UNIX WARS!
Exclusive Test - AT & T's new PC
BENCHTESTS & REVIEWS

AT&T UNIX PC
Olivetti is marketing this windowing, communicating Unix machine in Europe; Nick Walker takes a look.

COMPAQ PORTABLE II
The leading portable compatible maker is trying to bridge the PC-to-AT gap with a new low-end, high-power machine.

SPECTRUM 128
Sinclair's latest home release gets the once-over from Guy Kewney.

MICROSOFT LOGO
Seymour Papert approved this Logo for the Mac — Owen Linderholm draws his own conclusions.

DÉJÀ VU
Something David Tebbutt hasn't seen before; a decision-making database for the IBM PC.

PARADOX
This enormous database package includes artificial intelligence techniques. Kathy Lang pits her intelligence against it.

FEATURES

REMEMBRANCES OF TIMES PAST
The century of PCW issues has been reached without a telegram from the Queen, but with a special historical section from the ancient order of editors.

THANKS FOR THE MEMORY
Samuel Dick looks at memory management in micro systems.

TUNE IN TO THE WIRELESS
Robin Mudge introduces ways of connecting the humble micro to the worldwide radio network.

PHONE HOME
Electronic mail is really here — but the means of using it have fallen behind. Surya complains.

TRESPASSERS WILL BE PROSECUTED
Keeping data safe and secure is a growing problem.

READER SURVEY 1986
Tell us what you think and what you want us to think.
Offer the UK's Best Service on computer software

PEGASUS
PEGASUS SINGLE USER .......................................................... £160
PEGASUS SENIOR .............................................................. £295
PEGASUS MULTI USER ......................................................... £355
INFORMATION MANAGER ................................................... £225
INCOMPLETE RECORDS ......................................................... 1500

SUPPORT CONTRACT (Free to ISC Customers)
Prices are per module for 2 years

SINGLE USER ................................................................. £50
MULTI USER ................................................................. £100
Call for further details.

DATA TRANSFER/UPGRADES
BESPOKE/TRAINING
INSTALLATION

STATIONERY
2 PART STATEMENTS .......................................................... per 500 ................................................................. 26
3 PART STATEMENTS ........................................................ per 500 ................................................................. 27
2 PART INVOICES ............................................................ per 500 ................................................................. 29
3 PART INVOICES ............................................................ per 500 ................................................................. 31
4 PART INVOICES ............................................................ per 500 ................................................................. 43
PAYSLEPS ................................................................. per 500 ................................................................. 21
REMITTANCE ADVICE ...................................................... per 500 ................................................................. 32
BANK GIRO ................................................................. per 500 ................................................................. 19
P14/P60 ................................................................. per 500 ................................................................. 34
P35 ................................................................. per 500 ................................................................. 35
STATEMENT ENVELOPES ................................................ per 500 ................................................................. 22
PAYSLEIP ENVELOPES .................................................... per 500 ................................................................. 21

GUARANTEED 24 HOUR TNT DELIVERY ON ALL STATIONERY
FREE IN MAINLAND U.K.

COME TO THE EXPERTS — ISC ARE ONE OF THE LARGEST
AUTHORISED DEALERS FOR PEGASUS SOFTWARE IN THE U.K.

Call Huntingdon (0480) 300505 for further Information
I.S.C.

Offer the UK's lowest prices on computer systems

COMPUTERS
- APRICOT F2 WITH MOUSE £1,125
- APRICOT F10 WITH MOUSE £1,150
- APRICOT TWIN 720 512 K RAM £1,295
- APRICOT Xi 10s (512 K RAM) £1,985
- APRICOT Xi 20s (1MB RAM) £2,795
- APRICOT 9" MONITOR £145
- APRICOT 14" MONITOR £245

PRINTERS
- EPSON FX85 £310
- EPSON FX105 £410
- EPSON RX100 £299
- EPSON LX80 + TRACTOR £213
- EPSON DX100 £307
- EPSON LQ1500 + I/F £879
- CANON 1080A £259
- CANON 1156a £329
- CANON LASER £2,195

SOFTWARE
- PEGASUS SINGLE USER £160
- PEGASUS MULTI-USER £355
- dBASE II £235
- dBASE III £329
- WORDSTAR PROFESSIONAL £244
- WORDSTAR 2,000 £299

EXTRA OPTIONS
- APRICOT 256K RAM CARD £135
- APRICOT 512K RAM CARD £185
- IBM 256K RAM CARD £145
- IBM 512K RAM CARD £195

FINANCING:
- CASH, LEASE-RENTAL, LEASE-PURCHASE
- HIRE-PURCHASE, PERSONAL LOANS
- INSTANT CREDIT (subject to status)

* Provide a currently advertised lower price within 7 days of purchase and difference will be refunded.

SPECIAL OFFER
- APRICOT 256K AND 512K RAM CARDS HALF PRICE IF PURCHASED WITH ANY APRICOT COMPUTER

GRAPHIC HOUSE, 88 WAVENEY ROAD
ST IVES, CAMBS PE17 4FW
TEL: 0480 300533/300530
SUPPORT LINE: 0480 300505

All products carry 12 months full guarantee, with HOTLINE phone support.

Prices exclude only VAT and delivery
We GUARANTEE* the lowest prices!
IT'S ABOUT TIME!

Value for money, and good old fashioned common sense ...

We're backing IBM® and the IBM® format. Let's face it—THE SYSTEM is here to stay.

Whether for Business or Education our advice is simple—before you tie yourself to an inexpensive, inflexible, single-system business machine from a company that may not be in existence in time to come, take a good hard look at the features and value of the BUDGET-16.

- 256KB standard upgradable (on board) to 640KB (1024KB with CCP/M)
- 8088 processor operating at 4.77MHz or 6.67 MHz TURBO
- 8 IBM compatible expansion slots
- Provision for 8087 co-processor
- Four DMA channels.
- Three timer channels.
- MS-DOS®, PC-DOS® and CP/M-86® supported.
- 130 Watt XT-style power supply.

- 2 x 320K floppy drives
- 1 parallel, 1 serial (2nd. serial optional), 1 clock, 1 games port as standard
- Colour card fitted as standard
- Reset button fitted, enables cold boot without switching off
- 83-key cherry style keyboard
- 12 inch, Monochrome monitor, standard
- Supplied with 14" high res. colour monitor for just £199 additional

Don’t forget that KBS and DIGITASK are 100 percent British owned, and operate within the UK. Our products are guaranteed for a period of 12 months, and support and upgrades are as near as your telephone.

We also carry a full range of short and full-length peripheral cards for IBM® and compatibles. Please telephone for free brochure. Dealer enquiries welcome.

BUDGET-16
Just
£695

North
Kirklands Business Systems
Kirklands Business Systems, 27 City Road, Stoke, ST4 1DH
Tel (0782) 414333 or 415787

South
DIGITASK
DIGITASK Business Systems Ltd, Unit M, Charlwoods Business Centre, Charlwoods Rd, East Grinstead, West Sussex RH19 2HH
Tel (0342) 24631 Telex: 957418
COMPUTAPLANT BRINGS YOU THE MOST COMPETITIVE PRICES FOR COMPATIBLES

**Software**

<table>
<thead>
<tr>
<th>Product</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pegasus Single user</td>
<td>£175</td>
</tr>
<tr>
<td>Multi user</td>
<td>£415</td>
</tr>
<tr>
<td>Delta 4</td>
<td>£315</td>
</tr>
<tr>
<td>DBase II</td>
<td>£255</td>
</tr>
<tr>
<td>DBase III</td>
<td>£355</td>
</tr>
<tr>
<td>Friday</td>
<td>£135</td>
</tr>
<tr>
<td>Word Star Professional</td>
<td>£265</td>
</tr>
<tr>
<td>Word Star 2000</td>
<td>£299</td>
</tr>
<tr>
<td>Microsoft Word</td>
<td>£295</td>
</tr>
<tr>
<td>Lotus 1–2–3</td>
<td>£299</td>
</tr>
<tr>
<td>Lotus Symphony</td>
<td>£415</td>
</tr>
<tr>
<td>Psion X change</td>
<td>£325</td>
</tr>
<tr>
<td>Smart Series</td>
<td>£450</td>
</tr>
<tr>
<td>Open Access</td>
<td>£375</td>
</tr>
<tr>
<td>Logistix</td>
<td>£299</td>
</tr>
</tbody>
</table>

**Laser Printers**

<table>
<thead>
<tr>
<th>Product</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canon Laser</td>
<td>£2245</td>
</tr>
<tr>
<td>Qume Laser 10</td>
<td>£2700</td>
</tr>
<tr>
<td>NEC LC800</td>
<td>£2300</td>
</tr>
<tr>
<td>BDS</td>
<td>£2350</td>
</tr>
</tbody>
</table>

**Computers**

<table>
<thead>
<tr>
<th>Product</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apricot F2 + 9” Monitor</td>
<td>£1295</td>
</tr>
<tr>
<td>Apricot F10 + 9” Monitor</td>
<td>£1595</td>
</tr>
<tr>
<td>Apricot Portable 512K</td>
<td>£695</td>
</tr>
</tbody>
</table>

**Printers**

<table>
<thead>
<tr>
<th>Product</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epson FX85</td>
<td>£310</td>
</tr>
<tr>
<td>Epson FX105</td>
<td>£410</td>
</tr>
<tr>
<td>Epson LX80</td>
<td>£200</td>
</tr>
<tr>
<td>Epson DX100</td>
<td>£309</td>
</tr>
<tr>
<td>Canon 1080A</td>
<td>£279</td>
</tr>
<tr>
<td>Canon 1156A</td>
<td>£359</td>
</tr>
<tr>
<td>Honeywell 34CQ</td>
<td>£750</td>
</tr>
</tbody>
</table>

**IBM Compatibles**

<table>
<thead>
<tr>
<th>Product</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olivetti M21 Twin Drive 256K RAM</td>
<td>£1500</td>
</tr>
<tr>
<td>Olivetti M24 10Mb 360K 640K RAM</td>
<td>£2150</td>
</tr>
<tr>
<td>Olivetti M24 Twin Drive 640K RAM</td>
<td>£1600</td>
</tr>
<tr>
<td>Olivetti M24 10Mb 360K RAM</td>
<td>£2150</td>
</tr>
<tr>
<td>Olivetti M24 Sp 20Mb 360K, 640K RAM</td>
<td>£2500</td>
</tr>
<tr>
<td>Tandon Twin Floppy</td>
<td>£1295</td>
</tr>
<tr>
<td>Tandon PC X10 10Mb 256K RAM</td>
<td>£1595</td>
</tr>
<tr>
<td>Tandon PC X20 20Mb 256K RAM</td>
<td>£1795</td>
</tr>
<tr>
<td>ARC Turbo Twin 360K 512K RAM</td>
<td>£1250</td>
</tr>
<tr>
<td>ARC Turbo 10Mb 512K RAM</td>
<td>£1550</td>
</tr>
<tr>
<td>ARC Turbo 20Mb 512K RAM</td>
<td>£1850</td>
</tr>
</tbody>
</table>

**Prices**

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.

**Branches**

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

140 Queens Street, Peterhead, Aberdeenshire, Scotland
TEL: 0779 75518

Penwood House, St Beward, Bodmin, Cornwall
TEL: 0208 850918

APRIL 1986 PCW 7
FREE SOFTWARE???
YES!!

Up to 400 disks packed with 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 PC 640K IBM keyboard, 8 expansion slots, parallel board, mono screen, PC DOS, one year warranty.
- Printers and software  ●  Free delivery anywhere in the U.K.

DON'T MISS IT, CALL (0342) 28528 NOW
MICROLIVE LTD,
6 WHITEHALL PARADE LONDON ROAD,
EAST GRINSTEAD, WEST SUSSEX

CLIP FAST

NEW — CLIP 3.0 backs up your hard disk over twice as fast.
Use half the discs and save time compared with other copy or backup software.
CLIP 3.0 retains the features of series 2 and introduces some new ones. You will most appreciate the huge increase in backup speed.

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

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

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

COKEELE CODES LTD
University of Keele, Keele, Staffordshire, U.K. Tel: (0782) 629221 Telex: 36113
Worldwide Computers Ltd are authorised dealers for the leading computers and software at prices that are guaranteed to be the best in the country. We supply everyone from leading UK companies, government departments and local authorities to the small business and the private individual — anywhere in the world.

**WORLDWIDE PRICE LIST**

**OLIVETTI/EPSON/ACRIVOT**

**London**
Spa House, 11-17 Worple Road, Wimbledon SW19 4JS
Tel: 01573 62031

**Brighton**
Regent House, 2-3,4 North Road, Brighton, Sussex BN1 1YA

**Scotland**
14 Maritime Street, Leith, Edinburgh EH6 6SB

**IBM**

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBM PC</td>
<td>£799.00</td>
</tr>
<tr>
<td>IBM PC Model 64 X1060 D/D</td>
<td>£799.00</td>
</tr>
<tr>
<td>IBM Portable 265X 2X360 D/D</td>
<td>£799.00</td>
</tr>
<tr>
<td>IBM PC XT 256X 2X360 D/D</td>
<td>£1949.00</td>
</tr>
<tr>
<td>IBM PC 250X 1X360 D/D +/K/B</td>
<td>£1796.00</td>
</tr>
<tr>
<td>IBM ATE Base 256X 1X2MB D/D</td>
<td>£2149.00</td>
</tr>
<tr>
<td>IBM ATE 512X 1X2MB D/D +/2MB H/Disk</td>
<td>£2492.00</td>
</tr>
</tbody>
</table>

**OLIVETTI**

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olivetti M24 12X 1X360 D/D</td>
<td>£949.00</td>
</tr>
<tr>
<td>Olivetti M24 12X 2X360 D/D</td>
<td>£1950.00</td>
</tr>
<tr>
<td>Olivetti M24 12X 2X360 D/D +/10MB H/Disk</td>
<td>£1796.00</td>
</tr>
<tr>
<td>Olivetti M24 12X 2X360 D/D +/Key+VDU</td>
<td>£1949.00</td>
</tr>
<tr>
<td>Olivetti M24 12X 2X360 D/D +/Key+VDU</td>
<td>£1949.00</td>
</tr>
<tr>
<td>Olivetti M24 12X 1X360 D/D +/10MB H/Disk</td>
<td>£1796.00</td>
</tr>
</tbody>
</table>

**APRIVOC**

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC 256K RAM+2X720 D/D</td>
<td>£1225.00</td>
</tr>
<tr>
<td>XT/10 512K RAM</td>
<td>£1999.00</td>
</tr>
<tr>
<td>X205 1MB RAM 20MB+Expansion</td>
<td>£3095.00</td>
</tr>
<tr>
<td>50 Monitor</td>
<td>£150.00</td>
</tr>
<tr>
<td>52 Monitor</td>
<td>£190.00</td>
</tr>
</tbody>
</table>

**DOT MATRIX**

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anadex DP 9000</td>
<td>£875.00</td>
</tr>
<tr>
<td>Brother M1009 (P)</td>
<td>£145.00</td>
</tr>
<tr>
<td>Brother M1509 +S (NLQ)</td>
<td>£385.00</td>
</tr>
<tr>
<td>Canon PW 1082A (NLQ)</td>
<td>£249.00</td>
</tr>
<tr>
<td>Canon PW 1150A (NLQ)</td>
<td>£349.00</td>
</tr>
<tr>
<td>Canon Laser Printer</td>
<td>£2149.00</td>
</tr>
<tr>
<td>Data Products 8050</td>
<td>£1075.00</td>
</tr>
<tr>
<td>Data Products 8070</td>
<td>£1499.00</td>
</tr>
<tr>
<td>Epson LQ1000 (NLQ)</td>
<td>£199.00</td>
</tr>
<tr>
<td>Epson RX100 K/F/T</td>
<td>£249.00</td>
</tr>
<tr>
<td>Epson FX 85 (NLQ)</td>
<td>£339.00</td>
</tr>
<tr>
<td>Epson FX 105 F/T (NLQ)</td>
<td>£425.00</td>
</tr>
<tr>
<td>Epson LX-1500 (P)</td>
<td>£825.00</td>
</tr>
<tr>
<td>Hewlett Packard Laser Printer</td>
<td>£2594.00</td>
</tr>
<tr>
<td>OKI Microline 182</td>
<td>£249.00</td>
</tr>
<tr>
<td>Olivetti DM 8501 (NLQ)</td>
<td>£885.00</td>
</tr>
<tr>
<td>Panasonic KP1091 (NLQ)</td>
<td>£255.00</td>
</tr>
</tbody>
</table>

**ACCESSORIES**

- Keyboards, cables, interfaces, tractor feeders, sheet feeders, disks, software, up-grades, listing paper, ribbons, daisy wheels available for most products.

**EPSON**

- Epson PX9 computer: £649.00
- Epson PX91 128K RAM: £791.00
- Epson PX10 D/D: £295.00
- Epson C2X1 Acoustic Coupule: £849.00
- Epson PC: £999.00

**DAISYWHEEL**

- Brother HR15: £295.00
- Brother HR25: £609.00
- Brother HR35: £695.00
- Daisy 1200 (20CPs): £219.00
- Diablo 630 (API): £49.00
- Epson DX 100: £229.00
- Epson P40: £85.00
- Hitachi 672 printer: £305.00
- IBM Qwriter: £1150.00
- IBM Qwriter: £1150.00
- Juki 6100: £299.00
- Olivetti DY 250: £559.00
- Olivetti DY 450: £799.00
- Qume 1140 (P): £1175.00
- Qume letter Pro 20: £1450.00
- Ricoh RP 1600 8k: £1325.00

**CELLULAR TELEPHONES**

- Motorola 8000X: £209.00
- NEC Mobile: £899.00
- Panasonic Mobile: £1195.00

**SPECIAL OFFERS**

- Complete 20MB Hard Disk Systems

- Olivetti M24 System inc: £1999.00

- IBM PC System inc: £1999.00

**ALL SOFTWARE AVAILABLE AT BEST PRICES**
They really are fully compatible

They really do cost this little...

- **UDM PC**
  - 640K RAM
  - Twin 360K Drives
  - Mono Graphics Adaptor
  - Mono Monitor
  - Keyboard
  - **TOTAL COST £795**

- **UDM PC ENHANCED**
  - 640K RAM
  - 20 Mb Hard Disk
  - Single 360K Drive
  - Mono Graphics Adaptor
  - Mono Monitor
  - Keyboard
  - **TOTAL COST £1295**

- **UDM 286**
  - 1 Mb RAM
  - 20 Mb Hard Drive
  - 1.2 Mb Floppy
  - Mono Graphics Adaptor
  - Mono Monitor
  - Keyboard
  - **TOTAL COST £2495**

**EXCLUSIVE OF VAT**

- High quality Japanese manufacture
- 12 month Warranty
- Assembled in the UK under license by UDM - the people who brought you the successful DDFS for the BBC in 1983
- Legal BIOS
- Nationwide maintenance contracts available
- Technical Hotline
- Available for the first time direct to the public from UDM

**ALSO AVAILABLE IN KIT-FORM**

**Colour Upgrade**
- ADD £395
- 10 Mb TapeStreamer
- ADD £695

For your nearest dealer
ring 01-281 2161

STANHOPE HOUSE FAIRBRIDGE ROAD
LONDON N19 3ZP
<table>
<thead>
<tr>
<th><strong>IBM</strong></th>
<th><strong>Compaq</strong></th>
<th><strong>Olivetti</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>IBM PC Model 64kb 1 x 360kb D/Drive</td>
<td>Compaq Portable 2 x 360k Disks, 256k RAM</td>
<td>Olivetti M24 128k 1 x 360k D/Drive</td>
</tr>
<tr>
<td>£890.00</td>
<td>£1580.00</td>
<td>£925.00</td>
</tr>
<tr>
<td>IBM PC XT 256kb 2 x 360kb D/Drive</td>
<td>Compaq Plus 360k &amp; 10Mb Disks, 256k RAM</td>
<td>Olivetti M24 128k 2 x 360k D/Drive</td>
</tr>
<tr>
<td>£1247.00</td>
<td>£2585.00</td>
<td>£1104.00</td>
</tr>
<tr>
<td>IBM PC XT 256kb 1 x 360kb D/Drive + 10Mb H/Disk</td>
<td>Compaq 286 Model 1 1.2Mb Disk, 256k RAM</td>
<td>Olivetti M24 128k 1 x 360k D/Drive + 10Mb H/Disk</td>
</tr>
<tr>
<td>£1921.00</td>
<td>£2660.00</td>
<td>£1681.00</td>
</tr>
<tr>
<td>IBM AT Base 256kb 1 x 12Mb D/Drive + Keyboard</td>
<td>Compaq 286 Model 2 1.2Mb &amp; 20Mb Disks, 640k RAM</td>
<td>IBM M21 + 10Mb H/Disk</td>
</tr>
<tr>
<td>£2156.00</td>
<td>£3740.00</td>
<td>£1903.00</td>
</tr>
<tr>
<td>IBM ATE 512kb 1 x 12Mb D/Drive + 20Mb H/Disk &amp; Keyboard</td>
<td>Deskpro Model 2 2 2 x 360k Disks, 256k RAM</td>
<td>Olivetti M24SP 640k + 360k D/ Drive + 20Mb H/Disk</td>
</tr>
<tr>
<td>£3243.00</td>
<td>£3725.00</td>
<td>£2056.00</td>
</tr>
</tbody>
</table>

**IBM**
- Colour Display: £414.00
- Mono Display Green: £140.00
- EGA Colour Display: £552.00
- EG Colour Card: £362.00
- Mono Display/Printer Adapter: £136.00
- Keyboard UK: £139.00

**Compaq**
- Deskpro Model 2 2 2 x 360k Disks, 256k RAM: £1725.00
- Deskpro Model 3 360k & 10Mb Disks, 256k RAM: £2590.00
- Deskpro Model 4 360k & 10Mb Disks, Tape Drive, 640k: £3380.00
- Deskpro Model 5 360k & 30Mb Disks, Tape Drive, 640k: £4095.00
- 286 DESKTOPS: £3740.00
- Deskpro 286 Model 2 2 1.2Mb & 30Mb Disks, 512k RAM: £5755.00

**Olivetti**
- M21 10Mb H/Disk: £1903.00
- M24SP 640k + 360k D/Drive + 20Mb H/Disk: £2056.00
- M24 640k + 20Mb Tape: £2037.00

**Prices include VAT & Delivery. All goods subject to availability.**

**ALL MAJOR CREDIT CARDS ACCEPTED**

**0923 47405**
Unit 8, Woodshots Meadow, Croxley Centre, Watford, WD1 8YU
### HEWLETT PACKARD

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP110 Plus</td>
<td>15Mg byte Hard disk</td>
<td>€1650</td>
</tr>
<tr>
<td>HP110</td>
<td>Disk Drive</td>
<td>€2195</td>
</tr>
<tr>
<td></td>
<td>ThinkJet Printer</td>
<td>€360</td>
</tr>
<tr>
<td></td>
<td>LaserJet</td>
<td>€299</td>
</tr>
<tr>
<td></td>
<td>LaserJet Plus</td>
<td>€2999</td>
</tr>
<tr>
<td></td>
<td>7470A-2 Pen Plotter</td>
<td>€870</td>
</tr>
<tr>
<td></td>
<td>7475 6 Pen Plotter</td>
<td>€000</td>
</tr>
<tr>
<td></td>
<td><strong>FOR BEST QUOTE</strong></td>
<td></td>
</tr>
</tbody>
</table>

### OLIVETTI M24 & M21 PC

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>M24 Basic</td>
<td>Units</td>
<td></td>
</tr>
<tr>
<td>128K Ram, 2x360K byte</td>
<td>€1104</td>
<td></td>
</tr>
<tr>
<td>128K Ram + 10Mbyte</td>
<td>€1680</td>
<td></td>
</tr>
<tr>
<td>640K Ram + 20Mbyte</td>
<td>€1650</td>
<td></td>
</tr>
<tr>
<td>M24SP 20M, 640K Ram</td>
<td>€2056</td>
<td></td>
</tr>
<tr>
<td>20Mb Plus Card</td>
<td>€849</td>
<td></td>
</tr>
<tr>
<td>10Mb Plus Card</td>
<td>€794</td>
<td></td>
</tr>
<tr>
<td>60Mb Tape Backup At</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A 25Mb Price</td>
<td>€895</td>
<td></td>
</tr>
</tbody>
</table>

### IBM SOFTWARE

<table>
<thead>
<tr>
<th>Feature</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wordstar2000</td>
<td>£E449</td>
</tr>
<tr>
<td>Wordcrates</td>
<td>£E449</td>
</tr>
<tr>
<td>MultiMate</td>
<td>£E449</td>
</tr>
<tr>
<td>Smart</td>
<td>£E295</td>
</tr>
<tr>
<td>Graphies</td>
<td>£E295</td>
</tr>
<tr>
<td>Microsoft Chart</td>
<td>£E449</td>
</tr>
<tr>
<td>Microsoft Project</td>
<td>£E449</td>
</tr>
<tr>
<td>Accounting by Pegasus</td>
<td></td>
</tr>
<tr>
<td>Nominal Ledger</td>
<td>£E449</td>
</tr>
<tr>
<td>Sales Ledger</td>
<td>£E449</td>
</tr>
<tr>
<td>Purchase Ledger</td>
<td>£E449</td>
</tr>
<tr>
<td>Invoicing/Sales</td>
<td>£E449</td>
</tr>
<tr>
<td>Order Processing</td>
<td>£E449</td>
</tr>
<tr>
<td>Stock Control</td>
<td>£E449</td>
</tr>
<tr>
<td>Payroll</td>
<td>£E449</td>
</tr>
<tr>
<td>Network</td>
<td>£E449</td>
</tr>
<tr>
<td>10-Net Local Area Network</td>
<td></td>
</tr>
<tr>
<td>Entertainment</td>
<td>£E449</td>
</tr>
<tr>
<td>Flight Simulator</td>
<td>£E449</td>
</tr>
<tr>
<td>Psion/Chess</td>
<td>£E449</td>
</tr>
</tbody>
</table>

### COMMODORE

**Commodore 128 Computer**

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1570 Disk Drive</td>
<td>£350</td>
<td></td>
</tr>
<tr>
<td>128K</td>
<td>£210</td>
<td></td>
</tr>
<tr>
<td>1570 Disk Drive</td>
<td>£160</td>
<td></td>
</tr>
</tbody>
</table>

### MODEMS

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Answell Call</td>
<td>£75</td>
<td></td>
</tr>
<tr>
<td>Apple Modern</td>
<td>£295</td>
<td></td>
</tr>
<tr>
<td>Mimi Modern</td>
<td>£245</td>
<td></td>
</tr>
<tr>
<td>Hayes Smart Modem</td>
<td>£550</td>
<td></td>
</tr>
<tr>
<td>Acoustic Coupler</td>
<td>£120</td>
<td></td>
</tr>
</tbody>
</table>

### SONY WORD PROCESSORS

<table>
<thead>
<tr>
<th>Feature</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 10 System</td>
<td></td>
</tr>
<tr>
<td>Dual drive SS</td>
<td>£4999</td>
</tr>
<tr>
<td>22cps Printer</td>
<td>£4999</td>
</tr>
<tr>
<td>Cable</td>
<td>£4999</td>
</tr>
<tr>
<td>Basic software</td>
<td>£4999</td>
</tr>
<tr>
<td><strong>Our Price £2499</strong></td>
<td></td>
</tr>
</tbody>
</table>

### PRINTERS, PLOTTERS & MONITORS

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP150 Ex Demo</td>
<td>15Mg byte Hard disk</td>
<td></td>
</tr>
<tr>
<td>HP 150 II</td>
<td>£E449</td>
<td></td>
</tr>
</tbody>
</table>

### PORTABLE COMPUTERS

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP 11C</td>
<td>£E449</td>
<td></td>
</tr>
<tr>
<td>HP 12C</td>
<td>£E449</td>
<td></td>
</tr>
<tr>
<td>HP 15C</td>
<td>£E449</td>
<td></td>
</tr>
<tr>
<td>HP 16C</td>
<td>£E449</td>
<td></td>
</tr>
<tr>
<td>HP 17B</td>
<td>£E449</td>
<td></td>
</tr>
<tr>
<td>HP 41CV</td>
<td>£E449</td>
<td></td>
</tr>
<tr>
<td>HP 41CX</td>
<td>£E449</td>
<td></td>
</tr>
<tr>
<td>HP 75C</td>
<td>£E449</td>
<td></td>
</tr>
<tr>
<td>VisiCalc (HP75C)</td>
<td>£E449</td>
<td></td>
</tr>
<tr>
<td>Telextheme (HP75C)</td>
<td>£E449</td>
<td></td>
</tr>
</tbody>
</table>
Hard Disk 20 Adds Power to the Macintosh

Macintosh Plus
Lazer-writer
800 Disk drive
MacDraft
Mac Author
Appletalk

SPECIAL OFFER!!
SAVE £220!!
upgrade your
Macintosh to
Macintosh Plus
OFFER ENDS
ON 1-4-86

Hard Disk 20
Image Writer II
Apple Modem
Switcher
Pagemaker
Apple Accounting

Upgrade your Macintosh to 1Mb

Macintosh Software

Table:

<table>
<thead>
<tr>
<th>Category</th>
<th>Product</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Languages</td>
<td>MacSmith</td>
<td>£84</td>
</tr>
<tr>
<td>Graphics</td>
<td>Chart</td>
<td>£95</td>
</tr>
<tr>
<td>Accounting</td>
<td>MacAddison</td>
<td>£99</td>
</tr>
<tr>
<td>Utilities</td>
<td>Copy I Mac</td>
<td>£79</td>
</tr>
<tr>
<td>Memory Expansion</td>
<td>256 CARDCard</td>
<td>£245</td>
</tr>
<tr>
<td>256K Memory Expansion Kit</td>
<td>£55</td>
<td></td>
</tr>
<tr>
<td>ApplicationSuite</td>
<td>Complete Multi User System</td>
<td>£100</td>
</tr>
</tbody>
</table>

APPLE III
256 Ram Ex. demo.
£449

Disk Drive III ....... £175
5Mg byte Profile
s/h ......... £449

APPLE IIe
Memory Expansion
256 CARD
£245

256K Memory Expansion Kit
£55

APPLE IIe Bundle
Apple IIe64K
Duo-Disk Drive
with controller
£899

APPLE IIC Bundle
Complete Business System
Apple IIC - Monitor IIC
Monitor Stand IIC
Apple Works Carrying Bag
Apple IIC Mouse Paintwork
External Disk Drive TV-Colour Modulator
£849

The EPSON TAXI PC

We'd like to introduce a new concept in computers — the "Taxi" PC from Epson — an IBM compatible with a distinct character of its own. Supremey easy to use, even for those with no computing experience, it inspires confidence as soon as you switch it on.

Full IBM compatibility is available with a host of innovative Epson features — to make your work easier — and a degree of reliability for which Epson are renowned.

And if all this were not enough, the Epson 'Taxi' PC is offered at a remarkable low cost for such an accomplished performer.

From £777

20 MB Hard disk ....... CALL EPSON
HX20 16K Ram ....... £349
PX864K Ram ....... £749
PX8+ 128K Ram disk ....... £899
HX20 Rom ....... £40
Acoustic Coupler ....... £130
P10 Printer ....... £49
P160 Printer ....... £139
LX80 Printer ....... £129
GX80 Printer ....... £19

Authorised Dealer
APPLE — ASHTON TATE — COMMODORE — CORVUS
EPSON — HAYES — HEWLETT PACKARD — LOTUS
MICROSOFT — PEGASUS — TALLGRASS

01-937 8529
Monday to Saturday 9.30-6.30pm
Callers by appointment

Tel: 01-937 3366
01-937 7896
Telex: 946240 (CWEASY G)
MIN NO 19001120
Imagine a professional word processor so advanced it can check the spelling of 170,000 words. (That's more than the two-volume Shorter Oxford English Dictionary.)

A word processor that adds rows and columns of figures, subtracts, divides and multiplies, like a powerful calculator, with the ease of a spreadsheet.

A word processor whose text features are the most powerful ever created for the IBM PC – and which supports every leading printer on the market.

This astonishing combination is here now.

Volkswriter 3.

True, MultiMate, DisplayWrite, Word and Word Perfect share between them many of Volkswriter 3's features.

But none of them is blessed with the simple, memorable command structure that makes Volkswriter 3's power so accessible.

We've used the IBM PC's function keys to the full – making Volkswriter 3 easy to use for your secretary.

What other word processor will print an envelope automatically?

If you know Volkswriter Deluxe, its ease of use will come as no surprise. But those added features, and the new utilities, are another matter.

It'll converse (in DCA RFT) with IBM mainframes, just like DisplayWrite. You can use it in a network. It's perfect for electronic mail. And you can read Lotus, DBase and WordStar files straight into it.

It's a remarkable combination: a powerful and versatile word processor that can be learned in an hour.

Yet Volkswriter 3 is no more expensive than any of the packages we've mentioned – just better.

Call your nearest dealer for a demonstration today.

WE'D LIKE TO SHED SOME LIGHT ON WORD PROCESSING'S NEW LEADER.
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 the company has developed its understanding and skill in the manipulation of the product to meet user requirements. 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 been appointed to support the Apple University Consortium Scheme. We have opened a specialist branch based at Aston University in Birmingham to cater for the equipment and software needs of educational users. Phone 021-359 4624 for details of our specially negotiated prices of educational establishments. (Jazz, Microsoft products, Omnis 3, PageMaker and many others).

**1024k Macintosh Plus!**

Contact Second City for product information and prices on the latest additions to the Macintosh range.
PLOTMATE GRAPHICS PLOTTERS

Revolutionary plotter hits the micro industry

* Plotmate A4M is unique.
* Connects to all leading Micros IBM, Apple, Atari, Sinclair, Master.
* Multiple interface modes.
* Multiple language emulation sweet-P for Lotus 1-2-3, Watanabe for Britick, BBC for total compatibility with all Acorn products.
* Further language ROMs under development.

Plotmate A4M into a new graphics dimension send for free information pack

Send for demo pack and see for yourself.
If you like our prices, you'll love our service!

SMART SYSTEM II...£475
Integrated Package Par Excellence
Database + Word Processor + Spreadsheet
Graphics + Time Manager + Communications
We can configure SMART to your requirements.

PARADOX
Setting the standard for relational database
Ability to convert dBase, Lotus & PFS files
To find out more about this new product which
takes the US by storm, CALL!

Multimate ADVANTAGE
As Multimake but with many enhancements.
Includes table of contents generation,
information manager for sort, search, replace
etc. The advantage is clear — £250

HERCULES MONO GRAPHICS... only £289
The World's number 1 best selling monographs card.
For the IBM PC + compatible with all software
Includes printer port + Two years warranty
HERCULES COLOR CARD also available... only £150

HARDWARE & CONSUMABLES
We can supply Hard disks, Hard disks on-a-card
Memory boards Multi-function boards (AST, Tecmar,
Intel etc.) Processors, Memory Chips, Disks, Paper,
all competitively priced

HALF PRICE DISKS
CONTROL DATA
Authorised distributors
You've tried the rest, now try the best for less
StorageMaster TM

ZERO RISK DISKS BY CONTROL DATA
100% ERROR FREE LIFETIME WARRANTY
PRICES PER BOX OF 10 DISKS

<table>
<thead>
<tr>
<th>Type</th>
<th>1</th>
<th>2-5</th>
<th>6-9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS/DD</td>
<td>£13.00</td>
<td>£12.80</td>
<td>£12.50</td>
<td>£12.20</td>
</tr>
<tr>
<td>DS/DD</td>
<td>£17.00</td>
<td>£16.80</td>
<td>£16.50</td>
<td>£16.20</td>
</tr>
<tr>
<td>SS/OO</td>
<td>£17.20</td>
<td>£17.00</td>
<td>£16.80</td>
<td>£16.60</td>
</tr>
<tr>
<td>DS/OO</td>
<td>£22.00</td>
<td>£21.80</td>
<td>£21.60</td>
<td>£21.40</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>3½&quot;</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SS/DD</td>
<td>£24.50</td>
<td>£24.30</td>
<td>£24.10</td>
<td>£23.90</td>
</tr>
<tr>
<td>DS/DD</td>
<td>£33.00</td>
<td>£32.80</td>
<td>£32.60</td>
<td>£32.40</td>
</tr>
</tbody>
</table>

All prices include VAT
SAME DAY DESPATCH IN UK
LOTS MORE HARDWARE AND SOFTWARE BARGAINS
PHONE OR WRITE FOR A COMPREHENSIVE PRICE LIST
Send postal order or cheque to:
MAC COMPUTER AND BUSINESS SUPPLIES
Freepost: 35 Bonhill Rd, Durnbarton, Strathclyde G82 1BR
Tel: (0389) 61377 — 24-hour Phone-a-brochure

APRIL 1986 PCW 17

Which Computer?
When you need facts not fantasy talk to Alliance.
We've a reputation for straight talk and plain dealing.
If you're looking for hardware we'll advise on systems and PC's offering the best
prices you'll find on Epson, Victor, Apricot, Brother and other top name
equipment plus we guarantee the best of after sales service.
We can supply off the shelf software from Pegasus, Sage, Lotus, Delta, Wordcraft
d and many others or we'll design bespoke packages to suit your requirements.
Our back up facilities include the supply of a comprehensive range of consumables
and training programmes tailored to your needs.

For more information and an understandable chat ring Derek or Janet now.

Alliance Computers
Alliance Computers Limited, Brookfields Industrial Park
Werrington, Peterborough PE4 6LA Tel: 0733 77100
NIMBUS VISION
A complete image capture system including an 80186 based microcomputer with high resolution graphics, mouse, a high quality vidicon camera and a video digitiser with up to 512 x 512 pixel resolution. Applications include video displays, image analysis, object counting etc. Complete systems from £2950 + VAT.

MICROSIGHT
For connection to a range of microcomputers, MicroSight systems can provide a low cost image capture facility up to 512 x 512 resolution either by scanning or frame grabbing. Packages including camera, interface, software for disk storage, hard copy and display are available for IBM PC, Apricot, Hewlett Packard, BBC Model B etc from £900 + VAT.

MICROEYE
Video interface with 512 x 512 x 8 resolution £495 + VAT.

MPE-FORTH/09 for FLEX or NIMBUS
Editor, assembler, full system integration. Cross compilers available. £175

We are the Forth specialists, we also stock a large range of books, listings and implementations for machines ranging from Amstrad to Alan ST. IBM PC to PDP11.

IBM apricot + COMPATIBLES
TOP QUALITY SOFTWARE at UNBEATABLE PRICES
MAGICALC £70 Spreadsheet with Matrix, Trig and many more features
PEDIT86 £65 Programmers Editor with over 50 commands — very versatile
HEXED86 £20 Hexadecimal File Editor with ASCII & HEX windows
TOOLSET Packages available which include various utility programs, some shown below
GREP86 £10 Better than UNIX Grep utility
MERGE £15 File Merge with many formats
REPLACE £10 Search & Replace, any File type
MDUMP £10 RAM-ROM Dump, HEX + ASCII
MASK £15 Makes Files READONLY or HIDDEN
QDEL £10 DEL with prompt for each file

All programs supplied with DOCUMENTATION.

ALL PRICES INCLUDE P&P. NO VAT CHARGE.
PROBABLY THE MOST POWERFUL SYSTEM ON A MICRO...

... is the TRENDS INFORMATION SYSTEM.

Here are some extracts from PC USER'S recent review:

"When you're dealing with financial information, a two-dimensional spreadsheet is often not sufficient. Complex analyses can be done, but only if you can keep track of things yourself, and you may then find that you don't have as much control over the calculations as you'd like to have.

"Overall, I particularly liked the way the package mirrors the structure of data found in many numerical applications, and the way the 'programming language' provides considerable power without being over complex.

AVAILABLE FROM:
Planalysis: 01-435 1489
15 Lymington Rd
London NW6 1HX
Get the speed and brains of an AT for £799 +VAT

For only £799.00 + VAT you can make your PC run over SIX TIMES FASTER with the amazing new SpeedPac 286 Turbo board from Victor Technologies.

All the power of the AT-compatible machine at your fingertips for much, much less! At 8MHz, SpeedPac 286 makes your existing IBM PC/XT or Victor VPC system run even faster than the IBM AT's 80286 microprocessor...

The SpeedPac 286 works with your existing software – and it's easy to install. Just slot it in – at only 5 inches it occupies a half slot, leaving your long slots free to accept other add-on boards.

Take the coupon along to your Victor dealer and make sure you get your SpeedPac 286 with up to 30 days' full money-back guarantee if you're not delighted.

Order now only through Victor dealers to ensure early delivery.

For details of your nearest stockist call the Victor Actionline on 0272 217777 day or night.

Victor Technologies (UK) Ltd. Unit 1, The Valley Centre, High Wycombe, Bucks. HP13 6EQ.

We Never Forget You're Human.

Name ____________________________
Position in company ____________________________
Address ____________________________
Make of computer installed ____________________________
How long installed ____________________________

I understand you will refund my money in full within 30 days if I am not satisfied with the performance of the Victor SpeedPac 286.

IBM PC, XT and AT are trademarks of International Business Machines Corporation.
The image contains a page with various advertisements and listings. The content includes product offerings, such as software and hardware, along with pricing information and contact details. There are also mentions of telephone numbers and delivery details. The text is primarily in English, with some use of abbreviations and technical terms. The layout is typical of a magazine or catalog page, with sections for different products and services.
SUPER TOOLS™
by
PARAGON COURSEWARE
save you time & time & time...
If you program in Turbo™ Pascal this source code Library is a must. Includes Windowing package makes pop-up windows and menus easy to program. Allows definition of separate window library. ".......the most general and powerful implementation of overlapping windows available." Computer Language November 1985
Access System & File information from your programs (get dir, change dir, copy files, check hardware etc.) Evaluate any Math Expression typed by user, fully protected & bomb proof! All with documented source code £55. Also Savant Tools™ for your Math programs: Real & Infinite Precision Math. Call for info.
In UK Call: Grey Matter:(0364)53499
Paragon Courseware
4954 Sun Valley Rd, Del Mar, California 92014 USA.
(Visa, Master Card OK) Tel: (619) 481-1477.
Savant, SuperTec trademarks of Paragon Courseware. Turbo Pascal trademark of Borland Interna'l.

SAMS Apple Business Centres
Your Macintosh Specialists
Available Now from Stock:
Macintosh Plus – HD20 Drive
Laser Writer – Imagewriter II
Symbiotic Appletalk Network
For Early Delivery or Demonstration call us Now
Dial 100 and ask for
FREEPHONE SAMS COMPUTERS
or contact your nearest office direct
Sams in the City
Sams in Wimbledon
105/107 Whitecross Street
78 Durham Road
Barbican
Wimbledon
London EC1
London SW20
01-628 8781
01-946 2222

Plugging the Power Gap
Powerpoint provide the computer industry with solutions to problems that must not arise. From uninterrupted power supply (U.P.S.) systems and constant voltage transformers (C.V.T.) to mains interference units all designed to the highest specification to meet your demanding needs. Powerpoint give you and your system total protection.

C.V.T.
- Power Range: 125, 250, 500, 1000
- Input Voltage: 190-270 Volts A.C.
- Output Voltage: 220/240 Volts A.C.
- Output Regulation: +/- 3%
- Wave Distortion: 6% Maximum

U.P.S.
- Power Range: 125, 250, 500, 1000, 2000
- Input Voltage: 0-265 Volts A.C.
- Output Voltage: 220/240 Volts A.C.
- Output Regulation: +/- 3%

BLOC MAINS FILTER
- Mains suppression units
- Low cost protection
- 30 dB Suppression 1 MHz to 30 MHz
- 130 Joule spike suppression

POWERPOINT - PLUGGING THE POWER GAP
For more information on how you can plug the gap please contact

RME POWERPOINT LTD.
Unit 16, Vernon Street, Shirebrook, Mansfield, Notts. NG20 8ST.
Telephone: 0623-748129
Radford Business Centre, Radford Way, Billericay, Essex CM12 0DG.
Telephone: 02774-57911 Telex: 995540-DUPEX-G

As approved by Apricot Computers Ltd
Imagine you have to prepare a report, plan a holiday, launch a new product, arrange a wedding or simply sort out your ideas on a new activity.

BrainStorm is a three dimensional scratch-pad designed to be the quickest and most efficient way of organising your thoughts on any subject. It allows you to think, write, edit and structure all at the same time.

First dump your random thoughts into BrainStorm. Identify major points: jot in other thoughts as they come to you: maybe develop an idea that particularly appeals.

Unobtrusively BrainStorm starts to develop a model of what's on your mind.

You don't have

- to screw up balls of paper, use an eraser or write things out again. You can cut, paste and amend your ideas at will. Add in afterthoughts, change emphasis and resequence... all at the touch of a few keys.

BrainStorm is the equal to a word processor on words, or a spreadsheet on numbers. With it you will develop the ideas in your mind...all in a fraction of the time it takes with a scratchpad and pencil.

If you think you must BrainStorm.

SmartKey has the power to dramatically improve the way your personal computer works for you, by customising and automating your keyboard and software.

It enables you to assign any long, repetitive, or difficult-to-remember set of keystrokes to any single key on your keyboard. Press this key once and SmartKey, the electronic assistant, will do the work for you.

It can be used with, and is invisible to, your other programs.

With word processors you can type standard paragraphs.

Are you frustrated by the keyboard barrier? Would 'error prone and slow' fairly describe your keyboard skills?

Touch 'N' Go will change all this. It is a carefully designed keyboard skills course developed over the last 20 years. Having been implemented on today's business micro-computers it has

- achieved the UK's most popular typing tutor. And now it's available for the Amstrad range of disk-based computers.

The course develops your skill on the QWERTY keyboard and numeric keypad. With a little concentrated effort you can achieve mastery in just 24 hours.

It is actually so much fun to use that it becomes addictive. So don't start using Touch 'N' Go when you have something more important you should be getting on with!

Touch 'N' Go gives you the opportunity to banish keyboard frustration forever and increase productivity with the software products you use.

Cardbox is the most popular, the most flexible, the fastest and in fact THE BEST simple electronic card-indexing system on the market.

With Cardbox you can maintain

- instantly accessible records of customers, suppliers, staff, books, journal extracts, club memberships, widgets and just about anything you can think of.

You design the card layouts yourself and index the information as you put it in. You can have any number of keywords in a file, display or print cards in any format and exchange information with other programs.

You can have up to 65,000 cards in any one file (depending on disk capacity). Each card can have up to 1404 characters on it. There can be up to 26 fields on each card. The largest field you can have is 1404 characters (the size of the card).

And there is absolutely NO LIMIT to the number of indexed words you can have on a card or in a file.

Software the professionals use!

Now available for the Amstrad CPC-6128, PCW-8256 and CPC-464 (with CP/M)

Call our order hotline now! 01-379 6502

Offers last for a limited period only.

Please add £3 P&P per product.

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
  - Mac Drive 800k
  - ImageWriter 15"
  - ImageWriter II
  - *Apple* *LazerWriter* £3696

- **APRICOT**
  - Portable FP 512K
  - F2 INC Mouse
  - F10 INC Mouse
  - PC 512K 2 x 720
  - X1 605K 1985
  - XEN 2 x 720 Drive
  - *£1995*
  - XEN 20Mb
  - *£2399*
  - Apricot 9" MON
  - Apricot 12" MON
  - Apricot 10" Colour MON

- **OLIVETTI**
  - M21 2 x 720 Drive 1644
  - M21 640k 10Mb 1985
  - M24 2 x 360 Drive 1133
  - M24 640k 10Mb 1799
  - M24 SP 2220
  - *Special Offer* *M24 640k 20Mb 7 slot Bus converter Monitor, Keyboard + DOS* £1990

- **LAZER PRINTERS!!**
  - Canon Lazer Printer
  - *£1950*
  - HP LazerJet
  - *£2095*
  - *LazerWriter* *£3696*

**Goto Computers Ltd.**

10 Old Crown, Windsor Road, Slough, Berks SL1
2DL Telephone Orders: Slough (0753) 34191

**40 MILE FREE DELIVERY!**

**COMPUTERS**

- Canon A200 PC Colour with Monitor £1695
- Canon A200 PC HD 10Mb Col Monitor £3275
- Commodore PC10 with Monitor £995
- Commodore PC10 with Monitor £1495
- Diverti M21 256k 2 x 360k Drives £1425
- Apricot F2 512k 2 x 720 Drives £1195
- Apricot F10 512k 10mb drive £1695
- Apricot PC 256k 2 x 720 drives £1386
- Sony 885 PC £1095
- Bondwest 34 PC IBM comp £666
- Epson Taul PC £629
- Commodore Amiga CALL
- Atari 520ST £652
- Toshiba T1100 £1395
- BBC Master 128 £434
- Commodore 128D £434

**MONITORS**

- KAGA Supervision 111 Hi-Res Colour £385
- KAGA Supervision TV with Col Card £715
- KAGA XD 1203G Green £80
- KAGA XD 1203A Amber £89
- Philips BM 7502 Green £70
- Philips BM 7222 Amber £72
- Philips 5533 Col Monitor £222
- Mitrovic 1451 Med Res £390
- Commodore 1901 £250

**SOFTWARE**

- Supercalc 3.2 £215
- Superspect NEW VERSION £320
- Beagle 111 Plus £380
- Framework 11 £370
- Symphony 1.1 £359
- Autocad £999
- Multimate ADVANTAGE £208
- Lotus 1-2-3 Release 11 £275
- Turbo Pascal Vers 11.1 £52
- Wordstar 2000 £280
- Open Access £340
- SAGE Accounts £265
- SAGE Accounts Plus £465
- Too Many to list –

**ELEPHANT DISKS BOX 10 SS/DD £13.40**

**NOT ONLY THE PRICE IS GOOD**

Delivered free within 40 miles of Slough – £7.50 elsewhere in UK export orders

Undertaken – leasing and HP arrangements

UK government and education enquiries

Welcome instant credit on presentation of credit card

Please add V.A.T to all prices

We open Saturdays – pop in and see us anytime

Ring now: 01-729 7033

ATT Corporation Ltd
(T.I.) Industrial Units
Stanway Street London N1 6RY
Tel: 01-729 7033
Telex: 895 1182 GECOMS G

April 1990 PCW 25
# 10 Mb Hard Disk Upgrade

**FREE!**

With IBM-PC, XT & COMPAQ Complete Systems

**for example**

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>64K PC</td>
<td>£1287</td>
</tr>
<tr>
<td>Keyboard</td>
<td>£185</td>
</tr>
<tr>
<td>Second Drive</td>
<td>£266</td>
</tr>
<tr>
<td>Mono Adaptor</td>
<td>£181</td>
</tr>
<tr>
<td>Mono Display</td>
<td>£186</td>
</tr>
<tr>
<td>DOS 2.1</td>
<td></td>
</tr>
<tr>
<td>10 Mb Upgrade</td>
<td>FREE</td>
</tr>
<tr>
<td>TOTAL COST</td>
<td>£2084</td>
</tr>
</tbody>
</table>

**EXCLUSIVE OF VAT**

Optional Mono Graphics Card WORTH £295 FREE!

- 640K Upgrade? ADD £295
- 10 Mb Tape Streamer ADD £695
- 20 Mb Hard Disk ADD £390
- Optional 3 x 360K Drive ADD £250

Phone for your configuration quote

**MICROWARE**

**THE COMPUTER STORE**

**NORTH LONDON** 637 Holloway Road, London N19 5SS Tel: 01-281 2431

**SOUTH LONDON** 67 Westow Street, Upper Norwood, London SE19 3RW Tel: 01-771 6373

**MIDLANDS** 14 Charles Street, Hanley, Stoke-on-Trent ST1 3AR Tel: (0782) 269883

**SURREY** 8 Hill Street, Richmond, TW9 1TN Tel: 01-940 8635
# 20 Mb Hard Disk Upgrade

**FREE!**

With IBM-AT Complete Systems

---

For example:

<table>
<thead>
<tr>
<th>Component</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>256K PC AT</td>
<td>£287.4</td>
</tr>
<tr>
<td>Keyboard</td>
<td>£34.2</td>
</tr>
<tr>
<td>Mono Adaptor</td>
<td>£182</td>
</tr>
<tr>
<td>Mono Display</td>
<td>£186</td>
</tr>
<tr>
<td>DOS. 3.0</td>
<td>£58</td>
</tr>
</tbody>
</table>

**20 Mb Upgrade** FREE

**TOTAL COST** £3642.00

---

**EXCLUSIVE OF VAT**

- SERIAL/PAR UPGRADE ADD £99
- 256K RAM UPGRADE ADD £99
- 360K DRIVE UPGRADE ADD £199
- 20 MB TAPE STREAMER UPGRADE ADD £995

---

Phone for your configuration quote...

---

**MICROWARE**

**THE COMPUTER STORE**

---

**NORTH LONDON**
637 Holloway Road, London N19 5SS
Tel: 01-281 2431

**SOUTH LONDON**
67 Westow Street, Upper Norwood, London SE19 3RW
Tel: 01-771 6373

**MIDLANDS**
14 Charles Street, Hanley, Stoke-on-Trent ST1 3AR
Tel: (0782) 269883

**SURREY**
8 Hill Street, Richmond, TW9 1TN
Tel: 01-940 8635
THE TANDATA P.A.

NEW Data/voice communicating workstation: With a wide range of useful standalone computing facilities.

Tm 512 SMART MODEM
NOW HAYES COMPATIBLE The Tm 512, a multi-baud rate (V21 & V23) modem which allows completely automatic operation. Now understands Hayes or V25 (bb) commands too. With EPAD error correction option.

OVER 50,000 TANDATA COMMUNICATIONS PRODUCTS ALREADY IN USE.

GET THE MESSAGE?

I'd like to know why more & more people are investing in Tandata communications products. Please send me information on: (Please tick)

Viewdata terminals/adaptors
Tandata P.A. (data/voice communications workstation)
Tm 512 V21/V23 modem
Tm 602 V22 & V21/V23 modem
Comms software for micro:

I'd like to know more

Name
Position
Company
Address
Telephone

Send to: Tandata Marketing Ltd., Albert Road North, Malvern, Worcs. WR14 2TL.

PCW 4
TAY COMMERCIAL SERVICES LTD
WASH LANE, BURY, LANC'S BL9 7DU

TEL: 061 705 2288 TELEX: 665233

COMPUTERS

COMMODORE
PC10 256K RAM £975
2 x 360K Floppy Drives
PC20 256K RAM £1175
1 x 360K Floppy Drive
10MB Hard Disk £1475

SPERRY
MODEL 200 256K RAM £1850
2 x 360K Floppy Drives
MODEL 400 256K RAM £2620
1 x 360K Floppy Drive
1 x 20MB Hard Disk
MODEL 450 256K RAM £2950
1 x 360K Floppy Drive
1 x 20MB Hard Disk
MEDIUM RESOLUTION COLOUR MONITOR £3200
P.C./J.T. 512K RAM £482
1 x 1.2MB Floppy Drive
1 x 44MB Hard Disk £ECALL

OLIVETTI
M21 £ECALL
M24 £ECALL

PRINTERS

EPSON LX80 £189
EPSON FX80 £339
EPSON FX105 £439
EPSON LQ800 £462
EPSON LQ1500 INC. 32K/F £799
EPSON SC2000 £1399
EPSON EPL-6800 £315
BROTHER HR25 £649
BROTHER HR35 £749
DIABLO 630 £1539
STAR SG 10 £199
STAR SG 15 £291
STAR SD 10 £291

DISKETTES (BOX 10)

5¼ DSDD 40 Track £19
3M £23
DYSAN £18
3½ DSDD FUJI £32

SOFTWARE

WORDSTAR PROF £279
WORDSTAR £215
WORDSTAR 2000 £295
SYMPHONY £399
LOTUS 123 £319
SUPERCAL II £129
SUPERCAL III £235
MULTPLAN £215
MULTIMATE £287
PEGASUS £175

THIS IS A LIMITED SAMPLE OF THE GOODS WE OFFER.
PLEASE CALL FOR FURTHER DETAILS.
ALL PRICES EXCLUDE VAT AND CARRIAGE
CHEQUE WITH ORDER OR ACCESS/DINERS/AMERICAN EXPRESS

LOOK LOWER PRICES
LOOK QUALITY DISKS

CAN YOU AFFORD TO BUY ELSEWHERE?
We sell Factory Sealed - No Repackaging
We sell Top Quality - No Seconds
We sell Quality Brands - No Unknown Names

PC10 DRIVES

<table>
<thead>
<tr>
<th>Model</th>
<th>Price (excl VAT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1MB</td>
<td>£1175</td>
</tr>
<tr>
<td>2MB</td>
<td>£1375</td>
</tr>
<tr>
<td>4MB</td>
<td>£1575</td>
</tr>
<tr>
<td>8MB</td>
<td>£1995</td>
</tr>
<tr>
<td>16MB</td>
<td>£3175</td>
</tr>
</tbody>
</table>

PC20 DRIVES

<table>
<thead>
<tr>
<th>Model</th>
<th>Price (excl VAT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1MB</td>
<td>£1375</td>
</tr>
<tr>
<td>2MB</td>
<td>£1575</td>
</tr>
<tr>
<td>4MB</td>
<td>£1795</td>
</tr>
<tr>
<td>8MB</td>
<td>£2195</td>
</tr>
</tbody>
</table>

DIABLO 630

<table>
<thead>
<tr>
<th>Price (excl VAT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>£1539</td>
</tr>
</tbody>
</table>

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

PAPER-LABELS

<table>
<thead>
<tr>
<th>Size</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2&quot;</td>
<td>5000</td>
</tr>
<tr>
<td>2/4&quot;</td>
<td>2500</td>
</tr>
</tbody>
</table>

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 (50 boxes) and Trade Accounts.

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disc Label 1025 15 characters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disc Label 1025 6 character</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disc Label 1025 7 characters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disc Label 1025 12 characters</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Telephone Orders Anytime 01-868 9548

Pinner Wordpro

34 CANNONBURY AVENUE PINNER MIDDX HAS 1TS

APRIL 1986 PCW 29
APRICOTS GOING CHEAP!

<table>
<thead>
<tr>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1 + Monitor 256K RAM, 315K disk</td>
<td>£395.00</td>
</tr>
<tr>
<td>F1 + Monitor 256K RAM, 720K disk</td>
<td>£495.00</td>
</tr>
<tr>
<td>PC + Monitor 256K RAM, two 315K disks</td>
<td>£1095.00</td>
</tr>
<tr>
<td>Xi10 + Monitor 256K RAM, one 720K disk, 10 Mbyte hard disk</td>
<td>£1795.00</td>
</tr>
<tr>
<td>F2 + Monitor 512K RAM, two 720K disks</td>
<td>£1195.00</td>
</tr>
<tr>
<td>F10 + Monitor 512K RAM, one 720K disk, 10 Mbyte hard disk</td>
<td>£1495.00</td>
</tr>
<tr>
<td>XiFD + Monitor 512K RAM, two 720K disks</td>
<td>£1495.00</td>
</tr>
<tr>
<td>XiHD + Monitor 512K RAM, one 720K disk, 10 Mbyte hard disk</td>
<td>£1995.00</td>
</tr>
</tbody>
</table>

APRICOT PACKAGES

<table>
<thead>
<tr>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC + Monitor 256K RAM, 10 Mbyte hard disk + Epson LX80 Printer + Lead</td>
<td>£1245.00</td>
</tr>
<tr>
<td>Xi10 + Monitor 256K RAM, one 720K disk, 10 Mbyte hard disk + Epson LX80 Printer + Lead</td>
<td>£1945.00</td>
</tr>
<tr>
<td>F2 + Monitor 512K RAM, two 720K disks + Epson LX80 Printer + Lead</td>
<td>£1295.00</td>
</tr>
<tr>
<td>F10 + Monitor 512K RAM, one 720K disk, 10 Mbyte hard disk + Epson LX80 Printer + Lead</td>
<td>£1595.00</td>
</tr>
<tr>
<td>XiFD + Monitor 512K RAM, two 720K disks + Epson LX80 Printer + Lead</td>
<td>£1645.00</td>
</tr>
<tr>
<td>XiHD + Monitor 512K RAM, one 720K disk, 10 Mbyte hard disk + Epson LX80 Printer + Lead</td>
<td>£2345.00</td>
</tr>
</tbody>
</table>

These are the Cheapest Prices anywhere in the UK. If you think differently, then let us know!

SILICON DESIGNS
11 GREEN HILL GATE, GREENHILL, HIGH WYCOMBE
Tel: (0494) 452768

LOW PRICES ON HARD DISKS AND MATHS PROCESSORS

UPGRADEKITS
(INCLUDING VAT)

<table>
<thead>
<tr>
<th>Disk Size</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 MEGABYTE</td>
<td>£390.00</td>
</tr>
<tr>
<td>20 MEGABYTE</td>
<td>£453.00</td>
</tr>
<tr>
<td>30 MEGABYTE</td>
<td>£795.00</td>
</tr>
<tr>
<td>40 MEGABYTE</td>
<td>£875.00</td>
</tr>
<tr>
<td>85 MEGABYTE</td>
<td>£1,995.00</td>
</tr>
</tbody>
</table>

MATHS PROCESSORS
(INCLUDING VAT)

<table>
<thead>
<tr>
<th>Processor</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>8087 5 MHz</td>
<td>£90.00</td>
</tr>
<tr>
<td>8087-1 8 MHz</td>
<td>£152.00</td>
</tr>
<tr>
<td>8087-1 10 MHz</td>
<td>£168.00</td>
</tr>
<tr>
<td>CONTROL CABLES</td>
<td>£6.50</td>
</tr>
<tr>
<td>AT COMPATIBLE 512K RAM, 20 MEGABYTE HARD DISK</td>
<td>£2,995.00</td>
</tr>
<tr>
<td>HI RESOLUTION COLOUR MONITOR 640-720 PIXELS</td>
<td>£2,995.00</td>
</tr>
<tr>
<td>8 SPARE SLOTS, GRAPHIC CARD KEYBOARD</td>
<td>£2,995.00</td>
</tr>
</tbody>
</table>

ONE YEARS WARRANTY ON ALL PRODUCTS CASH ON DELIVERY

WAFT
FOURTH GENERATION APPLICATION PROGRAMME GENERATOR
FROM WESSEX SOFTWARE
AVAILABLE NOW FROM SILICON DESIGNS TRIAL DISK £10 REFUNDABLE AGAINST ORDER
IMPORTANT ANNOUNCEMENT
A MAJOR SUPPLIER HAS FOR DISPOSAL
A LIMITED STOCK OF BRAND NEW
DAISY WHEEL PRINTERS

FOR WELL UNDER
HALF PRICE!

WIDE CHOICE OF DAISY WHEELS & RIBBONS IN STOCK

Excess stockholding has enabled us to offer — for a limited period — a consignment of professional high quality daisywheel printers manufactured in Japan. Machines offer an exceptional specification which will never again be repeated at this price.

★ Works with any home or office 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 feeders

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 & Hamland only.

SAVE £296!

WIDE CHOICE OF DAISY WHEELS & RIBBONS IN STOCK

Excess stockholding has enabled us to offer — for a limited period — a consignment of professional high quality daisywheel printers manufactured in Japan. Machines offer an exceptional specification which will never again be repeated at this price.

★ Works with any home or office 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 feeders

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 & Hamland only.

SAVE £296!
FOR APRICOT
THE ANSWER IS
COMPUTAPLANT (UK) LTD.

ALSO AVAILABLE
THE
APRICOT
'F' RANGE

AUTHORISED DEALER FOR APRICOT,
FACTS SOFTWARE, PEGASUS SOFTWARE, AND MITELEX
TELEX SYSTEM

FULL RANGE OF PRINTERS AND
SOFTWARE ALSO AVAILABLE

PRINTERS
EPSON LX80
EPSON FX80
EPSON FX105
EPSON RX100
EPSON DX100
EPSON LX1500
CANON PW 1080 A
CANON PW 1155 A

SOFTWARE
PEGASUS ACCOUNTS
FACTS ACCOUNTS
WORDSTAR 2000
WORDSTAR PROFESSIONAL
LOTUS 1-2-3
DBASE III
SYMPHONY
SMART SOFTWARE

CONTACT ONE OF OUR BRANCHES FOR FURTHER DETAILS... OR VISIT ONE OF OUR SHOWROOMS
BRANCHES AT
Cromwell Mews, 5 Station Road, Penwood House, St Breward, Bodmin, Cornwall
TEL: 0480 300169

140 Queens Street, Peterhead, Aberdeenshire
TEL: 0779 75318

COMPUTAPLANT
MULTI-USER...
without the pain, agony, cost or system throttling of Unix.

...U-MAN + MIRAGE
= 10MHz 68000 supermicro and a 68000 optimized multi-user operating system. An all British solution.

- Fast response for all users.
- Economic use of system resources.
- Can use IBM PC’s as well as dumb terminals.
- Excellent support from UK companies.

Find out more...
clip the coupon and return to: Malcolm Birkett
U-Microcomputers Ltd, Winstanley Industrial
Estate, Long Lane, Warrington, Cheshire, WA2 8PR
Telephone 0925 54117  Telex 629279
AT LAST A BUSINESS COMPUTER WITH A HOME COMPUTING PRICE TAG

Now at last you can buy a business computer for less than the price of some home micro systems.

JUST LOOK AT THE WREN EXECUTIVE’S OUTSTANDING SPECIFICATION

- Twin 250K disk drives
- Built-in amber high resolution screen
- 67-key QWERTY keyboard
- On-board auto-dial modem — allows access to databases, electronic mailbox systems and can even turn your Wren into a telex!
- CP/M 3 (CP/M Plus) operating system — lets you choose from thousands of software packages for wordprocessing, accounts handling, data storage or communications.
- RS232 and Centronic printer ports
- Winchester disk port
- RGB high resolution colour monitor output
- Twin paddle/joystick controls
- 64K of RAM expandable to 256K
- 32K of video RAM
- 16K of ROM
- 50 bytes of battery-backed CMOS RAM
- Real time clock
- Executive Desktop software suite — a range of everyday aids including electronic diary and notebook, address and telephone filing systems, calculator and typewriter mode.
- Free registration to BT. Gold

So why choose a home micro for your business, or even a limited wordprocessing system, when you can pick up a Wren Executive portable for just £495 + VAT. Call Opus on 0737 65080 for details of your nearest Wren dealer or simply post the coupon.

Substantial Education, Government and dealer discounts available.
<table>
<thead>
<tr>
<th>Printer Type</th>
<th>Model/Description</th>
<th>Retail Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>KAGA TAXAN KP810</td>
<td>NLQ Dot Matrix Printer 160 c.p.s.</td>
<td>£199.95 + VAT</td>
</tr>
<tr>
<td>STAR GEMINI 10X</td>
<td>Dot Matrix Printer 120 c.p.s. + Friction &amp; Tractor, Epson Compatible</td>
<td>£129.95 + VAT</td>
</tr>
<tr>
<td>QUEN DATA DWP1120</td>
<td>Daisyprinter Wheel Printer 18 c.p.s. With FREE: Printer Cable, Extra Ribbon, 500 Sheets of Paper</td>
<td>£179.95 + VAT</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ALL PRICES EXCLUDE VAT**
All equipment fully guaranteed — Credit terms available

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

**DONT TAKE A CHANCE — COMPARE BEFORE YOU BUY**

**LONDON'S LARGEST DISPLAY OF PRINTERS MONITORS COMPUTERS AND PERIPHERALS**

**ATARI 520ST OFFER**
Buy an Atari 520ST complete for £749.95 inc VAT. (£652.13 + VAT) and we will sell you a STAR GEMINI 10X Printer for an incredible £24.95 inc VAT (£21.70 + VAT)

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

---

**ALSO VAST RANGE OF DISK DRIVES, JOYSTICKS, DISK BOXES, INTERFACES, SHEET FEEDERS, ETC.**

---

**MAIL ORDER + EXPORT + TRADE HOT Line Phone 01-666 6362**

**Delivery by Securicor: (3) days please add £5.00 + VAT per item.**

**Delivery by T.N.T. (overnight) please add £2.50 + VAT per item.**

---

**53-59 High Street, Croydon, Surrey CR0 1BD.**

---

**P Q U E N**

---

**Mail Order & Export Trade Hotline Phone 01-666 6362**

---

**Register now to order: Call 01-666 6362**

---

**Register now to order: Call 01-666 6362**

---

**Register now to order: Call 01-666 6362**
SOFTWARE PACKAGES

- IBASE II £28
- IBASE III £31
- DELTA £28
- FLASHY £34
- LOTUS VERSION 2 £275
- MULTIMATE £185
- NORTH PLUS £182
- OPEN ACCESS £348
- GOOD ACCOUNTANT £420
- SAGE BOOKKEEPER £198
- SAGE PAYROLL £198
- SMART SYSTEMS £328
- SYMPOSIUM £328
- MANTIS £191
- WORKSTAR £199
- WORKSTAR 2000 £279
- WORKSTAR PRO £281

UPGRADE NOTES

- The prices below include: S.200, Calculator, Brackets, Cards and Manuals. Post year's warranty for parts and labour.

- WORDCRAFT inc database £205
- DELTA DATABASE £375
- PROPHET ACCOUNTS inc Sales/Purchase Ledgers, Invoices & Statements £160
- CAD SOFTWARE & SYSTEMS — please call for details.

PRACTICAL COMPUTER PRINTERS

- DATYSYSTEM 2000/QUENDATA 1150 £18
- JUKI 6100/PE/TL £29
- EPSON L800 £50
- NEC PRINTER P2 £38
- BROTHER M1509 £99
- MANNESMA/T M85 £18

PRACTICAL BUSINESS PRINTERS

- DATYSYSTEM 2000/QUENDATA 1150 £18
- JUKI 6100/PE/TL £29
- EPSON L800 £50
- NEC PRINTER P2 £38
- BROTHER M1509 £99

BETTER SERVICE : BETTER PRICES : WIDER CHOICE

FERRANTI PC860

ATARI 520 ST inc free disks £599
AMSTRAD PCW 8256 £399

PERFECT 2 SOFTWARE SUITE. Contains Perfect Writer 2 inc. Speller & Thesaurus. Perfect Call 2 inc. The worst word processor available. The best thing we have ever seen. £119.95. Inc. £35.00 postage and packing. £155.95. Inc. £35.00 postage and packing.

OLIVETTI M24 SP 640K. complete £2699

- HARD DISK & MEMORY UPGRADES

- 10/20MB Hard Disk Upgrade (IBM and Compats) £499/£379
- 381KX MULTIFUNCTION Board + Ram disk = print spooler £249
- OLIVETTI Upgrade to 5MB £79
- £24
- SANYO Extra 128KB Ram + Ram disk + extra 25% disk capacity £55
- MACINTOSH Upgrade to 125KB (256K chips) 12 months warranty £179
- APRICOT 512K £149

PLOTTERS

- Hiachi/762 £95
- Roland DXY-880 £199
- Houston EMOP 42A £299
- Cherry 3 digitiser £339

DISKS — SAME DAY DESPATCH — POST FREE

- BOXED IN TINS. NO QUILIB GUARANTEE.
- PANASONIC 5½" First box £13.45 Extra box £10.95
- SONY 3½" £23.50
- MD60T £29.95
- MAXELL/MD10S £33.50

SPECIAL OFFER PACKAGES

1. TANDON PC
- Perfect writer II Word Processing
- JUKI Daisy Wheel Printer
- Discs & Paper £1549
- or RENTAL £1549

2. TANDON PC £10Mb Fixed Disc
- Perfect writer II Series
- AGE ACCOUNTS or similar
- JUKI Daisy Wheel Printer
- Discs & Paper £2400
- or RENTAL £2400

3. TANDON PC £20Mb Fixed Disc
- 640kb Upgrade
- LOTUS 123
- EPSON FX 106+ Printer
- Discs & Paper £2950
- or RENTAL £2950

4. TANDON PC £20Mb Fixed Disc
- TAPE STREAMER — For Backup
- 2 EXTRA TERMINALS
- CONCURRENT DSS
- EPSON FX 105 Printer
- Discs & Paper £3995
- or RENTAL £3995

5. TANDON PC £30Mb Fixed Disc
- Rest of Package — as in 4 above
- Discs & Paper £4495
- or RENTAL £4495

Rentals include full insurance cover and on-site maintenance.

These are just a few samples from the wide range of packages available — please telephone for particular requirements.

All prices exclusive of VAT and carriage.
**PRINTERS**

<table>
<thead>
<tr>
<th>Model</th>
<th>Price (£)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPSON LQ-20LQ</td>
<td>249</td>
<td>Optional Tractor Feed</td>
</tr>
<tr>
<td>EPSON FX 850</td>
<td>480</td>
<td>FX-850 (36col)</td>
</tr>
<tr>
<td>EPSON LX-800</td>
<td>480</td>
<td>LX-800 Colour printer</td>
</tr>
<tr>
<td>EPSON LX-800</td>
<td>435</td>
<td>LX-800 Colour printer</td>
</tr>
<tr>
<td>EPSON LW-900C</td>
<td>595</td>
<td>LQ-500 (36col)2k Buffer</td>
</tr>
<tr>
<td>TAXAN</td>
<td>195</td>
<td>K9FH (36col)</td>
</tr>
<tr>
<td>DIAMY</td>
<td>255</td>
<td>K9FH (36col)</td>
</tr>
<tr>
<td>BROTHER BR-815</td>
<td>285</td>
<td>BR-815 (56col)</td>
</tr>
<tr>
<td>EPSON S001-181</td>
<td>465</td>
<td>HITACHI 167181</td>
</tr>
</tbody>
</table>

**ACCESSORIES**

All models listed below are II/III approved.

**PRINTER BUFFER & SHARES**

**MIRRACLE WS 2000 RANGE**

- All professional range of microcomputer based modems offering a range up to 2400 baud, full duplex. Their many advanced features include: Auto-answer, Auto-dial, printer, internal memory switch to allow buffer recovery for the memory, data security option, audio-speeding, CCI ITU-BSS, standards, line monitoring etc. Speed buffering allows computers with 1200/1200 baud to use split-speed services etc. Price: Ease of operation is assured with "plain English" Hayes protocol.

- W2000: £295 (d) 22123 (V21 & V23) 22132 (V22 & V23)
- W5000: £295 (d) 22123 (V21 & V23) 22132 (V22 & V23)
- Data Cable: £10 (d) (IBMI PC)

**MIRRACLE 3000**

- A worldwide-modern covering V21, V22, (Bell 103 113 110 outside UK) and including 75, 150, 300, 1200 baud ratings. Optional Auto-dial, auto answer, cards complete control from computer keyboard. W3000 £125 (h)
- Aut Answer Card £50 (d) Auto Dial Card £50 (d)
- Software Control Kit £50 (d)
- Data Cable for IBM PC £10 (d)

**MODEMS**

All models listed below are II/III approved.

**TECHNOLINE VIEWDATA SYSTEM (using PRS8E type protocols)**

For detailed information on our product range, prices, order etc.

- 01-450 9764

- 24 hours - 7 days a week

**PROGRAMMES**

**MELIOS 80/PC 2nd Processor for the BBC**

The ultimate macro-assembler for the BBC. Covers a vast range of 8bit and 16bit processors including M68000, 68010, 1688. Free upgrades coming soon include 80800, 9860, 88000 etc. Mains advanced features available, conditional assembly. Search, replace, libraries and more. Please ask for leaflet.

- 01-458 1111

**Epson**

- EPSON LX-800 160 £490
- EPSON LX-250 110 £295

- EPSON LX-100 100 £245

**3M FLOPPY DISCS**

**CP/M & DOS SOFTWARE**

**BOOKS (No VAT £2.50 p/p)**

**DISC DRIVES**

- A range of Mitsubishi high performance, fast access, lower power 5 1/4 floppies and fixed disc drives.

**MONITORS**

- The monitors listed below are compatible with IBM PC and PC Compatibles and are supplied with leads suitable for the PC.

**MULTIFORM Z80 2nd Processor for the BBC**

This unique Z80 2nd Processor running OS/4 will allow use of almost any standard CP/M software on the BBC micro. It is supplied with four different CP/M formats and includes a capability to unify it to read other formats. This is particularly useful in environments where computers with different CP/M terminal are used and the data cannot be easily exchanged between them. Mains-powered.

**META ASSEMBLER for the BBC**

The ultimate macro-assembler for the BBC. Covers a vast range of 8bit and 16bit processors including M68000, 68010, 1688. Free upgrades coming soon include 80800, 9860, 88000 etc. Mains advanced features available, conditional assembly. Search, replace and libraries and more. Please ask for leaflet.

**BCC COMPILER SYSTEMS**

- We hold in stock one of the largest range of BBC computer software available for all models.

**TAYNCHON LTD**

MAIL ORDERS TO: 17 BURNLEY ROAD, LONDON NW1 1ED

SHOPS 8'T: 17 BURNEY ROAD, LONDON NW1 100

TEL: 01-208 1777 (d lines), TELEX: 922060

305 EDGWARE ROAD, LONDON W2 Tel: 01-722 0233

**PLEASE ADD CARRIAGE AS PER CODE & 15% VAT**

(A) sport: an VAT, p/p at cost

Orders from Government Dept's & Colleges etc. welcome.

Minimum Telephone Order £5.

Delivered / Plus £1 surcharge.

Stock items are normally in stock at present.

**TECHNOLINE LTD**
The event every Commodore user is waiting for...

The 7th official Commodore computer show

Champagne Suite and Exhibition Centre, Novotel, Hammersmith, London W6

This is YOUR chance to see the very latest developments in Commodore computing. On display will be all the new hardware and software releases from Britain and the USA that keep Commodore in the forefront in business, education and home computing.

See the AMIGA in action!

Save £1 a head - and miss the queues! - by sending for your tickets now!

How to get there:
Novotel London is right by the A4/M4 and is only two minutes from Hammersmith underground station (for the West End, City and airport). For those bringing their own car, there is a large underground car park at the hotel.

Advance ticket order

Post to: Commodore Show Tickets, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.

PHONE ORDERS: RING SHOW HOTLINE: 061-429 7931

Please quote credit card number and full address
It does accounts, projections.

No wonder people are racing out to buy Amstrad's new CPC 6128 computer. Not only does it answer all your business needs, it's also compatible with nearly 200 arcade and adventure games. So it can either speed you through your income tax returns or whizz you round a simulated Silverstone.

On the business side we start you off with a free disc which introduces you to the Amstrad CPC 6128's impressive range of capabilities, and the best ways to exploit them.

You'll discover how its massive 128k memory can open the door to over 8,000 CP/M applications.

Programs like 'Wordprocessing' and 'Database' will file and index records, produce standard letters, mailing lists and even compile reports. There's a series of business control programs which form a complete invoice, stock control and statement system.

In other words it's easy to choose the software you need to take the big problems out of your small business.

But even if you don't own a business there are plenty of good reasons for owning an Amstrad CPC 6128.

It makes short work of the problems we all face. Like keeping track of rates, mortgage and H.P. payments.

However even software packages as comprehensive
wordprocessing and 180mph.

as Amstrad's are only as good as the hardware they're loaded into.

You need a complete system.

That's why the Amstrad comes complete with a built-in disc drive as well as a monitor (green screen or full colour). So it's ready to go to work as soon as you get it home.

And if you want to go further additional disc drives, printers and joysticks are all available to ensure that your computer can grow with your growing needs.

Finally there's one feature of the Amstrad CPC 6128 that's both good business and a pleasure: the price.

With Green Screen around £299
With Colour Monitor around £399

Tell me more about the Amstrad CPC 6128

Name

Address

Amstrad CPC 6128 with 128k memory

Who says business and pleasure don't mix?

Amstrad P.O. Box 462, Brentwood, Essex CM14 4EE

*RUMBELOWS • SUPREME DISCOUNT STORES • TANDY • VALLANCES • W.H. SMITH • WIGFALLS • AND GOOD INDEPENDENT COMPUTER STORES*
**FERRANTI AT**

**THE BRILLIANT NEW FERRANTI AT IS AVAILABLE NOW FROM LABTEC**

**SPECIFICATION INCLUDES**

- Fully IBM compatible
- z800 Chip working at 6 or 8 M, Hertz
- 1.2 Mbyte Floppy Drive
- 20 Mbyte Winchester
- 64K Memory

**SPECIAL INTRODUCTORY OFFER:**

£2898 (rrp £3898)!

**LABTEC SUPER VALUE PACKAGES**

<table>
<thead>
<tr>
<th>Package</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PC 860 FERRANTI</td>
<td>£2898</td>
</tr>
<tr>
<td>2</td>
<td>XT FERRANTI + 10Mbyte Winchester</td>
<td>£2349</td>
</tr>
<tr>
<td>3</td>
<td>XT FERRANTI + 10Mbyte Winchester</td>
<td>£2349</td>
</tr>
</tbody>
</table>

**FREE ACCOMMODATION WITH COMPUTERS PURCHASED THIS MONTH WORTH UP TO £900**

- £1595 from Super Business Pack FERRANTI PC 860 (as above)
- Dot Matrix Printer
- Sage Accounting Software

**WHY PAY MORE?**

- Higher Performance
- One Year On-Site Warranty
- Wordprocessing
- Spreadsheet and Database
- Serial and Parallel Ports
- 256K Ram and Twin 360K Drives
- Colour Graphics Board

**ONLY £1195 including monitor 10 + 20 MB PC860 XTSAVAILABLE POA**

**TOP CLASS VALUE • TOP CLASS SERVICE**

- **_from FERRANTI AT 27 LONDON ROAD, QADBURY, LEICESTER LE2 5DL Telephone: (0553) 714226**

---

**HISOFST High Quality Microcomputer Software**

**UPGRADES**

We offer an upgrade service if you have an old version of a product and wish to get an up-to-date copy, please write or call for more information. We can offer an upgrade from one product to another free if you change your computer or go from cassette to CP/M because of the substantial effort which goes into creating each product.

**SPECIAL OFFERS**

- SHARP M1200 DEVPAC cassette £25.00
- SHARP M4000 Pascal cassette £39.95
- ULTRAKIT with another product £9.45

**DISC FORMATS**

CP/M software can be supplied in many different formats - call us if you are in any doubt. Amongst those available are:

- "IBM standard" (files as a) 5 1/4" or 8" (OD 96Kp), Gemini Galax, (2D 48Kp), Gemini (Perc PDD 48Kp), Gemini (G200 S 48Kp), Nascom Lucas, Newbram 40-track, Alphaline, Torc PCH, Acorn 280 second processor, Osborne single density: 3 1/2", MSXDS, 1": Amstrad, Tatung, and many, many more.

**ORDERING**

All products are available immediately from us by mail order or by telephone using Access or Visa. All prices are inclusive of VAT and postage and also include the relevant manual. We always dispatch orders by first class post. Please enclose a cheque or postal order made payable to HiSoft. Be sure to tell us exactly what computer you have, what product(s) you want and which disc format you require.

---

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

---

**PRICE LIST OF HISOFST PRODUCTS**

The following price list applies from 1 Oct 85 within the United Kingdom ONLY.

### PASCAL

- Pascal 808 for Z80 CP/M disc systems (including Amstrad and Tatung) £30.95
- Spectrum 48K cassette (fully Microdrive compatible) £2.50
- Spectrum 48K SPDSO disc £2.00
- Amstrad cassette (SOFT 15) £2.00
- Amstrad AMSDOS disc for 464/664/SOFI 15 £34.95
- Sharp cassette for MZ20K/A/B, and MZ2000 (supports Quick disc) £39.95
- MSX cassette (for 32K or above) £29.95

### DEVPAC

- Devpac 80 for Z80 CP/M disc systems (including Amstrad and Tatung) £39.95
- Spectrum 48K cassette (fully Microdrive compatible) £14.00
- Spectrum 48K SPDSO disc £14.00
- Amstrad cassette (SOFT 110) £21.95
- Amstrad AMSDOS disc for 464/664 (SOFT 111) £26.95
- Sharp cassette for MZ700 £25.00
- MSX cassette (for 32K or above) £39.95
- Amstrad ROM version (464/664/6128) ROM only £29.95

### C

- Spectrum 48K cassette (fully Microdrive compatible) £12.95
- Amstrad cassette £34.95
- Amstrad disc for 464/664/6128/6256 (includes MSDOS & CP/M & CP/M PLUS versions) £39.95

### OTHER PRODUCTS

- ESDM-CP/M disc - Wordstar compatible full screen editor (NH included with Pascal) £29.95
- LUTRANIT - Spectrum 48K cassette - BASIC tool kit £12.95
- MONOL - QL microdrive - dissembler/ debugger £49.95
- The Tool - Amstrad CP/M disc - interactive CP/M tutorial £12.95
- The Knife - Amstrad CP/M disc - Disk/Filer sector editor £12.95
- Font 64 - Amstrad cassette - font editor screen copy £7.95
- Font 64 - Amstrad AMSDOS disc for 464/664/6128 (NOT CP/M) £12.95
- Font MSX - cassette - font editor £9.95
- SuperBasic Extensions - QL ROM - 70 useful procedures and functions £29.95
- Your Health Expert System - Amstrad Spectrum 48K £8.95
- Your Horoscope Expert System - Amstrad Spectrum 48K £8.95
- Your Head Revals Expert System - Amstrad Spectrum 48K £8.95
"OFFERS YOU SO MUCH MORE, FOR SO MUCH LESS"

The TWIN is a part of the INTEGRATED 7 family

FOR FURTHER INFORMATION CONTACT

FUTURE MANAGEMENT
38 Tanners Drive, Blakelands North, Milton Keynes MK14 5LL
Telephone: (0908) 615274  Telex: 825220 FMC UK G
PICK UP THE PHONE FOR THE BEST PORTABLE PACKAGE.

(0280) 816087

APRICOT

FREE SOFTWARE & TRAINING WITH EVERY SYSTEM.

Phone (0280) 816087 for more information.

- Impartial advice from trained consultants.
- On site training.
- On site servicing & fully equipped workshops.
- Complete After Sales telephone support.

FRASER

Associates Limited

Bristle Hill, Buckingham MK18 1EZ Telephone (0280) 816087

APRIL 1986
The two pictures below represent two different types of potential computer purchasers - the gentleman on the left is a typical owner/director of his own business, and the gentleman on the right is a typical corporate buyer.

Both these gentlemen probably know what they want a computer to do, but one may know how to achieve it while the other doesn't. They both have a list of the pertinent criteria - see if you can spot the difference!

The Difference Is

Da Vinci Computers

We Treat All Our Customers Equally

112 Brent Street, Hendon NW4 2DT  Tel: 01-202 2272/3/4
Telex: 265871 (MONREF G) refer to 81:MMD102  Telecom Gold: 81:MMD102
Why are some of Britain's leading accounting firms and management consultants renting micros from CCA?

Whether you're in the Profession or not - think about it. These are the experts in advising whether to buy or rent. And, when it comes to micros, they're renting. From CCA.

Of course, one reason must be sheer economics. But there are some others as well.

For example, rental cost. CCA's published prices are the lowest in the UK micro-rental business. When it comes to service, no one is faster.

Delivery is often the same day you order - and certainly the day after. Maintenance response - should you need it - is just as quick.

Then there's the product itself. The micros handled by CCA are only the leaders - IBM, Compaq, Apple and Apricot. And we offer only the most advanced technology.

Of course, there's also our very generous purchase-after-rental option. For example, if you rent a micro from CCA for a month, then decide to buy it, you receive as a discount against retail twice the rental you've paid.

Even after three months, all the rental you've paid is applied to your purchase - which amounts to around 25% off the retail price!

We sell micros outright as well. Which means our "buy-or-rent" advice is as objective as our accounting consultant customers'.

So, when you need a micro or several, there's one way you can't go wrong. Come and see CCA.

CCA Micro Rentals Limited
Unit 7/8, Imperial Studios,
Imperial Road, London SW6 2AG.
Telephone: 01-731 4310.
The polished manners of a Parrot.

Parrot flexible diskettes always behave perfectly.

One of their secrets is the unique coating specially developed to minimise head wear which, coupled with the 'ultra-clean' liner material used by Parrot, ensures elimination of the problems causing data loss.

Another is the tough jacket, with its bonded edges to resist distortion. And the virtually indestructible dust resistant envelope dramatically reduces the risk of static.

Parrot diskettes are honed to perfection in what is probably the world's most advanced fully integrated diskette plant. And they are British through and through.

No other diskette is as well behaved.

For more information, and the name of your nearest dealer, phone or write to:-

Parrot Corporation Limited
Llantarnam Industrial Park, Cwmbran, Gwent NP44 3XL, United Kingdom.
Telephone: (06333) 71444 Telex: 497253.

We're unbending on quality
When your Computer needs PROTECTION

try the POWQUIP 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

Apple Macintosh
Your Dealer in Central London

State-of-the-Art Macintosh Hardware

Apple 
Mac Plus 
£2195.00

The latest Mac, with 1 Mb of RAM, 800Kb Disk drive, 128Kb of ROM and fast SCSI port - Brilliant!

Apple 
Hard Disk 20
with 20 Mb capacity. Uses new 
£1495.00

Finder with hierarchical directories.

Apple 
LaserWriter 
£5995.00

Link up a number of Macs to this high-quality printer, using the AppleTalk network, mixing both text and graphics output.

Symbolic 
Disk Server 
£5995.00

A 42Mb Hard Disk, Tape-Streamer and AppleTalk Interface, which links Macintosh's into a powerful network

STIRLING MICROSYSTEMS
231 Baker Street, London NW1 6XE
Telephone: 01-935 5262

Computers by Post

PRINTERS

- Epson LX80 £199
- Epson FX80 £229
- Epson FX90 £259
- Epson LX90 £279
- Brother HL-5 £172
- Brother HL-10 £182
- Brother HL-15 £212
- Brother HL-35 £695
- Commodore MPS 1101 £247
- Canon PW120 £324
- Canon PW115 £355
- Canon KP-10 £355
- Canon KP-20 £419
- Kodak DWP 305 £649

INKJS (pens are of TIPPET & PAG) £1
- Sony DSD-35E £31
- Minolta CF-2 £34
- Dot Matrix 350 £12
- Duplicated 401 £12
- Duplicated 403 £15
- Duplicated 503 £20

4 Day Insured Delivery £7 + VAT

COMPUTERS

- Amstrad PCW 8256 £699
- Amstrad PCW 1026 £749
- Amstrad PCW 128 £799
- Amstrad PCW 401 £829
- Amstrad PCW 2000 £959
- Amstrad PCW 3200 £989
- Amstrad PCW 2010 £1159
- Amstrad PCW 3000 £1199
- Amstrad PCW 4000 £1259
- Amstrad PCW 3200 £1349
- Amstrad PCW 4000 £1389
- Amstrad PCW 5000 £1439
- Amstrad PCW 4010 £1529
- Amstrad PCW 5000 £1589
- Amstrad PCW 6000 £1639
- Amstrad PCW 7000 £1689
- Amstrad PCW 8000 £1739
- Amstrad PCW 9000 £1789
- Amstrad PCW 1000 £1839

MONITORS

- Sanyo 94LS £199
- Sanyo 94LS £219
- Sanyo 94LS £239
- Sanyo 94LS £259

For further information — contact us at:

POWER EQUIPMENT LIMITED
Kingsbury Works, Kingsbury Road, London NW9 8UU
Tel: 01-205 0033
Telex: 8952887 POWERP G

CREDIT CARD HOT-LINE

01-760 0014
All prices include VAT
Export Enquiries Welcome

Galaset Ltd, 30 Bayford Road, Littlehampton, West Sussex.
MS DOS CP/M-86 £15

change bytes display bytes compare bytes
– of any files or parts

* Easier to use than DEBUG
* Handles files of any size
* Edits on-line or from a list
written with a wordprocessor
* Feedback and on-screen help

£17.25 inc. VAT and UK postage

KEELE CODES LTD
University of Keele, Keele,
Staffordshire
(0782) 629221

PC COMPLATIBLES.
WE GIVE YOU MORE THAN A LOW PRICE

At £995, our full feature COMPRO 88 is probably the best value PC compatible on the market.
But we all know that successful computer buying is more than looking for the lowest price.
You want support. We'll give you 24 hour nationwide response, on-site maintenance.
You want memory. We'll give you 640K as standard (without using valuable slots).
You want capacity. We'll give you a choice of hard-disks, up to 70Mbytes with tape back-up to match.
You want reliability. We'll give you superb engineering – built by us in Britain.
Yes. We'll give you more, all down the line.

COMPRO Processing Limited
195 197 Wardour Street, London W1V 3PA
Telephone 01-439 1819
Your hard disk can store hundreds – or even thousands – of programs and files, and DOS lets you create directories on the disk to assist in arranging your files in a logical order. These directories are like rooms in a house where you can group together similar programs. Files, letters, etc.

Direc-Tree originated the ideas that the best way to help you organize and operate your hard disk is to display a graphic picture – a tree diagram of these directories on your screen – and to make this picture "functional".

With Direc-Tree, you use the arrow keys to highlight any directory of interest and press a function key to do what you wish – such as LOOKING at a text file, or even EDITING it, or WRITING a new file, or LISTING, or RENAMING, or LOCKING, or DELETING, or COPYING or MOVING files, or RUNNING programs.

Beautifully ingenious – wonderfully simple.

To organize your hard disk – you can CREATE new directories, or RENAME directories, or DELETE old ones, again by simply pointing – and you can watch your tree change and grow on the screen, and print it out on your printer.

You can quickly PRESET up to 100 of your day-to-day programs on a stored menu, and simply press a key to select and RUN any of these – or set-up MACROS (one will auto-execute when Direc-Tree is started) – or LOCATE lost files – or get a disk and ram STATUS check – or MOVE from one drive to another. The list goes on and on.

There is no "learning" required with Direc-Tree. The program is easy to use – intuitive – visual. The functions are organized simply and logically – and a "menu" window pops up at the press of a key. You can customize Direc-Tree for your colour or monochrome monitor, your disk, and your printer.

Take a tip from the experts and a thousands of satisfied users who know that Direc-Tree is the best hard disk manager your money can buy. "Worth the price," says PC World, 8/85.

The DIREC-Tree operates with IBM, PC, XT, or AT (or true compatibles) using monochrome or graphics board display: Requires PC-DOS or MS-DOS versions 2.0 or higher – 128K RAM. Program can be set up to operate any IBM compatible printer.

RECOMMENDED RETAIL PRICE (inc VAT) £59.95
In computers the biggest thing about big names is usually the price. Tandon is the exception.

In case you didn’t know, Tandon is the world’s largest manufacturer of disk drives. We got there by simply doing everything in our power to make these highly sensitive and costly parts not only better but less expensively. Now we’re doing the same for whole microcomputers.

Please send me details of Tandon microcomputers.

Name: ________________________
Company/Address: ______________
Tel: ____________________________

Tandon Computer (UK) Ltd., Unit 19, Hunt End, Dunlop Road, Redditch, Worcestershire, B97 5BE. Telephone: 0527/16800. Fax: 0527/4324.
**MICROCOMPUTER HARDWARE SUPPLIES**

This list is a small sample of the wide range of microcomputers and peripherals supplied by us. Please ring for prices of equipment not listed.

**DISKS**
- 5¼" CDC StorageMaster DS/DD in plastic library cases of 10: £16.55 (c)
- 5¼" Goldstar SS/DD Box of 10: £13.50 (d)

**COMPUTERS**
- Commodore 64: £159.98 (a)
- Commodore 64 with 1531 Cassette Recorder: £164.35 (b)
- Commodore 128: £225.22 (a)
- Commodore 128 + 1570 Disk Drive: £373.00 (a)
- BBC B + 64x: £379.00 (a)

**PRINTERS**
- Epson LX80: £199.00 (a)
- Star SG10: £199.00 (a)
- Star SG10-C for CBM64 & 128: £199.00 (a)
- Commodore MPS801: £176.00 (a)
- Commodore DPS1191: £167.00 (a)
- JUNI 610D: £159.99 (a)
- CANON iMATE PJ1060A: £399.00 (a)

**MONITORS**
- Philips BM7502 Green: £72.00 (a)
- Sony CDM1126CA Green: £92.00 (a)
- Microvitec 1451 MS (Cat 653): £234.00 (a)
- Commodore 1901 Compy/RGB: £224.00 (a)

**ACCESSORIES**
- Commodore 130/1531 Cassette Recorder: £35.17 (c)
- Commodore 1541 Disk Drive: £156.51 (a)
- Commodore 1579 Disk Drive for C128: £156.51 (a)
- Datex Challenger RAM Disk for BBC: £156.51 (a)
- Epson 3020 Dual Disk Drive for BBC: £185.44 (a)
- Compaq 5340 Disk Drive for BBC: £106.61 (a)
- Compaq CD8005 Dual Disk Drive for BBC: £186.41 (a)
- Pocket Wordstar for Commodore 128/Amstrad CPC464: £39.00 (a)

**DELTA PI PROCESS INTERFACE** for Commodore 64/128
- 8 Analogue inputs (12 bit) & 32 digital input/output lines: £295.00 (b)

Delivery charges: (a) £7 (c) £3 (d) £1.

**DATA DESIGN TECHNIQUES LIMITED**

Unit 16B, Norman Way, Severnbridge Industrial Estate, Portskewett, Gwent NP6 4YU
Telephone: 0291 423781

---

**Delta Pi Software Ltd**

8 Ruswarp Lane, Whitby, North Yorks YO21 1ND
Tel: 0947 600065

---

**LOK** allows you to lock your power switch in either on or off position. When closed, PC Lok covers the power switch and makes it impossible to gain access to the interior of your computer. The heavy duty black anodized ⅛" thick aluminium extrusion attaches to the back of your PC:XT utilizing existing holes and screws. PC Lok is used in conjunction with Cable Lok and Pad Lok.

**LOK** is designed to provide you with maximum security for your disk drives when they are either empty or running a diskette, by attaching to the front of your full height floppy disk drive. Therefore protecting your investment in data and software.

**LOK** is a highly sophisticated software programme protecting a floppy or hard disk system. It is menu driven operating under MS DOS making usage easy with just two commands - lock and unlock. There are two levels of security either "normal" or "high security" (encryption mode). When locked, the file name will not appear on the directory and the file is inaccessible until it unlocked with the proper code.
Unique, Technically excellent Superb value

PC/XT PERIPHERALS

4-LAYER XT MAINBOARD
SUPER XT MAINBOARD
SUPER Turbo XT MAINBOARD
38K MULTIFUNCTION CARD
512K RAM EXPANSION CARD
576K RAMASTER EXPANSION CARD
2MB RAM EXPANSION CARD FOR PC/PC XT
PARALLEL PRINTER ADAPTER
ASYNCH SERIAL COMM. ADAPTER
ASYNCH. 2 PORT COMM. ADAPTER
MULTI ASYNCH. CARD (PC XT)
ADD ON SERIAL PORT KIT
514 FLOPPY DRIVE CONTROLLER CARD
514-48 FLOPPY DRIVE CONTROLLER CARD
MULTI I/O CARD WITH CABLES
PS/2X50XT MULTIFUNCTION CARD
MONOCHROME/GRAPHICS CARD
MONOCHROME/TEXT DISPLAY CARD
COLOUR GRAPHICS CARD
MULTI-LAYER COLOUR GRAPHICS CARD
COLOUR/GRAPHICS AND PRINTER ADAPTER
COLOUR/MONOCHROME GRAPHICS DISPLAY CARD
GAMES ADAPTER
B255 I/O CARD
PCB 128 EEPROM/EPROM PROGRAMMER
130V POWER SUPPLY UNIT
512K 4 BANK PROMBLASTER EEPROM PROGRAMMER/ANALYSER
PC/XT SWING TOP CASE
360K HALF HEIGHT FLOPPY DISK DRIVE

HARD DRIVES FOR SOFT PRICES

10MB Plus Controller & Cables
20MB Plus Controller & Cables
30MB Plus Controller & Cables
45MB Plus Controller & Cables
60MB Plus Controller & Cables

All above are internal upgrades for PC/XT emulation (IBM and compatible)

20MB (voice coil) High Performance
30MB (voice coil) High Performance
40MB (voice coil) High Performance

All above are internal upgrades for PC/AT and compatible

External Housing for 2 half-height drives—includes 40V power supply, cooling fan and LED power indicator

PC/AT PERIPHERALS

SUPER AT-COMPATIBLE MAINBOARD
AT-HARD/FLOPPY CONTROLLER CARD
3MB MULTIFUNCTION CARD FOR THE AT SERIAL/PARALLEL CARD FOR THE AT
PS/2X40SAT MULTIFUNCTION CARD
MULTI-ASYNC. CARD FOR THE AT
2X1 POWER SUPPLY UNIT FOR THE AT
PC/AT STYLE CASE
1.2MB FLOPPY DRIVE
AT COMPATIBLE KEYBOARD

PRINTERS—Daisy Wheel

BROTHER—TOWA, DIABLO, EPSON, JUKI, NEC, STARWRITER

PRINTERS—DOT MATRIX

ANADAX, BROTHER, CANON, TOSHIBA

MONITORS

INDESIT, MITSUBISHI, PHILIPS, SANYO

PRINTERS—PLOTTERS

ANADAX, ASTAR, CANNON, DIABLO, EPSON

SOFTWARE

CARD BOX PLUS, GROSTALK, DMS, DR, D BASE, EASEL, FLIGHT SIMULATOR
FRAMEWORK, LOTUS, MICROSOFT
MULTIMATE, MULTIBUS, NICEPRINT
NORTON, OPEN ACCESS, PCINEGAS
PERRMASTER, EPS, SAGE, SIDEKICK
SIDEWAYS, SMART, SPREADSHEET
SUPERCALC, SYMPHONY, TURBO PASCAL, WORDSTAR, WORD PERFECT, QUICK BASIC, COMPILER

COMPUTERS

APRICOT, EPSON, CANON, AMSTRAD, COMPAQ, IBM, OLIVETTI, SANYO

Prices do not include VAT and carriage.
PC/XT COMPATIBLE WITH 20MB HARD DISK
256KB on board, mother expandable to 640K,
one 360K floppy, 6 expansion slots, mono/
graphic/printer card, 150W power INCLUDES
MONITOR £995.
640K with 20MB hard disc, colour/graphics card, SANYO colour monitor,
and 384K multifunction £1395
Colour Graphics card 320x200 with printer port £125
512K memory expansion card for IBM and compatibles fully populated
512K £138
384K multfuction card, game controller, parallel printer, serial, clock,
fully populated £139
Mono Graphic/Hi-res 720x348 res with printer port £36
150W POWER SUPPLY UPGRADE OR REPLACEMENT FOR IBM PC XT
£99
Printer Cable 25-36 pin £13
APPLE COMPATIBLE EXPANSION
FLOPPY DRIVE £89
16K RAM card £25; 128K RAM card £250
64K-90 column for £6 £38
1 Megabyte virtual RAM card populated to 512K £250
Accelerator II+ £179, II £199
Backup card II+ £48, 90col cards with soft control VideoX compatible £46
580 CP-M £29; RS232 serial £33; IBM 488 £75
Parallel printer card inc cable (Centronics/Epson £29; Grappler +
compatible inc cable £48
Grappler + compatible with 64KB Printer Buffer inc cable £79
Extra Font card. Print at letter quality with a dot matrix printer. Use with
word processing programs £46
POWER SUPPLY for Apple II+ II £49
Fan for Apple II+ £19. Replacement keyboard for II+ £35
DISKETTE STORAGE BOX. ACCOMMODATES 70 5.25" DISKETTES £8
SOFTWARE LIST is available. We supply most titles at substantial
discounts.

PC/XT COMPATIBLE WITH 20MB HARD DISK

C.I. CAYMAN LTD
P.O. Box 77, Solihull, West Midlands B91 3LX
Telephone: 021-705 7097 Telex: 337000

Tandon
Computer (UK) Ltd.

PCX10 XT-Compatibe 10MB hard disc 360k floppy
256kRAM £1595
PCX20 XT-Compatibe 20MB hard disc 360k floppy
256kRAM £1795
PCA-AT-Compatibe 10MB hard disc 1.2Mb floppy
512kRAM £2495
PCA20 AT-Comaptible 20MB hard disc 1.2Mb floppy
512kRAM £2795
PCA30 AT-Comaptible 30MB hard disc 1.2Mb floppy
512kRAM £3095
PRICES INCLUDE 14" TILT/SWIVEL H/R MONITOR. KEYBOARD,
DOS AND BASIC
SPECIAL INTRODUCTORY OFFER THIS MONTH:
NOMINAL LEDGER (or any one Pegasus Ledger, normally £300)
INCLUDED FREE OF CHARGE
Additional charge for colour monitor £325
All prices exclusive of VAT

Cambridge
DATA LIMITED

Cambridge DATA LTD
15/16 MARGARET STREET, LONDON W1.
Tel: 580 9651

PRINTER BUFFERS
AND INTERFACES

— Examples —

* VIC 20, C16, PLUS 4, C64, C128/CENTRONICS.
FULL GRAPHICS. 8K BUFFER ........................................ £65.51
* RS232/CENTRONICS, H/W & S/W HANDSHAKE £59.99
* RS232/CENTRONICS, 8K BUFFER .................................. £89.99
* CENTRONICS/RS232 .................................................. £105.00
* IEEE/CENTRONICS ................................................... £75.00
* 128K CENTRONICS BUFFER ..................................... £250.00
* PRINTER SHARER. 2 COMPUTERS TO 1 PRINTER
CENTRONICS. FULLY AUTOMATIC ................................ £80.00
* IBM/PC/CENTRONICS 2-METRE SCREENED CABLE
£14.95
* RS232 CABLE, 5 LINES, ALL PINS CAN BE
RE-ALLOCATED WITHOUT TOOLS ............................. £13.95
ALL INTERFACES AND BUFFERS
INCLUDE CABLES
MANY OTHERS AVAILABLE. PLEASE CALL
WITH YOUR REQUIREMENTS

FCC SYSTEMS LIMITED
THE LODGE
MOORLANDS ROAD
MERriott
SOMERSET TA16 5NF
TEL: CREWKERNE (0460) 73442
PRESTEL MAILBOX 046073442

DISK COMPATIBILITY PROBLEMS...

WE CAN TRANSFER PROGRAMS TO, AND
FROM THE FOLLOWING FORMATS:
MPM, CP/M, CP/M-86, CP/M-88, MS-DOS, PC-
DOS, TRS DOS, APPLE DOS
SIZES AVAILABLE:
8 inch, 5½ inch, 3½ inch
AMSTRAD 3 inch NOW AVAILABLE
AMSTRAD OWNERS!!!
CAN'T GET HOLD OF THAT SOFTWARE?
HERE'S WHERE YOU CAN GET IT:
Contact DISK FORMATIONS on
01-515 2766
ANYTIME
OR SEND SOURCE DISK AND DETAILS TO:
DISK FORMATIONS
60 COVENTRY CROSS
ST LEONARD STREET
BOW, LONDON E3 3JT

Charges:
£10 per disk for conversion to 6" or 5½"
£12 per disk for conversion to 3" or 3½"
PRICE INCLUDES RETURN P&P AND US
SUPPLYING DISK
An office can be a bit like a battlefield at times. You've got the troops—sorry staff—but they're pinned down by an armoury of 'weapons' that don't measure up to the job any more.

Though your highly trained staff continue to battle valiantly against these odds the outcome is a foregone conclusion—you lose.

An office needs a heavyweight performer. One with enough punch to overcome the paperwork before it over-runs you.

The answer is the triple combination of the Canon LBP-8 Laser printer, the B.D.T. Laser-Feeder to keep it well supplied with ammunition and a word processing software programme to handle the strategy of your campaign.

Canon's Laser printer advances at a speed of 8 pages a minute but is so quiet you'll hardly know it's there. The three basic typefaces of normal, bold and italic effectively double to six with facilities for enlarging the text sideways, vertically or in both directions at the same time.

Further impact is available by deploying its reverse, shading and underlining forces.

Canon's ability to cover the ground when it comes to handling an army of mail is matched only by the capacity of the B.D.T. Laser-Feeder to keep it well supplied with both paper and envelopes.

The feeder tackles 400 sheets of paper at a time together with 50 envelopes. Between the two they feed, print and collate an office full of correspondence with precision that would pass the stiffest inspection.

The tactics behind that precision are found within the Wordcraft word processing software programme. Already posted within major companies, government offices and centres of learning both in the UK and throughout the world, the system affords an uncomplicated transfer from outdated typewriter keyboards. Used with an existing computer system it is fully integrated with the Canon LBP-8.

Behind this arsenal of office equipment is a commander with the reputation as the UK's foremost distributor. Mekom enlists only the best for their customers, so if you would like to find out more about what makes a winning team then just clip out the coupon and discover more about recruiting the latest technology to your side.

---

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.

Please complete and return to: Mekom Computer Products Limited, Enfield Hall, Enfield Road, Edgbaston, Birmingham B15 1QA.

Name

Position

Company

Address

Telephone

☐ Please contact me to arrange an immediate demonstration of the Canon LBP-8. My computer system is:

☐ Please contact me immediately to arrange a demonstration of complete Laser Printing System comprising Canon A200 Micro Computer, Canon laser LBP-8 and "Wordcraft Laser" software.

I'd also like to know more about other Mekom Products.

☐ Olivetti Daisywheel & Dot Matrix Printers

☐ Canon A200 PC.

PERSONAL COMPUTER SYSTEMS AND SOFTWARE
LARGEST COMPUTER CENTRE in MANCHESTER

**COMPUTERS**
- Apico F10 + Monitor £599
- Apico F2 + Monitor £1280
- Apico F10 + Monitor + Printer £1680
- Ferranti 860
- Ferranti 880XT
- BBC Master 128 £434
- BBC Plus 128 w/100K Drive £424
- Atari 520ST £807.82
- Memotech 512 £113
- Commodore C128 £217.30
- Sperry PC £2050

**PRINTERS**
- Canon P1700 + Taxan 810 £225
- Epson L920 £324
- Epson FX85-FTX10S £19.75
- Juki D100 Pica £128

**SOFTWARE**
- Brother Masterdealer Price
- Star Main Dealer
- Sakosha Full range
- Commodore Amiga POA
- NEC Laplhead £299
- Amstrad full range Main dealer
- Toshiba Portable Coming soon

**ASK FOR A QUOTE FOR**
- HERMES, TOSHIBA, SHINWA, HONEYWELL, NEC

WHAT ELSE DO WE DO?
- Books . . . over 500
- Rampfims . . of course
- Spinets certainly
- Computer Repairs . . . Yes
- Monitors . . . with all loading makes

Large showroom, all items include VAT.

FREE delivery mainland UK for items £100 or over.

PERSONAL export specialists

MIGHTY MICRO

268 Wilmslow Road, Fallowfield, Manchester M14 6W
Tel: 061-224 8117
Easy access M56, M61, M62, M63

FERRANTI PC 860

**ONLY £1,576**

- **256K RAM**
- **TWIN 360K DISKS**
- **SERIAL & PARALLEL**
- **MONOCHROME MONITOR**
- **ONE YEAR ON-SITE WARRANTY**
- **COLOUR GRAPHICS BOARD**
- **PERFECT SOFTWARE SUITE**

BUSINESS STARTER PACK:
- **FERRANTI PC 860 AS ABOVE**
- **MDMD MONITOR**
- **CENTRONICS GLP PRINTER**
- **1 BOX FLOPPY DISKS**
- **1 BOX LISTING PAPER**
- **INSTALLATION UK MAINLAND**

IBM PC, 256K RAM, 2x360K Disks, keyboard, monitor, printer port, PC-DOS, 1 box floppy disks £2000 FERRANTI PC2860AT, complete systems from £6,104 SOFTWARE at discount prices eg dBase III £399 LOTUS 123 £369

NOTE: Installation at your factory, home or office is included in all our computer prices!

PRICES EXCLUDE VAT

For further details contact:

MULTIPLEX COMPUTER SYSTEMS
11 St. NICHOLAS ROAD, WHISTON, MERSEYSEIDE L35 3SN
Tel: 051-426 3241
DID YOU HEAR THE ONE ABOUT THE BUSINESS MAN WHO SPENT £100 PER MONTH ON RIBBONS?

Don't Let The Joke Be On You!

Buying new ribbons could cost you an arm and a leg.

The INKER re-inks almost any fabric ribbon available for about 5-10 pence a time.

A clean and simple mainsdrive device with interchangeable mount for over 1000 different types of ribbon inc:-

Epson, Anadex, Qume, Image Writer, Smith Corona, M-Tally, Olympia, N.E.C., Olivetti, Centronics, Radioshack Tandy, Okidata, Brother, Dec Facit, Adler, C.ITOH, Commodore and more...

Colour ribbons, inks and blanks also available.

SOFTWARE FOR THE ATARI ST

METACOMCO PRESENTS ITS NEW RANGE OF SOFTWARE FOR THE ATARI ST: A SET OF POWERFUL PROGRAMMING LANGUAGES FOR PEOPLE WHO WANT TO WRITE PROGRAMS FOR THE ST.

MACRO ASSEMBLER

£49.95
A high specification macro assembler, complete with linker and screen editor. Assembler is a fundamental language, useful for all kinds of programming - particularly where speed and compactness are important. Essential for all serious programmers who want to exploit the ST's full potential.

MCC PASCAL

£89.95
A powerful Pascal compiler designed to meet the exacting ISO standard. This Pascal is already widely used on the Sinclair QL and the Commodore Amiga. A fast, single pass compiler, generating native code. GEMDOS interface allows windows, icons, etc. to be programmed using Pascal. Complete with screen editor and an extensive user manual.

LATTICE C

£99.95
The well known Lattice C compiler, a full Kernighan and Ritchie implementation with comprehensive libraries.

ALL METACOMCO'S LANGUAGES FOR THE ATARI ST INCLUDE METACOMCO'S POPULAR SCREEN EDITOR, AND A DETAILED MANUAL.

Metacomco are leading suppliers of systems software for 68000 based microcomputers. As well as these titles for the Atari ST, Metacomco have a very successful range of programming languages for the Sinclair QL, now widely used throughout the world. Metacomco was also chosen by Commodore to provide the operating system and a suite of languages for the new Amiga computer.

METACOMCO

26 PORTLAND SQUARE, BRISTOL BS2 6AZ. UK TELEPHONE BRISTOL (0272) 428781

Prices include VAT and P&P UK mainland. Delays may be up to 28 days.

PHONE TODAY OR POST COUPON TO METACOMCO 26 PORTLAND SQUARE BRISTOL BS2 6AZ

PLEASE SEND ME
MACRO ASSEMBLER "49.95 FOR THE ATARI ST
MCC PASCAL £89.95 FOR THE ATARI ST
LATTICE C £99.95 FOR THE ATARI ST
MORE INFORMATION

NAME
ADDRESS
SIGNATURE

PCW 39
TRY US FOR QUALITY, SERVICE AND PRICES

PRINTERS
NEW CENTRONICS DOT MATRIX PRINTERS
TWICE AS FAST AS THE OLD GLP

Price:
£182.00
Plus VAT & carriage

- 100 cps 10 cpi draft printing
- 25 cps near letter quality
- Cut sheet and fanfold (roll paper and tractors are optional)
- Original plus 2 copies
- Bidirectional logic seeking
- 48 international characters
- Subscripts, superscripts and underlining
- IBM PC block and high resolution pin-addressable graphics

BROTHREN PRINTERS

<table>
<thead>
<tr>
<th>MODEL</th>
<th>DESCRIPTION</th>
<th>PRICE INC VAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-1009</td>
<td>Dual Interface</td>
<td>£155.25</td>
</tr>
<tr>
<td>M-1009</td>
<td>Centronic Parallel</td>
<td>£152.95</td>
</tr>
<tr>
<td>M-1009</td>
<td>Dual Prestel</td>
<td>£175.95</td>
</tr>
<tr>
<td>M-1109</td>
<td>Dual Interface with T/F</td>
<td>£225.40</td>
</tr>
<tr>
<td>M-1109</td>
<td>Prestel</td>
<td>£247.25</td>
</tr>
<tr>
<td>EP-44</td>
<td>Teleprinter</td>
<td>£227.70</td>
</tr>
<tr>
<td>TC-600</td>
<td>Teleprocessor</td>
<td>£414.45</td>
</tr>
</tbody>
</table>

Please add £5.50 towards Post & Packing

PRINTER RIBBONS

<table>
<thead>
<tr>
<th>TYPE</th>
<th>PRICE INC VAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epson MX100/FX100</td>
<td>£8.50</td>
</tr>
<tr>
<td>Epson MX80/FX80</td>
<td>£5.20</td>
</tr>
<tr>
<td>Seikosha GP80</td>
<td>£5.20</td>
</tr>
<tr>
<td>Seikosha GP100</td>
<td>£5.70</td>
</tr>
<tr>
<td>Seikosha GP250</td>
<td>£6.85</td>
</tr>
<tr>
<td>Brother HR15 M/S</td>
<td>£6.90</td>
</tr>
<tr>
<td>Brother HR15 Carbon</td>
<td>£4.80</td>
</tr>
<tr>
<td>Juki 6100</td>
<td>£3.45</td>
</tr>
<tr>
<td>IBM B2 (High yield)</td>
<td>£3.50</td>
</tr>
<tr>
<td>OKI 80/82</td>
<td>£3.80</td>
</tr>
</tbody>
</table>

Rockfort blank label disks feature:
- Write protect notch
- Hub rings
- Individual sleeves
- Full set of labels
and are fully GUARANTEED. We are confident that you will be delighted with our disks, but in the event you are not we will exchange the disks or refund your money – the choice is yours!

HOW TO ORDER
We accept orders from all HMG, schools, universities, libraries, etc when accompanied by an official purchase order. All other orders must be sent with a cheque or PO for the appropriate amount.
If you wish to use Access/Visa card then call us on 01-203 0191.
You can save on P&P by calling in at our showroom in Hendon.

ROCKFORT PRODUCTS
81 Church Road, Hendon, London NW4 4DP
TEL 01-203 0191
YOU ARE WELCOME TO VISIT OUR SHOWROOM
TRADE ENQUIRIES INVITED
TIE UP THOSE LOOSE ENDS

MULTIPLEXING PRINTER BUFFER
- Allows 4 computers to share one printer
- Automatic switching between users
- Each user provided with printer buffer memory
- Printing tasks queued in memory until printer is free
- Front panel status display

FOR FURTHER INFORMATION CONTACT
QUARTECH LTD
14 Kingsgate Place
London NW6 4TA
01-328 7967

EVERYONE HATES US BUT OUR CUSTOMERS

CASH Terminal Supplies

3" 3" 3"
MAXELL DISKETTES
£32.00 PER 10 PLUS VAT
WE HAVE 10,000 3" MAXELL DISKETTES IN STOCK
JUST SEND MONEY WITH ORDER

3" 3" 3"
SONY DISKETTES
SS/DD 135 £22.50
DS/DD 135 £33.50
WE ALSO HAVE LARGE STOCKS OF FUJI AND DYSAN DISKETTES

apricot
HELP
The guidance which the Apricot manuals never gave you.
We publish over 20 booklets specific to using your Apricot...

PC & Xi F2 & F10
Portable Xen FD/H5
F1 & F1e Point 32

... with Apricot's Master Disks and versions of MS-DOS.
Each booklet is full of practical tips, useful information, corrections to the manuals, and much, much more.
Reviewed in Apricot User (Jul '85), Computers in Schools (Oct '85) and What Micro? (Dec '85) magazines.
Over 2500 UserPrompt Guides already helping Apricot users.
Send or phone for full details

USERPROMPT guides
54 Stanhope Road, Swindon,
BURTON-ON-TRENT, DE11 9BQ
0908-665038

CASH Terminal Supplies

3" 3" 3"
MAXELL DISKETTES
£32.00 PER 10 PLUS VAT
WE HAVE 10,000 3" MAXELL DISKETTES IN STOCK
JUST SEND MONEY WITH ORDER

3" 3" 3"
SONY DISKETTES
SS/DD 135 £22.50
DS/DD 135 £33.50
WE ALSO HAVE LARGE STOCKS OF FUJI AND DYSAN DISKETTES

Cash Terminal Systems Ltd,
Cavell Court, 11 North Street,
Peterborough PE1 2RA
Tel: Peterborough (0733) 314525
Telex: 32376 ANGTEL G
Bristol Boards

Multifunction Board
£99

Mono Graphics Card
£89

Serial Card
£29

Colour Graphics Card
£69

Multi I/O Card
£99

These boards are all available for the IBM PC, XT, AT and compatibles. All are provided with our standard 12 month hardware warranty, if it doesn’t work, we will replace it.

Bristol Micro Traders distribute a full range of hardware and software, including chips, boards, and drives for PC-, XT-, AT-compatibles, as well as XT- and AT-compatibles systems.

For further information on hardware products, write to our Upgrades Group or ring us on (0272) 279499.

We supply all Bortland products, both the Turbo Pascal family and business productivity software: Turbo Pascal (£69), the Database Toolbox (£99), and the Turbo Tutor (£55) are available for virtually all Z80-based CP/M systems, C64/M68, MSDOS, and PC/DOs.

The Graphix Toolbox (£39), Editor Toolbox (£49), and Turbo Gameswork (£49) are available for the IBM PC/XT/AT and true compatibles. In addition we supply various tools to support programming in Turbo Pascal.

Productivity products include Sidekick (£29, £99 for unprotected and Mac versions), Reflexic Analyst (£99), and Turbo Lighting (£99).

We also distribute other programming tools, especially those for the language C; write or ring us on (0272) 279499 for more information.

Price is in UK bound, add £10 for each 64K of memory.

Boards

Please send me:

Quantity

Product

Amount

Name

Shipping Address

City

Postal Code

Telephone

These boards are all available for the IBM PC, XT, AT and compatibles. All are provided with our standard 12 month hardware warranty, if it doesn’t work, we will replace it.

Bristol Micro Traders distribute a full range of hardware and software, including chips, boards, and drives for PC-, XT-, AT-compatibles, as well as XT- and AT-compatibles systems.

For further information on hardware products, write to our Upgrades Group or ring us on (0272) 279499.

We supply all Bortland products, both the Turbo Pascal family and business productivity software: Turbo Pascal (£69), the Database Toolbox (£99), and the Turbo Tutor (£55) are available for virtually all Z80-based CP/M systems, C64/M68, MSDOS, and PC/DOs.

The Graphix Toolbox (£39), Editor Toolbox (£49), and Turbo Gameswork (£49) are available for the IBM PC/XT/AT and true compatibles. In addition we supply various tools to support programming in Turbo Pascal.

Productivity products include Sidekick (£29, £99 for unprotected and Mac versions), Reflexic Analyst (£99), and Turbo Lighting (£99).

We also distribute other programming tools, especially those for the language C; write or ring us on (0272) 279499 for more information.

Multifunction board
£99

Sets of 64K RAM
£19

RAM board
£49

Sets of 64K RAM
£19

Mono graphics card
£69

Colour graphics card
£69

Multi I/O card
£99

Printer card
£19

RS232 serial card
£29

Game port (2 positions)
£19

Printer controller
£19

Hard disk controller
£19

Hard floppy controller
£19

Carriage included within the UK. Elsewhere in Europe, add £5 per board. Outside Europe, add £8 per board.

Please note that these boards are compatible with the IBM bus, and therefore are available for the IBM PC, XT, AT and compatibles only. Where software is supplied, it is supplied in PC-DOs-MS-DOS format.

These products are warranted for a full 12 months. Defective RAM or boards will be repaired or replaced.

Official orders accepted from PLC, government and education authorities only. Outside UK, make payment by bank draft payable in pounds sterling.

Bristol Micro Traders, Upgrades Group, Market House, 78 Queens Road, Bristol BS2 1DG.
Co-Star’s new Easydisk™ is the first fully integrated Hard Disk Add-on/Subsystem, fully compatible with IBM PC/XT or compatibles.

Easydisk™ allows you to swiftly add 20MB of storage to your existing system acquiring even greater speed and flexibility.

By the use of leading edge technology Co-Star’s Easydisk™ comes with an unconditional TWO year warranty.

CO-STAR LIMITED,
321 Bridgegate House, Irvine, Ayrshire. Tel. 0294 311555

All prices and specifications subject to change without notice

Easydisk™ is the registered trademark of Co-Star Limited

Access & American Express Welcome
OLIVETTI
20 Mb
640 Kb
360 K Floppy
£1,699

IBM PC XT COMPATIBLE

Complete system supplied incl. Cabinet and 130 watt Power Supply, Keyboard, MSDOS Operating System, Monochrome Display Adaptor, 640 K Memory on Motherboard (Serial and parallel ports, 6 expansion slots)

Configurations available
A CPU no Drives £ 500.00
B Single 360 K Drive £ 800.00
C Twin 360 K Drives £ 700.00
D 10 megabyte Winchester + 1 x 360 K Drive £ 990.00
E 20 megabyte Winchester + 1 x 360 K Drive £1090.00

OEM Labelling Service: These computers are not labelled – why not have your own name on the computer from £200

IBM AT COMPATIBLE

Complete system supplied incl. Cabinet and 220 watt Power Supply, Keyboard, MSDOS Operating System, Monochrome Display Adaptor, 512 K Motherboard (Serial and parallel ports), 1.2 Mb Floppy Drive £1680.00

Monitors
14" Monochrome £ 100.00
14" Colour £ 300.00

Colour Graphics Adaptor £ 100.00

OLIVETTI M24

Complete system supplied incl. Standard 360 K single drive unit, Keyboard, MSDOS Operating System, 640 K Memory on Motherboard, (2-slot bus converter in hard disk versions)

Configurations available
A - Single Drives Unit (as above) £1233.05
B Twin 360 K Drive £1339.65
C 20 megabyte Winchester + 1 x 360 K Drive £1568.00
D 10 megabyte Winchester + 1 x 360 K Drive £1690.00

Monitors
Green Monochrome £ 145.00
 Colour (supplied to order only) £ 400.00

Optional Upgrades
A 10 Megabyte Seagate Drive £ 255.00
B 20 Megabyte Seagate Drive £ 305.00
C 30 Megabyte Seagate Drive (no order)
D Xebec Controller Card £ 110.00
D Western Digital Controller Card £ 110.00
D Olivetti 7-Bus Slot Bus Converter £ 75.00

*L ULV 200888 is available and you wish to have one installed instead of the 3 slot please notify us at the time of placing an order and add £45 to price quoted for configuration.*

OLIVETTI Range Products

Entire range available, items not on price list supplied to order only. NB Olivetti prices undergoing changes so please check when placing an order that these are correct.

Maintenance and support 90-day warranty on all products, arrangement of service contracts upon request.

Terms
All items (unless indicated otherwise) available ex-stock. Prices exclusive of VAT and carriage. All purchases Cash With Order only. Prices subject to change, please check when placing order.

H.A.T. Ltd. 096324 551
Hornblotton House, Hornblotton
Shepton Mallet, Somerset BA4 6SB

System Science

C COMPILERS

PC-DO$ MS-DO$, CP/M-86
DERAMT C with ASM, Liner, full set of, one £155
90MB suppl. £275
DOS Full screen debugger £295
AND-supplied for Microsoft, DD1 Camper £45
LATTICE C - requires LMIN, the price, choice, all memory models, R8 support £275
MICROSOFT C ver 3.0, all intel mem. mods. £125
SB31 support £295
AZTEC C/68 with ASM, Liner, overlays and PC-DOS/3.3 £155
AZTEC C/68 with all sources, ROM supp, all mem mod. 8807 £295
Cross Compilers Call

PROGRAMMER’S TOOLS AND C LIBRARIES

PAREL - screen handling package for most langaages £295
GREENLEAF GENERAL FUNCTIONS-Dos & Win.
Video, Utilities, Mem. Data Keyboard £115
GREENLEAF COMMUNICATIONS LIBRARY
internal, long running, Status & Control £185
C-to-DOS (source functions to work with
DOS data and index file) £145
DEASE to C with CEMILIB Conversion £195
GRAPHIC ABSTRACT applications to £125
LATTICE WINDOWS £215

LISP and PROLOG

PC-DO$, MS-DO$ and CP/M-86
MULTI-LISPANS soft performer £225
LISP 68K on PC-DO$, only £195
MULTI-LISPANS soft performer £245
micro-LISP (plus mem. £120) £195
micro-PROLOG (full mem. win.) £195
APES (terms) £195
Symbolic math (source) £275
 tasted-PROLOG £195

LABORATORY MICROSYSTEMS FORTH-83

PC-FORTH for PC-DO$, £125
8808 FORTH for MS-DO$ (excl. Apricot) and CP/M-68 £185
Software Floating point extensions £195
8807 Floating point extensions £195
Z-80 FORTH £35

ASSEMBLERS and CROSS-ASSEMBLERS

PC-DO$, MS-DO$ & CP/M-86
Microsoft 8086 Macro Assembler (with DEBUG, HIGH, S & LINK) £129
256K RAM Memory with I/O Port £295
Monitor Plus Tools £195
Cross Assembler 68K, 6800, 8080, 60000 etc £10
Call

PASCAL

MICROFORTH 77 £295
MacroFORTH 68 £295
Turbo Pascal 3 £295
Turbo TUTOR £295
Turbo TASK BOX £295
Turbo GRAPHIC TOOLBOX £295
Turbo PROFESSIONAL-CP/M £295
 Turbo PROFESSIONAL-MS-DO$ £295

EDITORS and WORD PROCESSING

FINAL WORD -PC-DO$, MS-DO$, CP/M-80 for authoring, tech, writing etc. powerful commands £275
PRATT for IBM and Apricot, powerful
Cross-platform programming aid £195
EG-EDITOR (PC-DO$ only), multi window, multi file, save set access, £195
VEDIT PLUS-PC DO$ & MS-DO$ multi file editor, configurable, good forth formater £215

COMMUNICATIONS and UTILITIES

CROSS TALK for IBM PC, Apricot and CP/M- 80 £135
MOVE-IT for MS-DO$ and CP/M-80 £135
UNIX FOR MS-DO$ and CP/M-80 £135
CONVERT for IBM-PC, add-on tolerant to £295
PERSONA DATABASES £195

LIVING C PERSONAL

£19.90

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: CJ028

APRIL 1986 PCW 67
Most software companies are attentive suitors when courting a prospective customer. But all too often after the cash register has rung, attention is switched to new prospects and the jilted customer is left to fend for himself.

At Sage we do things differently, starting with 90 DAYS DIRECT SUPPORT ABSOLUTELY FREE. Thereafter you have the option of ongoing support, including free program up-dates, for a modest annual payment. We never desert you!

In practice, of course, you shouldn't need a lot of hand-holding. Every Sage program is easy to learn and use, yet highly effective. For sheer choice we're easy winners too — with one of the widest product ranges offered by any British software publisher and more in thepipeline. And when it comes down to price, Sage cost effective performance has no equal.

All of which explains why Sage is one of the best-respected names in business software — and why, in an independent* survey, 91% of Sage users said they would recommend our programs.

If you want to live happily ever after with your software, fill in the coupon or contact your local dealer.

*Romtec.

**THE SOFTWARE THAT KEEPS ITS USERS FRIENDLY**

*Please send me more details of Sage Business Software.*

NAME: ____________________________

POSITION: _________________________

COMPANY: _________________________

ADDRESS: _________________________

POSTCODE: _________________________ TEL NO: _________________________

Sagesoft plc., NEI House, Regent Centre, Newcastle upon Tyne NE3 1DS, Tel: 091 284 7077, Telex: 53823 SAGESL G.
Not enough room here – Call for Catalogue
The TELEBOX, computer case and keyboard, are all completely compact, and the case is made of high quality colour-tinted plastic, giving a neat and attractive finish. It provides a very compact box for the electronics inside. However, the TELEBOX computer does not come with a keyboard as standard. The keyboards are available in three different styles: the standard QWERTY, the modified QWERTY, and the PALM keyboard.

The TELEBOX is a very versatile computer system that can be used for a variety of purposes. It is ideal for use as a desktop computer in the home, or as a part of a larger computer network. It is also suitable for use in educational institutions and businesses, as it can be used for a wide range of applications. The TELEBOX is a very reliable and efficient system, and it is able to handle a variety of tasks simultaneously. It is also easy to use, with a user-friendly interface and a wide range of features and functions. The TELEBOX is a very cost-effective system, and it is able to provide a high level of performance at a reasonable price.
Advanced turbo.

For only the most modern offices.
IBM AT™ Compatible.
10 MHz.
Available only from ARC.

SPECIFICATIONS:
* Advanced 8MHz 80286 CPU
* Optional 80287 co-processor
* 640K DRAM on board
* 8 slots for expansion cards
* 32K Bios (64K On Board ROM)
* Clock Reset port on board

ARC (U.K.)
160B Handcroft Road Croyden,
Surrey CRO 3LE
Telephone:01-683-2896 01-684-4144

THE BEST COMPATIBLES — THE BEST PRICES

OLIVETTI M24

£1895

Olivetti M24 640K RAM; 360K F.D. Internal Add-on 20MB Hard Disk Monitor; Keyboard; MS-DOS

MAKE YOUR PC 4 TIMES FASTER — FOR FREE WITH MICROCACHE DISK HANDLING

ALL BUSINESS COMPUTERS NOW INCLUDE FREE PRINTER BUFFER AND DISK CACHE SOFTWARE — RRP £195, MM PRICE NORMAL £150

ALL COMPUTER PRICES INCLUDE MONITOR, KEYBOARD AND MS-DOS

<table>
<thead>
<tr>
<th>Product</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olivetti M24 128K 1 x 360K</td>
<td>£1275</td>
</tr>
<tr>
<td>Olivetti M24 256K 2 x 360K</td>
<td>£1525</td>
</tr>
<tr>
<td>Olivetti M24 128K 10MB</td>
<td>£2050</td>
</tr>
<tr>
<td>Olivetti M24 640K 10MB</td>
<td>£2150</td>
</tr>
<tr>
<td>Olivetti M24 SP 640K 20MB</td>
<td>£2395</td>
</tr>
<tr>
<td>Olivetti M24 256K 2 x 360K</td>
<td>£1475</td>
</tr>
<tr>
<td>Olivetti M21 128K 10MB</td>
<td>£2095</td>
</tr>
<tr>
<td>Compaq Plus 256K 10MB</td>
<td>£2650</td>
</tr>
<tr>
<td>Compaq 3 256K 10MB</td>
<td>£2395</td>
</tr>
<tr>
<td>Compaq 4 640K 10MB + Tape</td>
<td>£3795</td>
</tr>
<tr>
<td>Compaq Port 286 640K 20MB</td>
<td>£4195</td>
</tr>
<tr>
<td>Compaq 286 256K 1 x 1.2MB</td>
<td>£2995</td>
</tr>
<tr>
<td>Compaq 286 512K 30MB</td>
<td>£3995</td>
</tr>
<tr>
<td>Optional 10MB Tape</td>
<td>£695</td>
</tr>
<tr>
<td>Apricot F2 512K 2 x 720K</td>
<td>£1275</td>
</tr>
<tr>
<td>Apricot F10 512K 10MB</td>
<td>£1795</td>
</tr>
<tr>
<td>Apricot PC 256K 2 x 720K</td>
<td>£1495</td>
</tr>
<tr>
<td>Apricot Xi 10S 512K 10MB</td>
<td>£2195</td>
</tr>
</tbody>
</table>

ADDITIONAL PRICES

<table>
<thead>
<tr>
<th>Product</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apricot Xi 2512K 20MB</td>
<td>£2895</td>
</tr>
<tr>
<td>Apricot Xi 20S 1MB RAM 20MB</td>
<td>£3275</td>
</tr>
<tr>
<td>XEN 20MB</td>
<td>P.O.A.</td>
</tr>
<tr>
<td>Ericsson EPC 128K 2 x 360K</td>
<td>£1495</td>
</tr>
<tr>
<td>Ericsson EPC 2 256K 2 x 360K</td>
<td>£1995</td>
</tr>
<tr>
<td>Ericsson EPC 6 256K 10MB</td>
<td>£2345</td>
</tr>
<tr>
<td>Ericsson EPC 8 256K 10MB Colour</td>
<td>£2775</td>
</tr>
<tr>
<td>Ericsson Portable SAVE</td>
<td>£1000</td>
</tr>
<tr>
<td>Victor/Sirius 256K 2.4MB</td>
<td>£1399</td>
</tr>
<tr>
<td>Victor/Sirius 256K 10MB</td>
<td>£1999</td>
</tr>
<tr>
<td>Victor VPC 256K 2 x 360K</td>
<td>£1199</td>
</tr>
<tr>
<td>Victor VPC 256 15MB</td>
<td>£1699</td>
</tr>
<tr>
<td>Victor V266 512K 20MB</td>
<td>£2499</td>
</tr>
<tr>
<td>Six Pak Plus 384K</td>
<td>£299</td>
</tr>
<tr>
<td>Hercules Mono Graphics</td>
<td>£325</td>
</tr>
<tr>
<td>Hercules Colour Graphics</td>
<td>£175</td>
</tr>
<tr>
<td>512K RAM Card for IBM 256K RAM for Apricot</td>
<td>£149</td>
</tr>
<tr>
<td>512K RAM for Apricot</td>
<td>£199</td>
</tr>
<tr>
<td>Quadram 512K 1 Serial</td>
<td>£399</td>
</tr>
<tr>
<td>Jram 3 2MB Serial</td>
<td>£699</td>
</tr>
<tr>
<td>AST Advantage 5 + P 1.5MB</td>
<td>£599</td>
</tr>
<tr>
<td>Intel Above Board 2MB</td>
<td>£799</td>
</tr>
<tr>
<td>Hard Disks</td>
<td>£</td>
</tr>
<tr>
<td>Internal 10MB</td>
<td>£545</td>
</tr>
<tr>
<td>Internal 20MB</td>
<td>£695</td>
</tr>
<tr>
<td>Plus 5 10MB</td>
<td>£895</td>
</tr>
<tr>
<td>Plus 5 20MB</td>
<td>£995</td>
</tr>
<tr>
<td>Plus 5 40MB</td>
<td>£1895</td>
</tr>
<tr>
<td>Christie 25MB Tape</td>
<td>£795</td>
</tr>
<tr>
<td>Alloy 60MB Tape</td>
<td>£895</td>
</tr>
<tr>
<td>Printers</td>
<td>£</td>
</tr>
<tr>
<td>Brother HR15</td>
<td>£299</td>
</tr>
<tr>
<td>Brother M.1509</td>
<td>£390</td>
</tr>
<tr>
<td>Canon 1060A 160CP</td>
<td>£269</td>
</tr>
<tr>
<td>Canon 1156A 160CP NLQ</td>
<td>£349</td>
</tr>
<tr>
<td>Canon Epson Lx300 + Tractor</td>
<td>£234</td>
</tr>
<tr>
<td>Epson FX 105</td>
<td>£420</td>
</tr>
<tr>
<td>Juki 6100 16 CP</td>
<td>£299</td>
</tr>
<tr>
<td>Juki 6200 30 CP</td>
<td>£425</td>
</tr>
<tr>
<td>NEC Pinwriter P3</td>
<td>£495</td>
</tr>
<tr>
<td>P.O.A.</td>
<td></td>
</tr>
<tr>
<td>SOFTWARE</td>
<td>£</td>
</tr>
<tr>
<td>DBase II</td>
<td>£235</td>
</tr>
<tr>
<td>DBase III+</td>
<td>£350</td>
</tr>
<tr>
<td>DMS Delta 4</td>
<td>£350</td>
</tr>
<tr>
<td>DMS +</td>
<td>£155</td>
</tr>
<tr>
<td>DR Fortan 77</td>
<td>£199</td>
</tr>
<tr>
<td>Framework</td>
<td>£325</td>
</tr>
<tr>
<td>Friday</td>
<td>£125</td>
</tr>
<tr>
<td>Lotus 123</td>
<td>£235</td>
</tr>
<tr>
<td>Lotus Symphony</td>
<td>£395</td>
</tr>
<tr>
<td>Multimate</td>
<td>£265</td>
</tr>
<tr>
<td>Multiplan V2.0</td>
<td>£190</td>
</tr>
<tr>
<td>Multisoft Accounts</td>
<td>£295</td>
</tr>
<tr>
<td>Microsoft Word 2</td>
<td>£275</td>
</tr>
<tr>
<td>Open Access</td>
<td>£345</td>
</tr>
<tr>
<td>Pegasus Accounts</td>
<td>P.O.A.</td>
</tr>
<tr>
<td>Sage Accounts</td>
<td>£250</td>
</tr>
<tr>
<td>Smart Integrated System</td>
<td>£495</td>
</tr>
<tr>
<td>Supercalc 3 VS 2</td>
<td>£199</td>
</tr>
<tr>
<td>Wordstar 3.4</td>
<td>£190</td>
</tr>
<tr>
<td>Wordstar Professional</td>
<td>£245</td>
</tr>
<tr>
<td>Wordstar 2000</td>
<td>£299</td>
</tr>
</tbody>
</table>

MAYFAIR MICROSOFT

590 GRESHAM HOUSE, POEOWMOR INDIAN, LONDON W1T 1AJ

TEL: 01-871 2555 / 870 3255

the accept official orders from UK Government and Educational Establishments — Mail Orders and Export Enquiries welcome. Calls by appointment.

MAYFAIR MICROSOFT — WHERE ELSE?
Now, the system that’s driving the U.S. wild is available here in the U.K.!

Speed is what you buy a computer system for.

ARC TURBO PRODUCTS HAVE MORE.

SPECIFICATIONS:

- 640K DRAM on board
- High speed 8088-2 CPU microprocessor
- 4.77 MHz 8 MHz dual speed
- IBM XT compatible
- 7-Plus multifunction card
- Optional 8087-2 processor
- Supports MS-DOS 3.1, PC-DOS and CP/M Operating Systems

ARC (U.K.)
160B Handcroft Road
Croyden, Surrey CRO 3LE
Tel 01-683-2896 01-684-4144
The best thing

next to your Apricot

- Public Domain Software for the Apricot: we've got it — disks packed to the gills with useful utilities, games, information, insights. Over a hundred items so far, and more appearing each month!
- The FAST Apricot Accelerator: speed up your Apricot's display — for just £25!
- How to use GSX: the complete works — demo programs, subroutine library, explanation
- Hard-to-find software at great prices: like IANKEY, the best typing tutor. Or POLYPRINT to produce fancy printing from a matrix printer. Or the great PASD extras for SuperWriter. Or the MS-FORTRAN utilities disk ...

Yes, we've got something for everyone who uses an Apricot. And those are just selections from our DEALS FOR READERS mail order pages.

They're all in APRICOT FILE newsletter, and only APRICOT FILE subscribers can get at them.

APRICOT FILE is the alternative voice for the Apricot owner. It's a monthly Apricot-specific newsletter, written by Apricot users for Apricot users — but professionally produced to a standard that matches the quality of its editorial.

The annual subscription to APRICOT FILE is £35 a year for UK subscribers. We think we'll give you good value for the money. But if you disagree, we guarantee to refund the unused part of your subscription — without a quibble.

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

Name
Position
Organisation
Address

What computer(s) do you have?  Apricot PC □ Apricot Xi □ F series □ Portable □

Return this slip to: APRICOT FILE, TP Group, FREEPOST, London N1 1BR
## CP/M SOFTWARE & SUPPORT FROM DRA ★

**POCKET PROSTAR SUITE**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Includes Pocket WordStar, Pocket CalcStar, Pocket DataStar and Pocket ReportStar—PLUS the DRA independent Pocket ProStar Guide. Available for Amstrad 8256 (or 6128 with 2 drives), BBC/EBM etc.</td>
<td></td>
</tr>
<tr>
<td>MicroPro’s integrated family of software programs</td>
<td></td>
</tr>
<tr>
<td>Pocket WordStar for word processing and mail merging</td>
<td></td>
</tr>
<tr>
<td>Pocket CalcStar spreadsheet for calculations, projections and analysis</td>
<td></td>
</tr>
<tr>
<td>Pocket DataStar database filing and retrieval system</td>
<td></td>
</tr>
<tr>
<td>Pocket ReportStar the powerful report generator and data sorting program</td>
<td></td>
</tr>
<tr>
<td>Pocket ProStar Guide for the complete beginner to the most experienced MicroPro user</td>
<td></td>
</tr>
<tr>
<td>Support from DRA—the MicroPro software experts</td>
<td></td>
</tr>
</tbody>
</table>

Using the MicroPro Pocket programs and the Pocket ProStar Guide, you will be able to design complete systems for your small business, professional practice (e.g. medical, legal), for office administration, or for education at all levels from primary school/business/computer studies to university research departments. The MicroPro reference manuals are available at extra cost.

### FREE SOFTWARE HANDBOOK PLUS 70 PROGRAMS ON DISC

- **5.25” disks/book set** £35.00
- **3” disks/book set** £39.95

**Send Cheque (or VISA/ACCESS number) to:**

**DAVIS RUBIN ASSOCIATES LTD**

1 Canonbourne, Weston sub Edge, Glos. GL55 6QH

VISA/ACCESS orders: TEL (0386) 841181 All prices include VAT and Postage

★ ★ ★ ★ ★ SEND FOR OUR FULL LIST ★ ★ ★ ★ ★

## ALL-TIME CP/M MICROCOMPUTER SYSTEM BARGAIN!

Fantastic bulk purchase of a major European manufacturer’s entire stock of this top-quality machine enables us to retail it at far below its manufacturing cost. **ALL FEATURES LISTED are INCLUDED as STANDARD:**

- **COMPLETE** with EITHER single or double (as illustrated) TEAC half-height 5½” double-sided, double-density floppy disc drives. Formatted capacity: 320Kb per drive.
- 4 MHz Z80A CPU
- 64Kb RAM (in 4164 chips)
- 28Kb EPROM containing monitor & MICROSOFT BASIC
- CP/M Version 2.2
- 80 x 24 display with colour block-mode graphics
- Exceptionally high quality styled keyboard with numeric keypad & 6 function keys
- Centronics parallel interface
- RS232/V24 serial interface selectable 300-9600 Baud
- UHF Modulator for TV, RGD & composite video output
- ROM port. (A Word-Processor ROM is available at £59 + VAT)
- 6 month full guarantee

**PRICES:** With **DUAL floppy £199.00 (228.85 incl. VAT)** With **SINGLE floppy £135.00 (€155.25 incl VAT)** MONITOR £69.00 + VAT

**LOW COST DAISY WHEEL PRINTERS AVAILABLE**

**CARRIAGE:** £9.50 (incl. VAT) Visa & Access accepted

Available ONLY from:

**COMPUTER APPRECIATION, 111 Northgate, Canterbury, Kent. (0227) 470512**

**MATMOS Ltd., 1 Church Street, Cuckfield, W. Sussex RH17 5JZ. (0444) 414484/454377 or (0444) 73830**
Sugar of the Year

How nice that Alan Sugar became Personality of the Year at the Which Computer? Show! His 'professed aim to make the benefits of information technology available to everyone' apparently impressed the judges of the Rita awards. And his 'watchword is simplicity, both in presentation and operation'.

This sort of sanctimonious claptrap must have had Alan splitting his honest sides.

Actually, I use the word 'honest' without any attempt at satire — despite what some buyers of the CPC664 thought last year.

There were many who wrote to us, here at PCW, complaining that he didn't warn them he was going to release the CPC664, nor the 6128. Frankly, I have no sympathy: I told anyone who wanted to know about this column, that the machines were coming. And you wouldn't expect him to announce that his machines were about to be made obsolete, any more than you'd expect turkeys to vote for Christmas.

Alan Sugar's 'watchword' is not 'simplicity', but 'make it look expensive'.

His professed aim is not some plious altruism, but an intent to sell equipment (and what else is a manufacturer supposed to aim at?) in large volumes, at a good profit.

Myself, I'd have given him an award for honesty, following his financial results. They were, by the way, splendid, and it's a shame that some idiots in the City press misread his performance so far as to claim he had 40 per cent of the UK computer market.

What can they have been thinking of? Sugar's results are exciting enough without misprints.

No, honesty in the City is rather rare. Ever since it became illegal (rather than just frowned on) for companies to leak details of their annual financial results on the Stock Exchange, it has been thundehringly obvious that everyone does it. No one gets prosecuted, of course.

A company announces a 20 per cent drop in profits. Strange; for the previous two weeks, everyone had been selling the shares.

Another company announces a 100 per cent increase. Funny, but the share prices hardly moves (though it is twice what it was three weeks ago).

Alan Sugar's Amstrad announced profits are substantially above what the City expected, and all the City Editors commented on this.

What they meant was: Alan Sugar didn't let a few friends in stockbrokers' offices see his results before they were officially announced.

Wake up! — the industry lives

In the 100 issues of PCW since my original Computing magazine column was advertised in the first one, nearly an article on 'the history of computers' which I wrote, the only thing that has changed is the sheer volume of information.

It isn't true, honestly it isn't, that the industry has become dull and unexciting. It's just harder to find the exciting stuff among all the dross, used to be rare.

But the actual information is still interesting.

For example, last month, as was the case 100 issues ago, there were announcements of innovative, shoe-string budget micros with no hope of big-time success.

A 100 issues ago, it was the late John Miller-Kirkpatrick connecting his Scrumple to Clive Sinclair's original pocket TV — the one 'for people with deep pockets', as a colleague said at the time. It weighed a ton, and was almost as portable as the typical three-cell electric torch. A million to one sorry: Miller-Kirkpatrick, bless his enthusiastic socks, devised a way of generating print large enough to read on the tiny screen, and also found a way to save money by using only 16 keys and about five different shift combinations.

Something like the Spectrum, only more so.

This time, it's Micro Concepts with the Micro Box III, a Motorola 68000-based machine, rivalling the Amiga. It uses Motorola graphics chips to give the animation, it has Tripods (from which Metacomco's AmigaDOS was developed) and also has CP/M 68k, plus Tony Tebb's operating system with a name like SMS2.

What does SMS2 mean? 'I'm not altogether sure,' said the computer's designer when I asked, 'but I think it stands for Silly Micro System, and it's the second, because his first was the QL's ODOS,' the point being that it will run Sinclair QL software. 'And we also have CP/M 68k, and we're hoping to have GemDOS, too.'

Actually, the Box stands a much better chance of success than Scrumple, and is ever so bit as exciting. So why pretend things are getting dull?

Take software. A 100 issues ago, we stood in the library room of the first Build Your Own Computer Show, and listened to Computer Workshop dazzle us with the unbelievable: 'We're going to give you Basic! Many people there didn't believe you could get a Motorola 6800 to run a Basic interpreter; only mainframes could do that.'

This issue, Metacomco (again) has stood up and announced that IBM's new super-micro, the 'Reduced Instruction Set RT', uses Metacomco Basic.

Soon after PCW started, I had a whale of a time reporting the absurdities of Apple's appointment of two 'exclusive' importers, followed by the appointment of a third to replace them. And there was the background humour: the new distributor, Data Efficiency's Micorsense subsidiary which eventually turned into Apple UK (actually, it was Meta's Data Efficiency's way of buying out John Miller-Kirkpatrick just before his death), had been distributing a dross, a box made by ITT. It wouldn't run Apple II software, but it was painted silver.

Well, this issue, I can report on the anger of Novel Data, which has discovered that Novel Inc has appointed two other 'exclusive' distributors for its new super system.

And with tape-back-up maker Sysgen, the situation is even sweeter. Bonsai, a London shop, has taken over distribution of this range of products from a large distributor, P&P Micros. P&P is accordingly arranging to buy a whole lot of stock from a shop. Sysgen likes the idea because Bonsai will advertise the product, because it doesn't have rivals, oh, it all makes perfect sense: it always did.

The games business is recognisably more fun. I admit, a 100 issues or so ago, it was incredibly exciting to play Star Trek on a glass teletype. Star Trek assumed you had a printing terminal, so it could print out a map of the sector scan and you'd be able to scan it later. The glass teletype just forgot about anything that went off the top of the screen, and you'd have terrible trouble shooting Klingons. But it can't compare with the joy of Sir-Tech's Wizardry, which this month loaded a non-existent back-up roster of heroes onto my Level 5 Samurai and my 81 hit-point Fighters...

What has faded is the dream. The dream is still cherished by some falling politicians and one or two falling journalists. They dream that we, the Brits, will dominate the world of computers because we're so much Cleverer than Those Foreigners.

Some of them, really and truly, only build computers to prove that Brits are Cleverer than Others. I can introduce you to several. Obviously, the UK can't dominate the micro world any more than British
companies can sell more cars than Americans or Japanese. We British used to run an Empire, and had the resources of half the planet to play with. With that sort of clout, of course, we were richer than people in other parts; and with that sort of Empire, of course we came to believe that we were, somehow, just Cleverer than Others.

It doesn't work like that, and anyone who tells you that a machine is British — with pride in that fact alone — is living the dream, and is about to wake up.

If a micro is the best, it's the best. If a product is marketed properly, it sells as well as it deserves. A company which tries to control world-wide marketing of a new product from one small island in the Gulf Stream, is going to lose control. People who just get on with making and selling products, beating the competition when they can, will survive.

And anyone who tells you that this is a dull business, is someone who has never realised what is going on it.

The easy way to crash

My colleague Menno Aartsen says that he found it almost impossible to crash the Tandy 100 lap-held by using the new £170 portable disk (Checkout, PCW March). Menno obviously doesn't have what it takes to really crash a system.

His report on the 100k storage system bragged about lightning storms, hurricanes and other illustrations of how hard Florida (where he lives) can be on hardware.

I don't need Florida; all I have to do is plug in the thing.

Tandy lent me a drive at the Which Computer? Show. I'd used my Tandy 100 for an interview with one of my heroes, Chuck Peddle. He invented the 6502 chip (Apple, Acorn, Commodore) and the Sinclair which's now running Tandon Computer. The very next day, I had to fly off to the US with the machine, and I thought it would be nice to test the beast by saving my Peddle interview to disk, and get on with other work during the 11-hour flight.

To understand the problem, you have to count bytes. The Tandy 100, without expansion, can hold a measly 32k of memory. My Peddle interview took up about 11k, and my own Tandy 100 only has 24k anyway.

The software Tandy supplies is on the disk. There is a snag: if the disk software that reads the disk is on the disk, how do you read it off?

Answer: to use the thing you have to do something Menno didn't mention — you have to type in a Basic program of only four lines, but of nonetheless unbelievable ineptenability. It's a string of commands to the disk, telling it to send data from track x and load it into memory starting at point y, but it looks just like gibberish. You have to type it exactly right.

I'm fairly sure I got it right, because the message saying 'loading, please wait' came up on the screen. And the red light on the disk turned on and off, just like in the manual said. Then it turned on, then off, and this time, it stayed off. I waited, and chatted to my neighbour in the plane.

After a few minutes of chat, I began to have a sinking feeling about my interview. All the 'stop' buttons were pressed, and eventually, I found a way of getting the computer to watch me again. The interview, every byte of it, was still there, but the 8k worth of disk filing system was not. Instead, there was a missing 4k of memory. Add all the files together, and it comes to 4k less than the 24k in the machine. Why?

There was still room for that 8k of filing system software, so, foolishly, I suppose, I tried again. Any rational human would have let well alone, but I did want the interview to be turned into an article, and (let's face it, I had good reason) I was anxious that the machine was going to swallow it if I didn't get it on disk.

Again, I tried in the Basic. My colleague Peter Bright, who happened to be sharing the journey to San Francisco, checked it. We agreed that it was right.

We were wrong. This time, after two false starts, the system became serious. It stopped — totally and irrecoverably. Nothing could make anything happen — except an emergency full reset. That clears out everything from the memory.

At that point, there was one bright spot: at least we didn't have to worry about what else might be in memory. We had 24k free. We tried again, and the sequence repeated itself pretty well — apart from the fact that this time, we didn't wipe out an interview with Chuck Peddle, because there wasn't one there.

So now you know why I don't have an interview with Chuck Peddle of Tandon, and can't give you a report on the Tandy filing system. This will change, I'm certain. Tandy folk seemed (when I borrowed the disk) so anxious to please, I'm sure that soon, one of them will return at least one of the rather red-hot phone calls I've made to them, and I'll have another chance to make it work.

Or at least, I'll find out how many articles can be stored on a 100k disk and how long it takes to read them in and out.

What I hope happens, is that someone clever puts this wretched filing system software in a plug-in ROM chip, and we don't have to rely on writing Basic PEEK- and POKE programs which load filing system software off a faulty disk. It is 1986, after all, and I've heard tell of 64k ROMs which really don't cost all that much, compared with what they cost when the Tandy was launched.

In the meantime, I think I'll contact Zeotek, a firm which makes a filing system for the same disk, and see if it can supply a self-start-up program that works.

Zeotek is on (01) 205 9068 and you ask for John Starr.

Apricot network

The arrival of Microsoft's MS-DOS version 4.0 runs out to be a bit of a damp squib. Instead of being offered to you and me to speed up our IBM PCs and lookalikes, it is buried in networks.

The network was first announced by Apricot — or is due to be at press time — as MS-Net II.

It uses the Xen, stripped of disks, as a terminal, while another Xen, with a tape back-up unit stuck inside, functions as the network host. And it runs, say my sources, very much faster than the old Point 32 from Apricot.

My sources had to admit, however, that it still doesn't actually work very well. But, they say, it will soon.

The reason why the Apricot version (IBM should announce one very soon) of this network is the package — it includes a laser printer. Laser printers are the only really convincing reason I know of for buying a network, so if the company gets the timing right, it could make Apricot a bit of much-needed money.

Xen sales, by the way, appear not be affected by the rumors of a new Xen in June. They are strong, with 1000 more ordered than delivered (2500 delivered) in early February.
So much has been written about Clive Sinclair's 'secret' portable, called the Pandora, that it's worth comparing it with what the rest of the world is doing — waiting for IBM's lap-held.

Sinclair's project is under rather less effective secrecy than IBM's. It uses the 280, and should be both Spectrum and CP/M-compatible, but may not have disks. It will use existing flat-screen TV technology, with a magnifying glass, and it will cost under £500. And it will use plug-in Astron circuit cards.

If it were up to me, I think I'd scrap it, but then I haven't spent years of my life dreaming about flat CRTs. Clive has.

At press time, everyone is waiting for IBM to announce the 'Clamshell' lap-held portable. I'm expecting it on 11 March.

It had been due before 1 February, because that was the date it had to be announced if it was to get the American Inland Revenue Service contract. American law says that no unannounced product can be considered for public contracts. The contract was due to expire on 1 February. As you probably noticed, there was no Clamshell.

Meanwhile, Toshiba made a lot of headlines with this portable as illustrated. It was supposed, said whispering experts, to be very similar to the 'Clamshell'.

What seems to have happened in the States with IBM is that the Government made a mess of its budget, and the Inland Revenue had to abandon (postpone) its decision on new hardware.

It was not entirely certain that IBM would get the contract, even then.

There is a small micro company on the West Coast, run by George Morrow, called Morrow Computer. It produced the Pivit, which it sold through Zenith.

Zenith, a large Government supplier, offered the Zenith lap-held to the Government for the IRS.

But that, say my sources, is not the most likely winner: more likely to get the IRS contract would be Sperry.

Sperry builds the mainframes on which the States' taxes are calculated. It has the rights to the Pivit in the Morrow form, rather than the Zenith form. And it was looking pretty encouraging inside the Sperry camp, until news of the Congressional budget cuts came through.

There is also another contender — a lap-held from the Far East.

The one thing that is certain about all these imaginary machines, is that the Morrow/Zenith is the least compatible on keyboard terms; the Toshiba is the least portable; and the IBM is the largest.

People who have played with the IBM version say that the keyboard is wonderful. But, they add, it's a big box.

People who have been near the Toshiba say that the display is great in cold weather. Don't use batteries when trying to run plasma displays (Toshiba agrees) — plug in the machine instead.

The Zenith 170/Pivot has a flip-down keyboard. It is too narrow to have IBM's combined numerical keypad and cursor keys over on the right, so some of the more usual keyboard keys double as numeric/cursor keys; or perhaps, one should say, they treble, because obviously they aren't numbers and cursors together.

This makes the operation of programs which read the keyboard direct almost murderously difficult to drive. And some keyboard functions just don't work, because the Home, End, Page-up and Page-down keys are missing.

Meanwhile, Quadram has updated its Datavue portable. This has always had a detachable keyboard; it now has an intelligent keyboard, with a mini-display, so you can take the keyboard away and pretend it's some kind of Tandy 100 lap-held.

Behind all this, with Amstrad selling CP/M machines for £300, and Husky selling CP/M-compatible portables for £800-plus, Clive Sinclair is trying to use his old flat-screen TVs in a souped-up Spectrum, due for launch by November (apparently). I was marched out to Cambridge for an 'exclusive' look at the Pandora in prototype form. Some things about it had already been widely rumoured, but in particular, two things were, it was emphasised darkly, ultra-secret. I swore not to breathe a word.

Within a week of my return to London, fellow journalists were telling me all the details that I'd seen. In particular, they were also telling me the deadly secrets, saying that the new machine would use plug-in credit cards — the Astron design.

This looks like a credit card, but is actually a few RAM and ROM chips, and software pretends it's a floppy disk. You plug in a Homestar, and CP/M pretends it's reading a disk — but it goes much faster. And it's a deadly secret which everyone knows and has printed stories about.

The other thing which was particularly secret was the price. I've seen pretty accurate printed estimates about that, too, but since I (foolishly) promised to keep it secret, I'll have to refrain from saying whether Clive plans it to be around £300, or around £500. One of those is about right, as Clive himself said, in public, when launching the Spectrum 128.

IBM in it for profit

Existing technology is not being properly made available by manufacturers, and most users are totally blind to what is really possible.

The opinions are those, trenchantly expressed, of Martin Healey, a professor at Cardiff University. He was speaking at a conference run by Database Consultants Europe, and it was a welcome reminder of the fact that IBM's main aim in business is not the supply of the best possible machine, but the management of a profitable range of stock.

As an example of a manufacturer's concealed self-interest, says a report sent to me by Database Consultants (DCe), 'Healey cited IBM's latest local area networking announcement.' In his opinion, it was announced solely to protect IBM's own interests, and was actually against users' interests,' the report added.

It quoted Healey again: 'If the IBM network had been a good one, instead of this effort that is already out of date, network users would have realised how much more they could do than if they bought a System 36.' System 36 is an office mini which sells well, only because IBM chose not to make the PC/AT more powerful.

"Users would also have discovered," Healey went on, "how easy it is to put only one or two IBM PCs on a network, and use cheaper and more powerful compatibles for the other nodes. Neither of those two possibilities was in IBM's interest: however, they announced a LAN that was not of sufficient quality to allow users that freedom."

Healey's opinions are expert: he designed the FTS micro and helped implement that group's networking policies.
The days of the unenlightened Multifunction board are numbered.
And the Six-Pak, with all its faithful clones, has been overtaken.
Because the new Intel Above Board PS has all the essential Multifunction board features:
Such as serial and parallel ports.
A clock/calender with battery back-up.
And extra memory.
But where the Six-Pak's memory capacity runs out of steam, an Above Board PS is merely warming up.

One Above Board PS will upgrade your PC by a massive 1.5 Mbytes. And, with extra boards, you could go as high as 8 Mbytes.
It supports the Lotus/Intel/Microsoft Expanded Memory Specification, extra memory that makes the most of today's top software—and tomorrow's. It even includes a fast RAM disk and printer buffer.
Finally, there's Intel's 5-year warranty. Because while lesser boards are gathering dust the Above Board PS will be growing with you. Both ways.

It's a powerful Multifunction board.
It's an Expanded Memory board.

Intel from First Software
First Software, Intec-1, Wade Road, Basingstoke, Hants RG24 1NE. Tel: 0256 463344. Telex: 859030.
Trademarks: Six-Pak—AST Research Inc; Above—Intel Corporation.
Why spend £1000 on an ordinary NLQ printer when you can have this type for £600?
The new LQ800 and LQ1000 printers from Epson offer the best print quality ever available from dot-matrix printers. Indeed, they produce the sharpest print for any printers under £1000. (Prices start at only £595 + VAT for the LQ800.) You may think all this sounds rather big-headed. And you'd be right.

The LQ800 and LQ1000 print heads each have 24 pins (as opposed to the standard 9) arranged in a new pattern to create a far better definition of character.

Both printers produce an enormous variety of print styles at impressive speeds (180 c.p.s. in draft, 60 c.p.s. in letter-quality mode).

Both have IBM-compatibility options and provide serial as well as parallel interfaces as standard.

Both come with a 7K buffer as standard (32K optional). And of course, both the LQ800 and LQ1000 are every bit as reliable as you'd expect Epson printers to be.

If you'd like to learn more, get something sharp and clip the coupon.

---

The quality certainly looks grand. Please tell me more about the LQ800 and LQ1000.

Name

Company

Address

Telephone

To: Epson (UK) Ltd., Dorland House, 388 High Road, Wembley, Middlesex, HA9 6DH. Tel: 01-902 8892.
COMMUNICATE WITH TRISOFT
(0629) 3021

* TELEX ◆ ELECTRONIC MAIL ◆ PRESTEL ◆ FILE TRANSFER ◆ ONLINE INFO SERVICES ◆ AND MUCH MORE *

HAYES AND COMPATIBLE MODEMS
In order to make the most effective use of today's state of the art communications software, or even the communications modules of integrated packages such as Smart, Symphony, Framework etc, compatibility with the Hayes 'AT' command language is almost essential.
After extensive testing of many modem and software combinations, Trisoft are now pleased to be able to supply and support the following high quality products.

HAYES SMARTMODEM 5200
One of the Hayes products that has helped to establish the Standard A.V.22 Modem that features Auto-Answer and Auto-Dial £575.00

STEEBEK QUATPRO
A state of the art solution to compatibility with the Standard. This modem features V21, V22, V23 Bis and V23 Speeds, Auto-Dial, Auto-Answer, Error Correction, Synchronous or Asynchronous operations, non volatile programmable configuration, and other features too numerous to mention. £795.00

STEEBEK TRO (COMING SHORTLY)
All the sophisticated features of the Quattro, without the V.22 BIS (2400 Baud full Duplex) speed. Please call for availability/price

STEEBEK MINIMO +2
An extremely cost effective V21, V23 Auto-Dial, Auto-Answer modem, offering compatibility with the Standard. Equally at home on Teletype or Viewdata services with the appropriate software. £245.00

INTERNAL MODEM CARDS
Some of the above products will shortly be available as internal boards that will conveniently slot into the expansion bus of IBM and plug compatible machines. Please call for availability. Prices are as for equivalent external units.

BREAKOUT INTERNAL MODEM/SOFTWARE
Our only non-Hayes compatible offering, included due to the extreme established popularity of this internal V21/V23 internal card modem and its accompanying Teletype and Viewdata software. The Prestel mode includes full screen graphics. Excellent value at: £699.00

PLEASE NOTE THAT ALL PRICES QUOTED ARE SUBJECT TO £10.00 CARRIAGE AND VAT AT 15%
ALL MODEMS ARE FULLY EASILY APPROVED
TRISOFT LTD: are fully authorised dealers for the Dovty Information Systems Steebeck range of modems, and for Hayes Microcomputer Products (UK) Ltd.

Crown Square, Matlock, Derbyshire DE4 3AR
Telephone: 0629 3021
Telex: 895051 ONEONE G (Ref. 12977001)

ELECTRONIC MAIL — TELECOM GOLD 83: NTG344 PRESTEL — 533544601, ONE TO ONE — 12977001

MICRO-RENT

RENT ONE!

MACINTOSH
£35 PER WEEK

APRICOT
£35 PER WEEK

SIRIUS
£44 PER WEEK

IBM PC
£42 PER WEEK

Renting a microcomputer from Micro-Rent, you save time, save money — and save being overtaken by new developments.
It's a sad fact that most people who buy a micro become dissatisfied with it within six months, and most micro's are obsolete within a year. So renting is the obvious way to save your money, and keep up-to-date.
Micro-Rent offers you the best terms, the fastest service, and the best advice — plus priners, monitors, hard disks — even software — and training if you need it.
Rentals for any period from one day to two years, and leasing for longer periods with complete flexibility and minimal commitment. Ex-rental machines often available for purchase at reduced prices.

*Prices quoted are based on 3-month rental, excluding VAT.

CALL TODAY
01-833 2531
127 Cloudesley Road, London N1 0EN.

APPLE · APRICOT · IBM PC, AT XT · SIRIUS
MACINTOSH · OLIVETTI · COMPAQ · OSBORNE
High-quality laser printing from your disks — phone for details

RENT FROM MICRO-RENT

82 PCW APRIL 1986
Close to God

Had Ron Young of Systematics said, when he launched MacTime, that it was a religion and not a scheduling package, I'd probably have mentioned it before.

The program sounds dull enough: 'A software package to better help you manage and control your business and personal life.'

Ha! That's like describing Hitler as 'unpopular with later generations' or the Pacific as 'hard to cross in a small boat'.

MacTime is derived from something called Time Manager, which takes over your whole life. It requires you to decide what you do with your world. You decide what are 'key areas' in your life, and schedule them according to rules learned on religious retreats — sorry, tutorials — run by Chris Lane, who runs Time Manager International.

If something comes up, your Time Manager can tell you not only whether you have time for it, but whether you ought to bother doing it. 'Is this one of your key areas in your life? No? Then don't do it.'

For some people, the idea of only doing what they planned would be unthinkable, and the system breaks down.

For others, where planning is essential if difficult schedules are to be sorted out, Time Manager is irreplaceable. An example recently reported to me was of a just-separated couple, who had very strict child-care sharing arrangements, where they just had to make sure that appointments ended before it was too late to pick up the kids from the other partner. Time Manager can cope with that, whereas diaries just can't.

As to how MacTime works, you'll just have to ask Systematics, on (0787) 210252.

The problem with wizards...

I have a sad story to relate about a Macintosh Hyperdrive — a 10MBbyte internal hard disk that has (I think) just been rendered obsolete by the announcement of the Mac Plus.

To explain the sadness, I have to talk about Wizardry (see review, 'Screenplay', page 168).

Imagine that you had spent five days locked in a dark, dangerous dungeon, trying to teach a bunch of raw enthusiasts the rudiments of survival.

Imagine that at the end of those five days, after numerous terrifying encounters with pickpockets, footpads, and other criminals, not to mention inexplicable appearances by some very strange people who showed you all the signs of being... well, dead, but were still walking around attacking passing strangers...

Anyway, at the end of these days of training, you might imagine, these raw recruits were starting to show promise. One of them was not just a superb fighter, but a specially talented swordsman, a Samurai. Another had proved herself to be a tireless warrior, virtually impossible to wear down and kill — and, more important, very quick to heal. Still another had developed a talent for psychologically daunting enemies. He believed, himself, that he used magic; and sometimes, the effects he produced really were hard to explain away. And there was that weird character who believed himself to be in touch with God, and used to go into a strange trance whenever danger threatened. He claimed he'd been praying for our survival, and since we didn't actually die, there wasn't any way of arguing with him.

Anyway, I was rather proud of this team, and I thought I'd take them round to the editorial offices of PCW, and show them to my colleagues. Naturally, I decided to put them on a separate diskette.

The team, as you obviously realise quite soon in this fantasy, is a group of Dungeons and Dragons-type characters, which you develop in the Proving Grounds of the Mad Warlord.

The game was terribly popular a couple of years ago on the Apple II, but I never quite understood the version, possibly because of a disk fault. On the Macintosh, however, it is amazingly convincing, and an awful lot of fun.

Anyway, to save a particular character, there is a way of making a copy of the whole group, and then transferring one out. You use the 'back-up characters' routine, and then the 'transfer characters' routine. I'm not stupid enough to try the experiment of 'transfer' without first making a back-up! In fact, I made three separate back-ups.

Transfer turned out (as I had suspected) to have a problem. The Mac asked for a particular disk to be inserted. That particular disk was already there. Until you inserted that disk, it wouldn't do anything.

On the Mac, taking a disk out is not voluntary unless you cheat and use a paper clip. Desperate, I used the paper clip, got the disk out, and put it back in again.

As far as the Mac was concerned, my tender caresses hadn't had any effect — nothing had happened. I had to turn off the power. And when I turned it on again, my special transferred characters had disappeared.

Fortunately, there were the back-ups. I told the machine to 'restore characters from back-up'. At once, all the remaining characters disappeared as well.

I examined the disk, and discovered several files called back-ups, all containing OK bytes.
The similarities with Apricot's announcement of NET II are obvious — the super-powered server box, and the low-cost terminals. Apricot, of course, has gone for much faster (and much cheaper) terminals, with the diskless Xen. Olivetti seems to be more interested in multi-user Xenix systems. Both decisions are gamble with the future, and it will be fascinating for the rest of us to watch and see which works better.

The M28, by the way, has been subjected to internal Olivetti tests, still secret at press time, but which excited executives couldn't keep to themselves. Apparently, they show the M28 running faster than DEC's VAX 780 supermini.

On the Rampage

There are two ways of extending memory on the IBM family: Intel/Lotus' Above Board, and AST Research's Rampage. Why should you consider Rampage rather than the original? To help you make up your mind, AST has started giving away a multi-tasking operating system, Desview, with the boards.

Desview is reported to be better than IBM's TopView in that it handles graphics rather better. It isn't Microsoft Windows, but it does take advantage of the extra features of the Rampage, rather than the (comparatively) limited features of the Above Board, says AST.

Details on (0274) 309930.

Where there's life . . .

The hopes for a bright future at Commodore which one or two people still cherished last month, dissipated somewhat with an announcement by the company boss, Marshall Smith, that in effect said: "We are not going bankrupt — we have another month."

I spoke at length with senior Commodore executives after that announcement, and morale was low, even among the incorrigible optimists and positive thinkers. We can expect, I'm told, an announcement by Commodore's bankers on 12 March.
With losses of around $180m for three quarters and $53m in the last quarter of 1985, the share price is understandably low, and there must be a real chance that someone will buy Commodore.

Commodore insider seriously believes that the Amiga will be sold off separately, because the Amiga part is no longer separate and has made no money.

Commodore didn't have a display booth at the Consumer Electronics Show in Las Vegas. The company's excuse for not attending Comdex (among others) was that CES was more important. I think it was right.

Still: where there's life . . .

**Tall Trees' Preview**

The IBM PC cannot read floppy disks used by its big brother, the PC/AT, because the big machine stores 1.2Mbytes whereas the old model stores 360k (a quarter of the capacity).

Pull out one of your old 360k floppies, however, and you have space for two Tall Trees Systems' drives. One is half-height 360k, the other is half-height 1.2Mbytes.

They will read IBM PC/AT disks.

No, it isn't cheap. Details, for those who would like bigger floppy capacity, from the UK agent for Tall Trees - RCS Computer Services in North Feltham. Tel: (01) 844 2044.

Tall Trees is also giving away Flight Simulator with its high-resolution (monochrome) graphics board, Preview. You should buy this version of Flight Simulator: it lets you land just about anywhere, including the open sea, and has no objection to letting you belt off across Central America and the ground, driving straight through Seattle at 200 knots. And the mountains are made of a thin piece of cardboard! (It's awful!) But you can pretend you're flying . . .

**Advance problems**

Hard disk problems reported in a recent issue of PCW involving the Ferranti Advance have prompted an offer by Microbe Computer Systems of special fixes for the Advance.

The problem involves incompatibility between the Advance's internal software and IBM-standard hard disks. According to the Microbe people, the usual symptom is that the machine won't recognise the drive.

That may sound rough, but apparently it gets worse if the machine does recognise it: in that case, there can be serious read/write errors, and data on the disk can be lost.

Microbe reckons to have disks of 10, 20 and 40Mbyte capacity, specially for the Advance, and designed to work with Ferranti ROMs, BIOS versions FX 4, 5 and 6. You can't upgrade your existing disks and don't have to lose either floppy disk.

Details on (0468) 62333.

**What's in a name?**

'One computer system being given away free, does not,' as Nigel Grant says, 'make much of a dent in the figure of 75 pupils per computer.' That's the statistic an UK schools, the 'most computer literate in the world,' as our politicians keep saying.

Grant's way of handing over the machine is a competition, generating publicity for his cheap PC clone and software business. I don't care: everyone could think up a cute company name like his, I'd use any excuse to write about it.

The competition, simply enough, is to dream up a name for his £499 PC clone. With the machine as first prize, the winning school will get a hard disk, memory, a tape streamer, colour and a serial card, plus software, bringing the whole package up to a retail value of £10,000.

Grant's company, for those who just can't bear the suspense any longer, is CtrlAlt. Deli. He's contactable on (0908) 662759.

**If you've got it, advertise it!**

I hope Olivetti is charging advertising rates for the stuff it's giving away with its 'blank diskettes' these days.

The company has hit upon the idea of selling its own diskettes, with commercial advertising for software. On the box of 10 disks you buy with the Olivetti label, you get a non-functional WordStar 2000, Database, Multimate, SuperCalc 3, Multiplan, Easy, Gem, Superproject, PP$ and Word.

Of course, the diskettes are formatted, too. And apparently they cost 'no more than ordinary blank disks'.

**Euphemisms I have loved**

Victor, I read in my press handout, is 'poised to storm the Micro Market'. And Microsoft Windows, I note in another release, is 'set to become a standard'. In other words, in case I wasn't aware of it before I read this handout, they've got a long way to go before they succeed.

Similarly, I have received several press releases in the past few weeks from companies with a 'strong inventory position'. In other words, they can't sell a thing, and stocks are building up.

You might particularly like Apricot's descriptions of some of its micros as 'award-winning', a nice way of admitting that they've won more awards than sales.

Again, one has to acknowledge the artistry of Commodore's reference to its 'strong credit line' - meaning that it owes the banks one hell of a lot.

Systematics, publisher of one of my favourite brands of accounting software, recently reported that it has outsold 'most brands of accounting software; which, interpreted, means that it hasn't outsold Pegasus.

Apple has told the world of its failure to get Northern Telecom as an OEM customer, by describing the relationship as a 'strategic alliance'. This means something like: we didn't get it right, but they're telling us what we did wrong, and perhaps one day there will be a deal after all.

And how many hopefuls before Micro was turned down, then attempted (but failed) to conceal their awareness of how little hope they had, by announcing that their new product 'is not targeted at the mass market'. So much more artistic than 'we'll only sell a few of these to loony enthusiasts'.

Company, of course, is just the most recent of many to announce a reduction of £1500 in the price of a £9500 system now costing £8000 - something which would still be available for under £5000 from anyone else.

Recently, I had the pleasure of hearing something quite different, I was speaking to an advertising agency, which had not been paid for six months, and the chairman rang me to warn me that its computer-builder client was obviously going bust.

After talking to someone at the computer-builder company, I spoke to the ad man again. 'I spoke to X,' I told him, 'and he says the cheque is already in the mail.'

'Ha! You spoke to X, did you? That rat!' said my ad man. 'Did you ask him if it was signed?'

As it turned out, when I phoned back, X told me that it wasn't. But what I liked was not the subtle misdirection (euphemism?) of X, but the cadence of the ad man. 'That rat!' - if only more people were so clear, so accurate, so direct! On second thoughts, though, as a journalist, I think I'll continue to collect misdirections. At least I can print those.
Atari back in gear

Atari recently announced that it will sell its 520ST personal computer through mass market outlets. Specialty computer shops, which had been the company's channel for the product, will get a new model, the 1040ST with 1Mbyte of memory. Concurrent with this move, Atari has added an RF modulator to the 520ST and dropped the price by $100 to $399 for an unboxed CPU. A system with a 3.5in disk drive, a mouse, and a black and white monitor will sell for $599 while a system with a colour monitor is priced at $899. All systems include Basic, Logo, a graphics package, and a word processing package.

The new 1040ST will be the same price as the original 520ST—that is, $1200 for a complete system with a high-resolution colour monitor. Meanwhile, the 130ST has been quietly dropped along with the 800XL series.

On the other hand, the 65XE and 130XE are available in new, bundled packages. Complete with mouse, printer, disk drive, and five software titles, the 65XE sells for $300 and the 130XE for $400.

Surprisingly, Atari announced that the company had sold over one million video game systems in 1985 and that it would dust off its year-old plans to introduce the 7800 high-end game system (an 800 computer in a different box); price $80.

Also, a new compact version of the 2600 video game system has been introduced. Atari reasons that with a retail price of $39 to $49 for the new unit, the 2600 still has several good years of life.

Meanwhile INTV Corp., which purchased the manufacturing and distribution rights to Mattel Electronics' Intellivision in 1984, is continuing to invest in the video games market. At CES the firm showed its System III unit, which features enhanced graphics and an LED on/off indicator, as well as three new games: Baseball, Karate Chap and Thunder Castle (a survival game).

Robot link-up

Multibotics has announced an interface which connects a Commodore 64 computer to Capsella, a popular line of build-it-yourself motorised toys. The Capsella toy kits consist of 21n transparent spheres, each one containing a different working part such as motor, differential gear, transmission, right angle drive, and so on. While the models built with Capsella sets are interesting, there is no way to control them except by simply turning them off and on.

The Multibotics interface adds a new dimension of fun and challenge to a Capsella set by providing an input sensor (infra-red photo cell, audio responder, and so on) and output control signals to vary the speed and reverse the direction of up to three motors.

I built a robot crawler that executes a random walk on a large piece of white paper but will not go off the edge (sensed by the infra-red scanner). Joystick control lets me vary its speed, direction, and the 'randomness' of its walk. Multibotics kits are priced from $50 to $200 depending upon the number and type of sensors.

Meanwhile Computer Magic, which had announced an interface to three TODAY robots last June, is finally delivering the product. The interface works with the Verbot, Omnibot, and Omnibot 2000 robots and a Commodore 64. The software lets you control all the motions and sounds of the robot. It also saves batteries since it provides power from the computer to the robot.

Japan's Kahomusen Company has developed prototype computer interfaces for three of its Movit robot kits — Circular, Mr Bootsman, and Memoomon Crawler. No decision has been made at the time of writing as to whether these will be marketed.

Lights! Camera! Activation!

One of the most fascinating new software products I've seen lately is the not-quite-finished Director program from Activision. An extensive set of pull-down menus (similar to those in Garry Kitchen's GameMaker package) lets you take various figures (people, vehicles, animals) and combine them in animated sequences against varied scenic backgrounds, thus making your own movie. The beauty of the package is that you don't have to design your own figures — they're already built-in and they know how to walk, run, jump, dance, and even fly. Director will be the fifth package in Activation's line of creativity software.

Another dynamite package in this series is The Music Studio (for the C64, the Atari 800 and ST, the Amiga, and the PCjr). This package, complete with a MIDI interface, will appeal to both amateur and professional musicians. Pull-down windows for composition and editing coupled with complete music notation make it easy to use and understand; also, its colourful 'Paintbox Mode' is an ideal short-cut for fast key composition.

The other packages in the creativity series include GameMaker (an integrated set of five design tools for making your own games), The Designer's Pencil (a graphics and animation design tool) and The Complete Fireworks Celebration Kit (which makes electronic greeting cards).

Along a similar line as Director is PSI-5 Trading Company from Accolade. This package, designed by Mike Lorenzen, features detailed graphic depictions of 30 different characters who interact with the player through conversational text to produce a science-fiction 'mini-drama' whose plot and outcome is contingent on the player's relationship with the crew. PSI-5 Trading Company is available for the C64 and the Apple.

Random bits

Sharp has introduced the PC-7000, a portable IBM PC clone with dual 5.25in drives, 320k of RAM, a 25 × 80 back-lit LCD screen, plus serial and parallel ports for $1795. Another new transport is the Portable PC-5, an advanced machine compatible with the IBM XT. It has an electroluminescent display, a 20Mbyte hard disk, a 1200 baud modem, a 3½in disk drive and 256k of memory for a mere $2995.

Meanwhile IBM is going off in a different direction with a reduced instruction set computer (RISC) which uses a 32-bit proprietary MPU called the 801. The machine has three ports, 1Mbyte of RAM, a 5½in floppy disk drive, and a 30Mbyte hard disk. An entry level configuration will cost around $5000.

Bobley Softworks has created a rather interesting graphic environment operating system, GEOS, for the C64 which has a menu-driven windowing interface similar to the Mac, multi-tasking capabilities and a disk transfer speed-up routine. It comes with a word processor and painting/charting program for only $59 complete. Another nice package for the C64 (and IBM PC or CP/M computer) is PrintMaster, a package similar to Broderbund's Print Shop, but with a lot more bells and whistles built-in. It lets you make signs, stationery, calendars, greetings cards and banners. From Unison World, if you own a C64 or C128, a nice add-on is Graphics Expander for $39 from Springboard Software.
<table>
<thead>
<tr>
<th><strong>PHILIPS</strong></th>
<th><strong>SIRIUS</strong></th>
<th><strong>STOCK</strong></th>
<th><strong>EVB</strong></th>
<th><strong>EB</strong></th>
<th><strong>EB</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><em>P2010 64k</em> 2 x 640k drives</td>
<td>Sirius 1.2 256k</td>
<td>£800</td>
<td>dBASE II</td>
<td>£150</td>
<td></td>
</tr>
<tr>
<td><em>P2010 64k</em> 2 x 196k drives</td>
<td>Purchase Ledger</td>
<td>£65</td>
<td>Payroll</td>
<td>£15</td>
<td></td>
</tr>
<tr>
<td><em>15mb upgrade inc controller</em></td>
<td>Microfilm</td>
<td>£95</td>
<td>Microfilm</td>
<td>£15</td>
<td></td>
</tr>
<tr>
<td><em>256k 16 bit/MS-600 upgrade</em></td>
<td>Programmers Toolkit pts 1 &amp; 2</td>
<td>£125</td>
<td>Nominal Ledger</td>
<td>£45</td>
<td></td>
</tr>
<tr>
<td><em>Fitting extra</em></td>
<td>Cost Ledger</td>
<td>£15</td>
<td>Sales Ledger</td>
<td>£45</td>
<td></td>
</tr>
<tr>
<td><em>CM</em></td>
<td><em>Soroc Supercal database</em></td>
<td>£55</td>
<td>Peachcalc</td>
<td>£35</td>
<td></td>
</tr>
<tr>
<td><em>Carrying case</em></td>
<td><em>Galman database</em></td>
<td>£55</td>
<td>Peachcalc</td>
<td>£35</td>
<td></td>
</tr>
<tr>
<td><em>Printer cable</em></td>
<td>1 year 24hrs on-site contract</td>
<td>£89</td>
<td>Peachcalc</td>
<td>£35</td>
<td></td>
</tr>
<tr>
<td><em>Cardbox database</em></td>
<td>Otto for P2010</td>
<td>£125</td>
<td>Peachcalc</td>
<td>£35</td>
<td></td>
</tr>
<tr>
<td><em>Soroc Supercal database</em></td>
<td>Demo P2012 boxed</td>
<td>£435</td>
<td>Peachcalc</td>
<td>£35</td>
<td></td>
</tr>
<tr>
<td><em>Carrying case</em></td>
<td>Demo P2010 boxed</td>
<td>£435</td>
<td>Peachcalc</td>
<td>£35</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>PHILIPS</strong></th>
<th><strong>ZENITH PC</strong></th>
<th><strong>STOCK</strong></th>
<th><strong>EVB</strong></th>
<th><strong>EB</strong></th>
<th><strong>EB</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ZENITH PC, Colour monitor</strong></td>
<td>Juki 710014 (DEM)</td>
<td>20fps, 10/12/15 Pitch or Proportional spacing, parallel, RS232 optional 2k print buffer.</td>
<td>£225</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10mb hard disk, 360k floppy, MS-600, IBM compatible. Cost £12.5k.</td>
<td>HEWLETT PACKARD</td>
<td>HP83 Computer (demo)</td>
<td>£200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEC</td>
<td>HP87 Computer (demo)</td>
<td>£180</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td>HP11 Laptop 259k, Lotus 123</td>
<td>£95</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td>HP7225 Plotter HP-IB</td>
<td>£350</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td>HP747A Plotter HP-IB</td>
<td>£350</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td>Graphics Presentation Pack 97</td>
<td>£100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td>ROM drawer</td>
<td>£50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td>HP-IB cable, 1 metre</td>
<td>£25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td>Linear Programming Pac</td>
<td>£25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td>Serial Interface</td>
<td>£45</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>FLEA MARKET</strong></th>
<th><strong>MBC 555, 2 DISK DRIVES</strong></th>
<th><strong>STOCK</strong></th>
<th><strong>EVB</strong></th>
<th><strong>EB</strong></th>
<th><strong>EB</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>PARTS ONLY, NO WARRANTY GIVEN.</td>
<td>IBM PC 64k, inc monitor &amp; kbd</td>
<td>£1350</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Mannesman Tally printer</em></td>
<td>IBM XT 640k 10mb complete</td>
<td>£1500</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Televideo TV 912 Terminal</em></td>
<td>IBM PC 256k 10mb complete</td>
<td>£1500</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td>IBM ATE 128k 20mb complete</td>
<td>£2200</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td>IBM Expansion Unit 10mb</td>
<td>£400</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td>IBM Proprinter</td>
<td>£325</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td>IBM Graphics Printer</td>
<td>£225</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td>IBM 50Lc card</td>
<td>£55</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td>IBM AT serial cables</td>
<td>£35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td>IBM asyn card</td>
<td>£50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td><em>AST Megapax Clock card</em></td>
<td>£125</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td><em>AST Supax inc 64k Sidekick</em></td>
<td>£225</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td><em>MYX 8k + / 4k Monitor</em></td>
<td>£350</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td><em>Sanyo CRT 70 col Hi-Res mon</em></td>
<td>£220</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td><em>Intelligence Res PEP Express</em></td>
<td>£350</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td>Ibm 1053 10mb &amp; 5mb back-up</td>
<td>£60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td>Talglass 1053</td>
<td>£150</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td><em>Excellusion</em></td>
<td>£200</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td>Rbase 5000 adv database</td>
<td>£195</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td><em>BSTAM</em></td>
<td>£45</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td><em>Peachtree Doc Manager</em></td>
<td>£150</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td><em>Easy Junior A/C package</em></td>
<td>£150</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td><em>Word Plus inc BOSS spell</em></td>
<td>£175</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td><em>Calculation</em></td>
<td>£75</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td><em>Computer &amp; Quill Quickcode</em></td>
<td>£75</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td><em>Superterm 400</em></td>
<td>£95</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td><em>Volkswriter</em></td>
<td>£125</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td><em>Visicall</em></td>
<td>£35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td><em>Context MBA</em></td>
<td>£35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td><em>Oskept</em></td>
<td>£225</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td>Easywriter</td>
<td>£35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td><em>Carboot</em></td>
<td>£65</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td><em>Hardware manual PC XT</em></td>
<td>£65</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td><em>Hardware manual AT (2 volt)</em></td>
<td>£100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td>Technical Reference</td>
<td>£35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td>OOS 1.1</td>
<td>£9</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>MISCELANEOUS</strong></th>
<th><strong>EPSON</strong></th>
<th><strong>STOCK</strong></th>
<th><strong>EVB</strong></th>
<th><strong>EB</strong></th>
<th><strong>EB</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Epson FAX 80</td>
<td><em>Ox-16 computer, complete</em></td>
<td>£1200</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Epson FAX 80</td>
<td>PX-Randix 128 k</td>
<td>£25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Epson FAX 80</td>
<td>MX-80</td>
<td>£175</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Epson FAX 80</td>
<td>RS232 Interface FX-80, RX-80</td>
<td>£20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Epson FAX 80</td>
<td>PF-10 disk drive PX-8</td>
<td>£225</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Epson FAX 80</td>
<td>P40 printer</td>
<td>£25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Epson FAX 80</td>
<td>OK-5075 keyboard</td>
<td>£75</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Epson FAX 80</td>
<td>Personal Office</td>
<td>£15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Epson FAX 80</td>
<td>Milst</td>
<td>£15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Epson FAX 80</td>
<td>Epsocare</td>
<td>£15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Epson FAX 80</td>
<td>Sales Order System</td>
<td>£15</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>MORGAN COMPUTER CO.</strong></th>
<th><strong>MORGAN COMPUTER CO.</strong></th>
<th><strong>DISPOSAL OF MORGAN</strong></th>
<th><strong>L IQUIDATED STOCK, DEMO &amp; USED COMPUTER MERCHANDISE</strong></th>
<th><strong>MORGAN COMPUTER CO.</strong></th>
<th><strong>DISPOSAL OF MORGAN</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>APRICOT</strong></td>
<td><strong>APRICOT</strong></td>
<td><strong>PC 256k</strong></td>
<td>£905</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Act 8530 dot matrix printer</td>
<td>Act 1550 dot matrix printer</td>
<td>£125</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Act 1550 dot matrix printer</td>
<td>Act 1550 dot matrix printer</td>
<td>£150</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Act Systems Involving</td>
<td>Act Systems Involving</td>
<td>£35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Act Systems Involving</td>
<td>Act Systems Involving</td>
<td>£35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Act Systems Involving</td>
<td>Act Systems Involving</td>
<td>£35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Act Systems Involving</td>
<td>Act Systems Involving</td>
<td>£35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Act Systems Involving</td>
<td>Act Systems Involving</td>
<td>£35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Act Systems Involving</td>
<td>Act Systems Involving</td>
<td>£35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Act Systems Involving</td>
<td>Act Systems Involving</td>
<td>£35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Act Systems Involving</td>
<td>Act Systems Involving</td>
<td>£35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Act Systems Involving</td>
<td>Act Systems Involving</td>
<td>£35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Act Systems Involving</td>
<td>Act Systems Involving</td>
<td>£35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Act Systems Involving</td>
<td>Act Systems Involving</td>
<td>£35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Act Systems Involving</td>
<td>Act Systems Involving</td>
<td>£35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Act Systems Involving</td>
<td>Act Systems Involving</td>
<td>£35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Act Systems Involving</td>
<td>Act Systems Involving</td>
<td>£35</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**MORGAN COMPUTER CO.** | **OPEN MONDAY TO SATURDAY** | **ACCESS AND VISA ACCEPTED** | **VALUES SUBJECT TO 15% VAT** | **MAIL ORDER (CARRIAGE EXTRA)** | **MORGAN COMPUTER CO.** | **DISPOSAL OF MORGAN** |

179 TOTTENHAM COURT ROAD, LONDON W1. 01-636 1136
Apricot Collection starts where others finish -
then GEM gives you more

*Apricot F2 - twin disk drives, inclusive 9" mono green phosphor monitor, mouse, Writer 22 matrix printer and GEM software. System illustrated is with 10" colour monitor. Price excludes VAT.
If you're serious about putting a computer to work in your business, you won't be spoiled for choice.
In fact, there's only one firm starting point for serious business computing. The Apricot Collection and GEM - complete business systems designed to get you up and running from the word go. With monitor, printer, mouse and friendly GEM software all included, the

And there's all the disk storage you need. The Apricot F2 has two floppy disk drives which can store the equivalent of a medium-sized novel. A built-in hard disk drive gives the Apricot F10 the capacity to store all the paperwork of a medium-sized company.

The keyboard
A professional-standard keyboard is a must for novices and skilled typists alike. That's why the Apricot Collection features all the typewriter keys, a numeric keypad for financial work, and a built-in clock and calculator.

And with the Apricot mouse and GEM software, most commands are as easy as pointing.

The monitor
You can choose a 9" or 12" monochrome monitor, or a 10" colour monitor capable of displaying up to sixteen colours at once - ideal for GEM's high-quality graphics.

The printer
Whether you're running off the month's invoices, producing charts and tables, or turning your rough drafts into hard copy, you'll need a high-quality printer. That's why Apricot Collection computers come with a versatile printer - capable of handling both detailed graphics and correspondence quality lettering.

The software
Each Apricot Collection system gives you access to literally thousands of MS-DOS software packages, including all the big name packages from Lotus, Ashton Tate, Digital Research and many others.
And the inclusive GEM software means you can put your Apricot to profitable use within hours rather than days. Just by pointing an arrow and clicking a button you can execute the most complex tasks.
GEM puts the power of the Apricot Collection to work from the word go.

That goes for GEM Draw and GEM Graph too, and many other GEM-based applications are becoming available.
To find out more fill in the coupon or call us on Freefone Apricot (via the operator) and we'll send you a free brochure. It could be the start of something big.

Apricot Collection gives you everything you need - right down to the power cable and plug - in one unbeatably priced package.

The power
The Apricot Collection has all the power and versatility you expect from a high specification business computer. The standard 512K of memory is enough to cope with the latest integrated office systems.

GEM Write word processor lets you draft, edit and print out documents. While GEM Paint produces drawings, graphs and diagrams to order.
And you can combine the two for visually impressive presentations.
GEM systems software is included in the entire range, making all Apricot computers equally easy to work with. And all GEM packages work the same way - learn one and you have learned them all.

Apricot Collection and GEM - a complete package for the first time business user

Please send me a free information pack on the Apricot Collection.
To Apricot UK Limited, FREEPOST, Halesowen, West Midlands, B63 1BR.

Name: 
Position: 
Company: 
Address: 
Tel: ____________

GEM Applications
THERE'S A PRICE ON THEIR HEADS
...and paying it won't hang you

£599

Walters PCXT
Price includes:-
- CPU 8088/Clockspeed 4.77MHz
- 8-slot motherboard
- 256k memory expandable to 640k on board

Spec as above with 10 meg Winchester drive £1034.00
Spec as above with 20 meg Winchester drive £1245.00

You can search high and low, but we doubt you'll find better prices for PC compatibles than these. The PCXT model from Walters International is an amazing £599* and the AT £1650.

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.

£1650

Walters AT
Price includes:-
- CPU 80286/Switchable 6 MHz/8 MHz
- 8-slot motherboard
- 512k memory expandable to 4 mbyte
- 1.2 mbyte floppy disk

Spec as above with 20 meg Winchester drive £2200.00

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, Cresssex Industrial Estate, High Wycombe, Bucks HP12 3RD.
Tel: (0494) 32751-6 Telex: 838882 MATRIX G
LETTERS

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

Mounting horror

I read with mounting horror Mike Scialom’s piece on the Strategic Defence Initiative in the February issue of PCW (‘The computer strikes back’). Beginning with the pointed observation that Star Wars has ’stimulated little public debate within the scientific or computing fraternities’, and the even more pointed thesis that ‘Star Wars is showing the West to be bankrupt — of morality and true vision’, the article manages to conclude that SDI represents a ‘chance in a million’ that ‘the scientific — and especially the computing — establishment’ will ignore at its peril.

Two assumptions seem to guide his argument. On the one hand, that the objective of the Star Wars programme is exhausted by Reagan’s vision of a nuclear-free and totally defensive strategy. On the other, that speaking (I presume) as a member of the computing fraternity, Mike Scialom thinks that the whole issue can be approached solely from the point of view of the benefits that will occur to it at least, that is, to its American division.

It is patently not the case that Star Wars will be developed at the expense of the offensive American nuclear arsenal — let alone that of the West; the UK and France. In particular, we have shown no signs of winding down our offensive nuclear weapons programmes.

The basic problem with Star Wars is that it will not be a perfectly functioning system, a hypothesis that Mike himself considers possible. The ‘100 per cent accuracy’ which will be required if the thing is to work, is truly a ‘pipedream’.

If the (relatively speaking) simplistic systems and software which we work with today can never be fully debugged, how many more unmitting errors will, for example, the hypothesised 10 million lines of code required for Star Wars contain?

Clearly, some of the bugs will cause no more than hiccup, but what about the others? My own imagination boggles.

More importantly, the politicians and military personnel who now constitute the moving force behind Star Wars are well aware of the fact, and a less ambitious defence is envisioned which will not do away with offensive weaponry.

And what about the Soviets? There is no indication in the article that Mike is aware of their antagonism to Star Wars, let alone informed as to the reasons behind it. Moreover, the Soviets see Star Wars as yet the most ambitious attempt yet by the Americans to re-establish global strategic superiority and, ultimately, economic and political hegemony.

Herein lies the cause of the chorus of ‘No!’ which Mike finds so disheartening. Once the mind goes beyond the particular jobs which the high-tech industry will reap from the financial bonanza of Star Wars, it simultaneously revolts at the concept.

Let me thank Mike for opening the debate in PCW. I am sorry that I cannot agree more with his prospectus. Assuredly, let us make research money available to the scientific and computing establishments; definitely, let the politicians provide challenges for all involved so that ‘scientists of real stature and merit — perhaps genius’ can come forward; finally, let us make sure that our educational institutions are up to the challenges. But rather than creating all this on the development of military technology in the hope that civilian spin-offs will result, why not focus on the problems that are of direct concern to society worldwide. Lord knows, we have enough of them.

Randy Banks, Senior Research Officer, ESPC Data Archive, University of Essex

Starting something

I see that PCW has published two pages of one person’s political outlook on the world under the thin guise of a treatise on the responsibilities of the computer industry (‘The computer strikes back’, February). The problem with this approach is that there are going to be replies from people who disagree with the facts as stated because: (a) they see the facts as erroneous in some respects and in need of correction; or (b) they disagree with the political standpoint of the author and are about to use precisely the same facts to disprove the argument.

I hope that I belong to the first category. Communications are already a vitally important part of the defence environment. The Joint Tactical Information Distribution System (JTIDS) is already in existence. It allows ships, aircraft and troops to share and contribute to the information gathered by various sensors. For example, an aircraft usually has only the information, gathered by its radar, available to it regarding the disposition of targets. As a rough rule, it only knows what is going on ahead of it, as that is the area being swept by the radar. JTIDS means that this radar information is available on the displays of other aircraft in the vicinity, and that its information is available on the subject’s display. Typically, a pilot/navigator on a suitably-equipped fighter will be aware of targets in front and behind, which targets are at present unchallenged by defence forces and which targets are being actively engaged. Naturally, specially-built aircraft like AWACS are likely to be the biggest information providers to the network. The displays are not ‘raw’ data directed to the radar, but ‘synthetic’, having been processed by the radar’s built-in computer to provide a symbolic representation of the threats.

There are many examples of computer-controlled communications networks which are not open to the likes of Mike Scialom and myself (even with 1200-baud modems) because we are irrelevant to their operation. Just because the networks are not published each month in ‘Networks’ does not mean that the world at large is backward in the communications field. Argonet has been up and running for a long time in the US, and has been held up as a good example of a community network set up by universities and other institutions, but the name is derived from the US Defense Advanced Projects Research Agency. There are Argonet access points in the UK. There is also ‘Wimex’ (properly WWMCCS, the World Wide Military Command and Control System). These and others are all communications networks which are up and running and in everyday use. The whole field of data collection, analysis and dissemination is known as Command, Control, Communications and Intelligence, or C3I. The airborne control and command centres are C-135s (Boeing 707s with lots of bolt-on goodies) known rather aptly as ‘Silk Purse’. As they come into their own when the missiles are flying and the ground is no longer a safe place to be, no doubt they are indeed trying to make silk purses out of a lot of pigs’ ears.

Paul Hardy, Bingley, West Yorkshire
ChipChat modems are the most versatile and up-to-date Hayes Compatible modems available at the price. With autoanswer as standard and intelligent autodial with speed conversion as an option. ChipChats may be used to access computers and databases such as Prestel, Micronet, Homeline and BT Gold.

ChipChats support the CCITT V21 protocol: 300/500 baud and the V22 protocol: 1200/75, 75/1200 and 1200/1200 (half duplex). Where local regulations permit, Bell standard operation may be used for dialing US databases.

ChipChats use the latest technology and provide valuable extra features such as auto-disconnect to save your telephone bills, and speed conversion for operation with IBM PCs. A full complement of LEDs monitor data flow and the status of handshake lines on the Cannon D-type connector.

ChipChat modems have been designed with our experience of manufacturing BT approved intelligent terminals, they provide the facilities and data rates you need at the touch of a button or they can be left unattended under computer control.

ChipChats are supported by a large range of communications software packages and terminal emulations for the IBM, Sirius, Apricot, Apple and BBC micros.

Ring for details and special package deal prices.

ChipChat CC2125A Autoansw. £149.95
ChipChat CC2125AD Auto dial £229.95
P&P £2.70 + VAT

100% IBM® compatible PC £900 ex VAT
(Including 640k MEM, twin drive, High Res.)
Numerous configurations available, contact for quotations
Hard Disc for IBM and compatibles –
APRICO, SANYO, BBC

HARD DISC SUBSYSTEMS

<table>
<thead>
<tr>
<th>HARD DISC</th>
<th>Streamer</th>
<th>Internal/external</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Meg</td>
<td>£400.57</td>
<td>£399.1/175</td>
</tr>
<tr>
<td>10 Meg</td>
<td>£400.57</td>
<td>£399.1/175</td>
</tr>
<tr>
<td>20 Meg</td>
<td>£550.75</td>
<td>£550.75</td>
</tr>
<tr>
<td>20 Meg</td>
<td>£550.75</td>
<td>£550.75</td>
</tr>
<tr>
<td>40 Meg</td>
<td>£999.1/175</td>
<td>£999.1/175</td>
</tr>
<tr>
<td>60 Meg</td>
<td>£999.1/175</td>
<td>£999.1/175</td>
</tr>
</tbody>
</table>

Increase your 6088/86 performance by 30%.
Use our single chip add on, £45 + VAT.

DISCETTES

<table>
<thead>
<tr>
<th>(Price includes VAT + £1 for first pack and 50p thereafter)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 Trk 5S/DD</td>
</tr>
<tr>
<td>40 Trk DS/DD</td>
</tr>
<tr>
<td>80 Trk DS/QUAD</td>
</tr>
</tbody>
</table>

UNBRANDED

<table>
<thead>
<tr>
<th>(Prices exclude VAT but add £1 P&amp;P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 Trk 5S/DD</td>
</tr>
<tr>
<td>90 Trk DS/QUAD</td>
</tr>
</tbody>
</table>

CHIPS

<table>
<thead>
<tr>
<th>(Prices include VAT but add £1 P&amp;P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8271</td>
</tr>
<tr>
<td>6264 LPISR</td>
</tr>
<tr>
<td>2765/25</td>
</tr>
<tr>
<td>27128/25</td>
</tr>
<tr>
<td>Acom Interface</td>
</tr>
<tr>
<td>Acom DMF</td>
</tr>
</tbody>
</table>

QUANTITY DISCOUNTS AVAILABLE

CARSON DEVELOPMENTS
84 HIGHFIELD ROAD, ROMFORD, ESSEX
Tel: (0708) 27043

Apple II Users

These Apple II expansion cards were designed by an ex-Apple engineer. They feature gold plated connectors and low power components for high reliability. Each comes with a comprehensive user manual, covering everything from installation to programming.

Extended 80col Text Card (Apple Ile only)

A full, functional replacement for Apples extended 80col Text Card at less than ¼ the price.

It provides an 80col text display, doubled graphics resolution and double the memory in your Apple II. It is fully compatible with AppleSoft C, P/M and Pascal. The extra memory is usable as very fast temporary disk space under ProDos...

£95.00

Time Clock Card (Apple II + Ile)

The R.T.C. card maintains the time and date and incorporates a rechargeable battery to keep ticking away for over 3 months with the main power off. ProDos users can have their files stamped automatically with the date and time. A utilities diskette includes a high resolution graphics programme which displays and sets the time. The diskette includes programs for D.O.F. 3-D users, who can convert D.O.F. to stamp files with the date and time, and for Pascal programmers who can use simple PROCEDURES to read and set the time...

R.T.C. will emulate other clocks...

£99.00

Packaging and Posting included Please add 15% VAT

THE COMPUTER FACTORY LTD
38 Knowsley Road, Liverpool L19 0PG
Tel: 051-427 3144

Apple, Applesoft, ProDos, DOS 3.3 are Trademarks of Apple Computers Inc.
The author strikes back

In his article 'The computer strikes back' (PCW, February), Mike Scialom raises the very important subject of the Stars Wars programme, but it seems to be unaware of the dangers inherent in this programme.

The two main arguments raised in the article in support of Star Wars are that it will lead to important advances in computer technology which will benefit mankind in general while offering, however small, a chance to eliminate the nuclear threat that hangs over the world. I would agree that this project will lead to many technological advances, but these will be more costly in relation to their benefits to the civilian economy than the direct investment in civilian technology (including computers).

Most important, though, is the fact that Star Wars will be a destabilising programme: that is, it will increase, not decrease, the threat of nuclear war. This is because it is a system to create a large-scale anti-ballistic missile system, banned under the 1972 ABM treaty. The creation of a large-scale ABM system would give the nation that possessed it the ability to use, or threaten to use, nuclear weapons without itself being threatened by a retaliatory strike. Therefore, the only possible Soviet response to the technology if it is implemented, is to develop weapons to penetrate the Star Wars shield and quite possibly develop a similar ABM system as well, so as to ensure its own (and its allies') security. It should be noted that the Star Wars programme is not a defensive: weapons to be developed in the programme have capabilities to hit orbiting satellites, and possibly ground-based targets as well.

The way to eliminate the nuclear threat and also help accelerate technical progress to the benefit of mankind is by political measures. The recent Soviet offer made by Mr Gorbatchev, to eliminate all nuclear weapons by the year 2000, offers an excellent framework for a future without nuclear weapons. This will also allow the funds at present wasted on weapons to be better spent on peaceful developments to the benefit of all humanity.

D. Clarke, North Shields, Tyneside

Printer hint

The popular Mini-Office package will not support NLQ on many printers because it re-sets the printer to the initial state obtained at switching on. It does this at the start of a print routine by sending an 'Initialise' command, which cancels all margin and NLQ settings obtained from the control panel of printers such as the Seikosha SP-1000.

By quickly switching the printer off and on again, immediately after beginning printing, the NLQ mode can be set. Starting a letter with a line of spaces allows ample time for this operation before the letter heading is reached.

M.J. Banks, Northampton

Time wars

As George Sutherland revealed in 'Letters', PCW February, the Japanese unit of time is different to that commonly used in Purley. The reason for this is quite straightforward - continental drift (or plate tectonics, as it is called by printer manual writers).

Japan's position on the west side of the Pacific means that it suffers from an extreme rate of drift of a somewhat unpredictable nature. To keep pace with this, the East Perceives Second of Nippon was devised. This is the same as the internationally recognised Purley unit except in November when a correction term is added to compensate for the year's westward drift through the world's time zones.

November was chosen so as to boost the Christmas events, which explains the Japanese domination of the market.

The wily Japanese have, of course, taken full advantage of their nation's peculiar motions. In war, a fatal error of navigation led the Russian fleet to disaster in the Russian

Japanese war at the turn of the century, and the fall of Singapore has been attributed to the speed of the Japanese advance. In peace, all measures of speed and productivity are now made in November, so giving a totally false picture (witness the 45mph 'bullet train').

The Japanese 'miracle', however, is coming to an end. Western leaders increasingly talk of Japan 'catching up with' the US (although few realise they are talking of time zones). Trade agreements usually require the unit of time to be prominently displayed on the product; worst of all, Japan is expected to collide with its communist neighbours in the year 2001. It is doubtful if China and the Soviet Union will survive the impact.

Matt Webster, Preston

A company that cares

I have just read the February issue of PCW and saw a number of letters complaining about lack of dealer support. This letter is different in that it is a letter of praise.

I am the proud owner of a Tatung Einstein, and I am very pleased with it and would not swap it for any other computer that I have had the 'pleasure' to use. I have added an 80-column card and a Canon PW 1080A printer, and both are happy and doing well.

My only problem has been lack of detailed information on the delights of ROM languages. I have ordered a book, but it is not available.

All these functions are built into the ROM and are available to the user in assembly language programming. I wrote to Tatung asking for information, and within a week received a list of ROM commands for almost everything that I could think of. I say almost, because last week I wrote to Tatung again for more information and again received it within a week.

Tatung helped to set up a user magazine for Einstein users, and now I receive regular updates on what hardware and software is available.

There are some manufacturers which care about their users. I would like to say thank you to Tatung for its help and support.

S Price, Cambridge

Blank disks

Like Mr Sharland ('Letters', PCW February), I too bought a PCW 8256 based upon your Benchtest of October 1985. However, unlike Mr Sharland, I have had no problem in acquiring blank disks, except when trying to get them from Dixons. My experience indicates that it tends to give out 'duff gen', and also fails to stock consumable items in sufficient quantities. My advice would be to go to Comet, John Menzies, WH Smith or Boots for disks.

I do agree with Mr Sharland on one point - that Amstrad should include at least two blank disks with the package, but I disagree that the machine should be referred to as an 'electronic typewriter'. My job is to repair 'professional' word processors (among other things) and I can honestly say that the majority of the PCW 8256 are either on a par with or out-class these machines (costing several times the price) and also contain software packages (at least the 8256 shows the end of the page).

Mr Sharland should also note that if his LocaleScript is version 1.6, there are some bugs which have been ironed out in version 1.2. He should, once he's copied his master, return the master to Amstrad for replacement; the company will also provide him with an updated version of CP/M version 1.4.

I can only complaints about the PCW 8256 are that the Basic does not contain any graphics commands (can someone please help me on this by providing a routine for Draw, Plot, and so on) and there is no mention within the manuals of the way in which the memory is mapped and thus would not include such things as the time taken to line feed, and so on, and as such assumes an infinitely wide paper.

D Oxley, Penicuik, Midlothian

END
One hundred issues; it doesn't sound many, does it? - yet it is something over eight years since this august organ began charting the course of the micro industry. And during that time, what has it seen?

Well, sad to say, one thing PCW has observed is the demise of fun. It had to happen, of course. There was no way that the personal computer business could ever keep up its lunatic excesses of the early days of people such as Spangles Cary, Kerr Bordland, Kit Spencer, Martin Underwood and Robin Woods.

They were fun people in fun times; the whole PC business was built on the lunacy of its complete improbability. It was such an unlikely thing to happen, even for those who could predict its occurrence from technology trends. But the happening created a major industry and a major force in business, commerce, science, technology and, by no means least, the home.

In so doing, of course, things had to change. The fun has slowly gone out of the personal computer business, to be replaced by the smart suits and elegant accents of the professionals. They have come from industries such as canned drinks - but, somehow, a canned drink doesn't have any soul. As some have found, a personal computer can't be sold in the same way.

All this has been observed, reported and commented upon within PCW's pages during its 100 issues. But what of the future? What breakthroughs will occur to fill these pages during the next 100 appearances?

One thing that seems certain, there will be no fun. PC users seem to be dividing into two distinct camps: serious business; and the rest. Unfortunately for the fun lovers, it's going to be the serious business users that hold sway for some time to come.

The reason? Well, the market which manufacturers have been chasing for so long, the big corporate users, is now taking off. That in itself would be interesting enough for the average computer maker but there is more, for this development is occurring when the 'traditional' PC business market is declining. The industry has used up the individuals who have wanted to buy a personal computer.

What is more, unlike a canned drink, a personal computer isn't consumed that quickly. There are still people happily achieving what they want to achieve on Commodore Pets, North Star Horizons and, most of all, Apple IIs.

Users may like the idea of a new machine but they are unlikely to buy one, especially just when they've got the software running right.

Among the things that PCW is likely to see over the coming 100 issues, therefore, is a trend towards bigger overall systems that are generally more expensive. This will occur because the corporate market has bigger requirements than the individual user, and wants its systems to work. This means they have to be well engineered and reliable, and that costs money.

We are also likely to see a fundamental shift of emphasis away from PC hardware onto communications hardware and software as the centre of everything that is considered sexy in computer technology.

The box on the end of the line will become far less important to the corporate user than the line itself. A good, working network of Pets will be much better than any number of poorly connected ATs. Network systems, multi-user systems and their relevant operating software will be more significant than any stand-alone machine (especially if it won't interface to any standard network).

The boxes themselves are going to become more powerful in general, though there will be the opportunity for lower power, dedicated task machines. It would seem that the general trend towards more power is one of the inevitabilities of technology. More powerful chips are being produced, and because of the economics of semiconductor production, they end up costing the same as earlier, less powerful devices. The result is that the end user gets them in a box whether they are needed or not.

The corporate market is likely to need them, however; these are big users in more ways than one, and will consume as much memory and processing power as is available.

Two areas are going to become particularly important over the coming few years. One is operating systems generally. MS-DOS is coming to the limits of its usefulness in its currently available forms and, unless factors such as the 640k limit are removed or modified, it will be found too restrictive for many corporate users.

MS-DOS is also not well suited to the world of larger, inter-communicating systems where the complexities of mixing file and record locking systems with accurate control of transaction processing between multiple processors and physical file systems, require considerable operating system power.

There could, therefore, at last be the emergence of Unix as a major operating system, as well as networking software systems such as Novell's NetWare, which lots of companies already swear by.

The other area where corporate users will consume power below the line is in operator front-end systems. Here, users will find they need to know nothing about the computer or the applications program. All they have to do is follow the onscreen instructions and enter the required data as the system demands. This will be of much more use than all the icon-oriented graphics front-ends put together to the corporate systems manager.

And in the home market? Who knows what might happen there. Companies such as Sinclair, Acorn and Commodore have all fallen foul of trying to sell computers as consumer items. As with the business market, they have used up the customers. The games machine business will tick over gently but the next development will probably be in smart things such as ... well, anything you can think of, really. If they make money out of computerised pets this year, then anything is possible.

**Benchtest**

Toal users of this package a similar integrated package running on a Macintosh or even an IBM PC — they would never touch Office again. To my micro-orientated outlook, it really is that bad.

I had my doubts whether to include the Telephone Manager in Applications software — it's so integral that it could be considered as part of the system. Until a UK-approved modem is installed, there is nothing you can do with it apart from look at it. However, the telephone functions distinguish the machine from the competition, and in all respects it looks like a bundled application.

The telephone functions are accessed by opening the Telephone item from the Office menu. This leads you to a list of names and numbers from which you can dial people and online computers. Functions available from here include dialling a call; automatic redialling; single-key dialling; and putting a call on hold.

In addition to these 'standard' telephone functions, there are others that go beyond what you would normally expect and which make the machine potentially very useful for anyone who frequently uses the telephone. The Unix PC automatically maintains a log of all incoming and outgoing calls, complete with duration and phone numbers. A second window can be opened, into which you can copy any text that's coming in from an online system, and an optional Electronic Mail option allows you to control electronic mail from this window.

One of the biggest advantages of the Unix PC as far as applications software is concerned is that any software you purchase for it will be compatible with any of the larger machines in the Olivetti AT&T Unix range.

Possibly because the Unix PC could be considered a rival for present or forthcoming Olivetti machines, it is being treated very much as an entry point for larger systems. The base model, with 512K and a 10Mbyte disk, will not be available in the UK as it is considered to run too close to Olivetti's present business machines.

### Documentation

Users used to joke about the manuals for the IBM 370 mainframe outweighing the machine itself. With the Unix PC it's no joke — a complete set consists of eight hefty manuals. Combine this with the three manuals which accompany the Office application, and you have a pile of documentation which easily outweighs the machine.

To be fair, you only initially receive three manuals: the Telecommunications Guide, the Unix Guide and the machine's own Guide. Also included is a thin Introductory Guide which I used extensively throughout this Benchtest. If you were to seriously consider programming the Unix PC, you would need at least the further five Programmer's Guides — possibly more.

On the whole the documentation is very thorough but more than a little staid in style, and is certainly not suitable for inexperienced users.

### Prices

The Olivetti-AT&T Unix PC with 1Mbyte of RAM and a 20Mbyte hard disk costs £495, which makes it a competitive entry into the small multi-user business micro field. There are many peripherals available at the time of writing, including tape streamers, expansion boxes and external hard disks. Olivetti is treating the machine very much as an entry point for an entire range of Unix machines, all the way up to a £100,000 64-user mini.

### Conclusion

Olivetti will probably be annoyed that I've referred to the machine as the Unix PC throughout this review and not, as the company prefers, the 381, but to my mind the whole essence of the machine is that it is a true desk-top PC which runs Unix.

My views of Unix have changed during the course of this review. Initially I thought that it was the best thing since sliced bread in all respects; now I think it has the potential, but that awful user interface must be concealed from the user.

AT&T has tried to do this with the Office windowing system, but the company hasn't gone far enough in making it a true, easy-to-use desk-top PC.

Technically, I was impressed with the Unix PC's hardware. It uses a beefed-up version of my favourite processor, the 68010; it operates a virtual memory system; and is generally well designed and put together.

As a communications tool it has a lot to offer, with two phone lines, an internal modem and some well produced telecommunications.

But, overall, I was left with a feeling of disappointment. The Unix PC doesn't quite attain the level I expected after reading the specification. If you are a dedicated Unix user who occasionally requires a less knowledgeable user to use the system, it may be suitable, or if a larger Unix system is already installed, it may be just the machine for, say, a reasonably-sized office. If you require a small office machine, however, I would strongly recommend a close look at the more traditional IBM machines, or, if Unix is important, the Torch Triple X.

No Benchmarks are available for the Unix PC due to the system's lack of Basic.

PCW wishes to thank Buttell Computers (01) 993 1433) for the loan of the Unix PC.
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 4 supports CP/M, MPM, 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.

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 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, Olivetts 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, MPM, 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.

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 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, Olivetts 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, MPM, 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.
Compaq Portable II

Despite the uncertainty of the IBM PC/AT market, Compaq has decided to launch a cut-down version of the PC/AT in the shape of the Portable II. Smaller and lighter than its peers, the machine took Peter Bright by surprise.

Hardware

While I have always had great admiration for Compaq machines technically, you could hardly describe them as works of art aesthetically. And the Portable II is no exception. In fact, externally, there is very little to choose visually between the Portable II and any other Compaq Portable. In fact at 17.7in wide by 7.5in high...
by 13.9in deep, the Portable II represents a 30 per cent decrease in volume from the Portable 286. More importantly, perhaps, at 25lbs for the basic machine and 26lbs for the hard disk machine, the Portable II is some 20 per cent lighter than the Portable 286. While a 20 per cent weight reduction is to be welcomed, I still found the machine cumbersome to lug around.

When the machine is rigged for carrying, there's very little external evidence that it's a computer at all. The keyboard attaches to the front of the machine via two rather insubstantial clips. I soon found that unless I was very careful doing them up, the keyboard would drop off when the machine was put down.

The only object on the rear panel of the machine is a nice, large, warm leatherette carrying handle. The comfortable nature of this handle almost compensates for the machine's otherwise ungainly appearance when it is being carried around.

The Portable II when you have reached your destination requires two things: (1) a suitable power point; and (2) strong finger nails. The reason for the former is obvious, and the latter is necessary because the ineffective keyboard clips I mentioned earlier can play havoc with your beautifully manicured hands.

Once the clips are released, the keyboard can be removed to reveal the front panel of the computer. The mouldings for the front panel are finished in a darker shade than the rest of the casings, which are finished in standard business computer cream.

Most of the space on the left-hand side of the front panel is taken up by a 9in green monochrome display. To its right are a 10Mbyte half-height, 5.25in hard disk and a third-height, 360k IBM PC-compatible 5.25in floppy disk drive. This is hidden by a little flip-up cover which incorporates a piece of transparent red plastic so that you can see the drive access LED.

Below the disk drives is a small rotary knob which controls the brightness of the display, and a hole which the keyboard cable disappears into. Unlike most other portable micros, the keyboards on all Compaq portables are always permanently attached to the rest of the system via a short length of coiled cable. When the system is rigged for carrying, the cable disappears into the hole in the front panel so that it doesn't snag.

Both the left and the right side panels on the Portable II house sliding lids which cover I/O connections. On the left-hand side, the cover slides back to reveal the on/off switch, vents for the internal fan and the socket for the power cable. The right side cover reveals plates for four IBM expansion cards. On the basic machine two of these are taken up by an RGB/Composite video card and an RS232 serial/Centronics parallel printer card. This leaves two slots (one IBM PC standard and one IBM PC/AT standard) free for the user to add his own cards.

The final area of interest on the outside of the machine is a large hatch on the underside of the main unit. This incorporates two hinges: one at its edge to allow it to be opened; and one in the middle which allows the cover to fold back on itself. This arrangement means that it is possible to lock the cover in place to form a foot on which the system box can rest, which allows you to alter the viewing angle of the screen without having to resort to a pile of old telephone directories.

As well as serving as an adjustable foot, the cover also hides a large compartment designed to house the power cable when the system is being carried around. Included in the compartment is a dummy mains socket which holds the mains plug in...
working because even the IBM PC/AT won't run it.
I was totally amazed to find that Flight Simulator actually does run on the Portable II. I don't know how Compaq has achieved it, because it has managed to do something even IBM can't do.

As well as being supplied with MS-DOS version 3.1, the review machine was also supplied with Microsoft Basic version 3. This is not the place for a review of Basic 3's features, but it does seem to represent a marked improvement over GWBasic which is supplied with most other IBM compatibles.

When a file is accessed using the 'Open' command, it can now be 'Shared' — allowing other processes to read and write to the file; 'Lock Read' — which stops other processes from reading the file; and 'Lock Write' — which stops another process writing to the file. There is also a 'Lock Read Write' mode which stops both read and write operations from other processes and, finally, there is a compatibility mode which disables the locking process to allow old Microsoft Basic programs to run.

In addition to the facilities provided by the improved 'Open' command, Basic 3 also has a 'Lock' command which allows record locking, as opposed to the file-locking provided by the 'Open' statement. This allows you to build a greater degree of flexibility into your programs and should allow you to produce true multi-user networked applications programs written in Basic.

In addition to its improved file-handling features, Microsoft Basic 3 also has a range of new and improved features in other areas. While I can't go into them here, PCW should be doing a full review of Microsoft Basic 3 in the near future.

Documentation
The review machine was supplied with three manuals — one for MS-DOS version 3.1 and two for Basic version 3. Retail systems will also be supplied with an owner's manual covering the set-up and care of the machine, but this was not available at the time of writing.

All three manuals supplied with the review system were spiral-bound with hard covers and were produced to a very high standard indeed. The text was properly typeset and presented in a logical, if somewhat technical, manner.

My one criticism is that the layout is quite bland with no use of colour. I appreciate that colour printing is expensive, but it would have helped to break up what were sometimes long tracts of boring text.

Prices
The Portable II will be available in three configurations ranging from a single floppy disk machine to a 10Mbyte hard disk system with one floppy. At the time of writing the UK prices have not been fixed but, as a guide, US prices range from $3199 to $4799.

Conclusion
Rather against my better judgment, I ended up positively liking the Portable II. When I first saw it I let out a small sigh and exclaimed 'Oh, no, not another AT clone, and a portable at that!'

However, with the exception of Olivetti, Compaq is my favourite IBM clone manufacturer, and I should have known that the Portable II would probably be a notch or two above the rest of the pack.

Technically, the Portable II gives you more power than an IBM PC/AT and nearly as much power as a DeskPro 286 in a much smaller, neater package. However, one or two things lead me to think of it more as a very high-performance IBM PC/XT rather than as a straight AT clone.

First off, the Portable II only has a 10Mbyte hard disk compared with 20Mbytes for most AT clones. Also it only has a 360k floppy disk drive, compared with the 1.2Mbyte drives fitted to most other AT clones including Compaq's own Portable 286.

Finally, the Portable II only has two spare expansion slots which is far fewer than most AT clones. There is nothing wrong with this; in fact, for many people this will be a positive advantage — there is no point in paying for features you don't want.

All in all, if you want more power than an IBM PC/XT can provide (which isn't difficult), but you don't want all the unnecessary bits and pieces in an IBM PC/AT or clone, then the Compaq Portable II could be the one for you.
When we launched Nimbus earlier this year, we expected it to sell well in both the professional and educational worlds. In the event, the response to Nimbus has exceeded our most optimistic expectations. Why? Because its combination of power, networking capability and graphics makes Nimbus simply unbeatable at its price.

Of course, in the computer business the key to success is the range of software offered. The more software a computer will run, the more people will buy it. A measure of our success is that Nimbus now supports leading UK software packages in virtually all specialist application areas, as well as the vast range of generic MS-DOS software.

So whether you want a microcomputer for word processing, database, accounts... or have a specialist need such as CAD, statistics or laboratory work, Nimbus is the natural choice.

For further information, contact Research Machines Ltd., Mill Street, Oxford OX2 8FW. Telephone: (0865) 249866.
More years ago than I care to remember, I enrolled for a programming course. For me, it was a step to the most exciting universe of all—a universe that was both the product and the subject of imagination. Imagine—through programming, you could simulate how a universe evolves according to some given laws!

And then I attended the course. The standard of teaching gave fresh meaning to tedium. The content of the course made a vacuum look like the atmosphere of Venus. After completing the course somehow, dutifully registered in what was known as the executive register. I took delight in the irony of a computer printout informing me, month after month, that there were no openings for me as a computer programmer. Have you ever felt that you were being saved for a more suitable fate—like hanging, perhaps?

I never lost my conviction that there was more to programming than punched cards. In 1976, I visited my brother in Massachusetts. There I came across magazine articles (which I still have) on a microprocessor-based computer—the Altair. Can you think of anything more pleasing than the feeling that you have wished a product into existence?

Returning to London, I resumed clearing tables, writing my novel, and dreaming. I knew a certain, large Yugoslav who had a vast interest in life, who always had one money-making project or another on the boil, and who seemed successful enough to own two colour television sets. It turned out that he, too, had a consuming interest in personal computers, and one fateful evening he asked if I would be interested in editing a magazine which he would fund. A friend (David Leach) and I thought up a name: Personal Computer World. Publicity leaflets were printed and strewn like manna at a conference to launch a British personal computer, the Nascom. One of the first people to contact us was Tony Osman of The Sunday Times. He took us at our word, and mentioned us in the colour section; one thousand people wrote to us.

Guess who else contacted us? It was Guy Kewney, who must then have been approximately one light year ahead of anyone in the UK as far as personal computing was concerned, through his championship of it in the pages of the industry weekly, Computing. Once again, without having met me, and on the basis of one phone call, he took us at our word and mentioned the PCW-to-be, instead of pouring scorn and doubt on the idea, as he could so easily have done.

You would be right to think that I place the greater part of the credit for PCW into the accounts of certain names—those just mentioned, in at the very start, and those who sought us out to write for PCW. Without exception, they knew far more than I did, but realised that I was wise enough to understand that. And we had wonderful readers. I do not think that any other kind of magazine has the kind of readership that personal computer magazines have. They seem to me to be generally more active, more intelligent (and, fortunate-
ly, seem also to have a greater sense of the absurd.

In 1977, a few hundred bytes of memory seemed like a lot of real estate. Things began improving in 1978, but price was a great barrier. The Apple was, of course, the most glamorous of the early computers. It might be the first and last recorded instance of a homebrew computer being transformed into a mainstream success by a groundswell of enthusiasm of the sort one usually associates with the amateur.

The Nascom was good value for its time, as were the first Commodore Pet and Tandy computers. Research Machines was there early, with its characteristic emphasis on good product and straightforward dealing. And Acorn, too, showing the beginnings of that brilliant design flair which has today culminated in the RISC processor. Two very good machines, the DAI and the Sorcerer, were not as successful as they deserved to be.

How could I forget Clive Sinclair, who at the time was holding out the promise of our being able to control entire nuclear power stations? But seriously, whatever his vicissitudes, and however things turn out, he is a latter-day hero, far more deserving of large-scale funding than certain people who have hopped blithely from company to company, leaving just before responsibility could be pinned on them.

Meyer Solomon
Editor: May '78 – May '79

The dream comes true

Meyer Solomon was the first-ever editor of PCW and is really one of the nicest people you could ever meet. He and Angelo Zgorelec ran the magazine at a time when microcomputers were almost unheard of. Their brave pioneering work came to an end in the middle of 1979 when Angelo sold the magazine to Felix Dennis who, oddly enough, had just signed me up to work with an experienced publishing man, Bruce Sawford, on the creation of a new computer magazine. My 13 years' computing experience plus Bruce's long magazine experience made us the obvious choice to take over PCW.

With Paul Carpenter as art director, we completely redesigned and relaunched PCW, introducing several new sections, some of which survive to this day. Guy Kewney is the PCW equivalent of lettering in seaside rock. Break open any issue since our first, September 1979, and there's Guy laying the industry and providing all sorts of interesting news. JJ Clessa is the only other survivor from those days. We introduced Benchtests, Computer Answers, Young Computer World (RIP, interrupt for readers to 'soapbox'), Transaction File and the Programs/Micromart section. Calculator Corner, presided over by Dick Pountain and which became hugely popular, started the following month.

Those were the days of the personality: Tim Keen, Mike Sterland, Tim Moore, Bill Cannings, Alan Wood, Julian Allason and Bruce Everiss, to mention just a few. These people had the courage to get involved with the embryonic personal computer business and their names were constantly in the headlines. Now, anonymous grey suits and matching faces seem to be more appropriate. Mike Sterland (Personal Computers), Tim Moore (Kuma) and Alan Wood (Digi-tus) made their original ideas work. The rest have moved on to other things.

In those days, heavy business computing was done on machines like the North Star Horizon or the Cromemco System Three. Further down-market, the Tandy TRS-80, the Apple II and the Commodore Pet battled it out for pole position. Hobbyists had to make do with micros like the Nascom, the Ohio Superboard or the UK101. A year later, PCW had doubled in size, and the main new machines were Sinclair's ZX80, Acorn's Atom and, further up-market, the SuperBrain. By now we had introduced a few more regulars: Yankee Doodles, Chip Chat, Microchess and SubSet.

In November 1980 we launched Computer Town — a computer literacy project to be held in places such as town halls and libraries; this was before schools and Government managed to get their fingers out.
Apparently, around eight Computer-Towns are still running today.

Nineteen-eighty-one saw an awful lot of fuss about a project we unco-

over called The Last One. It also

saw the introduction of Banks’ State-

ment and TJ’s Workshop (now ‘RIP’). I

bowed out at the end of the fourth

PCW Show, but, in my last couple of

weeks as the magazine’s editor, we

got two scoops: the Osborne 01 and

the IBM PC.

Now, the IBM PC has changed ev-

everything. The stunning rate of

change has slowed as IBM first

established the standard and then

made sure that changes were in-

cremental only. As the installed base

grew, so did the supporting industry

of software and hardware. Apart

from Apple, no-one seems to be real-

ly trying to change the status quo.

Those who have tried ‘pop-up’ ap-

lications and switcher-like programs

have tasted the forbidden fruit. They

want machines with huge memories

and hard disks, so that they can

switch from task to task with mini-

mum fuss. They’d like very high-

resolution screens. With the need for

multi-tasking and better displays

comes the need for faster machines.

IBM appears to be resisting pressure

for such change, content to develop

the market at a speed which suits its

business plans.

Eventually Apple will bring out a

fast, open-architecture machine with

a decent-sized screen and built-in

hard disks. I say Apple should get its

product spec up and its prices down

as fast as possible in order to build

up a real user base. (Incidentally, the

Amiga seems a lovely machine, but

where does it fit at its price? In the

home? In the office? Hmm.)

Today we have cellular telephones,

wafer scale integration and parallel

processing, and the Japanese have a

television whose resolution is so

good it’s like looking through a win-
dow. In the quest for true artificial

intelligence, much is being learned

about how we think and interact with

computers. Let’s see where these

technologies may lead.

Your machine will get to know

your way of working. As it detects

regular work patterns or keyboard

entry sequences, it will store them

away. Next time you embark on the

same task it will ask: ‘Do you want

me to do that?’ Little by little, like a

personal assistant, it will take over

your menial tasks. Its photographic-

quality screen will be able to display

any information and will not strain

your eyes.

Lap-tops will have huge memories

and low power but a clearly visible

colour display. Many will be ‘paired’
to a mother computer on your desk

which itself may be part of a net-

work. However, the future is still

open.

Martin Banks: lost for words

David Tebbutt: star of page and screen

Suddenly there were micros to suit every budget – from home to business to schools
The golden era

It was a Bank Holiday Monday in 1981. The West End was deserted, the PCW office was empty — apart from me and PCW's publisher, Felix Dennis. In Boca Raton, Florida, it was just a normal working day.

Word had reached PCW that IBM was about to launch its long-awaited personal computer, and we were determined to get our hands on it. The difficulty was to convince IBM's publicity relations people that the lunatic who kept phoning every half-hour really meant business. Another difficulty concerned the logistics of Bench testing a computer on the other side of the Atlantic. There were only half a dozen machines and they were all in Boca Raton.

Finally, after numerous telephone calls, IBM agreed that if we could get to Boca Raton, we could play with its new toy. Two days later, David Tebbutt was on his way. A month later, PCW hit the streets with — as far as we could establish — the first published full review of the machine in the world. (This was because the US machine was typically held a lead time of three months, opposed to our one month.)

We all knew that when IBM entered the market, the impact would be considerable; I don't think any of us realised exactly how considerable. Even IBM seemed a little uncertain: the basic machine came with 16k of RAM, a built-in cassette interface and Basic in ROM. Early IBM literature showed happy families grouped around the system in their living rooms...

That particular issue of PCW contained a review (also by David Tebbutt — it was his month) of the Osborne 01, another machine which we knew to have a great impact on the industry, and, ironically, the inspiration for one of IBM's few failures, the 'portable' version of the PC.

The Osborne succeeded because it was cheap and practical. The IBM PC succeeded because... well, because it was made by IBM. The rest of the industry noted Osborne's success, assumed it was all to do with portability and rushed out dozens of unwieldy boxes. Then the industry noted IBM's success and started making IBM-compatible machines. A few machines tried to win both ways by producing portable, IBM-compatible computers.

As both trends — portability and compatibility — spread like wildfire, the phenomenon of 'white-line marketing' began to appear. This involved the massive promotion of products which in reality stood zero chance on the market. The theory was that the marketing departments were so out of their heads from the inhalation of certain powders that every product was the fastest, most powerful, cheapest and best, regardless of commercial realities. Mega-bucks went down drains and up noses in the marketing of these products and the industry boomed: PCW grew to 400 pages, dozens of other magazines sprouted, 16-year-old programmers were buying Ferraris, share prices rocketed and even national newspapers started carrying computer sections... it clearly couldn't last.

The crunch has been well documented — perhaps a little too well. The reality is that while those heady days are over for good, the computer industry, both home and business, is doing very nicely, thank you; it's just that the phenomenal growth curves have flattened rather sharply.

IBM's total domination of the microindustry is now a fact of life, and is both good and bad. Good, because it brought a measure of standardisation which was badly needed. Bad, because it has stifled so many good, creative ideas.

For such a high-tech industry, it is surprisingly conservative in many ways and the influence of IBM has worsened this aspect. (For instance, why must so many clone makers copy IBM's grotesque styling and terrible keyboard layout so exactly?) The industry has settled into much-needed stability and respectability, thanks to IBM, but, in my opinion, this is now being carried to a narcotic extreme.

One example: for years, the computer industry has stuck to a standard screen format of 80 columns by 24 or 25 lines. This dates back to the days of punched cards and has no relevance to modern computing needs. As the majority of personal computer users eventually want their work to appear on pieces of paper, why aren't we moving rapidly to screen formats which echo the familiar physical page shape? The Great Communicator, reviewed in the February issue of PCW, offered an A4 screen as an option, but at a ridiculous cost. Corvus produced a novel full-page screen some years ago: you could use it upright for word processing, or lay it on its side for spreadsheets, but again it was ex-
has become boring. Well, I suppose it has in some respects, but it was inevitable. While the time I spent at PCW fortunately coincided with the industry’s most exciting period, the stream of constant new developments, particularly on the software side, still provide immense interest.

Predicting the future in this business is a foolhardy venture. But the next 100 issues of PCW will be just as interesting as the first 100 — of that at least you can be sure.

Peter Rodwell
Editor: Nov ’81 — April ’83

Heady days
Micros were viewed with suspicion when I joined Computing newspaper early in 1981. They belonged with bearded boffins found in garages and attics at strange hours of the night — a far cry from the aloof, all-powerful world of company data processing departments. Computing consigned stories about them to a ghetto page, buried inside, with its own special label, ‘personal’.

As no-one else seemed interested, I found myself writing more and more about these curious creatures which began to sprout, Trilifid-like, everywhere. Despite the scepticism of mainframe programmers and the derision of systems analysts, micros were being born. Suddenly, the UK was the international champion of the home computer, its eager buffs having acquired twice as many machines per head as the US.

Where the people went, however idiosyncratic their whim, so the media piled in after. Television, radio, papers and magazines brief correspondents to ferret out the computer stories for which the British public seemed to have acquired such a voracious appetite. The BBC broke all its habits and backed a piece of hardware, thereby rocketing ambitious Acorn to a market valuation eventually topping £200m.

In May 1983 I found myself editing PCW. They were heady times: the industry in a permanent state of euphoria and full of surprises. Apricot, instantly covetable, adorned the front cover of our Show issue, capturing everyone’s imagination. The Macintosh, launched the following year at a fraction of the price of its mother, the Lisa, seemed to promise that soon, small and friendly computers would be affordable for all.

Each month it was tough deciding which of the multitude of new machines to Benchtest, and there was endless heated debate as to which operating systems or whose printer to recommend.

It was uncharted terrain. PCW — ever the pioneer — went to court for printing a routine enabling BBC Micro disk owners to unlock cassettes they had bought and load them onto floppies for fast reloading. And as British Telecom procrastinated over approval for modems, we agonised over whether to publish a review of the newest unbeatable-value offerings before they were okayed. We did.

Magazines, like micros, multiplied. Journalists and publishers alike watched incredulously as the downmarket Your Computer shot ahead of PCW in circulation figures to over 120,000. PCW’s sister publication Personal Computer News, looked, for an uncomfortable few months, like stealing the ground from under us as a weekly version of our own unique mix. Then the bold publishing gamble Soft magazine enticed away some of our best writers.

But as early as the summer of 1981, there had been warning signs for those who chose to read them. The PCW team had been justly proud of its world exclusive Benchtest of IBM’s new personal computer. Though destined not officially to reach the UK for two more years, the
brooding threat of the Jolly Blue Giant was depicted in sinister shadowy letters on the August issue's front cover. Not the huge head of Sirius, nor the ingenuity of ACT in Birmingham, could stem the Big Blue flood when it finally came.

Nor did the bookstalls escape the heat — a myriad of fat, glossy mags which had fought for shelf space and divided readers into ever more specialised groups, gave way to slim volumes and spaces. Virtually the only new launches were for IBM users.

PCW thrives. And to a former editor, it is good to see that some things don’t change. Guy Kewney clearly still demands constant vigilance to keep him in check, and garrulous Martin Banks waxes lyrical as ever — winning a national prize in the process.

Yet the mood is very different now. In 1983 it would have been unthinkable for a columnist to reflect, as David Ahl did earlier this year, on the ‘general dullness’ of the personal computer industry, and the ‘almost total lack of anything innovative’.

Even now, the industry is prone to dismissing its ills as the product of ‘irresponsible’ newspaper reports by people like myself in the national press — blaming the bearer for the bad news.

Ahl reported the appearance at Comdex of Microsoft’s much-vaunted Windows — but hang on. PCW was reviewing that in my day. Such events kill the myth that in the computer business, everything is obsolete as soon as it’s for sale. Some pundits believe that the new offerings from Atari and Commodore will put techno-thrills back into lacklustre home computing, but I wouldn’t put my money on it.

While many micros dubbed ‘future-proof’ have failed, the irrepressible Sir Clive Sinclair’s Spectrum is still the top-selling home machine; this despite being four years old and re-

Paradoxically some might believe the QL ended up ‘making a monkey’ of Sinclair.
The bubble bursts

It was autumn when I arrived to edit PCW - leaves were turning brown and micros were falling from heaven. Unfortunately, a lot of them crashed.

The MSX machines were the first of the casualties - they went from pride of place to the bargain basement in next to no time. Commodore's Plus/4 took the same downward trend, while the Enterprise failed to follow the Starship.

On a brighter note, Apple announced the Fat Mac towards the end of 1984. Still a long way from being the perfect Macintosh, the 512K machine made it easier to write sophisticated software for what remains the easiest micro to use. It's still a shame about the keyboard, though. Better news on this front came from ICL with its OPD - at last a 'Sinclair micro' with a comfortable keyboard. To compensate for this astute improvement, British Telecom decided to sell the machine under the daft name of Tonto.

IBM took a more straightforward approach to the title of its new micro, the PC/AT. The 'AT' stands for 'advanced technology' - well, it was the shape of things to come in that it was multi-user and based on Intel's 80286. And you could twizzle the logo around so that if you stood the system box upright on the floor, the initials IBM remained the right way up.

And then 1985 arrived - The Year of the WIMP. Mice proliferated and no self-respecting software package came without a selection of windows, icons and pull-down menus. Digital Research's GEM was among the first - Microsoft's Windows and

IBM's own TopView took up the challenge later in the year.

All these fancy operating environments, however, failed to stop an unexpected revival in good old CP/M. Commodore's 128 offered three micros in one box - the 64, a CP/M machine and the 128 itself (and not, you'll note, the Plus/4). Then Amstrad replaced the tape deck in its 464 with a disk drive to produce the 664 - before, to the fury of 664 purchasers, gong on to offer full CP/M on the 6288 later in the year. Not content with that, Amstrad came up with the 8256 which included a printer as well.

What were the other UK manufacturers doing while Amstrad was making all this money? The answer is: not so well. Sinclair, the man and not the micro company, tried a move into the motor industry before running out of road. Acorn was taken over by Olivetti. And Apricot wrestled with its problem of having too many machines and too little compatibility.

More promising developments came from the US - from Commodore (the company Jack Tramiel left with its Amiga, and from Atari (the company he went to) with its 520ST.

That was the year that was in terms of machines. On a more mundane level, my strongest memories are of wondering whether the stream of PC and then AT clones would ever run dry (it never seemed to); of lifting software manuals which would have served as useful props in a body-building course; of struggling with portable machines whose screens appeared to have been designed with contortionists in mind; and, on a brighter note, of trying (and failing) to improve my performance at chess with Psion's package for the Macintosh - a true, if expensive, marriage of soft and hardware.

Less satisfactory marriages consisted of machines such as IBM's PC/AT and packages such as Symphony. Judging from the phone calls I received, this was one of the more popular combinations among first-time users - first and last-time users at that. This was definitely not the dish to sit before a new and untrained user. Many purchasing decisions were, as ever, based on the slimmest of research; for example, one irate user rang to complain that he'd bought a new machine, only to discover that none of his old software would run on it. Then there were the stories of people cutting down 5¼in disks to fit into smaller drives. And that's just a selection to indicate the sometimes immense gap between wanting to make the most of a micro and actually being able to do so.

On the other hand, though, many users were more than making the most of their machines. Some of the programs PCW published put their commercial rivals to shame (as did our do-it-yourself memory expansion kit for the Mac), while others managed to condense some of the techniques involved in such things as expert systems into fewer lines of Basic than I would have thought possible.

The range of machines used by PCW readers - and the range of things readers did with them - was one of the most enjoyable things about the job. While the micro industry has changed beyond all recognition from its origins - boxes are shifted these days rather than machines sold, and companies such as Commodore wouldn't dream of running indulgences like the Petjet - the fun has not gone out of things for the user.

Graham Cunningham
Editor: July '84 - Sept '85
After the rush...

In the closing months of 1985, as I took over the editor’s chair at PCW, the talk was all of the disasters of the past and the disasters still to come. The keynote address at Comdex Fall, the industry’s Greatest Show on Earth, was called ‘Surviving the Industry Downturn’ and was delivered with fine gloom by the head of not-supposedly-shaky Hewlett-Pakard. Heads were being shaken over the chances of the supposed competitors to IBM, the home micro market had disintegrated, Commodore had posted $100 million losses, both Apple’s founders had left for more congenial surroundings, and Sinclair and Acorn still teetered ever-so-gently close to the brink.

Worst of all, the oldest of computer magazines, David Ahl’s Creative Computing, had its shutters lowered after 10 years by owner Ziff-Davis; PCW was, of course, unashamedly modelled in its early days on David’s... well, creation.

Perhaps, the cynics will say, that’s one reason we are celebrating now, after 100 issues and eight years, rather than hanging on hoping to clock up the full 10...

But of course that’s not the case, and a lot of the gloom in the micro and micro magazine businesses is equally misplaced. As someone once said: it isn’t what you don’t know that hurts you, but the things you know that ain’t so. We know that IBM has completely taken over the business market; that the home computer market doesn’t exist; that dealers are sharks who give no support and are always ready to fold; that software doesn’t work and costs so much to promote that no new products are emerging; and that the bubble in schools’ computing has been burst by the withdrawal of government financial support. And naturally, we all know that micro users today are hard-eyed businessmen and profit-seekers.

As vociferous groups of PCW readers will be quick to respond, all of that ain’t so. Or at least, it is such a superficial view of things that it loses all meaning in the real world.

Sure, IBM has two-thirds of the business micro market just as it has two-thirds of every computer market it is in; but the third that’s left is still worth billions and leaves enough room for Apple to ship 600,000 units of a ‘failure’ in the shape of the Macintosh. There are a couple of million home computers in the UK getting various amounts of use, and the success of the Atari ST (the availability of assemblers and compilers for a machine is a good measure of success — and the ST has dozens) shows that there is demand for a cheap-end computer in the home as well as outside. Some dealers are sharks who would remove your rings while shaking hands, but many aren’t; and the bad ones weed themselves out by losing the repeat business that is now coming through, following the first micro wave. Schools and universities, naturally enough as the homes of the most intelligent and enthusiastic computer users around, are still active and being actively wooed by the industry for innovative work.

And, most obvious of all, hundreds of thousands of people in the UK enjoy using computers, learning more about them, and exploring the boundaries of what they can do. Those people, if you’ll pardon some trumpet-blowing, are the readers of PCW. There is no rule which says that users of Lotus 1-2-3 on an IBM PC inside a large corporation have to hate the machine they work on. Equally, there is no reason why a Spectrum owner should not be interested in and inspired by machines well out of reach and power range. Early issues of PCW carried a couple of features reviewing the PDP-11 minicomputer alongside 6800 evaluation boards with hexagonal input, and no-one thought it strange. PCW’s coverage must stay wide and open, and the new PCW Online service should help to keep that going.

The nice thing about producing a magazine for enthusiasts is that you can rely on the readers to keep you on the right track and scream loudly if there are things they don’t like. In the current climate, it would help if they could scream even more loudly at the people who say the business is dead, and who seem so unhappy with annual growth of 25 per cent rather than 30.

Peter Jackson
Editor: Sept ’85 — present day

'Shall I compare thee to a summer's day; thou art more beautiful.' Peter Jackson receives the Computer Journal of the Year award sponsored by H-P and The Times

1986 heralds the arrival of Unix micros

Apple’s Mac goes into overdrive

APRIL 1986 PCW 115
Tune into the wireless

Robin Mudge looks at the way in which the micro has changed the design of the radio receiver and made short wave listening a much more approachable activity. Part Two next month.

Contrary to popular belief, the information revolution didn't start with the coming of the microprocessor, but with the transmission of the first transatlantic radio message by Guglielmo Marconi, way back at the beginning of the twentieth century.

Now, almost every country in the world transmits its voice by radio waves. Every year the number of nations becoming involved in radio broadcasting increases dramatically. Programmes range from political propaganda, through popular entertainment, information and news; their places on the radio dial and transmission schedules are published each year in large tomes like the World Radio and TV Handbook and the Guide to Utility Stations.

Whereas the microprocessor didn't start this revolution, it has certainly made Short Wave Radio Listening more accessible to the ordinary person. The radios, or more correctly receivers, have been reduced in size from these giant war-type receivers found in government surplus stores, to small portables with the power to pull in signals from all corners of the globe.

The control of them has been simplified and extended to a point where even the strange blips and blops of Morse and radio telegraphy can be easily decoded and printed onto paper. So, for those of you who can put up with less than hi-fi sound quality and a lack of pictures, the short wave radio can provide an intriguing source of information, without having to connect your micro to the telephone.

History

Short Wave Listening, or SWL in radio jargon, was very popular in the 1920s-30s and the war years. Indeed, there were almost as many radio magazines then as there are computer magazines now. During the war, radio carried all sorts of information, and the public soon became quite adept at tuning into stations from different parts of the world, hoping to pick up hot news. Government agencies were particularly keen on monitoring the short waves; clandestine messages and other secret codes made up a substantial proportion of the transmissions.

In fact radio became a substantial psychological weapon. Sefton Delmar ran a British radio station that pretended to be one of German military origin. Radio Atlanta, broadcast to the German U-boat service, was picked up by a huge German civilian audience. Later this station, transmitting from a hugely powerful transmitter on the south coast, imitated the ordinary civilian stations with some pretty devastating results.

The hobby lost popularity for a while, but recently it has become more popular again, along with people's increased interest in world events. This trend has led Sony and Philips, among others, to bring out a new range of portable radios which offer many of the facilities found on proper short wave receivers.

Before discussing these new transistors though, what is so special about these short waves and what do they carry? It's got a lot to do with the way that radio waves travel through space: radio propagation. A radio waves path is affected by the weather, the season, the sun's activity and the time of day; it's a wonder that they get anywhere at all! Some of the waves hug the surface of the earth and can travel fairly long distances; these are called ground waves. Others travel upward - sky waves - and eventually encounter the outer atmosphere, where they can be reflected back to the earth by layers of electrically-charged particles called the ionosphere. These waves often bounce back and forth many times and in the process travel from one side of the earth to the other.

Both ground waves and sky waves offer useful features for getting messages about the place. Whether a radio signal travels as a ground wave or a sky wave is dictated mainly by its frequency, the low frequencies being ground waves and the high sky waves.

Theory

On to the theory. All radio waves, in common with all other electromagnetic radiation (radio, heat, light, x-rays and gamma rays), have a frequency and wavelength, both of which are immutably linked by the simple formula:

\[ \text{Frequency} = \frac{\text{The speed of light}}{\text{Wavelength}} \]

The speed of light (and radio waves) is 299820 kilometres per second.

The best way to think of waves is to imagine one in the sea, edge on. These waves have a series of peaks and troughs; the distance between successive peaks or troughs is the wave's length, and as the wave moves, its frequency is the number of wavelengths that pass a fixed point in one second. The wavelengths in which we are interested range from 6000 metres to 10 metres in length — that's a frequency of 50KHz (kilo meaning a thousand and Hz meaning frequency measured in cycles a second) and 30MHz (mega meaning million).

The frequencies that most good shortwave radios can tune into are
COMMUNICATIONS

separated into three broad bands. Very Low Frequencies (VLF - Long Wave in Old English) stretch from 10kHz to 50kHz. These frequencies carry morse code and radio telegraphy, weather reports and other utility messages. Medium Frequencies (MF), or Medium Wave, stretch from 50kHz to 1600kHz (1.6MHz) and carries commercial radio transmissions with which we are all familiar. Then comes the ubiquitous short waves, or more correctly High Frequency (HF), stretching from 1.6MHz to 30MHz. It’s this huge range of frequencies in which the short wave listener is most interested. They carry an enormous range of information ranging from clandestine and underground groups, ship-to-shore telephone, weather reports and a whole wealth of foreign radio stations like the Voice of America and Radio Moscow. Learning their thoughts and interpretations of world events as far as the prevailing propagation conditions will allow. On the short wave the world is literally at your fingertips. There are plenty of books listing what is transmitted where, and when; right across the entire frequency range from 50kHz to 30MHz. The times of transmissions are given in UTC (Universal Time Co-ordinated) which is, as near as making no difference, Greenwich Mean Time.

Mixed up with all these stations are the radio amateurs, more usually called ‘Hams’. The Short Wave Listener (SWL) is not necessarily a Ham; Hams have to pass an exam testing their knowledge and practical ability in all things to do with the technology of radio before they are licensed to transmit radio messages. The exam the RAE (Radio Amateur Exam) is controlled by the Home Office which also makes sure that the Wireless Telegraphy Act is put into practice. This act relates to SWL as well. It is illegal to receive anything other than international domestic broadcasts and radio amateurs, and the fines for doing so are quite stiff. If you accidentally tune into a non-amateur or domestic broadcast you must tune off it immediately; it’s also strictly forbidden to pass on any accidentally overheard information to a third party. This is understandable: imagine you accidentally tuned into a ship-to-shore telephone conversation between two business colleagues, you might well hear some information which might be of value to a business competitor; without the protection of the Wireless Telegraphy Act, the consequences are obvious.

Requirements

Back to the short wave receiver; what do you need to become a short wave listener? This depends on how seriously you want to pursue the hobby. If you are only interested in picking up strong signals from transmitters in the larger countries on a very casual basis, or if you travel extensively and wish to stay in contact with Britain’s Points of view via the BBC’s World Service, then one of the new range of small portable radios is for you, costing between £150-£300. If you are more serious and want to capture signals from the most remote of locations (DXing in radio terms), then a more sophisticated receiver will be needed, costing anywhere between £400-£1000. These receivers are more sensitive, selective and stable than the smaller portables. This means that they can capture weaker, more distant signals and sort them out from the morass of surrounding ones. Having done that they can drift away without drifting slowly away from the station over long periods of time.

To be a proper communications receiver, the radio must have a number of essential features. The most important is the ability to receive signals transmitted using a number of different modulation techniques. (This is the way in which sound or digital information is superimposed on a radio wave, which then carries it to its destination on the carrier wave. The most common are Amplitude Modulation (AM), Frequency Modulation (FM), Single-Side Band (SSB) and Carrier Wave only (CW). Both AM and FM use quite a lot of radio space. SSB and CW signals use much less and so are used by amateurs in order to cram as many signals as they can into the narrow frequency bands allocated to them. Due to their efficient use of radio space, SSB and CW are also beginning to find favour in some commercial applications.

Listening to an SSB or CW signal on AM is impossible, so if you want to hear the amateurs, the set you choose must be able to decode them. Other useful features to look for are special filters to make the SSB and CW signals clearer by eliminating interference, and controls that affect the rate and finesse to which you can tune the set. The best place from which to buy a receiver is an amateur radio supplier rather than an ordinary hi-fi dealer.

Next comes an antenna, or aerial. The portables come with their own telescopic short whip antenna but for more serious listening and better results a more substantial one will be necessary. The simplest is a ‘long wire antenna’, which is just that, a long wire; the better it can be suspended from the roof to some other convenient point, either horizontally or down the side of the house. A feeder cable is then connected to it which leads into the house where it is plugged into the receiver. There are many commercial antennas around, many of which are very large and highly directional. The directional ones are much more sensitive to weak signals than a long wire, but they have to be mounted on a rotating device so that they can be pointed in the direction from where the signal is expected.

A useful and compact type is the Active Antenna. This contains active components which amplify the weak signals before they get to the receiver. Two types worth looking at are manufactured by Datong Electronics and Dressler UK. They cost between £55-£90. Both come with their own power supply and connecting cables.

Whether you choose a portable or a larger communication receiver, the design of the receiver will have been radically affected by the microprocessor. Its introduction brought about two broad changes: size and flexibility. The tuning range of these receivers is vast, from 10kHz in some cases, to 30MHz. In older sets the bit that does the tuning looks rather like a set of bacon slicers (the variable capacitor), it took up a lot of space and was badly affected by temperature changes and physical knocks. This has been replaced by a special computer-controlled tuning synthesiser which is unaffected by temperature and knocks and is an order of magnitude smaller. The miniscule Sony ICF-7600D is testimony to this: it measures only 12cm x 18cm x 3cm and is very light. It tunes from 15kHz to 19.999MHz in 5KHz steps.

The flexibility has increased enormously with the control possibilities offered by the microprocessor. They include: direct entry of the frequency from a keyboard; memories to store known stations; the ability to automatically switch between stored stations searching for active ones; and so on. All these are included in the smaller short wave receivers from Sony, Philips and the British Uniden 2000.

The larger ones offer this and more. The Japanese manufacturers, Icom, Yeasu and JRC all produce receivers in the £500-£1000 range which can be connected to an external microcomputer via their own built-in parallel or RS232 interface. Software is available for most popular micros which will allow the receiver/computer combination into a very versatile scanning receiver.

The scanning receiver lets you enter large numbers of station frequencies, identification notes and receiver
BEST U.K. SOFTWARE PRICES?
TRISOFT LTD. 0629 3021

PROFESSIONAL ADVICE • LOW PRICES • HOTLINE SUPPORT • FAST SERVICE

PEGASUS ACCOUNTING

Regardless of many accountants as the very best accounting software available, Pegas
sus complements existing modules, most of which will operate alone or together in a totally integrated system. We have professionals staff in London and the Midlands, fully trained to install and support Pegas. Prices and details on re-
quest. We are authorised Pegas dealers.

COMPUTER-AIDED DESIGN

As specialist consultants in this field we can supply either software only or a complete system configuration with full support. We are suppliers of AUTOCAD, ODDOLE and a number of other CAD packages. The productivity benefits of CAD are enormous — the cost of a system is almost certainly much less than you would expect. In most cases our clients have found a system pays for itself within 3 to 12 months!

MULTISOFT ACCOUNTS

A system offering top-level functionality at a very reasonable price. Recent press reviews have highlighted Multisoft as one of the most powerful micro-based accounting systems currently available. We can offer very impressive indeed, please telephone for further information. We are officially appointed Multisoft dealers.

DATAMASTER

• 255 fields per record • 255 characters per field • 8000 characters per record • 65535 records per file • 120 characters per index • 255 index fields per file • User password • Customised forms • Menu driven • Select on multiple fields • Produce DIF files • Statistical functions include Count, Sum, Mean, Variance, Standard Deviation, Standard Error. Back-up and restore capability • Extensive on-screen programming.

Telephone to learn more about what we regard as the best relational database currently available (most MS-DOS machines). List price £95. Our Price P.O.A.

HAYES — COMPATIBLE MODEMS

Hayes compatibility is almost essential to fully utilise the facilities offered by the communications modules of packages such as Smart Symphony, Framework, Open Access and, the top communications packages such as Crosstalk, Smartcom II and Microway. Both modem are B.A.T. approved.

TRISOFT SPECIALS

HERCULES MONO GRAPHICS CARD £279
8087 5 MHZ MATHS CO-PROCESSOR £135
10 BOXES SONY DS DISKS £345

LOTUS 1-2-3 £275
FRAMEWORK 2 £325
DBASE III PLUS £335
LATTICE C V 3 £299
MICROSOFT C 2.01 £275
MS WORD 2.01 £269
DELTA 4 £375
PC AUTOMATOR P.O.A.

WORDSTAR PROFESSIONAL £299 £225

All prices are subject to VAT. Carriage is charged at £5.00 + VAT on software orders.

All prices quoted are for IBM. For other formats, please enquire.

PEGASUS SYSTEM

• Xl 10S, 10MB HARD DISK, 1 x 720K FLOPPY, 512K, 2 SCREEN, Keyboard, MSDos. 4 X PEGASUS MODULES. 2 DAYS ON SITE INSTALLATION TRAINING BY A QUALIFIED CHARTERED ACCOUNTANT WITH SEVERAL YEARS MICRO-BASED EXPERIENCE. ONLY £3,495

SAVE OVER £1500
OLIVETTI M24, 10MB HARD DISK, 1 x 320/680 K FLOPPY, 640K RAM, MONO SCREEN, KEYBOARD. MSDos, ROLAND DXY 880 AS PLOTTER, TOS LC 12 DIGITIZER, AUTOCAD, AUTOCAD ADOX 1 & 2, 8087 8MHZ CO-PROCESSOR £5,995

HAYES — SMART!

IN OUR OPINION THE BEST INTEGRATED PACKAGE AVAILABLE FOR IBM-APRICOT

DATABASE • WORPCODEC

* SPREADSHEET • GRAPHICS

TIME MANAGER • COMMUNICATIONS

TELEPHONE FOR OUR TECHNICAL ANALYSIS OR TO ARRANGE A DEMONSTRATION.

PRICE ON APPLICATION

HAYES — SMART!

IN OUR OPINION THE BEST INTEGRATED PACKAGE AVAILABLE FOR IBM-APRICOT

DATABASE • WORPCODEC

* SPREADSHEET • GRAPHICS

TIME MANAGER • COMMUNICATIONS

TELEPHONE FOR OUR TECHNICAL ANALYSIS OR TO ARRANGE A DEMONSTRATION.

PRICE ON APPLICATION

HAYES — SMART!

IN OUR OPINION THE BEST INTEGRATED PACKAGE AVAILABLE FOR IBM-APRICOT

DATABASE • WORPCODEC

* SPREADSHEET • GRAPHICS

TIME MANAGER • COMMUNICATIONS

TELEPHONE FOR OUR TECHNICAL ANALYSIS OR TO ARRANGE A DEMONSTRATION.

PRICE ON APPLICATION

SAGE SUPERDEALS

| SAGE Accounts | £375 |
| SAGE Plus | £695 |
| SAGE Payroll | £195 |
| Accts/Bookkeeper | £495 |
| Accountant | £295 |
| Accountant Plus | £495 |
| £110 |
| £365 |
| £395 |
| £115 |

SAGE DigiMOD 

Olivetti AUTHORISED ACT AND OLIVETTI DEALER

We offer probably the widest range of software in the U.K. Please ask for a copy of our comprehensive price list.

Local authority, government and European enquirers welcomed. Further discounts may be negotiated for large orders.

TriSoft Ltd

Crown Square, Matlock, Derbyshire DE4 3AT

Telephone: 0629 3021

Telex: 8950511 ONEONE G (Ref 129 77001)

Telecom Gold: 83 NTG 344 Prestel: 533454601

APRIL 1986 PCW 119
COMUNICATIONS

control information into a memory bank. These can then be scanned automatically with the receiver stopped at any of them which start transmitting and recording the results on an audio tape recorder. If you don't know what specific frequencies to listen out for, then the system will search all those between a given upper and lower limit. Each package offers many variations on this theme, but the overall advantage of this combination is that you don't have to sit by the receiver all the time - you can go off and do other things and come back later to listen to the tape. You can also take advantage of the diurnal variation in the propagation conditions by letting the system search for stations transmitting on frequencies that are active while you're out of the house.

Most microcomputers transmit a great deal of radio waves themselves. These can bad interfere with the communication receiver and so the micro's case usually has to be shielded by spraying the inside with zinc paint (having first taken the circuit board out!) For people more interested in using the radio as a scanning receiver and not wanting to tie their micro up to it, there is a very good dedicated micro controller for the lcom and JRC range of receivers. Called the POCOM PFC-100, it's Swiss-made and supplied by Dewsbury Electronics at £450. This unit is an intelligent programmable frequency controller. It's built into a well designed plastic-covered metal case measuring 282 x 67 x 220mm and weighs 2.4kg. On the front is an array of push button keys that control all its functions and a liquid crystal display that shows what's happening. Once the unit is connected to the receiver's interface with just one cable, it's ready for action.

All the receiver's functions can be controlled from the keyboard directly. There are one hundred memories which can store the station's frequency, the text describing it, the reception mode (AM, SSB, CW, FM) and, on the NRD-515, even the bandwidth automatic gain control and attenuator can be set. There are also six 12-volt switchable outputs (for turning on different accessories) which can be set in any combination on any one location.

All one hundred memories can be continually scanned and individual dwell (pause) times for each set. They can be split into groups of 10, and then each group scanned at different times using the system's versatile clock. This is a useful feature, especially for listening to groups of stations with a common interest. There's also a special 'wobbler' mode which causes the receiver to continually tune either side of a station's expected transmission frequency by any selectable amount. This covers the probability of the station transmitting off frequency slightly and, therefore, under normal fixed modes, be lost.

The controller will search between any two frequencies in any tuning steps and at a variety of speeds. The set can, of course, be used manually, but has the advantage of being able to store all of its settings when an interesting station is found, at the touch of a button.

Scanning receivers of this sophistication do not guarantee the reception of those elusive DX stations. For those you have to spend time at your set. It takes operational skill and an understanding of the propagational effects of radio to really become a DXer. But they can considerably enhance the pleasure of short wave listening and certainly extend the use of the rather expensive equipment.

This combination of the lcom and PFC-100 is very versatile, and a joy to use. The only thing to come near it is the professional receiver range from the British company Vigilant. It's model v unwav has two hundred memories and the receiver is of the very highest quality. At £3000 it is the lowest-cost professional receiver around, but you'd have to be a very keen amateur SWL to buy it!
PSION CHESS. A FEAST FOR ALL WHO COMMAND PERFORMANCE

Turn lunch hours (and coffee breaks) into right-royal occasions with Psion Chess, acknowledged as the world’s finest microcomputer implementation of the game.

Recent improvements in microcomputer programs have opened the door to superior playing standards. But Psion Chess “...knocks the door off its hinges” (to quote the December ’85 issue of the leading American computer magazine ‘A+’).

What makes Psion Chess such a winner?

Brilliant graphics. Brilliant features. And above all, brilliant playing standards.

Take the graphics. The 3 dimensional display of the board has added a unique realism to the game with an extraordinary players-eye-view that makes ordinary 2-dimensional displays look decidedly flat. (But you can switch to the birds-eye-view, if you want.)

Then the features ... 28 levels of play from novice to champion ... ‘teach-me’ options such as move take-backs and helpful hints on request ... sophisticated analyses of games - not overnight, but while you wait ... 50 classic master games for you to study ... game saving ... a clock for tournament-type contests ... And so on. (You can even handicap the computer, when you’re desperate to win. Or make it play itself, and simply watch.)

Playing standards? Let us just say that Psion Chess was a winner at the 1984 World Microcomputer Chess Championships. And leave you with a quote from ‘InfoWorld’ ... “Run, don’t walk, to the store to buy a copy of the (Psion) program that plays chess so well and is programmed so superbly...”

Psion Chess. Available for IBM PC/XT/AT; Apricot PC/ixi and Apple Macintosh from your local stockist.

Selected for the special Chess Exhibition, Victoria and Albert Museum (Feb-Jun ’86).

For further information or the address of your nearest stockist, phone the Sales Department on 01-723 9408. Trade enquiries welcome.

Psion Limited, Psion House, Harcourt Street, London W1H 1DT

PSION CHESS
PSIMPLY BRILLIANT
of the communication link need to have their transmitters and receivers synchronised with each other. If they go out of sync, then the message becomes garbled.

ASCII transmissions and packet radio have come in with the increased use of microcomputers to decode RTTY. They use data formats similar to those with which computer users are already familiar. Using RTTY, messages can be sent at much higher data rates and with much greater reliability than other methods have allowed.

Objectives

The technology Marconi used was only capable of transmitting telegraphy by pulses, but while it is easy for us to transmit by voice telephony, you may well ask what is the point of all these codes. The answer is twofold. Firstly, voice transmissions use up lots more of the limited radio space; and secondly, RTTY is not as badly affected by interference — where a voice transmission might be completely obliterated by poor reception conditions, an RTTY signal can get through.

References

(2) RTTY Today by Dave Ingram. Universal Electronics Inc.

Contacts

Active antennas
ARA 30 Active Antenna
Dressier UK
191 Francis Road
London E10
Tel: (01) 558 0854

Datong Active Antenna
Datong Electronics Ltd
Spence Mills
Mill Lane
Bramley
Leeds LS13 3HE
Tel: (0532) 552461

Low-cost dumb computer RTTY terminals software
SCARAB Systems
39 Stafford Street
Gillingham
Kent ME7 5EN
Tel: (0634) 570441

Ward Electronics
422 Bromfield Lane
West End
Birmingham B8 2RX
Tel: (021) 328 6070
ICS Electronics Ltd
PO Box 2
Arundel
West Sussex BN18 ONX
Tel: (024) 365 590
Swiss intelligent controllers and RTTY terminals
Dowsbury Electronics (AFR 8000, 2010)
176 Lower High Street
Stourbridge
West Midlands
Tel: (0394) 390063
Radio books and frequency guides
Interbooks (Radio and RTTY books)
Lyon
Stanley
Perth PHI 4QQ
Scotland
Tel: (0738) 828575

General advice
BARTG (British Amateur Radio Teleprinter Group)  
(Membership)
Pat and John Beedle, GW6MOJ/GW6MOK
Fynnionas
Salem
Ullando
Wales SA19 7NP

There are two types of terminal unit: dumb and intelligent. In both cases, the terminal unit takes the audio signals from the loudspeaker or recorder socket of a communications receiver and turns them into digital signals representing the marks and spaces of the telegraphic code. The dumb ones pass these on to a separate computer where software decodes the telegraphy into text. The intelligent ones have a microprocessor and software built-in, decode the telegraphy and send it out of an RS232 or similar port, for printing or further computerised processing.

For dumb terminals prices range from £70 to £150, and a range of software for most popular home micros is available. Each of the telegraphic codes requires different circuitry to enable the audio signals to be decoded into digital form, so the cheaper ones usually only decode Baudot RTTY and Morse. The more expensive ones will also decode TOR and ASCII. The intelligent ones will usually decode Morse, Baudot, TOR (FEC and ARQ) and ASCII, some will even decode packet radio. ICS Electronics makes an intelligent terminal which can be used with its own software or with any micro running a standard communications package. The unit is controlled from the micro, but once it has been set up the actual decoding is done by its own ROM-based software.

Skills

Whichever one you choose, you will have to develop some special listening skills. There are three possible variables associated with any RTTY signal: the two-tone frequency shift, the Baud rate, and the polarity of the mark and space tones — but more on this next month.

Information

For more information about all aspects of RTTY, it’s worth joining BARTG, the British Amateur Radio Teleprinter Group which is dedicated to all aspects of amateur data communications.

The nice thing about RTTY is being able to find an interesting station and then leave the radio alone, coming back later to read the telegraphy in peace; a scanning receiver and dedicated RTTY decoder makes it even nicer.

Whichever computerised communications system you choose:  
DIT DIT DIT DIT DAH, DIT DAH, DIT DAH, DIT DAH DAH, DIT DAH DIT DIT, DIT DIT, DIT.

Next month: The micro and radio telegraphy

122 PCW APRIL 1986
NEW!
FERRANTI/XTECH OEM Business Computer Systems
Based on the FERRANTI PC680 micro computer, these systems have a number of enhancements that increase their capability in the more demanding applications:
1. Combined floppy and hard disk controller providing increased reliability and wider range of storage options.
2. Extra usable expansion slot.
3. Extended port for backup tape unit connection.
4. Most reliable 360K floppy drive available today.
5. Choice of 18 or 40MHz hard disk drives including a 40MHz, 35mb drive with a performance of up to 40% faster in speed over standard drives. These drives were selected after detailed evaluation and are the most reliable available today.
6. FREE 12 month on-site warranty which includes any Xtech peripherals, display adaptors and memory cards which are purchased with the system or subsequently.

PC680 RANGE
PC680
PC680-XT (10)
PC680-XT (20)
£1150.00
£1350.00
£2400.00

All these system upgrades are available on request.

DISKS AT LOW PRICES! 5 1/4" DD/DD 40T 48TP ONLY 99p EACH + VAT (5 + P min 10)

UPGRADE TO TRISOFT
0629 3021

PROFESSIONAL ADVICE ○ LOW PRICES ○ HOTLINE SUPPORT ○ FAST SERVICE

TECMAN CAPTAIN MULTIFUNCTION BOARD
For IBM and compatibles ○ Tecman's answer to AST Six Pak Plus ○ Sub-1% failure rate ○ 12 month warranty ○ Expandable to 384K ○ 24 personal productivity programs ○ Parallel port for fast printing ○ Serial port for communications ○ Clock/calendar ○ Autosave software ○ 10Mb board ○ Diskette encryption software ○ Ramdisk software

TECMAN HARD DISKS ON A CARD
IT IS NOW POSSIBLE TO UPGRADE YOUR IBM PC OR COMPATIBLE WITH A 10 OR 20MBYTE HARD DISK AS AN ADD-IN CARD AS SIMPLE TO FIT AS A MEMORY BOARD. BOTH EXISTING FLOPPY DRIVE DISKS ARE RETAINED AND NO TECHNICAL ABILITY IS REQUIRED.

10 MB HARD DISK £750
20 MB HARD DISK £850

We are dealers for Tecman, AST, Plus 1, Simcon, Intel and many other manufacturers of upgrade supplies.

INTEL ABOVE BOARD/RAMPAGE
TWO MEMORY BOARDS IN ONE ○ FILLS CONVENTIONAL MEMORY BELOW 64KB ○ EXPANDS WORKSPACE MEMORY ABOVE 1MB FOR USE WITH BASIC OR DOS 3.1 AND FRAMEWORK 2.0 ○ SUPERCALC III REL 2.1 ○ INTERNAL CLOCK/CALNDAR ○ 10 Bracket and Quadrant software with scanner and 2 disk drive (RAM disk) ○ £290.00 ○ PLUS FIVE EXTERNAL HARD DISKS FIXED/REMOVABLE SUBSYSTEMS

010M + 5M £245.00
20M + 5M £345.00

TriSoft Ltd
Crown Square, Matlock, Derbyshire DE4 3AT

0629 3021

APRIL 1986 PCW 123
Spectrum 128

The Spectrum 128 has many original features, but is sadly lacking in some of the 'basics', such as a screen and a disk, which might have been expected of a Spectrum upgrade. Guy Kewney finds out just what is offered in return for a high price tag.

The Spectrum 128 is so simple to describe that it hardly seems worth the bother of writing it down: it's a Spectrum with more memory and a few new features, none of which is remarkable, or first-of-its-kind, or even available at a new low price. Indeed, the price of the Spectrum 128 is £179 (or is planned to be, at the time of writing) and to get the benefits of the new machine, you need the 'optional' editing keypad, costing £20.

Logically, there is only one conclusion to draw: there are going to be lots of 'special offers' in the shops. Word has reached me of disks for the Spectrum, using CP/M. I've heard reports that the 'optional' keypad will actually be offered free — and, certainly, there's a space in the packaging where it would fit uncannily well.

I hope all these rumours and reports are true because, really, without these possible 'free' extras, the new Spectrum isn't much of a bargain for the money.

The Spanish Spectrum 128 is not the same machine, but is (although Clive will thank you not to mention this in Madrid) a test bed for this one. It has several little features which are not the same as on the 48k Spectrum, and you can't call it a disaster because word is that Sinclair has sold 25,000 Spanish 128's. But it did annoy software producers.

System specification

Your first question will be: why should I buy a Spectrum 128, instead of an ordinary Spectrum Plus?

Answer: you get lots of extra goodies, which are: a RAM disk; no dot crawl on a television; sound on the television; no internal speaker; proper three-voice synthesised sound, not just beep; a space bar that works; a serial printer socket, usable for Midi synthesisers; a monitor plug with two types of output — RGB, and composite video output; a handy calculator, if you're using Basic; no more complicated hunt-the-right-key Basic keyboard problems; absolute compatibility with the 48k Spectrum (bar a few POKEs); a full-screen editor for Basic; a better Basic than Spectrum Basic, as well as the original; a big, solid lump of radiator fin — a heat sink — which should mean a more reliable machine; and the hope of bigger...
The faster, more reliable games.

That's the good news. What you might wish you were getting includes: a joystick port; the 'optional' £20 keypad and editor box; a disk or even a microdrive interface; a display; a printer cable; a keyboard that you can read, instead of the typewriter's scrawled egg that this machine inherits from the Spectrum; and a keyboard that you can type on, instead of wobbly cushion covers in an arbitrary non-qwerty order.

All the grousers notwithstanding, there is no question that I'd rather have this than a 'real' Spectrum. It's a very noticeable improvement. The question that buyers will have to answer in their own minds is simple: in a world where the Amstrad 6128 is being sold complete with screen, disk and CP/M for £250 (mono) or £340 (colour), isn't £180 a lot to pay for a very ordinary games box?

The three features which stand out are the RAM disk, the sound chip and its serial output, and the total compatibility with the old machine. The total compatibility is really quite uncanny — I've never before known a micro manufacturer to produce Mk II that will really and truly run all the old programs written for Mk I. This one does. But will anyone write programs for Mk II?

Rather stupidly, I'll start by assessing the Basic; stupidly, because it doesn't really matter whether the new Basic is faster, slower, nicer, or whatever — no-one judges a micro on its Basic any more.

**Basic 128**

The new Basic looks identical to the old Spectrum Basic and, indeed, will run the old Basic programs, apart from one or two PEEK and POKE commands which might have been left in by mistake. It is slower (around seven per cent) on the identical programs, but faster on the programs which take advantage of the Spectrum 128's new features. The Basic includes a new, full-page editor with an automatic Renumber command, and, for the first time, keywords are typed in letter by letter. If the Basic were an important part of the machine you could happily spend hours debating the wisdom of this. If it's a good idea now, why did we have keys with four, or five, different functions before? On the other hand, if we don't need to have those crazy multi-function keys, why can't we have a clean keyboard? For example, to type 'greater than' on the old 48k Spectrum, you hold down the Symbol Shift key and press R. On the new one, you do the same. But on the old machine, you have another single key for < (meaning not-equal — greater than, or less than). On this machine, the <> is there on the W key, just like the < and the >, but if you press Symbol Shift and the W key together, nothing happens. You have to type...
Symbol Shift R and then Symbol Shift T.

I suppose, after you've had the machine a month or so, you get used to it. Sinclair's logic is that it had to do it, to be compatible with the old machine. You either agree, or you don't.

New Basic commands

Spectrum: this is the simplest new command, and turns your 128k system into a 48k system. It will then run all your old tapes. I almost guarantee (I do know of one it won't but I don't think you'll get excited about it) and behave exactly like a 48k Spectrum, even to the single-key tries you try to load. This means, it uses little RAM. The Spectrum: this is the simplest new command, and turns your 128k system into a 48k system. It will then run all your old tapes. The Spectrum: this is the simplest new command, and turns your 128k system into a 48k system. It will then run all your old tapes.

Play: to make music, either connect your Spectrum 128 to the TV plug in a cassette recorder and pop in a music tape — yes, the music will emerge from the TV loud speaker — or use the Play command. For a turn-up, you have to convert the notes into a Basic string. The Play command changes the notes played in the following way: the first number is the key, the second number is the duration of the key, and the third number is the velocity of the key. The key is specified by a string of letters, where 'A' is the key of C, 'B' is the key of D, and so on. The duration of the key is specified by the number of microseconds the key is held down. The velocity of the key is specified by the number of decibels the key is pressed. The Play command also allows you to specify the number of strings to be played, and the order in which they are played.

Bundled kit

With the Spectrum 128 there are two Ocean games: Daley Thomson Super Test, a sport simulation (re-written, Ocean assures me, and much better than the 48k version) plus an adventure story, Never-Ending Story, based on the film. This game used to come in three parts, and now it all fits into the machine at once. Ocean is planning to put it on microdrive cartridges.

A power supply, cables for connection to a tape recorder, and (possibly, it is undecided at the time of going to press) a monitor cable, or no plug on the display end, are bundled with the machine.

Conclusion

If you have to use a TV as a display, then it's nice to lose the annoying shimmering effect which is caused by 'dot crawls' on the old Spectrum. On the other hand, Alan Sugar is offering a machine with its own monitor.

If you are fed up with 48k memory and want to run longer or over-laid programs, the 128k Spectrum is a really nice move forward on the old. On the other hand, just about everyone else (bar Acorn) includes a disk in the price these days. And even the BBC Micro has a disk operating system, which at the price you might expect a CD ROM.

A heat sink should eliminate many of the old 'catatonic' machines that turn themselves off after two hours. On the other hand, I leave most of my computers switched on for weeks (it's better for them) — isn't this standard behaviour?

The sound output is a vast improvement on beep, and takes no time off the program in the way beep does. And the sound is almost as interesting as the old Commodore 64 sound (a bit simpler to program, admittedly).

In other words, the Spectrum 128 is very much nicer than the old Spectrum, but pretty damn ordinary compared with anything else. It's a calculated gamble, I suppose. Already, there is a good list of programs and products, specifically designed to work only on the 128k version, and so some software and hardware people are obviously convinced that it will sell. I just wouldn't like to predict how well.

Sinclair Research says that this is an 'evolutionary' product. I say the company had better get a screen and disk out for it, or it runs the risk of having produced just a better dinosaur.

Of course, Sinclair could always cut the price...
In a brave attempt to combat the increasing threat of hackers and pirates, the computer security business has spawned protection devices, and supposedly footrocks them down. Wendie Pearson breaks it down.

In the never-ending fight against hackers, pirates, or anyone else trying to invade your system, computer security is big business.

Everywhere, devices are springing up for the protection of hardware, software, computer rooms and data. Increasingly sophisticated devices are appearing on the software front, while some companies have set up shop to fight the physical removal of equipment.

Two security measures which have been around for some time are data encryption and the use of dongles, neither of which are often explained.

Data encryption works by encoding a message which you need to protect, which is then decoded at the receiving end. The encoding is done via a particular program designed for that purpose.

Single-key encryption is the normal method used, although it is fraught with complications, as the sender and the receiver use the same key.

In a large network, the problem of managing these keys is enormous — a large electronic fund transfer network linking 100,000 terminals to approximately 100 banks would use 10 million individual keys, all of which would have to be changed frequently, according to BT researchers.

Experts, therefore, see public key encryption as the answer to computer security. The fact that this uses two keys — one for encryption and a second for decryption, means that the two keys form a unique combination, so the author of the message must always be who he says he is.

The idea is that once a message has been encoded, neither the sender nor an eavesdropper will be able to decipher it. Messages can only be decoded by the second key, held by its owner. Although slower than single-key encryption, lack of speed is compensated for by the apparent security of the system.

The public key system means that the public directory need not be kept under tight security, and can be referred to whenever the caller needs to send a private message over a public data network using his own private key.

Two British banks are already using public key encryption on their data networks, and computer data banks containing sensitive personal information on individuals are also expected to adopt the system.

A public key encryption chip is reported to be under development by British Telecom, although spokesman David Orr couldn’t give any details on how rapidly (or otherwise) things are progressing.

The principles of public key encryption were first worked out in 1975 by Whitfield Diffie and Martin E. Hellman, electrical engineers at Stanford University, Connecticut, and the first practical implementation was developed in 1977 by Ronndal R Rivest, Adi Shamir and Leonard Adleman, computer scientists at the Massachusetts Institute of Technology.

Dongles

Basically a small piece of hardware, a dongle is usually comprised of a chip inside a cartridge which is encased in black plastic. This sits on the back of a micro, decked out in its black plastic mac, and without its presence you can’t run the software that comes with it. The software contains a recorded program which checks to see if the dongle is pre-
sent, so each package is sold with a different dongle.

When the program is run, it tries to read the dongle, and if this isn't found, it bombs out the program and produces a message on the screen stating the obvious — that is, that you are using an illicit copy.

Having a dongle means that you can copy a disk as many times as you like, the copies unless they can find this running the program will not work. So the micro, disk and clumsy way in which businesses, the software are authorised. Of course, this object, if you would have to break into the program and get rid of the part that detects the dongle. How it got its rather bizarre name is anyone's guess. Ask any software house whether it uses dongles and it will reply: 'What's that?'

A company called Forecaster in Slough offers a number of software protection devices, although its main product is duplicating equipment. Sales manager John Dockett says: 'Our work is nearly always for micros. Our speciality is encryption onto custom software to prevent copying, and customers include Ashton-Tate and Lotus.'

The company is also the UK agent for Access Key, a dongle which works optically. Sold in kit form at £24.15, it consists of a 'domino-sized device.' You enter some special encryption into the program to be protected, and before you can gain access to the program, the computer will produce four flashing spots of light on the screen. At this point, you touch the screen with the domino, and the lights change into a password. This password is displayed on a tiny screen built into the domino, and you enter this number into the micro which then allows you past the password and into the program. This method is used by small companies, as well as central government, research establishments and the police.

Micros protected by Foremaster products include the Macintosh, the Apple, the Commodore, the BBC and the Apricot — the company has a tailor-made, disk-based protection...
scheme for each one. The contents of the disk are added to the program to be used, and they can be used a set number of times, the minimum being 200. Normally used on business programs, there are a variety of titles including Superlock for the IBM, Century for the Apple II, MacLock for the Mac and Toughlock with the Commodore. When the mic wipes out all their precious data. One hacker explained that if a disk-copying program finds an error on disk, it will ignore that whole section of the disk — meaning that you have an incomplete second disk. Meanwhile, it thinks it has copied the whole program, but it hasn’t. What happens next is great fun. All the data disappears, as the program knows that if a particular section is erased, you have the wrong copy.

At PA Computers in London, Dr Costas Solomonides, development manager, says his company provides consultancy on protecting data or communications. 'We have expertise in current security issues and products which include software and hardware for PCs,' he says. 'We protect data kept on PCs and provide secure communications between a PC and a mainframe or local area network.

'PCs are configured to be easy to work with and make changes on; therefore they are difficult to secure. The advantage being that no password passes around. Instead, only random numbers whizz about — different ones each time which makes the system very secure. It's also low-cost, with the calculator costing around US$100 and associated software being loaded onto the mainframe, meaning little tampering with the micro.'

Solomonides is able to supply this system, although it is relatively new, and points out that any alternative may cost a few thousand dollars instead. He also stresses that writing encryption programs requires highly specialised knowledge and experience, as might be expected. 'The writer must be very knowledgeable about the operating system he is working with, so that the software encryption intercepts the addresses that are associated with physical devices which store data, such as disk drives,' he says. 'You need a competent mathematician, who is also experienced in security and programming.' He also advises at his local dealer to something he couldn't do with an illicit copy.

The company reckons that for every original copy of WordStar there are four illicit copies in use. WordStar 2000 was copy-protected, but MicroPro withdrew it because it was causing installation problems on certain machines. Like many commercial packages, users could make three copies of the program, which would record how many times it was copied.

Software houses specialising in games have developed a number of defences. Firebird recently began using a product called Lenslock to protect its games; the first to use the system is Elite, for the Spectrum. Consisting of a special lens and construction sheet, which come with the game, Lenslock looks like an looking-glass surrounded by plastic.

Spokesman Phil Pratt
'You need the lens to be able to read the letters initially produced onscreen, which appear as an absolute mess. Looking through the lens, you can read the characters, which you then tap into the machine to store the image.

Anyone developing a protection device, however, will have to hope he doesn't fall foul of the MOD or the Patent Office, which seized a product called Copylock two years ago (February 1984) from Jim Lamont, boss of JLC Data.

Lamont claimed that tape copying would be impossible using the device, which he described as 'a coded imprint, invisible in use on the master tape, which only appears when someone tries to copy it.'

Lamont intended to license it so that the price of applying it to tape wouldn't work out higher than 2p per copy, but the MOD and the Patent Office got there first and ran off with it, for the purpose of checking whether it was a danger to national security, and Lamont hasn't seen it since.

It is possible that the unfortunate Lamont inadvertently developed something of the same, or similar, to that used by the MOD, but, not surprisingly, neither the MOD nor JLC Data will confirm whether this is the case.

Even the Met has got in on the security act. In autumn 1983, the police launched a property-marking scheme to aid the return of stolen property as a means of proving ownership. The system means grafting your postcode onto your goods, with your house number following on; for example, if you live at 3 Apple Tree Lane and your postcode is PSA 1AA, the system number would be PSA 1AAA. If you move or sell the goods, you simply cross to the old number and insert the new one, using a panel pin or marker.

The FBI is also leaving its mark. Fingerprint analysis combined with a personal ID number makes up a fingerprint analysis system being evaluated at FBI Headquarters in Washington DC. Designed to restrict physical access to high-security areas as well as access to computers and cash-point machines, the Model IDX-10 biometric security system provides electronic fingerprint identification and is made by IdentiX Inc of Los Altos, California. It consists of a central microprocessor and at least one 'personal verification' terminal. Users have to insert a finger into the PVT scanning bay so that the print can be photographed, and the result is then associated with the appropriate PIN and stored in the unit's memory. All this takes one minute.

When you come to use this unit, prompts on the LCD screen instruct you to enter your PIN and insert a finger into the bay. The unit takes seven seconds to figure out if you are who you should be, and verification then appears onscreen.

Anyone inserting someone else's finger for a laugh will be met with a ghastly noise, according to IdentiX, as well as a message on the screen telling you to cut it out (the fooling around, not the finger). Don Wald, vice president of engineering for IdentiX, says the system can lock an adjacent door (one way of keeping staff in the office), log the time of attempted entry and store the culprits' fingerprint for future ID. The system is based on a Motorola 68000 chip, 512k RAM, an 11Mbyte hard disk and back-up floppy, and up to 60 terminals can be linked to each computer.

A recent study by market research firm Frost & Sullivan in the US noted that information security products will be worth over $1.5 billion in 1989, more than doubling 1985's figure of $741.13 million. Computer security is expected to account for nearly 95 per cent of all information security revenue there. Another US market research company, International Resource Development Inc, estimates that the amount spent on data communication and encryption products will hit US$121m in 1987.

Computer crime is considered a national crisis in the US, and Futrex Inc, a company specialising in security systems for banks, government agencies and insurance companies, suggests that serious, embarrassing thefts and crimes committed against large financial institutions are not publicised as no-one is going to want to admit to them and risk losing their credibility. But perhaps if the companies involved could overcome their pride, they might get together to organise a solution.

Many millions of dollars are said to have been lost, and firms often don't prosecute because of fear of embarrassing publicity. A survey by the American Bar Association on computer-aided crime found that about half the respondents had suffered from crime of this sort in the past year. Of these, one third didn't report the crime, and 39 per cent reported the crime but didn't identify any suspects.

Protection

There are a number of companies in the UK dealing with protection; one, Smart Solutions, provides a variety of devices to stop people walking off with hardware. Locking devices such as MicroSecure, DiskSecure and MonitorSecure come in kit form and cost between £13.95 and £26, depending on the combination of kit you choose. The finished result makes your PC look as though it has been wired up to a large drip — but surely that's a small price to pay when you consider that any burglar would have to stagger out with a whole desk attached to a micro?

Action Computer Supplies in Brentford supplies low-cost security systems, such as protecting printers, PCs and other computer equipment, for £11.95 a time. These fit under the unit you want to protect, and result in horrible 105-decibel noises being emitted if someone decides to carry off your equipment.

Sales director Dick Sheppard describes it as an effective deterrent against casual theft, especially bearing in mind the sheer inconvenience caused by the theft of an item such as a PC. Although anyone with any sense will be insured, the cost in business time caused by theft of this kind is a real inconvenience.

Guardmaster, a new company based in Slough, was set up in December 1985 at the same headquarters as Corkey Control Systems (UK) Ltd. While Corkey specialises in access control to computer rooms, Guardmaster protects actual hardware. Corkey managing director Tim Copeman describes the new business line this way: 'Often the whole, we bolt micros down to desks to stop people walking off with them — the idea is to beat dishonesty. You can't easily walk off with a mainframe, but a micro is a different story,' he says.

The company also supplies card-operated locks and other security devices which cost from £100 upwards, for manufacturers and end users. 'The problem in the computer environment is that damage can be caused by people who know what they're doing, as well as those who don't,' he says.

Final thought

Mike Brown, technical manager at Micronet, practically sums up the whole area of security. 'You can never come up with something totally foolproof because people are adaptable and very clever, much more so than machines, and will always come up with a way of cracking something,' he says.
Samuel Dick describes the functions of a memory management unit, and explains why such a unit is an invaluable aid in extracting the maximum performance from a micro.

The ability to extract a quart out of a pint jug has, like alchemy, long been sought after by mankind. Today, the problem reappears in the computer world — the quest continues to extract the maximum performance out of any computer. As software has become more complex, it has grown in size; operating systems and compilers with storage requirements near 1Mbyte are not uncommon, and applications programs can certainly exceed them in size. In many cases, such as digital image processing, it may be the data to be manipulated which takes up the space.

The increasing complexity in software has been matched by the improvement in hardware performance. Processors are intrinsically more able due to their rich instruction sets and different addressing modes. They are increasingly supported by intelligent peripheral handlers, floating-point math chips, and real-time interrupt control units. One of these support chips is the Memory Management Unit (MMU). Totally transparent to the high-level applications programmer, the memory management unit has helped systems programmers to tackle the space problem created by the ever-increasing size of software packages. With common processors, like the 68000 or National Semiconductor’s NS16000 series, which routinely have 16Mbyte address spaces, the MMU’s function is becoming more important.

Filling the jug
To understand how the MMU goes about its task, we must look at how a computer goes about executing a program. Typically, the program will have been written in a high-level language such as Pascal or Fortran, and will have been stored on a disk or tape as source code. In order to translate the source code into an executable form (machine code), the

![Diagram of the absolute loader](image)
The source is compiled to produce object code. Object code is rather like machine code, except that references to code called in by the program are left in dummy form. For example, a user might have written a program which is required to write to the VDU screen (a Basic ‘Print’ command, for example). At compile time, the compiler will translate the ‘Print’ command into a call to a system subroutine which has the task of writing the required string to the VDU. However, the actual address at which the system routine starts will not be appended — only its name will be sent to the object file.

This may seem to be an example of double-handling, but its advantages will be explained eventually. The task of going through the object file and inserting the machine code referred to by the compiler’s calls to routines is handled by the linker. The linker reads in the object file and searches in system and/or user libraries of subroutines to complete the references made by the compiler, and outputs the resultant executable image. The executable image is a file of the machine code instructions that will be resident in the machine’s core when the program is run.

At run time, the operating system loads the executable image into core. To take a simple system, the image will have a start and end in the processor’s address space and will be present in core for the duration of its life — that is, until the running program ends.

The ‘Run’ command sets the program counter to the start address of the image, and execution commences. Such an ‘absolute loader’ (Fig 1) relies on the addresses used in the executable image being those that will be used as the program runs. For example, if a program uses a GOTO instruction, then the compiler will have translated it into a JMP $12E3 instruction where $12E3 is the hexadecimal address of the GOTO’s destination. The addresses used as destinations of GOTOs or subroutine calls must be known at link time. The linker produces machine code for the executable image exactly as it will be at run time.

However, this simple loader has its disadvantages. The processor’s address space may not be clear of other programs and memory-mapping addresses for peripherals, so the loader might have to transfer the program into different parts of memory, depending on the space available.

To solve this problem, the relocating loader is used and the compiler is designed to produce object code which is compatible with the loading technique. Now, the executable image may be placed anywhere in core because the image stored on disk or tape does not contain absolute addresses — instead, it contains offsets calculated relative to the start of the program. When the program is loaded, a constant is added to all the offsets to produce the absolute address. This is illustrated in Fig 2.

The simple relocating loader allows you to place a program anywhere in the processor’s address space by changing the constant, and the final decision about where it is placed can be deferred until the program is run. In a large multi-user machine, user A’s program might be run in the space $115A to $12FF today but in $1044 to $11E9 tomorrow, because those are the only locations in core which are not being used by any other users (this fact will not necessarily be known by the user and will not affect the running of the program).

Quarts into pint jugs

With old computers, small users would stand in awe of large users who, when they piled their stacks of punched cards on the computer operator’s table, would write ‘Full Corners’ on their Card. This two-word incantation signified that their job was so large that the whole of the processor’s memory (which might have been only 32 kilo-words) was required. Today, such precautions are not necessary due to the advent of ‘virtual memory’.

The concept of virtual memory is simplicity itself. When you consider the way in which a processor runs a user’s program, you see that the processor is only executing one instruction at a time; as far as it is concerned, the other parts of the prog-

<table>
<thead>
<tr>
<th>Address</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>0000</td>
<td>7F CLR 8005 ; clear location 8005</td>
</tr>
<tr>
<td>0001</td>
<td>80</td>
</tr>
<tr>
<td>0002</td>
<td>05</td>
</tr>
<tr>
<td>0003</td>
<td>8F LDAA FF ; load accumulator A with 255</td>
</tr>
<tr>
<td>0004</td>
<td>FF</td>
</tr>
<tr>
<td>0005</td>
<td>87 STAA 8004 ; store accumulator A to location 8004</td>
</tr>
<tr>
<td>0006</td>
<td>80</td>
</tr>
<tr>
<td>0007</td>
<td>04</td>
</tr>
</tbody>
</table>

Relocation table

<table>
<thead>
<tr>
<th>Address</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arbitrary</td>
<td>00</td>
</tr>
<tr>
<td>+1</td>
<td>01</td>
</tr>
<tr>
<td>+2</td>
<td>00</td>
</tr>
<tr>
<td>+4</td>
<td>06</td>
</tr>
</tbody>
</table>

**Fig 2** Relocation schematic

Source text

```plaintext
CALL SIN
```

Machine instruction

```plaintext
014F JSR 0F00
```

Linker uses a jump instruction with dummy jump address, and places SIN and 0F00 in the symbol table

Once the linker locates the SIN function, the dummy jump address (0000) will be replaced with the real address of the function

**Symbol table**

<table>
<thead>
<tr>
<th>Function</th>
<th>Address of Jump</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIN</td>
<td>0F00</td>
</tr>
</tbody>
</table>

**Fig 3** Linking
Virtual memory systems recognise that, at any time, the part of the program which is executing or about to be executed by the processor. The remainder of the program is held on disk, and can be called into core within a few milliseconds when it is required.

The memory of the processor — both the actual core of the machine and the disk space allocated as virtual core — is partitioned into 'pages' which are typically 512 bytes in size: a 16Mbyte address space will have 32k pages. Most of these pages will be held on disk — 'swapped out to disk' — while perhaps only 1Mbyte or 2k pages will be resident in the machine's memory. Now you can see why quarts do fit into pint jugs — it's just that not all of the quarts is in the jug at any one time!

The pages come in two varieties: physical pages, which are pages of real memory — 'core'; and virtual pages, which are purely a software convenience. To see how the pages work and how the processor organises its memory at run time, let's consider an example.

A user runs a program on the machine. The operating system allocates the program 20 pages (virtual), which are numbered from, say, 101 to 120. The program starts at page 101 and ends at page 120. When the system loads the program, only five physical pages are available in core, so pages 101 through 105 are loaded into memory and the processor starts to execute code contained in virtual page 101. As execution proceeds, page 105 is finished with, and as there is no more physical memory containing program instructions, virtual pages 101 through 105 are swapped out to disk and the next five virtual pages are brought in to core. When that has been done, execution of the program continues.

This is the importance of the re-locating loader — being able to swap pages of program code to and from core relies on being able to execute code anywhere in the address space.

Invisible to the CPU

Keeping track of which virtual pages are in core and which are swapped out to disk would be very wasteful of processor time: it would have to calculate the physical address for each memory access from the virtual address.

Enter the Memory Management Unit. Each time the processor attempts to access a memory location, for either a read or write operation, the MMU translates the virtual address contained in the software to the physical address. If the physical address is in core, the memory access proceeds. If the required location is not resident in core, the MMU will set about loading the page of memory containing the required location from disk into core. This translation and loading is invisible to the processor and the user; all the user sees is a large program or large arrays of data being handled effortlessly by the machine.

The translation procedure is performed by the MMU with the help of the operating system. Inside the MMU, a table is maintained of correspondence between virtual and physical pages — rather like a dictionary which allows us to translate between languages. This table is maintained by the operating system and the MMU, and is typically known as the Page Translation Cache.

Apart from memory management, the MMU performs other duties. Within the MMU, the operating system can set protection flags on a page that, for instance, allows read only access or access only to privileged users. Protection is important on most multi-user systems: it helps prevent the hacker syndrome and, in real-time applications, where a multi-million dollar facility is being controlled online, it can prevent software bugs from spreading catastrophe.

Dynamic (at run time) debugging is simplified by the MMU because it can carry out hardware breakpoints during program execution, and can also trace the last few operations of a program before, say, a conditional GOTO. Anyone who has ever used a dynamic debugging tool appreciates the improvement in the ability to make the processor watch certain variables (to see when they change value), examine the value of or deposit a new value into a variable while the program is running, greatly eases detection of non-syntax errors.

The MMU can also keep an eye on hardware errors. Most memories have sophisticated error correction and control hardware built-in, and virtual memory systems help the computer engineer to design-in robustness. When the machine runs its diagnostics, extensive checking of physical memory takes place. If a fault is found, the software marks the page in which the error occurs as 'unavailable'. As the operating system is accustomed to shunting pages of virtual memory around to place them in unused physical pages, the avoidance of bad pages of physical memory does not cause severe problems; a large number of bad pages will only slow down the machine because more swapping has to be done to avoid them.

Working together

With memory management units proving so useful in address translation and debugging, it is obvious that they should be an integral part of any system architecture. How do the processor and the MMU work together? The exact method is dependent on the processor.

The National Semiconductor 16000 series processors (which range from 8-bit through to 32-bit CPUs) use a different technique to Motorola's 68000. When a 16000 series processor wakes up after a Reset command, it checks to see if an MMU is present. If the MMU is not present, memory accesses take four clock cycles: the address is placed on the address bus during the first cycle while the data is read-in during the
For Brighter Ideas...

COLOUR

DOT MATRIX The JUKI 5520 gives you seven separate colours (ideal for spreadsheet) for the price of black-and-white! What's more, a flick of its "dip-switch" brings instant compatibility with both the Epson JX-80 and the IBM Colour Graphic Printer. The JUKI 5520 also features Near Letter Quality print standard, full graphics mode and built-in paper tractor. PLUS bi-directional text printing at 180 cps. The JUKI 5520. One of our brighter ideas.

...and Quicker Thinking

The JUKI 6200, on the other hand, is a low-cost, high-speed daisywheel with full word processing support. Print standard is significantly crisper and clearer than Full Letter Quality, and its extra-wide 16" platen will cope with even the largest documents. Best of all, it gives you a maximum print speed of 32 cps with a standard DIABLO* 96-character wheel. The JUKI 6200. Quicker thinking.

* DIABLO is a trade mark of Diablo Systems Inc.

JUKI (EUROPE) GMBH
Eiffelstr. 74 - 2000 Hamburg 26 - F. R. Germany
Tel.: (0 40) 2 51 9271-23 • Telex: 2163 961 (JKI D)
Fax.: (0 40) 2 51 27 24

Sole distributor: Micro Peripherals Ltd
Interv 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 Atari 520ST Personal Computer has a list of qualifications as long as your arm. With a powerful 16 bit processor and 512k of memory linked to high resolution graphics and 512 colours its work is fast, clear and sharp on your screen, no matter how demanding the task.

Controlling the 520ST is easy through its mouse and unique operating system incorporating GEM desk top manager, whilst its eleven peripheral connectors including MIDI interface enables it to mix and communicate easily with other computer products.

The ST which presents itself in smart modern styling comes with powerful BASIC plus Logo programming languages, a word processor and drawing programme, yet costs only £652* including disc drive and black and white monitor.

Why? Because at Atari we bring up our products to work hard for their living.

*This price is exclusive of VAT.

GEM® is a registered trademark of Digital Research.
The New
MT 85/86 printers
are as quiet as a...

Take a listen to the new MT85 and MT86 serial matrix printers. They're amazingly quiet. Which makes their performance definitely something to shout about.

The MT85 is a compact 80 column printer, while the MT86 offers a full 136 column width. Both print high speed draft output at 180 cps. And high quality correspondence at 45 cps in various typestyles. Then there's compressed, expanded and bold print for even more variety. And of course graphics.

Flexibility doesn't stop there either. Both printers take continuous fan fold and single sheet stationery in their stride. And they're totally compatible via plug-in interface modules—IBM PC and Apple Macintosh included.

The new MT85 and MT86 from Mannesmann Tally Europe's leading matrix printer manufacturer.

The quiet revolution in print. Contact us now for our literature pack.

MANNESMANN TALLY
MANNESMANN TALLY LIMITED MOLLY MILLARS LANE WOKINGHAM BERKSHIRE RG11 2QT TELEPHONE (0734) 780711
IBM PC and Apple Macintosh are registered trademarks.
Clock cycle: one period of the system's timing oscillator
Handler: hardware and software designed to allow the processor to control a peripheral
Linker: a program which 'joins together' the various procedures in a user's program
Loader: a program which loads primary memory from the secondary store
Offset: that part of an address which represents the location of a byte within a page
Page: an arbitrarily-defined section of memory — typically 512 bytes
Page fault: a state generated when the page required by the processor is not in core
Page number: that part of an address which defines which page a particular address occurs on
Page table: a section of memory (which may be within the memory management unit) in which the map giving the relationship between virtual and physical addresses is kept
Physical address: the address which will be present on the address bus of the memory
Relocation: the process of moving a section of code in memory or altering the addresses within a section of code so that the code executes in a manner independent of its place in core
Symbol table: a section of memory used by the linker which acts as a cross-reference dictionary for the calling address of subroutines, functions, and so on
Virtual address: the address which is placed on the address bus by the processor — a notional address which has to be translated by hardware into a physical address

Fig 5 Glossary

fourth cycle. However, if the MMU is present, the processor configures itself so that memory accesses take five machine cycles. The processor places the virtual address onto the address bus during the first cycle. On the second cycle, the MMU places the translated (physical) address onto the bus and issues a Physical-Address-Valid signal. The data is latched into the processor during the fifth cycle when the Read-Data strobe has been activated. Contention over the address bus while the MMU is in control of it is prevented by the processor placing its address port into a high-impedance state, leaving the MMU to specify the physical address.

If the MMU has to update its internal translation table or a page of virtual memory has to be brought into core, the MMU goes about the action autonomously.

The 68000 processor also has an MMU chip. Unlike the NS16000 series MMU, the 68000's unit is placed in the address bus between the processor and the memory. If a page is selected and results in an access violation because the page of virtual memory has to be loaded into core, the 68000 idles until the page is made available. In multi-tasking systems, the idle time would be allocated to another user so that no machine time is wasted.

The Intel 80386 processor contains a memory management facility within the processor chip itself, which breaks the memory space of the processor into pages just like the other processors. Intel uses larger pages (4k), which allows the 4Gbyte physical address space of the machine to be mapped within the registers held in the processor.

Conclusion

What do virtual memory and the MMU mean to the average user? The advantages are really only apparent on large systems, although there is nothing to stop MMUs being used on 8-bit micros. With large, powerful machines, virtual memory gives the programmer freedom from having to worry about fitting a program into the physical (core) memory of the machine. Images, perhaps 2048×2048 pixels in size, can be handled using a machine with only 1Mbyte of core. As code has to be able to be used at any address in core, compilers and linkers produce machine code that can be shared between users so that the machine gives a truly interactive feel. Virtual memory brings us one step closer to having the perfect machine which is free from all physical constraints — just what the users want.

And the MMU? It just sits quietly by the processor, helping as required. The MMU lets even the processor forget that it has a limited physical memory, and guards sections of memory against illegal access. If someone is debugging, it helps the processor watch for users' program breakpoints.

And what of the future? An attractive scenario is one where each individual has a powerful, personal workstation — almost a return to single-user systems. As the price and physical size of fast-access semiconductor memory continues to decrease, it is tempting to speculate that the importance of virtual memory will decrease. The full addressing range of even 32-bit processors may be fully implemented as core — then quarters will fit into pint jugs.
The only language for the Macintosh which Microsoft has produced prior to Logo is Microsoft Basic. When it first appeared, as version one, criticism was levelled at it because it did not make sufficient use of the Mac's features. This was remedied in version two, which allowed full control of windows, pull-down menus, and so on.

Microsoft Logo, unlike Microsoft Basic, has not been written by Microsoft but by Logo Computer Systems Inc. It also has the sanction of the father of the Logo language, Seymour Papert. My expectation was that a version of Logo which had been approved by the highest authority, and which was to work on the Macintosh, would be a very exciting product. In some respects Microsoft Logo easily lived up to my expectations, but in others I found it hard not to feel disappointed.

In use

The Microsoft Logo package comprises a single disk and three manuals: a Reference Manual, a Guide to Programming and a Quick Reference Guide. The disk includes various files apart from the language itself: there are several Logo demonstrations; and various files concerned with configuring Logo to suit your preferences and the amount of memory available. I was pleased to see this, as other versions of Logo I have looked at only recognise a maximum of 64K memory.

Not surprisingly, Microsoft Logo is heavily influenced by the Macintosh, with separate windows for different purposes. Initially the display shows two windows — one labelled Text, the other Graphics. The menu bar at the top of the screen shows three options — File, Edit and Debug.

Communication with the language is via the text window, where there is a flashing cursor which can be moved using the mouse and pointer. Any text typed is inserted on the text window at the cursor. Initially I couldn't make the language react to anything I typed, but the documentation states that the Return key moves the cursor to the start of the next line. What I needed was the Enter key. On the American version of the Macintosh keyboard this has the word 'Enter' printed on it; the British version has a symbol like a letter K on its side. I discovered this by trial and error.

The demonstration programs written in Logo which accompany the language show that this version of Logo is certainly capable of some very powerful things. Almost all the Macintosh features can be controlled; the only exception is pull-down menus, and no indication as to how to use them is available at the time of writing.

Logo is a structured language but is slightly unusual in that it is modular, and is related to Lisp in the way that it uses lists and properties. Microsoft Logo has all the commands of a standard Logo for list processing, program control, workspace management, turtle graphics, variable assigning and mathematics, and these all work as expected. However, there is one difference in the format of standard commands between Microsoft Logo and other versions of Logo I have used, and this is the IF command. On previous encounters, the command consisted of IF followed by a predicate such as: A = 8B followed by one or two lists of commands. If the predicate was true, the first list was executed; if not, the second list was executed, if it existed, otherwise the next command was executed. Microsoft Logo separates these two possibilities into two commands, IF and IFELSE, with one or two lists to be executed respectively. Fortunately, this does not make it too difficult to convert programs to Microsoft Logo from other versions.

The standard Logo convention of having a separate editor for inputting procedures is adopted by Microsoft Logo. This can be activated from a pull-down menu or from the standard text entry window. Control of editing, such as inserting and deleting, is as delightfully simple as it usually is on the Macintosh. When editing is finished, control drops back to the text window and a message appears confirming that all the procedures entered have been defined.

Procedure execution is straightforward and output is directed to the text or graphic windows as appropriate, and everything is fine until a bug is discovered in the program. I found it very difficult to work out how to use the debugging facilities available, and when they were working I found them extremely unfriendly. Debugging information is directed to a debug window which has to be opened separately. To be of much use, the editor window also needs to be open, showing the listing of the procedure being debugged, and the text and graphics windows should be open to examine output. All these open windows have to be continually moved about and resized while debugging is taking place, which makes the process slow and irritating. It also means that graphics displays are sometimes overlaid and destroyed if another window needs to be expanded.

Interfacing

The most interesting part of exploring the language is finding out how
well it interfaces with the Mac's facilities which are not available on other machines. Previous languages such as Mac Pascal and Microsoft Basic have done this very well, and I had great hopes. A look through the manual convinced me that a comprehensive attempt has been made, apart from one glaring omission — pull-down menus. As a test of windows, graphics and mouse control, I wrote a simple, quick painting program which used a small oval brush shape. All it did was check that the cursor (controlled by the mouse) was in the graphics window. If it was and the mouse button was pressed, then a small black oval was drawn at the cursor position. The program then looped around. The program was approximately 10 lines in length and worked perfectly after some debugging of the graphic window.

Microsoft Logo's new, extra graphics commands allow the following facilities: choosing fonts and patterns; designing patterns; setting plotting width; drawing lines and shapes; filling; and changing cursor shape and font styles. These all worked as expected and quickly.

The new window commands are very interesting. Windows are set up as text or graphics and each has to be named; output can then be directed to any open window by giving the name. Commands are available to convert between whole screen coordinates and those within a particular graphics window. Windows can be moved and resized under program control as well as saved to and loaded from disk. Mouse commands are as expected, with the cursor pointer tied to the mouse position and primitives to check the state of the button and the window the cursor is in. Logo primitives are basic commands within the language and are, effectively, automatically-defined procedures.

Surprisingly, considering Logo's educational bent and the fact that it makes no claims to being a serious systems programming language, the disk access and filing commands are extensive. They allow the complete construction of things such as disk-based random access databases, and in some ways this makes sense considering Logo's underrated potential.

As a list processing language.

The available workspace management commands include some to control which disks are in the Macintosh, to remove comments from procedures and to hide procedures from view, as well as the usual ones to show contents of the workspace and to tidy it up.

Apart from the usual variable assignment commands, Macintosh Logo also fully covers properties. Any Logo word can have a property list associated with it (a property list is a list of attributes and values which are associated with a particular name). For example, Fred (hair black eyes blue weight 175 shoe 9) is an obvious property list associating the given values with the name Fred. A full set of primitive procedures is implemented to control and access these property lists.

An additional data type is allowed in Microsoft Logo: this is the array. One qualm I have always had regarding Logo is that it does not have a data structure like an array where data can be stored and retrieved extremely quickly, without having to look for it as with lists. An array in Microsoft Logo is, effectively, a list which has a specific number of elements. Elements of the array are accessed by their position within the array. It is also possible to convert a list into an array and vice versa. Some of the operations that apply to lists can also be applied to arrays, such as Count, MemberP, EmptyP, and so on.

One interesting addition to the mathematical calculations that can be performed are the commands Annuity and Compound which calculate annuities and compound interest. These are available presumably because they are part of the libraries available to Macintosh software developers.

In February 1985 PCW reviewed three versions of Logo for the BBC Micro, and four primitive Benchmarks, plus their listings, were given:

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edit</td>
<td>40secs</td>
</tr>
<tr>
<td>Line</td>
<td>78secs</td>
</tr>
<tr>
<td>Hamlet</td>
<td>13secs</td>
</tr>
<tr>
<td>Street</td>
<td>26secs</td>
</tr>
</tbody>
</table>

Fig 1 Benchmark results

Documention

The documentation accompanying Microsoft Logo is extensive and thorough. The Guide to Programming manual is really a guide to programming in Logo, with specific emphasis on the Macintosh and Microsoft Logo. Novice Logo users should find it an easy introduction to the language and this particular implementation.

The other main guide is the Logo Reference Manual which gives all the definitive answers. It is useful for people who know Logo and who simply require the finer details of how it operates.

Conclusion

Microsoft Logo is a powerful version of Logo, and has many facilities which make use of the capabilities of the machine on which it runs, the Apple Macintosh. It is suitable for people who wish to learn Logo or who wish to program in the language more seriously. Its structure conforms closely to previous standards, except in one detail — the use of the IF command.

Nevertheless, the interface with the user and the interface between the language and the machine are not as good as they could, and should, be. Experienced Macintosh users may find the language clumsy, although those new to it may not notice anything untoward. The package is rather expensive, even for educational users, although for those who want a comprehensive version of Logo with access to considerable power and memory, there is little to compete with it.

Microsoft Logo is available from Microsoft or its dealers at a retail price of £145, discounted to approximately £100 for educational users.

APRIL 1985 PCW 141
When Intelligent Environments first launched Déjà Vu, it billed the product as an intelligent database, a decision modeller and an electronic notepad. Wisely, the company has decided to reduce the confusion and concentrate on decision modelling as the primary application.

It is worth pointing out to those who would like help with complex decisions that they can also use Déjà Vu as a jotter-cum-database in between bouts of decision-making.

The program on the screen is presented in a straightforward way. The presentation of the program is excellent — a feature which is unfortunately not shared by its manual. To be perfectly frank, you would understand Déjà Vu much more quickly simply by using it, rather than trying to glean any insight from the manual. All is not lost though. I called Intelligent Environments to announce the bad news, and the company admitted that it already knew and had commissioned a new (extended) manual.

I don't want to labour the point because Déjà Vu is a very neat product, but if the manual had been better written it would have knocked a day to a day-and-a-half off my learning process. As it was, it took me two days to fully understand the product. Don't wait for the new manual if you need the product now, just keep a copy of this review — it may come in handy.

Decision-making

At the most superficial level, decision-making is simply a case of choosing between alternatives (called 'Options' in Déjà Vu). We ponder our options until one emerges the winner. The more systematic among us may even list the options in order of preference. You won't be surprised to learn that Déjà Vu presents its conclusions in exactly that way.

Before we reach our decision, we will have examined all the factors which affect the final outcome. If choosing a car, for example, we will have looked at the various common features — seating capacity, petrol consumption, top speed, insurance group, and so on. Some cars may even have unique features which separate them from the others and these need to be taken into account. Power-assisted steering or a sun roof might fall into this category. Each option may be assessed on the features it has in common with the others and then the overall 'score' for each may be adjusted according to the unique features. Deeper down in the decision might be sub-options or more detailed contributory factors. For example, petrol consumption will comprise urban cycle and high speed figures. In this way we plunge ever deeper into the details of a decision and somehow, miraculously almost, we decide, then act. And breathe a sigh of relief, because complex decision-making is certainly tough on the old brain.

Business decisions, like where to apply information technology next, are very complex, and to model the entire area which contributes to the decision is not easy unless you have access to something like this package. It enables you to build hugely complex models full of options, special factors and weightings. What's even more useful is that you can play 'what if' by tweaking the importance or weighting applied to each piece of information supplied. Time after time, Déjà Vu will re-evaluate the model and present its new conclusions, usually in a matter of a few seconds.

There is absolutely no doubt that the really great (and the really awful) human decisions owe much to 'gut feel', and you may be sceptical of a system which offers the facilities described here. But it is also true that the more we understand the component parts of our decision-making processes, the more frequently will our 'instincts' prove to be right. Déjà Vu enables you to create a map of the problem area which you can roam around and experiment with, gradually gaining the sort of insight which leads to the great 'instinctive' decisions.

Structures

Déjà Vu's complexity is derived from a number of very easily understood concepts. First of all, you may hold any number of decision models in memory at the same time, subject to memory limitations. This is useful when common factors affect different decisions; it saves re-entering information for each decision model.

Since the information is already in memory, albeit in a different model, Déjà Vu provides simple copying facilities to enable you to duplicate entries (but more on that below). Each model bears a name of up to 30 characters and Déjà Vu maintains a list of these called the 'Subjects' list, or page. A page is a list of items which may be longer than the display area of the screen. Additional information on the page, but off the screen, is indicated by arrows at the top and bottom of the display, depending on where the screen window is in the page. All Déjà Vu printing activities are based on these pages.
Each subject, or decision model, will have all the parameters and options relating to that decision descending from it in a hierarchy of pages, sub-pages, sub-sub-pages, and so on. Apart from the Subjects page there are only two other types of page — 'Options and Points'. The Options page is a numbered list of alternatives to choose between. In our case example, the top-most Options page might have listed cars such as the Mini, Nova and Fiesta. But, since most decisions require lower level options to be selected, Options pages are allowed anywhere in the model.

The Points pages carry facts about decisions; criteria if you like. Again, from the car example, you might expect to see entries for the number of seats, the fuel consumption, the top speed, and so on. Values are attached to these Points and it is the combination of these values which leads Déjà Vu to decide the ranking of the various Options under consideration. The only problem is that having given a Point a value, this is shared by all other Points of the same name. As we shall see shortly, this can be overcome and it is also not 100 per cent true. But first, you need to learn more:

— Each Option or Point may have its own lower level Points and/or Options page attached to it. In this way, we break down decisions into ever smaller details. The results from the lowest level pages are passed up to the next level which in turn are evaluated and passed up to the next level until eventually the results are attached to the entries in the topmost list of Options. (See the Calculation box for details of the method used.)

This may be clear for entries which have just Points or just Options hanging from them but we need to consider the case of entries with both Points and Options attached to them. This is where we overcome the problem of different Options sharing the same Points. When an entry has both Points and Options attached to it, Déjà Vu treats them as an Option/Point matrix. Each Option/Point pair is treated separately. In our case example we can have a Fuel Consumption Point on each car Option.

This is how a simple decision model might look:

Subjects page
Car decision
Options page
1. Mini
2. Fiesta

5. Nova
Points page
Seating capacity
Fuel consumption
Top speed

This could be visualised as a matrix (as shown in Fig 1) I find it convenient to imagine Déjà Vu model structures like this:

An entry on any type of page
Options . . . . Points page

The dotted line between the Options and Points pages reminds me that if both exist beneath an entry, then they are combined to form a decision matrix. And there is no reason why you shouldn't have complex structures involving nested matrices. In fact one of the examples given by Intelligent Environments is that of an economic model where companies are assessed in the form of a matrix; the results of these assessments are passed up to a higher level matrix which is looking at industry sectors according to the same criteria.

How to score

Now it's all very well to know that we can combine these structures into models of ever-increasing complexity. What we need to understand is how the values are assessed for each Point and Option.

Déjà Vu can only get values from the Points entries, so all the Points at the lowest level in the model are evaluated and the results passed to the level above. The only exception to this is in the case where we have a Point and Option page pair. In this case, the matrix is evaluated and the results attached to each Option in the list. The Déjà Vu user may attach a weighting to a Point in order to reflect its importance. In this way we may decide that seating capacity is more important than top speed, but less important than fuel economy. When the score arrives from down below, it is modified by this weighting before being attached to the higher level Point.

Once the ball starts rolling you will find results being passed up from Options pages, but which ones? The answer is either the highest score or whichever one the user forces up. We will see later that models may be evaluated ("analysed" in Déjà Vu jargon) under Déjà Vu control (Auto) or by the user (Manual).

We will also find values being passed up to Options which already have values coming in from a paired

<table>
<thead>
<tr>
<th>Seats</th>
<th>Fuel</th>
<th>Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mini</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Fiesta</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Nova</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig 1 Matrix layout
If you run a small business you'll know, only too well, how much unproductive time you spend on that necessary evil, paperwork.

Quest Business Software for the AMSTRAD, IBM and COMPATIBLES and most CP/M micros will, quite simply, relieve you of the paperwork millstone and can PAY FOR ITSELF in as little as ONE MONTH by dramatically increasing your efficiency and profitability.

Since our award-winning CASH TRADER was published last year we've considerably expanded our range of Business Software to save you time on accounting, searching through files, typing letters and producing reports.

As many of our packages are available for evaluation prior to outright purchase, you've everything to gain by ordering today. Just because our software costs less it doesn't mean that we've cut corners or skimped on detail - thousands of users, world wide, will testify to that!

All Quest Business Software is very easy to use and we've paid particular attention to provide detailed documentation, and, should you need it, ongoing support.

You could say that we haven't slept... So you can.

AMSTRAD BUSINESS CONTROL SYSTEM
QUEST BUSINESS CONTROL SYSTEM?
THE LOW-COST FULLY INTEGRATED ACCOUNTING SYSTEM WITH OVER 30,000 USERS WORLDWIDE!
"Behaves like much more expensive software, and is well structured" - What Micro Feb. '86.

These accounting systems designed for the Amstrad, IBM (and compatibles) and most CP/M micros put the power of fully integrated accounting within even the smallest budget. The three modules, of which the system comprises, are Sales Ledger/Invoicing/Stock Control: Purchase Ledger: Nominal Ledger. Modules may be purchased independently if required and full software support is available.

All packages are fully documented and an evaluation suite for ALL THREE modules is available.

EVALUATION COPY ONLY £19.95! (34 day Money Back Guarantee)

CASH TRADER**
"If your paperwork tends to be somewhat haphazard, Cash Trader is brilliant at creating order out of chaos" - What Micro Feb. '86.

Cash Trader has sold over 5,500 copies since its launch last year and has been universally acclaimed. Designed for business people - not accountants - Cash Trader is as easy to use as a Cashbook with the added advantages of automatic totalling and cross costing, the ability to produce printed reports for VAT and Auditors' requirements and the tremendous benefit of accepting ANY TYPE OF ENTRY IN ANY ORDER - eliminating tedious manual paper work sorting.

Additional reports from CASH TRADER may be simply produced with ANALYSER - a low cost add-on module.

Cash Trader and Analyse are supplied with full documentation and software support, if required.


EVALUATION COPY ONLY £19.95! (34 day Money Back Guarantee)

* For Amstrad CPC 6128, 6164 and 6144 (Twintwin). IBM. Compatables and most MS/DOS or CP/M machines. Cash Trader cannot run on a single drive.
THE AMSTRAD POCKET SERIES

WORD PROCESSING: SPREADSHEET: DATABASE: REPORT GENERATOR 'Office Automation at a price to suit your pocket'. Sold in 62 countries, these four essential business tools originate from Micropro - the authors of WORDSTAR - the best known software package ever produced.

POCKET WORDSTAR WITH MAILMERGE - Professional WORDPROCESSING with a host of features and incorporating MAILMERGE to allow personalised letters and address labels, etc., to be extracted from MAILMERGE.

POCKET SPELLSTAR - will check the spelling in your correspondence automatically, from a 'dictionary' stored in your computer.

POCKET CALCSTAR - Enjoy the benefits of accurate forecasting and planning with this spreadsheet.

POCKET DATASTAR - Your electronic filing cabinet in which valuable information is held safely and is accessed and sorted at the touch of a button.

POCKET REPORTSTAR - Designs and generates the reports you need - in the form that you require them. Invaluable when used with DataStar.

WORDLINK - Links ABC accounting with POCKET WORDSTAR to enable details from your ledgers to be utilised for WORDPROCESSING. Wordlink, for example, will enable you to send personalised letters to all accounts more than 30 days overdue - Automatically.

TYING TUTORS

KEYBOARD COACH - Absolute beginners will soon increase their speed and accuracy with this easy-to-use tutor. MASTERTYPE - for 'two fingered typists' to help bring other fingers into play WITHOUT starting from scratch.

MATCHBOX

The stand-alone Electronic Card Index you can't afford to be without!

Only £29.95

MATCHBOX is one of the easiest to use software packages ever designed. It allows you both to store information (e.g. customer records, product specifications etc.) and then to sort it in a variety of forms you may then use. If required, to print out lists or labels.

Features include:

• Up to 60000 records per file
• Up to 30 Alpha or Numeric fields per record
• Sorts on any selected field.

MATCHBOX is equally valuable for business or private use!

WAGES AND SSP*

How much time do you spend calculating wages, tax, and N.I. or maintaining SSP records? Too much?

Our WAGES and SSP package takes all the hassle away by automatically calculating salaries, wages and overtime. Income tax and N.I. contributions are also calculated and pay slips produced together with comprehensive payroll reports. The system also includes Year End Forms P45/P65 and P35 (CS). Full SSP records are maintained, sick pay due calculated and reports printed.

Annual updates for Tax and N.I. changes are available together with full software support, if required.

EVALUATION COPY ONLY £39.95
(14 Day Money Back Guarantee)

* Runs on AMSTRAD CPC 6128, CPC 464, and 64.

SOFTWARE FOR ACCOUNTANTS*

SHOEBOX: A powerful Incomplete Records Program produces Trial Balance, Profit & Loss A/C and Balance Sheet, simple to use, rapid entry routine, automatic VAT extraction. Links to Wordstar for tailored reporting, comprehensive audit trial, up to 300 Nominal Accounts with 99 sub analysis codes in each.

POCKET WORDSTAR accepts Final Accounts reports from Shoebox, formats and prints. Shoebox offers comprehensive editing and printing options.

TIME RECORDER records Time and Disbursements. Caters for up to 200 clients with 150 charge rates, produces comprehensive WIP reports.

* Popular for Accruals, IPM and Personal tax accountants.
* AMSTRAD CPC 6128, CPC 464, and 64 with hard drives and most domestic computers.

Evaluation Copies

Evaluation copies are usable but a restriction on the number of entries exists.

On payment of the balance you will be given a password to remove the restriction and enable full use to be made.

If, for any reason you find the product unsuitable for your purposes, send the evaluation copy back within 14 days for a full refund!

I enclose my cheque made payable to Quest International Computers for

Total:

Please debit my Access/America Express Card No:

Address:

Type of Business:

Quest International Computers Ltd., School Lane, Chandlers Ford, Eastleigh, Hants. SO5 3YH Tel: (0421) 66488
ignore the rest —
we are the very best

OLIVETTI M24
Internal 10Mb hard disk
Olivetti monitor
Olivetti keyboard
640k ram MSDOS
£1795

OLIVETTI M24 SP
10Mhz clock speed
Olivetti 20Mb hard disk
640k ram MSDOS
Olivetti monitor
Olivetti keyboard
£2395

OLIVETTI Twin 360k
Disk Drive
Olivetti monitor
Olivetti keyboard
256k ram MSDOS
£1495

OLIVETTI Single 360k
Disk Drive
Olivetti monitor
Olivetti keyboard
256k ram MSDOS
£1395

OLIVETTI M24
Internal 20Mb hard disk
Olivetti monitor
Olivetti keyboard
640k ram MSDOS
£1895

OLIVETTI Printers

DM280 80 column 160 cps 35 cps NLQ £290
DM290 132 column 160 cps 35 cps NLQ £360
DM580 132 column 160 cps 80 cps NLQ £875
JP101 80 column 100 cps inkjet £195
DY250 132 column 25 cps daisy wheel £555
DY450 132 column 45 cps daisy wheel £795

OLIVETTI Add-Ons

20 Mb tape streamer £895
Internal ½ Ht. 10 Mb hard disk £495
Internal ½ Ht. 20 Mb hard disk £695
512k up grade chips (min order 5 sets) £85
128k up grade chips (min order 5 sets) £30
8087 math co-processor £165

Epson Printers

FX85 80 column 160 cps 32 cps NLQ £328
FX105 132 column 160 cps 32 cps NLQ £425
LQ800 80 column 180 cps 60 cps NLQ £445
LQ1500 132 column 200 cps 67 cps NLQ £825
JX80 80 column 160 cps 32 cps NLQ £420

All other Epson printers available

We supply everyone from leading UK companies, government departments, educational establishments, local authorities, the computer trade to small businesses and the private individual — anywhere in the world!

Call us now — in your area!

Edinburgh 031 556 9903
Newcastle 091 276 6887
Manchester 061 228 7965
Nottingham 0602 583461
Birmingham 021 643 5072
London 01 481 3929
Bristol 0272 273665

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

*12 months warranty
*7 day money back guarantee
*Next day del. available
*On site maintenance contracts available
*Finance plans available
Points page. Déjà Vu uses one set to modify the other before attaching a final value to the Option. Phew! I hope that makes sense. Perhaps if we move on to see how weightings and scores are attached to Points it will become clearer. A Point's weighting is attached following entry of the Point name.

Simply press Tab and an 'Importance' weighting appears, preset to 50 per cent. You may vary this from 'Forbidden' through -100 per cent to +100 per cent and 'Essential'. This is done by pressing left and right arrow keys and watching the scale grow and shrink according to your needs. A press of the minus or plus key changes the sign and, on colour screens, the colour of the scale. This weighting is unique to this occurrence of the Point and is applied to any score which it receives from the user.

Having weighted the Point, we can attach a table of possible replies the user may give. This is entirely optional but it does make life a lot easier for the user and enables you to build a tidier and more consistent model. This may not be entirely clear until we look at evaluation next, but if the user is asked to think up answers during Analyse, there is a fair chance that he won't be very clever at dreaming up replies and values 'on the fly'. For example, let's say 'Petrol consumption' came up. The user, unprompted by your suggested replies, might go for 'heavy', 'moderate' and 'low' and attach scores of -50 per cent, 0 per cent and +50 per cent which wouldn't be too bad. On the other hand they might try to answer to the last decimal point '38.6 per km at 56 mph' and then try to think of a value for that answer which differentiates it sufficiently from all past and future petrol consumption figures they will need to load into the model. Take my recommendation and build some standard 'Reply Tables' before you let Déjà Vu loose on anyone, yourself included.

Having entered the weighting, press Tab again and a 'Tables' window will appear, inviting you to give your table a name. Type the name followed by Tab and an associated 'Values' window appears. In this you may type a 12-character description of a reply and a value to associate with it. Do this for each of the replies then, during Analyse, all the user will need to worry about is selecting from one of the plain English answers provided. Further help may be given by attaching a 'Footnote' at the bottom of the screen; for example: 'Please give an indication of the fuel consumption of this car. Sum

SCREENTEST

the three standard figures given in the brochure, divide the result by three and select the appropriate answer from the reply window.' And, just in case you're counting, you may have up to 240 characters of Footnote.

Analysing the model

You may roam around the model, evaluating bits and pieces as the fancy takes you (Manual mode) or you may pass control to Déjà Vu, which will work round the model systematically, pausing to ask you questions whenever it finds a gap in its knowledge (Auto mode). We'll take the latter route, although it's worth noting that you may switch modes whenever Déjà Vu pauses to ask you a question.

Choose your Subject and press F3. From now on you will be helped through by a combination of Questions (née Points), Footnotes and Reply windows. Once a reply is selected, it is multiplied by the weighting for the Point and the result displayed as a scale and as a percentage against the Point. Each page of Points is presented in turn and you may alter your replies before moving to the next page by pressing F3.

I must say that the screen presentation and ease of use of Analyse is very impressive, an important factor when you consider that this is the part most likely to be used by inexperienced people.

The final results are presented as your Options listed in descending score sequence. Again, the scores are shown as both scales and absolute percentages. If you want to enquire more deeply into the results, press F9 ('Switch' in Déjà Vu jargon) to see a detailed analysis of the Points associated with that Option.

Alternatively, a whack of F4 will produce an onscreen breakdown of all the Points for all the Options. Ctrl/ P will produce a printed copy of the report. As you can see, Analyse is the simplest part. It is also very fast which encourages experimentation. 'What if' modelling is not the tedious, time-consuming affair it is with some packages. It is almost instant once you've changed the parameters. And you are not restricted to changing replies: it's a simple matter to pop back into Déjà Vu's Edit mode and play around with weightings and even the Points and Options themselves.

In use

By now you will have realised that Déjà Vu is not at all a bad product to use. Considering its complexity, I think the authors have done a good job. Analyse of course is a dodger as we've just seen, so let's take a closer look at Edit mode and see what that's like to use. Edit is the bit that looks after you as you key in details of the Subjects, Points and Options. It has two other modes which let you foot around with the Index and with the Tables. The Table Edit is nice because it means you can do your thinking about replies and values away from the clutter of the model itself.

Most Edit facilities are intuitive — Ins, Del and arrow keys all do what you'd expect. A special 'Line mode' accessed from F5 introduces one or two nice touches. With this facility, you may operate on lines as a whole — insert and delete are the obvious options but here are a few more: — The 'Up' arrow switches the current line with the one above. — the 'Down' arrow does the opposite. — 'S' sorts the page either alphabetically or by weighting. — 'E' replaces the current entry with its Points. — 'R' and 'P' allow you to move entries around the model.

The Sort and Expand facilities I found most powerful: the Sort because it helps you tidy up Pages and Reply tables for presentation to the user; and Expand because it meant I could whip an entry out of the Index (always accessible from F7) and pull all its lower level Points onto the current screen. Sometimes you will want the same Points listed on several different pages; this is the quickest way of doing it.

Forgive me for not mentioning the + and - option. Intelligent Environ-
Calculation
Dejà Vu gathers two sets of figures for a page of Points, then combines them to give an overall total. One set is calculated for all the positive Points (the Pros) and the other for the negatives (the Cons).
To calculate the result for a single Point, Dejà Vu takes the Reply Score and multiplies it by the Importance Weighting for that Point, dividing the whole by 100.
Separate totals are accumulated for the page for both negative and positive results. Also adjusted totals are calculated for both negative and positive results in which each result has an increasingly marginal effect on the adjusted total. With AT = Adjusted Total so far and R = Result for this point, the formula is:
\[ \text{AT} = \frac{\text{AT} + (100 - \text{AT}) \times R}{100} \]

The final calculation which gives the overall page total is as follows:
where
- PAT = Pros Adjusted Total
- CAT = Cons Adjusted Total
- SPR = Sum of Pro Results
- SCR = Sum of Con Results
- PAT x SPR = \(\frac{(\text{PAT} \times \text{SPR}) - (\text{CAT} \times \text{SCR})}{\text{SPR}} + \text{SCR}\)

Dejà Vu is a program I wrote called BrainStorm. I really can't decide whether to be peeved or flattered.
Moving around the model is a dodle. Press F10 to expand the current line to its lower level components and F8 to go back up again. If the ‘owner’ (my description) of the current page exists on more than one other page, a press of F8 will bring up a window of ‘References’ which lists all the possible pages you can refer to. The most recently used is highlighted at the top of the list so if you want that one, simply press [Enter] or F8 again. The others are ranked in order of the most recent use—a nice touch, but confusing if you don’t know Dejà Vu is being clever. F9 switches between paired Points and Options.
The Index deserves special mention because it is so neat. You may access an entry in three different ways. Press F7 and the Index window opens with the current line highlighted. You may use the Pg and arrow keys to move around.
More exciting than that is that if you type a letter the index moves to the first word starting with that letter. Press another letter and focus switches to the word starting with both the letters. The letters, inciden-

SCREENTEST

tally, are displayed either flashing or in a different colour to the rest of the entry. In this way you can quickly move to the item you want. The third alternative is to press F7 again and to type in a string of characters — Dejà Vu will alight on the next entry containing that string.

Documentation
I've really said all I want to say on this subject. The manual is a very thorough reference document which looks as if it was written by someone intimately familiar with the product but totally unfamiliar with the sort of person who would use it. The result is that you have to read something like 96 pages before you start gaining an insight into this rather excellent program. In case you missed the earlier comments, Intelligent Environments is apparently commissioning some sort of rewrite.
The onscreen documentation is much more helpful than the manual. A double press of F1 gives contextual help (and it is helpful) at all times.

Price and supplier
Dejà Vu runs on IBM PCs and compatibles with at least one floppy disk and 256k memory. It costs £295 plus VAT and is available from Intelligent Environments Ltd, 20 Crown Passage, London SW1Y 6PP. Telephone: (01) 930 2967.

Conclusion
Before settling down to write this review, I spoke to Russell Hart at Otis Elevators about his experience with Dejà Vu. Like me he had great trouble getting into the product because of the manual but once he got going he found that it suited his requirements perfectly. Russell is a business planner at Otis and has used Dejà Vu to build a company model against which he can test strategic implications of various courses of action. The model contains details of every company process (around 75 of them) and the strategic elements of each process. As well as helping Otis, Russell is preparing his Master’s thesis on this subject. He has also used Dejà Vu for staff evaluation and selection and for picking winners on the ‘gee-gens’. Twelve out of fifteen winners sounds pretty good to me — and he didn't place a single bet! Russell is delighted with Dejà Vu. He is an experienced computer user — Lotus 1-2-3, Knowledgeman, AutoCAD and Multimate — and he’s still very keen on Dejà Vu after three months’ use.
Need I add more? The manual’s a dog, the product’s a gem. I could be picky about all sorts of details but there isn’t much point. The real question is: Does it do what it sets out to do in a usable way?” and the answer is an unqualified ‘yes’.

END

"He's sulking because he didn't come up with the idea of computer bugs."
MG DISCOUNT

A SELECTION FROM OUR EXTENSIVE RANGE OF PRINTERS

BROTHER PRINTERS

Brother HR-10 12 cps £230
Brother HR-15 18 cps Par. £295
Brother HR-15XL 18 cps IBM £335
Brother HR-25 25 cps Par. £599
Brother HR-35 35 cps £699
Brother Twinriter 5 Par. £1049
Brother 1509 Matrix £395
Brother 2024L Matrix NLQ £699

* SPECIAL BROTHER PACKAGE *
* Printer and Sheet Feeder *
* HR-25 with S/Feed £735 + VAT *
* 2024L with S/Feed £925 + VAT *

CANON LASER PRINTER

Canon Laser LBP-8 £1995
Canon Toner Cartridge £79
BOLT Laser Sheet Feeder P.O.A

* SPECIAL LASER DEAL *
* Canon Laser supplied complete *
* with software interface for *
* for WORDSTAR Control *
* Canon Laser Deal £2125 + VAT *

CANON MATRIX & INK JET

Canon PJ1080 A 7-COLOUR £433
Canon PJ1080A 160 cps 80 Col. £240
Canon PJ1156A 160 cps 132 Col. £345
Canon A50 180cps 80col NLQ IBM £305
Canon A55 180cps 156col NLQ IBM £430

KAGA MATRIX PRINTER

KAGA K810 160 cps NLQ £179

EPSON PRINTERS

Epson LX80 Friction NLQ £119
Epson FX85 160 cps NLQ £353
Epson FX105 160 cps NLQ £429
Epson LQ800 Dual I/F £560
Epson LQ1500 + 32K Buffer £799
Epson SQ2000 32K Ink Jet £1499

JUKI PRINTERS

JUKI 2200 Typewriter/Ptr. £260
JUKI 5510 180 cps 80 Col. £280
JUKI 5520 180 cps Colour £380
JUKI 6000 80 col 10 cps £170
JUKI 6100 132 col 20 cps £295
JUKI 6200 132 col 30 cps £430
JUKI 6300 132 col 40 cps £695

MICRONLINE MATRIX PRINTERS

Microline 182 120cps IBM £219
Microline 192 160cps IBM NLQ £335
Microline 193 160cps IBM NLQ £459
Microline 84 200cps NLQ £699
Microline 84 XS 200cps NLQ £1100

* SPECIAL MICRONLINE PACKAGE *
* Microline plus Sheet Feeder *
* M/Line 192 + S/Fe £435 +VAT *
* M/Line 193 + S/Fe £595 +VAT *

HIGH SPEED MATRIX PRINTERS

OKI 2350 Par. 350 cps £1550
OKI 2350 Serial 350 cps £1595
OKI 2410 Par. Graphics £1650
OKI 2410 Serial Graphics £1695
OTC 700 700 cps Triple Head £1995

OTHER PRINTERS

Citizen 1200 120 cps IBM £225
Mannesman-Tally MT-85 £325
Quendata D/Wheel 18cps £135
Shinwa CPA-80+ 100 cps £145
MP165 80 col 165 cps £199

TELEPHONE AND MAIL ORDER PRICE LIST

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

COMPLETE RANGE OF PRINTER CABLES, SWITCHES AND SERIAL INTERFACES AVAILABLE. PLEASE ASK FOR DETAILS.

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

MG DISCOUNT
A DIVISION OF MICRO GENERAL

MG Discount, Unit 25, Horseshoe Park, Pangbourne, Reading RG8 7JW
Access/Visa
Tel: 07357 4469
Phone home

Electronic mail is often presented as the epitome of fast and efficient communication. But while the rapidly increasing popularity of datacommunications is all too the good, we have, argues Surya, still got a long way to go.

Nineteen-eight-six has been heralded the Year of the Modem: electronic mail promises the end of delayed post, lost documents and 'telephone tag'. Online information databases proclaim themselves as the final solution to the need for fast, accurate information. Traditional telegraph terminals are a dying breed, as even a humble electronic typewriter can be adapted to send and receive telexes. Datacommunications is king.

Last year was something of a celebration period for the datacommunications industry. Electronic mail, once the preserve of large computer companies and a few enlightened individuals, is now almost a household phrase. Telecom Gold has expanded from a mere 200 mailboxes in 1982 to over 21,000 today, and this number is expected to double by the end of the year. The modem has, during the same period, been transformed from an expensive mainframe and minicomputer peripheral to a sub-£100 box owned by thousands of ordinary hobbyists. In today's business micro systems, a modem is almost as essential as a printer.

And yet the datacommunications industry can ill afford to sit back and rest on its laurels. The present-day industry is a mass of confusion, inconsistency and disinformation. The very fact that datacommunications is achieving such popularity is indication enough that the time has come to make radical and widespread changes to the way in which the industry operates. The three keywords of its future must be education, standardisation and rationalisation.

Some of the changes I suggest in this article are radical: they will require reorganisation, effort and a willingness to overcome the technical difficulties. Not least, they will require financial investment. But adapting to suit the changing requirements of your customers is hardly a radical move from a marketing viewpoint: it's simple economic sense.

For every inexperienced user struggling with the likes of IPSS, there are at least 10 others who have never even considered using any form of computer communications because of the perceived difficulty involved. For every online database user, there are a handful of potential users who aren't even aware of the existence of services which could be saving them time, effort and money. For every electronic mail user, there are thousands of people using antiquated telex machines simply because they believe electronic mail to be complex and uncertain. Not only are these potential comms users deterred now, but the chances are that a great many of them will remain prejudiced even after changes have been made. The need for action is urgent.

Education

Comms is no longer the exclusive domain of the expert computer user. More and more of today's users are neither experienced nor interested in the technicalities of computing. Their requirements are straightforward: they want a service which is efficient, reliable and, above all, easy to use.

Of course, the actual ease of use of a service is only half the issue; perhaps less than half. At least equally important is the way in which the service is presented to the user. A poor advertisement, and potential customers won't even bother to pick up the phone. A muddled leaflet or brochure, and you'll never hear from them again. An incomprehensible manual, and you will hear from them again. And again. And again!

The phrase 'computer literate' has become part of the English language. But while those outside the industry are perhaps beginning to appreciate what computers can and cannot do, comms is still shrouded in mystery, myth and muddle. While most people are aware that electronic mail is the computer equivalent of telex, few appreciate the advantages that it offers. While some are aware that Prestel is an online information service which allows them access to such information as train timetables, news and weather, few are aware of the vast and varied range of up-to-the-minute information available in this and other information databases.

A significant part of the educative process is simply to present the public with straightforward, accurate information in a comprehensible form. That this commodity appears sadly lacking is a responsibility which must be shared by service providers, software and equipment suppliers, dealers and the press. In a time when the largest untapped market for datacommunications products and services is the naive computer user, advertisements, brochures and manuals for modems, communications software and online services are still being aimed at the professional comms user.

And if jargon such as 'the service is accessed at 300-baud CCITT originate, using eight data-bits, one start, two stop, even parity, Xon/Xoff handshaking with optional XModem protocols and/or EPAD error-checking' isn't enough to deter people, the prices are. And yet, used correctly, dial-up computer services are not spectacularly expensive: the problem is simply one of education.

Let's take the example of an online database which offers information on limited companies registered in the UK. With a connect-time charge of £120 an hour, it seems at first glance a very expensive service. But in just 10 minutes' use, you can get a complete analysis of a potential customer or partner: balance sheet, directors' interests in other companies, parent and subsidiary companies, a credit rating ... all for just £20. Compare that with the cost of sending one of your employees down to Companies House, and it seems very reasonable. Think about the possible consequences of not having the information when you need it, and £20 becomes a ludicrously insignificant figure.

Similarly, with electronic mail. A connect charge of 10.5p per minute is an expensive way to send mail if you sit online while you compose replies to your business correspondences. But log off, write your mail offline using your word processor and then log on again to transmit the
completed file, and you can send a message faster than a courier for less than the cost of a first-class stamp. If we are to encourage people to take advantage of computer communications, then education on this level is every bit as important as de-mystifying the jargon.

But presenting users with clear and accurate factual information is only one of the things needed to convince people that comms can work for them. Equally important is to introduce widespread and sensible standardisation.

**Standardisation**

Standardisation is arguably the most complex, emotive and confused issue in the entire computer industry. The benefits, in terms of simplicity, convenience and efficient use of resources, are self-evident, and yet these have to be weighed against the equally apparent disadvantages. The two microcomputer standards currently on offer are MSX for the home market, and IBM for business. Neither are anything to write home about. It’s an uncomfortable dilemma which will doubtless be with us for a long time yet.

But standardisation of the data-communications industry is much simpler to achieve, and presents far fewer drawbacks. There are really only three baud rates in use, for example: 300, 1200 and 1200/75. And yet one 300-baud service requires eight data-bits, one start and two stop with even parity and Xon/Xoff handshaking, while another demands seven data bits, one start and one stop with odd parity and Sin/Sout protocols. There’s no particular gain to be had from either; they are simply arbitrary settings which could be easily changed.

Similarly with modems. The Hayes protocol, a set of standard codes by which comms software can control the settings of a modem, is a great step in the right direction, and thankfully seems to be achieving widespread acceptance. But manufacturers are still continuing to produce modems which require different signals from the computer. Tandata recently released a beautiful intelligent modem called the TM512. It’s completely automatic, does everything you might ask of it, has built-in memory for storing telephone numbers and is totally useless to me because it is controlled using non-standard codes. I can either throw away my existing, Hayes-compatible software and buy Tandata’s own package, or buy a less attractive Hayes modem. A friend of mine has the opposite problem. Her auto-answer, auto-dial modem is Hayes-compatible, but her auto-answer, auto-dial software isn’t — as she discovered only after buying both. Consequently her system neither auto-answers nor auto-dials.

A compatible modem and software
The Complete Solution

Evolving and growing a business is never easy, it is full of problems. Be it accounts, budget control, forecasting, production, personnel or office processing, each must be solved effectively.

In order to solve your business problems, we know what is available. Do you?

Our headquarters in Essex have some 28,000 sq. feet of warehousing, manufacturing, maintenance, training and seminar facilities. Our central London sales office offers professional advice and training. Take a closer look at some of our solutions.

IBM XT
256k RAM 2 x 360k floppy drives or 1 x 360k floppy drive and 20Mbyte hard disk including monochrome display adaptor and monitor (Philips), or colour card and monitor (Mitsubishi), and keyboard
£2395

IBM AT
256k 512k RAM 20Mbyte hard disk, 1 double sided floppy drive, monochrome display adaptor and monitor (Philips), colour card and monitor (Mitsubishi), and keyboard
£3495

IBM PC
256k RAM, 2 x 360k floppy drives, including monochrome display adaptor and monitor (Philips), and keyboard
£1549
Existing users can take advantage of our upgrades for IBM PC's XT's and AT's. A typical upgrade would consist of a 20Mb Winchester hard disk, and long-slot controller card from £595.

The Sperry IT is an IBM AT compatible which offers a remarkable performance. A typical system, with 5 work stations, 40Mb hard disk, and Xerox operating system, expandable to nine users would cost £6995.

Mitsubishi's 14" medium-res (640 pixels) colour monitor has advanced video and deflection circuits which guarantee stable, clear and brilliant images. This is supplied with a colour graphics card which also has a parallel printer port for £599.

The full range of Apricot products is available at very competitive prices for the whole of April 1986. Apricot products include the Sanyo 550 Series, and the 775 Portable, which have proven very popular. We are in a position to offer these systems at extremely good prices, with a typical 550 Dual 800k drives, MS DOS, Wordstar and Calcstar for £699.

AKHTER COMPUTER GROUP
Akhter House
Perry Road
Harlow, Essex CM18 7PW
Direct line: (0279) 443527
Switchboard: (0279) 443521

WEST ONE BUSINESS SYSTEMS
37 Store Street
off Tottenham Court Road
London WC1
01-636 7142
01-636 4102
Announcing the Qume Laser Ten. Perfectly prepared to fit in with your family.

Never has a newly arrived laser printer proved so instantly compatible with your existing system of business computers, whatever their parentage.

That's because we designed it from the start to be adaptable: not only with all major individual, multi-user or networked computers and word processors, but with your business software, too.

Easy to install, your Qume Laser TEN has all the well behaved Qume qualities to lead a rewarding and productive life. Its' pedigree ensures a durable, trouble-free performance producing 10 pages per minute of true letter quality text, even with constant use in high pressure environments.

The Laser TEN needs remarkably little attention, the integral 250-sheet capacity tray feeding system allowing virtually unattended operation. Not is its upkeep expensive. The drum and developer cartridge lasts 30,000 pages and the easy-load toner lasts 5,000 pages.

Whether you're upgrading output from a daisy-wheel or dot matrix printer or looking for higher standards of cost effectiveness and efficiency in laser printing, you'll immediately feel at home with the newborn Laser TEN. It has the Qume quality.

Qume Quality. Innovation 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
package isn’t the end of it, of course. There’s that most wondrous of beasts, the RS232 cable. The RS232 cable is, of course, an internationally-agreed standard. Except that we all know that it isn’t. My Macintosh has a 9-pin rectangular modem socket. My Tandy 100 has a 25-pin rectangular socket. My modem has a five-pin DIN socket.

Some machines have male plugs, others have female sockets. Some cables use nine wires, others use seven, five or three. Some carry DTR on one pin, others prefer a different pin; others don’t use it at all. Some machines want DCD to be high; others need it low. Some want five volts, others insist on 12.

Creating a standard RS232 socket, cable, power requirement and wiring system is simple. PCW has already published one (‘A Superior Standard’, December 1985). Unfortunately, CCITT has also published a different one. RS has one different to both and nobody uses any of them.

We must standardise. When the industry was young, and its relatively few users were quite happy with manual modems, suss-boxes and software configured by typing 1s and 0s against a list of options, a standard was a luxury to be considered in the dim and distant future, if at all, but that future has now arrived. Not only have many of today’s users never heard of a suss-box, but those of us who have are becoming increasingly irritated with the frequency of its use.

There’s nothing difficult about standardisation. Dial-up services could meet tomorrow to agree standard settings and protocols for each baud rate and have it in operation the same day. Modern manufacturers and software houses could switch to the Hayes standard with their next releases. Modern and micro manufacturers could adopt the PCW-standard cable in future machines. It’s not difficult, it’s not time-consuming and it’s not expensive.

Rationalisation

The dictionary definition of rationalisation is ‘to make sane’, and nowhere is this need greater than in the field of computer communications. Much of this task would be achieved by the kind of standardisation I have mentioned. For the rest, let’s start with IPSs.

The International Packet SwitchStream is an eminently sensible idea. Instead of calling distant and overseas computers directly, and running up huge telephone bills, simply call your local PSS node and let the IPSW network connect you. Data is transmitted through this network efficiently using data ‘packets’, and the low cost is either passed onto the user directly as a PSS invoice or is included in the cost of the dial-up service.

IPSS is also a strong candidate for the ‘1986 Most Ludicrously Unfriendly Computer System in Existence’ award. When you dial your local node, nothing happens. You have to send two carriage-returns, a two-character code identifying the type of terminal you are using and then another carriage-return before PSS will even acknowledge your call. After the briefest of unintelligible messages, it then sits there waiting for you to type ‘N’ followed by a six-letter ID and a six-digit password. This done, it then displays the well-known prompt ‘ADD?’ This is PSS’s way of saying: ‘Thank you for calling, which service would you like to be connected to?’ You then respond by entering ‘A’ followed by a number containing the eight digits.

British Telecom, the operator of the PSS network, would no doubt claim that this user-indifferent approach is for security reasons, to make life difficult for hackers. Well, apart from the fact that there’s not a hacker in existence who couldn’t log on to PSS in 55 seconds, I’ve just told the world (well, PCW’s readership at least) how to do it.

But’—I hear you call, ‘you’ve forgotten about MultiStream. This offers a much friendlier way of accessing PSS.’ No, my friends, I haven’t. MultiStream is at best a half-measure, and at worst an irrelevance. A half-measure because the menu system it offers has to be set up in advance by the user, and an irrelevance because it doesn’t allow access to the international PSS network. And the major use of PSS in this country is to access US databases.

The rational approach to PSS is to install a front-end to the system which firstly has a more welcoming and friendlier log-on sequence, and secondly requests you to type in the name of the service you require. An alphabetical list of services can be hash-searched almost as quickly as a numeric one, and it is a simple matter to include a ‘near miss’ search pattern to take care of mis-spellings and similar. Telecom Gold, for example, has a program which does this extremely effectively.

Electronic mail services need to install similar front-ends to their mail programs. It’s ridiculous to have to enter a mailbox number when you could enter a name. Most services offer a facility which allows you to set up your own cross-referencing file so that you can mail regular contacts by name, but this is only a partial solution.

There are problems to this approach, of course. Names are not always unique. And we may not know whether to address mail to an individual or his company. But these problems are nothing new: they already exist, and have been overcome, in user directories. And even a £130 bulletin board system allows me to address mail to a named user.

Online information systems, too, require reorganisation. Free-text searches, free-style menus and page numbers all have their advantages, and all should be offered in any database system. If I want to take a look at the business software directory on Prestel, for example, I know that this begins on page 60023, and typing this page number is the fastest way of getting there. If I want to check out tomorrow’s weather in Yorkshire, I’m not sure offhand which page it is on but I know that I can find it by following the ‘news and weather’ menu tree. If I want to get as much information as I can on a particular species of ant, then I would have no idea where to start, so a free-text search on the name of the species would be my best hope.

Again, there is a need for standardisation, as well as rationalisation here. A free-text search is straightforward: I start with a general word such as ‘ant’ and then qualify it using logical operators (AND, OR, EOR, and so on) until I am left with a manageable number of entries. Or at least it would be straightforward if all databases used the same commands and syntax. They don’t, of course.

Conclusion

Finally, one of the most fundamental aspects of rationalisation is to ensure that the service offered meets the requirements of its customers. Dial-up services frequently don’t. We put up with their shortcomings from necessity rather than choice. Most dial-up services are in their infancy in terms of both ease-of-use and the facilities offered, and many of them bear a closer resemblance to an untidy hatch-pot of miscellaneous features.

It is not my intention to criticise what has been done in the past; rather to point out the changes which must be made in the future. Electronic mail is an excellent means of contacting people, but I can’t leave the data equivalent of an answering machine in my mailbox telling anyone who mails me that I am on holiday and won’t receive their message for a fortnight.

Data communications has tremendous potential. But only through careful tailoring to its users’ needs, can that potential be realised.
Paradox

Paradox is an American package, similar to Lotus 1-2-3, which aims to bring together facilities from both spreadsheet and data management systems. Kathy Lang takes a look at how the capabilities merge.

Until about eighteen months ago, software writers maintained a clear distinction between spreadsheet packages and data management systems (DMSs). Spreadsheets handle information in a single rectangular table, held in the memory of the micro, and concentrate on good numeric processing with lots of functions; most also include direct graphical display of the spreadsheet. The essence of such packages is interaction, so control is exercised either directly from the keyboard, or through sequences of keystrokes stored in a file for subsequent use. Typical spreadsheets for the business market include Lotus's 1-2-3 and Sorcim's SuperCalc.

Data management systems, on the other hand, handle information in discrete records, usually allowing you to view just one record at a time; where the package allows several sets of records to be related, displaying and editing information from the whole set is allowed. Graphical display is rarely included. Control over DMSs ranges from the menu/keystroke approach used by the simpler packages, through combinations of menus and the ability to store keystroke sequences, to command languages of varying degrees of power up to that of a conventional programming language. In the upper part of this market, first dBaseII and now dBaseIII are the market leaders.

With the advent of the so-called integrated packages, these distinctions began to blur. Even with a closely integrated package such as Symphony, however, you must still define to the package which area of your worksheet is really a database, and it's possible to corrupt data by making mistakes in cell references.

The data must still be contained in a single regular table, with no possibility of explicitly relating dissimilar sets of records. Furthermore, all the data must still be held in memory (even though, if you use an extra memory board, this may be an indirect rather than an obvious limitation). In loosely integrated packages such as Smart and Open Access, the distinction between spreadsheet and data management system is clearer, to the point where they can be purchased as independent modules.

A further step down the road towards marrying the spreadsheet and data management approaches is represented by Reflex (reviewed in PCW, February). Reflex allows you to view your data either as a rectangular table or as a full-screen form showing a single record, and includes powerful calculation features and graphics. (It is also very cheap.) But Reflex retains the usual spreadsheet limitation of requiring all data to be in memory, and does not allow you to define relationships between two or more sets of dissimilar records.

Into this arena now steps a package which is being hailed in the US as the answer to these problems. For problems they are, in that, for many people, the need is to handle data using a combination of traditional data management and spreadsheet techniques without the difficulties which have hitherto impeded that approach. Paradox, from an American start-up company called Ansa, is so called because it aims to provide powerful features in a way which people will find easy to use. These features borrow extensively from both the spreadsheet and data management camps, to the point where the documentation includes two brief booklets: one an introduction for users of 1-2-3; and the other for dBase users.

Like so many new packages in the business market these days, Paradox is at present available only for the IBM PC and close compatibles. It comes on four disks (one of which contains example data tables) which, when installed on your hard disk, will take up just over 1Mbyte, and needs 512K memory to run. Paradox is copy-protected, using the method which does not require the system disk to be checked whenever the system is loaded, and has one back-up system disk in case your original is deleted or corrupted beyond the possibility of uninstalling it. (Sympathise though I do with software suppliers concerned to combat rip-off merchants, I still feel that people should think carefully before coming to depend heavily on copy-protected software, especially from an as yet unproven company.)

The basic Paradox display shows a menu of options and then, once a set of records is loaded, a table with up to 22 rows, each containing a record, on the screen. At that stage, apart from the use of names for column labels rather than letters and/or digits, the display appears quite like that of Lotus 1-2-3. You can load many tables at a time, and resize the image each table presents to enable you to see several at once. (As an alternative, records can be displayed in a form mode, using either the standard form supplied or one designed by the user.) The table approach extends to many areas of Paradox; for example, if you ask to see a subset of records from a table, these will be displayed in a special, temporary table set up by Paradox.
and called Answer, which can be handled just as any user-defined table. A table is also used to define queries — each row contains one group of selection criteria, and each field to be included in the Answer table is 'ticked', giving a visual indication of your choices.

A most unusual feature of Paradox is its memory management: a table will be kept in memory if possible, dramatically speeding up operations for small databases. If a table is too large to be held in main memory, Paradox will keep some of it on disk and 'page' it in as necessary. In addition, the disk version of the table being updated is amended regularly, to ensure that changes are not lost if the system fails. You can force this disk updating more frequently if you like, but at least Paradox takes some of the responsibility — a major objection to using large memory boards with conventional packages is the danger of losing data if the system goes down between your (usually lengthy and therefore irregular) saves.

Unlike most packages which use the table display approach, Paradox allows you to relate tables together when constructing queries, to add records from one table to those in another, and to check the validity of records in one table against values in another. These relationships are, however, only as permanent as the queries or updates themselves — they do not constitute a permanent part of the file definitions, as in packages such as Everyman; in this, Paradox is more like the dBase family.

The dBase similarity extends to the Paradox programming facilities, which considerably extend the interactive capabilities. You can record a sequence of keystrokes and store it as a 'script'; this script, which contains visible equivalents of all function keys, control keys, and so on, can be edited with the Paradox script editor, and extended using commands such as While/Endwhile which are not appropriate at the keyboard.

Constraints

The main constraints and features of Paradox are shown in Fig 1. The limit on record size shown is for keyed records, and at 1350 characters is rather on the low side. For records without a primary key, you can have up to 4000 characters per record. Date fields can be stored in two formats — MM/DD/YYYY and DD/MM/YYYY, and similar formats in other ports, but nowhere is the DD/MM/YYYY format used in Europe to be found, nor is there a special Time format field.

File creation & indexing

Creating a table in Paradox is quick and easy: you just name the table, and then enter the name and type of each field. For alphabetic fields, you give the maximum length as well. If the file is to be indexed, the field or fields which comprise the key must come first in the record; Paradox does not allow duplicate keys. The primary uses of the key are to ensure the correctness of the data (for instance, by stopping you storing two customer records with the same number), and to order the display of complete records, thus in turn speeding access by primary key.

Relationships between tables are not set up at file creation, but are temporarily established when they are required for queries or for table amendment.

Secondary indexes are not set up explicitly in Paradox; rather, they are related to specific sets of selection criteria. For example, if you set up a query which you execute frequently, perhaps to extract information about all customers whose balances exceed a given sum and have been outstanding for a specified period, you can request an option called 'Query speed-up'. This will set up secondary indexes to the file or files upon which the query is based, in order to speed up the retrieval process. These indexes are not updated when records are changed, but they are amended when next a query is invoked that uses the indexes. No penalty is therefore carried on data entry, but there is some overhead when queries are asked. The extent of this overhead will depend on the size and nature of your application, and needs watching. For example, in my Benchmarks, the extraction of 20 records from 1000 took 27 seconds without an index, and eight seconds with an index — but the index took 54 seconds to build, and to rebuild after records had been changed. (Fig 2 shows the remainder of the Benchmarks. They were carried out on a 512k system, and I am assured by Ansa that, relatively fast as most of these times are, a 640k system would be significantly faster.)

When a table has been set up, its structure can be modified at any time without penalty; unlike the great majority of packages, appropriate modifications are made to reports, saved queries, and so on, to ensure that they still match the new table structure. (Some products even oblige you to reconstruct all reports based on tables whose structure is changed.)

Data input & updating

Paradox allows data entry and updating either in its Table view — that is, with one record per line, or in a Form view, in which each record occupies one or more screens. Editing allows you to make changes in situ to existing records. Data entry can be carried out either directly into the table concerned, or into a blank table and then added into the relevant table. For either mode, you can set up a variety of data validity checks, such as checking the range or pattern of data entered, ensuring that a value already exists in another table, giving a default value for a field, or making keyboard entry of a field value mandatory. While entering data, you can use a 'ditto' instruction to give a field the same value in consecutive records.

If you enter data into a blank table for subsequent merging with the original table, you avoid the danger of unwittingly changing existing records, and the manual recommends this approach. However, using the interactive facilities directly, you cannot prevent the entry of keys which

APRIL 1986 PCW 157
duplicate existing records, and when these are added to the original file, the original records will be overwritten. You could avoid this danger by using Paradox's script-writing feature to check for existing records when the data is entered or when the update is made.

When editing data at the keyboard, there are two ways to find the record you require. You can use the cursor keys to scroll through the table, looking for the records to be changed, which would be a very slow process. The manual appears to suggest that, in this case, the edited records would be thrown out because they duplicate records in the original file. In practice they replace the originals, as you would hope.

In addition to interactive changes, you can set up automatic changes to all or a group of records, again through the query facilities ('Ask' on the Paradox main menu), thus enabling you to, for instance, increase the prices of a group of products by 10 per cent. If you need more sophisticated editing, you can set up a script using the full power of Paradox's command language PAL.

Screen display

Tables can be displayed onscreen either in a list format, one record per line, or in a form, one record per screen or screens. Moving between form and list view is achieved by toggling a function key. You can have as many tables open as you like (up to the maximum permitted by the amount of memory you have), and you can move about between them by using two function keys. The list format starts by showing all fields (allowing you to scroll sideways to see those that are off the screen), and up to 20 records at a time, but both these parameters can be adjusted to show fewer fields and/or records. This then makes it possible not only to have more than one table open, but to see them on the screen together — rather like using windows.

The use of tables is endemic in Paradox. For example, when you set up queries, the results are displayed in an Answer table; when you use the automatic updating feature, the old versions of the records are displayed in a table called Changed. If you are used to spreadsheet displays, this approach will seem very familiar. For those with more conventional data management experience, the form facility should fulfil most needs; a default screen format is provided for each table, and in addition you can set up a maximum of nine formats using paint-a-screen techniques. A big advantage is that a form developed in the interactive part of Paradox can be used as a basis for data entry or query presentation within scripts created in PAL. A form may extend over many screens, and you can move up and down within these screen pages with a single key.

Any report can be displayed either onscreen or on the printer, so for viewing records you can use the full formatting power of the report generator.

Printed reports

Paradox includes an extremely powerful report generator, giving great flexibility of design and formatting. However, it operates on a complete table; each table has a default report format and up to nine formats designed by the user. Reports operate on only one table at a time, so if you want to select a subset of records or fields, or to show information from more than one table, you must first set up the appropriate table using the Ask facilities.

As report formats relate explicitly to particular named tables, it becomes a four-stage process to produce a selective report, even when using an existing report design and preset selection criteria. The process is simple, and can be automated with a script, but it is not as easy or flexible as one would expect in a package of this type.

Selection & sorting

The selection of records for display through the Ask menu option could be said to be the heart of Paradox — certainly it is an area into which considerable development effort has been put. This is a welcome change from packages which seem to think that the goal of a data management system should be to get data in a subset of fields or records or both.

You fill in a query table, which consists of one or more rows with the same headings as the table to be queried. The process is highly visual, and very straightforward for the most part. For example, to choose a field for display, you give it a tick (by pressing a function key); all fields may be chosen by ticking the leftmost column, which contains the record numbers added by Paradox. To specify conditions a field must meet if a record is to be displayed, you enter the condition(s) in the field in the query specification table. Within a row, all conditions specified must be met for the record to be included; if more than one row of selection criteria is used, then all records must fulfil all the criteria in any one row.

Selection uses a wide range of options: these include comparison operators such as equal, less than, and so on; wild codes to match any character or any group of characters (these use the 1-2-3 conventions rather than the more usual DOS characters); the ability to choose re-

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max file size</td>
<td>65000 records</td>
</tr>
<tr>
<td>Max no fields</td>
<td>255</td>
</tr>
<tr>
<td>Max digits</td>
<td>15</td>
</tr>
<tr>
<td>Special disk format?</td>
<td>Y</td>
</tr>
<tr>
<td>Link to ASCII files?</td>
<td>Y</td>
</tr>
<tr>
<td>Fixed rec structure?</td>
<td>Y</td>
</tr>
<tr>
<td>Amend rec structure?</td>
<td>Y</td>
</tr>
<tr>
<td>Link data files?</td>
<td>Y</td>
</tr>
<tr>
<td>No sort fields</td>
<td>NS</td>
</tr>
<tr>
<td>Max key length</td>
<td>NS</td>
</tr>
<tr>
<td>(chars, fields)</td>
<td></td>
</tr>
<tr>
<td>Data validation</td>
<td>G</td>
</tr>
<tr>
<td>Unique keys</td>
<td>OP</td>
</tr>
<tr>
<td>Store calculated data</td>
<td>IN, BA</td>
</tr>
<tr>
<td>Store select criteria</td>
<td>P</td>
</tr>
<tr>
<td>&gt;1 criterion field?</td>
<td>Y</td>
</tr>
<tr>
<td>Browsing methods</td>
<td>SW</td>
</tr>
<tr>
<td>Reference manual+</td>
<td>***</td>
</tr>
<tr>
<td>Reference card+</td>
<td>***</td>
</tr>
<tr>
<td>Hot-line?</td>
<td>D</td>
</tr>
<tr>
<td>Max record size</td>
<td>1350/4000</td>
</tr>
<tr>
<td>Max field size</td>
<td>255</td>
</tr>
<tr>
<td>Max prime key length</td>
<td>NS</td>
</tr>
<tr>
<td>File size fixed?</td>
<td>N</td>
</tr>
<tr>
<td>Data types</td>
<td>N,C,D,S</td>
</tr>
<tr>
<td>Fixed record length stored?</td>
<td>Y</td>
</tr>
<tr>
<td>No data files open</td>
<td>ML</td>
</tr>
<tr>
<td>No keys</td>
<td>NS</td>
</tr>
<tr>
<td>Subsidiary indexes</td>
<td>Batch</td>
</tr>
<tr>
<td>kept up-to-date?</td>
<td></td>
</tr>
<tr>
<td>Screen formatting</td>
<td>D,P,L</td>
</tr>
<tr>
<td>Report formatting</td>
<td>P,D,L</td>
</tr>
<tr>
<td>Totals &amp; statistics</td>
<td>Y</td>
</tr>
<tr>
<td>Combining criteria</td>
<td>A,O,N</td>
</tr>
<tr>
<td>Wild code selection?</td>
<td>AF</td>
</tr>
<tr>
<td>Interaction methods</td>
<td>M,PL</td>
</tr>
<tr>
<td>Tutorial guide+</td>
<td>****</td>
</tr>
<tr>
<td>Online help+</td>
<td></td>
</tr>
</tbody>
</table>

Note: Maximum five stars possible

For a full explanation of abbreviations, see 'Database dossier', page 188, January 1985 issue

Fig 1 Features and constraints
Quite simply, it leaves other word processors lost for words.

WordPerfect 4.1 includes many features not found in other word processors.

Newspaper style columns can be displayed on screen, 120,000 word UK phonetic dictionary, word-count, background printing and automatic reformatting increase efficiency.

Line drawing and rulers, sorting search and 5-function maths are invaluable assets.

The colour-coded template makes using WordPerfect simpler than you would believe. Most features are available with a single keystroke. This makes learning easier than ever before and using it a real pleasure.

What you see on the screen is what will actually print. This makes good, professional layouts simple.

Documents are treated as a whole and not a series of pages. Reformattting and repagination after editing are automatic and very rapid.

However fast you type, you will never be too fast for WordPerfect.

To find out more, write to the address opposite.

And see how WordPerfect delivers today what others are still searching for.

Sentinel, Wellington House, New Zealand Avenue, Walton-on-Thames, Surrey KT12 1PY.
Telephone: (0932) 231104.
When updating records, but in some circumstances it may take longer to recreate the indexes than to carry out the query without using them. I certainly encountered an example of this when carrying out my Benchmark. I would prefer to see the package take a little longer — a second or two — to save each record, rather than taking a good deal longer when retrieving records in queries. It's worth emphasising, though, that this trade-off arises only when you cannot fit all your data into memory.

If your table has a key, it is displayed in key order; if it does not, it is shown in entry order. When you select records using Ask, the Answer table is shown in order by the first field selected. If you want alternative orderings, the Sort option can be used to sort a keyed table into another in the new order, or to sort a non-keyed table into another or into itself.

### Calculation

Paradox's calculation facilities are powerful, and include a wide variety of functions in addition to the usual arithmetic operators and brackets. You can include calculated fields in data entry, calculate field values and aggregate them in Ask and Report, and make calculated changes to records in Ask.

### Multiple files

Within the interactive part of Paradox, connections between files are made only through Ask. If you want to query files, you must set up relations between them through an Ask table, in the manner described under 'Selection & sorting'; such queries can be saved for subsequent re-use, but do not have any effect upon updating. (You can, though, check values in one file when entering data in another.)

If you want to update several tables from a single data entry exercise, you must either carry out the operations explicitly each time, or set up a script to automate the process. This is very similar to the approach taken by such packages as the dBase family and Knowledgeman, but contrasted with those of Powerbase and Everyman, which regard relationships between tables, as well as within tables, as central to correct data analysis. Its flexibility is at once a strength and a weakness: the advantage is that you don't need to fix the overall data structure at the start, but can link files flexibly as you require. The drawback is that this very flexibility makes it much harder to achieve data integrity, because checks about the validity of data in linked tables must always be made explicitly, rather than being inherent in the defined relationships between the tables.

### Tailoring

Paradox has a full command language, very similar to dBaseII (including procedures with parameters), but with some extra features such as Powerbase and Everyman, which regard relationships between tables, as well as within tables, as central to correct data analysis. Its flexibility is at once a strength and a weakness: the advantage is that you don't need to fix the overall data structure at the start, but can link files flexibly as you require. The drawback is that this very flexibility makes it much harder to achieve data integrity, because checks about the validity of data in linked tables must always be made explicitly, rather than being inherent in the defined relationships between the tables.

### Links with outside

Paradox includes the ability to import and export files in a variety of formats, including Lotus 1-2-3 .WKS files, dBase .DBF files (Paradox can distinguish for itself between dBaseII and dBaseIII data files), DIF and PFS.

### TIME TEST

<table>
<thead>
<tr>
<th>Benchmark Test</th>
<th>Time (seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BM1</td>
<td>Time to add one new record</td>
</tr>
<tr>
<td>BM2</td>
<td>Time to select record by primary key</td>
</tr>
<tr>
<td>BM3</td>
<td>Time to select record by secondary key</td>
</tr>
<tr>
<td>BM4</td>
<td>Time to access 20 records from 1000 sequentially on three-character field (same field as in BM2 key)</td>
</tr>
<tr>
<td>BM5</td>
<td>Time to access record using wild code</td>
</tr>
<tr>
<td>BM6</td>
<td>Time to index 1000 records on three-character field</td>
</tr>
<tr>
<td>BM7</td>
<td>Time to sort 1000 records on five-character field</td>
</tr>
<tr>
<td>BM8</td>
<td>Time to calculate on one field per record and store result in record</td>
</tr>
<tr>
<td>BM9</td>
<td>Time to total three fields over 1000 records</td>
</tr>
<tr>
<td>BM10</td>
<td>Time to add new field to each of 1000 records</td>
</tr>
</tbody>
</table>

Time to import a file of 1000 records: 3 mins 50 secs

Notes: NT = Not tested; NP = Not possible; + = including scrolling. Where two times are given, first is access to first record, second is access to each subsequent record.
files, and ASCII text files with any delimiter. Exporting and importing are very simple — not, as I know to my cost, a universal attribute!

User image

The basic Paradox approach is centred on the use of tables to store data and to handle queries and data entry. You can use forms as an alternative to tables, but you can't avoid tables. Control over Paradox operations is based on a combination of menus and function keys. The current menu is shown if you press F10, and is displayed along the top row of the screen. Menu options can be selected either by moving a highlighted bar with the cursor (in which case, an explanation of the menu option appears below it) or by pressing the first letter of the option name. Most menus have sub-menus, and some of these show further options. So far, the approach is very similar to that of other packages aimed at naive users, but probably owes more to Lotus 1-2-3 and other spreadsheet systems than to conventional database systems.

Within tables, you can move around using the cursor keys, go to individual records using an equivalent of the spreadsheet GOTO, and use Ask to find an individual record. Function keys are used to provide further movement and control functions, such as putting ticks in query fields, and moving up and down images on the screen.

When you become experienced, you will want to automate operations you perform regularly. To do this, you can record sequences of keystrokes in a script, or enter such commands directly using Paradox's own editor or any plain text editor or word processor. The command language includes a variety of statements which would not disgrace a programming language, allowing you to complete control over processes, including the ability to set up menus, re-assign function keys and, if you wish, hide Paradox from the user altogether. This takes the ability to control processing much further than spreadsheets permit, though no further than the most advanced data management systems.

Nevertheless there are; as you might expect in such a new package, some rough edges. The production of reports on subsets of data is one good example, where you must go through a four-stage process to carry out an operation which, in a command-based package like dBaseII, can be achieved in a single statement. I also had some problems persuading Paradox to allow me to edit a table when I had carried out several successive operations on a variety of tables since starting the system; Paradox is not always very good at releasing memory when it should. And, it seems likely to me, that these problems (which can be remedied by leaving Paradox and restarting) do not arise when your system has 640k memory.

That brings up another point, that Paradox's unique mixture of virtual memory processing and regular disk saves can be misguided, and it seems that the problems which can be remedied by leaving Paradox and restarting) do not arise when your system has 640k memory. On a 512k system, my Benchmarks on a 1000-record data table were no faster overall than comparable disk-based systems, but on the basis of handling smaller example tables, I would expect a significant improvement with a bit more memory. However, Paradox does not at present support any extended memory boards such as the Intel Above Board, but this must be an early development, and would greatly affect the effectiveness of the product for large databases.

Documentation

Paradox comes with an impressive — not to say intimidating — array of documentation, including an introduction with tutorial examples, a user's guide (which includes a menu 'road map'), a guide to the PAL language, and two booklets — one for Lotus 1-2-3 users and one for dBase users. The documentation is well laid out and imaginatively presented, but it is organised totally around the Paradox menu and command options. This is fine most of the time, but occasionally makes it hard to find out how to do something which is not directly provided for in the menus.

Conclusion

Paradox has an extensive range of functions, and takes a novel approach to combining the best elements of data management and spreadsheet methods of analysing structured data. It also has an extensive range of facilities for system developers. It should be clear by now that the interactive approach used by Paradox owes a good deal to that of Lotus 1-2-3, so many people will be drawn to it as a way of getting data management facilities in a form which they are already familiar. By and large, that would be a reasonable approach if the absence of graphics within the package does not worry you, and provided you accept that at least some of the functions you want to perform are likely to be tedious unless you are prepared to learn a little about scripts. This may not be as easy as all that, since the progression from keyboard use may be less natural in a package which builds individual commands on-screen as models of how stored commands work.

For those who are starting from scratch, the conclusion is less obvious. In particular, the approach is not well suited to all kinds of data, and Paradox is not cheap, so it is well worth doing some initial exploration of your data and its properties before you decide (and perhaps even experimenting with one of the cheaper packages such as Reflex if your data will fit into the memory you have).

But there is no doubt that Paradox is a force to be reckoned with, and should prove a powerful stimulus in the direction of integrating spreadsheet and database facilities.
IF THIS IS YOUR BUSINESS, A VICTOR COMPUTER IS MANURE.

No-one starts a small business expecting it to stay small.

So what can you do to help your business grow? You can buy a Victor Computer.

Our computers are specifically designed to help the small businessman.

Our twin-floppy model is just £1,199, all-in. That's some 30% cheaper than other comparable, best selling business computers.

Our computers are also fully IBM compatible. They're reliable and can run any of the 2000 or more industry-standard programs available. Meaning that you can choose the best possible software for your business.

Your Victor dealer will be pleased to show you our VPC or more powerful AT.* He'll listen to what you want to spend.

He'll match what you want your Victor to do, to the appropriate program.

And he won't blind you with science.

After all, he's just like you. A small businessman.

For your nearest Victor dealer, please call 01-200 0200 or send us the coupon.

*AT is a registered trade mark of International Business Machines Corporation
We need your help

The best magazine is the one which reflects its readers' needs. The only way to find out how we are doing is to ask you, so even if you don't normally fill in forms, we'd like to hear from you. Furthermore, if you help us, we will be helping the starving people of Ethiopia. For every 10 completed questionnaires returned, we will donate £1 to one of the charities listed below (please tick your preference):

- Save the Children Fund – Ethiopian Appeal
- British Red Cross Society – Ethiopian Appeal

<table>
<thead>
<tr>
<th>Charity</th>
<th>Ticks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxfam – Ethiopian Appeal</td>
<td>✓</td>
</tr>
</tbody>
</table>

HELP US TO HELP THEM.

Fill in the form and pop it in the post by 18 April 1986. No stamp is required – see the end of the questionnaire for the Freepost address.

1 How often do you purchase PCW? (Please tick box.)

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Every month</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Once every two months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Once every three months</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

Are you a subscriber? 04 Yes 05 No

2 PCW has many regular features – please rate as follows:

<table>
<thead>
<tr>
<th>Feature</th>
<th>Read always</th>
<th>Often</th>
<th>Sometimes</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newsprint</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yankee Doodles</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Letters</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Banks' Statement</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hardware Benchtests</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Software Screen tests</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Checkouts</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bibliophile</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Screenplay</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer Answers</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Networks</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>End Zone</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subset</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Program File</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ChipChat</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adverts</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3 What would you like to see in PCW that isn't there? Please attach a separate sheet if required.

T.3's World/Net or similar

4 Do you have any other comments about PCW (good or bad)?

Again, please attach a separate sheet if required.

Drifting away from its serious user with a 'gamer's' nic

5 How many other people read your copy of PCW?

Up to 2 01 3-5 02 6-8 03 9-11 04 12-15 05 15+ 06

6 Please rate the following list of special features. (Please tick)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Very</th>
<th>Quite</th>
<th>Mildly</th>
<th>Not</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emerging technologies</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hardware – how it works</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Software – how it works</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Programming languages</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Over the horizon – speculation</td>
<td>17</td>
<td>18</td>
<td>19</td>
<td>20</td>
</tr>
</tbody>
</table>

7 Do you own a personal computer? (Please tick)

YES 01 NO 02

Do you use a personal computer? (Please tick)

YES 03 NO 04

Do you plan to buy a personal computer system in the next 12 months? (Please tick)

YES 06 NO 07

If you reply yes to any of the above, which of the following categories apply? (Please tick)

Own Own Use To To & & at own own use use work pers. & at home work at work

Amstrad 01 Apple II 02 Apple III 03 Apple Mac 04 Apricot 05 Atari ST 06 BBC 07 Commodore 64/128 08 Amiga 09 IBM 10 PC/AT/XT/ 11 Compatibles 12 RML 13 Sinclair Spectrum 14 QL 15 Sirus/Victor 16 Other 17 (please specify) 18 19 20

APRIL 1986 PCW 143
### READER SURVEY 1986

**PERIPHERALS**

8 What peripherals do you own? What peripherals are you planning to purchase in the next 12 months? (Please tick)

<table>
<thead>
<tr>
<th>PRINTER:</th>
<th>OWN</th>
<th>PLANNING TO PURCHASE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laser</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daisywheel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dot matrix</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monitor</td>
<td>96</td>
<td></td>
</tr>
<tr>
<td>Modern</td>
<td>96</td>
<td></td>
</tr>
<tr>
<td>Plotter</td>
<td>86</td>
<td></td>
</tr>
<tr>
<td>Graphics tablet</td>
<td>86</td>
<td></td>
</tr>
<tr>
<td>Mouse</td>
<td>86</td>
<td></td>
</tr>
<tr>
<td>Expansion/add-on boards</td>
<td>86</td>
<td></td>
</tr>
<tr>
<td>Disk drive</td>
<td>86</td>
<td></td>
</tr>
<tr>
<td>Other (please specify)</td>
<td>86</td>
<td></td>
</tr>
</tbody>
</table>

9 How much do you expect to spend on peripherals in the next 12 months? (Please tick)

<table>
<thead>
<tr>
<th>FOR PERSONAL USE AT HOME</th>
<th>FOR USE AT WORK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to £50</td>
<td>01</td>
</tr>
<tr>
<td>Up to £100</td>
<td>01</td>
</tr>
<tr>
<td>Up to £500</td>
<td>02</td>
</tr>
<tr>
<td>Up to £1000</td>
<td>02</td>
</tr>
<tr>
<td>Up to £2000</td>
<td>03</td>
</tr>
<tr>
<td>Up to £5000</td>
<td>04</td>
</tr>
<tr>
<td>£5000+</td>
<td>04</td>
</tr>
</tbody>
</table>

**SOFTWARE**

10 What do you presently use your personal computer for? (Please tick)

<table>
<thead>
<tr>
<th>AT HOME</th>
<th>AT WORK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Word processing</td>
<td>01</td>
</tr>
<tr>
<td>Database management</td>
<td>01</td>
</tr>
<tr>
<td>Accounts</td>
<td>02</td>
</tr>
<tr>
<td>Spreadsheets</td>
<td>02</td>
</tr>
<tr>
<td>CAD/scientific/engineering</td>
<td>03</td>
</tr>
<tr>
<td>Business graphics</td>
<td>03</td>
</tr>
<tr>
<td>Presentation graphics</td>
<td>03</td>
</tr>
<tr>
<td>Programming</td>
<td>04</td>
</tr>
<tr>
<td>Project management</td>
<td>04</td>
</tr>
<tr>
<td>Education</td>
<td>05</td>
</tr>
<tr>
<td>Financial planning</td>
<td>05</td>
</tr>
<tr>
<td>Electronic mail</td>
<td>06</td>
</tr>
<tr>
<td>Online information services</td>
<td>06</td>
</tr>
<tr>
<td>Networks</td>
<td>06</td>
</tr>
<tr>
<td>Mainframe comed</td>
<td>06</td>
</tr>
<tr>
<td>Adventure games</td>
<td>06</td>
</tr>
<tr>
<td>Arcade games</td>
<td>06</td>
</tr>
</tbody>
</table>

11 Would you be interested in accessing an online information service written and produced by PCW's editorial staff? (Please tick)

<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>02</td>
</tr>
</tbody>
</table>

12 If you use an online service, what is your approximate budget per month?

<table>
<thead>
<tr>
<th>Up to £10</th>
<th>Up to £25</th>
<th>Up to £100</th>
<th>£100+</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>02</td>
<td>03</td>
<td>04</td>
</tr>
</tbody>
</table>

13 How much do you expect to spend on software in the next 12 months? (Please tick)

<table>
<thead>
<tr>
<th>FOR PERSONAL USE AT HOME</th>
<th>FOR USE AT WORK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to £50</td>
<td>01</td>
</tr>
<tr>
<td>Up to £100</td>
<td>02</td>
</tr>
</tbody>
</table>

### GENERAL DETAILS

14 Name: D.L. Poulton

Address: Sultan Qaboos University

Post code: 06

15 Age (please tick):

- 13-19: 01
- 20-25: 02
- 26-35: 03
- 36-45: 04
- 46-55: 05
- Over 65: 06

16 Sex (please tick):

- Male: 01
- Female: 02

17 Which category does your job title fall into? What type of industry is your company involved in? (Please circle)

### MD/Chairman/Owner/Partner

- Director level: 01
- DP manager: 02
- Other systems/programming: 03
- Professionals: 04
- Education: 05
- Engineer: 06
- Scientist, technologist, researcher: 07
- Student: 08

18 Company size (please tick)

<table>
<thead>
<tr>
<th>Up to 25: 01</th>
<th>26 to 50: 02</th>
<th>51 to 100: 03</th>
<th>101 to 150: 04</th>
<th>151 to 200: 05</th>
<th>201 to 500: 06</th>
<th>501 to 1000: 07</th>
<th>1000+: 08</th>
</tr>
</thead>
</table>

19 Do you authorise expenditure on computer products and services for your department/company? (Please tick)

<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>02</td>
</tr>
</tbody>
</table>

20 Please indicate your income bracket.

<table>
<thead>
<tr>
<th>Up to £8000: 01</th>
<th>£8000 to £15000: 02</th>
<th>£15000 to £20000: 03</th>
<th>£20000+: 04</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>02</td>
<td>03</td>
<td>04</td>
</tr>
</tbody>
</table>

Many thanks for the time you have spent completing this questionnaire. Please return it to the address below by 18 April 1986 — no postage is required:

VNU Business Publications
Freepost 25
London W1E 6EZ
50% DISCOUNT!

WHY PAY MORE?

WORDSTAR 2000 227 RRP 455 -51%!
MULTIMATE 225 RRP 450 -50%!
SUPERCALC 3.21 180 RRP 360 -50%!
OPEN ACCESS 309 RRP 550 -43%!
XCHANGE 280 RRP 495 -43%!
WORDSTAR PRO 229 RRP 399 -42%!
DBASE II 237 RRP 395 -40%!
DBASE III PLUS 368 RRP 595 -38%!
FRAMEWORK II 346 RRP 550 -37%!
SYCERO 370 RRP 595 -37%!
PROJECT MANAGER 242 RRP 375 -35%!
WORD PERFECT 280 RRP 425 -34%!
HERCULES MONO 299 RRP 449 -33%!
QED+ 200 RRP 295 -32%!
WORD 272 RRP 400 -32%!
SYMPHONY 375 RRP 550 -31%!
DB COMPILER 450 RRP 650 -30%!
LOTUS 1-2-3 275 RRP 395 -30%!
CAPTAIN BOARD 225 RRP 319 -29%!
CBASIC COMPILER 280 RRP 395 -29%!
MBASIC COMPILER 285 RRP 385 -25%!
CLIPPER 498 RRP 650 -23%
DATAMASTER POA NOW AVAILABLE!
IRMA BOARD 899 RRP 1158 -22%
MILESTONE 175 RRP 225 -22%
DGRAPH III 160 RRP 200 -20%
HERCULES COLOUR 156 RRP 195 -20%
QUICKCODE III 160 RRP 200 -20%
CLIP FAST 102 RRP 120 -15%!

- Most popular business micros supported!
- Fast delivery!
- Quantity discounts!
- Credit accounts available!
- Government & overseas orders welcomed!
- Customized 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
40 SATLEY ROAD HUNTINGDON CAMBS PE18 7YG

ATARI COMPUTERS

COMMODORE COMPUTERS

 Released the true potential of your personal computer

In-House Technical Support for PC Users?
One-Day Courses on Configuration System Software Option Installation Problem Solving Diagnostics

The Barefoot Engineer for general support staff

In-House training for IBM PC Network Spares Supply Maintenance Cover

Call Derek Hammond-Parker for further information on 01-8289000

Specialised Support for Business Computers

SWANLEY ELECTRONICS

The Computer Export Specialists
Dept PCW, 32 Goldsir Rd, Swanley, Kent BR8 6EZ, 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.

CWP COMPUTERS

Release the true potential of your personal computer

In-House Technical Support for PC Users?
One-Day Courses on Configuration System Software Option Installation Problem Solving Diagnostics

The Barefoot Engineer for general support staff

In-House training for IBM PC Network Spares Supply Maintenance Cover

Call Derek Hammond-Parker for further information on 01-8289000

Specialised Support for Business Computers

APRIL 1986 PCW 165
If you’re in the mood to confront hefty essays and tackle the intricacies of electronic faults, this month’s book review is for you. David Taylor is your host.

**Mad as a Hofstadter**

**Title:** Metamagical Themas: Questing for the Essence of Mind and Pattern

**Author:** Douglas R Hofstadter

**Publisher:** Viking

**Price:** £18.95

None but the highest of brows should tackle this dense and hefty tome: a kind of Old Hofstadter’s Almanac of essays by a Pulitzer Prize-winning polymath, recently given carte blanche in the indulgent columns of Scientific American.

The result is a brain-twisting rummage through some thornier thickets of scientific, literary and artistic thought, often combining the author’s passions for mathematics, music and philosophical fireworks.

And, of course, for feisty phrases like Metamagical Themas, which gets a questing essay all to itself.

“We’re in the coruscating company of one who is best known for Gödel, Escher, Bach (‘a metaphorical fugue on minds and machines’) and one who perseveres in swerving pursuit of patterns in perception, pointers toward the nature and nub of intellect, cognition, or, come to that, having fun with Rubik’s Cube, unscrambling DNA and why lately we seem hellbent on blowing ourselves to thermonuclear bits.

Don’t imagine it’s an easy read. But it is, if you can take it, a teasing and entertaining one: as for instance where Hofstadter, contemplating exaggerated claims often made for Artificial Intelligence, asks us to acknowledge what vexing complexity there is in the letter ‘a’ — on the face of it so simple and elementary an object for any smart-thinking machine to grasp, yet in practice one which may readily be represented in umpteen typographical fonts and styles, never mind human handwriting flourishes, all so subtly different as to defy precise geometrical analysis.

Figure that one out and you still have 25 letters to crack, and that’s just the English alphabet. So see how long it takes you to teach a machine to pick out faces in a crowd,
Hofstadter says.
And God forbid, quips he, that we ask a computer to compute with a formula which represents the existence of Bach. 'But even though I find the prospect repugnant,' Hofstadter adds, 'I am greatly attracted by the effort to do as much as possible in that direction. Indeed, how could anyone hope to approach the concept of beauty without deeply studying the nature of formal patterns and their organisations and relationships to Mind? How can anyone fascinated by creativity and beauty fail to be intrigued by the notion of a 'magical formula' behind it all, chimerical though the idea certainly is... or fail to see in computers the ultimate tool for exploring their essence? Myself, I can quite easily fall on that, but I wouldn't deny that Hofstadter is a captivating live-wire who, whether he's musing on life's path and moment or just joshing with The Magic Domino, commands and holds attention. If by chance you're questing for a thought-provoking book of snippets to read on the loo, this one's a winner.

Art'll Fix It
Title: Computer User's Guide To Electronics
Authors: The authors of the Margolis
Publisher: Tab (John Wiley in UK)
Price: £14.20 (paperback)

Art says you need to have mastery over your machine. It's not enough, Art says, to run your software, maybe program some; you gotta understand what's cooking in there. It's not an art of manual or analogue machine you have with a micro. It's a digital electronic entity. To figure it, you should learn electronics from the bottom up. That way you'll appreciate what the machine does much better, so you'll use it better. And if it malfunctions, why — maybe you can fix it. Art, by the way, is himself a service technician.

Well, if you can take the gee-whiz presentation, this is a lively and fast-moving introduction to computer electronics. You get a pretty detailed picture of how the MPU chats up the RAM, ROM, and I/O chips, get to know how digital and how interface circuits perform the switch. In no time the motherboards seem like one of the family. Art's a good teacher.

But, I'd hesitate to endorse Art's gung-ho approach to trouble-shooting faults. He makes it all sound simple, but computers aren't only delicate, they're potentially deadly besides. Remember: all of Art's mains voltages are the US's 120 volts. Make a single mistake with the UK's 240 volts and the chances are that will be that. I'm all for absorbing the theoretical

know-how of the digital world, but extremely cautious of hands-on tinkering until you know precisely what you're at. Art's book, good as it is, is not enough. If you're determined to lay spanners on any micro's innards, first get thoroughly trained.

Handsome is as handsome DOS
Title: Unix - A Practical Introduction for Users
Authors: RJ Whiddett, RE Berry, GS Blair, RN Hurley, RJ Nicol and SJ Muir
Publisher: Ellis Horwood
Price: £21.50 (hardback) £9.50 (paperback)

Nothing from the tea-lady, but practically everyone else at Lancaster University's Department of Computing seems to have had a hand in compiling this worthwhile austere Unix primer, in itself a commendable example for veritable multi-tasking. But whether any of us outside the Lamps campus still gives much of a damn whether Unix ever fulfils its never-ending potential is, alas, another matter.

It'll soon be 20 years since Ma Bell started work on Everyman's Operating System, and still we're told that the best is yet to come. For all its linking and networking quirks (real or imagined) Unix remains lumbered by its greed for RAM and lack of bitmapted graphics in its bid to supersede CP/M and MS-DOS. Mac's icons look far more commercially hot.

The sad fact is that Unix was devised at a time when CPUs were quite scarce and pricey. Today, with micros costing a few hunredths can have a 68000 onboard, one-man-one-micro no longer looks cost-ineffective. Besides, IBMs by the million are scarcely likely to throw in the towel when every DOS update brings the system closer and closer to the Unix Shangri-La.

One way and another, I'd have thought that if Unix isn't yet quite a dead duck for the micro market, it's looking pretty peky as time goes by. But the lads from Lamps insist that it's 'extremely popular' and a snap to grasp on any number of machines, so that we take it by the hand through the filestore and show how to edit text with 'vi', handle software tools in Unix and format documents with such nattily-named programs as 'nroff'.

Their pay-off is examining the Unix shell. It provides, they maintain, 'a sophisticated and productive programming environment.' I dare say, but it also provides a striking reminder of just how hideously hostile Unix commands now seem in these days of little pictures and mice. Ask an experienced Mac user to try finding a file, not by pointing to it and tapping the button, but by keying into Unix:

```bash
$ temp=/usr/temp/tempa=dummy
$ echo Stempa
dummy
$ echo @tempa
/usr/temp/a
$
```

If you and Unix would like to be introduced, this book will make the acquaintance. I just wonder whether you'll want to become firm friends.

Easy PC
Title: Managing your business with the IBM PC
Authors: Kathy and Terry Lang
Publisher: Holt, Rinehart and Winston
Price: Not known

The Doctors Lang, no strangers to regular readers of PCW, are plainly not ones to mess about with the metamagical or obscure when: (a) countless businesses are still burdened to be told what desk-top computers might do for them; and (b) the huge majority of business PC buyers will plump for IBM and clones.

The hard part is, as usual, to find a tone of voice which does not patronise the commercially astute, yet cannot take it as read that they'll necessarily know a damn thing about PCs. The Langs succeed in so far as this slim paperback is both lucid and digestable at defining likely needs, but they're in danger of skimping in the interests of brevity.

The likely needs they identify are planning and forecasting business accounts with a spreadsheet, presenting results graphically, managing database files, word processing, simple accounting packages and such desk-top helpmates as diaries and calculators, plus the wherewithal to set up occasional comms links to BT Gold and the like.

So far, so fine: tips and pointers, potential pitfalls identified. It's easily-followed, well structured advice. But I might feel a bit short-changed were I to wonder whether my PC could, for instance, whack off a Telex. The Langs explain: 'There are several ways to send messages using your PC. One possibility is to buy a special, which connects directly to the PC, but these are quite expensive. It is also possible to send telex messages via BT Gold provided you have made special application.'

And that's that. It's true, concise and accurate. On the other hand, it hadn't got you far.

Perhaps the book should be twice as fat, but then perhaps only half as many people might feel up to reading it. All-purpose primers for business computing tyros are, as I say, notoriously difficult to judge. I'd give this one alpha minus.
The American way

Title: NFL Challenge
Computer: IBM PC, PC/XT
Supplier: Challenge UK
Format: Disk
Price: £125

The Americans have an inordinate predilection for statistics, and nowhere is it more obvious than in the field of sport. You only have to watch Channel 4's coverage of American Football to discover a fascinating world of facts and figures, whose inhabitants communicate in a strange argot, indecipherable to those on the periphery.

Even with its innumerable hurdles for the uninitiated, American Football has swept across the UK, providing new fodder for the armchair sportsmen who have grown fat on a bland diet of soccer, snooker, and darts.

Television is the major purveyor of the sport, but Challenge UK plans to introduce it to a wider audience by distributing an IBM-based football simulation called NFL Challenge.

Simulation is a much used and abused term in computer game circles, but NFL Challenge has more right to the epithet than most. It views the game not from the perspective of the player, or even the spectator, but rather the master strategist - the coach. He is the brains of the team, controlling the action either from the bench, or while pounding up and down the sideline. Therefore, the player takes the role of the team coach, the worryer who views the game with a clinical eye and the strategic bent of a chess player.

When the game is first loaded, players are asked to choose their teams. Some knowledge of the way in which a team plays is helpful here, although not necessary. Each player is also given a choice of which side of the keyboard he wishes to use. The layout employed is quite simple; the right-hand player uses the numeric keypad, while his opponent uses the function keys on the left-hand side. Next, a computerised coin is tossed to see who kicks and who receives.

After some whirring of the NFL disk as the program loads the various files of data on the participating teams, the screen display changes to feature a grid representing the playing area, and boxes giving the coaches a chance to look at their team roster - a collection of hieroglyphics apparently representing the players' statistics, making a substitution, or starting the game.

Before going any further, here's a brief résumé of the rules. The basic idea is for the offensive team to make its way up the field by gaining distance through a number of downs. At least 10 yards must be made in a series of four downs, or possession is handed over to the opposition. Having reached the end zone, the attacking team is awarded a touchdown and a kick at goal.

Yardage is gained through a number of set offensive moves which are outlined in a playbook. This invaluable text is split into six sub-groups containing short-yardage plays, long-yardage plays, a group of special plays, and three groups for all situations.

Each move is represented graphically, which is a blessing, because names like Shotgun Draw Trap and Slot X.Y.Z Streak are rather too obscure when you're under pressure to make a move.

The six groups mentioned earlier are further sub-divided into five risk-gain categories. A play with a short risk-gain factor gives a team a good chance of making up a short distance with little risk involved. Plays designed to gain large amounts of ground logically involve more risk, and therefore should not be undertaken lightly, as the result can affect the game's outcome.

The defending team's coach has a similar manual to that of his counterpart, except it contains four groups of defensive plays. Here the names become really American, featuring such moves as the dubious Over Twist Willy (I kid you not), 10 Blitz Man and 10 Man Under. These, like the offensive moves, are divided into different yardage plays.

When each player has called his move, the display changes to an enlarged version of the playing grid, with the teams represented by red crosses for the defenders and green circles for the attackers - the shapes employed by real-life coaches to demonstrate plays to their teams. After taking up their specified formations, the crosses and circles rush about, frantically going through the moves called by the coaches.

If you're playing NFL Challenge on an IBM with colour graphics capability, the play sequence is replayed in

Our regular update of the best leisure software takes a more diverse approach this month, as Stephen Applebaum looks at three unusual and thought-provoking games for the Macintosh and the IBM PC.
slow motion, giving you a better chance to see what happened, and what went wrong.

Not every move will be played in the exact form that is given in the playbooks, as a lot depends on the situation at the time; that is to say, it depends a lot on the abilities of the teams making up the two teams. For instance, if a player realises he is blocked, he'll try and change his strategy, altering the overall pattern of play.

Not everything is certain in American Football. During a set play, a player could fumble (drop the ball), the ball could be intercepted, or the quarter-back could be sacked — a term used when a quarterback is brought down in the middle of throwing the ball.

One of NFL Challenge's most powerful features is its customisable team rosters file, which stores information on the 26 NFL teams in ASCII format. Loading the file into a word processor, such as WordStar, enables you to update the teams' statistics as the season develops.

A full game of NFL Challenge takes an hour, bar time-outs, and has very few low spots throughout. Its most disappointing feature is its sound, which is no better than the beeps and buzzes elicited from the Spectrum. Less annoying, though rather more surprising, is the fact that the computer only plays an average game against a human opponent.

NFL Challenge's only other drawback is its price. Even with all the team and player data, two playbooks, a separate NFL playbook, a User's Guide, and official NFL recommendation, the price tag of £125 is still excessive, and will probably limit its appeal to the executive games market. Its price notwithstanding however, which is too high for the British games market, NFL Challenge is a superb sport simulation that is not only fun to play, but also teaches you more about the game than even Nicky Horn can achieve on TV.

Thanks to Computer Business Systems for providing us with NFL Challenge. The company can be contacted at Sommerville House, 20 Southerness Hay, Exeter EX1 1NS.

---

Ever get that feeling...?

**Title:** Deja Vu (A Nightmare Comes True)  
**Computer:** Macintosh 128k, Mac XL  
**Supplier:** Mindscape  
**Format:** Disk  
**Price:** Not available  

The ironically-titled Deja Vu is one of a new crop of avant-garde games from US-based Mindscape. With its familiar lack of modesty, Mindscape asserts that 'Deja Vu is like no other adventure you've experienced,' a statement certainly true in my case.

Deja Vu literally demystifies the barrier between the action that takes place onscreen and the player's experiences, by allowing interaction with almost everyone and everything appearing in the game's brilliantly-drawn settings. Clever exploitation of the Macintosh's versatile screen-handling means that Deja Vu has an infinite number of possibilities, giving the program an air of ambiguity more akin to the real world than a clinical computerised version of what that real world should be.

French in title, but pure Americana, Deja Vu is set in a sleazy underworld which could have come straight from the pen of Raymond Chandler; it's more sordid than apple pie, and full of innuendo and stereotypical characterisation.

The first thought that crosses your mind as you lie on the floor of a squalid toilet in a small downtown bar, is that things can only get better. You stagger out of the room, your brain shot through with a potentially lethal cocktail of truth drugs, hoping to find the antidote and the reason for your being here you are. A barrage of unconnected memories flashes through your head, only to be swallowed up by the chemical pall that has enveloped your mind.

This is the state in which you find yourself at the start of Deja Vu: drugged up to the eyeballs and on the brink of death. Only by finding the cure will you survive long enough to discover who set you up, whose corpse is dumped in the boot of the car ominously parked outside the bar, and who's prowling about your office. Confused? You will be.

Deja Vu's greatest asset is the way in which it grabs the player by the throat, dragging him down into its turgid depths, from the very start. There's little time to orientate yourself before being informed that you're turning into a vegetable — a truly marrowing experience.

Very little of Deja Vu requires the player to touch the computer keyboard, most moves being made via a menu stretching across the top of the screen, obviating wordy typed commands.

The gathering of objects is a particularly interesting and inventive feature of the game. Using the Macintosh's icons to the full, Deja Vu's programmers have littered the game's various screens with a plethora of items which can be lifted and dragged from one part of the display to an inventory window at the side of the screen. Pointing to Open in the menu, then pointing to an object, allows you to study the window's contents.

An impressive example of how objects can be manipulated occurs at the beginning of the program. Hanging on the inside of the lavatory door is a large overcoat; relocating the garment in the inventory and then opening it, reveals several smaller icons representing such things as a wallet, an ID card, sunglasses and money. Opening the wallet produces another window displaying its contents. There are so many windows within windows that playing Deja Vu can be akin to dismantling a Russian Babushka.

An option called Operate in the menu enables you to use the equipment which has been diffused throughout the various windows. Operate causes one piece of equipment to have an affect on another: to unlock, say, a door, you'd select a key, click on Operate, and then point to the door in the graphic area. The screen you want to open. firing a gun is similar in style, except the door becomes the target.

Deja Vu is graphically superb, has a strong storyline, and is, above all else, funny. A very sense of humour pervades almost every corner of the game. A joke appears in its graphical form, while others are subtly inserted into little gems of text: a hooker goes out like a red light when you hit her, while a pet dog bites you and sends you for stitches. Muggers prowl the streets of Chicago and, it appears, always bump into you. One particularly keeps you immensely entertained: you time and again, but can be seen off with a right-hander, blackening his eyes and breaking his nose.

Deja Vu is a program beyond reproach. Although it isn't the last word in 16-bit software, it is a massive step forward, and heralds a new era in computer gaming.
Games that wizards play

Title: Wizardry
Computer: Macintosh
Supplier: Sir-Tech Software Inc
Price: £59.90
Format: Disk

In the ephemeral world of computers, it is rare to find a game which has stood the test of time as well as Sir-Tech's Wizardry. It has been at the forefront of the micro-fantasy movement since 1981, diverting, enthralling, challenging and exciting new adventurers in its various incarnations for the past four years.

Wizardry is Tolkien-esque, being full of characters with ridiculous names and eccentric lifestyles. Of course there's the obligatory mad megalomaniac, although this time, with a name like Trebor, he sounds as if he could simply be sucked to death. His arch rival is Werdna, an evil wizard with a notorious penchant for helping old ladies half-way across the street and then stealing their purses (a metaphor for the State of the Nation in 1986?)

The future of Wizardry rests precariously on the outcome of the struggle between Trebor and Werdna. To accomplish his plan of world domination, Trebor must first recover a magical amulet appropriated from him by Werdna, who has ensconced himself and the artifact within a skein of tunnels below a fortified town.

The embittered Trebor has instituted an Elite Guard to recover the amulet. Individuals are only qualified to enter this crack force after proving their mettle in Werdna's Maze.

As if there weren't enough creatures in the Maze already, the player must enter it, train his own merry band of psychopaths, and then liberate the amulet from both Trebor and Werdna, hopefully killing the latter in the process.

Characters are initially recruited from the Training Ground in the town. They come in a variety of morphological forms, including the appropriately ungodly Human, Elf, Dwarf, Gnome and (I can't think of anything original) Hobbit. Temperaments are less numerous, ranging from good, through neutral, to evil. Good and evil characters don't mix, so your party of six can only consist of all evil, or all good and/or neutral ones.

Before lumbering a character with an inadequate disposition, players should first peruse the Wizardry manual for information regarding which temperament is the most advantageous for what genus of creature. Applying the wrong one invariably forms a weak link in the party chain, leaving other members to fill the gap.

Six physical and psychological traits determine the class into which a character originally falls and the situations it's best suited to. There are eight different classes, only five of which appear to be accessible from the outset of play: Fighter, Mage, Priest, Thief and Bishop. There's also a Samurai with a well to the out of reach, initially, Even higher than the Samurai are the Lord and the Ninja, two forms which can only be reached after many hours of play.

Characters in the three clerical classes can all perform spells of one kind or another and although Priests can only perform Priest spells, and Mages Mage spells, a Bishop can cast both.

The first time I played Wizardry, I sent my party into the Maze under the delusion that they were kitted out with the necessary accoutrement for battle. It was like sending a cow into an abattoir with the hope that it would come out in a fit state to produce milk: bare flesh is a hopelessly poor defence against raw steel. With one group already six feet under, I returned to the Training Ground to recruit another band of hapless souls. This time, however, I took them to the village shop where I bought them designer armour, Emmanuel robes and several offensive weapons. I was ready!

Werdna's Maze is depicted as a 3D view along the various corridors. Movement is initiated by pointing an arrow in the direction you want to go, then clicking on the mouse to instigate the move. Entering an area containing beasts turns your arrow into a sword. Small icons representing the foe replace the view of the maze, while a list of your party members appears in the lower half of the screen.

If you surprise the Maze dwellers, the computer gives you the chance to run or engage them in combat. Selecting the latter option allows you to delegate actions to your party members. Only the front three are able to fight, but Mages and Priests can cast spells wherever they are in relation to the mûhûde.

First-level clerics (that's those on the lowest level of experience) only have very simple spells which cause the least amount of damage. As they progress up the ecclesiastical ladder, they gain experience and more potent spells. Level seven Mages, for instance, can cast what is termed a 'Titwaffle', the effect of which can be likened to ' . . . a small, well contained, nuclear fusion explosion.'

Money and experience are the rewards for winning a fight. Experience is the more important prize in the early stages of the game, though money becomes all the more necessary as it progresses.

Occasionally, you have to return to the surface to rest your party in the local Hotel. Only here can a character move up a level.

Also on the surface is the Temple of Cent, where the dead can be restored to life — for a small fee, of course. For this very reason, money takes on a greater importance as the adventure continues, especially as the cost of reanimation is always increasing.

There is little more to Wizardry than what I have described here. Most of your time is spent scouring the Maze's various levels for creatures to kill, before finally coming face to face with Werdna. The time spent on this enterprise could be phenomenal, as even at the time of going to press, it is still not clear exactly where the wizard has hidden himself. Our only clue to his whereabouts is the late discovery of an additional five levels, on top of the four we already know about.

Wizardry is brimming over with features which liven up the proceedings, such as designing your own icon when a character reaches the seventh level, and the odd lurid description outlining the painful death of one of your people. Best of all is the way in which teams lost in the Maze can be rescued by more experienced squads, even after the game has been put back onto the shelf for another day.
LIFETIME WARRANTY
Certified Error Free

ATHANA DISKETTES
THE BEST DISKETTE THAT MONEY CAN BUY!

ATHANA DISKETTES
ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!

ATHANA DISKETTES!
ATHANA DISKETTES!
I am involved in theoretically starting a small business dealing mainly in software, as a project at university, and have come across the problem of promoting my efforts. When you review software in your magazine, do you approach the supplier to get the software, or does the supplier approach you? Also, could you explain how the copyright system works for software?

David Kelsey, Coventry, West Midlands

Some firms send software to PCW 'blind' — that is, they just post the package to us in the hope that we'll take an interest. Alternatively, other suppliers send a concise summary of the features of their product, together with a contact address and number — we contact them later if we consider the program might be of interest to our readers. In either case, correspondence should be directed to the editor, Peter Jackson, who will pass material on to the appropriate reviewer.

British Copyright law is embodied in the 1956 Copyright Act and the 1985 amendment to the Act, which confirmed the fact that computer software could be copyrighted in much the same way as literary or artistic work. The law says — in essence — that you are entitled to a monopoly over the exploitation of your original work (expressed in some 'fixed form', like a program listing) until 50 years after your death. During this time no-one else may reproduce your work, or a direct adaptation of it, without permission.

Copyright law expresses the fact that ideas are 'intellectual property' once they have been expressed formally. Of course, you can't copyright the ideas themselves, but just the expression of them, and the work must have been done in your own time, with your own tools. You cannot copyright programs that you write 'in the course of your employment' unless your employer says otherwise.

You don't need to 'register' copyright work in the UK — it is copyright as soon as it is expressed in a 'fixed form'. However, you may have to sue other people in the civil courts if you believe that they are reproducing your work without permission and you want to defend your rights. This can be expensive, and most cases are usually settled 'out of court'. If you feel that your copyright is being infringed, you should start by sending a solicitor's letter pointing out your claim, and follow your nose from there.

You must be able to prove that there are striking similarities between your program and the copy, and that the copier had a chance to see your program. It is important to be able to prove that your work pre-dated the copy. You can establish this when you finish the copy, by setting the listing of the program in a book yourself by registered post, and then keeping it in a safe place, or by sending a copy and an appropriate fee to a 'software registry'.

In many other parts of the world you have to indicate that a program is copyright, by writing your name, the year and the copyright symbol — a letter C in a CLOSED circle — in a prominent place. Some countries — such as the USA — also require you to send a copy of the program to an official registry.


can't copyright the ideas themselves, but just the expression of them, and the work must have been done in your own time, with your own tools. You cannot copyright programs that you write 'in the course of your employment' unless your employer says otherwise.

... ideal Atari printer

I have an Atari 800XL with disk drive. I have just purchased a word processor program but, unfortunately, do not have a printer. I have borrowed a colleague's Atari 1027 but have not found it to be completely reliable. A friend has recommended one of the 8-bit machines but the interface would cost an extra £70. Unfortunately, money is limited and I can only afford £200—£250.

J Chapman, Erdington, Birmingham

You can put together quite a useful word processing system around an Atari 800XL; the cassette system is not really fast or reliable enough for this application (although you can do anything with a cassette system if you're stubborn enough). You'll probably need a 1050 disk drive, which gives you 127k of storage for £125.

You can't really avoid using Atari's own drives and printers, as the machine doesn't have standard Centronics or RS232 interfaces. You can add these, but — as you have found — the cost is probably prohibitive. Atari's own add-ons use the non-standard, rather slow, serial bus, via the large wedge-shaped socket on the side of the computer.

When you have the drive, you can buy a disk copy of the standard word processor, Atariwriter, for £14.50. This used to cost £65 on ROM cartridge. The Atari 1027 printer, at £137 or thereabouts, is the only low-cost, letter-quality printer that you can plug directly into your machine. It is slow and rather fragile, since it is based on a typewriter mechanism, but it should be...
reliable if you treat it with care. The letters are normal typewriter-size (the term 'Elite' refers to the fact that there are 12 characters per inch, across the page).

Amstrad wp
memory expansion

I have recently purchased an Amstrad PCW8256, and I had a spare 'Byte Drive 500' 3in disk drive. Is it possible to connect this up as drive B of the Amstrad?

Do you have any information about the extra memory sockets inside the computer?

R A Jacob, Hampton, Middlesex

The socket for 'drive B' is specifically set up to accept Amstrad's 1Mbyte drive, so it won't accept a 'normal' 80-track, 3in device. You might be able to connect the Byte Drive internally, but I don't know how and I wouldn't like to try it, especially as you might have some trouble getting the software to recognise it.

The RAM sockets are similarly hard to use. They were intended for 64k of chips, back in the days when the PCW8256 was designed to be a PCW8128B, with two 64k banks of memory. In the event, the price of 256k chips fell to the point where it was pointless to use 64k parts, and the machine was shipped with a single 256k bank. The other sockets are not properly driven or decoded to cope with memory in addition to this, according to Amstrad. This does seem plausible when you consider that Amstrad itself has not announced an upgrade using the sockets, and nor has any third-party supplier. As Amstrad put it: 'if it were easy, we'd have done it by now.'

Engineers within Amstrad and outside are working on the problem, so it might be worth waiting to see what turns up. But, in the meantime, I would not advise you to dive in, soldering iron smoking — you'll probably just break the 256k you've already got.

QL news

What is the address of the English 'supplement' QL User? Could you tell me how to contact QL groups or clubs in the UK?

Julio Pereira Proença,
Lisbon, Portugal

The QL publishing scene has had a fairly traumatic past and it is still in a state of some confusion.

First of all Sportscne published a magazine called QL User, then EMAP came out with another magazine with the same title. A few threats were exchanged and EMAP emerged victorious, only to close its title down 18 months later. In the meantime a rather poor 'free' magazine called QL World started up.

The publishers of QL World have now taken over QL User, and re-christened themselves Sinclair QL World (or publishing QL User (SQUALWUQI for short?). At the time of writing an issue of the new magazine has not been published, so it is a bit hard to know whether or not the title can be recommended. The publishers are based at 80-82 Upper Street, Islington, London N1 0NO (I hope the last part of the postcode is not prophetic).

Even the non-profit-making Independent QL User Group has suffered an identity crisis. It started out as IOLUG, and then changed its name to QUANTA. The group publishes a disorganised but informative monthly newsletter, and organises regular workshops and regional meetings. The chairman of QUANTA (and the UK 'C' User Group) is Paul Butler and he can be contacted at 8 Morris Walk, Newport Pagnell, Bucks MK16 9BD. His phone number is (0908) 613004.

Oric/Amstrad
merger

I am interested in buying an Amstrad CPC6128 as a replacement, of sorts, for my Oric-1. However I already have several programs for the Oric and have no wish to sell it — not that it is worth much anyway.

I would be able to use the Amstrad monitor (from a colour system) and the built-in power-supply with my Quanta.

When using the cassette recorder as a back-up, would I be able to use the Oric lead?

Could the Amstrad load text files generated by programs such as Tansoft's

'Author' at the Oric's 2400 baud speed?

Would it be practical to use the Oric as a peripheral, such as an intelligent printer buffer, maybe by swapping data between the cassette ports?

Timothy J Ruffle,
Sperrymore, Co Durham

The Oric RGB port should drive the Amstrad monitor without any problems. The monitor expects four signals: one for each colour, red, green and blue; and one for 'synchronisation' — to tell the display when to start a new line or frame.

The Amstrad computer varies the relative intensities of the colour signals to give more than eight colours — the limit, if you just turn the colours on and off in combination — but the Oric can't do this, so you won't get any of the 'new' colours available from the Amstrad.

The monitor supplies power to the CPC6128, but it produces two smoothed signals, nominally of five volts. I believe the Oric expects nine volts (though you should check this), so it doesn't seem likely that the supplies will be compatible. You could try running the five volt rail into your Oric power socket — it might work and would be unlikely to cause any damage, so long as you get the polarity right — but the 12-volt supply will probably cause the Oric to overheat.

The Amstrad uses a similar lead to the Oric, but the connections at the computer end are different — you'll need a five-pin DIN plug. Appropriate leads, designed for use with the TRS-80 Colour Computer, are available from Tandy shops. Your recorder should be fully compatible.

The format used for Amstrad tapes is quite different from that used by the Oric, so you will not be able to read them unless you're willing to write some quite complicated machine code. You'd also need some kind of 'buffer' amplifier, so this is not a sensible solution unless you're a brilliant hacker with a lot of time on your hands.

Amstrad tells me that someone has written a routine that allows its computers to read Spectrum data tapes, but the technique is of limited usefulness — it is no good for transferring programs.

The ideal way to transfer data between the machines is via an RS232 port, but

even this can be tricky — this is probably the favourite topic for 'Computer Answers! RS232 ports are optional extras on both machines, so it would be cheaper to buy a 'dedicated' printer buffer.

Apricot video

I have access to a Sirius and an Apricot Xi. Is there any suitable software I could obtain to allow me to create titles and other graphics on a colour TV?

As a hobby I make educational slide material but I find decent slide titles difficult to make — I'm fed up with Letraset, good though it is. I have a camera and taking still photographs of the colour screen. What do you think?

Peter Hogg, Hartlepool

Neither the Sirius nor the Apricot Xi support colour as standard — there used to be a colour option, but now it's just a licence fee. But it was expensive and I cannot trace anyone who stocks it nowadays. You can plug an Apricot 7220 colour board into an Xi, but it slows down the system very noticeably and it only works with an RGBI monitor, such as the Sony model which Apricot supplies. The colour cards for the Zen machine should work in an Xi, at a sensible speed, but you'd be well advised to 'try before you buy', and once again there's no TV output.

The second problem comes when you try to draw colour graphics, but all the graphics programs are compatible with the colour cards. The GEM system, for the Apricot Fi, works in colour, but a version is not available on the Xi.

To be honest, you'd be much better off buying a cheap colour graphics home computer and using that to make your slides. The hardware cost will be smaller and the software should be cheaper. You'd also need some kind of 'buffer' amplifier, so this is not a sensible solution unless you're a brilliant hacker with a lot of time on your hands.

Amstrad tells me that someone has written a routine that allows its computers to read Spectrum data tapes, but the technique is of limited usefulness — it is no good for transferring programs.

The ideal way to transfer data between the machines is via an RS232 port, but

even this can be tricky — this is probably the favourite topic for 'Computer Answers! RS232 ports are optional extras on both machines, so it would be cheaper to buy a 'dedicated' printer buffer.

APRIL 1986 PCW 173
Newcomers start here

Peter Tootill explains the rudiments of computer communications.

Let's assume that you have obtained a modem and 'terminal software'. The latter is what turns your micro into a computer terminal, taking your keystrokes and sending them to the modem for onward transmission to the distant computer that you are communicating with. It also takes the incoming characters and displays them on your micro's screen.

The first hurdle in getting your micro online is connecting it to the modem. The easiest way around this is to make sure that you are given a connecting cable for your computer with the modem when you buy it. Different micros have different connectors on their modem ports (usually called RS232, or serial ports). If you tell the supplier what type of micro you have, he should be able to provide the right cable. Don't forget that some micros need an additional card, or other interface, before they can be used with a modem. IBM PCs, Commodore 64s and Spectrums are all examples of micros which don't have an RS232 port as standard.

For your first sessions online, you won't need a sophisticated terminal package; in fact, the simpler the better -- a 'dumb' terminal program is perfectly adequate. If the software allows, set the RS232 parameters, then choose 8-bit word length — no parity, one stop bit. Then select the baud rate appropriate to the system you have chosen for your first call — probably 300 bits/sec.

Having bought the right connectors, connected your micro to the modem and loaded your terminal software, you are ready to go. It's a good idea to check that all is well by switching the modem to its Test mode, if it has one. In this mode, it echoes back to your computer everything received from it (the manual will show you how to do this). If what you type on your keyboard in this mode appears on the screen, then all should be working properly.

If all is well you can now choose a system to call, but there are a few points to watch here. Firstly, make sure that the system you call is compatible with your modem and software. U21 (300/300 bits/sec) systems are the most common, and most modems will work with these. Next, pick a few numbers from the list on the opposite page, and make sure that they are running at the time you want to call. (Please don't call a part-time system outside system hours: it leads to a lot of aggravation for the people who run it.) Bulletin boards are good systems to start with as they are designed to make it as easy as possible for first-time callers.

The next thing is to set your modem to 'Originate' mode (you are originating the call) and to the right speed (U21 for a 300-baud BBS). Now dial the number of the chosen system (if it is a 'ring-back' system, you will need to let the phone at the other end ring once or twice, and then dial again — this tells the computer that the next call is for it).

When the system answers, you should hear a high-pitched tone from its modem. At this point, switch your modem online (or put the handset in it, if you are using an acoustic type). The carrier light on the modem, if it has one, should light up, and you should see a welcoming message appear on your screen. If all you see is garbage, the most likely reason is that your word length and parity are different from the system you have called (most systems work with 8-bit words and no parity, but if you have problems, you could try seven bits and even parity). If nothing happens, try pressing Return a few times. If the carrier light still doesn't light up, you probably have the wrong modem setting for the system you are calling. U23 systems won't respond to U21 modems, for example.

When you make contact with a system, the first thing it will do is ask for your name. A BBS will then check to see if it recognises you from a previous call. If not, it will need to know certain things about the computer you are using to call it, in order that it can talk to you in the most convenient way, so it will ask you questions: one will probably be about the screen width you are using, which is simple; the others will be about 'nulls' (one-character pauses) and 'line-feeds'. The nulls question is to find out if your terminal needs a pause at the end of each line. It mostly applies to printer-type terminals, and is necessary to allow the print-head time to go to the start of the next line, before any more data is transmitted. It is usually safe to answer '0' to the 'How many nulls?' question, and if you want to play safe, you could ask for, say, five nulls.

The line-feed question arises because some computers automatically start a new line after a carriage return; but with others, the cursor just goes to the start of the line it is on, and needs a line-feed as well to make it start a new line. If you are not sure, say yes; if that's wrong, lines will be double-spaced on your screen. Better that than being wrong the other way and having everything that is sent to you appearing on one line, which can be very difficult to follow! Some BBSs have a standard list of computers to choose from, and if yours is included you won't be asked these questions, which makes life easier. If you give the wrong answers, there is usually a command on the system to allow you to change things later.

Calling a viewdata system, such as Prestel, is a lot simpler. All Prestel terminals work the same way, so there is no need for questions about nulls, and line feeds. All you are usually asked for is your name or ID.

When you are logged on to the system, you are on your own. Most systems operate from a series of menus and are designed to be simple for new callers.
UK free networks

(01)230 7577 JUG-Tandy Users Group 24 hrs....300
(01)262 1629 JTBBS Capital 24 hrs....300
(01)346 7650 JMarctel 24 hrs....300 & 1200/75
(01)348 9400 JTBBS London 24 hrs....300
(01)429 3047 LDL 24 hrs ring back....300
(01)458 5300 JNBBS London 24 hrs V.21/23
(01)542 4773 JNBBS Wimbledon sat-mon 7am-8am V.21/23
(01)579 4877 JTBBS London 7pm-7am Mon-Fri, w/e 24 hrs....300
(01)638 2034 JCyberzone - Atari 24 hrs....
(01)658 6942 JTypenet Budget typesetting 24 hr.
(01)679 1888 JDistel 24 hrs....300
(01)679 6163 JDistel 24 hrs....300 & 1200/75
(01)775 6152 JBruton ITEC 24 hrs 1200/75v.
(01)868 8894 JGnome (The Great Goblin) 24 hrs....(2 lines) 1200/75v
(01)941 4285 JNetrotel 24 hrs....1200/75v
(01)954 9647 JDark Crystal (Dark Crystal) 24 hrs....300 & 1200/75
(01)960 4742 JITCU Exch & Mark 24 hrs
(01)968 7402 JCommunity 24 hrs 1200/75v
(01)685 3227 JHackett BBS V.23
(0204) 43082 JBolton BBS 10pm-8am, w/e 24hrs 300
(0206)826 354 JPetes Place 24hr.
(021)430 3761 JCBBS Central Birmingham Atari BBS. 24 hrs (closed Thursday) (Mick Coleman)....300
(0232)243 442 JAcorn BBS 1200/75v
(0224)464 725 JCardiff ITEC 24 hrs 1200/75v
(0224)461 585 JABERDEEN ITEC 24 hrs....1200/75v
(0224)467 158 JNBBS Aberdeen V.21/23 24hr.
(0224)718 919 JAberdeens Commodore BBS 24hr. runs on C64
(0247)455 162 JSBBS II (The Irish Man)County Down, N. Ireland2100-2300 ring back;2300-0900
direct, 1200/75v/300
(0250)54 494 JBlandford 24 hrs....300
(0261)25 122 JBITEC 24 hrs....300
(0261)710 637 JRCBBS (Mag40056) 5pm-10pm weekdays, 24 hr w/e.
(029)710 812 JBxradio 10am-7am daily ....300
(037)318 818 JREGAT 24 hrs....300
(038)467 336 West Midlands 1730-0830 ....300
(039)253 116 JCBS South West 24 hrs....300 & 1200/75
(039)412 730 JABBS-1 Felixstow Apple User Group 24 hrs....300
(039)572 611 JCPC-Computers for Christ 24 hrs....300
(044)737 343 JMGBBS Mid Glamorgan BBS 6PM-9PM
(041)35 745 JRemote CP/M, MBBS Leonfield 24hrs....300 (1200/75v coming)
(048)249 170 JHamnet 5.45pm-8.45am w/e 24 hrs ....300
(048)2859 169 JHull Forum 80 1900-2200 daily.... 1200-2200 S & S....300 (Midnt to 8am Bell 103)
(048)2275 174 JFBBS-Adult' BBS 24 hrs....300 & 1200/75
(048)273 655 JFido CompuLink 24 hrs 300 & 1200/1200 +2400/2400 on BB710 10pm-6am
(049)2249 194 JCOMPUTEL 24 hrs....1200/75v
(050)683 526 JLivingstone BBS 24 hrs....300
(051)428 8924 JLiverpool Mailbox, 24 hrs.... 300 & 1200/1200(V.22)
(052)448 399 JCNOL - Medical notes 24 hrs....300
(053)455 855 JFBBS Jersey w/e 24hrs
(059)2860 313 JMBBS Amstrad 86 (Sponsored by John Menzies) Fife 9.30pm-8am ....300
(060)120 441 JReview (Northants Libraries) ... 24 hrs 1200/75v
(061)494 6938 JFido TeePee link 10pm-9am ....300
(061)736 8449 JMatrix - by subscription - 24 hrs....300 & 1200/75
(061)753 703 JTelemac IS 24hr ... 300 & 1200/75
(062)481 643 JSysmect 2000 Comp.Club 1900-0700 M-F....300
(063)2384 804 JYBBS - Scottish Atari BBS 24 hrs....300
(070)254 6373 JCVView Rochford Council 1200/75v
(070)252 552 JMapel (Commercial) 24 hrs....300
(070)552 805 JGosport 1800-0000....300
(070)573 025 JYBBS Wed & Sat 7pm-10pm Sun 10am-10pm ....300 7bits even parity.
(075)2364 000 JHaunting Thunder (Fido) 2 00-0000....300 & 1200/1200
(075)783 972 JMGBBS Northtown (N.Ireland) 10pm-1am ring back....300
(078)2125 078 JStock ITEC 24 hrs....1200/75v
(078)2415 416 JKirklands Viewdata service 24 hrs .... 1200/75v
(079)2203 953 JFBBS Swansoa
(079)71 447 JCommunity 24 hrs....300
(080)5470 164 JCBBS(London NW) 24 hrs....300
(080)552 685 JLondon West Tech 24 hrs....300 & 1200/75
(090)2212 552 JLasermail Fido - by subscription - 24 hrs 300 & 1200/75(1200,2400 coming)
(092)3674 444 JYBBS - Watford 7pm-11pm ring back, 11pm-6am direct ....300 & 1200/75
(093)677 025 JNBBS Cheshire 24 hrs....300 & 1200/75
(099)1885 634 JCBBS-Dublin 24hrs S & S (V21)...2000-0800 M-F13.30-16.30 W(Glenn)).
**TRANSACTION FILE**

Your chance to buy, sell or swap equipment.

- **KEELE CODES CUP VERSIONS 0.** MS-DOS software $10.
- **NEW Kasel.** Still sealed as supplied. £100 inclusive. Save £8. Tel: 0225 37184.
- **OLD WANTED** M208k. Complete with double disk drives and Epson printer interface. 8" paper tapes, 8" disks, business software, £250 O.D. (identy Stockport).
- **WANTED** FOR ZLOG MFC 1015. Running under RIO QOS Programs, manuals etc. Tel: 061 480 2439. Day: 0845 510 6002 after 6pm.
- **SHARP M208k.** Complete with double disk drives and Epson printer interface. Load of programs and business software, £250 O.N.
- **OYME TERMINAL with software.** Emulates television ADM3A and Hazeline. Complete with metal housing for two disk drives and PC/86. £115. Tel: David Forrest. Rowneough (0202) 576767.
- **APRICO F1** 256k. 120k disk, monitor, in original box. Software includes Superwriter, Superpaint, Superplan, MSBasic. £100 for both. Tel: Brian J. 4372.
- **UNWANTED PRIZE** (see above). 81" 15k. August 1985. Apo Escape, Caves of Olympus, Regatta £20 each, £50 for all. Accepted. £15. U-Talk speech card, £10. Tel: 0722 839262 between 5pm & 8pm.
- **SHARP MZ-80k 2.4kHz modem 48k.** Basic, Forth, Pascal, Assembly, Utilities and Database. All manuals £80 874507. (0794) 727427 after 5pm. Also PCW runs and MS-DOS offers! £40.
- **BBC 280.** Second processor (Acorn) complete, totally as new. Two month-old, genuine bargain. Cost £149. Tel: (0604) 712447 (home), 716928 (work). Antony.
- **CBM 128, MS863 printer.** New, unopened, for quick sale, unwanted gift. £370 for both. May split. Normal price over £500. Tel: Neil, eve live! on (01) 578 3309.
- **IMAN 176.** 712447 New, between 80, Cables, softwares Superwriter, disk, with disk drive. RIO with (daytime) version 0229 still CBM128. SHARP WANTED SHARP TRANSACTION U-Talk 5pm. Hazeltine. 48k. £500. May APRIL as User, Antony. 989 989 Program, 061 1732. Lee new. Second Supercalc, disk housing. 693262. 480 & 456 All supplied. PRIZE £38. 8pm. ZILOG Forth, 63602 8352 8352 8352 of £370 693262. 480k RAM, maintained 1.2M6 disks system. Epson 359330. Plus Assembler, 105k. 0473 1732. With this in mind, £70. 8pm. Happy Chips!) for Atari 810 or 1050 drive. Also Atari 810 manual. 0248 443913. TANGY MODEL 100 PORTABLE COMPUTER, 32kbytes CMOS memory, battery or mains operation. (Mains adapter included) Basic, Wordproc, Terminal, Address and appointments programs. Unused, boxed (For Stafford) 0909 702037.
- **TANDY DIASWHEEL II PRINTER + Printer & ROM software — (Wordstar, Cardbox, Basic, Wordproc, Terminal, Address and appointments programs). Unused, boxed (For Stafford) 0909 702037.
- **TANDY DIASWHEEL II PRINTER + Printer & ROM software — (Wordstar, Cardbox, Basic, Wordproc, Terminal, Address and appointments programs). Unused, boxed (For Stafford) 0909 702037.
TRANSACTION FILE

5713.
• BBC B. With dual 4090 disk drive, 32k RAM, 128K Monitor, 2
suites of perfect software. Hi-
res. Colour monitor, joystick and manuals. Mint condition. £750. Tel: Milton Keynes (0908) 675690 Eves.

• COMMODORE 8032
BUSINESS MICRO. Plus
8050 twin disk drive with Wordcraft 80 demo disks, all manuals, etc. All for £750
Tel: Tiverton (0884) 820513 any time.

• EPSOM H2O PORTABLE. Built in micro cassette and 32k expansion unit. All manuals and RS232 lead £190 o.n.o. 031 680 5788 (Eves). Also Apple II disk drive £40 Eves.

• COMMODORE 4040. Dual disk drive (upgraded 340k) with manual. Suitable for PET, C64 and C128 includes OAKS v:4 interface and cable. Only £300 o.n.o. 0753 512 Kim (Gerrards Cross) anytime.

• DATA GENERAL. One of the last of this rare oddity, 12k RAM 2 x 720 disks, +1 IBM drive, with manuals and software. Offers Mr. Kirby 938 2169.

• SPECTRUM 48k. ZX
printer, computer cassette recorder, programmable joystick, plus over £500 worth of software and boxes. Any reasonable offer. Tel: 0481 277168.

• BBC B. Inc. DFS

• ZX SPECTRUM +. Cahoot drive £35 with interface. Also VTX 5000 modem. All this and games for £180. Tel: 0283 222579 after 6pm.

• OLIVETTI M24. 256K RAM,
2 x 360k drives, MS-DOS +

• COMMODORE 8032
COMPUTER. With lookit!, 8050 disk drive, 4022 printer, C22 tape drive, cables, disks, tapes, sonu manuals. £450. Tel: (01) 777 7176 Eves. PET 512P LOOKIT! MANUALS WANTED. Perfect writer, filter and calc: version one. Any condition, name your price. John Sampson, 18 Gibson Road, Islington, London N1B 8EWS. Eves 0899 96 33358. Perfect software manuals.

• APRICOT PC 512K board. Bought in error, never used. £160. Tel: Petersfield (0793) 66752. BBC B. Acorn DFS.
Cummala twin double sided double density 4000SW. Disk drives (1984). As new. £230 o.n.o. Tel: (0800) 3313. Special offers for the new. £20 20 hr use, £1400. Software, manual and VTX5000 modem, both as new. Excellent Precision terminal. £120. Twin double sided AM40 disk drive and utility disk (for BBC). £100. Buyer collects. (01) 2049 2252 (Eves).

• SEIKOSHA GP-250
GRAPHICS PRINTER. With RS232C and Centronics interface. £180. Peter Goodwin, 159 Victoria Rd, Rutland Manor, Midddx. Tel: Ruislip 71911 after 6.30pm.

• AMIGA 500. Amiga Colour, Epson printer, Cirkit modern + Prestel software, joystick and amber monitor. Six blank disks, £250
business software, £100 games + utilities. cost £1200. Offers around £900. Tel: Keshi 061 226 4423.

• SHARP MZ R9a. 80k +1
printer, fully boxed, complete with manuals and C22 disk books. Eves 0282 26265.

• WANTED. Specifications of
MODEM. To access Prestel and Micronet from Sinclair Spectrum. Comes with manuals in original packing. £50 o.n.o. Tel: Neil Mathers (01) 959 4377 daytime.

• Le SCRIPT II column
word processing version 1.21 for Tandy models III and IV. Not used, will sell for less than half price. 031 322 8142 Headlee, 6 Leslie Place, Edinburgh.

• IBM PC BITS. Basic compiler £100. APL, £80, Easywriter £60, 360k
diskette drive, £50, 64k mosaic board, IBM card, printer card, etc. Tel: Bob, 0708 523896.

• MULTIPRINTER. COMPUTER (built-in colour). £250. Tel: MZ280P matrix printer, MX 80 with interface extra RS112 board. M3780 editor assembler package. £350 or offers for individual items.

• BROTHER EP44
PRINTER. Immaculate £135. Tel: 0273 813894.

• APRICOT PC. 256K RAM, 2 x 315k disk drives, and mouse. Includes
Basic, Logo, word processor, database, games, ten 3½ disks and books. £500 o.n.o. Tel: Tim, (01) 577885.

• APRICOT PC, 256K
RAM. £2315k disk drive, and monitor. All good condition. £200 o.n.o. Tel: (01) 44271 2657.

• APRICOT TP2. S 315k disk drive, with manuals. In good working condition. Tel: Colin (01) 675 4998 (Weekdays after 7pm).

• FOR SALE. Open university course PT502 microprocessors and product design costs £425, sell £300 only. Tel: (01) 482 1626 ask Hector L. Rondello, 22 Longmeadow, Torrino Avenue, London W3 4PP.

• CLEARANCE BARGAINS: Two Sharp MZ-700 colour monitors £40 each. £48k IBM drives, £50, 64k
mosaic board, IBM card, printer card, etc. Tel: Chris, 01289 5292.

• ATARI 520ST. Boxed as
new. Monitor, 500k disk drive, and mouse. Includes Basic, Logo, word processor, database, games, ten 3½ disks and books. £750 o.n.o. Tel: Tim (01) 577885.

• COMMODORE MPS 801
PRINTER. Excellent condition, hardly used. Reason for sale: money needed. £400 o.n.o. Tel: (01) 242441.

• COMMODORE 6532
PLUS. £205 o.n.o. Tel: (01) 242441.

• MICROCHEM.
Kevin O'Connell looks back at the overwhelming success of Hegen & Glaser's Mephisto machines at the 1985 World Microcomputer Championship in Amsterdam.

In the 1985 World Microcomputer Championship, the fifth, played in Amsterdam, the West German chess computer manufacturer Hegen & Glaser was spectacularly successful with their team of three Mephisto machines.

The results of the tournament were:
(1) Mephisto Amsterdam 1,8 out of 8;
(2-3) Mephisto Amsterdam II, Meephisto Amsterdam (Wetin); (4) Prinches 6 (Sweden), 4½;
(5-6) Novag Blitz Monster Y (Hong Kong, Plyphate Y (Sweden), 4;
(7-10) Orwell X (West Germany), Orwell Y (West Germany), Plyphate Z (Sweden), SciSys Turbostar K (Hong Kong), 3½;
(11-14) Novag Blitz Monster Y (Hong Kong), Orwell Z (West German), Plyphate X (Sweden), SciSys Turbostar 440 (Hong Kong), 3;
(15) SciSys Turbostar G (Hong Kong), 2½;
(16) Novag Blitz Monster X (Hong Kong), 1;

Results in the Amateur group were:
(1) Nona (Holland), 7 out of 7;
(2) Rebel (Holland), 4;
(3) Turnult (Romania), 3½;
(4) Kempelen I (Hungary), 1½;
(5) PKD (New Zealand),

It was interesting to see that the only non-Dutch entries in this section both came from Eastern Europe.

The huge success of the Mephisto team was due to three important factors: these machines did contain the strongest program for the same one in all three, but running significantly faster in the Amsterdam I incarna-
tion), they did not have to play against each other which was lucky, since in many cases the opposition was out of its way to lose against them.

Those of you who read Microchess last month will be aware of one very good reason why programs from the same stable should not play against each other. On the other hand, in an event like this, when teams of identical programs are permitted, only a small edge is necessary to make it appear that one program is invincible.

My abiding memories of the games from this tournament are of Mephisto sitting and doing nothing quite as well, simply waiting for its opponents to make a decisive mis

APRIL 1986 PCW 177
times. The game which follows is a representative example.

White: Orrell X. Black: Mephisto
Amsterdam 1 Opening: Nimzo-
witsch/Larsen Opening.
1 Ngl-f3 d7-d5
2 b2-b3 Bc8-g4
3 e2-e3 e7-e5
4 Bf1-e2 Nb8-c6
5 0-0 —

5 Bcl-b2 is rather better — it puts pressure on the black e-pawn and, after 5 e5-e4, provides piece support for the knight on d4. Incidentally, 5 e5-e4 there would be terrible, making White's dark-shaped bishop a superb piece.

5 e5-e4
6 Nf3-d4 Bg4xe2
7 Qd1xe2

7 Nd4xe2 is preferable, retaining fluid pawn play against Black's ossifi ed pawn centre.

7 e3xd4 Qd8-e7?

This is just a complete waste of time. The queen should have gone straight to d7, or to f6, or nowhere at all.

9 Bcl-a3 Qe7-d7
10 Ba3xb8 Kebxb8
11 Nb1-c3 Ng8-f6
12 f2-f3 c7-c6

13 f3xe4 is fine: 13 d5xe4 14 
Nc3xe4 Qd7xd4+ (14 Ra8-e8? 15 
Ne4xf6!) 15 Ne4-f2 with a very slight 
edge for White.

14 d2-d3 e4x3
15 Qe2xf3 Qd7-g4
16 Re1xe8+

This is a serious mistake, ceding the e-file, bringing Black's king into the centre and helping to prepare the entry into the game of the black rook on h8. Simply exchanging on g4 and then putting the knight, temporarily, on d1 was much better.

16 Kf8xe8
17 Qf3-e3+ Ke7-d7
18 Rf1-f4 Qg4-g5
19 Qe3-e5 h7-h6
20 Qe5-e3?

Still, White would have been all right after 20 Qe5xg5, but now the last black piece gets into the act and all three combine together very forcefully.

21 Qe3-h3+ Kd7-d8
22 g2-g3

Chessboard 3

34 Kg2-f2
Or 34 Rh5xh6 Rb2xe2+ 35 Kg2-g1 
(otherwise 35 Qg4-f3+ and mate 
next move) and now black has a 
choice between 35 Re2-g2+, winning 
the queen, and 35 Qg4xd4+ 
36 Kg1-f2, winning the queen since 
Qd1xe2 is forced to avoid mate.

34 Qg4-h5
35 Qd1-g1 Qh5xh2+
36 Kg2-f3 f7-f5
37 a4-a5 c6-c5
38 a5-a6 c5-c4
39 Qf1-e1

White is completely stuck. Note that if 39 d3x4, then 39 ... Rb2-b3+ 
is the end.

39 ... c4xd3
40-0 (White resigns).

Everything falls to pieces now: for example, 40 Ne2-c3 (to stop the black 
queen from giving mate on e4) 40 
... Qh2-g2+ 41 Kf2-e3 d3-d2 is the 
end — if there is nothing better next 
move, Black plays d2-d1N+ 1!

Chessboard 2

22 ... Re8-e1+
23 Kg1-f2 Re1-c1

Winning material.
24 Ng3-a2 Rc1xb2
25 a2-a4 Rb2-b2

White can do nothing constructive or even defensive.

25 ... Rc2-b2

Chessboard 1

13 Ra1-e1

14 d2-d3 e4x3
15 Qe2xf3 Qd7-g4
16 Re1xe8+?

Calling all graphics enthusiasts. This month Mike Mudge examines the overlap between geometry and number theory.

We draw on the entire plane squares of unit size, like those found on graph paper; the vertices of these squares are called 'Lattice Points'. Such points have been the subject of many interesting mathematical investigations since the time of Karl Fried- rich Gauss (1777-1855).

We give, in increasing order of difficulty, five questions relating to these lattice points together with the state of the art regarding their solu-
tion as known to the author. Each is followed by a programming problem where it is assumed that the programmer has access to at least a minimal graphics facility, involving the ability to display lattice points, also circles having a given centre and radius together with straight lines passing through two given points.

Question 1 (due to Hugo Steinhaus, the author of the highly recommended work Mathematical Snapshots). For every positive integer, n, does there exist in the plane a circle having its interior exactly ‘n’ lattice points?

The answer is known to be yes; however, we have to allow the coordinates of the centre to be not only non-integer but also irrational, by which we mean not of the form a/b where a and b are integers. (A Schinzel.)

Problem A. Write a computer program to count the number of lattice points within a circle having a given centre and radius. Graphical output would enhance this considerably.

Question 2 (due to J Browkin). For every positive integer, n, does there exist in the plane a square containing exactly ‘n’ lattice points?

The answer is again known to be yes; however, the proof is considerably more difficult than that for the circle.

Problem B. Write a computer program to count the number of lattice points within a square defined by two adjacent vertices. (Note that there are, in general, two different answers: why?)

Graphical output is again desirable.

Question 3. For every positive integer, n, does there exist a set of ‘n’ lattice points lying on the circumference of some circle, and such that the distance between any two of them is an integer (when expressed in terms of the mesh spacing of the lattice)?

Answered in the affirmative by W Sierpinski.

Problem C. Construct and display such sets of ‘n’ lattice points for n = 3, 4, 5 . . . , together with the associated circle upon which they lie.

Question 4 (due to K Zarankiewicz, 1951). For a positive integer n greater than or equal to three, consider the n² lattice points (x,y) where x and y are positive integers less than or equal to n, denote the set of these points by Rₙ.

What is the smallest positive integer k (dependent of course on n, so we write k(n)) for which each subset Rₙ, having k(n) points contains nine points in three different rows and three different columns?

It is known that k(4) = 14, k(5) = 21, k(6) = 27 (W Sierpinski), and that k(7) = 34 (J Brzezinski).

Problem D. Write a computer program to display the n² lattice points and allow the user to select k(n) of these (or to delete n² - k(n)) before determining a set of nine points satisfying the above condition.

Initially restrict the program to n = 4, 5, 6 and 7 but, hopefully, extend the values of k(n).

Question 5 (due to Mazurkiewicz c 1914). Does there exist in the plane a set of lattice points with which every straight line in the plane has exactly two points in common?

The answer is yes and has been established using the logical tool known as the axiom of choice; however, no concrete example of such a set is known.

Problem E. How can the computer help here?

Readers are invited to submit their attempts at some (or all) of the above problems to: Mike Mudge, 'Square Acre', Stourbridge Road, Penn, Wolverhampton, Staffordshire WV4 5NF. Tel: (0902) 892141.

Submissions which must reach me by 1 July 1986, will be judged using suitably vague criteria. A prize will be awarded for the best entry received.

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. However, in the interests of efficiency, interested readers are urged to contact the prizewinner directly.

October review

Responses to the topic of continued fractions were extremely varied. In addition to the references given in PCW (October 1985), mathematically inclined readers should consult Exercises in Number Theory by DP Parent (Springer Verlag 1984, ch 9).

The future interest in applied numerical continued fractions seems likely to lie in investigating the relationship between the CF expansion of an algebraic number (that is, a number which is the root of a polynomial equation with integer coefficients) and the properties of the sequence of quasi-random numbers nx - [nx], n=1,2,3,... where [nx] denotes the greatest integer not greater than nx (the computer function Enter of Int).

Thus \( n\sqrt{2} - \lfloor n\sqrt{2} \rfloor \) yields values approximately .A142, .0284, .2426, .6569, .0711 and so on.

Such numbers may be used to model a Uniform Distribution over the interval 0,1 for certain simulations; that is, Monte-Carlo Techniques and, in particular, numerical integration. Extensive references are available on request.

This month’s prizewinner is Richard T Dindall of 26 Poplar Close, Great Shelford, Cambridge for an extensive submission combining analytical methods with a New Brain in Basic and a T859 calculator.

Much of Richard’s work is concerned with the determination of an empirical function for the longest periods of second-degree algebraic numbers.

(See CD Patterson and HC Williams’ ‘Some Periodic Continued Fractions with Long Periods’. Mathematics of Computation (Vol 44 No 170 pp523-539 April 1985) including the square root of 46257585588439 with period 25679652. Their paper mentions the work of GF Voronoi, On the generalisation of the algorithm of continued fractions, Doctoral Dissertation Warsaw 1896 in Russian (any volunteers to translate?)

Brain-teasers courtesy of JJ Clessa.

Quickie

No prizes, no answers, but which of the following words is the odd one out?

Laughing, Mangled, Default, Thirsty, Canopy.

Prize puzzle

A certain nine-digit number is comprised of each of the digits 1-9. If the number is divided by one of the digits, it gives an eight-digit quotient which contains each of the remaining digits.

If I tell you that the original number does not end in 8, can you tell me what it is, and what is the digit by which it must be divided to satisfy the above requirements?

Answers on postcards, please, or...
LEISURE LINES

back of envelopes, to reach us not later than 30 April 1986. Send your entries to Leisure Lines, April Prize Puzzle, PCW, 32-34 Broadwick Street, London W1A 2HG.

January prize puzzle
Most readers spotted the deliberate mistake in the January puzzle. Since you’ve all been complaining that the problems are too easy, I thought I’d slip a crafty error into one of the clues. Keep your eyes peeled.

The winner is Mr S Fox of Barnstable. Congratulations, Mr Fox — your prize is on its way.

The winning solution is:

ACC NEWS

Join a computer club and get more out of your machine. Rupert Steele tells you how.

The personal computer industry is a very special one. Home computers are a good deal more complicated to use than TVs or HiFis, and differ from one manufacturer to another, unlike most consumer goods. This means that many of the people who own, or are thinking of owning, home computers might experience difficulty in using them other than for playing games. Games are of course great fun and not to be decried, but people who limit their use of the machine to games are not getting the maximum out of their computer. This problem is particularly acute for those who own less popular or discontinued micros, as it becomes increasingly hard to find software or books relevant to their machine.

Enter computer clubs. These are associations of computer enthusiasts, usually run by and for the members, but occasionally run as a business sideline by a proprietor. Many are ‘local’ clubs which meet typically in schools, community centres or educational institutions; here enthusiasts and beginners can get together to use various kinds of home and personal business computers, so that ideas and (non-copyright!) software can be pooled, tips shared and, quite often, friendships made. Some local clubs will restrict their interest to one or two machines; this leads to meetings being more directly relevant to members’ particular interests, but a good deal of the variety can be lost. Most local clubs (whether single-machine or not) will have a combination of meetings, with informal ‘workshop’ meetings mixing with slightly more formal presentations or talks.

The other main type of computer club is the postal club. Usually aimed at a particular micro, this club produces a newsletter or similar information sheet on a regular basis. This type of group is especially valuable when a manufacturer goes out of business or otherwise fails to support an existing micro. Such ‘user groups’ tend to specialise in sending out technical information, programming tips and information about where spares and software can be obtained.

The Association of Computer Clubs (ACC) acts to bring together the common interests of computer clubs around the UK. It is a democratic organisation, run by and for its member clubs, providing such common services as insurance and publicity. The ACC runs ClubSpot 810, one of the most highly-accessed areas on British Telecom’s Prestel system, through its Communications sub-committee. The ACC also sponsors the formation of new computer clubs, with the availability of a free information kit and a service to put potential members in touch with their nearest club. The ACC is presently reviewing its internal organisation with a view to improving the efficiency of its services to UK computer clubs.

Attention NewBrain users! As you will know, the NewBrain was a technically sophisticated micro that never caught on, with only 18,000 having been made. With a lack of support from the manufacturer, various groups have been set up to support the machine and its users. Probably the largest such group is NBUG, run by Gerald McMullen of 36 Harmitage Way, Cambridge CB4 2UE. This group has 2000 members (membership is free!) and a very large amount of software including some source code. A small fee (£5 a year plus postage) secures six issues of the newsletter. A smaller group, which has a software library, but which may not presently be publishing a newsletter, is INGROUP. This is run by Anthony D Hodge of 15 St John’s Court, Wakefield WF1 2RY. For details about either group, send an sse.

Also from Cambridge, I have received a copy of the Cambridge ComputerTown Newsletter. This is a very active group, supported by a wide range of local businesses and institutions, which meets at the Lending Library, 1st Floor, Central Library, Lion Yard, Cambridge. Bob Waixel has stepped down as chairman through pressure of other work, and the helm has been taken by Eric Willner. Eric’s address is 8 Clare Street, Chatteris, Cambs PE16 6JE or call (03543) 5793. Being a Computer-Town, this group sees one of its major aims to be bringing computing to the attention of the general public. The dates for the next few meetings are 19 April (provisional), 17 May, 14 June and 27 September. Call Eric to find out more.

Also in the area is the Huntingdonshire Computer Club. The secretary of the club is John Childs, of 57 Manor Gardens, Buckden, Huntingdon, Cambs PE18 9TW. Send an sse to John for more information.

A little further afield, we have news of the West Herts 80 Users’ Association. This group is involved with Genie, Tandy, Amstrad, BBC and Commodore computers. The secretary is Brian Larkin at 82 Church Street, Leighton Buzzard, Beds LU7 7BT and his phone number is (0525) 373813. The club meets on alternate Tuesdays, 7.30-10.30pm at St Stephen’s Parish Centre, Station Road, Bickett Wood. There is a specialist group on computing techniques.

I have received a note from the newsletter editor of the Harpenden Micro Group. It’s an interesting newsletter with a session on QL networking, where the group had three QLs linked on a network all working together. This group has links with the local branch of the professional British Computer Society (BCS), and a chairman who writes witty articles in the newsletter. Meetings are held on alternate Mondays (but I don’t know the venue), so you should contact Harry Fisher of 38 Piggots Hill Lane, Harpenden, Herts or call Har-
Amstrad computer users and provides free public domain software (mainly contributed by its users) and a newsletter containing articles and programming information contributed by the members. AUSD can usually arrange for prospective users who are within travelling distance to get some 'hands-on' experience of hardware and software, and it also has a database listing commercial programs that may be of interest to members. For details send an s.a.e to AUSD, PO Box 11, Gosforth, Newcastle upon Tyne NE3 1RP.

Finally this month, I have had a letter from ‘London Facilities Limited'. One of its jobs is to sell computer systems repossessed under HP agreements. The company says that some of its equipment is quite decent, so it will be offered for sale through computer clubs. Call (01) 739 7765.

For a mention in this column, to notify the ACC of a new or existing computer club, or to release address labels for mailing information to computer clubs, write to Rupert Steele, 12 Philbeach Gardens, London SW5 9DY or call (01) 370 0601.

For any other enquiry, including the address of your local computer club or that of your micro's user group, write to John Bone, ACC chairman, 3 Claremont Place, Gateshead, Tyne & Wear NE8 2TL, or call (091) 477 3339.

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.

Hanover
CeBit, Hanover Fair — World Centre for Office & Data Technology Exhibition. Contact: Deutsche Messe und Ausstellung, (01) 651 2191
12-19 March

London
Olympia, The 9th Informational Technology & Office Automation Show. Contact: B.E.D Exhibitions, (01) 847 1001
24-27 March

Birmingham
Metropole Hotel, NEC. CADCAM Conference '86. Contact: EMAP, (01) 837 3699
8-10 April

Glasgow
Scottish Exhibition & Conference Centre, 5th Scottish Computer Show 
& Conference. Contact: Cahners Exhibitions Ltd, (01) 891 6051
15-17 April

Writing for PCW

We're offering readers the chance to get rich (well, at least richer) and to influence what's published in the magazine — by writing for it. We welcome approaches from would-be writers, including those who have never appeared in print before. It's often users with practical experience who have the most interesting things to say, so don't worry if your prose is less than perfect, we can take care of the polishing.

If you have an idea for a feature write, with a brief synopsis, outlining the proposed structure and content. If your article is already written, then send it in for consideration. Remember to put your name and address on both the covering letter and the manuscript — along with a daytime phone number if possible. Manuscripts should be typed or printed out (dot matrix output is fine), in double-line spacing with ample margins top and bottom and on each side.

We'll try to return all submissions sent in with a suitable s.a.e, but make sure you keep a copy of everything you submit as well for reference. Any accompanying program listings should be supplied on disk or cassette, ideally with a printout as well.

Bear in mind that it's worth taking a look at the Back Issues advertisement to see what sort of things we have already published — after all there's no point in reinventing the wheel. And please be sure to tell us if you've contacted another magazine (perish the thought): it would be very awkward if the same article appeared elsewhere. Frankly, we're more likely to accept something which has been offered exclusively to us.

Finally, we do pay for published work — the rate is £55 per 1000 words, and payment usually follows about four-six weeks after publication.
If you consider yourself to be an expert on a particular subject, why not give others the benefit of your knowledge by creating an expert system? Sergio Vaghi presents an example of DOS as an expert system shell which contains many useful characteristics.

Many specialised domains of knowledge can be represented in the form of structured decision trees such as the one shown in Fig 1. Examples vary from the expert knowledge needed for the classification or identification of objects, from plants and animals to certain types of medical consultations, from fault diagnosis in complex machines to investment advice, and from simple games to the selection of mathematical routines from a software library. Tree-structured expert knowledge can then be used as the basis of an expert system (ES) (see also 'Playing by the rules' by Ed Stenson, PCW, November 1985 for a method to build decision trees).

If you plan to develop an expert system of this type, or simply wish to gain experience in this area of artificial intelligence (AI), this article will help you.

When you have organised the expert knowledge, you are confronted with the problem of translating it into computerised form. Two main alternatives currently exist: coding the knowledge base in an AI language such as Lisp or Prolog (although in certain cases a procedural language can also be suitable); or using a generic mechanism of inference, a so-called expert system shell.

The first approach requires, of course, that you know the language in question. Learning it may or may not be worth the effort, depending on your application and on whether you intend to write many expert systems in future.

Expert system shells are programs which are commercially available and can be used in different ES applications, provided that the knowledge base is coded with a structure and syntax understandable by the shell. Structure and syntax are kept very simple, so that even someone with no programming experience can easily write the code.

Shells can be written in high-level languages such as Pascal and Fortran, or even in Basic; their prices range from less than £40 to well above £1000. The source code is not always included and you will use the shell as a black box attached to your knowledge base — a rather unsatisfactory situation.

If you use a PC running under PC-DOS/MS-DOS (DOS for short), ver-
Fig 2 Listing of the files in OS-ES (subset)
sion 2.00 or later, you perhaps have a better alternative — using DOS it-
self as an expert system shell. It will be shown in this article that DOS can
be used as an inference engine for expert systems based on determinis-
tic, tree-structured knowledge, not
directly involving numerical calcula-
tions. All you have to do is write
the knowledge base using the simple
syntax of the DOS batch files, which
essentially amounts to the most
direct form of structured English. It's
simpler than Basic, and it comes
'bundleed' with your machine.

**DOS as an ES shell**

The minimum that is required from
an ES shell is the ability to perform
conditional testing (of the type IF...
THEN ...), branching (of the type
GOTO ...), and input/output man-
agement suitable for interactive use
of the program.

In DOS, conditional testing is pro-
vided by the batch sub-command IF
(NOT) condition command, where
the condition parameter is one of the
following:
ERRORLEVEL number
string 1 = string 2
EXIST filespec
and command is any DOS command.
NOT condition is true if condition is
false.
Branching is performed by the
GOTO label sub-command, which
does commands to be executed
beginning with the line immediately
following :label.

I/O management is rather more
complex, if interactive use is desired.
Output can easily be obtained by the
sub-command ECHO [ON:OFF] mes-
 sage]. ECHO message displays the
string message onscreen and can
thus serve for communication with
the user. ECHO OFF inhibits screen
display of the commands following it
in the batch file, and can be used to
avoid displaying useless messages
onscreen.

Interactive input to a batch file re-
quires, on the contrary, a program-
ming trick, as the usual way to pro-
vide input to a DOS batch file is to
pass the values of the replaceable
parameters when the file is called.
Dummy parameters — represented
by the symbols %1 to %9 in the
code — are replaced, at execution
time, by the actual parameters which
follow the name of the file when cal-
ced. DOS does not offer the feature,
present in the more powerful operat-
ings systems of minis and main-
frames, of allowing the user to be
prompted — during execution — for
a missing parameter.

How this problem can be solved
will be explained when I present an
eample of an expert system.

Other features of DOS used in the
eample are:

- the aforementioned possibility of
transferring parameters to a batch
file;
- I/O redirection with the TYPE com-
mand and ECHO sub-command, to
direct text and messages to a file;
and
- the DOS commands CLS, to clear
the screen, and PROMPT, to change
the prompt, with, the PAUSE and
REM sub-commands, will help in
adding a cosmetic touch to the ex-
pert system.

Only a small number of internal
DOS commands and batch sub-
commands are needed in our ex-
ample. All the other DOS commands
can, however, be used and may
prove helpful in certain applications.

**Desirable features**

An expert system should, first of all,
be easy to write and maintain. I
personally find Lisp and Prolog pro-
grams often hard to read, which also
means they're difficult to debug and
maintain, because errors can easily
slip into the code and go unnoticed.
A friendly interface with the user is
also desirable. Interactive use is
generally required, with reasonably
efficient error-trapping for the less
experienced or occasional user. A
'help' facility can be useful.

Backtracking — that is, the possi-
bility of going back to the previous
decision node — is also important as
it allows the user who has reached
the end of a limb to go one step back
and choose a different path, without
having to start the consultation from
the beginning.

Another essential feature is the
possibility of tracing and recording a
consultation. This is invaluable dur-
ing debugging of the program, and
convenient for the user, who gets a
complete record of the session.

Easy access to a database directly
from the ES — for example, to pro-
vide a detailed description of a given
recommendation — can also be
handy in certain cases.

It may be appropriate to let the
user ask, during the course of the
session, why a certain question is
asked, or how a certain conclusion
has been reached. Depending on
the application, 'how' and 'why' capabil-
ities are often desirable and some-
times essential.

The example chosen for this arti-
 cle, and which will be completely
developed to the point where you can
run it on your PC, is a subset of a
real expert system currently under
alpha-testing.

**Option Strategies** - Expert System
(OS-ES) provides investment advice
in the area of listed stock options.
Although this is perhaps a somewhat
unfamiliar field to many PCW read-
ers, I have chosen OS-ES instead of
the 'toy' expert systems so often
found in academic literature — such
as a fictitious psychiatric session or
the 'twenty questions' game — to
show that, within the limits spelled
out later, you can indeed develop
absolutely 'serious' and useful expert
systems with DOS.

I'll briefly explain what OS-ES is
about. Listed stock options are secur-
ities contracts which give the right
to buy (call option) or sell (put option)
a given number of shares of the under-
lying stock for a fixed price within a
limited period of time. Option con-
tacts can be bought or sold in the
exchanges, where they are listed in
the same way that it is done for the
shares of a stock. The attraction of options for many investors and portfolio managers is that they can be used, alone or in combination with the shares of the underlying stock, to implement various advanced investment strategies.

Considering that option strategies can be very complex and the money involved is often quite substantial, this is an ideal application field for expert systems. OS-ES, of which the example given here is a subset, assists the investor in the selection of a suitable option strategy, depending on factors such as the attitude of the investor towards the stock, the risk he or she is prepared to accept, and others. Our subset of OS-ES covers the particular case in which the investor is 'bullish' on the stock — that is, he believes that the price of the stock will rise during the lifetime of the option. The complete expert system also includes the cases when the investor is 'bearish' on the stock — that is, he believes that the price will decline, or when he is neutral.

Here's a word of warning: as I have stated, OS-ES is, at the time of writing, still under testing, so if you do invest in options please refrain

Fig 3 Example of consultation as it appears onscreen

Fig 4 Example of consultation including backtracking

Fig 4 continued

End of the consultation

Fig 5 Printout of the file 'journ' with the record of the consultations
"That 16-bit professional FLYER with the big storage tucks neatly into a briefcase—so goes out working on location, in company with the top people in the best places.

Not desk bound like me—I can do all the same things, but unfortunately I'm a little overweight.

Perhaps its that incredible memory, integrated software and back-lit screen—not to mention the 6g shock rating that make the TAVA FLYER such a popular travelling companion."

Features
- MS DOS and CP/M 86 operating system
- The processing power of the IBM PC AT
- Back-lit screen
- Serial and parallel printer
- ports and connections for additional monitors
- Full size display
- Integrated software packages
- Weighs under 15lbs

Options
- Internal modems
- Battery pack (floppy disk model)

The Tava Flyer is available in Winchester and Floppy disk versions and is distributed throughout the UK and Europe by Computer Frontier (UK) Limited.

For your nearest dealer contact:-
Computer Frontier (UK) Ltd

IBM PC is a registered trademark of International Business Machines
MS DOS—Microsoft Corporation
CP/M—Digital Research Inc.

"SINCE TAVA GOT THAT 20MB WINCHESTER—THEY'RE INSEPARABLE"
from using this subset for your investment decisions.

Writing the System

The knowledge base of our expert system is contained in Tables 1 and 2, and in Fig. 1.

The option strategies considered are listed in Table 1. Each strategy is characterised by certain attributes: strategy s3 (bull spread) is, for example, suitable for an investor with a bullish attitude towards the stock, ready to take a limited risk only, and accepting a limited reward on the investment. These attributes are translated into answers to the relevant questions listed in Table 2. For the bull spread strategy the answers to the first three questions are bullish, limited, limited. This, in turn, is reflected in the position of the strategy in the knowledge tree in Fig. 1. The other ramifications of the tree are built up in the same way for the other strategies considered.

The tree itself consists of levels and nodes. The expert system reasons along paths, from one node to the other, asking questions whenever a piece of information is needed and then moving to the corresponding node at a deeper level, eventually reaching a solution: that is, a recommended option strategy (note that strategy s0 is included for the cases when no suitable strategy is available with the attributes specified by the user).

Following the sub-tree in Fig. 1 it is possible to code the knowledge base as a DOS batch file, which I have called kb.bat. It consists of three sections — 'rules', 'questions' and 'solutions'.

We start at level one, node A1. The answer to the first question, q1, will correspond to the first dummy parameter, %1, in kb.bat. If %1 is equal to bullish, we move to node B1. If %1 is equal to bearish or neutral, the recommended solution will be 'no suitable strategy available', because only the 'bullish' sub-tree of the knowledge base is considered. If %1 is equal to none of the above, this means that either it is the first time that the ES has come to this node, or a 'non-acceptable' answer was entered. In either case, the program will prompt you for more information. All this can be coded very simply:

```
:%1
ECHO Are you bullish, bearish or neutral on the stock? >> facts
ECHO Are you bullish bearish or neutral on the stock?
and in the solutions section:
:%0
rec (NO SUITABLE STRATEGY AVAILABLE)
```

At this point kb.bat is called again, with bullish replacing %1 and % replacing %2. At node A1 the first IF test is fulfilled (bullish = bullish is true) and the next command to be executed will be the following label :b1:

```
What we have managed to do, in short, is to make the ES ask for the information it needs.

When the answer is entered the ES starts again from the first rule, but — being now in possession of the relevant information — it moves to the next node in the tree. This control strategy is called forward chaining in AI terminology.

In the process it has also recorded question and answer, so keeping track of the conversation with the user (tracing capability), and changed the prompt to emphasise that you are within the program environment. Convenient error-trapping is also automatically provided. You must distinguish here between 'acceptable answers' for a given question and 'legal answers' for the entire ES. Acceptable answers for a given question are those which transfer control to a new node or to a solution. Acceptable answers for question q1 are bullish, bearish or neutral; they are also legal answers, as are all the other acceptable answers for all the other questions in the tree. In our example, bullish, bearish, neutral, limited, large, unlimited, yes and no are all legal answers, and the ES contains eight identical batch files with these file names.

Error-trapping works as follows. If a legal, but not acceptable, answer is entered — for example, if yes is entered in reply to q1 — the question is repeated, because the conditions in the IF sub-commands at node A1 are not true. If an illegal answer is entered — for example, bulls instead of bullish — the following message is displayed:

```
BAD command or file name simply because the batch file bullis
.bat does not exist. In both cases the prompt >> follows, and you can enter an acceptable answer.

But let's come back to node A1. Had the answer to the first question been bearish or neutral, control would have been transferred to label :s0 in the solutions section of kb.bat. The batch file rec.bat would have then been called with the parameter:

```
(NO SUITABLE STRATEGY AVAILABLE).
```

The file rec.bat is the output manager of the expert system. It has three functions: displaying the recommended strategy onscreen; writing it into a file 'journ' preceded by the information contained in the file 'facts' (that is, the list of questions

APRIL 1986 PCW 187
asked and answers received); and, in the case of the strategy s0, instructing you on how to backtrack, if desired, to the previous decision node. Backtracking is possible because $.bat maintains a 'memory' of the facts learned by the system so far.

The original prompt is finally re-established, indicating that you have left the program environment. The listing of rec.bat in Fig 2 shows the details of the implementation. Coding the other ramifications of the knowledge base is now just a matter of repeating, at each node, what has been done at node A1. At each level a new question is included in the questions section, and a new dummy parameter is added when ECHO-ing to $.bat. If a question is irrelevant to certain solutions, the corresponding level in the tree is ignored; therefore, only relevant questions are asked, provided that the tree is properly structured. At certain nodes, a new solution is reached and added to the solutions section.

The resulting code is straightforward and easy to read, as you can see by simple inspection of the listing of kb.bat in Fig 2. Just remember that all legal answers must be present in the ES as batch files: in our example, these are bullish.bat, bearish.bat, neutral.bat, limited.bat, large.bat, unlimited.bat, yes.bat, no.bat. (Note that unlimited.bat will actually be unlimited.bat, as in DOS a filename can't exceed eight characters; this has, however, no practical consequence here.)

Now we need a way to start the program. This can be done through a file that may contain the title and some information on the ES, and must include, at the end, the following two lines:

```
IF EXIST facts DEL facts kb?
```

The first line deletes — if it exists — the file 'facts' containing the trace, now useless, of the previous consultation, and the second line actually starts the program by calling kb.bat with '?' as first parameter. All you have to do is start the consultation is to enter 'start' after the prompt.

This, rather lengthy, description can be summarised by saying that the entire expert system consists of the following elements:

— a starter (start.bat);
— a knowledge base (kb.bat) containing three sections — rules, questions and solutions; and
— the I/O management files (ppp.bat, rec.bat, bullish.bat, ... , no.bat).

A listing of all the files which constitute the expert system of Fig 1 is shown in Fig 2. The code is reasonably self-explanatory, and you should have no problem in following it with the help of Fig 1. In order to improve legibility I have reserved capital letters for the DOS commands and the second line, and a structured style in writing the code. The sub-command ECHO OFF occupies the first line in all files, to avoid the situation where all the following lines will be shown onscreen. Only useful messages will appear instead.

With the exception of priv.bat, all files include the command CLS in the second line to clear the screen. In practice you will see ECHO OFF briefly flashing on the screen, and then the next useful message or the prompt. The impression of a completely interactive system is almost perfect.

Fig 3 shows an example of consultation as it appears on the screen; Fig 4 is a consultation including backtracking; and Fig 5 is a printout of the file 'journ' with the record of the above consultations.

You may wish to run the ES on your PC and see how it behaves in actual use. At the end of the session, consisting of one or more consultations, you can print out the file 'journ' which contains the complete record of the session; 'journ' should then be deleted, unless you want the record of the next session to be appended to it. The other two files created during the session — $.bat and facts — are automatically dealt with by the program and you don't have to worry about them.

**Using a RAM disk**

An expert system using DOS as an inference engine is fairly slow, especially if it runs directly from disk. This is due to the frequent jumps from one batch file to the other, and the fact that the GOTO sub-command does not immediately transfer execution to the line following the label, but lets the system also scan all the lines inbetween. This considerably slows the execution, particularly when the system has reached a deep level in the tree. Much strain is also imposed on the disk drive, which is kept busy all the time.

A better method is to copy the ES, together with any external DOS command used, into a RAM disk and run it from there. The increase in speed is remarkable and there is no over-load on any disk drive. A further marginal increase in speed can also be obtained by using a run-time version of the program, where all the command lines (those beginning with REM) have been suppressed. Nonetheless, as you shouldn't encounter any problems when running the OS-ES subset.

The complete OS-ES comprises, in the present version, eight levels and more than 20 strategies. It runs quite efficiently in RAM, and is barely acceptable when run from disk. More complex expert systems may, however, become unacceptably slow.

**Limitations**

The major limitation of DOS as an ES shell is the inability to perform mathematical calculations other than the simplest form of equivalence. The batch sub-command IF string 1 = = 2 command actually compares the ASCII values of the characters in string 1 and string 2. Thus, while 2 = 2 is true, 1 = 1 = 2 is false (for the same reason as A = A is false, so watch out when using both capital and small letters in the code). Consequently, DOS can be used as an inference engine only for expert systems not involving mathematical calculations.

Nondeterministic systems requiring fuzzy logic are typically excluded, since probabilities can't be calculated, but there are many applications in which this is not a serious constraint.

Another limitation is that only up to 10 dummy parameters — %0 to %9 — can be specified within a batch file. As %0 is reserved to the file name, this means that in practice the expert system can only contain up to nine levels, although this limit can perhaps be increased by clever use of the SHIFT sub-command, which allows command lines to make use of more than 10 replaceable parameters. But nine levels are not too bad, and there is no limit to the ramifications between levels (that is, the number of acceptable answers to a given question).

**Conclusion**

DOS can be used to develop simple expert systems with many desirable characteristics. The knowledge base is easy to code, read, maintain and update. Friendly interface, backtracking capability, error-trapping and tracing/recording facilities are all available.

It is worth noting that what is possible with DOS is certainly possible with the more powerful operating systems used in minis and mainframes. Coding is equally easy, interactive I/O and a larger choice of commands are available, mathematical calculations of some complexity is possible, and execution speed is not a problem. Using operating systems as inference engines may indeed prove a convenient way, in certain cases, to develop expert systems without having to learn a new programming language or buy expensive commercial shells.
What unseen damage is static causing in your office?

Each year static strikes and will irreparably damage computers and programs to the tune of £ millions.

Right now your computer system's at risk every day...unless you guard against static discharge.

We hope you and your staff will find this advertisement helpful, in highlighting what actually causes static and how a Static-Master provides the permanent answer.

Q1. Do you know how much static one person can generate? Would you believe 30,000 volts!  
Q2. Is that amount dangerous? Not to you, but even 2,000 volts can seriously damage the chips in your computer.  
One fingertip touch can:  
* Fatally 'burn out' micro chips.  
* Erase memory data. 
* Induce a major malfunction.  
* Create 'Ghost bits' you didn't program!  
* Cause data drop-out.  
* Bring your computer operation to a standstill. Render it useless. The cost? Perhaps thousands of pounds and many wasted hours.

Q3. Where does static come from? From people simply walking about. Walking over a vinyl tiled floor you can generate 4,000 volts. On carpets much, much more. But even sitting at your desk will generate static discharge.

How many of these Static-Builders are in your office?  

 Hale  
 Not forgetting the clothes...  
 Nylon clothes  
 Cotton, wool and silk too  
 Spectacles  
 Even your lenses...  
 Paper  
 Paper clips too  
 Carpets  
 Wool or synthetic.  
 Furniture  
 Wood, metal or synthetic are all a problem  
 Paper caps  
 Empty or full  
 Pencils  
 Pens, brushes, staples, rulers - the list is virtually endless  

Q4. Why do women generate more static than men? Because the soles of their shoes are usually thinner! So they generate more voltage when walking about the office.

Q5. Why has this man just greatly increased the static risk? Simply walking to get a drink and you immediately increase your static charge.

Q6. Are the latest computers less vulnerable? NO! In fact they may be more sensitive and be even more at risk. So why take that risk when there is an inexpensive permanent solution?

Q7. So, what can be done about static damaging your P.C.s? Thankfully, exactly that kind of permanent solution is now available in UK. It's called Static-Master, it's from Formica Corp and it's guaranteed a lifetime. For a few pounds in fact it could save you thousands.

International research shows that: "...the optimum (protection) is a Static Dissipative Surface with a conductivity in the range of 10^6 to 10^8 ohms per square." Return the coupon below and we will send you the new booklet: "STATIC DISCHARGE. The High Tech Gremlin."

FREPOST BOOKLET & ADVISORY SERVICE

Please send me [ ] FREE copies of your helpful new Booklet: "STATIC DISCHARGE. The High Tech Gremlin." I will not be under any obligation to buy anything.

PLEASE PRINT   
Name Mr/Mrs/Ms  
Company  
Address  

[ ] I think I may have a Static problem. Please ask your STATIC ADVISER to call me. 
I have the following types of computers 
[ ] Mainframe 
[ ] Less than 3 mini computers 
[ ] More than 3 mini computers 
[ ] Word Processors 
[ ] EDP Operation (Please tick) 

Telephone No  
FREPOST TO: STATIC ADVISORY SERVICES, Dept PCW33 FREPOST 279 Burnley Lancs BB11 1BR (No stamp required) 

EXPORT ENQUIRIES TO: MICRO X LTD, 785-787 Harrow Road, London NW10 8NY. Tel. 01-608 6622 Telex 915885
Terry describes the result PSHCCR (Datasheet 1) as 'a mess, taking about 200 cycles to execute.' Without denigrating Terry's programming skill, I have to agree that, despite a hint of elegance, PSHCCR is undoubtedly a costly way to read the 68000's flags.

Nevertheless, the only alternative to this or a similar routine is to rely entirely on the system software's ability to trap an illegal instruction or privilege violation and return the CCR state from the exception. This, too, is likely to be quite slow because of the lengthy internal interrupt processing. Furthermore, exceptions are bound to introduce timing uncertainties when precise timing could be crucial.

**DATASHEET 1**

- **PSHCCR** 68000-series MOVE from CCR to User Stack.
  - **JOB** 68000-series fully portable push of CCR to User Stack (A7) without using MOVE CRC (A7) instruction.
  - **ACTION** Clear CCR copy register, DB.
  - **CPU** 68000-series.
  - **HARDWARE** None.
  - **SOFTWARE** None.
  - **INPUT** None.
  - **OUTPUT** Copy of CCR on User Stack top (A7).
  - **ERROR** None.
  - **RESERVED USE** None.
  - **STACK USAGE** User Stack, 65 bytes.
  - **DESCRIPTION** (PSHCCR increases program stack use by 2 bytes.)
  - **LENGTH** 65.
  - **CLASS** 1
  - **Requirement** Interruptable.
  - **TABLE** 1

**SUBSET**

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 Broadwalk Street, London W1A 2HG.

**68000 SERIES CONDITION CODES ACCESS**

In August 1985 I explained how access to the Condition Codes Register in User Mode required a different instruction for the 68000 and 68000B side of the family (MOVE SR, <EA>) to that of the 68010 and 68020 virtual machines (MOVE CCR, <EA>).

So far, only Terry Browning of Wells has attempted to provide a useful, truly portable routine to put the CCR on top of stack — ready for use within a subroutine or for RTR exit.
**8086 SOUNDEX**

**letters entering SOUNDEX**

The **SOUNDEX** extension to the IBM 8086/8088 instruction set uses the addressing mode.

<table>
<thead>
<tr>
<th>Address</th>
<th>Instruction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x0000</td>
<td>LEA BX, [BX]</td>
<td>Load effective address into BX</td>
</tr>
<tr>
<td>0x0002</td>
<td>MOV AL, [BX]</td>
<td>Move byte from memory into AL</td>
</tr>
<tr>
<td>0x0004</td>
<td>MOV CX, BX</td>
<td>Move BX into CX</td>
</tr>
<tr>
<td>0x0006</td>
<td>JMP BX</td>
<td>Jump to memory location</td>
</tr>
</tbody>
</table>

**NAMES**

The **NAMES** extension to the IBM 8086/8088 instruction set uses the addressing mode.

<table>
<thead>
<tr>
<th>Address</th>
<th>Instruction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x0000</td>
<td>LEA BX, [BX]</td>
<td>Load effective address into BX</td>
</tr>
<tr>
<td>0x0002</td>
<td>MOV AX, [BX]</td>
<td>Move word from memory into AX</td>
</tr>
<tr>
<td>0x0004</td>
<td>MOV DX, BX</td>
<td>Move BX into DX</td>
</tr>
<tr>
<td>0x0006</td>
<td>JMP BX</td>
<td>Jump to memory location</td>
</tr>
</tbody>
</table>

**error correction**

Upon entering SOUNDEX, the computer checks for errors in the input string. If an error is detected, the program stops and an error message is displayed.

<table>
<thead>
<tr>
<th>Address</th>
<th>Instruction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x0000</td>
<td>LEA BX, [BX]</td>
<td>Load effective address into BX</td>
</tr>
<tr>
<td>0x0002</td>
<td>MOV BS, BX</td>
<td>Move BX into BS</td>
</tr>
<tr>
<td>0x0004</td>
<td>JMP BX</td>
<td>Jump to memory location</td>
</tr>
</tbody>
</table>

**NAMES**

The **NAMES** extension to the IBM 8086/8088 instruction set uses the addressing mode.

<table>
<thead>
<tr>
<th>Address</th>
<th>Instruction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x0000</td>
<td>LEA BX, [BX]</td>
<td>Load effective address into BX</td>
</tr>
<tr>
<td>0x0002</td>
<td>MOV AX, [BX]</td>
<td>Move word from memory into AX</td>
</tr>
<tr>
<td>0x0004</td>
<td>MOV DX, BX</td>
<td>Move BX into DX</td>
</tr>
<tr>
<td>0x0006</td>
<td>JMP BX</td>
<td>Jump to memory location</td>
</tr>
</tbody>
</table>

**error correction**

Upon entering SOUNDEX, the computer checks for errors in the input string. If an error is detected, the program stops and an error message is displayed.

<table>
<thead>
<tr>
<th>Address</th>
<th>Instruction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x0000</td>
<td>LEA BX, [BX]</td>
<td>Load effective address into BX</td>
</tr>
<tr>
<td>0x0002</td>
<td>MOV BS, BX</td>
<td>Move BX into BS</td>
</tr>
<tr>
<td>0x0004</td>
<td>JMP BX</td>
<td>Jump to memory location</td>
</tr>
</tbody>
</table>

**NAMES**

The **NAMES** extension to the IBM 8086/8088 instruction set uses the addressing mode.

<table>
<thead>
<tr>
<th>Address</th>
<th>Instruction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x0000</td>
<td>LEA BX, [BX]</td>
<td>Load effective address into BX</td>
</tr>
<tr>
<td>0x0002</td>
<td>MOV AX, [BX]</td>
<td>Move word from memory into AX</td>
</tr>
<tr>
<td>0x0004</td>
<td>MOV DX, BX</td>
<td>Move BX into DX</td>
</tr>
<tr>
<td>0x0006</td>
<td>JMP BX</td>
<td>Jump to memory location</td>
</tr>
</tbody>
</table>
ONLINE

Personal
Computer
World

Puts your finger on the pulse
Owen Linderholm selects the best of readers’ programs.  
For details on submitting your own, see the end of this section.

Happy birthday to us! This is the 100th issue of PCW. Many people have been regular readers of Program File for a long time; others are new to the section and have no idea of its past. To refresh some readers’ memories and to give others a glimpse of PCW’s history, there follows a brief overview of Program File over the past 100 issues of the magazine.

The first issue of PCW appeared in January 1978, and even then it was publishing program listings. A program listing section called Programs started in the 21st issue, September 1979. In the 46th issue, October 1981, TJ’s Workshop began, with a mix of hardware and software tips for terminal junkies. In January 1983 the first Program of the Month award was made, and the Programs section was renamed Program File in the 81st issue, September 1984. TJ’s Workshop was merged with an expanded Program File in February this year.

To give some indication of the type of program that appeared in Program File and to show how the section has changed, here is a list of the contents of the programs section for every tenth issue since September 1979, with a brief comment on each list:

**September 1979 Issue 21**
- **Machine**: Casio
- **Program**: 2D manoeuvring for a spaceship
- **fx-201-P**: Number memory tester
- **Apple II**: Creating acronyms
- **Commodore**: Orbital simulation
- **PET**: Limited time response subroutine
- **6800 code**: Program calculators; the Apple and the Commodore PET; and homebrewed systems based on chips like the 6800.

**July 1980 Issue 31**
- **Machine**: Pet
- **Program**: Cat and mouse game
- **Pet**: Golf game
- **TRS-80**: Extra graphics
- **UK101**: Black box game
- **Pet**: Robot NIM game
- **UK101**: Graph plotter

The programs editor for this issue complained about receiving too many programs which were rehashes of old, familiar themes. This is as true today as it was then, with many people submitting versions of Hangman, Breakout, character set editors, sprite editors, simple monitor/assembler, and so on. The mix of machines available had increased and a British-made micro, the UK101, had arrived, although it was based on the American Ohio Scientific Superboard.

**May 1981 Issue 41**
- **Machine**: TRS-80
- **Program**: Demon Hunts
- **Pet**: Zap
- **UK101**: Get Them
- **Acorn Atom**: Missile Dodge

The American machines were now joined by the first proper British machine, and this was the beginning for Acorn. The programs’ content reflects the simple arcade game image of that year, when Space Invaders was taking the pubs by storm.

**March 1982 Issue 51**
- **Machine**: TRS-80
- **Program**: Business documents
- **ZX81**: Graph plot
- **TRS-80**: Solitaire
- **TRS-80**: Ducts (children’s educational)

The programs here are rather more serious, as the personal computer is recognised as more than a toy.

**January 1983 Issue 61**
- **Machine**: Vic
- **Program**: Connect 4
- **Vic**: Mic monitor
- **Atari 400/800**: Character set mover

(Computer of the Month)
- **Vic**: UFO
- **Pet**: Forth Teacher
- **Vic**: Doppler
- **BBC**: Gomoku

The next level of home computer power now appears, with the advent of the BBC Micro and the long-surviving 128K machines.

**November 1983 Issue 71**
- **Machine**: Vic 20
- **Program**: Robotank (Program of the Month)
- **Acorn**: Scramble
- **NewBrain**: Easyprint (text editor)
- **Osborne**: Magsearch (database)
- **Atom**: Decision-Maker
- **BBC**: Real-time clock
- **Dragon**: World (rotating globe)
- **BBC**: Screen dump to Tandy CQP11
- **BBC**: Envelope designer (sound)
- **Oric 1**: Raspo
- **BBC**: Bearings (from co-ords)
- **Lynx**: Star Trek

1983 was one of the boom years for personal computers, with six British micros appearing in the list. The range of program coverage has expanded from simple games and utilities to the tentative exploration of more interesting fields.

**September 1984 Issue 81**
- **Machine**: Spectrum
- **Program**: SP-Easel (business graphs) (Program of the Month)
- **Atari**: Authorun (menus)
- **C64**: Basic assembler
- **BBC**: Equation solver
- **BBC**: Astrorun
- **C64**: Honey trap
- **BBC**: Function key lister
- **Apple II**: Menu

The Commodore 64 made its debut in this issue, but in fact programs for the machine had been appearing for many months.
July 1985 Issue 91

Machine
C64 Turboload 64 (Program of the Month)
Spectrum Speech
Epson HX-20 HX-Modem
MBasic Compress
OZ Shading
BBC Revenge of the flying bunnies
BBC Ramspool
Sirius Bank account
BBC LSTFMT (formats listings)

By 1985 Program File had settled almost into its present form, publishing useful and serious programs with a smattering of games and unusual, original programs.

PCW Online, our online database, will be starting up soon. One of the services which this database will offer is a facility to allow users to download software from the database. The software available will initially be a selection of public domain programs for various machines, plus all the programs in the Program File and a selection of programs from previous issues. All you have to do to obtain these programs — and save yourself typing — is to join the service, log onto it and download your chosen programs onto disk. Initially this service will only be available to subscribers, but when sufficient demand has been generated, it will be available to everyone.

Once again, I must stress the type of programs I would like to see in Program File. Original ideas and applications that can be performed well by a micro are more than welcome, as are good utility programs and routines to be incorporated in other programs. Any games submitted must be both original and challenging.

Programs should not be too long since people will not be willing to type them in (exceptions can be made for extremely high-quality programs such as the Expert System published last month). There should not be too much machine code or too many long data statements, as these are especially tiresome to type in. Small amounts are acceptable, but commented source code is preferable.

I am also concerned that it should be as easy as possible to convert programs to different machines. This means that programs in standard Basic, or standard forms of other languages, will be more welcome. Any parts of code that are specific to a particular machine or which rely on specialised hardware should be carefully explained.

Most people would like to know how the programs they use work, so all submissions must be accompanied by documentation or comments that explain how the unusual parts of the code work.

All submissions should be on cassette or disk, with a separate listing.

If your submissions are to be returned, they must be accompanied by a stamped addressed envelope. Further details on submitting programs are given at the end of Program File.

This month's Program File has an educational flavour. It has been written for very young children, and is unusual in that the author has taken extreme care to ensure that the program is as easy to use, understandable and coherent as possible. The program, simply called Order, has been written by JC O'Callaghan who works in the educational computing field. Its purpose is to introduce the concepts of ordering sets of objects to the very young. A full explanation of the reasoning behind the program is given before it.

Other programs this month include Commodore 64 Stock, a simple stock control and re-order database for small businesses or shops. The Tatung Einstein receives very little support, so Einstein Random Access Database should be welcomed by users of this machine. For Spectrum owners, there is a program to produce formatted output of listings. Tips include a graphics hint for the Atari 520ST, how to use your Epson HX-20 as a printer buffer for another micro, and a scr嫩endump for the Memotech machines.

---

Program of the Month

BBC Order

by JC O'Callaghan

This program allows young children to practice and solve problems which relate to ordering sets of objects, and it was designed with some specific aims in mind.

Firstly, as there exists a shortage of serious educational software for the very young, the program should be targeted at that age range.

Secondly, the age at which children are able to appreciate the concepts of bigger, smaller, biggest, smallest, and so on, tends to be well below their reading age. Consequently, normal methods of providing work for children on these concepts — say, worksheets or workcards, tend to be of little use due to the language limitations. Therefore, no language should be needed for the part of the program the children use.

Thirdly, most parents and teachers are bound to have different ideas and preferences for the presentation of material to their children. However, almost all educational programs provide the user with only one fixed method of presentation and only a limited amount of flexibility concerning the level of work. The program, therefore, should allow the parent or teacher to decide upon the exact method of presentation and give maximum choice over the widest range of possible problems.

The program Order goes a long way to fulfill these three aims.

The children have to put into order five sets of shapes. They are presented with five large boxes containing these sets, below which are five empty boxes. The order of the boxes on the top line has been randomly mixed so that the sets are no longer in order. The task for the child is to transfer the boxes from the top row into the bottom row, in the correct order. For example, the top row might contain, in this sequence: two triangles, five squares, one star, three triangles, four stars. After transfer the bottom row should contain: one star, two triangles, three triangles, four stars, five squares.

When the problem starts, each set of shapes on the top row will, in turn, change colour from white to blue. A set from the top row is transferred to the bottom row by pressing the space bar, while that set is coloured blue. If the choice made is a correct one the program will move on; if not, the incorrect set on the
**TERMINAL MADNESS! PRICE INSANITY! OR JUST GOOD BUSINESS SENSE?**

If your needs include any of the following then you should be looking seriously at the ATARI 520ST. You could be saving yourself or your company valuable time and expense by using the Atari for fast processing speeds at low unit cost.

<table>
<thead>
<tr>
<th>Option</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMMUNICATIONS (VT100, VT102, VT52 – Mini or Mainframe Terminal – Prestel – Electronic Mail)</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>WORDPROCESSING</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>ACCOUNTING</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>EDUCATIONAL</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>DATABASES</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>BUSINESS GRAPHICS</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>SMALL BUSINESS</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>SPREADSHEETS</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>CAD SYSTEM (colour &amp; B/W)</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>DESIGN</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>TIME RECORDING</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>CONTROL</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>CAD SYSTEM (B/W)</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>DESIGN</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>TIME RECORDING</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>CONTROL</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>CAD SYSTEM (B/W)</td>
<td>YES</td>
<td>NO</td>
</tr>
</tbody>
</table>

System illustrated includes 512K Ram fast 68000 processor, half megabyte 3½” disk drive, high resolution b/w monitor, GEM mouse and free word processing, graphics, basic and logo software. Options include double sided 1 meg disk drives, 10/20 megabyte hard disks, colour monitors and cdrom players (laser disks).

---

**Silicon Centre**

Scottish Distributors for ATARI Products

7 Antigua Street
Edinburgh
EH1 3NH
031-557 4546

Unit 16, Anderston Centre
Glasgow G2 7PH
041-226 5346

Terminals • Computer Systems • Training • Maintenance

---

To: SILICON CENTRE, 7 ANTIGUA ST., EDINBURGH EH1 3NH
Dept
PLEASE SEND ME FREE INFORMATION – 520ST

Mr/Mrs
Address

COMPANY/DEPT

MAIN INTEREST

---

CUT AND SEND:-

APRIL 1986 PCW 195
bottom row will be wiped out and the child will have to try again.
This continues until the correct set of shapes has been put into all five empty boxes on the bottom line. When this happens, there will be a match-up between each set and the number of shapes in each set; for example, under a set containing three stars, the number three will appear.
At the end of each problem, the child must press the space bar to move on.
The key part of the program comes at the beginning, when the parent or teacher makes certain choices from the two 'selection pages' which determine the type of problem to be solved. Below are a set of descriptions outlining the various components of the selection pages:

**SHAPES:** Typing in B, T or S will make sure that only boxes, triangles or stars will appear in the sets of information. Typing M, on the other hand, will mix them up so that some of the sets might be triangles, some stars, and so on.

**FEEDBACK:** Here, the user has the choice of T for ticks, X for crosses and ticks, and S for sound only. Many parents and teachers do not like to see a lot of crosses on children's work, and this option provides them with the chance to decide on what type of response the child should get for correct and incorrect answers.

**ORDER:** The problems can either be set in ascending (A) or descending (D) order.

**POSITION:** R for random will result in the position of the shapes being randomly arranged in each set, and will make the problem more complex. However, if P for pattern is selected, the shapes will be positioned in a sequence which has a building block effect, which means that the bottom row will be filled before the next row is started on. As you can see, this building block effect provides the child with some help as to which of the sets should be selected:

```
  :: :: :: :: ::
  :: :: :: :: ::
  :: :: :: :: ::
```

For the same descending problem, the shapes would be arranged this way:

```
  :: :: :: :: ::
  :: :: :: :: ::
  :: :: :: :: ::
```

**RANGE:** the number of possible shapes in each set can vary from one to nine. R will select a random range of numbers. If a specific range is required, you must type in the lowest number in that desired range; for example, typing in 2 will select the range two — six.

**ELIMINATION:** When this option is selected, an incorrect choice is eliminated from the top row; this will make the choice easier next time around. If mistakes are continually made, then after four incorrect choices, the correct choice will be the only one left.

**PICTURE:** If you select this facility, a picture of an incline will be drawn. The slope of the incline will be going up if the problem is an ascending one and down if it is descending. Depending on the type of problem, a man will also be placed at either the bottom or top of the slope. This should provide some help to the child in deciding what kind of problem has been set. At the end of the problem, when the correct solution has been arrived at, the man will then either move up or down the slope towards the opposite end of the incline.

**TIME DELAY:** This fixes the time, in seconds, that each individual set is made available for selection by the child. After the period of time has expired, the next set will be made available, and so on. This means that the speed of the program can be matched to the need of each individual child. Only values between one and 60 will be accepted.

**NUMBER OF QUESTIONS:** This option sets the number of questions that will be presented to the child on a particular type of problem. Up to 20 questions may be selected. However, a particular type of question may be continually repeated by entering zero for this option. This instructs the program to keep repeating questions on the type of problem that has been decided upon, and an R will appear instead of zero when the Return key is pressed.

The space bar will have to be pressed to move on from the end of each question. If there are still more questions, the next one will be displayed; if not, then the program will return to the selection pages. To get out of the repeat cycle, the Escape key must be pressed at the end of the question to bring the program back to the selection pages. This facility is available any time at the end of a question in case a sequence of questions needs to be halted.

**SOUND LEVEL:** The user has the choice of 0, 1 or 2 which correspond to no sound, sound at half the normal volume and normal volume. These three options will only allow the entry of numbers, and only two of them at most. When the correct number has been entered, the Return key must be pressed. Prior to pressing the Return key, alterations may be made to any entry by using the Delete key.

After setting the problem it will be necessary, especially when a child is first using the program, for the parent or teacher to explain what is happening and what is expected of him or her. For the first few times, it may even be advisable for the parent or teacher to work through a few problems with the child. After using the program, the child should, from the visual clues, be able to decide what kind of problem it is and how to solve it.

Pressing the Break key at any time will cause the program to start all over again.

A suggested progression of problems is tabulated in Fig 1.

**FEEDBACK:** PICTURE, NUMBER OF QUESTIONS and SOUND are all a matter of personal preference and are therefore not included in Fig 1.

Apart from the first four selections, Fig 1 only attempts to indicate the range of possible problems. There are many more intermediate steps that could be inserted into the table.

Generally, you should concentrate on a single concept at a time. For example, the first four selections in Fig 1 only change one parameter — the shape. This way, the child is able to see that the problem is not affected by the type of shape but by how many shapes there are. After that, the next progression is to increase the number of shapes. The rest of the table indicates the general trend you might take. The order in which the parent or teacher introduces the different concepts will, of course, depend upon personal preference.

<table>
<thead>
<tr>
<th>SHAPES</th>
<th>B</th>
<th>T</th>
<th>S</th>
<th>M</th>
<th>B</th>
<th>M</th>
<th>T</th>
<th>M</th>
<th>S</th>
<th>M</th>
<th>B</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>ORDER</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>D</td>
<td>D</td>
<td>D</td>
<td>D</td>
<td>A</td>
<td>D</td>
</tr>
<tr>
<td>POSITION</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
</tr>
<tr>
<td>RANGE</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>ELIMINATION</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>TIME</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

*Fig 1 A suggested progression of problems*
The season is never over with NFL CHALLENGE!

Join the fun of the most exciting computer game for IBM or Apple. "Hi-tech makes a U.K. touchdown" (The Times). "Classic is the name of the game" (Quarterback). Pro-football excitement is as close as your keyboard with NFL CHALLENGE. From Challenge UK

This is the officially licensed NFL action computer game with offensive and defensive plays based on the actual real-life plays and the 28 teams in the NFL. Complete with full 144x96 pixel NFL logo, the games are as used in the NFL.

You can even update the players and teams as the season progresses.

NFL CHALLENGE is the most intense and expert simulation of the pro-football experience ever devised. You choose the plays and feel the clash of the scrimmage, the triumph of soaking the quarterback, and the satisfaction of completing the long pass.

NFL CHALLENGE requires IBM PC or PCW with DOS 2.0. 256 bytes of memory, monochrome monitor with IBM monochrome font or RGB colour monitor with IBM graphics adapter. Also runs on the IBM PCAT.

NFL CHALLENGE makes you the coach and the quartermaster.

THE NEXT PLAY

Already a classic in America, NFL CHALLENGE can be purchased from Challenge UK for only £99.50 + VAT for you to play Super Bowl.

CHALLENGE UK

Sommerville House, 30 Southernhay East, Exeter, Devon, EX1 1NS.

For further details
Phone: (0392) 217631

Terminals UK Distribution

Officially Licensed Product

HARDWARE

SOFTWARE

COMMUNICATIONS • COMPUTER SERVICES • DATA MANAGEMENT • DATABASE MANAGEMENT • DATABASE SYSTEMS • WORD PROCESSING • WORD PROCESSING SOFTWARE

Cambridge Computer Store

1 & 4 Emmanuel Street, Cambridge

Business & Professional Systems: Cambridge 65335/4
Low Cost Systems: Cambridge 358264

APRIL 1986 PCW 197
**PARROT DISKETTES**
(Assured by Legal Authorities etc.)

**LIFETIME WARRANTY**

- 5½" IN RIGID PLASTIC LIBRARY BOX
- SS/DD 48pix 1-3 3+
- DS/DD 48pix 17.85 16.75
- SS/DD 96pix 19.75 18.85
- DS/DD 96pix 22.90 21.90
- DS/DD HD 1.6 MB 35.90 34.25

3½" SONY
- SS/DD 27.85 26.90
- DS/DD 35.95 34.85

**FREE DELIVERY - VAT EXTRA**

RUSH! Company orders with Cheque to:-

SUNBIRD, FREEPOST,
BASINGSTOKE RG25 2RA

---

**SECOND HAND SYSTEMS BUYING/SELLING**

APRICOT, APPLE, IBM, SIRIUS, OLIVETTI, TELEVIDEO...

We buy and sell all types of computer equipment from Micros to Mainframes Plus discount on new Apricot XEN

FD 25270K £169
HD 20MB £247
12 inch Green Mag. + Adaptor add £236
12 inch Paper white + Adaptor add £459
12 inch Hi-Res col. + Adaptor add £942

VICTOR/SIRIUS-subject to availability
1.2Mbs £1,050 2.4Mbs £1,250 10Mbs £1,800

ALL PRICES + VAT + CARRIAGE

Call:
Cromwell Business

BARNWELL HOUSE, BARNWELL DRIVE
CAMBRIDGE CBS 4LW
Tel: (0223) 241446  Telex: 817847

---

**HUMAN INTERFACE MICRO COMPUTER SUPPORT**

COMPLETE RANGE from SHAPWICK BLAISE ltd.
FULLY ADJUSTABLE COMPUTER and PRINTER STANDS, LIGHTING AND COPIERS

Unit 45B, St. Michaels Trading Estate, Bridport, Dorset DT6 3RR
Telephone: Bridport (0308) 23846

---

**1600DS 7**
1180PROC@front
1380PROC@up
1380PROC@left
1480PROC@right
1580PROC@center
1680PROC@DOS.ini
1780PROC@mouse
1880PROC@font
1980PROC@end

**FREE DELIVERY**

10% off @ 100
20% off @ 500
30% off @ 2000

**MICROBUS**

- 8088
- 8086
- 8085
- 8080

**COMPLETE RANGE**

- IBM PC
- IBM PC XT
- IBM PC AT
- IBM PS/2

** SOFTWARE**

- Microsoft
- Lotus
- Wyse

**PROGRAM FILE**

---

**FREE POST**

1280PROC@free
1224PROC@free
1224PROC@free
1224PROC@free
WANTED FOR CASH!!
ALL TYPES OF COMPUTER EQUIPMENT
ATARI, AMSTRAD, BBC, COM 64, AFRICOM, IBM PC, etc.

WE BUY, SELL
AND PART EXCHANGE
NEW AND USED
FULL MAIL ORDER SERVICE
WITH GUARANTEE

(DATA DIRECT LTD)
53 RUGBY ROAD, WORTHING, SUSSEX BN18 1SN
Tel: (0903) 40509 24 hours

MICROMART

PROGRAM FILE

<table>
<thead>
<tr>
<th>PRODUCER</th>
<th>CODE</th>
<th>BARCODE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DUST COVERS
Amstrad PCW 525X £1.15
Light grey 3 piece set, monitor and printer piped in green, name on keyboard.

Amstrad CPC 6128 464 654 £6.95
Matching product covers, piped with grey ribbons. Piping on monitor cover, 9128 red, 404 green, 664 blue, Amstrad CPC keyboard cover. Please state monitor size. Colour or Mono.

Tatung Einstein £7.50
Une piece cover for monitor and keyboard in piped light grey ribbons. Piped in red with name on keyboard.

Business Machine Covers
Matching product covers with piping and name on keyboard. ACT SIMBUS, APFROC PC 127, ATARI 5200, IBM PC, OLIVETTI M14, MACHO, SANTY MBC, TIPIC, ALL, B.S.O, OLIVETTI M34 (COLOUR), IBM AT 3200, APFROC PC (9), APPLE II, APPLE MAC £7.00.

Matching covers for Printers
e.g. Amstrad Daisy, Brother MFC, LEX, TALLY, Canon PW 1000A, Epson FX80, RXB3, XBO, Brother MFC, Canon FAX250, Tuxing TP100, AM £4.50. Brother HR15, Juki 8100 at £3.50. Much larger range of other covers on request.

BBD COMPUTER DUST COVERS
3 MANSE AVENUE, WRIGHTINGTON WN6 8RF
Telephone: (0257) 242968

SAVE 50% ON FLOPPY DISKS
WITH FLIPPY DISKS AND DISK NIBBLER

FLIPPY DISKS are the most versatile 5½" soft sided disks available. They are double sided, double density, and specially designed to allowfloppy disks to be used, both on a double or single sided drive.

Single sided drives will require the use of a DISK NIBBLER to enable them to write to the 5½" side. The end user can now save up to 50% on disks and disk transport costs.

ORDER NOW
AND TAKE ADVANTAGE OF OUR LAUNCH "SPECIAL OFFER"
(SAVE £4.30) £2.00 off Disk Nibbler plus free Flippy Disk

TRADE AND BULK ORDERS PLEASE CALL 061 602 8006

200 PCW APRIL 1988
Commodore 64 Stock
by PA & DC Stanford

This program provides a simple program for small stock control of businesses and individual MPS 801 printer, but could easily be adapted, not only for other printers, but also for other computers. The program is intended for use with a disk drive, but could be modified to work with a cassette by changing all references to 'disk' to read 'cassette', and by substituting the following by the following line number.

All control codes in the listing have accompanying REM statements to 12090 OPEN 1,1,0,FIS$
££ MONEY ££
EARN ROYALTIES
1. Do you have access to a P.C.?
2. Can you write spreadsheet or database applications?
3. Are you interested in supplementing your income?

Contact us now –
Help - Key
Computer Services Limited
35 Abinger Ave, Cheam, Surrey SM2 7EW
Tel: 01-393 4332

We sell –
Custom-made spreadsheet and database applications to businesses

MEGABUFFER

UNIVERSAL DATA BUFFER – Free your computer while printing or printing. Let MEGABUFFER do the work!
Press 64/128/256/512/1024 KB RAM for large printouts.
Combinations with most computers, printers and plotters. IBM, Apple, HP, SUX, TANDY, APPLIQ, DEC, SHARP, EPSON, ORI, BENSON, etc.
Serial and parallel interfaces in one unit. PAR, PAR, PAR, PAR, PAR, PAR, PAR.
Multiple copy and page printout facilities. Handles text and graphics. ASCII-Com Conven.
Internal Power Supply. SL/LL/TEST MODE.
High Quality Construction. Built to Last.
British Designed and Manufactured.
Works Pay More for Less.

64K/128/256/512/1024 K Memory cards.
16K/4K/2K/1K Cartesian.
Cables 10 feet (bundle all details of Computer Printing) Order Enquiry Welcome.

RIDGEFORD PERIPHERALS
15 Deepdene Road, Worthing.
Telephone 00603 219131
West Sussex, BN14 6RD

PROGRAM FILE

1. 1079 FORM=TYPE
1075 PRINT"DENTAL NUMBER :"
1074 REM BLU
1073 PRINT"PRINT"$DENTAL NUMBER (BD 1866)
1072 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1071 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1070 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1069 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1068 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1067 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1066 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1065 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1064 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1063 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1062 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1061 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1060 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1059 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1058 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1057 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1056 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1055 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1054 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1053 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1052 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1051 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1050 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1049 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1048 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1047 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1046 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1045 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1044 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1043 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1042 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1041 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1040 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1039 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1038 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1037 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1036 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1035 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1034 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1033 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1032 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1031 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1030 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1029 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1028 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1027 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1026 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1025 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1024 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1023 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1022 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1021 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1020 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1019 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1018 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1017 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1016 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1015 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1014 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1013 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1012 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1011 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1010 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1009 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1008 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1007 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1006 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1005 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1004 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1003 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1002 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1001 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)
1000 PRINT**"PRINT"$DENTAL NUMBER (BD 1866)

COMPUTER REPAIRS

We are the experts, having serviced Sinclair computers since the introduction of the Z80.
Do not waste money on estimates — we repair Sinclair computers at prices quoted inclusive parts, labour, postage, VAT, irrespective of fault. No hidden charges.

Repairs guaranteed for 3 months.
Spectrum £18.75 inc parts
Keyboard fault only £7.55 inc parts
ZX81 £9.55 inc parts
16K RAM £11.50 inc parts
Commodore £9.59 inc parts
Microdrive £15.25 inc parts
Interface £11.75 inc parts
BBC £22.90 inc parts
Electron £19.95 inc parts
Commodore 64 £19.95 inc parts
XR Memory Expansion Kit £15.95 inc parts

Computer Retail price please phone for Special Trade Price.

Call or send with cheque or P.O.

T.V. Services of Cambridge Ltd.
French's Road, Cambridge CB4 3NP
Tel. 0223 311371

202 PCW APRIL 1986
PROGRAM FILE

DISK-OUTNEN DISKS
FROM
MONA'S OVERSEAS UK LTD
UNIT 34, CANNON WORKSHOPS
CANNON DRIVE, WEST INDIA DOCK
LONDON E14 1SU. TEL: (01) 987 12/12

BARGAIN 31/2" DISKS
PRICES PER BOX OF 10 DISKS (£)

<table>
<thead>
<tr>
<th>SONY</th>
<th>2-6</th>
<th>6-8</th>
<th>10+</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSD</td>
<td>23.00</td>
<td>21.00</td>
<td>20.00</td>
</tr>
<tr>
<td>SD/DD</td>
<td>33.00</td>
<td>30.50</td>
<td>29.50</td>
</tr>
<tr>
<td>FUJI</td>
<td>1-2-5</td>
<td>6-9</td>
<td>10+</td>
</tr>
<tr>
<td>SS/DD</td>
<td>25.50</td>
<td>24.00</td>
<td>23.00</td>
</tr>
<tr>
<td>BD/DD</td>
<td>33.50</td>
<td>31.00</td>
<td>28.50</td>
</tr>
</tbody>
</table>

BULK DISKS
PRICES PER 100 DISKS (£)

<table>
<thead>
<tr>
<th>SONY</th>
<th>100+</th>
<th>300+</th>
<th>500+</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSD</td>
<td>193.00</td>
<td>145.00</td>
<td>135.00</td>
</tr>
<tr>
<td>SD/DD</td>
<td>250.00</td>
<td>240.00</td>
<td>230.00</td>
</tr>
</tbody>
</table>

FREE P&P ON ALL 31/2" DISKS IN UK

5 1/4" DISKS
PRICES PER BOX OF 10 DISKS (£)

<table>
<thead>
<tr>
<th>MAXELL</th>
<th>2-6</th>
<th>6-8</th>
<th>10+</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSD</td>
<td>12.80</td>
<td>12.00</td>
<td>11.60</td>
</tr>
<tr>
<td>SD/DD</td>
<td>17.50</td>
<td>16.70</td>
<td>16.50</td>
</tr>
<tr>
<td>BD/DD</td>
<td>22.00</td>
<td>21.00</td>
<td>20.50</td>
</tr>
<tr>
<td>DS/1.6 MB</td>
<td>31.00</td>
<td>28.50</td>
<td>26.00</td>
</tr>
</tbody>
</table>

DYSAN
1-2-5 | 6-9 | 10+ |
| SSD | 15.00 | 14.50 | 14.30 |
| BD/DD | 21.40 | 20.70 | 20.00 |
| BD/DD | 21.30 | 21.20 | 20.50 |
| BD/DD | 27.60 | 26.90 | 25.90 |

P&P: 1-5 Boxes: £20 per box
6+ boxes: FREE IN UK

BULK DISKS
PRICES FOR 250 DISKS INCL P&P

| SSD | 117.50 |
| BD/DD | 168.50 |
| BD/DD | 222.50 |

CERTIFIED WITH ENVELOPES & LABELS

ALL PRICES EX VAT
(SUBJECT TO AVAILABILITY)

LOW! LOW! LOW! LOW!
LOWEST PRICES

ATARI 520ST £560 + VAT
BBC MASTER 128 £399 + VAT
AMSTRAD PCW 8256 £370 + VAT
EPSON TAXI PC (IBM Compact)
from £775 + VAT
APRICOT F1 (incl Monitor) £550 + VAT
ALSO AVAILABLE:
EPSON, CANNON, JUKI, VICTOR, SPERRY, COMMODORE, OLYVETTI, etc., etc.
SOFTWARE — SUPPLIES — MAINTENANCE

RING US NOW

1st CHOICE DISCOUNT MICROUS
TEL: 01-952 2512
43 CHATHSWORTH Gdns. LONDON W3 9LP

APRIL 1986 PCW 203
PERIPHERAL MANAGER

A new generation of intelligent buffers

- 4 ports, 38k, electronic routing, printer sharing, protocol conversion, port expansion.

- Much more than a buffer
  - The Peripheral Manager not only stores information, but sends it just where you want it when you want it.
  - Any number of copies from one printer to three computers on up to three peripheral in simultaneous.

- Put the PM in charge
  - re-configure your office computer system at the touch of a button.

- Easy use, keypad and/or software operation.

- Compatible: RIS22 and/or Centronics interfaces.

- No more cable-swapping or wasted time.

- UNRIVALLED FLEXIBILITY - UNBEATEABLE VALUE!

To: C295 (+ VAT)

Dealer enquiries welcome.

Adder Technology
Cambridge Science Park
Milton Road, Cambridge CB4 4AT
Tel: 0223251717 Fax: 0223251716
REVENUE: 0223251716

ADDER

204 PCW APRIL 1986

MICROMART

PROGAM FILE

\*\*\* MASSIVE PRICE REDUCTION \*\*\*

CABALIST

NOW ONLY £7.50 AS THE DEADLINE APPROACHES

CABALIST is a series of interlinked programs which contain protection, encoding and encryption devices. Each program must be broken into a part of the overall solution. The difficulty increases as you progress.

To become a registered owner of a CABALIST disc send a cheque for £7.50 and your name and address to:

ROSS REUTER RESEARCH
EDGEFIELD SCHOOLS ROAD
ERPINGHAM NORWICH NR11 7QY

Minimum system: BBC B; single 40 track drive; Agiva Hundred Brain.

The first registered owner to send a complete solution to Ross Reuter Research before 31st May 1986 will receive £1500. Second prize £75. Third prize £50. Winners will be published in this magazine. Complete solution will be published when CABALIST is superseded.
### PROGRAM FILE

```
<table>
<thead>
<tr>
<th>Program</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>PRINT</code></td>
<td>Display data</td>
</tr>
<tr>
<td><code>READ</code></td>
<td>Read input</td>
</tr>
<tr>
<td><code>GOSUB</code></td>
<td>Call subroutine</td>
</tr>
<tr>
<td><code>REM</code></td>
<td>Comment</td>
</tr>
<tr>
<td><code>OPEN</code></td>
<td>Open file</td>
</tr>
<tr>
<td><code>CLOSE</code></td>
<td>Close file</td>
</tr>
<tr>
<td><code>INPUT</code></td>
<td>Read input</td>
</tr>
<tr>
<td><code>LET</code></td>
<td>Assign variable</td>
</tr>
<tr>
<td><code>LOCATE</code></td>
<td>Move cursor</td>
</tr>
<tr>
<td><code>CLS</code></td>
<td>Clear screen</td>
</tr>
<tr>
<td><code>RCL</code></td>
<td>Recall variable</td>
</tr>
<tr>
<td><code>STO</code></td>
<td>Store variable</td>
</tr>
<tr>
<td><code>STOP</code></td>
<td>End program</td>
</tr>
<tr>
<td><code>RUN</code></td>
<td>Execute program</td>
</tr>
<tr>
<td><code>FOR</code></td>
<td>Loop</td>
</tr>
<tr>
<td><code>NEXT</code></td>
<td>End loop</td>
</tr>
<tr>
<td><code>IF</code></td>
<td>Conditional statement</td>
</tr>
<tr>
<td><code>THEN</code></td>
<td>Branch statement</td>
</tr>
<tr>
<td><code>ENDIF</code></td>
<td>End conditional statement</td>
</tr>
<tr>
<td><code>READLIB</code></td>
<td>Read library</td>
</tr>
<tr>
<td><code>PRINTLIB</code></td>
<td>Print library</td>
</tr>
<tr>
<td><code>DELETE</code></td>
<td>Delete object</td>
</tr>
<tr>
<td><code>NEW</code></td>
<td>Create object</td>
</tr>
</tbody>
</table>
```

### Basic → C

Converts Microsoft Basic programs to readable and portable C. Full C support libraries for PC-DOS included.

<table>
<thead>
<tr>
<th>Version</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic → C Compiler</td>
<td>£195</td>
</tr>
<tr>
<td>DOS library source</td>
<td>£295</td>
</tr>
<tr>
<td>Unix library source</td>
<td>£495</td>
</tr>
</tbody>
</table>

Please specify version of C compiler (Lattice or Aztec) and add £2 P&P per item. Prices exclude VAT.

**Stop-press:** Microsoft Version available now

Living Software Ltd
34 Bramble Avenue
Cotswurth
Milton Keynes MK14 7AP
(0908) 600667

Basic → C supports all of Basic except joystick, graphics and sound. It requires 192K and PC-DOS version 2 or later.

---

### 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, Apple, 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.

**SA THE BALCONY, QUENS 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 Saturday

**USED COMPUTER AGENCY**

---

### FAITH COMPLETE BUSINESS SOFTWARE

Send £20-WAT for (s.a.e.) list to: and you will receive a complete list of SOFTWARE, SELL, PURCHASE ledger, patient records, stock control, estimation, data analysis, job costing, letter writer etc, and future updates in the future. This software incorporates 5 year work and is self-standing with no need to predefine accounts structure and T balance sheet. All details are immediately updated as transactions are entered. Should you like the system and we have used £20-WAT each month. NOW AVAILABLE for Apple/IBM/Sinus/Vixen. (Trade enquiries welcome.)

**NEW and SECOND-HAND hardware supplied by us contains with FAITH. ANY NEW SOFTWARE SUPPLIED AT £150-£250. SECOND HAND SOFTWARE £10-£50.**

**IMMEDIATE CASH FOR MOST BUSINESS Hardware. Good selection second hand computers available - émove from £450 also chat with our Hardware dell £20 below market.**

**TELEPHONE ADVICE LINE 01 964 1686.**

**CONSULTANCY / TRAINING / BROKER SOFTWARE / ACCOUNTANCY / WORD PROCESSING / MAILSHOTS / EXPORT SERVICE etc. Please ask. No cost too small - even £5.**

[Demonstrations etc by appointment]

**PCS LTD.**

96 Oldfield Rd, Hampton, Middx TW12 2HF

01-941 1447

APRIL 1986 PCW 205
This program is a random access database and runs under Xtal-Basic. The program starts up with a title screen and a prompt to press a key. If Esc is pressed, the program is exited; if I is pressed, an introduction will be printed from which a further key press will take you to the main program. Pressing any other key from the title screen will also take you straight into the program.

When the program is asked to find a particular record, you will have to select the required index followed by the search key, which is the particular word or phrase you wish to look for. This key may be up to eight characters long. When entering records into the database, the Delete key and the cursor keys may be used.

The introduction within the program provides information about getting started. It is suggested that you experiment before starting on serious use, so that you can get the feel of the program.
COMPUTER AND PRINTER REPAIRS AND MAINTENANCE AND SUPPLIES
Tel: 01-966 8622
* EPSON * IBM * APRICOT *
* SIRIUS/VCITOR * APPLE *
WE HAVE A SAME DAY SERVICE BY APPOINTMENT, IF YOU BRING YOUR COMPUTER OR PRINTER, OR WE WILL COME TO YOU.
EASY FREE PARKING ON ENQUIRIES WELCOME, TERRIFIC PRICES ON SALES TOO!

LOGIFIX LTD
HORMEAD WHARF, HORMEAD ROAD, PADDINGTON, LONDON W9
Evening and weekend collections possible

DATA PRESS
COMPUTER STATIONERY PRINTERS
TOP QUALITY PRINTED STATIONERY FOR COMPUTERS AND WORD PROCESSORS MINIMUM QUANTITY FROM 100 SHEETS!
Send large S.A.E for Samples, Price list and Order Forms

ALSO
COMPUTER LISTING PAPER at Wholesale Prices!
e.g. 11"x9" Unprinted 60gm SuperWhite fan-fold perforated sheets. Boxed in 2,000s
Sample box £17 5 boxes £16
10 boxes £15 25 boxes £14
50 boxes £13 100 boxes £12

PRICE ARE PER BOX OF 2000 SHEETS AND INCLUDE CARRIAGE & VAT
Huge range of other Computer Paper – Send SAE for details.

194 KINGS ROAD - HARRARGATE - H G 5/0

PROGRAMS WANTED!
We're probably the oldest microcomputer software company in the UK (we were founded in 1978). Originally we specialised in Commodore programs, but now we sell Amstrad IBM PC, and some BBC products (we even manufacture hardware odd-ball). We are particularly looking for Amstrad, Amiga, and Atari ST programs. Not but games, but productivity software and programming aids too. Don't bother sending us Basic games or Quilled adventures – ideally we are looking for machine code programs that really stretch the computer they're written for.

SUPPORT
Winchester House, Comerin Road, Wodeston, Harrow, Middlesex HA3 751
Telephone: 01-861 1146

308 PCW APRIL 1986
**SEX PROBLEMS**

Filter all your RIS232b woes with our universal cable. Plug and socket at both ends of the one more cable.

**PRINTER CONNECTION PROBLEMS?**

**SOLUTION 1**

**CONVERTER: SERIAL TO PARALLEL £39.95**

For owners of computers with RIS232 output who wish to drive compatible printers. Add 525v for additional ways. Reverse also possible at some points.

**SOLUTION 2**

**DATA SWITCH: 2-WAY SERIAL £29.95**

For computer owners who wish to drive more than one compatible printer. Add 525v for additional ways. Reverse also possible at some points.

**SOLUTION 3**

**CONVERTER: PARALLEL TO SERIAL £39.95**

For owners of computers with parallel output who wish to drive serial printers. Add 525v for additional ways. Reverse also possible at some points.

**FOR SALE**

Please ensure your cables handle the load and also our new-vat Computer Cable. All the above prices include VAT, postage and packing charged at 15%.

For further details, write, phone or contact us:

**TYPER PRO-LIMITED**

35 Carlisle Road, CAMBRIDGE CB4 2NG

Tel: 0223 322324 (24 hour service)

---

**THE CRACKER**

The spreadsheet designed for normal people who make mistakes and need an easy and quick way to fix the mistakes. 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 £44.113 **CM-8086** 8086 MPU-86, CP/M-86, MIP, MC-80, MS-DOS, PC/OS.

**DIASTASSEMBLERS, 288, 8086**

Powerful practical Fractional 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, **CM**, **COM** and **EKE** files also. R03+ VAT. CP/M-86, 286, 8086, MIP, CP/M-86, MS-DOS, PC/OS.

**TRANSLATOR 8080/286 TO 8086**

This is a single page 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 on 8086 based Intel processors. Output for popular assemblers. An easy way to learn 8086 assembly language.

**SOFTWARE TECHNOLOGY LTD**

PO BOX 724, BIRMINGHAM B18 3AQ

TEL: 021-427 7800

TELEX: 33767 TELGE

---

**SAME DAY DELIVERY**

**DISCS**

6 discs (packs of 16) £10.99 (March Sale) £6.00 (209808 86 Tracks) £4.60 (286 86 Tracks) £1.90 (100 86 Tracks) £1.15 (310 86 Tracks)

**ACOUSTIC DISCS**

600 86 Matrices £33.99

**LIBRARY BOXES**

**BASIC**

BASIC To Hold 16 2-32 Tracks £10.99

**FORTRAN**

FORTRAN To Hold 64 Tracks £38.99

**COBOL**

COBOL 286, IBM 15 Track £32.99

**SHELL**

UNIX 25 COBOL tracks £32.99

**MICRO**

PCW512 £25.99

**PRINTER RIBBONS**

IBM 286 £15.99

**THERMAL PRINTERS**

IBM 286 £16.99

Apple £19.99

**SUPERS**

Apple £25.99

**STEELING**

Apple £9.99

**SOFTWARE**

Apple £25.99

**OTHER**

Apple £5.99

---

**SOFTCOMPUTING LTD**

104 Northampton Road

Goffs Oak, Cheshunt, Herts EN7 5RF

Tel: (0277) 873715

---

**APRIL 1986 PCW 205**
Laser printing by
C&P I computer services
Having trouble printing HIGH QUALITY Manuals, Reports etc that include Graphics
WE are the people FOR QUALITY PRINTING & QUALITY CONTROL
BY PEOPLE WHO WANT TO HELP

Lasercopying

PC<--->BBC

With a suitable disc drive and a BBC model B with a 1700 upgrade, a model B+, or a Master 128 you can now easily read and write discs for a range of MS-DOS and PC-DOS machines, including: 5.25" discs: IBM PC and compatibles (16k, 160k, 320k, 640k, 1.2M) 3.5" discs: Agnecy (312k, 720k), RML Nimbus (720k) ATARI 520 ST Our program is menu-driven and has full facilities for disc management, viz:
COPY files from MS-DOS discs
DEirectory of MS-DOS disc
ERase MS-DOS file(s)
FORMAT MS-DOS disc
HEX dump of MS-DOS file(s)
TYPE MS-DOS file(s)
Access is also allowed within the program to BBC * commands.

Price £15.00 inclusive
State disc size (5.25", 3.5"), number of tracks (40,80), and type of 1700 upgrade.

Baksoft
20 Leys Avenue CAMBRIDGE CB1 2AW

---

Saxon Computing
31 ARAM ROAD, LEONFIELD, BEVERLEY, HUMBERSIDE
TEL: 0409 50697

PCW
20 PCW APRIL 1985
7 REM Prevents flashing border and sets caps lock.
4 CLS : POKE 23750,7: POKE 23
638,8
5 LET baud=19200: REM Change the value of baud to suit the baud rate of your printer.
10 CLEAR #: PRINT AT 0,4:"PROG R.
RAND LISTING UTILITY";AT 1,6;"(Eps.
son Compatible)";AT 3,4;"(c) B.M.
Gittings 1985"
15 PRINT AT 5,0;"---

Spectrum Program Printing Utility
by GM Gittings

The second issue of Interface 1 provides a POKEable address to set the number of characters printed before a line feed and carriage return, and this program easily makes use of this. It opens the relevant printer channels and allows specification of character fonts; the program to list is then specified with the location from which it is to be loaded. Listing to stream (#5) dumps the listing to the printer. The program works with all Epson-compatible printers, but can work with others if the control sequence is changed. It should be noted that the program will not work with proprietary printer units such as the Kempston printer interface.

3 REM Prevents flashing border and sets caps lock.
4 CLS : POKE 23750,7: POKE 23
638,8
5 LET baud=19200: REM Change the value of baud to suit the baud rate of your printer.
10 CLEAR #: PRINT AT 0,4:"PROG R.
RAND LISTING UTILITY";AT 1,6;"(Eps.
son Compatible)";AT 3,4;"(c) B.M.
Gittings 1985"
15 PRINT AT 5,0;"---

Spectrum Program Printing Utility
by GM Gittings

The second issue of Interface 1 provides a POKEable address to set the number of characters printed before a line feed and carriage return, and this program easily makes use of this. It opens the relevant printer channels and allows specification of character fonts; the program to list is then specified with the location from which it is to be loaded. Listing to stream (#5) dumps the listing to the printer. The program works with all Epson-compatible printers, but can work with others if the control sequence is changed. It should be noted that the program will not work with proprietary printer units such as the Kempston printer interface.

3 REM Prevents flashing border and sets caps lock.
4 CLS : POKE 23750,7: POKE 23
638,8
5 LET baud=19200: REM Change the value of baud to suit the baud rate of your printer.
10 CLEAR #: PRINT AT 0,4:"PROG R.
RAND LISTING UTILITY";AT 1,6;"(Eps.
son Compatible)";AT 3,4;"(c) B.M.
Gittings 1985"
15 PRINT AT 5,0;"---

Spectrum Program Printing Utility
by GM Gittings

The second issue of Interface 1 provides a POKEable address to set the number of characters printed before a line feed and carriage return, and this program easily makes use of this. It opens the relevant printer channels and allows specification of character fonts; the program to list is then specified with the location from which it is to be loaded. Listing to stream (#5) dumps the listing to the printer. The program works with all Epson-compatible printers, but can work with others if the control sequence is changed. It should be noted that the program will not work with proprietary printer units such as the Kempston printer interface.

3 REM Prevents flashing border and sets caps lock.
4 CLS : POKE 23750,7: POKE 23
638,8
5 LET baud=19200: REM Change the value of baud to suit the baud rate of your printer.
10 CLEAR #: PRINT AT 0,4:"PROG R.
RAND LISTING UTILITY";AT 1,6;"(Eps.
son Compatible)";AT 3,4;"(c) B.M.
Gittings 1985"
15 PRINT AT 5,0;"---
**FERRANTI PC860**
(incl Monitor) £1,195.00
12 months on-site warranty + software

**ADVANCE 86B**
(IBM Compatible) £650.00

**EPSON PC** available from £700

**PRINTERS**
- KAGA TAXAN KPS10: £239.00
- STAR SG-10: £235.00
- STAR SG-15: £250.00
- NEC ELF SPINWRITER: £320.00
- EPSON 105: £250

**SOFTWARE**
- KAGA TASSAN KPS10
- STAR SG-10
- STAR SG-15
- NEC ELF SPINWRITER
- EPSON 105

**LEICESTERSHIRE COMPUTER SYSTEMS LTD**
27 LONDON ROAD, GADDY, LEICS
TELEPHONE: (0533) 714228

**NewBrain**

**The NewBrain Files**
"I could not write a better book about the NewBrain", said Gerald McMullen of NBUG.
All the info you need PLUS programs and examples. UK £9.50, Europe £10.00, elsewhere £12.00 in sterling to:

**VITAGRAPH LTD, 26 College Road**
Bromley, Kent BR1 3PE

**Program File**

```
00 REM Set American Char Set
00 PRINT #4;CHR$ 27;CHR$ 64;CH
R$ 27;CHR$ 82;CHR$ 0
```
int?  "i: INPUT "Yes or No ", A$: PRINT A$: GO SUB 1000
205 IF LEN A$<1 THEN GO TO 202
210 IF A$(1)="Y" THEN PRINT #4;
CHR$ 27;CHR$ 69: GO TO 300
220 IF A$(1)="N" THEN GO TO 300
230 BEEP .5,-10: PRINT AT A+2,0;
A$;" is not an option": GO TO 2
02
299 REM Set no. of chars per line
300 LET A=A+2
302 PRINT AT A,0; "Enter Characters per line: "; i: INPUT ",10 to 8
0 (32 is normal) ": A$: PRINT A$
;: GO SUB 1000
305 IF LEN A$<1 THEN GO TO 302
320 IF A$<"10" OR A$="80" THEN
BEEP .5,-10: PRINT AT A+2,0; "Value
out with limits": GO TO 302
330 IF B$="EN" AND A$="40" THEN
BEEP .5,-10: PRINT AT A+2,0; "Too
long for enlarged text": GO TO
302
335 LET B=INT (VAL A$)
339 REM Poke in Page width
340 POKE 23729,B: PRINT #4;CHR$
27;CHR$ 81;CHR$ B
399 REM Inquire from where the
program should be loaded
400 LET A=A+2
402 PRINT AT A,0; "Load file from
here: "; i: INPUT "Drive or Tape
?: ": A$: PRINT A$: GO SUB 1000
410 IF A$<"""DRIVE" AND A$<"TAP"
E" THEN BEEP .5,-10: PRINT AT A+
2,0; A$:; "is not an option": GO
TO 402
402 REM Inquire filename
500 LET A=A+2
502 POKE 23658,0: PRINT AT A,0;
"File for listing: "); i: INPUT 
"Enter name ": b$: PRINT b$:; GO
SUB 1000: POKE 23658,8
510 IF LEN b$>10 THEN BEEP .5,1
0: PRINT AT A+2,0; "Name too long
": GO TO 502
520 IF b$="" THEN BEEP .5,10: P
RINT AT A+2,0; "Must give a file-
name": GO TO 502
530 IF A$="TAPE" THEN GO TO 570
549 REM If loading from Mdv
inquire which drive
550 LET A=A+2
551 PRINT AT A,0;"Drive Number:"
552 INPUT "Enter number (1 or 2) " ;d$; PRINT d$; GO S
559 REM Put your own values here if you don't have two drives
560 IF d$="1" OR d$="2" THEN BE
561 PRINT AT A+2,0;"Drive number ";d$; "unavailable": GO TO 551
565 LET d=INT (VAL d$)
569 REM If all options are correct continue, otherwise
570 PRINT AT 20,0;" ARE ALL THE VALUES CORRECT ?": INPUT "Yes or No ":C$
580 IF C$(1)="N" THEN BEEP .5, -10: LET A=A+5: GO SUB 1000: GO TO 60
581 REM IF C$(1)="N" THEN BEEP .5, -10: FOR E=1 TO 13: PRINT AT E+6,0;" ": NEXT E: GO TO 60
589 REM Put closing message on screen
600 CLS : PRINT AT 5,1;"LOADING ";B$:; FROM ";A$": ";
602 IF A$="DRIVE" THEN PRINT d
605 PRINT AT 10,3;"LIST#5 LISTS TO PRINTER":AT 11,3;="=*=*=*=*=*=
607 PRINT #5;"PROGRAM PRINTING UTILITY": PRINT #5;"(c) B.M.Gittins": PRINT #5;"Listing of ";B$:; ";
609 REM Load file for printing
610 IF A$="DRIVE" THEN LOAD **M ";d:B$
620 IF A$="TAPE" THEN LOAD B$
630 STOP : STOP : STOP : STOP
999 REM *** Clear from current line to bottom of screen.
1000 PRINT " 1010 FOR X=A+1 TO 21
1020 PRINT A+X,0;"  "}
Spectrum Variable Lister
by Kurt Carroll

This machine code routine for the 48k Spectrum allows you to list the variables that have been set up in memory, and their values. It is only for use with Basic programs.

Type NEW and CLEAR 64999, which must always be typed before loading in the machine code, and load in the machine code that you have saved.

The routine can now be used at any time by typing RANDOMIZE USR 65000. If it works incorrectly, reload the Basic program and check all the data statements are correct. Remember that no variables will be listed unless a program line that uses some has been executed. The list of variables can be directed to the ZX printer by typing POKE 65001.3, and returned to normal by typing 65001.2. When a number or character array is listed, the contents of the array are not listed, but the number of bytes reserved for the array and the number of dimensions are printed. When the control variable for a For/Next loop is listed (the current value of the loop variable), the value that the loop is counting up/down to and the step value are given.

The routine is 245 bytes long and occupies memory from 65000 to 65244; it is not relocatable.

MULTIMART

Don't buy any more ribbons!
Re-ink your old fabric ribbons for pence and save £££s.
Mains-powered & Clean & Simple 6 colours available, Blanks & Reloads
Cheap to run & fits 1000+ printers
Sole UK Distributors for

THE INKER
Applied Technology
FREEPOST MI 135
Stockton-on-Tees
Cleveland TS18 1YH
0642-672268

CASSETTES - DISKS
BEST PRICES - TOP QUALITY
CASSETTE - Complies with IBM, Tandy Cards and Cases. Priced per box of 10.

<table>
<thead>
<tr>
<th>QUANTITY</th>
<th>PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-50</td>
<td>£2.50</td>
</tr>
<tr>
<td>50-100</td>
<td>£2.10</td>
</tr>
<tr>
<td>100+</td>
<td>£2.00</td>
</tr>
</tbody>
</table>

Top breed Black — Basic, Compact Cases. Priced per box of 10.

<table>
<thead>
<tr>
<th>QUANTITY</th>
<th>PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-50</td>
<td>£2.50</td>
</tr>
<tr>
<td>50-100</td>
<td>£2.00</td>
</tr>
<tr>
<td>100+</td>
<td>£1.70</td>
</tr>
</tbody>
</table>

Prices include VAT and postage UK only.
Cheque/PO enclosed for...

NAME
ADDRESS

KEILWORTH
COMPUTERS LIMITED

19 Tallman Square, Keilworth, Harwellstr, CB1 1BH. (01223) 912349 / 214217

HAVE YOU A DESKTOP COMPUTER THAT NEEDS BRINGING UP TO DATE? Do you want to run your present software from disk or move into the commercial CP/M world?

WE CAN SUPPLY IT.

DESK TOP COMPUTERS & SYSTEMS

The above can be supplied from our large stock of CP/M software and hardware.

If you have a CP/M 8088 or 8086 we can supply almost any of the CP/M software on the market.

We also handle SD-BUS products from DURFAN, MAP-DIG, KIMBERLY, etc. For more information contact us by telephone or write to the address above.

This was typed with "PANTSPP" a multi-format formatter, for which the sole agents are KIMBERLY LTD 1YH (Computers Limited).
This simple mailmerge program takes data from Archive and incorporates it into Quill text files. To use the program, create a document in Quill in the normal way, but when you want to include a field from Archive, mark it by typing in the field name enclosed in hash marks (#). Then, instead of saving the document, print it to a microdrive file.

Export a file from Archive containing all the fields to be used in the document and, finally, run the mailmerge program. It will print out a series of documents, each using data from a different record from the Archive file. Remember that the length of the field will affect justification; also remember that the program uses export and print files, not database or document files.

10 REMARK *****************************************************
20 NONAME
30 REMARK I *****************************************************
40 END REMARK
50 END}

FERRANTI PC 860
C.W.O PRICES
BEST VALUE, IBM COMPATIBLE, FAST 8086
PROCESSOR, 256K, PERFECT 2 SOFTWARE SUITE
FREE ON-SITE WARRANTY
PC860 2x38K$ 1015.00, MONO MONITOR £90
PC860X 10MB £1975, COLOUR MONITOR £325
NL PRINT £350, OUIDATA 1800 IFR £198

OSBORNE 01 ONLY £355

SAGE AMATSTPCB256 £379
ACCOUNTS £160
INVOCING £55
PAYROLL £55
PHONE REDUCTION £50

AMSTRAD PCW 1550 £375

MONITORS
TANAX CX1025 £120
TANAX RGBM121 £100
TANAX SUPERVISION £260
TANAX SUPERVISION £40

PRINTERS
TANAX LQ SUP25 £205
TANAX LQ SUP50 £230
TANAX LQ SUP90 £310
TANAX LQ SUP105 £475

COMMODEX PCW 1610 £79
SANYO BM 240 £75
DUET 10 AE £60, MONO MONITOR £150

PLUS SEVERAL OTHERS

SAGE SUPERDEALS

SAGE Accounts £150
SAGE Payroll £160
SAGE Sales £160
SAGE Plus £160
SAGE Spares £150

OTHERS

SYSTEMS SUPPORT, VAT FREE AND CARRIAGE EXTRA

ATTENTION ALL CIRCUIT DESIGNERS!!
LOW COST ELECTRONICS C.A.D.
IBM PC XT, BBC MODEL B and SPECTRUM 48K

"Analyzer" computes the A, Frequency Response of Inter (analog) circuits. Gain and Phase. Important. Output Impedance and Delay (sweep spectrum version) are calculated over the frequency range required. The effects on performance of load are seen to the circuit configuration and component values can be specifically evaluated.

Circuits containing Resistors, Capacitors, Inductors, Transformers, Bipolar and Field Effect Transistors and Operational Amplifiers can be simulated - up to 150 components (IBM version).

Ideal for the analysis of Active and Passive Filter Circuits, Audio Amplifiers, Loudspeaker Crossover nets, Wide Band Amplifiers, Tuned RF Amplifiers, Aerial Matching Networks, TV IF and Chroma Filter Circuits, Linear Integrated Circuits, etc.

"Analyzer" can greatly reduce or even eliminate the need to breadboard new designs.

Used by Industrial R&D Departments and Universities world-wide. Very easy to Use. Prices from 120 ex VAT. Access of American Express welcome.

For further details and sample compilation or for details on our New Drafting Program, please write, phone or telefax:

NUMBER ONE SYSTEMS LIMITED
Dept PCW, BA Crown Street. St Ives
Huntingdon. Cambs PE 17 4EB. UK
Tel: (0480) 61770. Telex: 23358

MICROMART
216 PCW APRIL 1986

QL Mailmerge
by Matthew Cockerill

Atari 520ST Graphics
by Douglas Harvey & Paul Lake
To clear a window from the keyboard. After initialisation, VDISYS(1) is utilised to transfer the characters to the required screen position without drawing a window box.

After the VDI POKEs in lines 1000-1040 have been initialised, the character screen may be changed. The additional subroutine to provide the variable character is:

10 REM obtain a string variable not exceeding ten chars.
20 POKE 52790,1; 291090; GOSUB 1000
30 =""; FOR x=1 TO 10 IF a(x)=95 THEN a(x)=32
40 = = = = :CHR$(a(x)); NEXT x; END
1000 FOR i=1 TO 10
1010 a(i)=INP$(2); IF a(i)=32 THEN a(i)=V$; REM trap space
1020 IF a(i)=8 OR a(i)=127 OR a(i)=203 THEN i=i-2
1030 GOSUB 1160: i=i-1
1040 IF i<1 THEN i=1
1050 IF i(i)=13 THEN 1080
1060 IF a(i)=46 OR a(i)=123 THEN 1010 ELSE GOSUB 1150
1070 NEXT i
1080 RETURN
1090 REM initialisation
1100 COLOR 1,1,1,1,1,1
1110 POKE ch1=0; REM required for character display
1120 POKE ch2=2,1; REM required for character display
1130 POKE ch3=1,1; REM character positions required
1140 POKE ptin,ypos; POKE ptin+2,ypos; RETURN
1150 REM display output character routine
1160 FOR x=1 TO 10 POKE intin+2x,a(x); NEXT x
1170 FOR y=1 TO 10 POKE intin+2x,a(x); 32:NEXT x
1180 VDISYS(1):RETURN

2000 POKE contl,12:POKE contl+2,1:POKE ptin,0
20005 POKE ptin+2,variable
10 2010 VDISYS(1):RETURN

The default variable value is 13 and should be entered through VDI before finishing, otherwise editing may be affected. For smaller characters, the variable may be set to four or six; for larger characters, to 25 or something similar.

\[ \text{POKE contl,12:POKE contl+2,1:POKE ptin,0} \]
\[ \text{20005 POKE ptin+2,variable} \]
\[ \text{10 2010 VDISYS(1):RETURN} \]

The short program is designed to allow the HX-20 with 16k expansion to be used as a 27k printer buffer for another computer. The RS232 parameters for the host computer (X$) and printer (Y$) are given in line 40.

When the program has been saved, it can be run. The machine code section will load in and the loader section will delete itself; type in CLEAR 300,n where n is the size of RAM you want to use. (It is safer to select approximately 27000 rather than the maximum.)

To use the program, connect the distant computer and RUN. Press PF2 to clear the RAM file. Make sure that the ready signal is on the LCD before anything is sent from the host computer; then use the host computer as if it were connected to a serial printer that is switched on. As soon as the HX-20 receives any input, a telephone sign will appear on the LCD. If the RAM file fills up, an XOFF signal will be transmitted and you will be given the option of printing, clearing or finishing. To print, connect the HX-20 to a printer, run the program again and press PF1.

Other functions are: PF4 to set up function keys to load other programs through the RS232 port; and PF5 to end the program.
This short subroutine, starting at line 9000, will dump any size of graphic screen to any Epson or DMX-compatible printer. On entry to the subroutine, the variable VSN should contain the number of the screen you want to dump.

```
100 REM MEMOTECH MTX MICROSD
110 REM Demo program and subroutine to
120 REM dump any size graphics screen
130 REM to Epson, DMX type printers.
140 REM Full size screens dumped to
150 REM centre of paper.
160 REM by Eric Roy. July 85
170 REM
180 REM Demo VS Screens 4, 3 & 2
190 REM
200 CVRS 4,1,1,1,30,22,32
210 CVRS 3,1,2,6,12,10,32
220 CVRS 2,1,20,4,10,16,32
230 VS 5:  COLOUR 2,6:CLS
240 PRINT "VS 4"
250 FOR R=10 TO 80 STEP 10
```
PROCEDURE FILE

- 260 CIRCLE 120,90,R
- 270 NEXT R
- 280 VS 3: COLOUR 2,10: CLS
- 290 PRINT "VS 3"
- 300 COLOUR 3,1
- 310 ANGLE 0
- 320 FOR SQ=0 TO 10
- 330 PLOT 15+SQ,15+SQ
- 340 PHI 0
- 350 DRAW 20+PHI PI/2
- 360 DRAW 20+PHI PI/2
- 370 DRAW 20+PHI PI/2
- 380 DRAW 20
- 390 NEXT SQ
- 400 VS 2: COLOUR 2,3: CLS
- 410 PRINT "VS 2"
- 420 COLOUR 3,4
- 430 FOR R=0 TO 2*PI STEP 0.4
- 440 ANGLE R: PLOT 40,60
- 450 FOR S=0 TO 9
- 460 PHI PI/6: DRAW 10
- 470 NEXT S
- 480 LET VX=VW=1
- 490 REM
- 500 REM VSN = Screen number to dump
- 510 REM
- 520 CLOCK "000000"
- 530 LET VSN=4: GOSUB 9040: LPRINT TIMES
- 540 CLOCK "000000"
- 550 LET VSN=3: GOSUB 9040: LPRINT TIMES
- 560 CLOCK "000000"
- 570 LET VSN=2: GOSUB 9040: LPRINT TIMES
- 580 STOP
- 9000 REM
- 9010 REM Subroutine to dump screen.
- 9020 REM First calculate screen size.
- 9030 REM
- 9040 LET VSI=65373+(VSN*15)+3
- 9050 LET VX=PEEK(VSI)
- 9060 LET VY=PEEK(VSI+1)
- 9070 LET VW=PEEK(VSI+2)
- 9080 LET VH=PEEK(VSI+3)
- 9090 LET VX=VX+8B-1
- 9100 LET VW=VW+8B-1
- 9110 IF VY=0 THEN LET VY=191: ELSE LET VY=VY-1
- 9120 REM
- 9130 REM Now calculate start position
- 9140 REM of screen on paper, and total
- 9150 REM number of bytes to send.
- 9160 REM
- 9170 LET LM=INT((480-256)/2)+VX
- 9180 LET N1=MOD(LM+VW+2,256)
- 9190 LET N2=INT((LM+VW+2)/256)
- 9200 REM
- 9210 REM Draw line around screen.
- 9220 REM
- 9230 VS VSN
- 9240 LINE 0,0,VW,0: LINE VW,0,VW,VY
- 9250 LINE VW,VY,0,VY: LINE 0,VV,0,0
- 9260 REM
- 9270 REM Set printer line feed to B.
- 9280 REM
- 9290 LPRINT CHR$(27)+"A"+CHR$(B)
- 9300 FOR GY=VV TO 6 STEP -8
- 9310 REM
- 9320 REM Send LM+VW+2 bytes of data.
- 9330 REM
- 9340 LPRINT CHR$(27)+"K"+CHR$(N1)+CHR$(N2)
- 9350 FOR C=0 TO LM
- 9360 LPRINT CHR$(0)
- 9370 NEXT C
- 9380 FOR GX=0 TO VW
- 9390 LET GD=G8+8+GX
- 9400 LPRINT GD;
- 9410 NEXT GX

MICROMART

P.C. 'X.T'

- 10 MEG HARD DISK
- 640K RAM
- 360K FLOPPY DISK
- MONO MONITOR
- MS-DOS 2.11
- FULLY COMPATIBLE

£1,095 + VAT & Carr

BRENTWOOD COMPUTER SYSTEMS

Tel: (0277) 230666
(0322) 338889

Write: BRENTWOOD COMPUTERS
FREEPOST, BRENTWOOD,
ESSEX CM14 5YE

Also:

‘XT TURBO’ 20 MEG + 8088 (BCLASS) £1,495
‘AT 2000’ 20 MEG + 80286 £1,995

QL COMMUNICATIONS

the answer

No hardware additions, just a good modem and some intelligent software. A complete turnkey package:

THRUS EMI DATATECH 543 Models, 1200/1200, 1200/75, 300/300. Automod and Answerphone.

GEMPRESTEL Vendetta software featuring auto dial and log on. Page views, printer dump in ASCII and graphics. For modem or TV dialers.

GEMTERM 1200/75 and 300/300 8-bit Line transfer software with XMODEM and ARC file transfer. Auto dialling from keyboard.

PATCHER To modify personal details, page and phone numbers in the above and to correctly set the header of QL files after MOD transfer.

CITADEL A QL only bulletin board the server. Multiple heads. Room oriented full file transfer service. Subscription only.

SERIAL CABLE to hook it all together

Software supplied on disk or cartridge - state choice when ordering.

The GNP of the above (excluding VAT) is normally £224.00
As an introductory offer the price is £210.00
Plus VAT £23.50

Total including VAT and Postage £241.50

Write or phone for further details or send cheques only please.

DATAMANAGEMENT

Clark House, Hadby, YORK Y03 8HU
Tel: (0904) 720687

Amstrad-PCW 8256

STANDARD 5 1/4" ADD ON DISK DRIVES

100% CP/M SOFTWARE AND LOCSOCGRAPHIC
COMPATIBILITY USING LOW COST FLOPPIES

DRIVE 1

- DOUBLE SIDED
- 40 TRACK 360K
- £177.50

DRIVE 2

- DOUBLE SIDED
- 80 TRACK 720K
- £207.25

PC/M/DOS ----> CP/M TRANSFER UTILITY

ALLOWS 360K DRIVE TO READ AND WRITE
888 FILES, READ ONLY WITH 720K
£23.50

FOR QUOTATIONS OR OTHER PRICE QUERIES PLEASE CALL

338889

PRICES INCLUDE INSTALLATION SOFTWARE, P&P & VAT

BOX LTD

22 HENDRED ST, OXON OX4 2ED
TEL: (0905) 717265

APRIL 1986 PCW 219
**BBC Tabkeys**
by Ross Hunter

This machine code utility allows any keys, when pressed with the Tab key, to act similarly to the function keys. It has been set up to enter several Basic keywords, using their initial letters together with the Tab key. X and Y will enter the integer variables X% and Y%, and the numbers 0 through 7 will enter the respective modes. The effect of pressing Tab and R at the same time would be the same as typing the whole keyword Repeat.

The strings associated with each word can easily be changed by altering the Data statements at the end of the program.

Tabkeys works with Basic II and *should* work with Basic I, but this has not been tested. Once typed in, Tabkeys should be saved before running in case of typing errors and so that the date statements can be altered to make different versions of the program.

The machine code and data may be stored in any free area of memory by altering lines 50 and 60. If these lines are not altered, then the machine code and data can be saved from two pages of memory by *SAVE TCODE 900 B00.*
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 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.

A1 COMPUTER SERVICES
4 Paddock Mount
Dawley
Telford
Tel: (0952) 502737

AVOID COSTLY DATA LOSS/ CORRUPTION
Due to MAINS VOLTAGE FLUCTUATIONS, SPIKES, RF INTERFERENCE etc

Professional heavy duty units to give complete protection for your data

Uninterruptible power supplies also available

PRICES FROM ONLY £70
PHONE OR SEND SAE FOR DETAILS

H.C. (Computers)
OLD FARMHOUSE, CHURCH ROAD,
NORTH WALTHAM, BASINGSTOKE,
HANTS RG25 2BL

TEL: 025 675 357
E-Mail 72: MAG 2021
Telex UK 265871 ref: Mag2021

Low level telex users — save G.A. Larger companies — save on phone bills with better communications. TELECOM GOLD advice and demos. Buy a Miracle technology modem and your £40 gold registration fee will be paid by HCC.

DO BASE COMPILING & PROGRAMMING

Do you use dBASE II or dBASE III on a MS/DOS machine. Have you programs compiled and SAVE money, disk space and RAM space. RUNS 2 to 20-times FASTER.

If you are thinking of buying dBASE III or II/*DON'T*. Have your application written and compiled by HCC. You do not need dBASE to run it. Compiled files are machine executable i.e. **COMPATIBLE** with the normal dBASE III and II and will work on any type of us("£)

HCC (Computers)

APRIL 1988 PCW 221
EPSON PRINTER
LX80 .......................... £187.00
FX85 ................................ £238.00
FX105 ................................ £396.00
SPECIAL
FX80+ ................................ £285.00
*RX100 ................................ £220.00

STAR PRINTER
SG10 ................................ £185.00
SG15 ................................ £269.00
SD10 ................................ £289.00
SD15 ................................ £329.00

SONY DISKETTES
DSDD 3/fach............................ £3.05 ea
Tel: (0295) 415635

IF YOU LIVE IN
SWEDEN
FOR ALL SMALL OFFICE AND
HOME COMPUTERS
INCLUDING SINCLAIR, ATARI &
AMSTRAD
SEND TO:
NIMAX
DROTTNING KRISTNAS VÅG 13
114 28 STOCKHOLM, SWEDEN
08/102703

ATARI 520 ST
Includes b&w monitor, 500k
disk drive, mouse and
software
For only £605 ex VAT
1 MB RAM upgrade £150.00
1 MB disk drive upgrade £260.00
Dual 2 MB disk drive £380.00
Colour monitor plus lead £220.00
Monitor stand £22.00
31盘 single-sided disks £24.00
31盘 double-sided disks £29.00
Fidelity monitor plus lead £2.95
Printer lead £14.95
All prices exclude carriage and VAT

OPTIKOM COMPUTER TECHNOLOGY
138 Parkhill Road, Bexley
Kent DA5 1JA
Tel: (0322) 58854
CALLERS BY APPOINTMENT ONLY

BRITAIN'S LOWEST PRICES
for
FULLY WARRANTED & CERTIFIED DISKS
with
Money Back Guarantee if not Satisfied
Prices per disk: Packed in 10s
5½" SSD 69p + VAT + 75p per P & P per 10s
SSD 75p + VAT + 75p per P & P per 10s
SSD 99p + VAT + 75p per P & P per 10s
SSD 109p + VAT + 75p per P & P per 10s
For see 10 box add 10p to disk price

3½" SSD 189p + VAT + 100p per P & P per 10s
SSD 209p + VAT + 100p per P & P per 10s
TRADE & BULK PRICES: MIN Q'TY 100
SSD DISC DISC DISC
5½" SSD 69p + VAT + 75p per P & P
£189
SSD 75p + VAT + 75p per P & P
£119
SSD 99p + VAT + 75p per P & P
£29
SSD 109p + VAT + 75p per P & P
£4.99

Ex VAT/DeVry; 3 Disk Available
Cheques of postal orders with order, or
COD also accepted: to,
PROJECT PLANNING CONSULTANTS
6 VICTORIA SQUARE, CLIFTON
BRISTOL, AVON BS1 4EU
Tel: (0272) 742008
Government & Education Authority orders welcome.

DISK COPYING/FORMATTING/
FILE TRANSFER
WE CAN TRANSFER YOUR DATA BETWEEN
OVER 1000 DIFFERENT MICRO, MINS AND
MAINFRAMES VIA FLOPPY DISK OR
MAGNETIC TAPE.
FORMATS INCLUDE:
CPM, CP/M, MS-DOS, PDS, DODDS, UNIX, XENIX,
IDIS, TAR, RT11, MDOS, IBM B/EF, ISIS,
FLEX, OS/3, VICTOR-SIRIUS, TORCH, ACORN,
AMSTRAD, APPLE, MISC. TYPESETTING/
WORD PROCESSING
*OVERNIGHT SERVICE - most formats returned by
next day's post
+$18.95 - VAT per copy
(Blank disks not included)
**DISCOUNT FOR BULK
4.2. DOWNLOADING
SERVICES

** NUMERICAL TEXT PROCESSING FROM YOUR WORD PROCESSOR **

Use your own Word Processor for keying in text for books, magazines, newsletters etc.
We have the latest equipment which will convert your data into phototypesetting with
access to our large range of fonts.
Do your own editing, proofing and last minute copy updates so that you are sure you
have it right. Supply us with a marked up printout for details of line length, point size,
indents etc. and we will do the rest.
By return your job will be posted or delivered back to you.

P.B. ELECTRONICS
49 Whitechapel,
Liverpool L1 8DT
051-236 7953

222 PCW APRIL 1986

MICRObe Computer Systems
FERRANTI PERSONAL COMPUTERS
P.C.W.1 HARD DISK FLOPPIES - MONTHR
FERRANTI PC, MONTHR
£199
PC AT 286/386, 1MB FLOPPY'S X 2, 100% NEW, WITH MOUNT
£399
PC AT 286/386, 2MB FLOPPY'S X 2, 100% NEW, WITH MOUNT
£499
DIAGNOSTICS, 1MB UPGRADE from 286
£99
DIAGNOSTICS, 2MB UPGRADE from 286
£169
Upgradable kits, include a Parallel adapt. and Cable. Contact Mark, Sales and Services, and be "smitten" on the " Shaft".
2MB OPEN "DOGET" DRIVE ON CARD
£199
But contained 7.3 hard drive suitable for a single point card - easy install.
1MB IBM Enhanced PC and Enhanced IBM models supported.
INTERNAL, 800KB EXTENDED LATEX
£49
1MB MICROFLOPPY CARDS compatible with the new old style cards. cards are £99
1MB MULTI-FUNCTION CARD on CARD
£189
Mark or IBM, salient point is, IBM special card, Compaq point.
1MB IBM Enhanced EAGLE 30/80
£299
3MB DRIVE CARDS - card in 3MB drive
£399
3MB DRIVE CARDS - card in 3MB drive
£499
" LAZYTIP " CARD - make your PC XT on 25/80, 386, 386SX
£99
2MB NDIDAM CARD - suits all IBM compatible PCs under the IBM AT 286 4MB RAM installed - note there is no DOS emulated, hence no FIFI support, hence in-factivity
" Fit for your needs, please ensure that we have the right unit, as above all, regardless of the requirements of the equipment.
All units are exclusively available at VAT.
MICRObe Computer Systems
PO Box 1, Wirral, Lancaster L2J 8RF
Telephone Birkenthall (0462) 82233
Telex: BBR051 ONECONE 03 (Mail Box 22356 001)
We'd like to say how much we've improved the WS2000 manual-dial modem.

(But as it's already the best, we've brought the price down.)

Modem WS2000 from Miracle Technology. The best manual-dial modem you can buy. Runs at 1200/75, 75/1200, 300/300 plus 600 and 1200 half duplex. Gives access to Prestel*, Micronet*, Microlink*, Telecom Gold*, telex, viewdata services, Email, databases, bulletin boards, user-user communications. So versatile, any computer with an RS232 port or interface and the right comms software can use it — from a ZX81 to an IBM mainframe. (Necessary leads and software for most computers available.) Such high quality it was a 1985 British Microcomputing Awards Finalist and is Micronet recommended. Comes with BT telephone lead, mains power supply, comprehensive manual, free introductory subscriptions to Micronet and Microlink and the full backing of our Customer Service and Technical Support departments.

It's down to only £108.70

(£130.75 inc VAT & UK delivery).
To get the best for less, phone your Access or Visa order, or send your cheque/official order today.

Miracle Technology (UK) Ltd. ST PETERS STREET IPSWICH IP1 1XB ENGLAND
Tel (0473) 216141 6 LINES TELECOM GOLD 79: KEY 001 (Dealerlink 72: DTB 10135)
946240 CWEASY G 19002985 PRESTEL MAILBOX 919992265
**BRING Twillstar INTO YOUR HOME**

### Computers

**Master 128**
- Complete With Internal Software
- 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 (2E2) £14.95
- 6502 Second Processor £179.00
- 8020 Second Processor £379.00
- Acorn Prestel Adaptor £125.00
- Acorn Teletext £35.00
- Winchester 406 Drive £1450.00
- Winchester 406 Drive 30 MBYTES £225.00
- IEEE Interface £299.00
- Micro 500 £178.00
- ECONET ACCESSORIES
  - Fileserver: Level II £29.00
  - Econet Starter Kit £95.00
  - Printer Server ROM £49.00
  - 10 Station Lead Set £29.00

### TCL Special Package

**The TCL All in One Word Processing Package**
- Contains: Master 128, View 3.0, Viewsheet, High Res Globe Monitor, 800K Dual Drives with PSU, Quemada Daisy Wheel Printer together with a box of Oxs, Paper, and all the Cables

### Disc Drives

**DISC DRIVES**

- User Friendly Disc Drives
- 100% compatible slimline disc drives
- Drives are supplied complete with formatting diskettes, comparative users manual and all necessary cables
- All drives are 40/80 track switchable and 80/160 track in two years warranty
- 80/160 Drive without PSU £35
  - MO 80/160 Single 40K £109.00
  - MO 80/160 Dual 40K £189.00
- 80/160 Drive with PSU £129.00
  - MO 80/160 Single 40K £129.00
- 80/160 Drive with PSU £129.00
  - 80/160 Single 40K £129.00
- Double Sided £129.00
  - MO 80/160 Dual 40K £129.00
- Double Sided £39.95
  - MO 80/160 Dual 40K £39.95

### BBC Upgrades

**A & B Upgrade (incl fitting)** £99.00
- Acorn DFS Interface £89.00
- Acorn DFS Interface £49.29
- Speech Interface £46.00
- 6A4 Upgrade Kit £39.95
- 17/70 Upgrade Kit £49.94
- AOS ROM £29.95
- ONFS ROM £19.55

### Monitors

**MONOCHROME MONITORS**
- Philips BM 7502 £79.00
- Philips BM 7602 £79.00
- Philips BM 7702 £79.00
- Kajik 1202G £95.00
- Hi Res Green £120.00
- Kajik 1203G £120.00
- Ultra Hi Res Amber £120.00

**COLOUR MONITORS**
- Microwise 1431 Std Res £201.25
- Microwise 1441 Med Res £270.25
- Microwise 1441 Hi Res £391.00
- Microwise 2030 CS 20 £245.25
- Microwise 1431 AP £224.25
- Microwise 1451 AP £293.25

**SPECIAL OFFER**
- Microwise 1404 Medium Resolution Monitor with 640 x 200 Pixel RGB available with IBM or BBC Leads £23.90

### Modems

**Nightingale Modem**
- Including Cartridge and Comprehensive Manual
- Auto Dial/Auto Answer Board £130.00
- Auto Dial Utilities Disc £11.00
- OFS Bulitin Software £279.00

**DEMON MODEM**
- With its Developable Cover Features
- Auto Dial, Auto Redial, Auto Answer Full and Half Duplex
eutronics and USA Standards
- Complete with Power Supply Leads and Manuals Full Baud Rates
- Demon with BBC ROM £81.00
- Dial Disc £4.95

### Printers

**OCT MATRIX PRINTERS**
- NOW AVAILABLE
- Juki 5510 - gives you 180 CPS & NLO Standards £269.00 Inc. VAT and thats 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 4K) built in Parallel Centronics Interface and BSWitch international character sets
- If you need colour too, the optional Juki 5510 Colour Kit gives you seven colour printing for £112.00

**CITIZEN 120 D**
- This new Citizen 120D with 120 CPS and 25 CPS NLQ comes with tractor and friction feed in standard IBM and Epson compatible with 2 year warranty £175.00

**CITIZEN MPSIO**
- The new Citizen MPSIO with 150 CPS Draft and 40 CPS NLQ. With 2 years warranty £269.00

**KAGA KP 810**
- The 80 column printer with 140 CPS Draft and NLQ with friction and Tractor feed offering 91 V.T character sets, long life carriage ribbons and standard centronics interface £199.50
- Also available KAGA KP 910 (white carryage, printer) £379.00

**GLP**
- Complete with Tractor Adaptor offering 50 CPS Draft and 12 CPS NLQ £125.00

**EPSON LX80**
- with 100CPS draft and 160CPS NLQ and optional tractor adaptor and built in serial interface £229.00
- ALSO AVAILABLE
- Epson FX 80 £235.00
- Epson FX 80T £485.00
- Epson FX 85 £369.00
- Seiko SP 50A (Parallel) £69.00
- Seiko SP 5020 restricted models £69.00
- Printer 80/PF - Cables £69.00
- Seiko SP 100A (NLQ) £199.00
- Canon PW 1090A (NLQ) £209.00
- Canon PW 1156 A £799.00
- Brother EP 44 £229.00
- Shihwa CP 80A £189.00
- MP 165 £249.00

### TCL Special Workstation

**No more Messy Wires**

- Mushroom Console £399.00

**FEATURES INCLUDE**
- Advanced cable management
- Twin 800K Mitsubishi Slimline drives switchable from 40 to 80 Tracks with status indicator LED's
- On board regulated 40ma power supply with overload protection
- Master unit filter for clean power supply
- Fitted power supply 3 the take off sockets at rear for Micro, Monitor and Printer

**Mushroom Workstation** £399.00
### Printers
- Epson LX-80: £198.00
- Epson RX100 F/F 100 cps: £350.00
- Epson FX80 160 cps: £355.00
- Epson LQ-1500 2K: £625.00
- Brother HRS Portable P or S: £127.00
- Brother EP44 Ribbon Trans: £167.00
- Brother M1009: £158.00
- Brother M204L: £685.00
- OKI 152 IBM: £235.00
- OKI 772 AF: £235.00
- OKI C5A5: £465.00
- OKI CP2350 P: £1430.00
- QUME QUS 12P: £425.00
- QUME QUdish 140: £1200.00
- RICOH HI 120P: £460.00
- KIRIN LCD: £3245.00
- Honeywell Dot matrix printer for phone: £1895.00
- NEC Spinwriter 200: £3560.00
- NEC all: £310.00
- NEC B800 Printer: £11300.00

### Cables
- Parallel Printer Shielded: £12.50
  - 10 Core BA 2 Metre: £14.50
  - 25 Core Grey 2 Metre: £16.50
  - 25 Core Grey 3 Metre: £18.50
- Serial: £9.50
  - 12 Core 3 Metre: £14.50
  - 25 p Core Converter male to male: £18.00
  - 25 p Core Converter female to male: £18.00
- ACT Cables:
  - 12 Core 2 Metre: £13.50
  - 12 Core 3 Metre: £15.75
  - 16 Core 2 Metre: £16.00
  - 16 Core 3 Metre: £17.25
  - 36 Core 2 Metre: £24.00
  - 36 Core 3 Metre: £26.50
  - Or give us your spec: £18.00

### Disk Storage
- MCA Rompack 100 for 512: £22.85
- MCA Rompack 135 for 314: £14.50
- MCA Keyboard Cover: £6.65
- MCA Easy View Ease: £13.15
- MCA Turn & Tilt: £18.85
- MCA Keyboard Storage: £54.50
- MCA Printer stand: £19.95

### Floppy Disks
- Maxell 5/4 5.25 SSD Box of 10: £15.50
- Maxell 5/4 2.88 SSD Box of 10: £19.95
- Fujitsu 5/4 SSD Box of 10: £15.50
- Fujitsu 5/4 DDD Box of 10: £19.95
- IBM 7300 Label SSD (10pcs): £8.50
- IBM 315 Labeled DDD (10pcs): £11.50
- Maxell 315 SD Box of 10: £29.00
- Fujitsu 315 SD Box of 10: £32.00
- Sony 315 SD Box of 10: £38.00
- Sony 315 DDD Box of 10: £31.00
- Colour Disks in Blue, Red, Yellow or Green SD: £15.00 DD: £17.00

### Cleaning & Accessories
- KIRIN Core Kit for 512 Drive: £8.50
- KIRIN Core Kit for 314 Drive: £8.50
- General Cleaner: £9.50
- Anti Static Screen Cleaner: £7.50
- Memory Head Cleaner Kit: £8.50
- PC Mouse: £125.00
- ADD Key for IBM: £168.00
- Touchstone Technology 1 Keyboard: £180.00
- Touchstone Technology 2 Keyboard: £198.00
- Foot Mouse: £135.00

### Ribbons
- QUME Type Min 1 Doz: £3.00
- NEC Type Min 1 Doz: £3.00
- Dasko Type Min 1 Doz: £3.00
- EPSON Type Min 1 Doz: £3.00

All Other Types Apply Too.

### Power Cleaner
- KIRIN Anti-Surge 1500 Watts: £29.85
- KIRIN Power Conditioner 2000 Watts: £125.00
- KIRIN Power Conditioner 650 Watts: £265.00
- MPE Power Cleaner 2000 Watts: £21.00

### Modems
- Steeltek MD 3000: £272.00
- Steeltek MD 3001 Auto: £212.00
- Steeltek 581212 Hayes Type: £485.00
- Miracle 2000: £120.00
- Pace V21/23 Complete: £110.00
- Pace 6501: £85.00

### Monitors
- Phoenix Monochrome Hi-Resolution: £165.00
- Porteisis Keyboard: £145.00
- Zenith 122 Amber 12" £75.00
- Zenith 123 Green 12": £73.00
- Zenith 23T B/F Base: £6.50
  - Circle No. 114

### ORCHID TECHNOLOGY
- Blossom 64K: £256.00
- PC Net Adapter Board: £345.00
- PC Net Cluster Kit: £72.00
- PC Daughter Board: £345.00
- PC Starter Kit: £75.00
- PC Turbo 186/286: £695.00
- Speed Demon for Apple 2: £198.00
- IBM Accelerator: £602.00

Cash With Order only, send cheque or Credit Card No. to Kirin Computing Systems Ltd.
Estate, London SW11 3RE or phone Hot Line 01-549 3194 Delivery Add £7.50 for Printers, £3.50 for small items, orders over £1,000.00 F.O.C. (All enquiries) 01-228 1551

<table>
<thead>
<tr>
<th>QTY</th>
<th>MODEL</th>
<th>PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
BTEC HIGHER NATIONAL DIPLOMA IN INFORMATION TECHNOLOGY

This new full-time/sandwich course gives you the opportunity to develop the skills needed to design and implement modern Information Technology systems and offers:

* Exemption from Part 1 examination of the British Computer Society.
* One year industrial placement.
* Excellent career opportunities

Vacancies exist for September, 1986 and the normal entry requirements are 4 GCE passes in appropriate subjects, at least one of which must be at 'A' level.

For further information about this and other courses offered by the School, such as the HND in Mathematics, Statistics and Computing, contact: The Admissions Tutor, Leeds Polytechnic School of Mathematics and Computing, The Grange, Beckett Park, Leeds LS6 3Q5. Tel: (0532) 744122.

---

**PERIPHERALS PLUS**

**THE WORLD OF PC UPGRADES**

<table>
<thead>
<tr>
<th>Model</th>
<th>Capacity</th>
<th>Type</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>IS10</td>
<td>10MB</td>
<td>Rodime Disk (Internal)</td>
<td>450</td>
</tr>
<tr>
<td>IS20</td>
<td>20MB</td>
<td>Seagate Disk (Internal)</td>
<td>525</td>
</tr>
<tr>
<td>FREE/ASSIST 5MB</td>
<td>of Software supplied with the above systems only</td>
<td>FREE</td>
<td></td>
</tr>
</tbody>
</table>

The above Winchester drives are supplied for the IBM PC/XT or compatibles. They are half-height and are supplied with complete kit and a half-height front plate if needed.

<table>
<thead>
<tr>
<th>Model</th>
<th>Capacity</th>
<th>Type</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT20</td>
<td>20MB</td>
<td>Rodime Disk (Internal)</td>
<td>495</td>
</tr>
<tr>
<td>AT33</td>
<td>33MB</td>
<td>Rodime Disk (Internal)</td>
<td>695</td>
</tr>
<tr>
<td>AT120</td>
<td>120MB</td>
<td>Maxstor Disk (Internal)</td>
<td>4495</td>
</tr>
</tbody>
</table>

These Winchester drives are supplied for the IBM AT and are full height. They are supplied with full kit for installation.

<table>
<thead>
<tr>
<th>Model</th>
<th>Capacity</th>
<th>Type</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>MT10</td>
<td>10MB</td>
<td>Interdyne Tape Unit (Internal)</td>
<td>395</td>
</tr>
<tr>
<td>MT10P</td>
<td>10MB</td>
<td>Interdyne Tape Unit (Portable)</td>
<td>525</td>
</tr>
<tr>
<td>MT40</td>
<td>40MB</td>
<td>Interdyne Tape Unit (Internal)</td>
<td>CALL</td>
</tr>
<tr>
<td>MT40P</td>
<td>40MB</td>
<td>Interdyne Tape Unit (Portable)</td>
<td>CALL</td>
</tr>
<tr>
<td>MT60</td>
<td>60MB</td>
<td>Archive Tape Unit (Internal)</td>
<td>925</td>
</tr>
<tr>
<td>MT60E</td>
<td>60MB</td>
<td>Archive Tape Unit (External)</td>
<td>1050</td>
</tr>
</tbody>
</table>

These back-up units are available for the PC/XT/AT or compatibles and come complete

Plug N card 20Mb Drive on a Card with SCSI Port | 850
COMMAND/ASSIST DOS Manual on Disk | 30
CACHE/ASSIST Disk Access (Free with any Disk ordered) | 30

ALSO AVAILABLE ARE SCSI DEVICES, SLOT DRIVES, EXTERNAL DRIVES AND LARGE CAPACITY DISKS.

ONE YEAR WARRANTY, 30 DAY MONEY BACK GUARANTEE ON ALL PRODUCTS.

IF YOU CAN BETTER THESE PRICES — PLEASE CALL AND WE WILL SEE IF WE CAN MATCH YOUR PRICE.

To place your order please call
(02302) 3397

**PERIPHERALS PLUS**

30 High Street
Oakley
Bedfordshire
MK43 7RG
**FREE DISKS**

For every 10 ordered we supply 11

5¼”

SS/DD £10.99
SS/QD £13.19
DS/DD £13.19
DS/QD £15.39

3½”

S/Side £27.49
D/Side £32.99

All prices INCLUDE VAT
Delivery is FREE
All disks guaranteed for 12 months

Cash with order please to

HOLLBARN LTD
Dept WM1
8 Alexander Road, Stotfold, Hitchin, Herts. SG5 4NA

---

**CASH BOOK**

• Provides for automatic double-entry book-keeping controls
• Enter receipts and payments
• Record Standing Orders
• Bank reconciliation
• Account enquiries
• Detailed Analysis
• Up to 1,500 accounts
• Up to 32,000 transactions
• Up to 26 companies on one disk

Easy to use, low cost cash book with many powerful features including Automatic VAT calculation from nett or gross figures, full screen editing, disk spoilings, and screen dumps.

For further details please contact:

J.A.G. SOFTWARE

Maxet House, Liverpool Road, Luton, Beds LU1 1RS.
Tel: 0582 416516/429141
Telex: 827 545 FAX: 0582 24835

---

**PHILIPS**

P2010 Portable Computer + Bundled Software

A full-function personal computer, complete with software and ready to use, at below half price.
The Philips P2010 Portable is supplied as a complete package for home or office use. 9” high-resolution phosphor green screen gives an exceptionally clear text/graphics display.

SPECIFICATION

- 44 K RAM user
- 32 K RAM video
- Two 5¼" disk drives
- 9-key keyboard
- 512 x 256 pixels
- 320 K data storage
- Shoulder strap

With the P2010 you have access to the vast library of CP/M business software. Applications, catalogues supplied with each computer showing where to obtain specialist programs for:

ACCOUNTANCY
- ANCHOR
- BUSINESS SOFTWARE
- COMMUNICATIONS
- DATEBASES
- DENTAL/MEDICAL
- ESTATE AGENTS
- FARMING
- FINANCIAL
- HEATING/ENGINEERING
- HOTELS
- INSURANCE
- JOB COSTING
- MATHS/STATISTICS
- PAYROLL/PERSONNEL
- PROGRAMMING LANGUAGES
- STOCK CONTROL

£390

Morgan Computer Co.
179 Tottenham Court Road, London W1.
01-636 1138

NEW

1 MByte Macintosh Plus - ring for special price and delivery

---

**Macintosh & LaserWriter**

Special Offers

128K Macintosh £1279.00
512K Mac (Apple Board) £1549.00
LaserWriter Printer* £4595.00

All prices plus VAT
* We must deliver - please call and check

---

**CCS Microsales**

7 The Arcade
Letchworth Herts SG6 3ET
Telephone (0462) 673301
**COMPUTERS**

**APRICOT**
- XI-FD 512K RAM, 2 x 720K D/S Disk Drives ........................................ £1299
- XI-HD 512K RAM 10MB Hard Disk ...................................................... £1999
- F2 – 512K RAM, 2 x 720K Floppy D'Drives, 9" Mono Monitor, Mouse, Epson LX80 Printer ................................. £1199
- F10 – 512K RAM, 10MB Hard Disk, Single 720K Floppy, 9" Mono Monitor Mouse, Epson LX80 Printer ............. £1599

**ADDITIONAL MONITORS**
- 9" Mono ..................................................... £160
- 12" Mono ................................................... £200
- 10" Colour ................................................ £355
- XEN FD – 512K RAM 2 x 720K Floppys ........................................ POA
- HD – 512K RAM 10MB Hard Disk ..................................................... POA
- VICTOR (Sirius) ................................................................................ POA

**PRINTERS**
- EPSON LX80 ..................................................................................... £191
- EPSON FX85 ..................................................................................... £339
- EPSON FX105 .................................................................................... £435
- EPSON LO800 ................................................................................... £460
- EPSON LO1500 ................................................................................ £798
- EPSON SG2000 ................................................................................ £1400
- CITIZEN MSP10 ............................................................................... £325
- CITIZEN MSP15 ............................................................................... £412
- CITIZEN MSP20 ............................................................................... £457
- CITIZEN MSP25 ............................................................................... £577
- BROTHER HR25 .............................................................................. £645
- BROTHER HR35 .............................................................................. £748
- STAR SG10 ....................................................................................... £199
- STAR SG15 ....................................................................................... £293
- STAR SD10 ....................................................................................... £293
- STAR SD15 ....................................................................................... £385
- STAR SR10 ....................................................................................... £344
- STAR SR15 ....................................................................................... £415

**SOFTWARE**
- DELTA 4 ......................................................................................... £395
- D/BASE III ....................................................................................... £335
- FRIDAY .............................................................................................. £139
- LOTUS 123 ....................................................................................... £295
- MULTIPLAN ....................................................................................... £135
- SYMPHONY ..................................................................................... £395
- SUPERCALC II ................................................................................ £129
- SUPERCALC III .............................................................................. £205
- WORDSTAR PROFESSIONAL ....................................................... £259
- WORDSTAR 2000 .......................................................................... £290
- WORD PERFECT ............................................................................ £340
- PEGASUS ACCOUNTS MODULES From: ........................................ £175

*Prices exclude VAT and carriage
Cheque with Order
Above is a small selection of goods available.
Please ring for further details*
The fantasy quiz game that transforms you and your opponents into mighty ancient gods. You control four great warriors fighting for your honour in the Temple of Apollo. Demonstrate your superior knowledge and they will transform into stronger beings — but you must master the use of 'mutations', 'teleports' and 'challengers' to emerge from the battle victorious!

“Powerplay is exceptionally well presented.” “The most original of all such games currently available and unlikely to be matched.”

A & B Computing March ’86

“Powerplay is an outstanding piece of software. It challenges players mentally, but never becomes a bore.” “... here's a game brimming over with originality.”

Personal Computer World Feb ’86

**Clearance Sale!**

This is the Morse stocktaking clearance sale at prices that are in nearly every case far below dealer cost. Most items are available in easy and two, first-come-first-served. Errors and omissions excepted! No mail order for these items.

**APRICOT**
- Point 7 mail user Xe (£3295) **2195.00**
- Point 32 network file server with: 10mb b/disk (£2395) **1395.00**
- Databank 100mb for Point 32 **4195.00**
- Network board + tap box **195.00**
- F1 256k **595.00**
- F1 12 inch mono monitor **250.00**
- Xi 10 256k **1795.00**
- Xi 10s 512k **2085.00**
- Xi 9 inch mono monitor **200.00**
- Xi 10 inch colour monitor **385.00**
- Colour board **295.00**
- Portable Mouse **65.00**
- F1 Mouse **65.00**

**SANYO**
- MBC 555 128k, 2 disk drives **559.00**
- MBC 555 128k, 1 disk drive **395.00**
- CRT-70 colour monitor **225.00**

**IBM**
- Enhanced colour monitor **495.00**
- Enhanced colour adaptor **395.00**
- IBM PC 360 Disk drive **119.00**
- IBM Graphics Printer **195.00**

**MISC**
- Casio FP200 computer with free RAM etc (£299) **118.00**
- Brother HL 15 printer (serial) **299.00**
- Qume 11/40 **995.00**
- Qume 11/40 serial IF **101.00**
- Qume 11/40 sheet feeder **299.00**
- Acoustic hood (£235) **148.00**

**DUST COVERS**

(MADE OF PROOOFED NYLON)

**APRICOT dust covers**
- Apricot PC — 9" monitor — £7.00
- Apricot Xi — 9" monitor — £7.00
- Apricot XI — 12" monitor — £8.50
- Apricot Frange — 9" monitor — £7.00
- — 10" monitor — £8.50
- — 12" monitor — £8.50

**IBM dust covers**
- IBM PC — £8.50
- IBM AT — £9.50

**OLIVETTI M24 dust covers**
- Monoscreen £8.50
- Colourscreen £9.50

**SANYO dust covers**
- Monoscreen £8.50
- Colourscreen £9.50

Matching covers for Printers

Large range of printer covers also available which match the computer covers, e.g. Brother, Canon, Epson, etc. From £4.50. Other business machine covers available. Please enquire.

**BBD COMPUTER DUST COVERS**

39 Manse Avenue, Wigtongtown W16 9RP Telephone 0257 422968
Trade enquiries welcome

---

**Please quote this magazine if ordering directly**
If you operate a number of personal microcomputers, your choice of maintenance facilities has, until now, been frustratingly limited. You either commit a fixed annual budget to contract maintenance, or rely on slower, expensive over-the-counter repairs when they become necessary.

Now there's **CUSTODIAN** — a complete maintenance facility that offers you the benefits of other services, with none of the drawbacks.

It's been developed specifically for professional microcomputer users by Bell Technical Services — one of the largest computer maintenance companies in the UK, backed by the giant Bell Canada Group of Companies which employs over 100,000 people worldwide.

Custodian is rather like opening a bank account. A low initial investment, entitles you to our full on-site services with pre-determined response, and helps you make considerable savings over other maintenance options.

Savings on up-front commitments. Just £250 gives you immediate cover on all your PC's and peripherals.

---

**Cut maintenance premiums. Not response.**

- Only £250 initial investment required.
- Up to 3 years to make full use of your capital.
- A range of Service Options which you decide on when equipment fails.
- Fixed price repairs.
- Pay-as-you-go with unique Custodian Service Cheques.

---

Savings on time and service. Qualified engineers from 17 regional offices offer on-site maintenance with an 8 hour pre-determined response to your call. Alternatively, our 13 Bus Shops throughout the UK give an efficient over-the-counter Custodian Service, too. You choose the level of service you require, and are charged accordingly at fixed prices per job.

Savings on your involvement. Simply pay-as-you-go for any service using your Custodian Service Chequebook without fear of forfeiting your investment. Every book is valid for up to three years.

See how Custodian really works to your advantage. It's a small price to pay for complete peace of mind.

**Take action on cutting your maintenance costs NOW . . .**

- Complete the FREEPOST coupon today . . . and we’ll send you, without obligation, the Custodian Information pack, and a sample Service Chequebook (valid only if you choose to formally try Custodian for yourself).
- or telephone Julie Cleary on 01-898 9631 for immediate details.

---

**CUSTODIAN**

Available for Apple • Apricot • Compaq • IBM
Olivetti M24 • Osborne • Superbrain • Sirius

---

**Bell Technical Services**

Bell Technical Services Ltd.
13 Mount Road, Hanworth
Feltham, Middlesex TW13 6JG
Telephone 01-898 9631

Europe's leading computer maintenance company

---

Post to: Bell Technical Services Ltd., FREEPOST, 13 Mount Road, Hanworth, Feltham, Middlesex TW13 6JG.

Please send me full details of how Custodian Service Cheques can cut my maintenance premiums, but not service response.

Name: ________________________________
Position: _____________________________
Company: ____________________________
Address: ______________________________
Tel. No. ______________________________
Number and type of microcomputers operated: _____________________________
RIBBONS
OUR PROMISE
NO ONE sells better — Superb XTRALIFE Ribbons
NO ONE ships faster — Orders despatched in 4 hours
NO ONE matches us — Value for money every time
OR YOUR MONEY BACK!
DISKING, FREEPOST, Liphook, Hants. GU30 7BR. UK
General enquiries & sales (0428) 722563 Wholesale & Government (0428) 722840

All prices are for 10 ribbons or more — mix 'n' match

<table>
<thead>
<tr>
<th>PRINTER</th>
<th>PART No:</th>
<th>PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANADEX 9500</td>
<td>262</td>
<td>5.39</td>
</tr>
<tr>
<td>APPLE IMAGERYWRITER</td>
<td>330</td>
<td>3.69</td>
</tr>
<tr>
<td>BROTHER EM200</td>
<td>224</td>
<td>3.29</td>
</tr>
<tr>
<td>BROTHER EM200</td>
<td>656MS</td>
<td>3.59</td>
</tr>
<tr>
<td>BROTHER EM200</td>
<td>666SC</td>
<td>2.59</td>
</tr>
<tr>
<td>BURROUGHS 8800L9000</td>
<td>216</td>
<td>3.39</td>
</tr>
<tr>
<td>BURROUGHS 9322</td>
<td>54</td>
<td>9.89</td>
</tr>
<tr>
<td>CANON PW 156A MATRIX</td>
<td>223</td>
<td>3.39</td>
</tr>
<tr>
<td>CDC 222 MF</td>
<td>53</td>
<td>4.99</td>
</tr>
<tr>
<td>CENTRONICS 150</td>
<td>328</td>
<td>2.99</td>
</tr>
<tr>
<td>CENTRONICS 350</td>
<td>344/5</td>
<td>11.89</td>
</tr>
<tr>
<td>CENTRONICS LINEWRITER 400</td>
<td>361</td>
<td>21.09</td>
</tr>
<tr>
<td>CITOH 8510/8300</td>
<td>330</td>
<td>3.69</td>
</tr>
<tr>
<td>CITOH 8600</td>
<td>383</td>
<td>11.09</td>
</tr>
<tr>
<td>COMMODORE SHINWA/MT80</td>
<td>698MS</td>
<td>4.29</td>
</tr>
<tr>
<td>DATA GENERAL LP2</td>
<td>231</td>
<td>3.49</td>
</tr>
<tr>
<td>DATA PRODUCTS B1000</td>
<td>377</td>
<td>7.89</td>
</tr>
<tr>
<td>DATA PRODUCTS SPG 8010</td>
<td>375</td>
<td>4.69</td>
</tr>
<tr>
<td>DE LA 30.36 (25m) EYE</td>
<td>51P</td>
<td>2.79</td>
</tr>
<tr>
<td>DE LA 34.36</td>
<td>237</td>
<td>2.99</td>
</tr>
<tr>
<td>DE LA 120'180</td>
<td>62</td>
<td>3.29</td>
</tr>
<tr>
<td>DIABLO HYII</td>
<td>206</td>
<td>3.19</td>
</tr>
<tr>
<td>DIABLO HY11</td>
<td>567HM</td>
<td>2.09</td>
</tr>
<tr>
<td>DIABLO HY11 B/R</td>
<td>256</td>
<td>4.59</td>
</tr>
<tr>
<td>EPSON MX80</td>
<td>273</td>
<td>3.29</td>
</tr>
<tr>
<td>EPSON LX80</td>
<td>454</td>
<td>2.99</td>
</tr>
<tr>
<td>EPSON UNIVERSAL 100</td>
<td>320</td>
<td>4.59</td>
</tr>
<tr>
<td>EPSON MX100</td>
<td>320</td>
<td>4.59</td>
</tr>
<tr>
<td>EPSON 220 ERC03</td>
<td>274</td>
<td>2.99</td>
</tr>
<tr>
<td>EPSON LQ 1500</td>
<td>409</td>
<td>3.79</td>
</tr>
<tr>
<td>IBM DISPLAYWRITER</td>
<td>667MS</td>
<td>5.29</td>
</tr>
<tr>
<td>IBM SYS 23 (5241/5242)</td>
<td>313</td>
<td>3.59</td>
</tr>
<tr>
<td>IBM SYS 32C</td>
<td>207</td>
<td>5.39</td>
</tr>
<tr>
<td>IBM 1443 (25M) MET EYE</td>
<td>51M</td>
<td>3.39</td>
</tr>
<tr>
<td>IBM 3262/5261 (SYS38) EYE</td>
<td>70</td>
<td>6.99</td>
</tr>
<tr>
<td>IBM 5224</td>
<td>369</td>
<td>17.19</td>
</tr>
<tr>
<td>IBM 5225</td>
<td>71</td>
<td>20.69</td>
</tr>
<tr>
<td>MANNESMANN TALLY 110</td>
<td>351</td>
<td>4.49</td>
</tr>
<tr>
<td>MANNESMANN TALLY 140</td>
<td>358</td>
<td>5.39</td>
</tr>
<tr>
<td>MANNESMANN TALLY 1000 (X)</td>
<td>236</td>
<td>2.99</td>
</tr>
<tr>
<td>MANNSMANN TALLY 1000 (X)</td>
<td>235A</td>
<td>2.99</td>
</tr>
<tr>
<td>NAKAJIMA</td>
<td>7015C</td>
<td>2.09</td>
</tr>
<tr>
<td>NEC PINWRITER P1 P2</td>
<td>254</td>
<td>4.49</td>
</tr>
<tr>
<td>NEC PINWRITER P3</td>
<td>260</td>
<td>5.09</td>
</tr>
<tr>
<td>NEC 3500</td>
<td>372</td>
<td>3.88</td>
</tr>
<tr>
<td>NEC SPINWRITER 5000 SERIES</td>
<td>259</td>
<td>3.19</td>
</tr>
<tr>
<td>NEC SPINWRITER 5000 SERIES</td>
<td>576MS</td>
<td>2.69</td>
</tr>
<tr>
<td>NCR 499</td>
<td>209</td>
<td>5.09</td>
</tr>
<tr>
<td>NCR 499 B/R</td>
<td>209</td>
<td>5.09</td>
</tr>
<tr>
<td>OKI 80/82A/83/32A</td>
<td>66</td>
<td>1.19</td>
</tr>
<tr>
<td>OKI 84</td>
<td>87</td>
<td>3.29</td>
</tr>
<tr>
<td>OLVETTI T201 TES 401</td>
<td>572MS</td>
<td>3.89</td>
</tr>
<tr>
<td>OLVETTI TES 401</td>
<td>301</td>
<td>4.49</td>
</tr>
<tr>
<td>PRINTRONIX P300MF</td>
<td>60</td>
<td>6.39</td>
</tr>
<tr>
<td>QUME SPRINT 3/5</td>
<td>204</td>
<td>2.69</td>
</tr>
<tr>
<td>QUME SPRINT 3/5 B/R</td>
<td>253</td>
<td>3.59</td>
</tr>
<tr>
<td>QUME SPRINT 7/9</td>
<td>343</td>
<td>4.19</td>
</tr>
<tr>
<td>QUME SPRINT 7/9</td>
<td>684MS</td>
<td>2.99</td>
</tr>
</tbody>
</table>

PRINTER | PART No: | PRICE |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>QUME 3/5 QUICKLOAD</td>
<td>665MS</td>
<td>2.39</td>
</tr>
<tr>
<td>RICOH 1300/1600</td>
<td>691MS</td>
<td>2.69</td>
</tr>
<tr>
<td>STAR RADIX 10/101</td>
<td>410</td>
<td>4.49</td>
</tr>
<tr>
<td>STAR RADIX 15</td>
<td>415</td>
<td>5.99</td>
</tr>
<tr>
<td>TANDY TONOPRINT LP5</td>
<td>292</td>
<td>3.39</td>
</tr>
<tr>
<td>TANDY LP VI</td>
<td>311</td>
<td>2.99</td>
</tr>
<tr>
<td>TEXAS INSTRUMENTS 850/855</td>
<td>400</td>
<td>5.99</td>
</tr>
<tr>
<td>TEXAS OMNI B20</td>
<td>51M</td>
<td>3.39</td>
</tr>
<tr>
<td>TOSHIBA P1350</td>
<td>362</td>
<td>7.99</td>
</tr>
<tr>
<td>WANG 2231 MATRIX</td>
<td>261</td>
<td>4.19</td>
</tr>
</tbody>
</table>

With EVERY RIBBON from DISKING

UK P&P rates exc VAT

All ribbons any quantity (10+) £1.50 exc VAT
DISKING, FREEPOST, Liphook, Hants, GU30 7BR
Tel: (0428) 722563 Retail
Tel: (0428) 722840 Wholesale

KEY TO REF No: ABBREVIATIONS
All ribbons fabric unless, MS, SC or HM
M = Metal spool
P = Plastic spool
MS = Multistrike
SC = Standard correctable (requires Lift-off Tape)
HM = High Yield Multistrike
A = Closed jaw
DISKETTES

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

YOUR MONEY BACK!

DISKING, FREEPOST, Liphook, Hants. GU30 7BR. UK
General enquiries & Sales (0428) 722563 Wholesale & Government (0428) 722840

How to Order

Enquiries/Retail (0428) 722563 (24-hrs)
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 (if not ordering by post) — delivery address
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 your address, and use our normal post code GU30 7EJ 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, and 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 hierarchy clogging the works. For you we will send a proforma invoice. We only wish we had done that with THORNI EM RADAR & BT FULCRUM COMMUNICATIONS.

Offical 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.

5¾" Storage

FREE Diskette storage with disks
Choose either the Flip ’n File 10 (FF 10) library box worth £4.64 inc with every ten 5¼" disks, or the Budget 50 (B 50) if you don’t specify, we will always pack library boxes.

5¼" Storage

★ BUY 2 GET 1 FREE ★

FF10 Flip’n’File for 10 disks
3.90
FF50 Rainbow pack of FF 10’s
18.90
FLP15 Flip’n’File for 15 disks
5.90
MINI 50 Flip’n’File for 50 disks
16.30
MINI 100 Flip’n’File for 100 disks
32.30
KMF7 Keyfob labels with 17 disks
25.50
KMF5 Keyfob File for 50 disks
36.90

Economy Storage

★ BUY 2 GET 1 FREE ★

W5 Flip’n’File for 5 microdisks
3.30
W5S Rainbow pack of W 5’s
10.90
W5D Flip’n’File for 10 microdisks
4.60
W5M Flip’n’File for 25 microdisks
10.50
W5S0 Flip’n’File for 50 microdisks
19.80
M40 F N F for 40 microdisks latch
31.90

Diskette Accessories

Minimum order value 50p per order:

DSM 5¼" Mayer for 1-4 disks (100)
24.90
DBW 5¼" White blank envelopes (100)
5.00
LAB 5¼" Disk user labels (100)
3.00
WP 5¼" tabs for 5¼ disks (100)
1.00
DW Dis万里au disk or blue (10)
5.00
MOD 5¼" Blue drive head cleaning kit
8.90
SODM 31/2" Drive cleaning kit (boxed)
8.90
PC/Compatible Users

Upgrade your PC’s with . . .

INTERNAL HARD DISKS!

- 10 megabyte internal hard disk upgrade для 449 £
- 20 megabyte internal hard disk upgrade для 449 £

INTERNAL TAPE STREAMERS!

- 10 megabyte для 399 £
- 20 megabyte для 599 £

All units are Half height!

Prices include:
- Collection
- Installation (on site available)
- Return delivery
- 48 hour turnaround
- 12 month “swop out” guarantee

IBM BOARDS

- 256K RAM ..... 99 £
- 384K RAM ......... 129 £
- 512K RAM ......... 149 £
- 384K Multifunction Card .... 199 £
- RS 232 Special Card .... 59 £

ALL PRICES EXCLUDE VAT

01 541 5638

BOLTON WELLS LIMITED

1st Floor, Pearl House
746 Finchley Road,
London NW11 7TH

Telephone: 01-209 1521 / 01-209 1592
RECOMMENDED BY THE PROFESSIONALS

For the Amstrad PCW 8256

The new

48 Hour Dispatch

DataGem is the database for the 8256. It has been specifically designed and written for the 8256 (it hasn't been 'ported' down from older machines) and makes full use of its special features. Examples are supplied with the software.

- Gemini is one of the longest established and most respected software houses. We've been writing superior software for years, but more than that we offer a continuing service for as long as you need it, not just for a fixed period.
- DataGem is only the first of an exciting new range of serious software for the 8256. This includes Gemini's already legendary cashbook and final accounts packages.
- Just 48 hours after we've received your instructions DataGem will be dispatched to your door. Either fill in the coupon and enclose a cheque or, if you're an Access or Amex holder, please call our credit card hotline.
- If DataGem doesn't prove to be value for money, send it back! If you return it complete and undamaged within seven days we'll refund your money with no quibble.

Check that out with the 'competition'

Distributed to the trade by CentreSoft 021-359-3020.
PC Communications announce two NEW communication products for the IBM PC and compatibles.

**QUATTROCARD 2400** and **BREAKOUT 2400**

- **QUATTROCARD 2400** is the first BABT 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** 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 TELETYPYME SYSTEMS such as E, T, L 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 TELETYPYME 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 TELETYPYME 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 582429PC internal modem*
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 TELETYPETE 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.

---

*P.C. Communications ADM® internal modem and software. **Pulse Digil Unit
### Best Quality At Best Prices

<table>
<thead>
<tr>
<th>5¼&quot; Disks</th>
<th>1-4</th>
<th>5-9</th>
<th>10-49</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS/DD 48TPI</td>
<td>13.50</td>
<td>13.00</td>
<td>12.50</td>
</tr>
<tr>
<td>DS/DD 48TPI</td>
<td>17.75</td>
<td>17.25</td>
<td>16.50</td>
</tr>
<tr>
<td>SS/DD 96TPI</td>
<td>17.75</td>
<td>17.25</td>
<td>16.50</td>
</tr>
<tr>
<td>DS/DD 96TPI</td>
<td>23.75</td>
<td>22.75</td>
<td>22.25</td>
</tr>
<tr>
<td>1.6 MB</td>
<td>32.50</td>
<td>30.00</td>
<td>28.00</td>
</tr>
</tbody>
</table>

Supplied in free plastic library boxes.

<table>
<thead>
<tr>
<th>3½&quot; Disks</th>
<th>1-4</th>
<th>4-9</th>
<th>10-49</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS/DD</td>
<td>23.50</td>
<td>22.50</td>
<td>21.50</td>
</tr>
<tr>
<td>DS/DD</td>
<td>33.50</td>
<td>32.50</td>
<td>31.95</td>
</tr>
<tr>
<td>Post &amp; Packing per box</td>
<td>75p</td>
<td>50p</td>
<td>FREE</td>
</tr>
</tbody>
</table>

8" Disks Bulk/Plan Label/Private Label/Contract Formating & Duplicating + Details On Request

<table>
<thead>
<tr>
<th>Anti-Glare Screens</th>
<th>Mono</th>
<th>Colour</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>29.50</td>
<td>39.50</td>
</tr>
</tbody>
</table>

ON Ordering State Machine & Dimensions. Post & Packing £1.00 per Screen.

Also Available — Details On Request — Ribbons — Compatible & Originals — Storage Boxes — Various Sizes — Cleaning Kist — Various

All prices exclude V.A.T.

Payments with Orders Please To:

J.L. Computer Services, Bridge House, P.O. Box 412
Kings Langley, Hertfordshire, WD4 8BG
Tel: (09277) 61212 Telex 919358 King. G.
(40) From London Fax 0376520546

Trade & Contract Enquiries Welcome
FLOPPY DISKS AND PRINTER RIBBONS

How much are you paying for yours? All our Nashua diskettes carry a

LIFETIME WARRANTY

Price per box of ten diskettes

<table>
<thead>
<tr>
<th>NASHUA 5¼”</th>
<th>1-2</th>
<th>3-4</th>
<th>5-9</th>
<th>10+</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS/DD 48tpi</td>
<td>11.82</td>
<td>11.59</td>
<td>11.36</td>
<td>10.91</td>
</tr>
<tr>
<td>SS/DD 96tpi</td>
<td>15.70</td>
<td>15.40</td>
<td>15.10</td>
<td>14.50</td>
</tr>
<tr>
<td>DS/DD 96tpi</td>
<td>16.40</td>
<td>16.15</td>
<td>15.90</td>
<td>15.65</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NASHUA 3½”</th>
<th>1-2</th>
<th>3-4</th>
<th>5-9</th>
<th>10+</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS/DD</td>
<td>—</td>
<td>28.41</td>
<td>27.86</td>
<td>27.31</td>
</tr>
<tr>
<td>DS/DD</td>
<td>—</td>
<td>36.93</td>
<td>36.22</td>
<td>35.51</td>
</tr>
</tbody>
</table>

NASHUA 5¼” diskettes available in plastic library case at £1.50 extra.

MAXELL and PANASONIC 3” £37.50 per box of 10.
(Subject to availability.)

Ribbons for JUKI 6100 £1.75 each or £7.50 for 5.

NO POSTAGE ★ NO PACKING ★ NO VAT

Cheque with order to:

ALPHA CV

47 Makepiece Road, Bracknell
Berks RG12 2HG
Tel: (0344) 54049
DISK COPYING/FORMATTING/FILE TRANSFER

WE CAN TRANSFER YOUR DATA BETWEEN OVER 500 DIFFERENT MICROCS, 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
Fortunately, you won’t find PC Promise in the high street!

Why fortunately? Because when you need expert advice, you will get it. From System Designers who care about their product and their customers. Not from a salesman.

Not that you’ll need much assistance. Using PC Promise is simplicity itself. Easy enough for first time users to understand, you’ll be entering data within a few minutes. Yet it’s powerful enough for professionals who want to develop full scale systems.

And last. It’s capable of indexing 1000 records within 40 seconds. No problem.

As for flexibility, PC Promise allows you to change anything at the drop of a hat, without having to reorganize files.

You’ve no compatibility problems with other software. PC Promise interfaces with most commonly used packages.

And because there’s no middleman taking a cut — the package is available for a mere £175 plus VAT including the ‘Hotline Support’ service and free updates throughout the year.

The new standard in Database Management Systems for IBM PCs and Compatibles
WHAT DO YOU THINK OF S&S's PRICES?

CHEAP CHEAP

DOS UTILITIES (YMI)
ENCRIPT Encrypts/decrypts files using a password.
UNDDELETE (£1.15) Restores files that have been accidently deleted.
SECRET Makes files invisible to directory searches.
READONLY Makes files Readonly so that they can't be deleted.
DOSMENU A menu-driven front end for DOS.
QDEL Quick deletion of files with confirmation.
QCOPY Quick copying of files with confirmation.
QMOVE Move files from one subdirectory to another with confirmation.
ZAP Kills files dead, so they can't be UnDeleted.

GENERAL UTILITIES (YM2)
SIDELINE Prints your worksheet SIDELINE/WSY!
SOLID 123 (£25) Consolidates multiple 123 and Symphony worksheets.
QPRINT A print buffer. Stops you waiting for your printer. IBM only.
FXPOUND Loads the IBM character set into your Epson FX Printer.
THE POUND Puts all the IBM character set on your 123 screen.

COMPLEX COMPUTERS — PRINTERS — MONITORS — ORIVES — SOFTWARE

COMPUTERS
Apple IIB £795
Apple FZ £1345
Apple II £1695
Apple II £1795
Apple IiI £1965
Apple Monitor II monochrome £795
Apple Monitor II monochrome £795
Apple Monitor II colour £795
Apple ME50 £1765
Apple ME50 £1765
Tandon 754 £895
Tandon 756 £945
Tandon 756 £945
Tandon PCZ £1995

MONITORS
Philips 14" £395
Philips 14" £395

HARD DISK UPGRADES
PC Hard disk upgrade 10meg £695
PC Hard disk upgrade 20meg £695
20meg Hard drive (in composite)
IBM, Sperry and Olivetti supplied.

PRINTERS
Sperry £173.00
Epson LX 100 £187.00
Epson RT 80 £225.00

GOVERNMENT AND EDUCATIONAL ORDERS WELCOME. EXPORT ENQUIRIES WELCOME.

STANDARD DELIVERY £5 — ADD 15% VAT TO ORDER TOTAL

FIX123 (£1.15) Run 123 off your hard disk without the Lotus floppy (FIXSYM for Symphony also available) IBM only.
READAGE Counts the words and measures the readability of a document.
SETFXPR Allows your Epson FX printer to print different styles.
WSASCII Converts a Wordstar file to plain ASCII.
CAPS/NUMLIGHT Puts CAPS LOCK and NUM LOCK indicators on your screen.

EACH PROGRAM ONLY COSTS £10!! + VAT

(except FIX 123, FIXSYM and UNDELETE. £1.15 and SOLID 123, £25). Or get either package of utilities for £75 + VAT each. Ask for VM1 or YM2) or any 2 for £65.

Waste on IBM, Apricot, Sane, Rainbow and other PC's.

HAVE WE GOT A DEAL FOR YOU??
WE SURE HAVE!!

We deal in computers not just sell them. We can offer you a top Part/Ex. price for your current micro against all the leading makes today.

We buy computers and peripherals outright.

We are main stockists for Commodore, Amstrad, Sinclair and Acorn.

We have a full repair service, a lead making service and excellent credit facilities.
There's no substitute for success.

As sponsors of the 1986 Business Microcomputer Award, we are proud to associate ourselves with this accolade to innovation and success.

Computer People
— we have the best people
"At £199 TAS Must be Best Value Ever"

If you looked at database products like dBase, Dataflex and Sensible Solution you should know about TAS and the fantastic performance and facilities it provides at a very low price. A 14 day money back guarantee allows you to try it and find out for yourself why we think TAS must be best value ever.

TAS is an easy to learn database and procedural language. That's a nice word for a programming language that, unlike BASIC, you learn in days rather than months. If you have brains and want to write your own programs quickly, TAS is for you! If you have brains and programming knowledge you can use TAS to develop professional menu driven business applications and produce fast, efficient and good looking results quicker than ever before. And it will handle the big stuff as well. When other database packages start to grind, TAS continues to fly.

"You get TAS Accounting for only £150 more"

Why stop at the database. For an additional £150 you get TAS Level 2, an Integrated Double Entry Accounting System consisting of a Nominal Ledger with Report Writer, Purchase Ledger and Sales Ledger with invoicing. For another £150 you get TAS Level 3 which integrates with Level 2 and provides Stock Control, Purchase Order Processing and Sales Order Processing with Backorders.

And please understand that with both Level 2 and Level 3, you get the source code as well. So you can use it as an extended tutorial, find out exactly how it works and make changes and additions when you want to.

**TAS Level 1**
- Consists of the Data Dictionary and the Relational Database Programming Language/Compiler
- Price Single User: £199
- Multi-User add: £100

**TAS Level 2**
- Is an integrated Double Entry Accounting System consisting of Nominal Ledger with Report Writer, Purchase Ledger and Sales Ledger with invoicing
- Price is Level 1 price plus an additional: £150

**TAS Level 3**
- Consists of Stock Control, Purchase Order Processing and Sales Order Processing (with Backorders) that integrates with Level 2
- Price is Level 2 price plus an additional: £150

Prices include shipping in the UK but you must add 15% VAT. Quantity, Corporate and Educational Discounts Available.

---

**"TAS’s Unbeatable 14 Day Money Back Guarantee"**

Yes, there is a 14 day money-back guarantee (less a handling charge). The package you receive will contain two sets of floppy disks. One set will contain the run-time version of the accounting product you ordered and a fully operational copy of the database but, with a 200 record limit build in. This allows you to evaluate TAS on your own system. The second (sealed) set of floppy discs contains the source code of the accounting product you ordered and an unlocked version of the database. Provided this set remains unopened and all goods are returned to us within 14 days, you will receive a refund less a 10% handling fee.

---

**"TAS for the Technically Minded"**

Because TAS compiles down to intermediate machine code your programs will execute fast. Very fast! TAS itself was written by Phil Mickelson in Assembler and executes machine code. (Phil originally created "The Sensible Solution" relational database). TAS uses B-Tree multi-key file access and it is probably the fastest database package around. Individual applications may have 16 different screen/report formats, 16 files open, with 16 keys per file (all data file keys stored in only one index file) accessing up to 17 million records in any one file. Individual fields may be up to 354 characters long and a record up to 10KB in size. It supports box-drawing graphics and colour on certain systems. The multi-user version supports record and file locking (if provided by operating system) and TAS can exchange standard ASCII data with other programs. The database provides multiple company capability. TAS has 60+ commands including, IF, DO, WHILE, GOTO, GOSUB etc. All data and programs are compressed (numeric fields stored in BCD format). TAS is available for B-Bit and 16-Bit single and multi-user systems and also for certain LAN’s. Order your copy now. Phone us if you are in doubt about your system or disk format.

---

**"Affordable Software for Your Business Needs"**

Describe your computer system:
- 8 Bit
- 16 Bit
- PC-DOS
- MS-DOS
- TurboDOS
- FastNet
- Laser

Computer Name/Model: ____________________________

Your Name: ____________________________

Comp Name: ____________________________

Address: ____________________________

Postcode: ____________________________

Card Number: ____________________________

Signature: ____________________________

**Business Tools**

[19x674]ONLY

[39x553]£199

[51x490]TAS

[59x282]CORPORATION

[71x444]TAS

[83x399]TM

[95x516]The Accounting Solution

---

[117x454]TAS

[129x383]TM

[141x526]The Accounting Solution

---
We'd like to present you with a package we call Hotelier. A complete software package for Hotels.

Hotelier takes care of Guest Billing. Handles Sales, Purchase and General Ledgers and produces management reports for the restaurant and bar.

The complete in-built word processor will format documents, letters and mailshots. Hotelier even amends and produces new menu cards.

Hotelier is a friendly, easy to use system available for Apricots, IBMs and other PC compatibles.

So, if you'd like an à la carte system which makes everything check out, simply call 076-686 551. Or ask your local dealer.

He'll serve up the facts.
Interlex Telehelp gives hot-line support when you need it.

Interlex Telehelp provides hot-line support for users of personal computers from 9.00AM to 9.00PM on Weekdays and 9.00AM to 1PM on Saturdays. Most of the major machines and application packages are supported.

Telehelp is purchased in time-slices at rates to cater for the occasional and regular user. The duration of each call is logged and deducted from the total support time purchased.

We have a team of highly trained consultants waiting to answer your call.

01-943 4366

The DEMON modem

Devlislshly Clever Features

Auto Answer
The Demon answers, then unloads or downloads data into your micro and printer just like a telex.

Auto Dial
Numbers dialled by the micro. Doesn't even need a telephone attached.

Auto Redial
The dial allows you to set your favourite numbers and keeps dialing until you are connected.

Full UK, European & USA

Band Rates
300/300 Bulletin Boards, etc.
1200/75 Prestel, Micronet, etc.
75/1200 Reverse Prestel, etc.

Bulletin Board Facility
Start your own contact information boards throughout the world.

PNS
Packet Switching Service lets you dial worldwide databases for the cost of a local call.

Complete with plugs & leads
For Telephone, BBC 5 pin DIN RS423 and Mains Power Supply.

Easy To Use?
You don't need to know anything about baud rates or protocol or 'handshaking', simply plug it in and talk to the world.

Direct From The Manufacturer
By selling it directly we are able to offer it at this low price and still give you support should you need it.

We also have complete control of the quality and build it to the same standards as the products we supply to BT and whilst this modem is not yet BT approved the components we use are.

We also offer a money back guarantee now extended to 12 months for registered users. PROHIBITED from direct or indirect connection to public telecommunication systems. Action may be taken against anyone so connecting the apparatus.

NOW AVAILABLE AT ONE HELL
OF A PACKAGE PRICE
FOR THE BBC MODEL B

MODEM +
BBC ROM
only
£79.95
plus VAT + p&p

With free registration for MICROLINK

To: Wallaby Consultants (Modem Dept) 1
Unit 1, Allard Square, Woodston Industrial Estate, Peterborough PE2 9BA
Tel: Peterborough (0733) 255187

Please send me:

---(Qty)---
Demon Modem plus Demon BBC ROM at £64.95*
Demon Dial Disk at £6.95* 40 tracks
Demon Dial Disk at £11.95* 80 tracks
Demoset Adapters (allows telephone and modem to plug into same socket) at £5.25*

*inclusive of V.A.T. and Postage and Packing

I enclose cheque to the value of £

or

No

Signature
Name
Address
Post code
(please print)
Laboratory work station for your computer

Professional instrumentation with the 1401 intelligent laboratory interface

Compatible with: Apple, Apricott, BBC, HP, IBM, Nimbus, VAX...

- Full 12 bit analogue input and output
- Up to 2 Mbytes of internal memory
- Full laboratory software – including FFTs – is included
- Application programs including Spectrum Analyser, Signal Averager

Designed and made in Cambridge, England

CED Real – Time Computers
Science Park, Milton Road Cambridge, CB4 4FE. Tel Cambridge (0223) 316186
**THE EPSON 'TAXI' PC**

- IBM compatible
- Very compact
- Easy to use
- One year's warranty
- 256k Ram
- Remarkably low price

<table>
<thead>
<tr>
<th>CONFIGURATION</th>
<th>BASIC PRICE</th>
<th>INCLUDING TAXI SOFTWARE</th>
</tr>
</thead>
<tbody>
<tr>
<td>256K — 1x360K FDD</td>
<td>£777</td>
<td>£1045</td>
</tr>
<tr>
<td>256K — 2x360K FDD</td>
<td>£898</td>
<td>£1166</td>
</tr>
<tr>
<td>256K — 1x360K FDD +1x20mb HD</td>
<td>£1666</td>
<td>£1934</td>
</tr>
</tbody>
</table>

Taxi includes: Mouse Card with 64K RAM, TAXI System Disk, Information File Disk, 3 Button Mouse and Manual, Colour Video Interface Card.

---

**OXSTAT**

WHATSOEVER YOUR NEEDS — OXSTAT PROVIDES THE ANSWERS

Available on any OPI, MS-DOS, or OPI-80 based micro

**Features**
- Large matrix with extraordinary screen Editor
- Menu driven, no complicated command indications
- Data input validation
- Common statistical tools built in parametric, non-parametric & multivariate
- Missing value statistics
- One storage of data... data once entered stored for future use, editing or manipulation
- Rapid data analysis, reports under 15 seconds need in MS
- Search mode... automatic processing built-in

---

**£459 20Mb hard disk upgrade**

**Olivetti M24**

- 20Mb NEC hard disk
- 640k ram
- MSDOS monitor, keyboard

**Olivetti M24 SP**

- 20Mb hard disk
- 640k ram, MSDOS monitor, keyboard

**Olivetti**

with 256k ram MSDOS monitor, keyboard,
- M24 2x360k d/d
- M21 2x360k d/d
- M21 20Mb NEC

**Epson PC now in stock!**

---

**TELEPHONE 265871**

**MONDAY TO FRIDAY 9.30am-7pm**

**SATURDAY 11am-6pm**

**prices subject to change without notice; goods subject to availability**

**ADO 15% VAT TO PRICES**

---

**You can’t find a better deal...**

Crestmatt Limited
a division of CrestData International
67a York Street (BAKER ST)
London W1H 1PQ

**TELEPHONE 01.402.1234/5 01.723.4699**

---

**EPSON** authorised dealer

**OLIVETTI** authorised distributor

**APRICO** authorised dealer

**COMPAQ** authorised dealer
Pick a disk... any disk

Floppy disk incompatibility — an unpleasant fact of computer life. GEMINI M-F-B 2 SYSTEM — a pleasant computer solution.

When we introduced the original Gemini M-F-B system, we provided a lot of answers to the growing problem of disk size and format incompatibility. And now with the M-F-B 2, we can provide even more answers.

The new system continues to provide the ability to format and transfer data between any of the microcomputer formats currently available within its library of over 400 machine type and format combinations, but now goes even further.

The changes in hardware manifest themselves in a system that now provides either 10MB or 20MB of Winchester based storage and the adoption of half-height devices have allowed the inclusion of a 3.5" floppy drive as standard.

The software changes now provide the M-F-B 2 system with the capacity to not only hold up to 700 format combinations, but to also supply an MS-DOS suite of software enabling support of the entire IBM PC (PC, XT and AT) family, and IBM 'lookalikes'.

The Gemini M-F-B 2 now comes with a 12 month free format update service.

The 8" drive shown may be omitted from the system. A 0.5MB RAM Disk is an additional option for the system.

Gemini
Computer Systems Limited
Springfield Road, Chesham, Bucks HP5 1PU
Telephone (0494) 791010 Telex 837788
Your Macintosh Centre in Kingston-upon-Thames

CALLHAVEN COMPUTERS

43 Fife Road Kingston-upon-Thames Surrey KT1 1SF
Tel: 01-549 5612
Our field engineers will maintain your PC...

...and our good name!

Personal Computers Ltd

Field Engineering

We know you depend on your computer system for the smooth-running of your business. That's why we offer Field Engineering as part of Personal Computers Limited total service. Few companies can match our service network, our stocks of spares, and the efficient call-handling system that routes a qualified engineer to you as fast as possible. After all, it's not only your business that's at stake, it's ours too—because our good name rests on the quality of our service.

You can opt for as much—or as little—maintenance as you need—or use us for one-off tasks like network wiring, or training your own staff to deal with day-to-day repairs. Wherever you bought your computer system, choose wisely when it comes to maintaining it. Many major organisations put their systems in our care, because we stake our good name on it, every time.

218 & 220/226 BISHOPGATE, LONDON EC2M 4JS, TEL. 01-377 1200
MUNRO HOUSE, DUKE STREET, LEEDS LS9 8AG, TEL. 0532 441 631
UNLIMITED COMPUTER TRAINING

OUR NEW 'LEARNING CARD' IS THE CHEAPEST WAY TO KEEP YOUR STAFF UP-TO-DATE WITH MICROCOMPUTERS

More and more of your staff will have to acquire some computer expertise soon. So you'll need a full introductory training programme for some. Advanced tuition for others. And various refresher courses too.

Our £500* Learning Card covers any or all of these requirements. Literally, your employee can book as much or as little as he needs in a 12-month period, without any extra charge.

*Price quoted ex-VAT

COURSES INCLUDE:
- Smart, Symphony, Framework
- Lotus 123, d/Base III, Samna
- Wordstar, Display Write II
- Introduction to the PC, XT and AT.

The Entré system is famous for small classes, top results and extensive practical training. So find out more now by filling in the coupon, or ringing Lynn Chetcuti on 01-831 0311.

Please send me your training schedule and course details

Name

Position

Company

Address

Telephone

Entré Computer Centre
150 Holborn, London EC1 2NS Telephone: 01-831 0311
(Entrance in Grays Inn Road)
Your PC system should work like...

Even if your business is not as standard as a standard software package... the way you want to operate shouldn't clog up the works. Whether you need a little fine tuning, a major overhaul, or some practical help with planning your computing growth path—you can count on our expert Consultancy service to engineer your system the way you want, and keep it humming.

Personal Computers' consultants are all experienced in finance or accounting, and project development is their specialty. We've successfully handled work in networking, ledgers, fund management, mailing lists and many other fields for leading banks, brokers, and shipping companies, as well as smaller enterprises. Naturally, our wide experience of all the top-selling database and spreadsheet packages gives us a head-start when it comes to shaping an application to your needs.

Call our Consultant on 01-588 3448. We'll get your system running like clockwork.

218 & 220/226 BISHOPGATE, LONDON EC2M 4JS, TEL. 01-377 1200
MUNRO HOUSE, DUKE STREET, LEEDS LS9 8AG, TEL. 0532 441 631
HANDLES REPETITIVE TASKS:
- Automatic Re-Dialling
- Short Code Dialling
- Multi-Addressing

REDUCES TRANSMISSION COSTS:
- Batch Transmission
- Delayed Send
- Automatic Time Log

STORES AND MANAGES ALL YOUR TELEXES FOR YOU:
- Large Memory

SAVES FURTHER INVESTMENT:
- Links into future networks

NO RETRAINING:
- Could use your existing word processing package

NO LOST COMPUTER TIME:
- Works in the background

Adding Telex to your PC opens up a new dimension in business efficiency, slashing your communications costs and releasing your staff to do other work. Result—More opportunity, More achievement.

As Britain's leading telex company, with 15 years' experience in telex markets, we have now brought all our expertise together to develop the best possible PC-Telex interface. Result—The 2040-PC, the most advanced interface system available, at the most cost-competitive price.

Help us to help you to revolutionise your business communications. Contact us today.

ATS (Communications) Ltd Burrell Road Haywards Heath West Sussex RH16 1TP England
Telephone: (0444) 414911 Telex: 877134 ATSLTD G
There's training...

...and there's

Personal Computers Ltd.

Training

When you need help in taming the fearsome micro... don't join a circus, because no amount of clever training tricks will help you face the beast on your office desk. That's why you won't find us cracking the whip at PCL: our training staff have the expertise to develop your understanding and practical knowledge—to get you and your micro performing skilfully together, fast.

Whether you or your staff need training in computing concepts or the latest software—come to the professionals. We have years of successful experience with large and small companies, superb facilities, and regular courses to suit your needs (or we'll design one specially).

Call 01 377 1200 or 0532 441 631 and ask about the professional way to learn amazing feats with your micro. Even if you've never seen a computer out of its cage before, we promise you some fun—without clowns, magicians or tricks.

218 & 220/226 BISHOPS GATE, LONDON EC2M 4JS, TEL. 01-377 1200
MUNRO HOUSE, DUKE STREET, LEEDS LS9 8AG, TEL. 0532 441 631
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 processors, 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** 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!

---

**HISOFT**

**DevpacQL** assembler debugger editor

£39.95 now with free Motorola programming guide.

the fastest macro assembler.

integral full-screen editor.

**MON QL** debugger available in ROM

180 High Street North, Dunstable, Beds, LU6 1AT Tel: (0582) 696421

---

**Super‘B’**

Super**Basic** Extensions

£29.95

70 powerful procedures and functions giving random access filing; mac-style window and much more

To order: use cheques, Access or Visa. All goods sent first class. Call for further details of our Spectrum compilers and utilities.
LOGISTIX ADDS TO THE SPREADSHEET WHAT YOU REALLY NEED

TIME MANAGEMENT

The Logistix worksheet provides the four facilities required by the professional microcomputer user: a powerful spreadsheet, extensive database facilities, presentation quality graphics and that vital fourth dimension — Time Management.

Vital because Logistix lets you plan any aspect of your business; the assignment of staff to tasks, the allocation of jobs to machines or even the scheduling of a full scale project using Critical Path Analysis.

Only Logistix integrates Time Management with classic spreadsheet features, an easy-to-use database and unparalleled graphics.

Logistix even reads data files from other popular spreadsheet and database packages.

Logistix: the best idea in business software since the Spreadsheet.

Contact Grafox now for a Logistix Evaluation Pack.
Paying too much for floppies? £3 (€3.60)? We offer NEXT DAY delivery of all the top brands (Dysan, IBM, 3M, etc), fully guaranteed, from only £1.49. (Pages 26-33).

VDU taking over your desk? Slide it out of the way with the Misco Glideaway. Full comfort adjustment. Supports heavy terminal. (Page 12).

Failing over your floppies? 100 ways to file a floppy, in both lockable and unlockable versions. See pages 6-9 in your FREE catalogue.

Static kills data, harms equipment, upsets operators. Just walking across a room can produce 30,000 volts. Now you can control static with our special mats and rugs. (Page 16).

Sore eyes? Dry skin? Headache? Fatigue? An anti-static, anti-glare screen could be the answer. Prices from only £45. (Pages 10/11).

Telex too slow? Transmit data through your telephone six times faster than telex. 4 acoustic couplers to choose from. (Page 45).

101 COMPUTER PROBLEMS -SOLVED!

Send today for the best catalogue of computer supplies & accessories ever compiled...FREE.

FREE to all Company Computer Users

Call 01-998 9068 or Bracknell (0344) 482121 for your copy or post this coupon

Please rush me my FREE 56-page Misco Catalogue.

Mr/Mrs/Miss/Name

Position/Title

Company

Address

Postcode

Tel

Make/type of computer

No. of Terminals

No. of staff

POST TODAY TO:

Misco Computer Supplies Ltd., FREEPOST, Bracknell, Berks RG12 1BR.

Urgent order? Call 01-998 9068 or Bracknell (0344) 482121

Misco

Your computer's choice
The Cub 653 featured here is the perfect mate for computer users who wish to combine the advantages of brilliant, low cost colour graphics with professional 80-column software. Yet it is only one of a range of 26 superb models in the Cub range.

This includes 14" and 20" monitors in resolutions ranging from 452 to 940, together with the Cub RGB/PAL displaying the best in both computer graphics and video pictures.

Naturally, with a range as wide as this, compatibility extends to virtually every micro. Add the many cabinet options and it becomes clear why Microvitec’s British designed and built Cub range of monitors lead the field.

**RESOLUTION 653**

Screen size 14"
Tube Resolution (pixels) 653(H)
Pitch 0.43mm
Bandwidth – 18MHz
Input – TTL with PAL/AUDIO option
CRT – super high contrast
Cabinet options – plastic (featured)
  tilt and swivel
  metal
  structural foam
ADVERTISERS INDEX

A
Acme Computers 204
Adder Technology 204
ADP 229
A. L. Downloading 222
A-Line Diapers 199
Albert 212
A1 Computer Services 221
Applied Technology 215
Art Electronics 217

B
Bahnhof 210
BBD Dust Covers 200
Ben Box 219
Brain Boxes 222
Brewster Computer Services 219
Budget Typing 211

C
Chips Computer Centre 200
Computer Aid 200
Computer Exchange 205
Computer Facilities 216
CP & I Computer Services 210
Crownwell Business Computers 196

D
Database Publications 39
Data Design Techniques 52
Data Factory 52
Data Plus 32
De-Vinci 45
Delta Ruben Assoc 75
Delta Pl Software 92
Digisolve 53
DigiLink 18
Digitabs 54
Disk Formations 232, 233
Display Electronics 70
E
Eden Trade Computers 8
Elite Computer Systems 165
Elora 86, 81
Erina 228

F
FCC Systems 54
First Publishing 127
First Software 79
Fornacs 189
Fraser Associates 44
Future Management 43

G
Gemini 239
Goto Computers 25
Grey Master 1, 271

H
HAT 67
Hi-Voltage 36
Hi-Soft 42
Hit Systems 101

I
IDS Insurance Solutions Consultants 4, 5
Ifc 229
Jrnlg 135
Juki 8, 49
Keele Decades 6
Kirklands 6

L
Labtec 42
Lambda 18
Leeds Polytechnic 229

M
Lambda Software 219
Leicester Computer Services 208
Link Design 199
Living Software 205
Logix 208

N
Maple Micro 211
Microcomputers 201
Microcomputer Systems 209
Microprocessors 209
Microprocessors 209
Microspec 209
Microtech 209
Microvision 209
Mighty Micros 58

O
OAC Training 225
Optimum Computer Technology 222

P
Pareto Corporation 240, 241
Parsons 240, 241
Peg Associated 225
Power Equipment 48
Power Pointer 23
Prism Craft 60
Pylon 121

Q
QW Training 225

R
Ringdale Engineering 208
Ross Reuter 204

S
Saxon Computing 213
Shagbark Blaine 210
Softalk 210
Software Technology 203
Sound Design Studio 211
SP Electronics 214
Superstore 208, 214
Swedate 214

T
Tourni 222
TV Services of Cambridge 202
Tyepro 209

U
U-Micron 20
User Prompt Guides 64

V
Vie-Oddles 227
Victor Technologies 21, 162

W
Walters 96
WD Software 22
Worldwide Computers 9

MICROMART ADVERTISERS INDEX

A
Access Computers 204
Adder Technology 204
ADP 229
A. L. Downloading 222
A-Line Diapers 199
Albert 212
A1 Computer Services 221
Applied Technology 215
Art Electronics 217

B
Bahnhof 210
BBD Dust Covers 200
Ben Box 219
Brain Boxes 222
Brewster Computer Services 219
Budget Typing 211

C
Chips Computer Centre 200
Computer Aid 200
Computer Exchange 205
Computer Facilities 216
CP & I Computer Services 210
Crownwell Business Computers 196

D
Database Publications 39
Data Design Techniques 52
Data Factory 52
Data Plus 32
De-Vinci 45
Delta Ruben Assoc 75
Delta Pl Software 92
Digisolve 53
DigiLink 18
Digitabs 54
Disk Formations 232, 233
Display Electronics 70
E
Eden Trade Computers 8
Elite Computer Systems 165
Elora 86, 81
Erina 228

F
FCC Systems 54
First Publishing 127
First Software 79
Fornacs 189
Fraser Associates 44
Future Management 43

G
Gemini 239
Goto Computers 25
Grey Master 1, 271

H
HAT 67
Hi-Voltage 36
Hi-Soft 42
Hit Systems 101

I
IDS Insurance Solutions Consultants 4, 5
Ifc 229
Jrnlg 135
Juki 8, 49
Keele Decades 6
Kirklands 6

L
Labtec 42
Lambda 18
Leeds Polytechnic 229

M
Lambda Software 219
Leicester Computer Services 208
Link Design 199
Living Software 205
Logix 208

N
Maple Micro 211
Microcomputers 201
Microcomputer Systems 209
Microprocessors 209
Microprocessors 209
Microspec 209
Microtech 209
Microvision 209
Mighty Micros 58

O
OAC Training 225
Optimum Computer Technology 222

P
Pareto Corporation 240, 241
Parsons 240, 241
Peg Associated 225
Power Equipment 48
Power Pointer 23
Prism Craft 60
Pylon 121

Q
QW Training 225

R
Ringdale Engineering 208
Ross Reuter 204

S
Saxon Computing 213
Shagbark Blaine 210
Softalk 210
Software Technology 203
Sound Design Studio 211
SP Electronics 214
Superstore 208, 214
Swedate 214

T
Tourni 222
TV Services of Cambridge 202
Tyepro 209

U
U-Micron 20
User Prompt Guides 64

V
Vie-Oddles 227
Victor Technologies 21, 162

W
Walters 96
WD Software 22
Worldwide Computers 9
We supply cross-assemblers by Avocet. 250AD, and 1AS systems for more than 30 target processors to run on MS-DOS, CP/M-86 and CP/M-80. These total 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 Plik-86 is here.

Plain-86 MS-DOS £260.

Plain-86 Plus MS-DOS £235.

Plain-85 CP/M-80 £235.

SUNK-PLUS (80) CP/M-80 £235.

SUNK-PLUS (280) CP/M-80 £185.

**PROGRAM EDITORS**

BRIEF V.11. PC-DOS £150.

LATTICE V.8.PC DOS £195.

Epsilon V3.01. PC-DOS £170.

Firsttime for C. PC-DOS £175.

Firsttime for Pascal. PC-DOS £175.

Firsttime for Turbo-P. PC-DOS £175.

Meta PC. PC-DOS £150.

XPC w/Pascal source. PC-DOS £120.

Vedit-Plus. PC-DOS £175.

C (with source). MS-DOS £55.

MIX Editor. MS-DOS £40.

Plain 86 w/lock. MS-DOS £150.

Vedit-Plus. MS-DOS £175.

C (with source). CP/M-86 £175.

MIX Editor. CP/M-86 £175.

Vedit-Plus. CP/M-86 £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, as they are updated every few 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.

**ASSEMBLERS**

New version of Microsoft Macro-86 and lower prices for Microsoft Macro-80.

250AD DB06 Aem. MS-DOS £95.

Dig.Rema. RASH-86 MS-DOS £180.

MS Macro-86 V4.0 MS-DOS £115.

Phoenix Pasm-86 MS-DOS £175.

250AD DB08 Aem. CP/M-86 £95.

Dig.Rema. RASH-86 CP/M-86 £180.

Microsoft Macro-80 CP/M-80 £75.

SLR BRASAN CP/M-80 £50.

SLR BRASAN-PLUS CP/M-80 £185.

SLR CPC 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 £250.

Not all assemblers are supplied with a linker. Check before ordering.

**C COMPILERS**

Astec C Personal 1.060 CP/M-80 £150.

Astec Commercial 1.060 CP/M-80 £250.

Toolwork C/86 v3.1 CP/M-80 £45.

Rob C 1.500 CP/M-80 £150.

Eco-C v3.1 CP/M-80 £140.

C MIX v3.1 CP/M-80 £55.

Acol C CP/M-80 £95.

Lattice C v3.00 MS-DOS £295.

Microsoft C v3.00 MS-DOS £295.

Astec C86 Personal MS-DOS £150.

Astec C86 Developer MS-DOS £210.

Astec Commercial MS-DOS £210.

Antec Apprentice MS-DOS £50.

Mark Williams MHC86 MS-DOS £360.

C Optimizing C86 v2.3 MS-DOS £270.

Wizard C v2.1 MS-DOS £350.

C-Systems C v2.0 MS-DOS £210.

De Smet C86 v2.4 MS-DOS £145.

Digital Research C MS-DOS £290.

Toolwork C/86 v3.1 MS-DOS £45.

MIX C MS-DOS £55.

LETS C (Mark Williams) MS-DOS £75.

Acol C MS-DOS £95.

Astec C86 Developer CP/M-86 £270.

Astec C86 Personal CP/M-86 £160.

C Optimizing C86 CP/M-86 £270.

De Smet C86 CP/M-86 £165.

Digital Research C CP/M-86 £290.

Lattice C v1.04 CP/M-86 £295.

Astec C65 Apple DOS £150.

Astec C86 Commercial MACINTOSH £225.

Astec C86 Developer MACINTOSH £220.

Astec C86 Personal MACINTOSH £150.

**C CROSS COMPILERS**

We supply Astec and Lattice Cross Compilers hosted on MS-DOS, Apple, PD/1G, 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.

Linvig C PC-DOS £75.

Instant-C v1.44 MS-DOS £360.

Run/C MS-DOS £99.

Run/C Professional MS-DOS £250.

Linvig C Aprioc MS-DOS £75.

Instant-C v1.27 CP/M-86 £360.

**LIBRARIES**

**DATABASE**

Multi-HALO (CL/L, MSB) PC-DOS £175.

Halo Font Libraries PC-DOS £70.

Graph防 (CL/L, DMS) PC-DOS £210.

MetaWORMS (CL/L, MSB) PC-DOS £120.

GSS Kernel PC-DOS £255.

GSS System Controls PC-DOS £250.

GSS Plotting System PC-DOS £320.

GSS Metafile Inprtr. PC-DOS £140.

GSM Programmer Toolkit (L) PC-DOS £150.

GSD Programmer Toolkit (88) PC-DOS £225.

**SCREEN & WINDOWS**

Panel (Most Compilers) MS-DOS £245.

Entelephon Window((ce) PC-DOS £99.

Vivace C MS-DOS £140.

Lattice Windows (L) PC-DOS £195.

Windows for Pro (Most) PC-DOS £250.

Windows for C MS-DOS £165.

Blaise View Manager PC-DOS £245.

Curses Screen Mgr. (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.

Entelephon Prompt(source) PC-DOS £99.

Novum Blocks 1 (source) PC-DOS £150.

Novum Blocks 2 (source) PC-DOS £150.

**COMPS LIBRARIES**

Blaise Anywh (source) PC-DOS £145.

Greenleaf Comps (source) PC-DOS £145.

Novum Comps. (source) PC-DOS £140.

**SCIENTIFIC LIBRARIES**

Wiley Scientific Lib. ANY C £165.

**PROGRAMMERS UTILITIES**

PC-Lint MS-DOS £100.

Pre-C (Phoenix Lint) MS-DOS £90.

FigureFlow C-DOC PC-DOS £275.

FAST-C (debug util)(L) PC-DOS £195.

C Help. PC-DOS £125.

Lattice Cross Ref. MS-DOS £45.

Lattice Test 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, CP/DOS, ISYS, APPLE, BUSINESS, BBC, TORCH, APPLIX, HPP2, TRW2, BCC, MS-DOS, TR-11, IBM BDP, ADFM320, AMSTRAD.

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

For more information call us.
Memo from marketing  
To: The hand-picked team  
Re: The great and secret anniversary push

Well, strange as it may seem, we survived the Christmas rush — or perhaps spavined shuffle would be a better description — and following the grand vizier's examination of the entrails on the top floor, it turns out that celebration is in order.

(Except for the sales manager, of course, whose metaphorical entrails they were.)

It transpires that, having bent its brains to the problem of counting up to 60 without removing its collective shoes and socks, your board has calculated that our fifth anniversary occurs next month. And naturally enough, it has asked me to run some ideas up the flagpole and try to improve our chances of surviving the next five years — or five minutes, come to that.

Well, where have we been in the last five years? Back in 1981, we were selling clapped-out 8-bit computers at grotesquely-inflated prices. Now we are selling clapped-out sort-of-16-bit computers at even more grossly-inflated prices (thanks to inflation). Plus ça change, plus c'est la même old rubbish, if you ask me.

But how to celebrate this great anniversary that I have 10 minutes' notice to promote? Simple. The motif is cables.

Think back and you will remember that five years ago, we were shipping wonderful systems with Z80 processors, 64k RAM, WordStar, and all that sort of stuff. We were also shipping printers like the Diablo 630 and 1640, which could be used for balingast the Q2, and also vibrated themselves along the table and into the WPRB unless watched carefully and sandbagged in. And NB: we did not supply a cable that connected them.

Those were the days. Caveat emptor, or caveat sucker as we used to call it. Give 'em the machine, give 'em the printer, and then refuse to take phone calls when they panicked about plugging one into another. And then, and then, sell 'em the cable they needed for £40 and make sure it didn't work properly!

It brings tears to my eyes, thinking of the bank balances we got out of putting right the things we'd done wrong. And we didn't even have to do them wrong on purpose; micro engineers, on the wages we paid in 1981, could be guaranteed to connect every wire in every cable to every other at random to find out if something worked.

But enough nostalgia — after all, even in 1986, we can get some WTS orang-utan for 3p a week for two years — and back to business.

Wouldn't it be nice to say: 'We give you all the connections you'll ever need' and then add: 'We also sell computers' in brackets? Along with photos of all the beautiful cables we produce at prices that would make Getty think twice, we've already proved that customers don't care what hardware they buy — they buy ours, after all — so our unique selling point must be the bits of wire. And don't mention software, for God's sake: we've still got half of the buyers convinced that we actually wrote WordStar and let them use it out of charity.

No, it's got to be something concrete, marginally useful and ruinously expensive, and cables qualify on every count. So does the chairman of course, but that's another story...

Please eat the last paragraph after reading, and think ribbons and PVC sheathing!

Yours entangledly,

Charles
The new Juki Model 6100 letter quality daisy wheel printer, has full features you'd expect to find on a more expensive printer. It can support word processing and graphic functions, print 20 CPS and use a simple drop-in daisy wheel. The 6100 has 10/12/15 pitch, proportional spacing, utilizes IBM standard Selectric ribbons, has 2K buffer memory, parallel interface both tractor feed and serial interface are available as options. That's only the beginning — Best of all, the low-noise Juki 6100 is extremely reliable. You can pay more, but you can't buy better than the Juki 6100.

**FEATURES:**
- 20 CPS (max.) print speed
- Bold and shadow printing
- Subscripts and superscripts
- Wordstar compatible
- Auto underlining
- Diablo protocols
- Standard 2K buffer
- 1 year parts and labour warranty
- Comprehensive user friendly manual
- 10, 12 & 15 CPI + proportional spacing

available for around £399*

INTEC UNIT 3, HASSOCKS WOOD, WADE ROAD, BASINGSTOKE, HANTS, ENGLAND, RG24 1NE
Telephone: BASINGSTOKE (0256) 473232 (32 lines)
Telex: 859669 MICROP G Facsimile: 0256 461570

**Micro Peripherals Ltd**

"PRINTERS FOR ALL APPLICATIONS"

Call your local dealer NOW for full information on the Juki 6100 Daisy-wheel Printer or clip this coupon and we'll send you brochures and print samples.

Name: ____________________________
Address: __________________________
Tel. No.: __________________________

PCW 4186
There's a place where you can buy a Mac, buy Mac software, talk to Mac experts, see the latest Mac add-ons, join Mac training courses and have your Mac maintained and serviced. It's called

The Macintosh Centre

(Where were you going to buy yours?)