manchester. Details are available from the secretary, Stephen Stanner, of 21 Gatling Avenue, Longsight, Manchester M12 5SX or call (061) 224 4700.

Not far away is a very special computer club which has important charitable aims. Known as 'The Special Needs Computer Club', it is run by Jeff Hughes of 39 Eccleston Gardens, St Helens WA10 3BJ. This is a group dedicated to using computers with people having special needs, such as the disabled or the handicapped. There are regular Sunday morning

workshops, with further talks and demonstrations at the weekends. There is a free software library and the group is always anxious to receive (non proprietary!) good-quality material for addition to its stock.

Further north, we come to Gateshead and our old friend John Bone. John is now spending more of his efforts on his local computer club, ComputerTown NorthEast. One of its projects is a Fido super bulletin-board 'Log on the Tyne'. It runs 300/300 and 1200/75 and the number is (091) 477 3339. The board runs at least 21 hours a day, so it's a bit hard to catch John on the phone unless you've got a modem. Best bet: drop him a line at 3 Claremont Place, Gateshead, Tyne & Wear NE8 1TL. PS Log-on-the-Tyne will support public domain freeware (software that is distributed free, where you may be able to make a donation/buy a manual if you like it). Why not dial up and see what John's got for you?

Further south, I have had a letter from Chris Bone, who runs the Watford Atari User Group (or WAG). The club aims to provide a chance for Atari computer owners to meet each other, swapping ideas and expertise on software, translating manuals into English, as well as many other topics. The group also produces 'fact' and 'tip' sheets covering a variety of subjects, as well as an occasional newsletter. Members' discounts and a collection of public domain software complete the picture. WAG is attached to a company called 'Infomania' located at Carey Place, Watford, Herts, or you can contact Chris at 10 Garston Drive, Garston, Watford, Herts WD2 6LB.

For those with an interest in tobacco, I have received a letter from Mr R R Smith of 7 Trafalgar Road, Beeston Rylands, Nottingham. He runs a computer club at the John Players factory there. More details? You'll have to

cough up for a stamp and send him an SAE.

Also something of a closed shop is the club recently formed by Mr K Lammiman at the Royal Naval Air Station at Portland. Quite a lot of service bases have computer clubs, perhaps now reflecting the higher level of technology in modern warfare. The club at Portland has about a hundred members, all of whom are serving members of the Royal Navy. So, if you qualify, why not contact POAEA(R) K Lammiman, 815 Sqdn, RNAS Portland, Dorset?

Finally, I hear the sound of pipes from the Silicon Glen. Alan Donaldson, chairman of the Glenrothes Computer Club, has written to me from 111 Huntly Drive, Glenrothes, Fife KY6 2HT. The club meets at factory unit Q10b, Flemington Road, Queensway Industrial Estate, Glenrothes. It has software libraries (non-copyright, of course) for Commodore 64 and Amstrad machines, and meets every night at 7.30pm. Over the summer and early autumn, the club hopes to be visiting some of the electronics factories in the area, and of course there is a monthly club newsletter. Generally sounds well worth a try, so send Alan an sae for details.

Remember, I cannot give the details of your club by ESP! Please write to me if you would like people to know about your club.

For a mention in this column, to tell the ACC about your club, or to obtain address labels for mailing to UK computer clubs, contact: Rupert Steele, 12 Philbeach Gardens, London SW5 9DY.

For any other enquiry, contact: Mike Mudge, 'Square Acre', Stourbridge Road, Penn, Wolverhampton WV4 5NF or call (0902) 892141.

DIARY DATA

Readers are strongly advised to check details with exhibition organisers before making arrangements, in order to avoid wasted journeys due to cancellations, printers' errors, and so on.

London	Olympia; PCW Show. Contact: Montbuild (01) 486 1951.	3-7 September
Manchester	UMIST; 8th Official Commodore Computer Show. Contact: Database Exhibitions (061) 456 8383	12-14 September

INNOVATION '86 COMPETITION — PCW, MARCH: Congratulations to reader RR Jackman of Worcester who won the £1000 first prize for his Braille reader idea.

END

DON'T MISS THESE AMAZING UPGRADE BARGAINS FROM OPUS

Check out these superb upgrade offers from Opus. We guarantee you won't find better quality, we know you can't find better prices.

20 MEGABYTE WINCHESTER DISK UPGRADE

All you'll need to upgrade your IBM PC or compatible.

- 20 MEGABYTE WINCHESTER DISK DRIVE
- CONTROLLER CARD
- ALL NECESSARY CABLES AND INSTALLATION KIT
- INSTRUCTION MANUAL

Our half-height Winchester is of the very latest design, offering 20 Megabytes of additional on-line storage, equivalent to around 57 floppy diskettes. Our price is just as stunning as the performance, only £349.00

IBM PC UPGRADE

360K half-height floppy disk drive combining the latest technology with low power consumption for just £79.95

80-87 5 Mhz MATHS CO-PROCESSOR NEC 256K D RAM CHIPS 150ns

Only £99.00

ROCK BOTTOM PRICES

We offer fast, guaranteed 72-hour delivery, generous discounts on multiple orders and unbeatable government, education and dealer prices. Call Opus now on 0737-65080 for full details. Access/Visa cards welcomed. Prices exclude VAT and carriage



Opus Supplies Ltd,
55 Ormside Way,
Holmethorpe Industrial Estate,
Redhill, SURREY RH1 2LW.

Opus.



TOSHIBA P321



- Superb letter quality at 72 CPS
- 216 cps high-speed draft
- High resolution graphics
- 80 columns at 10 cpi
- Accepts font cartridges
- IBM-PC compatibility
- Phone for sample output

£590 PLUS VAT

TOSHIBA P341e



- 136 column version of P321

OUTSTANDING
VALUE FOR MONEY
LETTER QUALITY
PRINTER

ONLY

£695 PLUS VAT

Whatever your printer needs let us quote. We specialise in TOSHIBA and BROTHER.

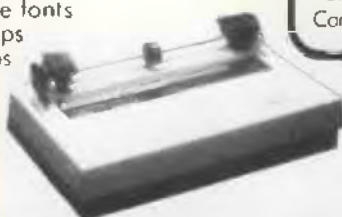
TOSHIBA P351C 4 colour version of P351
TOSHIBA P351 136 col 24 pin 288/100 cps
TOSHIBA P341e 136 col 24 pin 216/72 cps
TOSHIBA P321 80 col 24 pin 218/72 cps
BROTHER M-1509 136 col 180/45 cps
BROTHER M-1409 110 col (132 col at 12 cpi)
BROTHER M-1109 80 col



M-1109

- Epson and IBM G.P. emulation
- Built-in pin feed
- Downloadable fonts
- draft at 100 cps
- NLQ at 25 cps
- Dual i/f
- 4K buffer

£220 PLUS VAT



REAL TIME PRINTERS

Real Time Printers Ltd
Compton Place,
Surrey Avenue,
Camberley, Surrey.
GU15 3DX
Tel:
Camberley (0276) 681444

To: Real Time Printers Limited

Please send me details of the following:

Name: _____ Position: _____
Company: _____
Address: _____
Telephone: _____

P351C ☐
P351 ☐
P341e ☐
P321 ☐
M-1509 ☐
M-1409 ☐
M-1109 ☐

**NEW FROM THE DISTRIBUTOR
OF ENHANCED PERIPHERALS**

£349

30

MBYTE

HARD DISK

Featuring:

■ High quality 1/2 height NEC ■ Western Digital half-length controller card ■ Easy fitting ■ Full instructions provided ■ One year warranty ■ Fast disk access ■ IBM PC compatible

ASD Peripherals, fully franchised by Western Digital and NEC, is the major force in the distribution of tape streamers, EGA cards and monitors, CD ROMs, modems, and EMS. Phone us now for prices and details of quantity discounts.

ASD PERIPHERALS

Europa House, Europa Trading Estate, Fraser Road, Erith, Kent, DA8 1QL.
Telex: 8954213. For Sales and Technical Support Telephone: 03224 49235.

A Member of the C.E.H. plc Group of Companies 

**...Stop Press...
New 3 1/2" IBM
compatible drives
in stock at
under
£60**

maxell® EPSON® brother® banana DISKING MEMO

IONS RIBBONS RIBBONS

Prices are based on a minimum order of £10.00 exc. VAT.

PRINTER	PART No.	PRICE	PRINTER	PART No.	PRICE
Anadex 8000/9500/all models	262	6.29	Nakajima AE300/AE330/AE350	701 SC	2.39
Apple Imagewriter	330	3.89	NEC Pinwriter P1/P2	254	5.29
Brother CE40/CE50/CE51/CE60	224	3.89	NEC Pinwriter P3	260	5.99
CE70/EM100/EM200/EM300/HR15	696 MS	4.19	NEC 2000 Series/3500/3520/7700	372	4.49
HR25/Compu & Executiv/DX15	696 SC	2.99	NEC Spinwriter 5000 Series/700	259	3.69
Canon 1156/1080	223	3.99	NEC Spinwriter 5000 Series/700	576 MS	3.19
Centronics 150/152	328	3.49	NEC 8023 Series	330	3.89
Centronics 350/352/353/357/358	345	13.99	NCR 499/0202/2500/6440/8150/1770	209	5.99
Centronics Linewriter 400/800	361	24.99	OKI Microline 80/82/82A/83/83A/92	66	1.29
Centronics 702/703/704	243	5.90	[Colours @ 1.39]		
Centronics 6000 Series	226	9.39	OKI 84	87	3.89
Centronics Horizon	223	3.99	OKI 182/192/193		9.99
Citoh 8500/8510/1550	330	3.89	Olivetti ET201/TES401	572 MS	4.49
[Colours @ 4.39]			Printronix P300MF	60	7.49
Citoh 8600	383	13.19	Qume Sprint 3/5	204	3.19
Commodore 1516/1521/1525/4023	698 MS	4.99	Qume Sprint 3/5 [Black/Red]	253	4.19
Commodore MPS801	236	4.99	Qume 7/8/9/11/11+1/14	343	4.89
Commodore 2022/4022	273	3.89	Qume 7/8/9/11/11+1/14	664 MS	3.49
[Colours @ 4.29]			Qume Quickload/Letterpro	665 MS	2.69
Data General LP2/Dasher	231	4.09	Ricoh 1600/1200/1300/1500/Flow'r	691 MS	3.19
Dec LA 30/36	51 P	3.89	Sanyo 1150/1250/Infostar/Calestr	235	3.49
Dec LA 34/38	237	3.49	Seikosha GP500/A/550A	236	4.99
Dec LA 120/180	62	3.79	Shinwa CP80	698 MS	4.99
Diablo-Hytype 11/630/1300 Series	205	3.69	Star Radix 10	410	5.29
1600 Series/3200/MG30	256	5.39	Star Radix 15	415	5.99
As above	567 HM	2.49	Star Delta & Gemini 10 & 15	66	1.29
Epson MX70/80/82/FX80/85/RX80	273	3.89	Takara Kaga	223	3.99
Epson LX80	454	3.49	Texas Instruments 800/855	400	5.90
Epson FX100/MX100/RX100/ERC-08	320	4.89	Texas Instruments 810/820	51 25E	3.29
[Colours @ 5.39]			Texas Instruments 850	400	5.99
Epson 220/240/ERC-03	274	3.49	Toshiba RC02/1350	362	9.49
Epson LO1500	409	4.39	Toshiba P1150/PA7251/2	330	3.89
IBM Displaywriter	667 MS	6.29	Wang 721	52	5.09
IBM Sys 23 [5241/5242]	313	4.19	Wang 5531/2/2231/W/V/V/S	261	4.89
Juki 6100	562 MS	3.99			
Mannesman Tally 110/120/160/261	351	5.29			
Mannesman Tally 130/140/180	358	6.29			
Mannesman Tally 1000 Series	235 A	3.49			
Mannesman Tally MT80	698 MS	4.99			

THIS IS ONLY A TINY SELECTION OF THE PRINTER/TYPEWRITER/CASH REGISTER RIBBONS AVAILABLE. IF YOURS IS NOT LISTED, PLEASE CALL.

TE DISKETTE DISKING STORAGE STORAGE

5 1/4" STORAGE

BUY 2 GET 1 FREE

FF10	Flip 'n' File for 10 disks	3.90
FFS10	Rainbow pack of FF 10's	18.90
FF15	Flip 'n' File for 15 disks	5.90
MINI 50	Flip 'n' File for 50 disks	16.90
MINI 100	Flip 'n' File for 100 disks	32.90
KM25	Keybox Flip 'n' File 25 disks	25.90
KM50	Keybox Flip 'n' File 50 disks	36.90

3 1/2" STORAGE

BUY 2 GET 1 FREE

M5	Flip 'n' File for 5 microdisks	3.90
M55	Rainbow pack of M5's	18.90
M10	Flip 'n' File for 10 microdisks	4.90
M25	Flip 'n' File for 25 microdisks	10.90
M50	Flip 'n' File for 50 microdisks	19.90
M40	F 'n' F for 40 microdisks latch	31.90

ECONOMY STORAGE

BUY 2 GET 1 FREE

Slim 5	Best U.K. library box for 10 disks	1.90
Slim 3	As above for ten microdisks	1.90
SEE 10.8	As above for ten 8" disks	3.50
B50	Budget 50 for 50 disks	8.90
JUMBO	Lockable storage for 100+ disks	18.90
EM50	Lockable 50 x 3 1/2" or 15 x 3" disks	19.90

DISKETTE ACCESSORIES

Minimum order value £5.00 please

DSM	5 1/4" Mailer for 1-4 disks [100]	24.90
ENV	5 1/4" White blank envelopes [100]	5.00
LAB	Diskette user labels and write-protect tabs [100]	4.00
DW	Diskwriters black or blue [10]	5.00
MDD	5 1/4" Disk drive head cleaning kit	8.90
SDD	3 1/2" Drive cleaning kit [sided]	8.90
WLT	2-Disk wallet in black pvc 6" w by 8 1/2" h. Clear front & back for your advertising	1.90

HOW TO ORDER

Enquiries/Retail [0428] 722563

Wholesale [0428] 722840

Roger & Joan are here to HELP --- JUST CALL

Credit Card Orders [0428] 722563 [24 hrs]

ACCESS & VISA welcome. Call anytime but please don't whisper when leaving the following details.

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

Leave the REST to US!

URGENT ORDERS

If posting your order, omit the word FREEPOST from our address, and use our normal post code GU30 7BJ and stamp it first class. If telephoning your order request first class post, which for mini or microdisks is £2.00 1st pack, £1.50 each extra pack.

DESPERATE ORDERS

Just call, we'll put you on to our marriage guidance counsellor.

OFFICIAL COMPANY ORDERS

If you are a large but efficiently run public or private company, we will accept your order. Unfortunately the majority of dinosaur corporations in our Sceptred Isle are not efficient, due to political heirarchy clogging the works. For you we will send a pro-forma invoice.

OFFICIAL GOVERNMENT

ORDERS WELCOME

We supply all Government bodies including Schools, Universities, Colleges, Hospitals, the Utilities, Research Establishments, Armed Forces, the Ministries and Local Authorities world-wide. If ordering in quantities of fifty diskettes or more, please ask for our Wholesale Price List.

DISKING, FREEPOST, LIPHOOK, HANTS GU30 7BR

TEL: [0428] 722563 RETAIL

[0428] 722840 WHOLESALE

UK P&P rates exc. VAT

5 1/4" DISKS/MICRODISKS

- 1-2 packs each pack @ 95p
- 3-5 packs each pack @ 75p
- 6-9 packs each pack @ 60p
- 10 + pack POST FREE

DISKETTE STORAGE

- M10, FFI0, SLIM 5, FFI5, SLIM 3, SEE 10-8
- 1-4 off @ 40p each
- 5-9 off @ 30p each
- 10 + off @ 20p each

- M50, M40, MINI 100, KM25, FFS10, KM50, JUMBO
- 1 off £2.00 each
- 2-7 off £1.30 each
- 8 + off POST FREE

- 1 off £2.00 each
- 2-7 off £1.30 each
- 8 + off POST FREE

DISK ENVELOPES, LABELS, DISKWRTERS ETC. 50p ANY QUANTITY

8" DISKETTES

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

M25, MINI 50, BUDGET 50, EM50

- 1 off £1.00 each
- 2-7 off 70p each
- 8 + off POST FREE

CLEANING KITS

- 1 off 60p each
- 2-7 off 40p each
- 8 + off POST FREE

DISKING SUPERMAILERS 100-pack 3.00

PHONE THE HOTLINE

Verbatim
Canon
Dysan

DISKING



DISKETTES DISKETTES DISKETTES DISK

5 1/4" Diskettes

Prices exc. VAT & relate to Ten Packs

'PROFESSIONAL'

	1	2-4	5+
D1D S/S 48 tpi	15.90	13.90	13.40
D2D D/S 48 tpi	17.90	15.90	15.40
D1O S/S 96 tpi	17.90	15.90	15.40
D2O S/S 96 tpi	19.90	17.90	17.40
D2HD IBM PC-AT 1.6 MB	29.90	27.90	26.90

DISKING COLOURED

Red/Orange/Yellow/Green/Blue/White

	1	2-4	5+
1D S/S 48 tpi	16.90	14.90	14.40
2D D/S 48 tpi	18.90	16.90	16.40
1OD S/S 96 tpi	18.90	16.90	16.40
2DD S/S 96 tpi	20.90	18.90	18.40

To order precede type number with the letter (R)ed, (O)range, (Y)ellow, (G)reen, (B)lue or (W)hite eg. R2D for Red D/Sided 48 tpi. Order RAINBOW for multicoloured pack

BANANA

ZREV D/S D/D and Reversible All one price 8.65

VERBATIM OPTIMA

Specially developed (OPT/3) media for 'Critical data' storage. Double average life of 76 million revolutions, and specially formulated surface lubricants. Ultra thin gold hub-ring and new low-torque fibre liner.

MD750-01 D/Sided 48 tpi	All one price	29.90
MD757-01 D/Sided 96 tpi	All one price	39.90

VERBATIM DATALIFE

	1	2-4	5+
525 S/S 48 tpi	20.90	18.90	17.90
550 D/S 48 tpi	23.90	21.90	20.90
577 S/S 96 tpi	23.90	21.90	20.90
557 D/S 96 tpi	26.90	24.90	23.90
MD/HD IBM PC-AT 1.6 MB	34.90	32.90	31.90

VERBATIM VEREX

	1	2-4	5+
150 S/S* 48 tpi	14.90	12.90	11.90
200 S/S 48 tpi	15.90	13.90	12.90
250 D/S 48 tpi	17.90	15.90	14.90
257 D/S 96 tpi	19.90	17.90	16.90

*Single Density

BULK BLACK

	1	2-4	5+
BL 1D S/S 48 tpi	10.00	9.50	9.00
BL 2D D/S 48 tpi	12.00	11.50	11.00
BL 1OD S/S 96 tpi	12.00	11.50	11.00
BL 2DD S/S 96 tpi	14.00	13.50	13.00

BULK SILVER

	1	2-4	5+
S1D S/S 48 tpi	11.00	10.50	10.00
S2D D/S 48 tpi	13.00	12.50	12.00
S1DD S/S 96 tpi	13.00	12.50	12.00
S2DD S/S 96 tpi	15.00	14.50	14.00

MEMOREX

	1	2-4	5+
S210 S/S 48 tpi	18.90	16.90	15.90
S220 D/S 48 tpi	21.90	19.90	18.90
S410 S/S 96 tpi	21.90	19.90	18.90
S420 D/S 96 tpi	24.90	22.90	21.90
S660 IBM PC-AT	34.90	32.90	31.90

MAXELL

	1	2-4	5+
MD 1-D S/S 48 tpi	20.90	18.90	17.90
MD2-D D/S 48 tpi	24.90	22.90	21.90
MD1-OD S/S 96 tpi	24.90	22.90	21.90
MD2-DD D/S 96 tpi	29.90	27.90	26.90
MD2-HD IBM PC-AT 1.6 MB	34.90	32.90	31.90

DYSAN

	1	2-4	5+
104/1D S/S 48 tpi	22.90	20.90	19.90
104/2D D/S 48 tpi	29.90	27.90	26.90
204/1D S/S 96 tpi	29.90	27.90	26.90
204/2D D/S 96 tpi	34.90	32.90	31.90

3 1/2" Diskettes

Prices exc. VAT & relate to Ten Packs

'PROFESSIONAL'

	1	2-4	5+
DM1D S/S 135 tpi	24.90	22.90	22.40
DM2D D/S 135 tpi	31.90	29.90	29.40

VERBATIM DATALIFE

	1	2-4	5+
MF350 S/S 135 tpi	29.90	27.90	26.90
MF360 D/S 135 tpi	39.90	37.90	36.90

MEMOREX

	1	2-4	5+
3450 S/S 135 tpi	29.90	27.90	26.90
3460 D/S 135 tpi	39.90	37.90	36.90

MAXELL

	1	2-4	5+
MF1-DD S/Sided	37.90	35.90	34.90
MF2-DD D/Sided	49.90	47.90	46.90

3" Diskettes

Prices exc. VAT & relate to Ten Packs

MAXELL/AMSOFT

	1	2-4	5+
CF2 D/S Revers	44.90	42.90	41.90

8" Diskettes

Please Call — All stocked.

A big THANKS to ALL our customers for their support since 1980. Our sixth birthday saw the launch of Banana reversible diskettes, at the time an incredibly low price of only £8.65 exc. VAT. We're all going bananas here! For the serious business user, our Silver 'Professional' disk is proving very popular, as it combines high quality with keen pricing. Once you use these disks, you will appreciate their silky smooth operation. The secret is in the quality jacket and liner which are a cut above the rest. We now offer the new D1/D2 in the 'Professional' range, for the IBM PC-AT, and at our price can you afford to buy anyone else's?

OUR PROMISE

NO ONE sells better —
Lifetime guarantee on all disks

NO ONE ships faster —
Orders despatched in 4 hours*

NO ONE matches us —
Value for money every time

OR YOUR MONEY BACK!

*only when stocked

DISKING, FREEPOST,
Liphook, Hants GU30 7BR. UK
General enquiries & Sales (0428) 722563
Wholesale & Government (0428) 722840

SPECIAL OFFERS

Buy any 2 Ten-packs of—

Verbatim or MEMOREX
DISKETTES

before Sept. 31st 1986 at these
prices and we will pack another
ten-pack **ABSOLUTELY FREE**.

FREE Diskette storage with disks.
Choose either the Slimpack 10 library
box worth £2.19 inc. with every ten
5 1/4" disks, or the Budget 50 (B 50)
with every fifty 5 1/4" disks. If you
don't specify, we will always pack
library boxes.

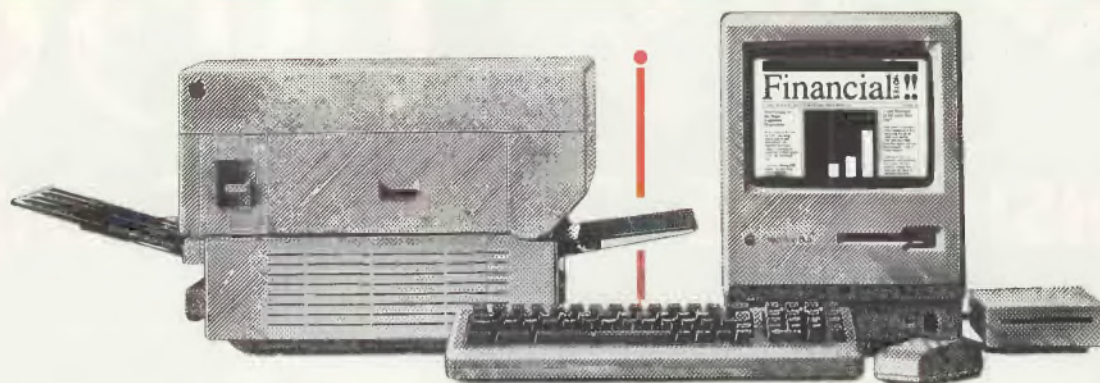
FREE CALCULATOR.

On Disking 'Professional' and
Coloured Diskettes, you will receive
a free Credit Card Memory
Calculator with every pack.



S (0428) 722563

AUTUMN SPECIAL SAVERS



STARTER SYSTEM

- MAC 512K
- EXTERNAL DRIVE
- LASERWRITER
- CONNECTORS
- JUST TEXT
- MAC WRITE

THE BUSINESS SYSTEM

- MAC + 1MB
- EXTERNAL DRIVE
- LASERWRITER +
- CONNECTORS
- JUST TEXT
- MAC WRITE
- MAC DRAW
- PAGEMAKER
- FULL PAINT

PC COMPATIBLE PRICES

- TANDON PCX20 — 20MB XT COMPATIBLE NOW ONLY £1495 + VAT
- THE 10 DON AT COMPATIBLE PCA 30 — 512K, 30MB WINCHESTER 1.2 MB FLOPPY, COLOUR MONITOR + ADAPTOR ONLY £2495 + VAT

APPLE DESKTOP PUBLISHING

	STARTER	BUSINESS	PROFESSIONAL
RRP	£7,675	£9,373	£18,678
CASH PRICE	£5,995	£7,295	£16,995
DELIVERY & INSTALLATION	£75	£75	£250
* LEASE PER MONTH	£195	£238	£496

Call for annual support + on site maintenance charge. Offer subject to availability. Prices quoted excluded VAT.

PROFESSIONAL SYSTEM

- MAC + ,HD20
- CONNECTORS
- DATA PRODUCTS LZR 2665
- JUST TEXT
- MAC WRITE
- MAC DRAW
- PAGEMAKER
- FULL PAINT

* Based upon lease Purchase over 5 yrs.
Subject to Finance company acceptance.
A WIDE RANGE OF ACCESSORIES, SOFTWARE AND REPAIR SERVICES AVAILABLE.



KOMPUTATION AUTOMATION
INFORMATION LTD
104/106 ST JOHN STREET
LONDON EC1

TEL: 01 608 0082

Consultancy · Support
Maintenance · Systems



Authorised Dealer

FOR MORE INFORMATION



BOS SOFTWARE



APRICOT



APPLE

Tandon
Computer (UK) Ltd

● SUPPORT

● MAINTENANCE

Name: _____

Company Tel: _____

Address: _____

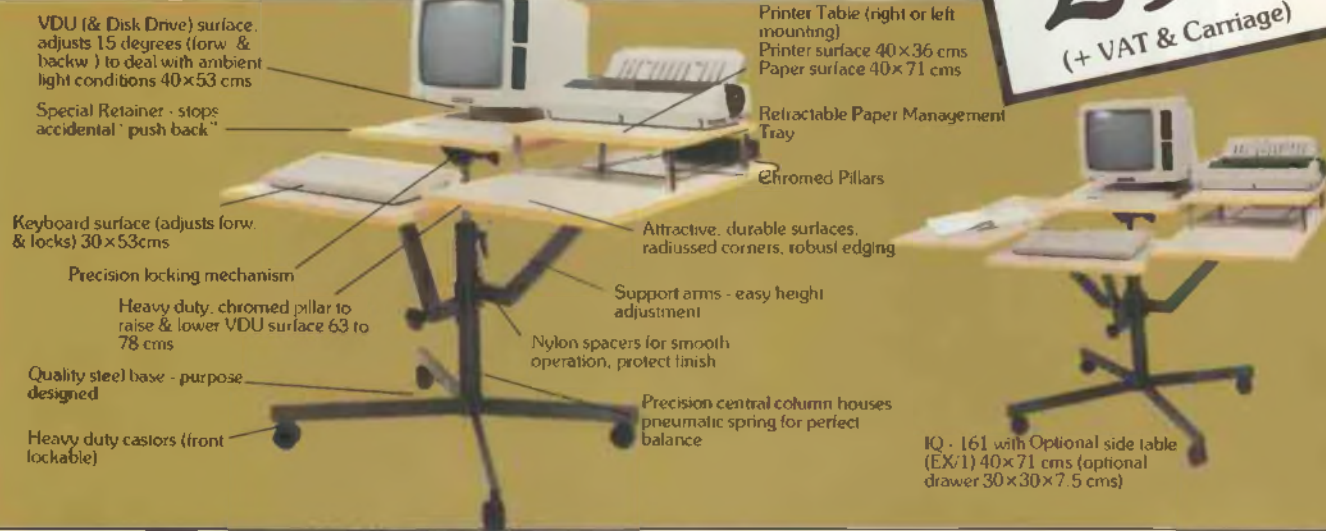
Computers Need IQ

.....already best-sellers in North America, these superb products were designed, developed and manufactured by some pretty bright chaps here in the U.K.

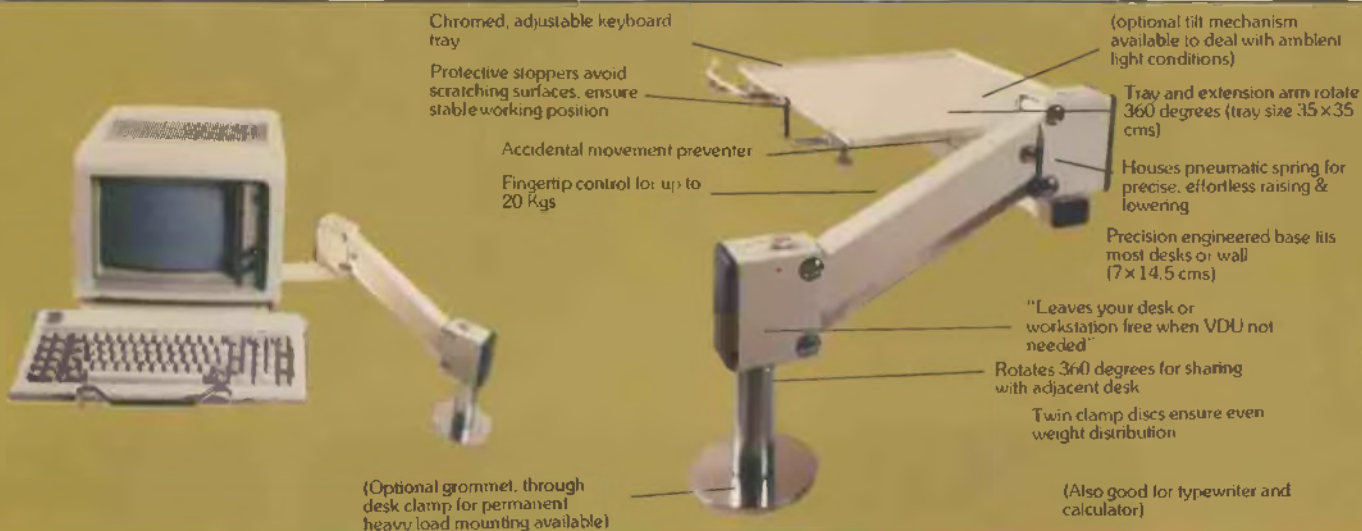
Normal retail value would be around £200 - you save by buying DIRECT !

ONLY
£98 each
(+ VAT & Carriage)

1. the IQ-161 workstation



2. the IQ-162 VDU/Monitor arm



The IQ-161 & 162 are warranted against material & manufacture defects for 24 months.

If you're not entirely happy with your purchase return unused within 30 Days for a full, prompt refund !

PHONE YOUR ORDER (Credit Cards only) 062780 - 331/24 hours - 7 days or MAIL COUPON TODAY

To: Intelligence quotient (IQ) Ltd - (address) 45 Epping Close, Romford, Essex RM7 8BH

PLEASE RUSH THE FOLLOWING ORDER (complete as needed)!

	Qty	Unit Price £98	VAT 15%	Delivery £8.00 per unit	Sub Total
IQ-161 Workstation					
Optional side table EX1		£19			
(with drawer) EX/2		£29			
IQ-162 VDU/MONITOR ARM		£98			
Optional grommet clamp		£10			
Optional tilt mechanism		£10			
Optional 42x42 cms tray	tick ☐		NO EXTRA CHARGE		
TOTAL: £					

State colour preference: IQ161

- 1 - Grey base, light grey surface, yellow trim ☐
 2 - Grey base, light grey surface, grey trim ☐
 3 - Blue (metallic) base, light grey surface, red trim ☐

IQ-162

- 1 - Grey ☐
 2 - Brown ☐
 3 - Beige ☐
 4 - Metallic blue ☐

Signature: _____ Name: (Caps) _____

Address: _____

Post Code: _____

Reg. Office: intelligence quotient (IQ) Ltd - 45 Epping Close, Romford, Essex.

I enclose cheque/P.O. for £ _____

or, please debit my Credit Card account

(state ACCESS/Visa/Amex) _____

Card Number: _____

Expiry Date: _____

(Tools for easy assembly included)



WHAT'S MADE OLIVETTI EUROPE'S BIGGEST PC MANUFACTURER?

The human touch.

After 78 years in the business environment, we understand that people aren't machines in the way they use machines.

Needs vary almost infinitely. So Olivetti computers are unusually flexible.

We start by offering a range of three very different PCs: the compact M19, the fast, best-selling M24, and the superfast, high capacity M28.

We add flexibility by offering each model with a wide selection of features.

You have a choice of four screens, 6 disk sizes, and up to 16 colours.

For graphics resolution there are three options, including 640 x 400 pixels for super-high resolution.

Where other manufacturers give you one keyboard, we offer a choice of three.

As for software, nobody offers a wider choice than Olivetti.

Our approach of putting people first has helped make Olivetti the largest PC compatible supplier in the world.

We intend to stay there: this year we're backing our experience with a £100 million R&D budget.

For more information about Olivetti PCs, post the coupon or simply call us on 01-785 6666.

To: Carol White, British Olivetti, Olivetti House,
86-88 Upper Richmond Road, London SW15 2UR.
Tel: 01-785 6666.

Please rush me details of the Olivetti range of
personal computers.

Name _____

Position _____

Company _____

Address _____

Tel. No. _____



**OLIVETTI PERSONAL COMPUTERS.
YOU WON'T FIND A BETTER ANSWER.**

olivetti

limited offer

256 K Turbo XT £599

70% FASTER

After all these years IBM's PC/XT still chugs along at a steady 4.77 MHz. Our slick new turbo - charged PC's will poke along at the same speed, or at the flick of a switch roar along at 8 MHz - almost twice as fast!

70% CHEAPER

How much more do you have to pay for this leap in performance? - About 70% less! That's right, 70%. Go to your local dealer, check out the prices and work it out on your calculator.

SORRY ABOUT THE OPTIONS

Don't forget the AST Six Pack. You will need to add the printer ports, extra RAM sockets and the battery-backed clock/calendar to match the free one included in our system!

And remember to ask how much more you will need to pay for the Hercules Monochrome Graphics Card so that you can run high resolution graphics - standard on our system!

AND THEN THERE'S THE WARRANTY

Ours is for a full year.

AND MAINTENANCE CONTRACTS

They are based on the total system costs so if you need on-site maintenance you will pay about 70% less!

THE DOCUMENTATION

IBM's is still better but we're working on it!



- Switchable clock speed 4.77/8 MHz
- High quality 4 layer motherboard
- 256 RAM expandable to 640K on the motherboard
- 135 watt switching power supply
- 8 expansion slots
- Enhanced 5150-style keyboard
- IBM standard 360K floppy disk drive
- Optional 20 MB hard disk drive
- Hercules-compatible monochrome graphics card
- High resolution monochrome monitor
- Clock/calendar with battery back-up
- parallel printer ports
- serial port
- game port
- Free software upgrades for six months

PLEASE SEND ME

Standard 256K monochrome system with 2 floppy drives £599

PLUS

384K, total of 640K on system board - add £60
 RGB colour version instead - add £200
 EGA high resolution colour system instead - add £400
 20MB hard disc drive instead of second floppy - add £300
 Heavy duty 150 watt power supply - add £20

Total

UK - add 15% VAT

Total enclosed £

Please send me more information on

☐ This product

☐ Add-on boards

NAME

ADDRESS

TOWN

POST CODE

TELEPHONE

☐ AT-compatible system

☐ Borland software

Send your order to Bristol Micro Traders, Systems Group, Maggs House, 78 Queens Road, Bristol BS8 1QX. Tel: (0272) 298228

Terms are strictly cash with order, please allow time for cheques to clear before delivery.

XT, AT, IBM are registered trade marks of IBM Corporation.

Hercules Graphic Card is a registered trade mark of Hercules Computer Corporation.

Six Pack is a registered trade mark of AST research.

BRISTOL
Micro Traders

For further details ring us on
(0272) 298228

Once Upon A Time

a huge Business Machine corporation created a micro computer standard. It had limited memory and processed information relatively slowly . . . so they introduced an Advanced standard machine . . . and

then Dataflex Design (the UK's leading manufacturer of PC enhancement boards) decided to give standard users the opportunity to attain an advanced standard with an add on board to process 3 times faster, co-processor chips to speed up numeric calculations from 3-37 times, or to simply boost memory by up to 8 Megabytes (to the Lotus/Intel industry standard). They didn't forget input/output delays either, providing Magic Memory Manager, with all board products to dramatically speed up disk operations and provide a printer buffer so that you can print and work at the same time.

To achieve the transformation you simply slide off the machines cover, slot in the boards or chips and switch on.

Dataflex Design offer the PC user informed advice, a support service second to none, and for absolute peace of mind, a two year warranty on all products. Call us today or contact your local Dataflex dealer.

PC Accelerator

This board speeds up PC processing around three times in complete safety. Compatibility is guaranteed with all your existing software and installation is straightforward. An 8087 co-processor can be added to PC ACCELERATOR for even faster numeric processing.

PC Liberator

Europe's first board to extend the PC's memory by up to 2 Megabytes, using the now industry standard Lotus/Intel Extended Memory Specification. Up to four boards may be used in a PC.

Magic Memory Manager

Included with all Dataflex Design memory boards. Disk accesses are speeded up by around 5 times automatically. Printing is controlled in the background, allowing full use of your PC at the same time.

8087/80287 Numeric Co Processor

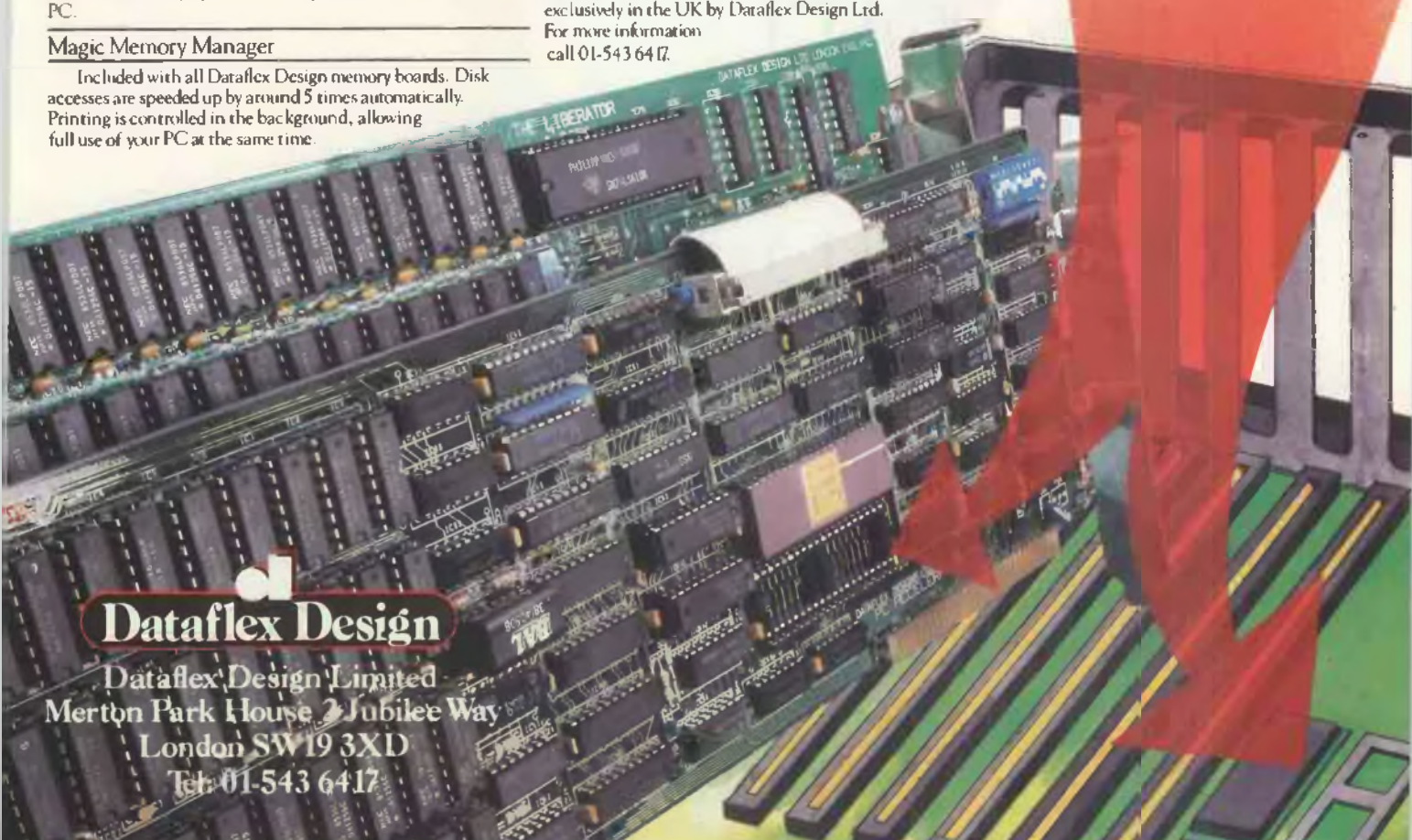
Speed up all numeric calculations from 3 to 37 times. FAST modules are also available to operate at a faster speed than allowed normally by the machine processor. A full range of 8087 support software is available.

Dataflex Design Ltd

Are the UK's largest producers of add on products for all IBM and lookalike PC's, Wang, Apricot and Victor micro computers. HAUPPAUGE are the largest value added Intel distributor in the World, their 8087/80287 range is distributed exclusively in the UK by Dataflex Design Ltd. For more information call 01-543 6417.

**Dataflex Design**

Dataflex Design Limited
Merton Park House 2 Jubilee Way
London SW19 3XD
Tel: 01-543 6417



dBWORLD
dBWORLD
dBWORLD
dBWORLD
dBWORLD
dBWORLD
dBWORLD
dBWORLD
dBWORLD
dBWORLD
dBWORLD
dBWORLD
dBWORLD
dBWORLD
dBWORLD

Development Techniques

Tools and Utilities

Product Evaluation

Open Forum

Bugs and Work around

USA Developments

The Horses Mouth

Technical Training

VAR Register

Employment Corner

The dBASE Journal

Please enrol me in the dBWORLD FORUM
I enclose my subscription of £30 for 18 issues*

Name

Address

Post Code

STRATEGIC MARKETING

FREEPOST

1T Midlands Neville House 14 Waterloo Street

Birmingham B2 5TX England

*offer closes 14th August

dBASE is a trademark of Ashton-Tate

TYPEMAKER...

BEYOND DESKTOP PUBLISHING

Apple Desktop Publishing is inexpensive, fast and simple to learn. The Macintosh can be used for preparing anything from galleys of text, to graphics, tints, special effects and page makeup, to Tabloid.

We have established our TypeMaker division to provide professional services to the media and printing industries, bringing the creativity and efficiency of Desktop Publishing to a professional level.

TYPESETTING BUREAU SERVICE

Choice of • 1270 DPI **Linotronic** on 12" Bromide
• 300 DPI LaserWriter on A4 paper

CONSULTANCY & TRAINING

We are able to offer expert advice on the capabilities of software and hardware for the designer and typographer.

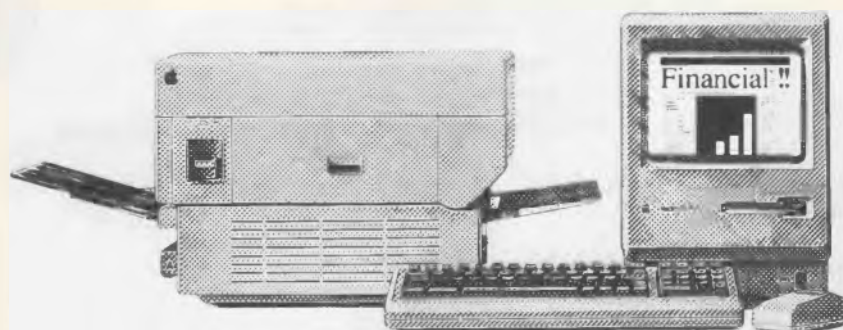
TYPEMAKER DESIGN SERVICE

Ranging from typographically enhancing your page layouts to designing full jobs from copy supplied.

SYSTEM SALES

Second City provide nationwide support for Apple Desktop Publishing systems including installation, training and after-sales service.

CONTACT: TypeMaker Ltd at Second City House
on 021-707 8739



SECOND CITY
SYSTEMS

talk
apple
with


SECOND CITY have been supporting Apple computer systems since 1979. We are a leading supplier of Macintosh systems and software to industry, small business and educational establishments in the Midlands and across the country. We only sell Apple systems and can offer total support, including nationwide on-site maintenance.

By dealing with one range of hardware instead of the multiplicity of products sold by most dealers, Second City has developed its understanding and skill in the manipulation of the product to meet user requirement. The company is therefore better able to provide satisfactory solutions than those dealers who dissipate their skills over many types of equipment and software packages.

EDUCATIONAL ESTABLISHMENTS
Second City have opened a specialist branch based at Aston University in Birmingham to cater for the needs of educational users. Phone 021-359 4621 for details of our specially negotiated prices for bona fide educational establishments.

*Authorised Apple Dealer
and Service Centre, Lotus,
Microsoft.*

C-SOFTWARE DEVELOPMENT TOOLS

C COMPILERS

Amiga Lattice C
Atari Lattice C
Aztec C86 Personal
Aztec C86 Developer
Aztec C86 Commercial
C1-86
Desmet W/Source Debugger
Lattice C V.3.0
Let's C V.3.02
Let's CSD Source Debugger
Mark Williams C. V.3.0
Microsoft V.3.0
Wizard C

LATTICE CROSS COMPILERS

Z-80 Cross Compiler V.3.02
68000 Cross Compiler V.3.0
Xenix, Vax, Unix, Amiga

C INTERPRETERS

C-Terp
Instant C
Introducing C
Living C
Run/C
Run/C Professional

COMMUNICATIONS LIBRARIES

Asynch Manager for C
Greenleaf Comm Functions with Source
C Power Packs Communications

DATABASE LIBRARIES

Btrieve V.4.0
Btrieve/N V.4.0
C-Index/Plus
C Power Packs Database
C To Dbase
C-Tree with Source
Dbvista
Lattice DBC II/III
Lattice DBC with source
Phact V.2.27
Phact Query V.1.10
Phact Report V.1.10
Rtrieve V.1.02
Rtrieve/N V.1.02

GRAPHICS LIBRARIES

Essential Graphics V.1.0
Graphiccc
GSS Graphic Dev. Toolkit
GSS Toolkit - Kernel V.2.0
GSS Toolkit - Metafile V.2.0
GSS Toolkit - Plotting V.1.01
Halo V.2.26
Halo Ten Font Pack L 1 and L 2
Entelekon Superfonts for C

MISCELLANEOUS LIBRARIES

APL2C
APT Toolkit
Basic V.1.0
Blaise C Tools
Blaise C Tools 2
C-Food Smorgasbord
C Utility Library V.2.01
Entelekon C
Float 87
Greenleaf Functions with Source
Pforc V.1.0 with Source
Scientific Subroutines
The Hammer Library
Vitamin C
C Power Packs V.5.5
Building Blocks I
Building Blocks II
Communications
Database
Mathematics
Utilities I

270.00
99.95
150.00
210.00
325.00
265.00
140.00
270.00
49.95
49.95
355.00
260.00
345.00

SCREEN/WINDOWS LIBRARIES

Blaise View Manager for C
Blaise View Manager with Source
Curses V.1.02A
Curses with Source
Entelekon Windows
Metawindows
Panel V.6.2B
Topview Toolbasket V1.01
Windows for C V.4.04
Windows for Data (includes WFC) V.1.04

199.00
250.00
105.00
215.00
94.00
135.00
225.00
250.00
180.00
270.00

C UTILITIES

DEBUGGERS

C-Sprite V.2.02
CI Probe Source Level Debugger for C-86
MSD C Source Debugger

100.00
250.00
150.00

LINT PROGRAM CHECKERS

PC Lint V 1.08
Pre-C V.1.35

90.00
255.00

MAKE

LMK V.2.28
Polymake Unix-Like Make Facility
Powermake V1.0

160.00
90.00
160.00

TEXT MANIPULATION

C Cross Reference Generator
Text Management Utilities
Polyxref Cross Reference Utility (1 language)
Polyxref Cross Reference Utility (4 language)

40.00
80.00
124.00
219.00

TEXT EDITORS

Brief
Emacs
ESP for C
Firsttime for C
Pmate
Vedit
Vedit Plus

180.00
375.00
295.00
270.00
150.00
125.00
225.00

TRANSLATORS

Bastoc V.2.0 (Basic to C)
DBX (Dbase III to C)
Fortrix-C V 4.10 (Fortran to C)

290.00
290.00
6000.00

PHOENIX PRODUCTS

PASM86 V.1.02 (Assembler)
Pfinish (Optimizer)
Plix86 Plus V.2.0 (Debugger)
Pforce V.1.0 (Large Utility Library)
Plink86 (Overlay Linker)
Plink86 + (Adds overlay caching)
Pmaker V.1.01 (Make Utility)
Pmate V.4.0 (Editor)
Pre-C V.1.35 (Source code analyser)
Pel V.4.0 (Binary File Transfer)

255.00
255.00
255.00
275.00
255.00
320.00
170.00
150.00
255.00
170.00

PHOENIX PRODUCTS

Pasm86 V.1.02 (Assembler)
Pfinish (Optimizer)
Plix86 Plus V.2.0 (Debugger)
Pforce V.1.0 (Large Utility Library)
Plink86 (Overlay Linker)
Plink86 + (Adds overlay caching)
Pmaker V.1.01 (Make utility)
Pmate V.4.0 (Editor)
Pre-C V.1.35 (Source Code Analyser)
Pel V.4.0 (Binary File Transfer)

255.00
255.00
255.00
275.00
255.00
320.00
170.00
150.00
255.00
170.00

POLYTRON PRODUCTS

Polymake Unix-Line Make Facility
Polytron Version Control System
Polytron Version Control System (For networks)
Polylibrarian
Polylibrarian II
Polytron Virtual Memory File Manager
Polytron C Library 1
Polyxref Cross Reference Utility (1 language)
Polyxref Cross Reference Utility (4 language)
Polyoverlay
Polytron C Beautifier

90.00
390.00
CALL
90.00
50.00
194.00
90.00
124.00
219.00
90.00
44.00

Available for the IBM PC and 100% Compatibles

For further information on any of the products listed above contact

THE SOFTWARE CONSTRUCTION COMPANY LTD.

28 Churchmead, Roydon, Harlow, Essex CM19 5EA
Telephone: Roydon (027 979) 2566

LOAD & RUN

THE AMSTRAD SPECIALISTS

LOAD & RUN,
DEPT. CWA
P.O. BOX 123
DARTFORD
DA1 5AA

RING (0322) 73128 FOR ENQUIRIES + LATEST RELEASES
These are just a small selection from the large range which is constantly growing!!

PCW

	RRP	OUR PRICE P&P
Supercalc II (Amstrad)	£49.95	£39.95
PCW 8256 (Amstrad)	£458.85	£439.95 £12.00
PCW 8512 (Amstrad)	£573.85	£559.95 £12.00
PCW Printer Ribbon (Amstrad)	£5.95	£5.50
PCW Cover		
(Set of 3 Mon/Kew/Print) (Amstrad)	£9.95	£9.45
Cambase (Cambrion)	£49.95	£45.95
Brainstorm (Caxton)	£49.99	£39.95
Cardbox (Caxton)	£99.99	£79.95
Touch 'n' Go (Caxton)	£24.95	£20.95
Scratchpad Plus (Caxton)	£69.99	£59.95
Popular Accounts (Sage)	£99.99	£79.95
Popular Accounts + (Sage)	£149.99	£129.95
Popular Invoicing (Sage)	£69.99	£59.95
Popular Payroll (Sage)	£69.99	£59.95
Popular Combo Pack (Sage)	£149.99	£129.95
Popular Super Combo Pack (Sage)	£199.99	£175.95
Sage Database (Sage)	£89.99	£59.95
Pocket Wordstar (Micropro)	£49.95	£45.95
Accounts (Compact)	£199.99	£185.95
Nucleus (requires FD 2H Compact)	£99.99	£85.95
Di Graph (D.R.)	£49.95	£45.95
Di Draw (D.R.)	£49.95	£45.95
C Compiler (D.R.)	£49.95	£45.95
Pascal MT/+ (D.R.)	£49.95	£45.95
Money Manager (Connect Systems)	£29.95	£26.95
Teladd (Cavalier)		£21.95
Invoicing & Stock Control (Cavalier)		£59.95
dBase II (Ashton-Tate)	£119.00	£109.00
Newsword (News) Ltd	£69.95	£55.95
Multiplan (Newstart)	£69.95	£55.95
Two Finger Touch Type (Lansys)	£24.95	£20.95
Crash Course (Lansys)	£24.95	£20.95
Datagem (Gannit)	£39.95	£35.95
Hands on CP/M (Microcal)	£24.95	£20.95
Hands on Supercalc (Microcal)	£24.95	£20.95
Hands on dBase II (Microcal)	£24.95	£20.95
All Handline tutorials £9.25 each		

**NOW IN
THE PROTO 3" DISC BOX
RRP £6.99
Special Summer Offer
£6.50**

**MIDI MUSIC SYSTEM
RRP £129.95
Special Summer Offer
£99.95**

AMSOFT 3" DISC x 10 ONLY £37.95
Lockable Recal 3" Disc Box Special Offer £18.50
At last a quality Disc Box we don't mind selling. Made by REXEL in brown with two keys, left off cover and three dividers. It will take discs either with or without cases.
DART LIGHTPEN £39.95 £34.95
PAGE MODEM PACK £172.50 £185.95 £2.00
(includes Comstar on ROM)
SPECIAL SUMMER OFFER £189.95

CPC CASSETTE SOFTWARE

	RRP	OUR PRICE
Commando	£7.95	£6.95
Countdown	£8.95	£7.55
Doomsday Blues	£9.95	£7.85
Frankie Goes to Hollywood	£8.95	£7.45
Get Dexter	£9.95	£7.85
Monopoly	£9.95	£8.55
Moon Cresta	£7.95	£6.95
Play Your Cards Right	£8.95	£7.45
Saboteur	£8.95	£7.85
Theatre Europe	£9.95	£8.65
Thing on a Spring	£8.95	£7.55
Tuborg	£7.95	£6.55
Turbo Sprint	£8.95	£7.85
Cluedo	£9.95	£7.95
Melt Down	£7.95	£6.95
World Cup Carnival	£9.95	£7.95

DISC SOFTWARE FOR CPC + PCW (*)

	RRP	OUR PRICE
2112 AD	£14.95	£12.95
JD Clock Chess (for 8256) (*)	£19.95	£18.95
Bridge Player (for 8256) (*)	£19.95	£17.95
Fighting Warrior/Exploding Fist	£24.95	£19.95
Forbidden Planet	£14.95	£12.95
Friday 13th	£16.95	£13.55
Heroes of Karn (for 8256) (*)	£17.95	£15.95
Highway Encounter	£13.95	£10.95
Macrosmosc	£13.95	£10.95
Mastercalc 128	£34.90	£25.95
Mini Office II	£19.95	£17.95
Monopoly	£14.95	£12.95
Office Master	£25.00	£21.95
Office Mate	£17.50	£15.50
Premiere	£24.95	£21.95
Spindizzy	£14.95	£12.95
Tank Commander	£14.95	£12.55
Who Dares Wins II	£14.95	£11.55
Hitchhiker's Guide (for 8256) (*)	£29.95	£28.00
Heavy on the Magic	£14.95	£11.95
Cyrus II Chess (for 8256) (*)	£15.95	£14.95

FULL RANGE OF
IBM

UK: All prices include VAT and P&P in UK. Add P&P in brackets for hardware.
For Europe & Overseas: All prices exclude VAT & include P&P in Europe.
Elsewhere add 50p extra for P&P hardware outside Europe add £2.50.
E.&O.E.



APRICOTS GOING CHEAP!

Apricot F1 256K RAM, one 720K
disk with 9" monitor **£349.00**
with 12" monitor **£399.00**
with 10" colour monitor **£449.00**

Apricot F2 512K RAM, two 720K
disks with 9" monitor **£499.00**
with 12" monitor **£549.00**
with 10" colour monitor **£599.00**

Apricot F10 512K RAM one 720K
disk, one 10 Mbyte hard disk
with 9" monitor **£649.00**
with 12" monitor **£699.00**
with 10" colour monitor **£749.00**



COMPESHOP 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

COMPESHOP 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.

All prices quoted are exclusive of VAT.



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

Apricot X1FD 512K RAM, two 720K
disks with 9" monitor **£799.00**
with 12" monitor **£849.00**

Apricot PC256K RAM, two 315K
Disks with 9" monitor **£549.00**
with 12" monitor **£599.00**

Bargain basement
Sanyo 555 **£399.00**

VISIT OUR NEW SHOP AT
311 LONDON ROAD,
CAMBERLEY, SURREY
Tel: (0276) 22677

These are the Cheapest Prices anywhere in the UK. If you think differently, then let us know!

Boot Out

Visit us on
Stand 3086
PCW Show

Come and visit us at the PCW show where we will have a wide selection of **REMAINDERED 'Software', 'Hardware', and 'Books'** at very **CHEAP** Prices. 'Apple', 'Atari', 'Commodore 64', 'IBM', are some of the machines covered.

Business		Recreation	
Home Accountant	£30.00	Adv. Construction Set	£16.50
Peachtree Accounting		Adv. in Namia	£20.00
(all modules)	£25.00	Fahrenheit	£10.00
Visischedule	£65.00	Red Alert	£5.00
Wildcard	£50.00	The Brain Game	£15.00

Hardware		Books	
Accelerator II	£75.00	The Apple Almanac	£5.00
Videx Videoterm 80 col. card	£50.00	The Apple Users Enc.	£3.50

Plus Apple Spares and Manuals.
Plus "Call Apple" & the new "Mac Apple" magazines will be on sale

There are just a few examples . . .
PLEASE CONTACT US FOR A COMPLETE LIST !!!

SPECIAL ANNOUNCEMENT - 'Desktop Publishing'

We now offer a **Laserwriting** service. We can print from your IBM (or compatible) disk which contains an ASCII text file of the document. We can print to A4 size using plain paper or your letter heading. We can print Price Lists, Newsletters, Catalogues, Forms, Logos, etc . . .

We will also have someone on the stand at the PCW Show to advise you on all aspects of Desktop Publishing. We can also arrange a complete system to be installed for as little as £5,000.

Please send me further details of:-

Remaindered S/W & H/W List ☐

Call/Mac APPLE Subs. ☐

LASERWRITING Service ☐

IBM Desktop Publishing ☐

Name

Company

Address

.....

.....

.....

Telephone

DON'T BUY A JOYSTICK UNTIL YOU HAVE TESTED THE FANTASTICK III AND THE QUICKSHOT II PLUS WE KNOW YOU WILL BE IMPRESSED



THE QUICKSHOT II PLUS

All the features of the worlds most popular joystick NOW incorporating microswitch technology improving the speed and durability of the product.

PRICE £12.95



THE FANTASTICK III

Incorporating dual electronic firing buttons, auto centering, auto fire control and eight direct fire movements with built in MSX detection. A fantastic joystick at a fantastic price.

ONLY £6.95

TRADE ENQUIRIES WELCOME

For details of your nearest stockist phone Palan Electronics on 01-368 1276 or visit Palan Electronics at the PCW Show, Olympia. Sept 3rd-7th. Stand 3001-3.

PALAN ELECTRONICS LTD

A Prestwich Holdings PLC Company

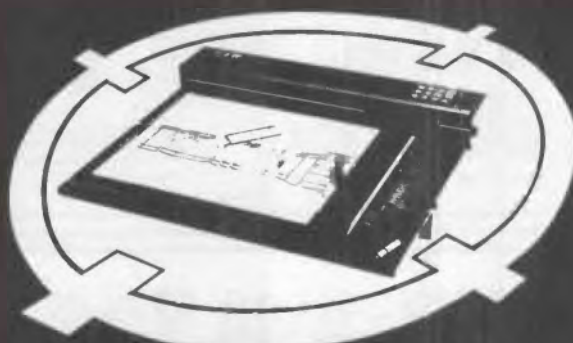
UNIT 10, BRUNSWICK INDUSTRIAL PARK,
WATERFALL ROAD, NEW SOUTHGATE, LONDON N11 1JL.
Telephone: 01-368 1276. Telex 269023 PRESTG.

PLOTMATE

EXTENDS YOUR SYSTEM OPTIONS

Plotmate graphics plotters are compatible with all leading micros. They run a wide range of Linear Graphics' and third party software and have numerous functions and add-on capabilities ideally suited to the requirements of the Education, Industry and Business environments.

All of which means that for between £299-£569 you can greatly extend your present system's options for a fraction of what you thought it would cost.



SEE US AT THE PCW SHOW STAND No. 1422

- * Compatible with Acorn, IBM, ATARI, Amstrad, RML and other micros.
- * Linear Graphics' Software includes PCB Design, CAD, Data Display, Mathematical Modelling, Mapping, Digitising.
- * Third Party Software includes LOTUS 1 2 3, Supercalc 3, Autocad, Logo, Interchart and many others.
- * Other features — understands BBC Graphics Commands; Sweet P and Graphtec; Serial and Parallel Interfaces, Direct Drive Mode, Sector & Segment Hatching.

⊕ PLOTMATE A4 — £299 ex VAT

⊕ PLOTMATE A4M — £399 ex VAT

⊕ PLOTMATE A3M — £569 ex VAT

⊕ LINSKAN — £150 ex VAT

Linskan is a high resolution optical scanner that fits onto all PLOTMATE models and, in conjunction with a BBC Micro, allows scanning of photographs, diagrams, maps and display data.

LINEAR GRAPHICS LTD

28 Purdeys Way Rochford Essex SS4 1NE
Tel 0702 541663/4/5 Telex 995701 Ref 356

MICRO-RENT

MICRO-RENT DO MORE!

MACINTOSH



APRICOT



SIRIUS



IBM PC



Micro-Rent do more than offer you the best rental deals on microcomputers. They rent printers, hard-disk systems, monitors - even some software! They offer impartial advice on the best machines for your purposes, and provide training for both beginners and specialists, to help you make the most of your micro.

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.

* Prices quoted are based on 3-month rental, excluding VAT.

01-700 4848



St. Marks Studios, Chillingworth Road, London, N7

APPLE · APRICOT · IBM PC & XT · OLIVETTI
MACINTOSH · OSBORNE · SIRIUS · COMPAQ

High-quality laser printing from your disks - phone for details

AUTHORISED DEALER TANDON & AUTOCAD



The ideal Combination. Fully supported IBM XT & AT compatible hardware with 6 months ON SITE WARRANTY 8MHz 80287 processing speed (PCA), Hi-res 14" monitor, Quality Professional Software

BASIC SYSTEM

Tandon PCX10 (10MB, 640K RAM) 720 x 348 resolution on 14" screen
1 parallel & 2 serial ports, Basic Autocad, summamouse, Hitachi A3 plotter

£2149

ADVANCED 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.

£7799

We can tailor Autocad systems to your requirements due to our extremely wide range of support peripherals (see below) Installation and training - independent consultancy service available. Please call for details.

BOS: TOTALLY PORTABLE SOFTWARE

Lowest cost entry into IBM compatible multi-user systems. Requires only one PC plus serial port and terminals. No additional cards are necessary.



HIGH SPEED MULTIUSER HARDWARE PLUS SHARED RESOURCE SYSTEMS. Please call for details.

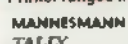


1040 ST mono/colour E649/£819 AMSTRAD PCW 8512 Inc free disks of paper

£499

PRINTERS & SHEET FEEDERS

Printer ranges that stand head and shoulders above the rest.



Best value quality 9 pin (216 cps, 45cps NLO) from

£299



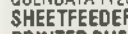
Best value quality 24-pin (216cps, 76cps NLO) from

£425

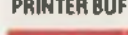


Spinwriters (letter quality) from

£299



QUENDATA 1120 £149 JUKI 6100



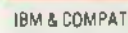
SHEETFEEDERS for most printers

£269

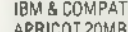


PRINTER BUFFERS Serial/parallel in/out 8K-2MB

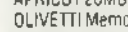
£179



HARD DISKS & MEMORY UPGRADES



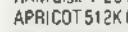
IBM & COMPATIBLES 20MB (NEC Drives) £425



IBM & COMPATIBLES 20MB PLUSCARD £595



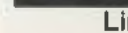
APRICOT 20MB (Internal Drives from Plus 5) £695



OLIVETTI Memory upgrade to 640K £99



SANYO Memory upgrade to 256K +



RAM disk + 25% extra disk capacity £65



APRICOT 512K Memory upgrade £115



SUPERCALC 4 (IBM)



Limited stock

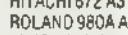


£239

PLOTTERS & DIGITISERS etc



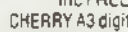
HITACHI 672 A3 £425



ROLAND 980A A3 £925



HOUSTON DMP42A1 £2995



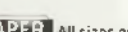
* inc FREE 11K buffer ** inc stand



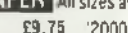
SUMMAMOUSE with IBM support software £439



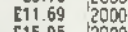
SUMMAMOUSE with GEM + WRITE & PAINT (IBM) £89



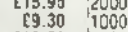
HITACHI 672 A3 £425



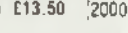
ROLAND 980A A3 £925



HOUSTON DMP42A1 £2995



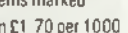
* inc FREE 11K buffer ** inc stand



SUMMAMOUSE with IBM support software £439



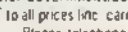
SUMMAMOUSE with GEM + WRITE & PAINT (IBM) £89



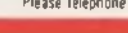
HITACHI 672 A3 £425



ROLAND 980A A3 £925



HOUSTON DMP42A1 £2995



* inc FREE 11K buffer ** inc stand



SUMMAMOUSE with IBM support software £439



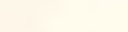
SUMMAMOUSE with GEM + WRITE & PAINT (IBM) £89



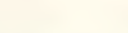
HITACHI 672 A3 £425



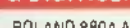
ROLAND 980A A3 £925



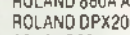
HOUSTON DMP42A1 £2995



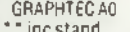
* inc FREE 11K buffer ** inc stand



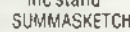
ROLAND 880A A3 £649*



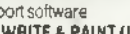
ROLAND DPX2000 A3 £3395**



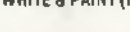
GRAPHTEC A0 £5995



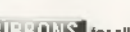
* inc FREE 11K buffer ** inc stand



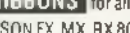
SUMMAMOUSE with IBM support software £439



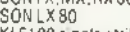
SUMMAMOUSE with GEM + WRITE & PAINT (IBM) £89



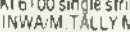
HITACHI 672 A3 £425



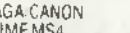
ROLAND 980A A3 £925



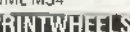
HOUSTON DMP42A1 £2995



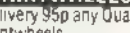
* inc FREE 11K buffer ** inc stand



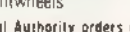
SUMMAMOUSE with IBM support software £439



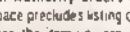
SUMMAMOUSE with GEM + WRITE & PAINT (IBM) £89



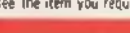
HITACHI 672 A3 £425



ROLAND 980A A3 £925



HOUSTON DMP42A1 £2995



* inc FREE 11K buffer ** inc stand



SUMMAMOUSE with IBM support software £439



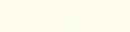
SUMMAMOUSE with GEM + WRITE & PAINT (IBM) £89



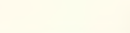
HITACHI 672 A3 £425



ROLAND 980A A3 £925



HOUSTON DMP42A1 £2995



* inc FREE 11K buffer ** inc stand



for
VALUE
PRODUCTS

DISKS - POST FREE

PRICES DOWN!!

Packed in tens. No Quibble Guarantee.

DYSAN 5 1/4"	First pack	Each Extra pack
SSDD	£14.45	£13.45
DSDD	£18.45	£17.45
SSDD	£18.45	£17.45
DSDD	£24.75	£23.45
HD 1.6 MB	£35.95	£33.95

SONY/PANASONIC 5 1/4"	First pack	Each Extra pack
SSDD	£11.95	£10.95
DSDD	£14.95	£13.45
DSDD	£17.95	£15.95
HD 1.6 MB	£28.95	£26.95

XIDEX PRECISION 5 1/4"	First pack	Each Extra pack
SSDD	£9.95	£8.95
DSDD	£11.95	£10.95
DSDD	£14.95	£13.95

SONY 3.5"	First pack	Each Extra pack
SS Plain	£19.95	£17.95
SS Boxed	£21.95	£19.95
DS Plain	£27.95	£25.95
DS Boxed	£29.95	£27.95

AMSOFT CF2 3" £33.50
3 1/2" & 5 1/4" see 10 Lib. case £1.75



ADVANCED MICROCOMPUTER APPLICATIONS 1ST/2ND FLOORS
40, HIGH ROAD, BEESTON NOTTINGHAM NG9 2JP Tel: 0602 252627

EINSTEIN COMPUTERS: THE AFFORDABLE PACKAGE YOU REALLY WANT!

**500
SOFTWARE TITLES**
AVAILABLE DIRECT FROM TATUNG

for details contact the Mail Order Office,
P.O. Box 230, Telford,
Shropshire, TF1 6SP



ONLY
£199

+ VAT

FREE 10 DAYS TRIAL

Money Back Guarantee
(subject to return in
perfect condition)



FREE!

£150 WORTH OF BUSINESS
AND 10 GAMES SOFTWARE
with any package you
purchase including Word
Processing, BBC Basic,
Spreadsheet and Database.

PACKAGE A: EINSTEIN BASIC

- Built-in 3" Disc Drive
 - Massive 80K Ram Memory
 - Familiar QWERTY Typewriter Keyboard
 - Connects direct to your T.V.
 - Not limited to one language
 - Connects to virtually any printer or monitor
- Plus: facility for 3 additional disc drives, Hard disc drive facility, Centronics port, RS232 port, user ports, analogue digital converter plus much more.

PACKAGE B: STARTER PACK



ONLY
£260
+ VAT

SINGLE DRIVE EINSTEIN COMPUTER PLUS GREEN MONITOR

- High resolution 12" display with ant glare screen
- Suitable for a range of home and simple business uses
- Connects to your T.V. for colour games facility
- Package connects to virtually any printer or colour monitor
- Option of the 80 column card to extend business use £59.00

PACKAGE C: ADVANCE PACK



ONLY
£305
+ VAT

SINGLE DRIVE EINSTEIN COMPUTER PLUS COLOUR MONITOR

- 14" high resolution screen with 16 vivid colours
- Excellent graphic animation
- Ideal for sophisticated games
- Package connects to virtually any printer
- Ideal for full colour business programmes

PACKAGE D: ENHANCE PACK



ONLY
£380
+ VAT

TWIN DRIVE EINSTEIN COMPUTER PLUS GREEN MONITOR PLUS 80 COLUMN CARD

- Second disc drive doubling the storage capacity
- Can be used for storage of data and programmes
- Simplifies copying of programmes
- 80 column card for massive increase in business software capability
- Package connects to any printer
- Option of connecting to your T.V. screen for colour games

PACKAGE E: PROFESSIONAL PACK



ONLY
£485
+ VAT

TWIN DRIVE EINSTEIN COMPUTER PLUS GREEN MONITOR PLUS 80 COLUMN CARD PLUS PRINTER

- Superb Dot Matrix printer, text and semi-graphic bidirectional, logic seeking
- Various print styles, normal condensed, enlarged mode
- 100 characters per second
- Adjustable sprocket feed and friction feed

The flexibility of Einstein is phenomenal. In addition to these packages outlined above numerous peripherals are available.

SOME EXAMPLES OF EINSTEIN'S CAPABILITIES (storage on one side of diskette)

- Powerful Word processor for the home or business up to 100 pages
 - Programmable spreadsheet with graphic facility up to 1300 cells
 - Advanced Database management up to 30,000 records
 - Stock Control up to 500 products
 - Purchase ledger up to 500 Vendors
 - Sales ledger up to 500 Accounts
 - Invoicing, mailing, nominal ledger
 - Viewdata, Prestel
 - Comprehensive specific vertical packages for pharmacists, cash sales-simplex, Telepack, Micro landlord, Garages, Farms etc.
 - Educational Packages
- Plus a great deal more!

**SEE US ON
STAND
1209**

I would like to take advantage of Tatung's unbeatable 'direct from the manufacturer' offer.
(Please tick).

Package A ☐

Package B ☐

Package C ☐

Package D ☐

Package E ☐

My cheque is enclosed for £..... or please debit my credit card account to the amount of £.....

My Access () Visa () No. is

Please send me further details of the Einstein

Name Address

Postcode Tel

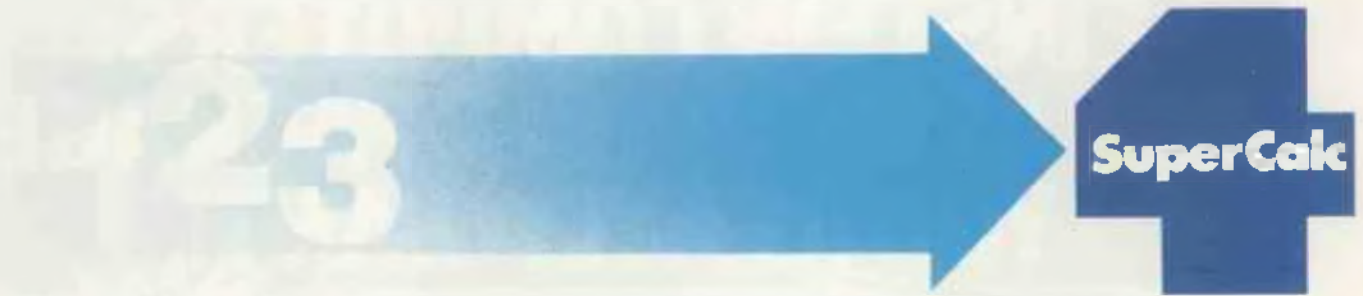
I understand that if I return the package within 10 days, in perfect condition, my cheque will be returned or my credit account credited.

PC 9/86

TATUNG

Stafford Park 10, Telford, Shropshire.

The 4th dimension in spreadsheets



SuperCalc4 has something new to offer these users:

Lotus users

- No install procedure
- Reads and writes Lotus WK? files.
- Not copy protected.
- Site licensing available.
- Full word menu commands – command path displayed.
- 9999 rows x 255 cols., named ranges.
- Reads Lotus macros, macro 'learn' mode.
- Supports up to 8MB of RAM.
- Calculates only dependent cells and solves circular references.
- Over 75 built-in functions.
- Full consolidation and user defined formatting options.
- Supports B/W, EGA and ECD.
- Alphabetic not ASCII sorts.
- Integrated and superior graphics.
- SIDEWAYS™ print utility included.
- User defined reporting functions.
- Interactive data file directory.
- Full sparse matrix memory management.
- Error handling with diagnostics.

SuperCalc3 users

- Reads & writes earlier .CAL files.
- Full word menu commands.
- Automatically engages: ready, menu, entry, file, name or point modes.
- 9999 rows x 255 columns, named ranges.
- Supports function keys.
- Reads eXecute files.
- Over 40 new built-in functions.
- Full consolidation and user defined formatting options.
- User defined reporting functions
- Macro 'learn' mode.
- Interactive data file directory.
- Command path displayed.
- Error handling with diagnostics.
- Advanced screen handling and colour usage.
- SIDEWAYS™ now supports full ASCII set and more printers.
- Site licensing with equity for existing products.
- Upgrade scheme for existing users.

Spreadsheet users

- Reads and writes DIF, CSV, ASCII, text and numeric file formats.
- Full word menu commands; macro 'learn' mode.
- 9999 rows x 255 columns.
- Full consolidation and user defined formatting options.
- User defined reporting functions.
- Interactive data file directory.
- Command path displayed.
- Error handling with diagnostics.
- Advanced screen handling and colour usage.
- Site licensing available.
- Not copy protected.
- No install procedure.
- Integrated and superior graphics.
- SIDEWAYS™ print utility included.
- Interactive data file directory.
- Error handling with diagnostics.
- Advanced screen handling and colour usage.

COMPUTER ASSOCIATES

Software superior by design.

CA Computer Associates M.P.D.
43-51 Windsor Road, SLOUGH
Berkshire SL1 2EQ
Tel: Slough 77733

**SPECIAL OFFER
TO LOTUS
USERS**

Trade up to SuperCalc4 from £49.95 plus VAT.
Telephone Micro Products Division, Computer Associates
Slough (0753) 77733 for full details.
Offer closes 30th September 1986

Name _____

Title _____

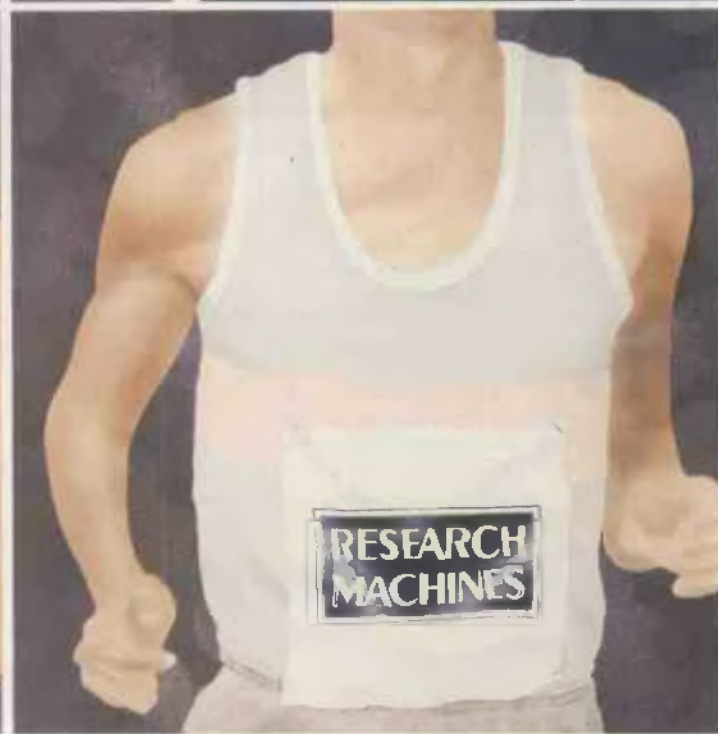
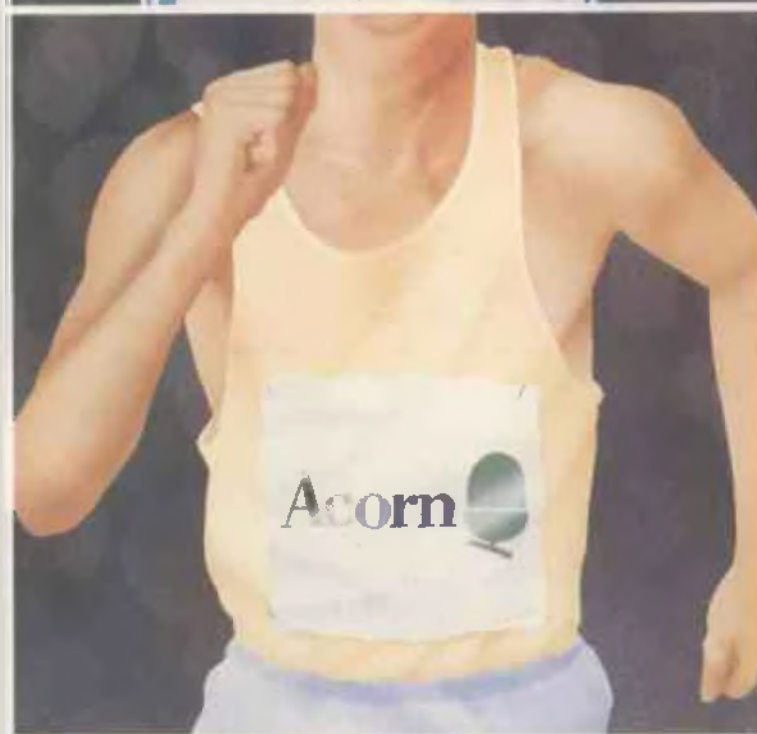
Organisation _____

Address _____

Telephone No: _____

To
obtain a free
evaluation copy
of SuperCalc4, clip
your business card to this
coupon or complete as required.

The way is CA.



Join the front runner

The main event in the personal computing calendar has got to be the PCW Show at Olympia. It's the largest event of its kind held under one roof. And this September we're proud to be celebrating our 9th year.

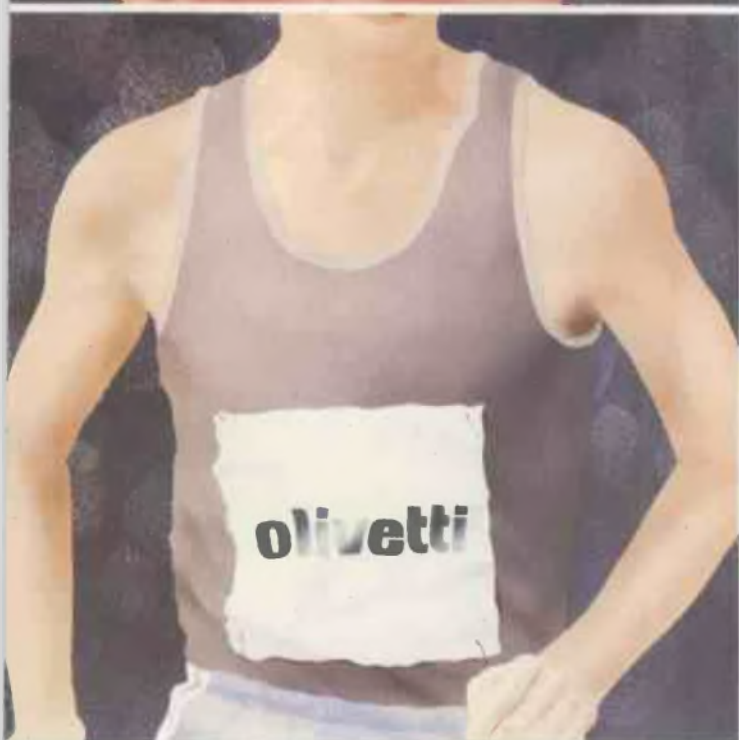
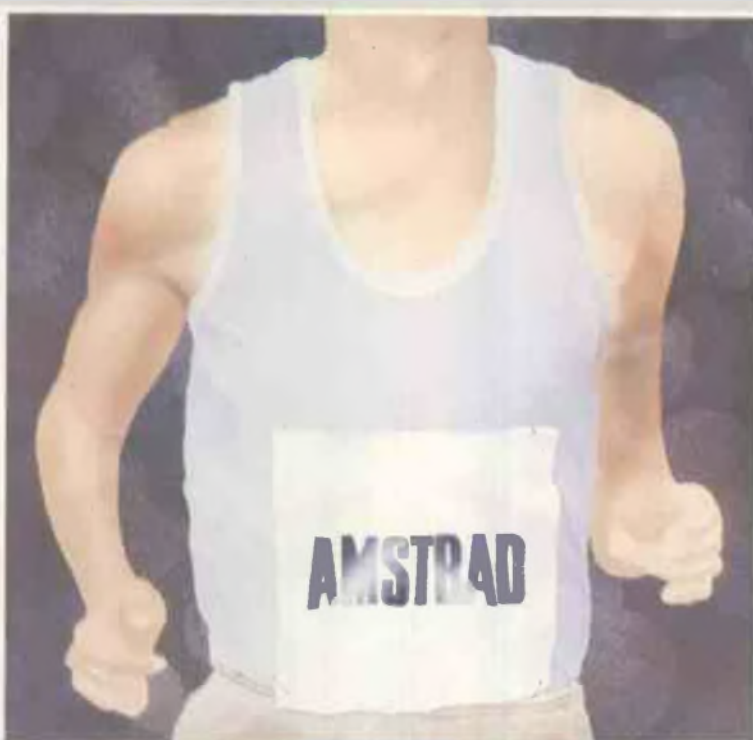
Once again you've the golden opportunity to see all the famous names in the business battling for top positions alongside fresh, talented newcomers.

At your leisure you can pick and choose

the ideas that will profit you best.

And with an extensive range of hardware, software and peripherals on show, you can be certain there's something of interest for everyone. Whether you're a seasoned professional, a teacher or an enthusiast.

There's also a line-up of services and facilities to help you make the right decisions. Like the Application Advisory Service and consultancy area, our Product Locator system,



rs at the main event.

the new PCW Show Education Centre and the Association of Computer Clubs.

All offering help and advice with your computing problems. So how will the stars fare against the smaller specialist suppliers this year? Get set for the main event when all will be revealed.

The stadium is London's Olympia. The dates 3-7 September 1986. Send

for your tickets now. [Business, professional and trade only days 3-4 September].

For advance tickets at £2.00 each ring the PCW Show ticket office on 01-487 5831 with your Access or Barclaycard number. Or send a cheque to PCW Show Tickets, 11 Manchester Square, London W1M 5AB.



**3-7 SEPTEMBER 1986
OLYMPIA LONDON**

Sponsored by Personal Computer World

Organised by Monihull Limited 11 Manchester Square London W1M 5AB



BREAKOUT

At last, the first complete BABT approved INTERNAL MODEM package for the IBM PC, XT, AT, Compaq and compatibles.

BREAKOUT* is an INTERNAL MODEM with a menu driven colour software package allowing AUTODIAL/AUTO ANSWER access to private and public VIEWDATA and TELETYPE services such as PRESTEL®, TELECOM GOLD®, P.S.S., DOW JONES and hundreds more.

This British product plugs into any expansion slot and offers V.21 300/300, V.23 1200/75, Bell 103 full duplex and 1200/1200 half duplex with FULL ERROR CORRECTION. (Particularly useful for sending spreadsheets between two PC'S for example).

26 Remote Computer details can be held on disk and dialled automatically with full autologon capabilities. FULL VIEWDATA graphics are displayed WITHOUT replacement chips on the colour card or the need for the IBM Viewdata Card.

BREAKOUT is available from IBM dealers at a price of £499** + VAT.



INCLUDES FREE
CROSSTALKTM

DATA COMMUNICATIONS SOFTWARE

Lotus SymphonyTM
interface program

and
FREE SUBSCRIPTIONS TO

TELECOM GOLD

one to one
Communications for the Computer Age

For further information contact
PC Communications Ltd., Business and
Technology Centre,
Bessemer Drive,
Stevenage,
Herts SG1 2DX.
Tel: Stevenage
(0438) 316561/
310145.
Telex: 825824

PC COMMUNICATIONS

QUATTROCARD 2400* and BREAKOUT 2400**



Plastic safety cover not shown.

PC Communications announce two NEW communication products for the IBM PC and compatibles.

Quattrocard 2400* Autodial/Answer HAYES Compatible Internal Modem.

Quattrocard is the first BAPT approved internal autodial/answer modem offering 2400bps (V.22bis), 1200bps (V.22 and Bell 212A), 1200/75bps (V.23) and 300bps (V.21 and Bell 103) full duplex speeds ON ONE FULL LENGTH CARD.

Being HAYES compatible means that software such as SMARTCOM, SYMPHONY, CROSSTALK, SMART, FRAMEWORK, SIDEKICK etc., runs with it.

Breakout 2400** Communications System.

Breakout 2400 consists of the Quattrocard 2400 and TWO software packages. BREAKOUT COMMUNICATIONS SOFTWARE is a menu driven, colour/monochrome package allowing FILE UPLOADING and access to hundreds of VIEWDATA and TELETYPE SYSTEMS such as PRESTEL and TELECOM GOLD. FULL VIEWDATA GRAPHICS are displayed WITHOUT replacement chips on the colour card or the need of the IBM Viewdata card.

Facilities include Autologon to VIEWDATA and TELETYPE services and the ability to capture to disk or print information received.

Included is CROSSTALK XVI the worlds best selling communications software (RRP £170 + VAT). It is a command driven package offering excellent FILE TRANSFER, access to TELETYPE services and TERMINAL EMULATIONS including VT100 and IBM 3101.

QUATTROCARD 2400 and BREAKOUT 2400 are available from IBM dealers for £795 and £945.

*PC Communication SB2422PC internal modem.

** INCLUDES FREE
CROSSTALK[®]
DATA COMMUNICATIONS SOFTWARE
and
FREE SUBSCRIPTIONS TO
TELECOM GOLD

one to one
communications

For further information contact:
PC Communications Ltd., Business and
Technology Centre,
Bessemer Drive,
Stevenage,
Hertfordshire
SG1 2DX.
Telephone:
Stevenage
(0438) 310145/
316561.
Telex 825824



IBM is a registered trademark of International Business Machines. Hayes Smartcom II is a registered trademark of Hayes Microcomputer Products Inc., Lotus Symphony is a trademark of Lotus Development Corporation, Crosstalk is a trademark of Microsoft Inc., Prestel and Telecom Gold are trademarks of British Telecommunications Plc. Smart is a trademark of Insignia Systems, Framework is a trademark of Ashton-Tate, Sidekick is a trademark of Borland International.

BRING Twillstar INTO YOUR HOME

ALL PRICES INCLUDE VAT

Computers

MASTER 128

Complete With Internal Software	£454.25
Master Turbo Upgrade	£113.95
Master Econet Module	£46.00
Master ET	£373.75
Master 512 Upgrade	T.B.A.
Master SC Upgrade	T.B.A.
Eprom Cartridge	£14.95
Reference Manual Part 1	£14.95
Reference Manual Part 2	£14.95
6502 Second Processor	£179.00
280 Second Processor	£379.00
Acorn Prestel Adaptor	£125.00
Acorn Teletext Receiver	£135.00
Winchester Disk Drive	
10 MBYTES	£1250.00
Winchester Disk Drive	
30 MBYTES	£1850.00
IEEE Interface	£299.00
Music 500	£178.00

ECONET ACCESSORIES

100in Cable	£89.00
Station Lead Set	£29.00
Econet Starter Kit	£99.00
Econet Bridge	£199.00
Level 1 Fileserver 40 Track	£99.00
Level 2 Fileserver 80 Track	£235.00
Printer Server Eprom	£49.00

Disc Drives

MITSUBISHI DISC DRIVES

User Friendly Disk Drives
100% BBC compatible slimline disc drives. All drives are supplied complete with formatting diskette, comprehensive users manual and all necessary cables.
All drives are 40/80 Track switchable at the front and have two years warranty.

5 1/4" Drives without P.S.U.

MD 400A Single 400K	
Double Sided	£118.00
MD 802C Dual 400K	
Double Sided	£219.00

5 1/4" Drives with P.S.U.

MD 400B Single 400K	
Double Sided	£135.00
MD 802E Dual 400K	
Double Sided	£249.00

SPECIAL

MD 802D Dual 400K Drives horizontally mounted in a monitor stand to fit both the BBC B and the Master series. £289.00



We are unable to list all the products that we stock - Please call for further details or visit our NEW SHOWROOM

BBC Upgrades

64K Upgrade Kit	£39.95
1770 Upgrade Kit	£49.94
ADFS ROM	£29.95
Disc Upgrade Kit	£89.00
Econet Upgrade Kit	£49.00
Speech Upgrade Kit	£49.00
DNFS ROM	£20.00

Monitors

MONOCHROME MONITORS

Phillips BM 7502	
Green Screen	£79.00
Phillips BM 7522	
Amber Screen	£95.00
Kaga KX 1202G	
Hi Res Green	£120.00
Kaga KX 1203G	
Ultra Hi Res Amber	£120.00



Hantarex Hx 12 Dark Gloss Screen high resolution monochrome monitor 12" Composite Video & Audio input £89.00

COLOUR MONITORS

Microvitec 1431 Std Res	£201.25
Microvitec 1451 Med Res	£270.25
Microvitec 1441 Hi Res	£391.00
Microvitec 2030 Cs 20	
Std Res	£425.50
Microvitec 1431 AP	
Std Res	£224.25
Microvitec 1451 AP	
Med Res	£293.25
Phillips CM 8501 STD Res	
Monitor with grey glass Screen	
RGB and Audio input	£209.00
Phillips CM 8533 Med Res	
monitor with dark glass etched screen composite video input RGB and Audio Input.	£289.00

OUTSTANDING PERFORMANCE

OUTSTANDING VALUE
Just released by Hantarex 14" Colour Monitor Std Resolution RGB PAL Audio Input (Inc. VAT) £189.00

SPECIAL OFFER

Mitsubishi 1404 Medium Resolution Monitor with 640 X 200 Pixels RGB available with IBM or BBC Leads £229.00

Taxan Super Vision III



This display is designed for business use which provides both high-res monochrome (Green, Amber, and White reverse) mode and high-res Colour graphic mode all in one. £369.00

TV MONITORS

Phillips 1114 colour TV/monitor with 14" tube offering 10 Preselect channels RF CVBS and RGB inputs £199.00

TCL Special Package

The TCL All in One Word Processing Package contains a Master 128, View 3.0, Viewsheel, High Res Green Monitor, 800K Dual Drives with PSU, Quendata Daisy Wheel Printer together with a box of Discs, Paper, and all the Cables. £914.25

Modems

NIGHTINGALE MODEM

Including Cominstar Manual and Comprehensive Manual	£130.00
Auto Dial/Auto Answer Board	£55.00
Auto Dial Utilities Disc	£11.00
OBBS Bulletin Software	£23.00

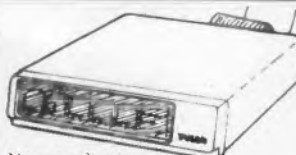
DEMON MODEM

With its Devilishly Clever features Auto Dial, Auto Redial, Auto Answer Full and Half Duplex European and USA Standards Complete with Power Supply Leads and Manuals Full Baud Rates Demon with BBC ROM £81.00
Dial Disc £4.95

MAGIC MODEM

with 300/300 Full Duplex, Auto Dialing RS232 & 5 LED's (Transmit Data-Receive Data) Carrier, Power & Data £81.00

Printer Buffer



Now available Taxan Multipurpose Type Printer Buffer KIF-430B compatible with any Centronics interface printer £149.00

MODE EXPOSITION

1. Manual Mode
In the manual mode, data which has been received is sent to a selected printer and directly printed out. Copy is also available by pressing the COPY key.
2. Double Mode
In the double mode the same data which has been received is sent to two printers simultaneously and printed out. Copy print is also available by pressing the COPY key.
3. Free Mode
In the free mode the command VT and FF code are read as a data fill end code. Of the two printers the data is automatically sent to whichever unit is free for service first. This means that the print time of a amount of data is minimized by using two printers without regard to the data list size.
NOTE: This means that if you try to print two reports at the same time, on two printers, the printers may intermix pages.
4. Command Mode
In the command mode the operation is similar to the manual mode. Data sent is not determined by the SELECT key, but by a certain command the required printer is selected and the number of copies is assigned. This command is internally processed as a control code and is not output.

5. Clear Key Mode

The clear key mode is furnished for clearing an error occurring during the printing and data input. The function is to stop the printer currently under operation and erase the copy count. However, only the last data input remains and can be reprinted by pressing the COPY key.

FEATURES

1. A printer currently under operation is indicated by an LED, and therefore is immediately known.
2. The copy capacity is available up to 255 sheets. The number of copies expressed in a binary mode by LED (up to 15).
3. The Buffer is furnished A 64K RAM as standard, optionally expandable in increments of 64K, up to 256K and can be connected to most printers and CPU's.

Printers

DOT MATRIX PRINTERS

SPECIAL OFFER

Juki 5510 - Gives you 180 CPS & NLO Standards £179.00 Inc. VAT

...and that's not all! The Juki 5510 also has full graphics mode, two position 'dip-switch' (providing instant compatibility with both the Epson and the IBM Graphic Printer). Standard 2K memory (expandable to 14K) built-in Parallel, Centronics interface and 8-switch international character sets. If you need colour too, the optional Juki 5510 Colour Kit gives you seven colours. £112.00

CITIZEN 120 D

This new citizen 120D with 120 CPS and 25 CPS NLO comes with tractor and friction feed as standard. IBM and Epson Compatible with TWO years Warranty £159.00

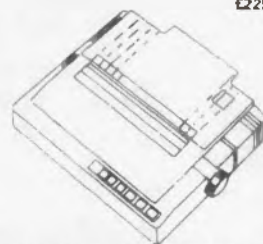
CITIZEN MSP10

The new citizen MSP10 with 160 CPS Draft and 40 CPS NLO. with TWO years Warranty £269.00

NEW

STAR NL-10

Fine Near-Letter-Quality, 100% compatibility and total reliability all in one easy to use printer. For quality, ease of operation and dependability, nothing beats the Star NL-10. You get outstanding print quality at 120 cps in draft mode and 30 cps in near letter quality. Plus, the sleek NL-10 offers full compatibility with most popular computers through plug in interface cartridges. Just insert the appropriate plug in interface cartridge for your IBM-PC, Commodore, Apple IIc or other parallel computer and your Star NL-10 is ready to print. Touch a button on the control panel to set the print pitch (3 choices), to select the typeface and to print in either draft or NLO mode. You can even set left and right margins, make top of form settings and control forward and reverse feed in the smallest pitch. £229.00



BROTHER M1109 NLO

Printer 100cps Directional Logic Seeking Friction Feed and secondary optional tractor feed £189.00

Printers

KAGA KP810

The 80 column printer with 140 CPS Draft and NLQ with friction and tractor feed offering 9 INT character sets. Long life cartridge ribbon and standard centronics interface. £249.00

Also available KAGA KP 910 (wide carriage printer) £379.00

EPSON LX80

With 100 CPS draft and 16 CPS NLQ and optional tractor adaptor and sheet feeder. This printer has a standard parallel connection and accepts all other Epson serial Parallel boards with external dip switches for easy access and internal 1K buffer. It offers a high specification at a low price. £229.00

EPSON LQ800

24 Pin Dot Matrix Printer offers a high 200 CPS draft speed and near letter quality at 67 CPS with high resolution graphics and a variety of fonts £585.00

ALSO AVAILABLE

Epson FX 85	£365.00
Epson FX 105	£495.00
Seikosha GP 50A (Parallel)	£69.00
Seikosha GP 50S inc.	
Printer WF + cables	£69.00
Canon PW 1080A (NLQ)	£249.00
Canon PW 1156A	£379.00
Brother EP 44	£228.00
Shinwa CP 80A	£189.00
MP 165	£240.00

DAISYWHEEL PRINTERS

QUENDATA DWP 1120 with optional tractor/sheet feeder and 13" paper width facility. This Daisywheel printer with 20 CPS has 96 character printwheel compatible with the QUME. Standard centronics interface. (optional RS232 C) £169.00

Brother HR 15	£349.00
Juki 6100	£285.00
Juki 2200	£275.00
Juki 6300	£799.00

COLOUR PRINTERS

Canon PJ1080A	£440.00
---------------	---------

TRACTOR ADAPTERS

FX85	£33.00
LX80	£23.00
Juki 6100	£129.00
Juki 6300	£129.00
Quendata DWP 1120	£114.00
Brother HR 15	£95.00
LQ 800	£43.00

SHEET FEEDER

Juki 6100	£173.00
Juki 6300	£173.00
Quendata DWP 1120	£165.00
Brother HR 15	£212.00
LX80	£55.00

RIBBONS

Full selection of Ribbons available. Call for latest prices & availability.

FONT AID

NLQ Designer for Canon and Taxan KAGA NLQ Printers.

Design your own NLQ Fonts or download one of our 20+ predefined fonts. The Fontaid Disk includes the following type styles:- Square, Outline, Gothic, Bold, Computer Type, Bold Shadow, and Broadway.

Additional Disk 'A' Includes:- Greek/Matus Script, P.S., Plain Handwriting, and 2 styles of Elite, Condensed, & Super Condensed. Fontaid requires 6264 RAM CHIP in printer.

Fontaid BBC	£30.00
Fontaid additional Disk	£15.00
ROMS of individual fonts	£18.00

CREDIT FACILITIES

Full credit facilities now available nationwide

- LOW DEPOSITS
- FAST FRIENDLY SERVICE
- UP TO 3 YEARS TO PAY

Typical APR 36.3%

Accessories

Raven Discs Double Sided, Double Density 96 TPI uses 3M media. Guaranteed for life. Free Library

Box included £17.00

EPROMS

2764	£2.20
27128	£3.95

RAMS

6264 LP 15	£3.95
EPROM Extractor	£5.00
EPROM Eraser	£32.00
Soft Life EPROM Blower	£75.00

COMPUTER

BBC dust cover vinyl	£3.50
Data recorder complete	
BBC lead	£24.95
Tracker Ball	£59.00
GRAFPAD II	£59.00

JOYSTICKS

Voltmace 14b Handset	£14.95
3b Singlet	£12.95
3b Duelsset	£19.95
14b Interface	£14.95
DRAWER Cassette	£5.95
DATAPAD Keyboard	£39.95

DISC STORAGE

10 x 5 1/4 Library case	£2.00
70 x 5 1/4 Lockable	£9.95

SERIAL INTERFACES

EPSON 8143	£34.00
JUKI	£58.00
CANON	£91.00
KAGA	£85.00
Epson 814R + 2K buffer	£65.00

LISTING PAPER

11" x 9 1/2" 2000	£14.00
Teleprinter Roll	£4.50
Teleprinter Roll Holder	£14.00

PRINTER LABELS

1000 90 x 36mm 1 across	£5.70
1000 90 x 36mm 2 across	£6.70
1000 90 x 36mm 3 across	£7.70

PRINT FEED SYSTEM

Revolutionary low cost Printer Feed System tidies up all Micro Desks - No more paper on the floor. £35.00

MONITOR ACCESSORIES

Monitor stands single	
Monitor stands	11.50
double plynth Metal	£21.00

BBC BOOKS

BBC B Compendium	£5.95
Advanced Disk User Guide	£14.95
Advanced Basic Rom User Guide	£9.95
The Epson FX Kaga Printer Commands Revealed	£5.95
BBC Micro Disk Drives	£6.95
Complete Disk Manual	£7.95
The BBC Micro Rom Book	£9.95
The Super User's BBC Micro Book	£9.95
View BBC	£10.00
View Store	£10.00
Viewsheets Electronic S/Sheet	
BBC	£10.00
Wordwise Plus	9.95

AMX MOUSE & SOFTWARE

AMX Mouse with Super Art ROM	£79.00
AMX Pagemaker	£49.95
AMX 3D Zicon	£24.95
AMX Database	£24.95
AMX XAM	£24.95
The Original AMX art Plus Utilities	£14.95
AMX Paintpot	£14.95
AMX Desk	£24.95

SYSTEM SOFTWARE

THE MUSIC SYSTEM	
Disk Pack	£29.95
Cassette 1	£14.95
Cassette 2	£14.95

EXPANSION BOARD

Computer Concepts Sideways Board	£45.00
----------------------------------	--------

RAMAMP

RA20 +44	£79.00
RA32N	£59.00
RA32+	£58.00
ROM6S	£32.00
RAM16	£32.00
WPK for all above	£5.00

BBC Firmware

FIRMWARE

Acorn View Word Processor	£52.00
Acorn View Sheet	£52.00
Acorn Logo ROM	£65.00

Acorn ISO Pascal	£65.00
Acorn BCPL	£99.00
GXR	£29.00
GXR B+	£29.00
View 3.0	£85.00
Hi-View	£55.00
View Store	£52.00
LISP ROM	£49.00
BASIC Editor	£28.00
Terminator	£31.95
Microprolog	£69.95

COMCONCEPT

Wordwise	£36.00
Wordwise Plus	£46.00
Intersheet	£55.00
Disk Doctor	£27.00
Printmaster (Epson)	£27.00
Printmaster (Star)	£27.00
Caretaker	£27.00
Graphics ROM	£27.00
Communicator	£59.00
Accelerator	£55.00
Gremlin Debug ROM	£27.00
Interchart	£33.00
Speech ROM	£30.00
Speech Processor	£10.00

BEEBUG

Toolkit Plus	£39.00
Wordase	£29.00
ICON Master	£34.00
Studio Eight	£22.00
ROMIT	£34.00
Sleuth ROM	£28.00
Help ROM	£24.00
Exmom II	£28.00
Spellcheck II	£29.00
Spellcheck Wordwise	£29.00
Spellcheck View	£29.00

CLAIRES

Frontwise Plus	£19.00
BROM	£34.00
Wordase	£27.00
ALTRA	
Enigma Disk Imager	£42.00
Tube Editor	£42.00
Probe I	£34.00
Basic Editor 2	£34.00
Basic Editor I	£25.00
First Aid II	£19.00

GEMINI

Datagram Database	£79.00
-------------------	--------

LBO

Life & Business Organiser	£19.50
---------------------------	--------

PAGE

Commstar	£33.00
System ADE ROM	£60.00
System SPY ROM	£30.00
Edward User Pack	£44.00
Edward Teacher Pack	£25.00
BBC Ultracalc II	£79.00
Claires B ROM	£32.00

VINE

Replay ROM	£34.00
TD ROM	£18.00

Disc Utilities

View Index	£14.90
View Printer Driver	
Generator	£10.90
Hi View	£55.20
Acorn Soft Database	£14.25
Claires Database	£21.85
Claires Graphdisc	£12.30
Claires Replica III Disk	£13.95
Claires the Key Disk	£12.30
Betabase Utilities	£11.00
Beta Accounts	£21.95
Profile	£11.00
Micro Text Disk	£55.20

Beebugsoft Design	£18.00
Beebugsoft Masterfile II	£18.00
Beebugsoft Teletext Disk	£10.90
Beebugsoft Sprites Disk	£10.90
Beebugsoft Disk Master	£18.00
Beebug Billboard Disk	£18.00
Beebug Quickcalc Disk	£14.25
Beebug 'Hershey' Font	£14.25
Beebug Paintbox II Disk	£12.30
Office Mate	£12.00
Office Master	£25.00
Fleet Street Editor	£39.95
GAMES DISK	
Karate Combat	£11.95
Way of the Exploding fist	£14.95
Reptone II	£11.95
Speech	£11.95

Services

Many components now in stock. Call for details and price.

SERVICES

Fast Repair Service for the BBC Computer	
average charge from	£23.00
Printer repairs from	£20.00
Disk Drive repairs from	£15.00

BBC COMPUTER SPARE

PARTS AND COMPONENTS	
PSU	£59.00
Keyswitch	£2.00
Complete Keyboard	£59.00
Keyboard Connector	£5.18
UHF Modulator	£5.18
Video ULA	£20.00
Serial ULA	£16.00
6522 VIA	£4.10
6502 2 MHZ CPU	£7.50
UPD 7002	£17.25
6845SP CRT CON	£7.50
SAA 550 Teletext	£10.35
LM 324	£0.50
6522A 2 MHZ VIA	£6.33
8271	£52.00
74 LS 123	£0.46
74 LS00	£0.28

How to Order

You can purchase any of the items listed. All you have to do is write your requirements on a sheet of paper, and we will despatch your goods within 24 hours, subject to availability.

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 £8.00

(UK Mainland only)
All prices include VAT at 15%
'No Hidden Extras'

Please make cheques payable to:

TWILLSTAR COMPUTERS LTD.

Access/Visa Card Holders:

Call us on

01-571 5938 or 574 5271

Or visit our

NEW SHOWROOM

Open 9am-6pm Mon-Sat



TELEPHONE ORDERS

(01) 574 5271

Telex No. 25247 atin TLL

Twillstar Computers Limited

Apex House, Blandford Road,
Norwood Green, Southall, Middx. UB2 4HD

BRING Twillstar INTO YOUR HOME

ALL PRICES INCLUDE VAT

TCL Special Packages

ATARI
Power Without the Price™



TCL 1
520 STM Computer with 500k Disk Drive and High Res Monochrome Monitor £575.00

TCL 2
520 STM Computer with 500k Disk Drive and Medium Resolution Colour Monitor £775.00

TCL 3
520 STM Computer with 1 MBYTE Disk Drive and High Res Monochrome Monitor £635.00

TCL 4
520 STM Computer with 1 MBYTE Disk Drive and Medium Resolution Colour Monitor £845.00

TCL 5
1040 STF with built in 1 MBYTE Disk Drive and High Resolution Monochrome Monitor £790.00

TCL 6
1040 STF with built in 1 MBYTE Disk Drive and Medium Resolution Colour Monitor £950.00

All TCL Packages come complete with all interconnecting cables and are supplied with ST Basic, ST Logo, and 1st Word

Printers

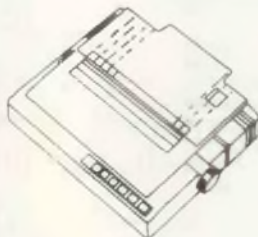
CITIZEN 120 D
This new citizen 120D with 120 CPS and 25 CPS NLO comes with tractor and friction feed as standard. IBM and Epson Compatible with TWO years Warranty £159.00

CITIZEN MSPIO
The new citizen MSPIO with 160 CPS Draft and 40 CPS NLO. With TWO years Warranty £269.00

BROTHER M1109 NLO
Printer 100cps Directional Logic Seeking Friction feed and secondary optional tractor feed £189.00

NEW

STAR NL-10
Fine Near-Letter-Quality, 100% compatibility and total reliability all in one easy to use printer. For quality, ease of operation and dependability, nothing beats the Star NL-10. You get outstanding print quality at 120 cps in draft mode and 30 cps in near letter quality. Plus, the sleek NL-10 offers full compatibility with most popular computers through plug in interface cartridges. Just insert the appropriate plug in interface cartridge for your IBM-PC, Commodore, Apple IIc or other parallel computer and your Star NL-10 is ready to print. Touch a button on the control panel to set the print pitch (3 choices), to select the typeface and to print in either draft or NLO mode. You can even set left and right margins, make top of form settings and control forward and reverse feed in the smallest pitch. £229.00



EPSON LX80
With 100 CPS draft and 16 CPS NLO and optional tractor adaptor and sheet feeder. This printer has a standard parallel connection and accepts all other Epson serial Parallel boards with external dip switches for easy access and internal IK buffer. It offers a high specification at a low price. £229.00

EPSON LQ800
24 Pin Dot Matrix Printer offers a high 200 CPS draft speed and near letter quality at 67 CPS with high resolution graphics and a variety of fonts £585.00

ALSO AVAILABLE
Epson FX 85 £365.00
Epson FX 105 £495.00
Seikosha GP 50A (Parallel) £69.00
Seikosha GP 50S inc. Printer I/F + cables £69.00
Canon PW 1080A (NLO) £249.00
Canon A55 £379.00

DAISYWHEEL PRINTERS

QUENDATA DWP 1120
with optional tractor/sheet feeder and 13" paper width facility. This Daisywheel printer with 20 CPS has 96 character printwheel compatible with the QUME. Standard centronics interface. (optional RS232 C) £169.00
Brother HR 15XL £389.00
Juki 6100 £285.00
Juki 2200 £275.00
Juki 6300 £799.00

COLOUR PRINTERS
Canon PJ1080A £440.00

TRACTOR ADAPTERS

FX85 £33.00
LX80 £23.00
Juki 6100 £129.00
Juki 6300 £129.00
Quendata DWP 1120 £114.00
Brother HR 15 £95.00
LQ 800 £43.00

SHEET FEEDER

Juki 6100 £173.00
Juki 6300 £173.00
Quendata DWP 1120 £165.00
Brother HR 15 £212.00
LX80 £55.00

PRINTER RIBBONS

Brother HR 5 £3.45
Brother EP 44 £2.65
Brother M1009 £4.60
Brother HR 15/25 £5.45
Multi-strike
Brother HR 15/25 fabric £4.85
Canon PW 1156A/1080 £6.85
Daisystep 2000 Multi-strike £4.00
Daisystep 2000 fabric £6.30
Epson FX/MX/RX80 £4.50
Epson LX80 £4.90
Epson MX100 £5.80
Epson LQ1500 £6.60
Epson DX multi-strike £5.40
Epson DX 100 fabric £4.85
Juki 6100 multi-strike £3.20
Juki 6100 single-strike £1.95
Juki 6300 multi-strike £3.05
Juki 6300 fabric £4.10
Juki 2200 single-strike £2.95
Juki 2200 correctable £2.88
Kaga KP 810/910 £6.85
MP165 £4.50
OK 1 microline 80/82/83 £2.07
Quendata 2000 Multi-strike £3.97
Quendata 2000 fabric £6.30
Ritman 80 £6.30
Seikosha GP80 £4.00
Seikosha GP 100/250 £4.30
Seikosha GP 500 £4.95
Shinwa CP80 multi-strike £5.50
CP80 fabric £5.46
Walters WM80 multi-strike £5.30
Walters WM80 fabric £5.46
Wm2000 £5.90

Accessories

LISTING PAPER
11" x 9 1/2" 2000 £14.00
Teleprinter Roll £4.50
Teleprinter Roll Holder £14.00

PRINTER LABELS
1000 90 x 36mm 1 across £5.70
2000 90 x 36mm 2 across £12.00

SF354
500k Disk Drive £133.00
SF314
1 MBYTE Disk Drive £175.00
SH207
20 MBYTE Hard Disk £750.00
SM124
12" High Resolution Monochrome Monitor £133.00
SC1424
14" Medium Resolution Colour Monitor £349.00
Printer Lead for ST Series £12.00

SERVICES

We have a comprehensive range of spares for the ST. Backed by our in-house Service Department.

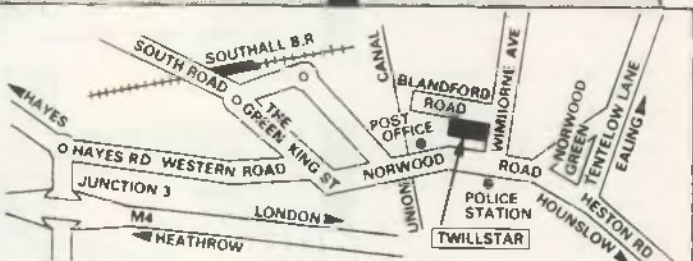
CREDIT FACILITIES

Full credit facilities now available nationwide
* LOW DEPOSITS
* FAST FRIENDLY SERVICE
* UP TO 3 YEARS TO PAY
We have negotiated with a leading Finance Company to provide this additional service for our clients. Call for further details

How to Order

You can purchase any of the items listed. All you have to do is write your requirements on a sheet of paper, and we will despatch your goods within 24 hours, subject to availability.
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 £8.00
(UK Mainland only)
All prices include VAT at 15%
'No Hidden Extras'
Please enclose your cheque made payable to:

TWILLSTAR COMPUTERS LTD.
Access/Visa Card Holders:
Call us on
01-571 5938 or 574 5271



TCL



TELEPHONE ORDERS
(01) 574 5271
Telex No. 25247 attn TLL

Twillstar Computers Limited

Apex House, Blandford Road,
Norwood Green, Southall, Middx. UB2 4HD

MICRO INDER CONSULTANTS LTD

AUTHORISED **Tandon** DEALERS
Computer

OFFER

**very competitive deals
on Fully IBM Compatible Micros**

- * **TANDON PCX (IBM PC Compatible)**
2 x 360K Disk Drives, 256K RAM (expandable to 640K), 14" High Resolution Monochrome Monitor, MS-DOS 2.11, GW-BASIC
RRP £1,195 + VAT
- * **TANDON PCX 10 (IBM PC XT Compatible)**
1 x 360K Disk Drive, 20MB Hard Disk, 256K RAM (expandable to 640K), 14" High Resolution Monochrome Monitor, MS-DOS 2.11, GW-BASIC
RRP £1,295 + VAT
- * **TANDON PCA 20 (IBM ATE Compatible)**
1 x 1.2MB Disk Drive, 20 MB Hard Disk, 512K RAM (expandable to 16 MB), 14" High Resolution Monochrome Monitor, MS-DOS 3.10, GW-BASIC
RRP £1,995 + VAT

London House, 68 Upper Richmond Road,
London SW15 2RP
Telephone: 01-870 7431 / 01-870 4650

Approved by Digital Research, Inmos and Microsoft.

T

ECHNICAL PC TRAINING

PC NETWORKS AND
THE TOKEN RING

30 Sep, 4 Nov, 9 Dec, 27 Jan

'C' PROGRAMMING
UNDER DOS

8 Sep, 29 Sep, 27 Oct, 17 Nov, 15 Dec, 26 Jan

MICROSOFT WINDOWS
APPLICATION PROGRAMMING

18 Nov, 9 Dec, 13 Jan

INTRODUCTION TO IBM
BASED PC'S

2 Sep, 14 Oct, 18 Nov, 13 Jan

THE TRANSPUTER

13 Oct, 24 Nov

XENIX
TECHNICAL SUPPORT

17 Sep, 10 Nov, 7 Jan

286/386 BASED PC
SYSTEMS PROGRAMMING

6 Oct, 8 Dec

ADVANCED 'C'
SOFTWARE DEVELOPMENT

5 Nov, 3 Dec, 21 Jan

GEM APPLICATION
PROGRAMMING

13 Nov, 17 Dec

IBM PC ASSEMBLER
LANGUAGE APPLICATIONS

8 Sep, 22 Sep, 20 Oct, 1 Dec, 19 Jan

STRUCTURED PROGRAMMING
WITH PASCAL

7 Oct, 11 Nov

PC MAINTENANCE
AND REPAIR

22 Sep, 27 Oct, 24 Nov, 5 Jan

For full details, call Kay Jefferson on 0285-69173

QA Training Ltd, Queen Anne House,
Cricklade Street, Cirencester, Glos. GL7 1 JN.

QA
TRAINING

LOOK
DISKETTES



Q-TRONICS

OPEN SIX DAYS TILL 7.00p.m. 01-580 7086 (5 lines)

COMPARE
DISKETTES



5¼" 3M		5¼"	5¼" VERBATIM 5¼"		5¼" MEMOREX 5¼"	5¼" DYSAN 5¼"
All prices Exd. VAT and relate to ten packs			Prices Ex VAT		Prices Ex VAT	
No. of disks	10-19 Disks	20+	10-19 Disks	20+	10-19 Disks	20+
SS/DD 48tpi	10.65	10.40	10.95	10.80	10.20	11.00
DS/DD 48tpi	12.79	12.60	12.10	11.90	10.85	15.00
SS/QD 96tpi	14.75	14.65	13.99	13.70	13.40	16.50
DS/QD 96tpi	18.10	17.99	15.99	15.70	14.99	21.56
3" PANASONIC		3"	3" AMSOFT 3"		3" MAXELL 3"	
Prices Esc. VAT and relate to ten packs			1-9 Disks		1-9 Disks	
No. of disks	1-9 Disks	10+	1-9 Disks	10+	1-9 Disks	10+
CF2	3.45	3.00	3.25	3.00	3.45	3.00
CF2DD	6.05	5.70	5.95	5.45	5.95	5.45
3½" MEMOREX		3½"	3½" SONY 3½"		NEW SPECIAL ONLY AT A-TRONICS GUIDES AND COMMAND SUMMARIES FOR LOCOSCRIPT AND AMSOFT SUPERCALC 2 PLUS REFERENCE DATA ON AMSTRAD SOFTWARE AND APPLICATIONS WITH	
Prices Esc. VAT and relate to ten packs			1-9			
No. of disks	1-9	10+	1-9			
SS/DD 135tpi	17.50	17.30	18.70			
DS/DD 135tpi	24.90	24.60	25.50			

NEW
SPECIAL
ONLY AT
Q-TRONICS

DIAL YOUR ORDER
Rapid Ordering Service
By Telephone on Access or Visa
01-637 9054
24 hours a day, 7 days a week

MAIL ORDER NATIONWIDE

Order form to: Q-TRONICS ENTERPRISES LTD
232 Tottenham Court Road, London W1P 9DP

Goods subject to availability/indicated prices may change without notice

Description	Quantity	Amount
Enclosed cheque £	Sub Total	
American Express/Barclaycard/	P&P	
Access No.	VAT	
	Total	

Name.....
Address.....
.....
.....
.....

Add £1.00 per order p&p + 15% VAT. Allow 7 days for delivery

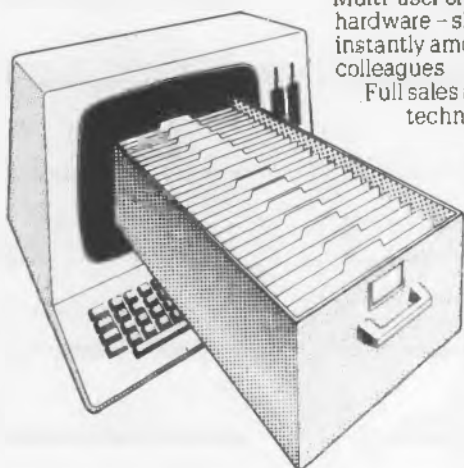
AVAILABLE ON
DISCS FOR
**AMSTRAD
COMPUTERS
ONLY
£5.95**

SUPERFILE

The advanced Multi-User Database Manager

Superfile turns your micro into a hyper-intelligent filing cabinet. Select data by *anything* in it. Find one record in 100,000 in 3 seconds. Unique sounds-like searching. Doubles or trebles disk capacity. Easy-to-create screen

forms and reports. Multi-user on the right hardware - share data instantly among your colleagues. Full sales and technical support.



Southdata Ltd
166 Portobello Road,
London W11 2EB
Tel: 01-229 2724 & 01-727 7564

NOW AVAILABLE ON
AROGATE AND COMART

DON'T BE A CHARLIE! Buy a New AMSTRAD



New Amstrad Business Micro	P.O.A.	
Amstrad PCW8512	£469.00	(Delivery £8.00)
Amstrad PCW8256	£373.00	(Delivery £8.00)
8256 Memory Upgrade	£28.00	(Delivery Free)
8256 2nd Disk Drive	£130.00	(Delivery Free)
CF2 3" Disks	£3.40	(Delivery Free)
CF2-00 3" Disks	£5.70	(Delivery Free)

8256/8512 Interface	£55.00	(Delivery Free)
8256/8512 Printer Ribbon	£4.17	(Delivery Free)
(Printer Ribbon minimum order Oix. 2)		
8256/8512 Dust Cover	£7.45	(Delivery Free)
8256/8512 Anti Slip Mat	£2.50	(Delivery Free)
40 x 3" Disks (Lockable)	£9.25	(Delivery Free)

Large range of software at sensible prices
(Send A5 S.A.E. for catalogue)
Wide range of computer stationery available
(Send A5 S.A.E. for catalogue)
Large range of printers at sensible prices
(Send A5 S.A.E. for catalogue)
Two day word processing course £60.00
(Locoscript or Wordstar Professional with Mailmerge)

Nabitchi's
Exbasic

ADD
THE MISSING
COMMANDS TO
YOUR

● ONLY £9.95 MALLARD BASIC

EVEN LOWER PRICES TO STUDENTS/EDUCATIONAL USERS

NABITCHI COMPUTING

131 MOUNT PLEASANT, LIVERPOOL L3 5TF

AMSTRAD "HELP LINE"

051-708-0123/708-8775

ALL PRICES QUOTED ARE EXCLUSIVE OF VAT

The Amstrad CP/M Plus

by

David Powys-Lybbe
Andrew R. M. Clarke

Second Edition - 520 pages

Paperback ISBN 1 869910 05 2 £12.95

Ringbound ISBN 1 869910 00 1 £14.95

Disc of software from book £14.95 + VAT

The most complete book on CP/M PLUS for the Amstrad 8256, 8512 and 6128 computers by two leading authorities on CP/M PLUS.

Includes a section on using CP/M with chapters for the first time user, sections for the programmer with full details on the BDOS and GSX and chapters on languages and assemblers. It is both a book and a reference manual.

On sale at bookshops, computer stores, and software distributors, or in case of difficulty from the publishers (add £2.00 p & p):

MML Systems Ltd.,
11 Sun Street, London EC2M 2PS

SECOND HAND SYSTEMS BUYING/SELLING

APRICOT, APPLE, IBM, SIRIUS, OLIVETTI,
TELEVIDEO...

We buy and sell all types of computer equipment from Micros to Mainframes

XEN

SPECIAL INTRODUCTORY OFFERS
AND PART EXCHANGE AVAILABLE
FULL APRICOT DEALER
INSTALLATION AND
SUPPORT

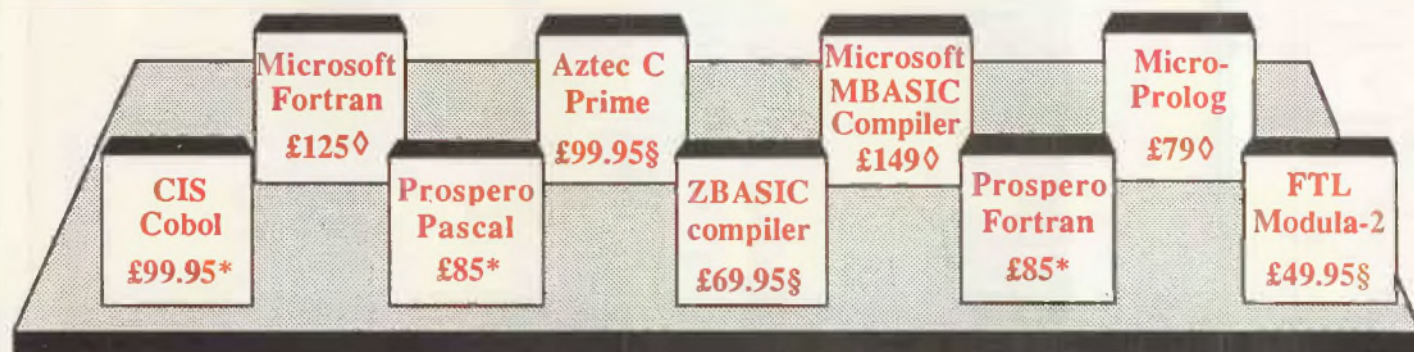
Call:
Cromwell Business
Computers

BARNWELL HOUSE, BARNWELL DRIVE
CAMBRIDGE CB5 8UJ
Tel: (0223) 241446 Telex: 817847

Software Toolshop

from HiSoft

The Software Toolshop One-Stop Programmer's Shop



Off-the-shelf Software at the Right Price

* Amstrad Z80 Only

◊ All CP/M-80

§ CP/M-80 and PC-dos

The Software Toolshop has been formed to satisfy the ever increasing demand for high quality programming tools on popular CP/M and IBM PC & compatible micros. Set up by HiSoft, the aim of the Software Toolshop is to provide a one-stop service for programmers and developers who want assistance in the purchase and use of programming tools, languages, assemblers, debuggers, editors and other utilities.

Information

Send for our free catalogue that lists many more products than we have space for here. We also have detailed factsheets on most of the popular languages giving benchmark timings and specifications; see the box opposite for an example.

Ordering

You may order direct by telephone using Access or Visa or by sending a cheque together with a written order. All the products listed here are readily available and will take 7 to 10 days to get to you. We can normally rush an order for an extra charge e.g. £2 for Royal Mail Special Delivery. All prices quoted here are inclusive of VAT and normal first-class postage. Write for export prices.

Some More Products

CP/M-80

HiSoft Pascal80	£39.95	HiSoft Devpac80	£39.95
Microsoft Macro80	£79.95	Aztec C Developer	£149.50
Pascal MT+	£49.95	Aztec C Commercial	£276
Nevada BASIC	£39.95	Nevada Fortran	£39.95
Nevada Pilot	£39.95	DR CBASIC	£49.95
The Knife from HiSoft	£12.95	HiSoft Catalog	£14.95
Turbo Pascal	£63.25	Write-Hand-Man	£29.95

PC DOS

Aztec C Developer	£230.00	Aztec C Commercial	£360.00
Aztec C Personal	£172.50	Brief Text Editor	£172.50
Knife86 from HiSoft	£29.95	Lattice C V3.00	£330.00
Microsoft QuickBASIC	£86.25	Prospero Pascal	CALL
Prospero Fortran	CALL	Turbo Pascal	£65

and much more ... just call:

The Software Toolshop Ltd

The Old School, Greenfield, Bedford MK45 5DE. Tel. (0525) 718271

Factsheet Focus

The following is an extract from our factsheet on Pascal compilers available on CP/M-80 computers. Firstly, the PCW benchmark timings and then some facts about each compiler in turn. 1st column is time (secs), 2nd column is object size (bytes).

	Pascal80		Turbo		DR MT+		Prospero	
1	0.2	1920	0.2	8320	0.2	3328	0.2	2304
2	3.8	1920	4.2	8320	6.5	3328	1.9	2560
3	6.2	1920	10.7	8320	10.3	3328	3.4	2560
4	5.3	1920	9.8	8320	9.4	3328	2.8	2560
5	4.8	1920	5.3	8320	7.5	3328	2.9	2560
6	5.1	1920	5.5	8320	7.7	3328	2.7	2560
7	25.3	3584	67.9	8448	68.1	7296	11.9	3584
8	20.3	3584	55.6	8448	54.3	7296	22.9	3584
9	11.6	1920	13.8	8448	14.2	3456	5.8	2816
10	8.5	1920	11.7	8320	15.1	3328	4.3	2816
11	4.3	2048	1.8	8320	1.2	3328	4.2	2560
12	8.5	1920	11.8	8320	15.0	3328	4.8	2816
13	5.3	2048	2.5	8448	4.5	3456	5.4	2816
14	5.2	2048	2.7	8448	4.7	3456	5.4	2560
15	8.6	4864	66.3	8320	57.5	9984	16.0	4096

The **HiSoft Pascal80** compiler is Standard (Jensen/Wirth) Pascal and includes fully interactive editor, random access filing, CHAIN facility, variant records, GSX graphics support, Turtle Graphics routines and everything else you'd expect. This recently-released version 2 is tremendous value for money.

Borland's **Turbo Pascal** has the advantage of being available on both Z80 CP/M and IBM PC computers. It includes an interactive editor and supports most of Standard Pascal although in a rather unorthodox manner. Expensive on Amstrad computers.

Pascal MT+ from Digital Research can generate code for Z80 or 8080 computers together with code that is destined to run in ROM. It comes with its own linker and debugger and is close to the ISO standard. Special price on Amstrad computers.

Prospero Pascal is fully ISO-validated and comes with a linker and librarian. The code-generation stage of the compiler produces excellent, efficient code. Unlike the other compilers, it has powerful 32-bit integer arithmetic. A polished and professional product, this is the natural choice for the commercial Pascal programmer. Exceptionally good value on the Amstrads.

ADVERTISERS INDEX

A		Delta PI Software	181	Microanvika	51	S	
Abacom	75	Digitask	57/63/102/184	Micro Computer Technology	55	Sailing Strong	84
Accent Computers	106	Digitrust	107	Microcosm	169	Screens Micro-computers	54
Acorn	36	Disk-Coverly	78	Micro General	53	Second City Software	267
Advance Research Technology	167	Disking	258/259	Microgold	68	Shep Associates	77
Almo Computer Systems	26	Display Electronics	10	Microhnc	8	Sierra	43
AMA	272	Dowly Information	124	Micro Macro	34/50	Silica Shop	103
Amstrad	40/41	E		Micro Media	23	Simmonds Magee	66
Amian Ltd	131	Eidersoft	73	Micro Minder	283	SJB Disks	94
Applied Micro Systems Tech	72	El Doneray	91	Micronet 800	59	Slough Computers	29
Aptus	69	Elite Computer Systems	250	Micronix	14/15	The Software Construction Co	268
Art of Software	95	Elonex	20	Micro Peripherals	IBC	Software Punch	197
Associated Book Publishers	64	English Comp Shop	75	Micro Processing Engineering	83	The Software Supplies Co	75
Atari	120/121	Epson	112/113	Micro Products Int	52	Software Tool Shop	285
Athana	60	TJ Evans	31	Microrent	272	Sorcin Computer Associates	274
ATT	17/24	F		Microvitec	185	Southdata	284
Avro Systems	37	First Software	29	Mighty Micro	91	Spectravideo	22
B		Fraser Associates	122	Miracle Technology	61	S & S Enterprises	64
Bits Per Second	197	G		MML Systems	284	SSI Software	56
Boot Out	271	Galaset	44	Morgan Computers	69	Star	168/169
Borland Int	191	Gabileo Computers	77	Morse Computers	86/111	Stirling Microsystems	19
BRK Computer Serv	84	Gemini Marketing	48/49	Mountandene	73	Strategic Marketing	266
Bristol Micro Traders	264	Glentop Publishers	114	N		Strategic Plus Software	37
British Olivetti	262/263	Go to Computers	31	Nabitchi Computers	284	Summagraphics	223
C		Gresham Business Computers	31	NCR	81	Swanley Electronics	43
CAF	98	Grey Matter	1/287	New Star Software	97	System Science	99
Callhaven Computers	122	H		Newtons Laboratories	80	System State	70
Cambridge Micro Electronics	250	High Voltage	38	New World Computers	34	Systemware	29
Candid Computer Technology	85	Hi-Soft	20	North West Computer Supplies	85	T	
Canton	88/89	H M Systems	1FC	O		Tandy	143
Capitol Computer Products	194	John Holmes	75	Olympic Systems	46	Tasha Business Systems	12/13
Cardex	91	I		Opus	100/205/211/256	Tasma Sound	92
Cashlink	79	Iansyst	22	Osprey	86	Tatung	273
Chromasonic	32	Infosoft	133	P		Taxan (UK) Ltd	119
CI Cayman	83	Integrex Ltd	104	Pace Micro Technology	90	Tay Commercial	21
Cirttech	95	Intelligent Quotient	261	Palan Electronics	271	Technical Systems Int	94
Citequip	28	ISC	4/5/74	PAP Distribution	218	Technology Computers	181
City Software	122	J		PCC Communications	278/279	Technology Concepts	39
Clark Hooper	86	Jabel Associates	37	Peg Associates	64	Technology Software Ltd	71
Cliff Time Works	47	Juki	170	Personal Computers Ltd	64	Technomatic	30
Cocking & Drury	270	JVC	27	Picadilly Micros	186	TP Group	25
Col Software	87	K		Pink Software	95	Trident	85
Comart	175	Keele Coles	8	Pinner Wordpro	21	Trisoft	114/178
Comlex	83	Kirklands	16	Pitman Publishing	92	Twilstar	280/281/282
Compumart	11	K K Stationers	83	Plus 5	82	2001 Systems	93
Comp Shop	269	L		Power Equipment	194	U	
Compstand	26	Leigh Computer Systems	78	Pragma	33	User Prompt	37
Compton Electronics	197	Lightening Graphics	77	Precision Software	18	V	
Computaplant	67	Lightwave Leisure Ltd	77	Preston	131	Victor Technologies	135
Computer City	76	Linc Graphics	271	Prior Knowledge	58	Vision Computer Prod	181
Computer Frontier	96	Load & Run	269	Q		VMS Data Systems	78
Computer Precision	19	Longman Group	69	Q A Training	283	W	
Computers Unlimited	275	Longworth	99	Q Tronics	283	Walters Micros	35
Computopro	257	M		Quest	275	Wilkinson Sword	161
Connections	86	Macmillan Software	43	Qume (UK) Ltd	101	Winfortune	93
Cristie Electronics	42	Matmos Ltd	107	R		Worldwide	9
Cromwell	284	Maxell Ltd	137	Realtime Printers	256	X	
Crotan Electronics	250	Mayfair Micros	62	Ringdale Peripherals	99	Xitan	193
D		Mekom	105	Roland D G	168	Xycorp	92/270
Datafile Software	275	Metacomco	65	Romtech Ltd	19		
Dataflex	265			Roundhill Computer System Ltd	131		
Dataplus	84						
Datcline	67						
Davinci	45						

MICROMART ADVERTISERS INDEX

A		Chips	228	J		Poseidon Computer Services	226
A B Electronics	241	Chromagraphics	244	John Holmes	234	Professional Magnetics	224
Access Computers	224	Competitive Computer Supplies	247	Josie Turner Business Centre	249	R	
Acurite	248	Compton Electronics	237	K		Raynor Group	239
Aladdin	237	Computer Exchange	248	Keyzone Ltd	235	Rewse Consultants	225
A L Downloading	249	Computer Facilities	244	Kingsley Enterprises	226	Robert Cain	230
A Line	225	Cromwell Business Computers	227	Knowledge Software	248	Rugby Micro Supplies	239
Alek	227	D		L		Rule (MEM)	244
Amson Computers	248	Delostar	228	La Carte	231	S	
A N Electronics	236	DPH Computing Cons	246	The Lynx User Group	229	Softalk	229
APL Systems	232	E		M		Software Technology	226
Athana	240	Electronic Aids	248	Manderette	248	SPElectronics	233
B		F		Martin Hurst Ltd	249	Squall Tree Publishers	246
G Baker	228	Fair Trade	234	Michael Durkin	235	SSW Electronics	243
BAS	243	First Choice	229	Mikes Computer Store	242	Supersoft	224/242
Belmont Business Serv	230	G		Micro Concepts	239	Suredata	231
BBD Dust Covers	249	General Guarantee Co	249	M L H Technology	245	Synchronicity	246
Beck Systems	248	H		Monas	236	T	
Box Ltd	233	Harrison Macey Ltd	245	N		SI Taylor	243
B&S Holdings	235	Hi Density	248	Nimax	236	Technotype	249
Brundean Ltd	249	Holdens	233	P		Telex 2000 Ltd	231
C		HSV Computer Services	238	Paul Fray	227	Thema Communications	232
Carey Electronics	248			P & H Electronics Ltd	237	Triangle Digital Services	230
Carousel Tapes	247					Trisoft	242
Cassette Shop	249					Tyepro	249

ASSEMBLERS

New version of Microsoft Macro-86 and lower price for Microsoft Macro-80

2500AD 8086 Asm.	MS-DOS	£ 95
Dig.Res. RASM-86	MS-DOS	£180
MS Macro-86 v4.0	MS-DOS	£115
Phoenix Pasm-86	MS-DOS	£175

2500AD 8086 Asm.	CP/M-86	£ 95
Dig.Res. RASM-86	CP/M-86	£180

2500AD Z80 ASM	CP/M-80	£ 95
Dig.Res. RMAC	CP/M-80	£180
Microsoft Macro-80	CP/M-80	£ 75
SLR Z80ASM	CP/M-80	£ 50
SLR Z80ASM-PLUS	CP/M-80	£185
SLR MAC	CP/M-80	£ 50
SLR MAC-PLUS	CP/M-80	£185
SLR 180 (Hitachi)	CP/M-80	£ 65
SLR 180-PLUS (Hitachi)	CP/M-80	£230

Not all assemblers are supplied with a linker. Check before ordering.

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.

LINKERS

The new version of Plink-86 is here.

Plink-86	MS-DOS	£260
Plink-86 Plus	MS-DOS	£325

Plink-11	CP/M-80	£235
SLINK (Z80)	CP/M-80	£ 60
SLINK-PLUS (Z80)	CP/M-80	£185

PROGRAM EDITORS

BRIEF V1.31	PC-DOS	£180
Lattice CVUE	PC-DOS	£ 95
Epsilon V3.01	PC-DOS	£170
FirstTime for C	PC-DOS	£275
FirstTime for Pascal	PC-DOS	£235
FirstTime for Turbo-P	PC-DOS	£ 85
Pmate PC	PC-DOS	£150
XTC (with Pascal source)	PC-DOS	£ 70
Vedit-Plus	PC-DOS	£175

CSE (with C source)	MS-DOS	£ 85
MIX Editor	MS-DOS	£ 40
Pmate 86 v4.00	MS-DOS	£150
Vedit-Plus	MS-DOS	£175

Vedit-Plus	CP/M-86	£175
------------	---------	------

CSE (With C source)	CP/M-80	£ 85
MIX Editor	280 + CP/M-80	£ 40
Vedit-Plus	CP/M-80	£175

For more information please call us.

PRICES & 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.

For other products in our range see our other page in this issue or ask us to send you a complete price list.

THE C LANGUAGE

There is a new version of Lattice C.

C COMPILERS

Aztec C Personal 1.06D	CP/M-80	£150
Aztec Commercial 1.06D	CP/M-80	£250
Toolworks C/80 v3.1	CP/M-80	£ 45
BDS C 1.50a	Z80 + CP/M-80	£ 75
Eco-C v3.1	Z80 + CP/M-80	£140
Mix C	Z80 + CP/M-80	£ 55
Alcor C	Z80 + CP/M-80	£ 95

Lattice C v3.00	MS-DOS	£295
Microsoft C v3.0	MS-DOS	£290
Aztec C86 Personal	MS-DOS	£150
Aztec C86 Developer	MS-DOS	£210
Aztec C86 Commercial	MS-DOS	£325
Aztec Apprentice	MS-DOS	£ 50
Mark Williams MWC86	MS-DOS	£360
CI Optimizing C86 v2.3	MS-DOS	£270
Wizard C v2.1	MS-DOS	£350
C-Systems C v2.0	MS-DOS	£210
De Smet C88 v2.4	MS-DOS	£145
Digital Research C	MS-DOS	£290
Toolworks C/86 v3.1	MS-DOS	£ 45
MIX C	MS-DOS	£ 55
LETS C (Mark Williams)	MS-DOS	£ 75
Alcor C	MS-DOS	£ 95

Aztec C86 Developer	CP/M-86	£270
Aztec C86 Personal	CP/M-86	£160
CI Optimizing C86	CP/M-86	£270
De Smet C88	CP/M-86	£145
Digital Research C	CP/M-86	£290
Lattice C v1.04	CP/M-86	£295

Aztec C65	Apple DOS	£150
-----------	-----------	------

Aztec C68 Commercial	MACINTOSH	£325
Aztec C68 Developer	MACINTOSH	£210
Aztec C68 Personal	MACINTOSH	£150

C CROSS COMPILERS

We supply Aztec and Lattice Cross Compilers hosted on MS-DOS, Apple, PDPII, and targeted on Z80, 8085, 6502, and 68000. Please call for information or advice.

C INTERPRETERS

C-terp	PC-DOS	£240
Introducing C	PC-DOS	£ 99
Living C	PC-DOS	£ 75
Instant-C v1.44	MS-DOS	£360
RUN/C	MS-DOS	£ 99
RUN/C Professional	MS-DOS	£400

Living C	Apricot MS-DOS	£ 75
----------	----------------	------

Instant-C v1.27	CP/M-86	£360
-----------------	---------	------

PROGRAMMING TOOLS

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

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

C LIBRARIES

DATABASE

C-tree	(source any C)	£265
SoftFocus Btree	(source any C)	£ 70
Softfocus ISAM	(source any C)	£ 40
C-Index/Plus	(source any C)	£285
db-VISTA	(most C's)	MS-DOS £165
db-VISTA	(with source)	MS-DOS £375
Btrieve	(CI,DS,L)	MS-DOS £225
Btrieve/N	(multi-user)	MS-DOS £485
Multikey	(DS,L)	MS-DOS £170
C-to-dBase	(source CI)	MS-DOS £120
Lattice dBCII	(L)	MS-DOS £175
Lattice dBCIII	(L)	MS-DOS £175
Novum Database	(CI,DS,L)	MS-DOS £350

GRAPHICS

Multi-HALO	(CI,L,MS3)	PC-DOS £165
Halo Font Libraries		PC-DOS £ 70
Graphic	(CI,L,DS,MS3)	PC-DOS £210
MetaWINDOWS	(CI,L,MS3)	PC-DOS £120
GSS Kernel		PC-DOS £350
GSS Lattice Binding		PC-DOS £110
GSS Additional Drivers		PC-DOS £140
GSS Plotting System		PC-DOS £350
GSS Metafile Interpreter		PC-DOS £140
GEM Prog.Toolkit	(L)	PC-DOS £450
GSX Prog.Toolkit	(DR)	PC-DOS £325

SCREEN & WINDOWS

Panel (Most Compilers)	MS-DOS	£245
Entelekon Windows(s'ce)	PC-DOS	£ 99
Vitamin C	(source)	PC-DOS £140
Lattice Windows	(L)	PC-DOS £195
Windows for Data (most)	PC-DOS	£250
Windows for C (most C)	PC-DOS	£185
Blaise View Manager	PC-DOS	£245
Curses Screen Mngr.	(L)	PC-DOS £110

GENERAL FUNCTIONS

Greenleaf	(source)	PC-DOS £155
Smorgasbord	(source)	PC-DOS £120
Blaise Tools	(source)	PC-DOS £ 95
Blaise Tools 2	(source)	PC-DOS £ 75
ESI Utility Lib(source)	PC-DOS	£155
Entelekon Funct(source)	PC-DOS	£ 99
Novum Blocks 1 (source)	PC-DOS	£150
Novum Blocks 2 (source)	PC-DOS	£150

COMMS LIBRARIES

Blaise Asynch	(source)	PC-DOS £145
Greenleaf Comms(source)	PC-DOS	£145
Novum Comms.	(source)	PC-DOS £140

SCIENTIFIC LIBRARIES

Wiley Scientific Lib.	ANY C	£165
-----------------------	-------	------

PROGRAMMERS UTILITIES

PC-Lint	MS-DOS	£110
Pre-C (Phoenix Lint)	MS-DOS	£260
Figureflow C-DOC	MS-DOS	£275
FAST-C (debug util)(L)	PC-DOS	£195
C Helper	MS-DOS	£125
Lattice Cross Ref.	MS-DOS	£ 45
Lattice Text Utilities	MS-DOS	£ 85

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 REF, ADRI520, 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.

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

How about this for the ultimate computing obscenity? I quote from the *San Francisco Chronicle*: 'A 15-year-old computer buff, left alone to tinker in his bedroom, was found stabbed to death after his parents grew worried after not seeing him for two days.' Two days! Turns out he owed his best friend \$85 for a printer, and the friend got ratty when the money wasn't forthcoming... We do get some odd information sent to us. The Hungarian Chamber of Commerce has sent details of a medicinal bathing salt, supposed to be good for gynaecological ailments. Just thought our 2.7 per cent of female readers would like to know that... We are deeply indebted to reader John Kendall of Bristol who sent us an advertisement for a WORLD processor. I wonder if it's the same one Ronnie Reagan uses? (see picture, below)... I don't wish to cause offence, but the press photos of Tandon's James Minotto don't half resemble Derek Hatton... Congratulations to Derek Cohen, currently with *MicroScope*, who will become PCW's next editor.



Everything but the kitchen sink...

Derek recently lost the use of the letter 'L' on his AT-alike keyboard. The result was letters and articles printed like this... It reminded me of the calculator salesman who said: 'I'm sure you'll agree that it's a smashing little calculator, despite the lack of a number nine'... I recently took my courage in both hands and reformatted my hard disk. This unselfish act was on behalf of you, dear reader, to see if S & S Enterprises' £195 Recover program really did. The good news is that the program works. The bad news is that it creates huge files of anything it thinks is ASCII to floppy disks, in the order that it is encountered on the hard disk. It's your problem to read it, slice it up and bolt it back together again. It could be a lifesaver... Well, bless my soul. Someone just told me about P & P's Mace +. It's a combined recovery

program/disk reorganiser/global file undeleter. As FORMAT cheats and only formats the system information, the Mace folk simply keep a copy of that somewhere safe on the hard disk. With the Mace recovery facility, you get back everything except data and programs affected by disk writes since the last boot. Brilliant!... What will IBM do now that it's losing market share and lots of PC profit to the clone makers? Perhaps it will decide on a proprietary architecture, offer compatibility with PC-DOS for a while, then, when software companies see the value of exploiting the machine's proprietary features, quietly close the door and leave the so-called compatibles to fight to the death... Watch out for intelligent agents. You tell these programs what you want and they go off and do

it. You know the kind of thing — 'Get me all the information we've got on Mrs Blenkinsop, knock up a decent report and send a copy to each of the directors'... If you're on Prestel, don't miss Micronet's Celebrity Chatline on 31 August when the PCW Show will be featured... Finally, don't PR companies get up to some daft stunts? Take a grassy field, a pretty 17-year-old, a helicopter, a Charlie Chaplin cut-out and a PC keyboard, and what have you got? The first award in ChipChat's new 'How many images can you cram into a photo' competition. This month's winner: Computerworld of Northampton.

ChipChat was compiled by Bumper Harris.

MSX

LATEST MODEL TOSHIBA HX22



★ BUILT-IN WORLD PROCESSOR

Originally £249.99

- 144K MEMORY
- Twin Cartridge Ports
- RGB / RS 232 Output
- Twin Joystick Ports

NOW ONLY
£99.95

SLADE + HOPE

393/395 GLOUCESTER ROAD
TEL. BRISTOL 47204

A WORLD processor?

WE'RE LOOKING FOR (MORE) EXPERTS

PCW prides itself on being up at the sharp end of personal computing. We try to bring you the scoops, the new-machine reviews, the technical information on the latest products. But we can't do it all ourselves; there's just too much to cover and not enough of us. So we rely upon outside experts, like Kathy Lang, Guy Kewney, Mike Liardet and Martin Banks, and we need even more of them. In particular, we're looking for people who are professionally involved with personal computers, and who would like to write about them.

You might be a programmer, a hardware designer or a college lecturer; if you have something to say that's relevant to our readers, we'd like to hear from you.

Our readers are people who use personal computers, and they want to read articles that help them get the most from their investment. They want to know how hardware and software works, what new technologies

are coming along, what products and techniques the professionals use, and why.

Let's be quite clear: we are not interested in letting people puff their own products for free. But we might be interested in the design decisions that went into your product, or the problems you encountered in getting it to work.

Don't be fooled that it's easy. Things which have become second nature to you will need explaining to a non-specialist. Remember, PCW readers are smart and highly motivated; they want the benefit of your experience, without being preached at, patronised or blinded with jargon.

If you'd like to share some of your expertise with PCW readers (and get paid for it), why not send us a synopsis or a few sample paragraphs?

We look forward to hearing from you.

Affordable and reliable printers from **Micro P** give you more **Quality** CPS for your money



CPA 80 - 100 cps
+ EPSON COMPATIBLE
CPB 80 - 130 cps
+ IBM COMPATIBLE

FROM **£199***



MP 165 - 165 cps
+ EPSON COMPATIBLE
NLQ PRINTER

FOR ABOUT **£269***



CPP 40 - 4 COLOUR
PORTABLE
PRINTER/PLOTTER

FOR ABOUT **£79***

Even in today's high tech world, for most of us, the written word is still the least expensive means of sending and receiving information. If you own a microcomputer the chances are that sooner or later you are probably going to need a printer in order to get into print.

Micro P — CPP40

A low cost 4 colour 40/80 column printer/plotter capable of printing text or graphics on plain paper. The CPP40 is an ideal companion for small and portable micro's, as it is fitted with re-chargeable batteries — perfect for beginners.

Micro P — CPA80

With 100 cps quality printing, the CPA80 probably gives more cps/£ than any other printer available today. The CPA80 is packed with features you would normally find on a more expensive printer. With an optional RS232 version available (even for the QL) this Epson compatible printer will hook up to almost any micro.

Buy from your local dealer today!

Micro P — MP165

Looking for a matrix printer as well as a daisywheel? Well, the MP165 combines all the attributes of these two technologies to give a matrix printer capable of printing at up to 165 cps, as well as providing crisp Near Letter Quality, (NLQ) print at 75 cps. Features include a 2k buffer as well as both friction and tractor feed, as standard. Ideally suited to most popular micro's, the MP165 is now available in a new RS232 QL compatible version.



**Micro
Peripherals Ltd**

LINKLINE
0800-521111

"PRINTERS FOR ALL APPLICATIONS"

INTEC UNIT 3, HASSOCKS WOOD, WADE ROAD,
BASINGSTOKE, HANTS. ENGLAND, RG24 ONE.

Telephone: BASINGSTOKE (0256) 473232 (32 lines).

Telex: 859669 MICROP G Facsimile: 0256 461570

*Full 12 months warranty - RRP ex. VAT. QL is a registered Trade Mark of Sinclair Research.



There's a place where you can
buy a Macintosh, choose
Macintosh software, consult
with Macintosh experts, see the
latest Macintosh add-ons, join
Macintosh training courses, rent
a Macintosh system and arrange
a Macintosh maintenance
contract. It's called

The Macintosh Centre

(Where were you going to buy yours?)

Personal Computers plc

218 & 220/226 BISHOPSGATE, LONDON EC2M 4JS Tel. 01-377 1200
MUNRO HOUSE, DUKE STREET, LEEDS LS9 8AG Tel. 0532 441 631