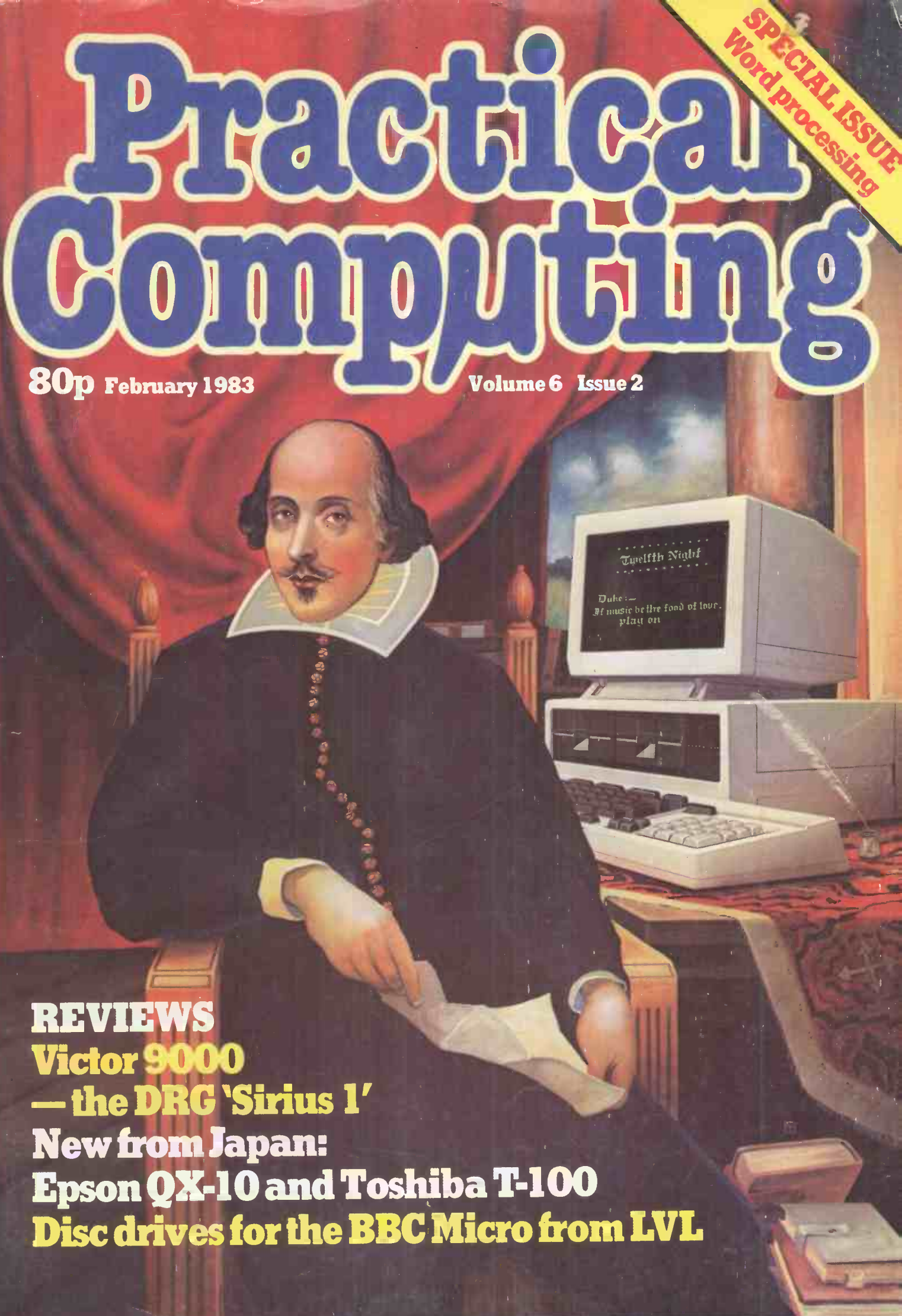
Practical Computing

SPECIAL ISSUE
Word processing

80p February 1983 Volume 6 Issue 2



REVIEWS

Victor 9000
— the DRG 'Sirius 1'

New from Japan:
Epson QX-10 and Toshiba T-100

Disc drives for the BBC Micro from LVL

Cromemco System One

MicroCentre introduce Cromemco's new System One computer, available with an integral 5 megabyte Winchester hard disk, at a new low price.

The System One supports the full range of Cromemco interface cards, including high resolution colour graphics, and software packages. The choice of operating systems includes CDOS, CP/M and CROMIX—Cromemco's answer to Unix.

Call MicroCentre for Cromemco

MicroCentre Ltd
(Complete Micro Systems)
• Circle No. 101

Britain's independent Cromemco importer

30 Dundas Street
Edinburgh EH3 6JN
Tel: 031-556 7354

>LIST

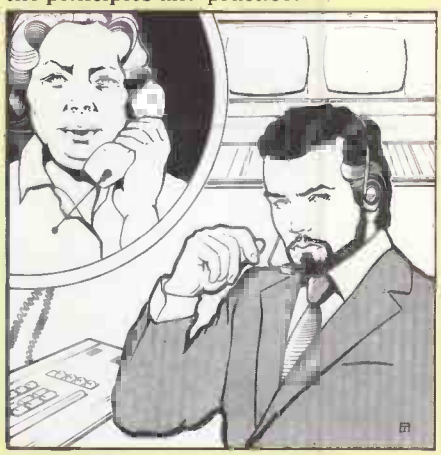
PRACTICAL COMPUTING FEBRUARY 1983

>NEWS

>REVIEWS

>WORD PROCESSING

>FEATURES



>REGULARS

We take all the guessing out of terminal buying

Micropute is a fast developing distributor with the sole aim of guiding you through the systems jungle. We carefully test, evaluate and then select the best product from its own marketplace. We then add our own extensive product knowledge and all the necessary ancillaries related to the main product. All this fully backed and protected by fast, comprehensive nationwide servicing and maintenance coverage.

K9 Terminal

Main features:

- 80 x 25 (including status line)
- Green display
- Seperate keyboard
- Function keys
- Self test
- Reverse video
- Underlining
- Half intensity
- Protected mode
- Line and block graphics
- Televideo compatible
- Baudrates to 9600

The K9 Terminal is undoubtedly one of the most competitively priced terminals available on the market today which can offer so many outstanding features.

The K9 Terminal is supplied to us by I.C.L. and includes the type of back-ups and product development that you would expect from a major manufacturer.

Delivery is ex-stock and this amazing terminal is now available at the incredible price of only: **£525.00** + V.A.T.

Insight Terminal

Main features:

As the K9 Terminal plus,

- Deeper contrast on screen
- Black screen surround (eliminates reflections)
- Deeper recessed screen
- Customised for Wordstar
- Optional 15" screen
- Optional graphic display
- Alternative emulations. VT52, Beehive

The Insight Terminal is again, extremely competitively priced offering an even greater amount of features than the K9.

The latest addition to the already impressive list of this terminals features is the option of full graphic display, which is now available as an ex-stock item.

Delivery on all Insight Terminals is ex-stock and prices start from as little as **£595.00** + V.A.T.

All Micropute products are backed by a nationwide service and maintenance team.

For further technical data and the name of your nearest dealer send the coupon now!

MICROPUTE Catherine Street, Macclesfield, Cheshire SK11 6QY. Tel: (0625) 612759

Name _____ Position _____

Company Name _____

Company Address _____

_____

_____

Tel. No. _____

MICROPUTE

Catherine Street, Macclesfield, Cheshire SK11 6QY. Tel: (0625) 612759

● Circle No. 102

Practical Computing

EDITORIAL 01-661 3609
Editor
Jack Schofield
Deputy Editor
Bill Bennett
Assistant Editor
Ian Stobie
Art Editor
Steve Miller
Production Editor
John Liebmann
Sub-editor
Sally Nicholls
Editorial Secretary
Julie Milligan
Consultants
Chris Bidmead
Peter Laurie
ADVERTISING 01-661 3612
Advertisement Manager
Ian Carter 01-661 3021
Assistant Advertisement Manager
Kenneth Walford 01-661 3139
Advertisement Executives
Flona Howell 01-661 3468
Robert Payne 01-661 8425
Advertisement Secretary
Janet Thorpe
Midlands office:
David Harvett 021-356 4838
Northern office:
Geoff Aikin 061-872 8861
PUBLISHING DIRECTOR
Chris Hipwell

Published by IPC Electrical Electronic Press Ltd. Quadrant House. The Quadrant. Sutton. Surrey SM2 5AS. Tel: 01-661 3500. Telex/grams 892084 BIP RESG.

Typeset by Centrepoint Typesetters London EC1 and printed by Eden Fisher (Southend) Ltd. Southend-on-Sea.

Distributed by IPC Business Press (Sales and Distribution) Ltd. Quadrant House. The Quadrant. Sutton. Surrey SM2 5AS.

Subscriptions: U.K. £12 per annum: Overseas £18 per annum: selling price in Eire subject to currency exchange fluctuations and VAT: airmail rates available on application to Subscription Manager IPC Business Press (S&D) Ltd Oakfield House. Perrymouth Road. Haywards Heath. Sussex RH16 3DH. Tel: 0444 459188.

ISSN 0141-5433

Would-be authors are welcome to send articles to the Editor but *PC* cannot undertake to return them. Payment is at £30 per published page. Submissions should be typed or computer-printed across a 40-character width, and include a tape or disc of the program. Handwritten material is liable to delay and error.
Every effort is made to check articles and listings but *PC* cannot guarantee that programs will run and can accept no responsibility for any errors.

Protecting U.K. micro builders

THE BRITISH MICROCOMPUTERS Manufacturerers' Group recently presented a letter to the Prime Minister asking her to ban for one year all imports of Japanese and American microcomputers. The group argues that imports are already taking 90 percent of the market and that British manufacturers are about to be wiped out.

Now not every British micro manufacturer is a member of the BMMG, whch is a fledgeling organisation. Not every member of the BMMG is fully behind the import ban: Sinclair is, for example, one exception. Nor probably, does any member of the BMMG seriously think such a ban is going to be imposed. However the BMMG does have cause for complaint and has drawn attention to them.

The first problem is the list of microcomputers prepared by the government's procurement agency the CCTA (Central Computer and Telecommunications Agency). This includes imported micros but excludes some well-known British names.

It seems admirably fair for the British government to recommend its departments to buy foreign micros and we could only wish that the Japanese and American governments would show similar open-mindedness. Of course they don't. However, it is the exclusion of British manufacturers that really rankles. Some members of the BMMG receive government support, in the form of grants, to produce microcomputer products. Meanwhile the government procurement agency prevents them from selling these products to other government departments.

This surely is ludicrous. If products are good enough to receive government funding then they should be good enough for the government to buy. That foreign products are recommended instead merely rubs salt into the wound.

Sadly, exclusion from the CCTA list does not only affect purchases by government departments. The list is published, so to other potential buyers may be influenced by it. This apparent lack of government approval can hardly help any vigorous export drive.

A second point, raised particularly by Sinclair, is that government import duties discriminate against U.K. manufacturers. The duty on imported components is 17 percent, but on most fully assembled products is only six to seven percent, which must give an advantage to the overseas manufacturer.

So there are at least two things the government can do to help: revise the CCTA list and change the way import duties work.

Having said that, the members of the BMMG can do a few things to improve matters themselves. Often their products are technically exciting, but they do not always put as much effort as they should into other areas, such as styling, marketing, and delivery systems on time. No names, no pack drill. It is, however, worth noting that the Dragon has been a great success in the U.K. despite the fact that it is not a very interesting or sophisticated machine. Advertising, availability and price have so far proved more important.

Finally, is British microcomputer manufacturing really on the point of extinction? In the home-computer field, exemplified by Sinclair, we would say not. In the nearly-mini business field, exemplified by Systime, we would say not. In the mid-range business field, maybe.

The reason is that the U.S. competition is already tough, and now the Japanese are poised to swamp us with vast quantities of business micros. They will probably not be very interesting technically, but they will be well advertised, available and cheap. Those qualities are hard to argue with.

5 Years ago...

The early microcomputer hobby customer base was amazing in the fervour with which it pursued products. Customers were so eager to buy that they established an industry payment practice which was initially necessary — but which has become a liability.

It is the practice of paying in advance for products. frequently months in advance of delivery. In the early days of the personal computing industry. front-end payments were absolutely necessary. since manufacturers had no track record. no visibility. and no chance of obtaining loans or funding through any traditional sources.

Instead. they were forced to advertise a product before it existed. demand cash payments with orders. and then spend the cash to build the product which had been ordered.

This is called "forward financing". it works while business is increasing rapidly and products are designed on time. Business has. indeed. increased rapidly. but products have not always been designed on time. Frequently they have been very late or have not worked at all.

Dr Adam Osborne

Practical Computing Volume 1 Issue 1

WATFORD ELECTRONICS

33b Cardiff Road, Watford, Herts, England
Tel Watford (0923) 40588. Telex: 8956095

ALL DEVICES FULL SPEC. AND FULLY GUARANTEED. TERMS OF BUSINESS: CASH/CHEQUE/P.O.S. (OR ACCESS) WITH ORDER. GOVERNMENT AND EDUCATIONAL INSTITUTIONS OFFICIAL ORDERS ACCEPTED. TRADE AND EXPORT INQUIRIES WELCOME. (P&P add 50p on all cash orders). Unless stated otherwise.

VAT ALL PRICES ARE EXCLUSIVE OF VAT. PLEASE ADD 15% TO THE TOTAL COST INCLUDING P&P. SHOP HOURS: 9.00am-6.00pm MONDAY TO SATURDAY. AMPLE FREE CAR PARKING SPACE AVAILABLE. FOR QUANTITY PRICES PHONE WATFORD (0923) 40588

Computer IC's

1702	350
1802CP	650
2112-2	250
2114L-300n	50
2114L-200n	95
2147-3	425
2532-450n	350
2564	£10
2708	225
2716-5v	215
2732-450n	350
2764	550
3242	590
4027	190
4116 150	85
4116 200	80
4118 250	325
4164 200	450
43343	
(CMOS 2114)	325
4816A 100nS	225
4864 364k	450
5101	220
6116 150nS	390
6116L 120nS	550
6117 100n	490
6167-6	795
6502 CPU	325
6503	600
6504 250	550
6521	125
6522 VIA	300
6530 RRIOT	£11
6532 RIOT	570
6545 CRTC	899
6551 ACIA	650
6592 PC	£20
6800	225
6802	250
6803	850
6804	160
6805	670
6808	520
6809	630
6810	115
6820	110
6821	110
68B21	220
6840	375
6843	£12
6845	885
6847	650
6850	110
6852	250
6854	599
6875	500
6800	£78
74C922	420
8080A	250
8088	£18
8085A	350
81LS95	80
81LS96	80
81LS97	80
81LS98	85
8118	£225
8118-10	250
8123	125
8155	350
8156	350
8202	£25
8205	225
8212	110
8214	225
8215A 300	300
8216	100
8224	110
8226	250
8228	220
8243	270
8250	850
8251	250
8253	400
8255	255
8256A	£35
8257	400
8259	395
8271	£36
8279	385
8284	350
8288	£10
8T26A	99
8T27-3	150
8T28A	120
8T31	350
BT95N	90
BT97N	90
B364AP	550
9602	220
AM26LS31C	125
AM26LS32A	125
AY 3890	£438
AY 3 1095	300
AY 3 1270	£675
AY 3 8910	375
AY 5 1013	300
AY 5 1350	388
AY 5 2376	600
AY 5 3600	750
COM8017	275
COM8116	700
ON81 31	275
DP8304BN	260

DS3691N	320
DS8BLS120N	275
DS8830	110
FD1761	£15
FD1771	£15
FD1791	£22
FD1793	£23
FD1795	£28
FD1797	£28
HD26501	75
HM61676	795
IM6402	380
INS8060N	1050
INS8154N	£9
MC1488	55
MC1489	55
MC14411	675
MC14412	775
MC3446	215
MC3447P	315
MC6845	625
MC6846	625
MK3886 2M	£7
MM5280D	695
MM5303	635
MM5307	1275
MM5387A	475
MM538174	720
RO 3 2513L	650
RO 3 2513U	600
SFF96364E	800
SP0256AL2	£18
TMS27163	725
TMS4164 15	475
TMS6011	365
TMS9928	£30
TMS9929	£30
TMS9995	£12
ULN2003	75
UPD7002	440
Z80B	875
Z8CPU2.5	299
Z80ACPU	300
Z80B	875
Z80CTC	250
Z80ACTC	260
Z80DART	495
Z80ADART	550
Z80DMA	675
Z80ADMA	895
Z80PIO	260
Z80APIO	275
Z80SIO	850
Z80ASIO	900
ZN419CE	190
ZN423E	138
ZN424E	130
ZN425EB	345
ZN426EB	300
ZN427EB	590
ZN428E	410
ZN429EB	210
ZN459	570
ZN1034E	200
ZN1040E	675
ZNA234E	850

74S Series

74S00	30
74S02	30
74S03	32
74S08	40
74S10	40
74S20	40
74S27	40
74S32	70
74S74	75
74S112	90
74S132	110
74S133	60
74S133	115
74S139	115
74S155	39
74S158	195
74S175	260
74S188	140
74S189	140
74S194	320
74S201	350
74S225	525
74S274	390
74S241	300
74S244	290
74S257	250
74S260	50
74S262	850
74S287	300
74S288	210
74S189	290
74S301	000
74S365	000
74S374	365
74S470	325
74S471	620
74S472	1150
74S475	825
74S571	620

75 Series

751078	95
75110	90
75150/54	125
75182/3	99
75118/9	55

7532	140
75450	86
75451/2	52
75454	70
75491/2	65
74S112	90

TTL74

7400	11
7402	11
7404	13
7410	14
7411	15
7423	18
7414	20
7420	15
7422	20
7427	18
7430	14
7442	32
7447	40
7400	11
7448	40
7473	24
7474	20
7475	25
7485	60
7486	20
7489	170
7490	20
7491	35
7492	25
7493	25
74100	80
74116	50
74121	25
74125	35
74126	35
74143	210
74148	60
74150	50
74151	40
74153	40
74154	55
74186	470
74188	250
74383	99

74LS

LS00	11
LS02	11
LS04	12
LS08	12
LS10	13
LS11	13
LS13	20
LS14	26
LS19	58
LS20	13
LS22	12
LS27	12
LS32	13
LS30	12
LS42	28
LS47	35
LS48	55
LS63	120
LS73	18
LS74	18
LS75	20
LS85	42
LS86	16
LS90	24
LS91	60
LS92	32
LS93	23
LS125	24
LS126	25
LS138	25
LS139	28
LS148	70
LS151	40
LS153	40
LS156	36
LS157	27
LS158	30
LS175	50
LS240	55
LS241	55
LS242	55
LS243	55
LS244	55
LS245	70
LS273	54
LS373	60
LS374	55
LS393	42
LS471	629
LS640	180
LS641	180
LS645	180
LS668	125
LS669	120
LS670	100
LS673	550

CMOS

4000	10
4001	10
4002	12
4009	24
4010	24
4011	10
4012	16
4018	20
4017	32
4018	45
4023	13
4025	13
4027	20
4034	140
4040	40
4042	44
4051	45
4052	60
4053	50
4066	24
4068	14
4069	13
4070	13
4076	50
4077	13
4081	13
4093	20
4099	75
4160	95
4161	99
4162	99
4163	99
4174	99
4175	105
4411	690
4412	790
4419	350
4450	350
4451	350
4490	350
4500	675
4501	75
4504	75
4505	185
4508	130
4511	46
4519	30
4528	50
4549	375
4569	175
4583	99
4584	48
4585	99
4597	330
4598	290
4599	290
40101	130
40105	118
40106	75
40108	450
40110	300
40114	240
40163	50
40244	195
40245	195
40373	240
40374	245
45106	595

DRAGON

The family computer

Only: £173 (car £4)

JUPITER ACE

Microcomputer. Uses the Ultrafast FORTH. Has 8K ROM 3K RAM. 32 × 24 display. User definable characters, timer fast cassette interface, all controlled by a Z80A CPU.
Only: £78

ULTIMUM

WATFORD's own most versatile MICRO EXPANSION SYSTEM. Ideal for interfacing with APPLE, ATOM, DRAGON, PET, RESEARCH MACHINE, SPECTRUM, SUPERBOARD, UK101, VIDEO GENIE, ZX81, etc.
Low cost, high spec. As published in Practical Electronics starting from November 1982 issue. Send SAE for details.

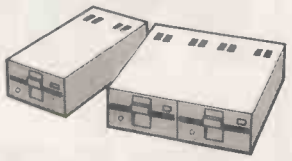
BBC Micro UPGRADE PARTS

Upgrade your BBC Micro with our Upgrade & Kits and save yourself £sss...

- 16K Memory (8×4816AP-100nS) BBC1 £18.00
- Printer User I/O Port BBC2 £8.20
- Complete Printer Cable 36" £12.00
- Disc Interface Kit BBC3 £41.00
- Analogue I/O Kit BBC4 £6.75
- Serial I/O Kit BBC5 £7.50
- Expansion Bus Kit BBC6 £6.50
- Model A to Model B Upgrade Kit £45.00
- Joysticks for BBC (per pair) £12
- Complete range of Connectors & Cables available. Send SAE for list.

We specialise in BBC Peripherals, Software and Accessories. Just phone us for your requirements.

FLOPPY DISC DRIVES



- TEAC FD-50A Single Uncased 40 track S/sided 100K £125
- TEAC FD-50A Single Cased 40 track S/sided 100K £180
- TEAC FD-50A TWIN Cased 40 tracl S/sided 200K £335
- TEAC FD-50A Single Cased 80 track S/sided 200K £238
- SIEMENS FDD 100-5 Cased, Head Motors, track zero, micro switch motor control PCB with read write and control electronics plus cable. Special Apple compatible £215
- Apple Disc Interface Card £38
- Apple 80 Column Card £125
- 2 Drives Daisy chain cable £12
- Single Drive Cable £8
- 10 Verbatim Diskettes 5¼" SSSD £20
- 10 Verbatim Diskettes 5¼" DSDD £30
- 10 Verbatim Diskettes 8" SSDD £30

NEC PC8023-C

Europes most popular printer

Bi-directional, 80 column, 100CPS, Logic seeking, Hi-Res, block graphic Forward and Reverse line feed, proportional spacing, true descenders, 2K buffer. at a giveaway price:
Only: £320 (carr. £7)

SEIKOSHA GP100A

Price includes FREE 500 Sheets

Unihammer Printer, gives normal and double width characters as well as dot resolution graphics 10" Tractor feed. Parallel interface standard. £175 (£7 car.
SEIKOSHA GP250X Only: £235 (£7 carr.)

SOFTY-2

Price includes FREE 2532

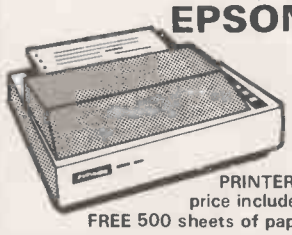
Softy is an intelligent EPROM Programme & Emulator. Has Memory Map, TV Display, RS232 & Centronics I/P & O/P. Copies, Emulates and Programs EPROMS. RS232 & Centronic routines standard. Includes PSU. Price: £169

SPECIAL OFFER

	1+	25+
2532	330p	295p
2732	350p	330p
2764	550p	475p
4116-200n	85p	80p
6116	390p	360p
6522	300p	280p

Just 'phone your order through, we do the rest.

EPSON



PRINTERS price includes FREE 500 sheets of paper

MX80FT/3 10" Tractor & Friction Feed 9×9 matrix, 80 column, speed 80cps, Bidirectional, Centronic Interface, Baud rate 110-960 (RS232) Hi-res, Bit image graphics, Subscript & superscript, Italic & Underlining facility. Fully guaranteed. Only: **£324 (carr. £7)**

MX100FT/3 136 columns, 15" carriage, plus all the facilities of MX80FT/3.
Only: £425 (carr. £7)

ACCESSORIES

- **TEX EPROM ERASER.** Erases up to 32 ICs in 15-30 min. £33
- **TEX EPROM ERASER** with incorporated Safety Switch £38
- **Electronic Timer** Solid state. Connects directly to above Erasers. Protects your expensive Chips from overcooking. Our timer pays for itself in no time. £15
- **Tex Eprom Eraser** including the Electronic timer. £44
- Spare UV lamp bulbs £9
- Power supply regulated, overload protection variable: 5V to 15V @ HA £38
- **Multirall psu** kit including Case. Output: +5V/5A; +12V, +25V, −5V, −12V @ 1A. Only £39 (p&p 95p)
- Attractive Beige Brown ABS CASE for Superboard UK101 or Home Brew £26
- C12 Cassettes in Library Cases 40p
- 8" Fan fold paper (1000 sheets) £7
- 9½" Fan fold paper (1000 sheets) £7
- Teleprinter Roll 250p
- UHF Modulator 6MH2 280p
- UHF Modulator 8MH2 450p
- **Stack Pack** the unique stackable twin drawer racking system for Computer Cassettes. 5 Drawers (10 sections) including labels. 250p
- **Stack Pack** incl. 10 off C12 Computer Cassettes. 550p

CRYSTALS

32 768KH	100	16 0MHz	200
1MHz	275	18 0MHz	180
1 6MHz	392	18 432M	150
1 8MHz	395	19 968M	150
1 843M	200	20 0MHz	200
2 0MHz	225	24 0MHz	170
3 2768M	150	24 930M	325
3 57594	98	48 0M	175
3 6864M	300	100 0M	375
4 0MHz	150		
4 433619	100		
5 0MHz	160		
6 0MHz	140		
6 144MHz	150		
6 5536M	200		
7 0MHz	150		
7 168MHz	160		
7 68MHz	200		
8 0MHz	150		
9 0MHz	200		
9 375M	350		
10 0MHz	175		
10 7MHz	150		
10 24MHz	200		
12 0MHz	175		
12 528M	300		
14 31818	170		

WEMON

Watford's specially designed 4K Ultimate Monitor IC for UK101 & Superboard

Only £10.

IDC CONNECTORS

Speed block type	PCB Plug with latch Strt Pins	PCB Plug with latch Angle Pins	Female Header Socket	Female Card Edge Connectors
10 way	90p	99p	85p	120p
16 way	130p	150p	110p	—p
20 way	145p	166p	125p	195p
26 way	175p	200p	150p	240p
34 way	205p	236p	160p	320p
40 way	220p	250p	190p	340p
50 way	235p	270p	200p	395p

JUMPER LEADS Ribbon Cable Assembly DIL Plug (Headers)

Single Ended Lead 24" Long

Length	14pin	16pin	24pin	40pin
24"	145p	165p	240p	380p

Double Ended Leads

6"	185p	205p	300p	465p
12"	198p	215p	315p	490p
24"	210p	235p	345p	540p
36"	230p	250p	375p	595p

IDC female receptacle jumper leads

	20way	26way	34way	4way
24"				
1 end	160p	200p	260p	300p
2 end	290p	370p	480p	525p

DIL SOICKETS

	Low Prof	Wire Wrap
8pin	8p	25p
14pin	10p	35p
16pin	10p	42p
18pin	16p	52p
20pin	16p	52p
22pin	25p	70p
24pin	25p	70p
28pin	28p	80p
40pin	30p	99p

RIBBON CABLE

Ways	Grey	Colour
	Price per Foot	
10	12p	22p
16	25p	32p
20	25p	40p
26	35p	52p
34	48p	60p
40	55p	70p
60	75p	115p

DIL PLUGS (Headers)

	Solder	IDL
14pin	38p	95p
16pin	42p	100p
24pin	88p	130p
40pin	195p	218p

AMPHENOL PLUGS

24way IEEE	560p
36way Centronics	
Parallel	550p

ZIF DIL SOCKETS

24way	575p
28way	850p
40way	975p

VIDEO MONITORS

A choice of 5 attractively finished video monitors with a smoked antiglate display filter. Bandwidth 12MHz; Res 750 lines, I/P 72Ω or high; 240V, 50MHZ.

	9"	12"
Black & white	£89	—
Green	£95	£114
Amber	£98	£118
Zenith 12" Green Monitor		£85

EURO (DIN) CONNECTORS

	Female Strt. Pins	Female Angle Pins	Male Strt. Pins	Male Angle Pins
DIN41617 31way	170p	—	—	175p
41612 A+B 2×32way	285p	325p	220p	295p
41612 A+C 2×32way	300p	325p	240p	300p
41612 A B C 3×32way	360p	385p	260p	400p

EDGE CONNECTORS

	.156"	.1"
TWO ROWS		
2×18	145p	180p
2×22way	200p	199p
2×23way		185p
2×25way		225p
2×28way		195p
2×30way		245p
2×36way		295p
2×40way		315p
2×43way		395p

D CONNECTORS: Miniature

	9 way	15 way	25 way	37 way
Male				
Solder	80p	110p	160p	250p
Angle	160p	210p	250p	355p
Pins	120p	130p	195p	295p
Female				
Solder	110p	160p	210p	350p
Angle	165p	215p	290p	440p
Pins	150p	180p	240p	420p
Covers	100p	95p	100p	110p

IDC 25way 'D' plug 385p Skt 450p

● Circle No. 103

A great new career for Kenneth Baker

THANK YOU for printing Boris Allan's common-sense article about Information Technology Year — December 1982 issue, page 141. It made a welcome change from the high-powered propaganda that we have come to associate with IT 82.

As part of my work as an independent consultant, I have been asked to advise dozens of companies who neither need nor can afford microcomputers but who are being scared — I use the word in its literal sense — into new technology. They have seen the ads: the seven-year-old who is "better equipped to run the office than you are"; the technology that is better in the pub than in the office.

Worse, they believe this nonsense. So instead of making rational investment decisions they rush out in a panic to buy, as if there were indeed "no future without it".

IT 82 did a great job in pushing American and Japanese hardware into businesses that were not always in a position to use it. It did nothing to make those businesses more competitive or more likely to survive. If Kenneth Baker ever leaves politics he can have a great career selling soap powder.

Mike Lewis,
London NW3.

Printer interfaces

GEORGE HILL'S ARTICLE on page 155 of November's *Practical Computing* did not mention to which model of Microline printer he was referring. Having a Microline 82 I was surprised to note that the Dip switch settings in figure 3 select a German character set and the parallel interface, which would make little sense of a serial output from a BBC Micro.

For the benefit of others with Microline 82s the correct Dip settings are.

Front board	Rear board
1 Off	1 On
2 On	2 On
3 Off	3 Off
4 Off	4 On
5 Off	5 On
6 On	6 Off
7 Off	
8 On	

P S Rickets,
Manchester.

Computer wanted

I HAVE a terminal but no computer. It has standard V-24 20mA interface with TTY-compatible keyboard. I would like to interface this to a single-board computer preferably with 8K minimum RAM.

Judging by numerous unanswered enquiries some U.K. distributors seem uninterested in small export orders. Perhaps they forget Apple grew from a secondhand VW.

Would any readers be in a position to assist? A secondhand board, even self-assembled, might do the trick.

Des O'Brien,
Dublin.

Advantage problems

I HAVE JUST SEEN in the June issue the article by Mike Hughes on the North Star Advantage. The first point is in that your specifications column, the distributor is quoted as Comart Ltd. As a point of information, Comart is just one distributor: we are another.

Point two is the problem which "North Star, through Comart ought to sort out". We have sorted it out, and distributed the solution to our dealers through our monthly newsletter. The May edition contained the following.

TECHNICAL TIPS: Your Questions answered.

Q: Can you supply a patch to CP/M for the Advantage to prevent a possible crash when ASCII 255 (DEL) is sent to the screen?

A: The fix for the problem described is as follows:

1. Modify CPMGEN.COM
2. Save the new version under a new name (e.g. NEWGEN.COM)
3. Regenerate your system
4. Try to recreate the failure
5. If the fix works, delete the old CPMGEN.COM, and rename NEWGEN.COM to CPMGEN.COM.

The fix is:

1. DDT CPMGEN.COM
2. NOP (ZERO OUT) locations 3612 + 3613
3. Exit DDT
4. Save the file
5. Test the fix
6. Scratch the old and rename the new.

Thirdly in your conclusions sections, you suggest that WordStar be "patched to make use of the 15 function keys": we have in stock Enhanced WordStar for the Advantage which does, in fact, use the function keys, both alone and shifted, for the 30 most common operations and includes an adhesive legend strip with which to label the keys.

We appreciate that the machine was lent to you for review by Comart, but we do feel most strongly that references to distributors should include ourselves.

Stuart Herman,
Trader Computers Ltd,
London NW8.

Compacted code

I READ with interest Bob Mackay's article on compacted text on page 147 of November's *Practical Computing*. Anyone who would like to read further on the subject should read my paper on text compression in the *Computer Journal*, Volume 4 (1981), page 324 which shows how to efficiently combine Huffman coding with dictionary coding in a single scheme.

Jack Pike,
Chawstone,
Bedfordshire.

Trade marks

A LARGE NUMBER of advertisers appear to be under the misapprehension that the trade mark "CP/M" is a registered trade mark. This is not the case — the mark is not a registered mark as defined by the Trade Marks Act, 1938. Moreover, while it may well be that "CP/M" is a registered mark according to U.S. law, none of *Practical Computing's* advertisers have indicated this to be so.

Section 60 of the act lays down that a £5 fine is the penalty upon summary conviction for representing that a mark is registered when in fact it is not, unless the representation makes it clear that the relevant registration is in accordance with the laws of some other country.

J P E Hooper,
Colchester,
Essex.

Machine code

IN THE JULY and October issues two readers reported an unusual bug in Pet Rem statements. The cause of this bug is that the Microsoft interpreter treats the shifted characters as tokenised Basic keywords.

This problem only occurs in Rem statements because in normal lines the interpreter automatically deletes shifted characters that appear outside quotes before the line is copied into the main memory. The characters in Rem statements are protectd from this.

A way round this problem is to put a quote character immediately after the Rem — the rest of the line will now list exactly as entered.

Robert Bannister's letter in the October issue raised many points that I should like to be able to comment on. Firstly manufacturers still make computers with built-in VDUs because they are increasingly required for the business market where their clarity and good ergonomic design are appreciated. Incidentally, most monochrone VDUs that I know of use a green phosphor that actually reduces eye strain.

If Mr Bannister has tried to write any complicated games, with many multi-character, moving objects, he will have had difficulty in making the program run fast enough because of the inherent slowness of interpreted high-level languages such as Apple Basic.

For this reason, many programmers prefer to write in

(continued on next page)

Our Feedback columns offer readers the opportunity of bringing their computing experience and problems to the attention of others, as well as to seek our advice or to make suggestions, which we are always happy to receive. Make sure you use Feedback — it is your chance to keep in touch.

(continued from previous page)
machine code which in typical game applications is 100 to 1,000 times faster than Basic.

The amount of RAM taken up by a Space Invader program is of little importance unless it exceeds your RAM limitations, otherwise it merely gives a rough indication of the complexity of the program.

To say that machine code is "gibberish" indicates that Mr Bannister is as misinformed as someone who, knowing nothing of computers, says that Basic program is meaningless gibberish — a statement born of ignorance rather than logical reasoning.

Like it or not, computer games are attracting the most newcomers to computing and in particular these are the better arcade-style games such as Invaders or Pacman, which are by necessity written in machine code. These newcomers help to create competition between the manufacturers not only for the best computer but also the most attractively priced one. So we machine-code programmers are actually doing those who do not indulge a great service.

Finally if Mr Bannister wants a better Basic with long variable names, easier and better graphics, more user-friendly commands and better sound, perhaps he would like to try a BBC model B micro — not just because of it's British, but because it's the best.

If he wants more memory he could add a 3MHz 6502 card or an Z-80 card or a 16032 card.

P D Martin,
Manchester.

Speed freaks

CONTRARY TO the editorial in the July 1982 issue, Hermann Hauser has stated in July's *Which Micro?* that the 16032 processor does have advantages over eight-bit processors. To be precise, a speed advantage of 1,000 percent and size advantage of 35 percent. This is of course carefully written 16-bit code, not converted 8080.

P G Womack,
Kenninghall,
Norwich.

● Yes but only a floating-point maths program ran that much faster. Many users only care about processing words made up of eight-bit letters, and about maths rounded to two decimal places — that is, the pence column. A Ferrari is faster than a Mini and has more cc's in its engine, but these advantages are not very significant for normal use, such as pottering around town in the rush hour.

Monte Carlo.

```
10  REM  MONTE-CARLO INTEGRATION
20  HOME
30  PRINT "THIS IS A MONTE-CARLO
     INTEGRATION"
40  PRINT "PROGRAM IN APPLESOFT"
50  PRINT "ENTER THE FUNCTION ON"

60  PRINT "LINE 130 "
70  PRINT "AS DEF FN F(X)=....."
80  INPUT "LOWER LIMIT OF INTEGRA
     TION=";A
90  INPUT "UPPER LIMIT OF INTEGRA
     TION=";B
100  INPUT "GIVE THE NUMBER OF RA
     NDOM NOS  ";N
110  PRINT "OK.. HERE GOES...."
120  PRINT "THERE MAY BE SOME DEL
     AY.."
130  DEF  FN F(X) =  EXP (X)
140 R = B - A: REM  RANGE OF INTE
     GRATION
150 S = 0
160  FOR I = 1 TO N
170 S = S +  FN F(R *  RND (1) +
     A)
180  NEXT
190 S = R * S:S = S / N
200  PRINT "OK ..RUN ENDS"
210  PRINT "FUCTION WAS GIVEN BY"
220  LIST 130: PRINT : PRINT
230  PRINT "NO POINTS=";N
240  PRINT "INTEGRAL=";S
250  END
```

```
]RUN
THIS IS A MONTE-CARLO INTEGRATION
PROGRAM IN APPLESOFT
ENTER THE FUNCTION ON
LINE 130
AS DEF FN F(X)=.....
LOWER LIMIT OF INTEGRATION=0
UPPER LIMIT OF INTEGRATION=1
GIVE THE NUMBER OF RANDOM NOS  100
OK.. HERE GOES....
THERE MAY BE SOME DELAY..
OK ..RUN ENDS
FUCTION WAS GIVEN BY

130  DEF  FN F(X) =  EXP (X)


NO POINTS=100
INTEGRAL=1.72262556
```

Graphics storage

IN MY ARTICLE on graphics storage in the November issue there is an error in part e of figure 11 on page 107. The caption should read:

Scans second block
Finds nothing
Stores 0 to show block is not used
No need to check lower levels.

Graham Kirby,
Knutsford,
Cheshire.

Monte Carlo

IT WAS NICE to see the article by William Hill advocating simulation methods but your readers should treat his integration method with some scepticism. While it is both simple and intuitive it is the most inefficient of the accepted Monte Carlo techniques.

To evaluate

$$I = \int_0^1 f(x)dx$$

a more efficient method is to generate n uniform random numbers on (0,1), say $u_1, u_2 \ldots u_n$, that is numbers lying between 0 and 1, and then calculate the estimate $\hat{I}$ of I where

$$\hat{I} = \frac{1}{n} \sum_{i=1}^{n} f(u_i)$$

The variance of this estimate is

$$\text{var}(\hat{I}) = \frac{1}{n} \text{ var}(f)$$

which we might be able to determine using calculus but whch we can easily estimate as

$$s^2 = \left(\frac{1}{n-1}\right) \sum_{n=1}^{n} (f(u_i) - \hat{I})^2$$

using the same numbers $u_1, \ldots u_n$.

In the Applesoft listing you can see the coding is fairly simple. Notice if we have

$$\int_b^a f(x)dx$$

this can be written

$$(b-a)\int_0^1 f(y(b-a) + a)dy$$

Dr G J Janacek,
University of East Anglia,
Norwich.

The Tube

HAVING RECENTLY read in your November issue, the article "Torch: a tool for the 80s?", I should like to point out an error of fact. The ULA-based inter-computer interface known as The Tube was designed and developed by Acorn Computers Ltd in Cambridge, and not by Torch as mentioned in the article.

J R Horton,
Acorn Computers Ltd,
Cambridge.

Oric's origins

THE ARTICLE on micros under £200 — December 1982 issue — gives the country of manufacture of the Oric as the U.K. According to a recent edition of the BBC TV's *The Money Programme* it is from Singapore. I hope you will correct this so that people who wish to buy a U.K. micro are not misinformed.

E Walsh,
Crowthorne,
Berkshire.

● The Oric uses a ULA which was designed in the U.K. and is made in the U.S. It uses PCBs from Singapore. However, the casing is U.K. made and the Oric is completed and assembled here. This, in our view, qualifies it as "U.K. made".

Vic-20 errors

"BRING TRUTH HOME, to error-stricken souls" said E Burr in 1871.

The Vic-20 stores numbers using five bytes. The first byte is the binary exponent plus 129. The remaining four bytes give the binary mantissa. As the first bit of the mantissa is 1 it is not stored but understood, instead

(continued on page 13)

NOW AVAILABLE WITH 8086 16 Bit Processor

comart communicator

PROGRESS REPORT

...now the pedigree really shows

How has Comart's controlled, down to earth development strategy kept Communicator a firm favourite in the UK, and the leading candidate to reverse the tide of microcomputer imports?

New Range Additions The Communicator range has broadened to add a new 20 Megabyte 5" Winchester Hard Disk Drive System to the already well established 5 Megabyte and floppy diskette models. Another new system offers 8" floppy disk drives for compatibility of data transfer. With the associated tape and additional Winchester back up systems that adds up to eight basic models – all in the same neat, stackable, casing – all based on S100 bus construction to keep future options in memory, users, peripherals and interface requirements wide open.

New System Additions Communicator operating systems continue to broaden both in options and facilities. An improved CP/M offers enhanced diagnostics, for example, and auto boot from Hard Disk. These basic improvements are reflected in the now tried and tested Communicator multi-user MP/MII™, whlch also provides for full CP/M™ compatibility.

New Communications Options Communicator now offers CP/Net™ and RBTE communications protocols. Individual Communicator Systems can now operate as intelligent information terminals, integrated with either existing mainframe or mini computer installations, or be part of a shared resource or communications network.

New Range of Terminals Find out more about Comart's new smart VDU. It's a new advanced ergonomically designed unit. It has a 105 keyset detached keyboard, soft green phosphor tilt screen, and a low profile foot. Its a perfect complement to the Communicator in both styling and performance.

Some things don't change Communicator still has Comart's established dealer network and nationwide after sales service back up, supporting thousands of Communicators already at work throughout the UK.

And In the Future? Behind all these innovations are advanced programmes of research and development. Soon Comart will be bringing you 16 bit, multi processor and distributed processing systems. This is your guarantee that Communicator will continue to keep pace as microcomputer technology progresses.

To find out more about Communicator today, call us now on 0480 215005.

Main Dealers

Birmingham The Byteshop 94/96 Hurst Street **Tel** 021-622 7149
Dublin Lendac Data Systems 8 Dawson Street **Tel** 0001 372052
Glasgow The Byteshop Magnet House 61 Waterloo Street **Tel** 041-221 7409 **Leeds** Holdene Bray House Leicester Place **Tel** 0532 459459 **London** The Byteshop 324 Euston Road NW1 **Tel** 01-387 0505 Digitus Lading House 10/14 Bedford Street Covent Garden WC2 **Tel** 01-379 6968 Jarogate 197/213 Lyham Road Brixton SW2 **Tel** 01-671 6321 **Manchester** The Byteshop 11 Gateway House Piccadilly Station Approach **Tel** 061-236 4737 **Nottingham** The Byteshop 92a Upper Parliament Street **Tel** 0602 40576 **Southampton** Xitan Systems 23 Cumberland Place **Tel** 0703 38740

A member of the Comart Group of Companies

comart

SPECIALISTS IN MICROCOMPUTERS

Comart Limited, Little End Road, Eaton Socon, St Neots, Cambs PE19 3JG
Tel: 0480 215005 Telex: 32514 Comart G

Dealers

Aberdeen MOM Offshore **Tel** 0224 22863 **Bedford** Remdex Bradley **Tel** 93 68581 **Cambridge** Cambridge Computer Store **Tel** 0223 65334 **Edinburgh** Holdene Microsystems **Tel** 031 557 4060 **Glenrothes** Computer Services (Scotland) **Tel** 0592 773710 **Blackpool** Western Computers **Tel** 0253 404676 **Manchester** NSC Computers **Tel** 061 832 2269 **Norwich** Anglia Computer Centre **Tel** 0603 29652 **Worthing** Ace Computing Services **Tel** 0903 35411 **Middlesbrough** Aztech **Tel** 0642 222621 **Barking** Moldavia **Tel** 01-591 6511 **Belfast** Cardiac Services Co **Tel** 0232 625566 **Wilmslow** Holdene **Tel** 0625 529486 **Colchester** Eurotec Consultants **Tel** 0206 72538 **Huntingdon** Westcom **Tel** 0480 217217 **Luton** M E Marketing **Tel** 0582 31806 **Middlesex/Berks** Newbury Data Recording **Tel** 0784 61141 **Sheffield** Hallam Computer Systems **Tel** 0742 663125 **Watford** Lux Computer Services **Tel** 0923 29513 **Aylesbury** J K Wakeford Assoc **Tel** 0296 27473

CP/M, MP/MII and CP/Net are all trademarks of Digital Research Inc

● Circle No. 104

It's a picture.

*PRICES START AT £995 EX. VAT.

And it's worth a thousand words.

The brilliant new Commodore 700 is arguably the most aesthetically pleasing micro-computer ever designed.

Beauty and brains allied in the most literal sense.

Beneath the soft-sculpted lines of the 700 lies the most impressive achievement in technology from one of the world's leading micro-computer companies.

Built to a standard and to a specification which no competitor comes close to emulating, and at a price* which makes this fact all the more remarkable, the Commodore 700 is unique.

It is a very special computer indeed.

However you care to look at it.

SUMMARY SPECIFICATION

1. Tilt and swivel anti-glare 80 column green-on-black display screen.

2. Comfortable, easy-to-use detached keyboard with sculptured keys, separate calculator pad, isolated critical operation keys and separate cursor controls.

3. Ten special function keys are programmable in BASIC or machine code to execute twenty special operations.

4. Capable of addressing 896K of user RAM. Available with either 128K or 256K as standard. Configured in 64K banks with switching managed by the 6509 processor.

5. The full RAM is available for machine code programs. BASIC programs can be up to 64K in length with the remainder of the RAM available for variables and/or data.

6. Integral dual disk drives with direct memory access available as an option.

7. An optional dual processor – the Z80 or 8088 – can operate concurrently with the standard 6509. This enables access to the existing library of CP/M® programs.

8. Interfaces through several ports – IEEE-488, RS 232C, CBM cassette, 8 bit parallel, and cartridge slot. Built-in networking capability.

9. Supports a full range of peripherals including dual disk drives, hard disks, dot matrix and letter quality printers, and plotters. Works with all existing Commodore systems peripherals.

10. Standard language is BASIC 4.0 plus, so existing Commodore 8000 system programs in BASIC are easily converted. Soft loaded languages will include UCSD Pascal and Forth.

11. Includes a sound synthesis chip to produce a full range of "noise" and music effects.

*DETAILS CORRECT AT TIME OF GOING TO PRESS

CP/M® IS A REG. TRADEMARK OF DIGITAL RESEARCH INC.

commodore

Changing business for the better.

For a thousand words and more on the Commodore 700, and the address of your nearest Commodore dealer, telephone or write to us at:
The Commodore Information Centre,
675 Ajax Avenue, Slough, Berkshire SL1 4BG.
Telephone: Slough (0753) 79292.

NAME (MR/MRS/MISS)

POSITION

COMPANY

ADDRESS

POSTCODE TEL

75 PCO 0283

● Circle No. 105

upgrade to an ORIC-1

16 colours
professiona
keyboard
full graphics
real sound

- Superb styling
- Choice of 16K or 48K RAM
- Ergonomic keyboard with 57 moving keys
- 28 rows x 40 characters high resolution
- Teletext/viewdata compatable graphics
- 6 octaves of real sound plus Hi-Fi output
- Centronics printer interface and cassette port
- Comprehensive user manual

FOR HOME, EDUCATION, BUSINESS & ENTHUSIASTS.

FROM £99.9 incl VAT

OPTIONAL MODEM OFFERS COMPUTER PHONE LINK FOR: ELECTRONIC MAIL ● TELESOFTWARE ● PRESTEL

COMING SOON, TO COMPLETE YOUR SYSTEM: ORIC MICRO-DRIVE DISCS & SPEED PRINTER

ORIC is no toy! Its professional keyboard, Basic language and extensive specification, will do all you expected of your home computer, plus a whole lot more. For home, educational, business and games use.

If you're buying for the first time beware! Only ORIC computers offer full colour capability for under £100 and the most powerful and comprehensive micros in their price brackets.

So whether you're just starting out, or upgrading existing equipment, make the professional decision and choose ORIC. Send for our comprehensive brochure NOW, or better still, order your ORIC today.

Delivery is around 28 days with a money back guarantee if you're not delighted.

Clip the coupon below, or call our telesales number ASCOT (0990) 27641.

FREE FORTH with every mod

ORIC-1

The Real Computer System

ORIC PRODUCTS INTERNATIONAL LTD Coworth Park Mansion, Coworth Park, London Road, Sunninghill, Ascot, Berks SL5 7SE.

Prices Include VAT				
	ORIC-1 16K RAM		£ 99.95	
	ORIC-1 48K RAM		£169.95	
	ORIC Communications Modem		£ 79.95	
	Postage and Packing		£ 5.95	
			TOTAL	£

Please charge my Access, Barclaycard Amex, Diners Club account no.

*Please delete/complete as applicable.
*I enclose a cheque/P.O. payable to: ORIC PRODUCTS INTERNATIONAL LIMITED for £_____

Name

Address

If you require a brochure please tick ☐

● Circle No. 106

(continued from page 8)

bit 7 of byte 2 is used to indicate the sign of the number.

For example, 0.5 is stored as

128,0,0,0,0.

while −0.5 is stored as

128,128,0,0,0.

The number 10, which is 1010 binary, is stored as

132,32,0,0,0.

To determine how a number is stored you can Peek in the following way, by typing

```
NEW:CLR (then press Return)
X = (type your number and press Return)
FOR I = 5 TO 9:PRINT PEEK (PEEK(44)*256 + 1); :NEXT I
```

Pressing Return will then give the desired result.

Now for the errors. The number 1 + .5↑24 is stored as

129,0,0,0,128.

However, the same number written as 2*(.5 + .5↑25) is stored as

129,0,0,64

Similars problems occur with number of the form 2*(.5 +.5↑B) where 25 ≦ B ≦ 31.

There is no problem if B < 25 or B = 32. Similarly, there is no problem if you do the multiplication the other way round, that is if you look at (.5 +.5↑B)*2. There is no problem if the third and fourth byte are both zero.

You can check this either by Peeking or by Running the following:

```
10 FOR I = 20 TO 32
20 PRINT (2*(.5 + .5↑I) − 1)*2↑I;
30 NEXT I
```

The answer should be 2 in each case, but it isn't! You can also try one of the following in line 20:

```
(4*(3/4 + .5↑I) − 3)*2↑(I − 1)
(8*(7/8 + .5↑I) − 7)*2↑(I − 2)
(16*(15/16 + .5↑I) − 15)*
2↑(I−3)
.....
(256*(255/256 + .5↑I) − 255)*2↑
(I − 7)
```

Again, the answer should be 2 in each case, but it isn't.

There are many other examples. Just make sure that the third and fourth byte are both zero and multiply by a power of 2 on the left. These bugs have been found on several different Vics. Is there a Vic without these errors?

Czes Kosniowski,
School of Mathematics,
University of Newcastle upon Tyne.

Paper Tiger

I HAD THE SAME problem as P E Roberts — June 1982 Issue, page 45 — with a Paper Tiger outputting garbage on long listings when driven from an Apple II with the serial interface card.

One way of looking at it is that the Apple dumps characters faster than the Tiger can print them, and the buffer is filled by even medium-length programs, thus causing the garbage. One way to cure this without any hardware modifications is to slow the rate that characters are transferred to that at which they can be printed.

In Basic I found the best and simplest way was to use the Speed instruction which introduces pauses between characters as they are printed to the screen or printer. To list a long program simply type in:

```
PR # 1
SPEED = 190
LIST
SPEED = 255
PR # 0
```

I have found that a Speed of 190 — it needs some experimentation for previous character sizes — works with all my programs. Even a 16-page listing comes out OK.

Andrew Gordon,
Brechin,
Angus.

Cool Atom

I EXPERIENCED the same overheating problem with my Acorn Atom as P Sharma — Feedback, December 1982. After several hours work, my Atom loses byte indirection. The Atom is one of the few computers without provision for ventilation, and though there may well be another cause for the fault, this one is easily corrected.

First turn the computer upside down and undo the two screws on the bottom. Open the case to expose the aluminium-coloured heat sink. Check that the screw-headed bolts securing the heat sink are tight. If they have slackened, tightening will restore the heat transfer and this alone may prove sufficient remedy.

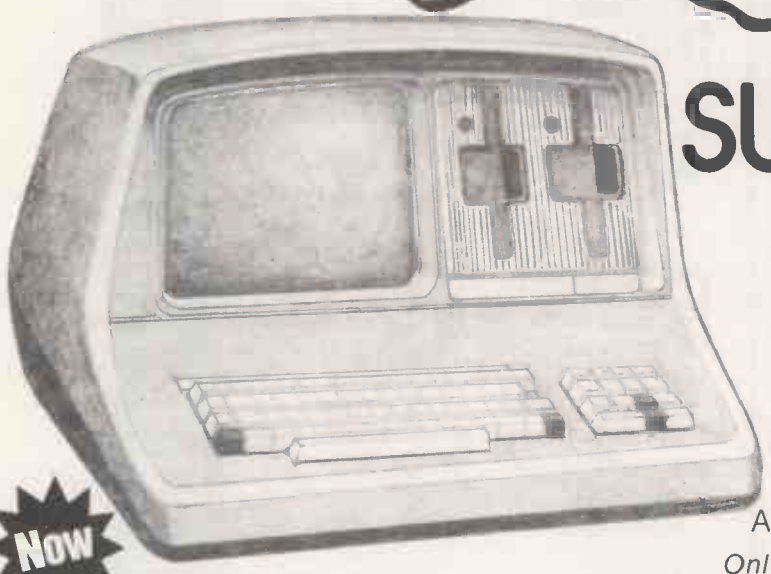
However, once you have opened the case it may be worth making further improvements. Using a hand-drill and hacksaw, cut out a neat rectangle in the back wall of the computer case opposite the heat sink. The Atom case is extremely strong and will not miss the material. Drill ventilation holes in the base

(continued on page 15)

● Circle No. 107

Brainless prices!

FREE Membership to Micro Computer Club when you buy SUPERBRAIN Entitles you to other special offers



SUPERBRAIN™ INTERTEC DATA SYSTEMS

at unbelievably low prices from the Micro Computer Club

JUNIOR	320K DISK CAPACITY	£1250
QD	720K DISK CAPACITY	£1550
SD	1.5MB DISK CAPACITY	£1800
MICROLINE 83A PRINTER WITH M/C		£ 450

NOW

And price includes CP/M and Microsoft M Basic

Only by selling direct mail order can we offer these prices

From the Micro Computer Club, popular software lines:

MICROSOFT	Basic £175	**MICRO PRO**	Wordstar Vers. 3.0 £210	Organic Software Milstone ...	£170
	Basic Compiler £202		Mailmerge ... £ 70	Ashton Tate dBase II	£345
	Fortran £225		Datastar £155	Sorcim Supercalc.....	£135
	Cobol £330		Calcstar £105	Software post and packing.....	£2.50
	Microplan ... £150				

NOTE: SUPERBRAIN & 8in. IBM FORMATS ONLY

3 MONTH Return to Works Warranty

MAINTENANCE

- On site maintenance available from day one.
- Nationwide contracts through Software Sciences — a member of THORN EMI group.
- Software Sciences will inspect, deliver and maintain your SUPERBRAIN.
- The 24 hour call-out basis.

JUNIOR	£375 pa
QD	£415 pa
SD	£440 pa
MICROLINE 83A PRINTER	£150 pa

To: The Micro Computer Club PO Box 66 Croydon CR9 4QB Tel: 01-689 2080
Please accept my order and enrol me as a member of the Micro Computer Club.

All prices are based on exchange rate at time of going to press and may be subject to change. All orders must be accompanied by a cheque for the sum due. This will not be banked until four days before despatch.
Carriage within UK extra at £25 Greater London, £35 outside London.

ITEM	QNTY	UNIT PRICE £ p	TOTAL £ p

Name .....

Address .....

.....

Post Code .....

All machines sold to UK specification with full manufacturers warranty

TOTAL

CARRIAGE

VAT at current rate

CHEQUE TOTAL

Membership of the Micro Computer Club entitles members to other special offers.

(continued from page 13)
of the case under the heat sink.

If you then paint the outward-facing side of the heat sink with heat-resisting black paint, heat will now be radiated out of the case through the rectangle while cool air is drawn in through the vents in the base. My Atom has performed reliably for very long periods since undergoing this mild surgery.

Trevor Whyatt,
Gillingham,
Kent.

Software piracy

I WOULD LIKE to add a comment to your December editorial on protection from pirates. As a dealer it is my objective to marry computer hardware and a particular software package to meet a client's requirements. Computer publications are full of vertical market packages: some good, some not so good, and all with their own individual characteristics.

From a dealer's point of view it has become increasingly difficult to assess these packages because the majority of software houses insist on retaining their products until sold, due to the fear of piracy. This attitude, however valid, has to be harmful to both themselves and the industry in general. Dealers are in business to sell software not buy it.

It is correct to believe that at the top end of the market — £200 and above — piracy can be contained in the area of support; all our clients are required to register either with us or the software house concerned. I do not, however, agree that the users have the right to modify code to suit their requirements. Customising should, if applicable, be built into the software and permanent changes made, at a cost, by the software house. If the concern over piracy was reduced such costs could be kept to a minimum.

Frank Faulkner,
RCB Ltd.
Abergele,
Clwyd.

● **Some people favour the turnkey approach to computing: they are not interested in how things work, they just want them to do a job. Other people like to "customise" their computer by changing chips, addings bits on and taking bits off. Where would Apple and Pet be today if enthusiasts had not taken this approach? And if it is done with hardware and firmware, it is going to be done with software.**

Wordpro points

AS ONE who has been using Wordpro and other programs for nearly three years as a means of introducing students to word processing I was, of course, interested by the articles about it in the October and November 1982 issues of *Practical Computing*. Like David Oborne I consider Wordpro to be a very good and powerful package and it equals or is superior to a number of dedicated word processors. It is a pity that the two articles contain some inaccuracies to the detriment of Wordpro.

The statements "Wordpro I is a tape-based system whereas the others are disc based. All levels of Wordpro require at least 32K RAM" are both incorrect. Wordpro II can be run with either tape or disc and means are available for conversion of programs from tape to disc if a user upgrades. Up to Wordpro II can be run on a minimum of 16K memory. More memory gives more working area but Wordpro II is a good, cheap starter for teaching establishments in view of its upgrading capabilities.

The centring commands are cn1 and cn0 not cel and ce0 as stated.

The use of the backslash facility and the visibility of the directory when calling files are very useful assets of Wordpro. However, if the backslash facility is not used there is no risk of corrupting other files. Incorrect entry of the file name merely creates a new file under the incorrect file name without scratching the old file it was intended to replace.

The use of the comment line to hide formatting commands is not necessary in continuation files of a multiple-file document, providing each file starts a new page. If it doesn't start a new page the page lengths go wrong. Inclusion of the p# command ensures that the section of the document starts always at the correct page. Incidentally, p#1 on the first document also ensures that multiple outputs number the first page as page 1.

J K Burge,
Caterham,
Surrey.

Two's company on 16-bit Televideo

WHY IS the TeleSystem II named the II when it is Televideo's first micro to run Unix? Answer: because it is supplied, as standard, with two CRTs. The standard machine is a personal computer designed to be personal to two people — such as a manager and his or her secretary.

As befits a business micro, the standard TeleSystem II also comes with 512K of RAM, a 40Mbyte hard disc, 17.5Mbyte tape drive for back-up, and the Unix operating system. In the U.S. the price is under $14,000.

The TeleSystem II uses the Motorola 68000 chip, like the Fortune 32:16, Corvus Concept and Sage II microcomputers. Televideo's first 16-bit machine, the TS-1600, used the Intel 8088. The TeleSystem II was first shown at Comdex in Las Vegas, but is not expected to reach the U.K. for another six to nine months.

Contact Colt Computer Systems, Fairfield Works, Fairfields Road, Hounslow, Middlesex TW13 1YU. Telephone: 01-577 2686.

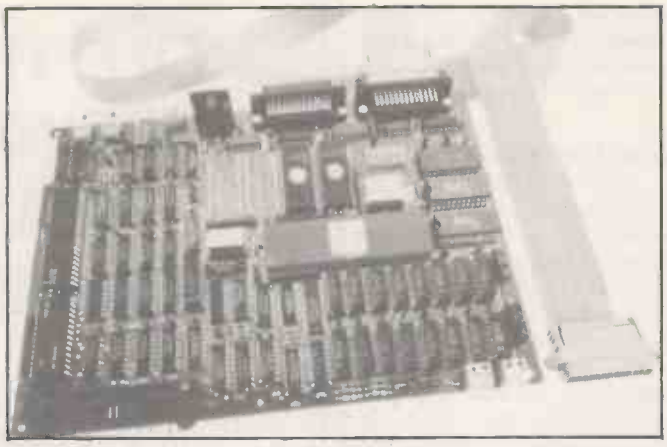
Portable has 8Mbyte on disc

THE COMPUCASE is a briefcase-sized portable micro with 8Mbyte of disc storage, full-size ASCII keyboard, 80-column printer and a display screen. The briefcase is only 13in. by 18in. by 5.5in.

The Compucase uses two eight-bit Intel 8085AH-2 processors, and has 64K of RAM. The display is 40 characters by 12

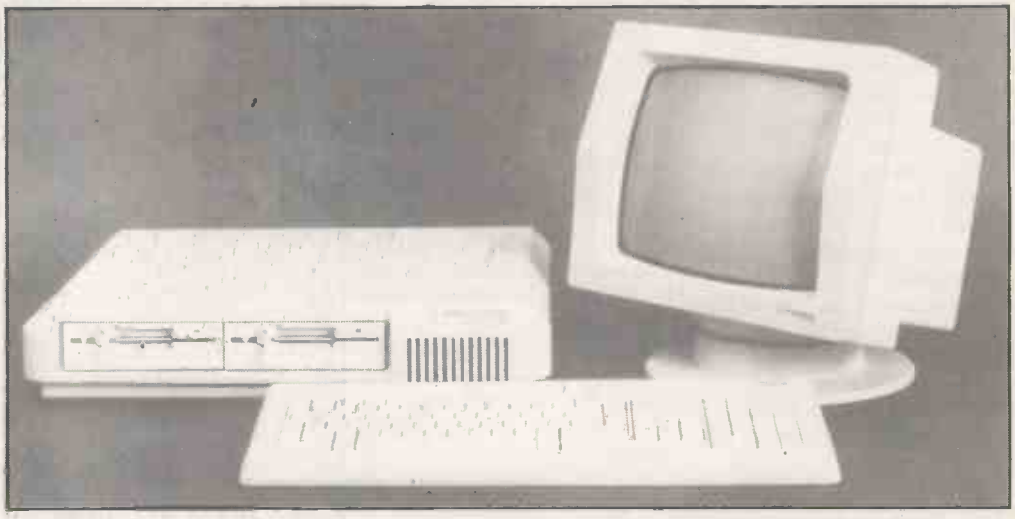
lines, uses gas-plasma technology, and is built into the lid of the case. The price is about £2,800.

Contact Advanced Software Technology. Telephone: 01-330 0764.



The Profi Kit 2 is a 16-bit single-board computer using the Motoroala 68000 processor. Designed by Force in Germany, the board is an upgrade of the Profi Kit 1. It includes 128K of RAM and serial, parallel and cassette ports. Profi Kit 2 costs £499 plus VAT. Contact Microsystem Services, PO Box 37, Lincoln Road, Cressex Industrial Estate, High Wycombe, Buckinghamshire HP12 3XJ. Telephone: (0494) 41661.

U.K.-built micro range to start with IBM look-alike



THIS NICE-LOOKING machine is the FX-20, one of a range of IBM-compatible 16-bit systems. It will retail at a low £1,800, and will be available in April 1983, according to the manufacturer, Future Computers.

The processor used by the FX-20 is the ubiquitous Intel 8088, as found in the Sirius and IBM machines. The FX-20 is both software and hardware compatible with the IBM PC, and should be able to take the full range of plug-in boards which are being manufactured for the IBM by Independent suppliers.

The very reasonable price of the FX-20 includes two 5.25in. floppy drives totalling 1.6Mbyte, 128K of RAM, the CP/M-86 operating system as standard, and the Spellstar word-processing package thrown in free. MS-DOS will be available as an option immediately. An eight-bit CP/M emulator, to enable users to run standard CP/M software, as well as the Unix look-alike operating system Xenix will be following soon.

According to Future Computers' Managing Director Brian Jackson, not having the IBM name means the company has to offer the user something extra in order to compete. Apart from the lower price, the FX-20 will run a claimed 60 percent faster, as it uses high-speed memory and runs the 8088 at a fast 8-MHz clock rate. Fully half the on-board ROM is taken up with diagnostic software, reflecting a welcome realisation that a business machine must be reliable and easy to maintain.

Good looks and good design are where 16-bit machines score over their generally older eight-bit rivals, whatever one thinks of the claims of much greater operating speeds and throughput. Starting from scratch, with modern technology and probably much more money than the early microcomputer pioneers whose machines still dominate the market, the design team has come up with a machine which should be pleasant to use in an office environment.

The screen, which can be tilted in any direction, displays 25 lines of 80 characters using a high-definition 16-by-10 dot matrix for each character. Alternative character founts can be user generated.

The FX-20 forms part of a range of machines which will appear during 1983, including the 50Mbyte FX-50 hard-disc system. All machines come with a local area network interface as standard.

Some £400,000 of the funding for the range comes from the British Technology Group, which holds 15 percent of the company's equity. Distributors will include the Encotel chain, which is part of the same group. Maintenance arrangements are currently being negotiated with two national third-party maintenance companies.

Contact Future Computers Ltd, PO Box 306, Purley, Surrey. Telephone: 01-689 4341.

'APL gives me all I need from a computer'

APL has a reputation for being a Boffin's language, but Helen who learned APL through PPL, is a Business Analyst whose needs are strictly practical. She solves her modelling problems almost as soon as she can formulate them. In fact, the structure of PPL is such that it actually assists her thinking!

WHAT IS APL?

APL is a concise programming language which has achieved great success in the larger firms and institutions. They have long discovered that APL is the answer to using the computer as a problem-solving tool with an economy on programing time which programmers in conventional languages do not believe until they've seen for themselves.

WHAT IS PPL?

PPL – *Personal Programming Language* – is a brilliant new package, written in APL, which enables the novice or experienced programmer to quickly exploit the strengths of APL painlessly. PPL is suitable for anyone, and you will never outgrow it.

WHO IS A.P.L.?

A.P.L. (Alan Pearman Limited) is a firm, established in 1977, dedicated to APL, especially on the micro. We were the first firm in the UK to bring APL on the Z80 and thus within the reach of many thousands for whom APL had been inaccessible. Now we sell APL on many machines, using Z80, 8088 and 68000 processors. As well as hardware, we run APL courses regularly, sell APL books, and do APL consultancy. Our package, PPL, is the latest and most comprehensive of our applications software which has included database, statistics, wordprocessing, and communications, among others.

HOW TO FIND OUT MORE:

A comprehensive and well-written guide is available, price £25.00 plus £1.00 p & p, describing PPL. Send off for it today and be amazed at the power that you can get from this package. Payment by cheque welcome or Visa accepted.

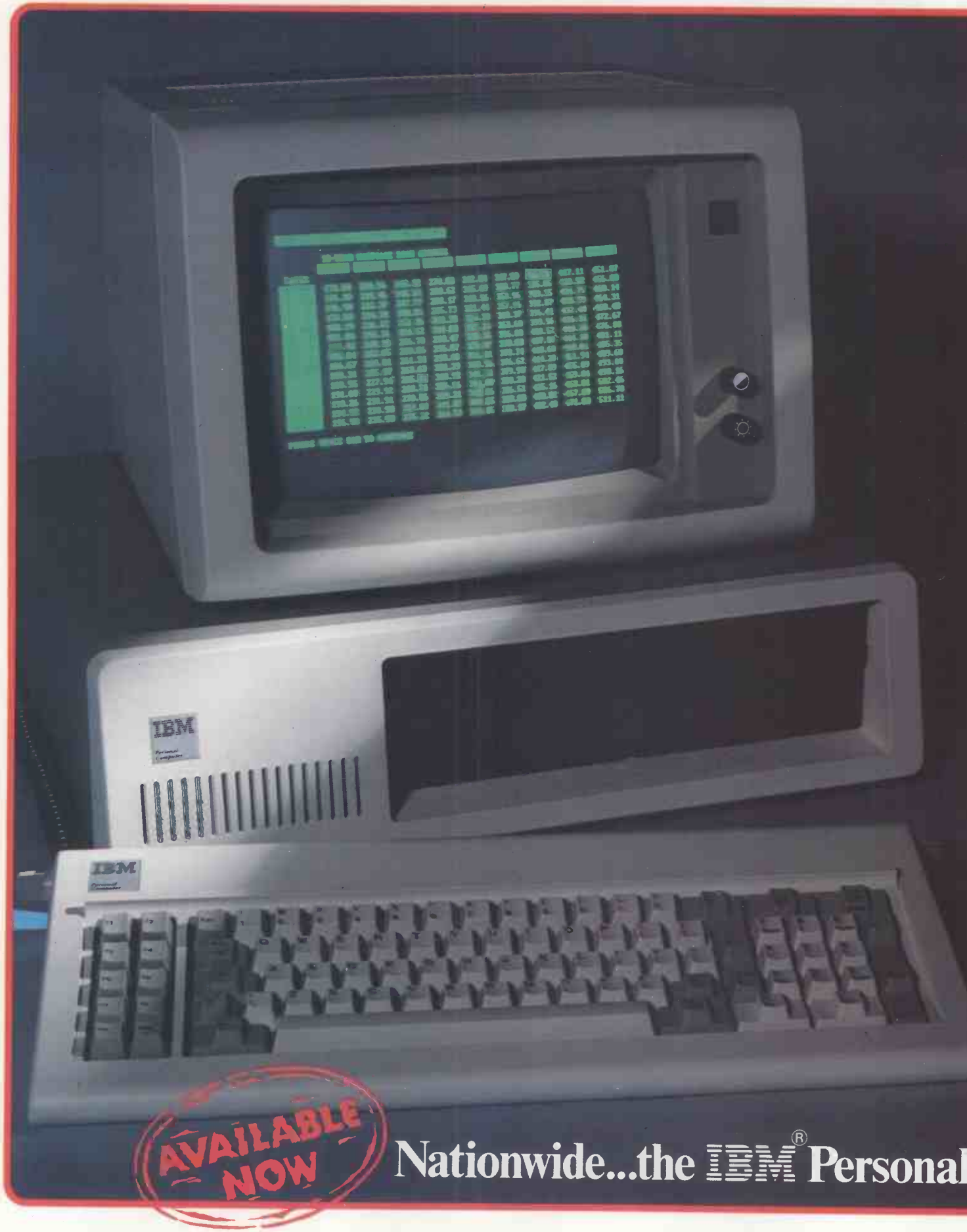
Bringing personal computing to all

Alan Pearman Limited

Maple House, Mortlake Crescent, Chester CH3 5UR Tel: Chester (0244) 46024

● Circle No. 110

The small Business Compute



by the Biggest in the Business

The IBM Personal Computer is available NOW throughout the United Kingdom from EOS Dealers. With its crystal clear display, detachable keyboard with built-in calculator pad, colour graphic options PLUS compatibility with the widest range of software options to keep in line with your development needs, the IBM Personal is today's investment in tomorrow's technology.
Heart of the IBM Personal is the powerful INTEL 8088 giving performance excellence normally associated with mini-computers.
Its 64k standard memory is expandable internally to 768k.
EOS Dealers can also provide IMMEDIATELY a complete range of IBM plug compatible memory boards, 320k disc drives, a selection of winchester hard discs, local area networking and the unique EOS 7000 three-in-one printer.

THEY WILL ALSO PROVIDE FULL FIELD MAINTENANCE AND SERVICE THROUGHOUT THE U.K.

The IBM Personal Computer

Specifications and Technical Summary

User memory: 16K – 768K
Permanent memory (ROM): 40K bytes*
Microprocessor: High speed 8088*
Video buffer: Separate from user's memory, contained on video adapters (16K bytes colour/graphics, 4K bytes monochrome)
Auxiliary memory: 2 optional internal diskette drives 5¼", 160K/320K bytes per diskette

Keyboard: 83 keys, 6ft cord attaches to main cabinet*, 10 function keys*, 10-key numeric pad*, tactile feedback
Monochrome display: High-resolution (720h x 350v)*, 80 characters x 25 lines, upper and lower case, green phosphor screen*.
Colour/Graphic: *Text mode* – 16 colours*, 256 characters and symbols in ROM*
Graphics mode – 4-colour 320h x 200v resolution*, black-and-white 640h x 200v resolution*
Languages: BASIC Pascal , Cobol, Fortran
Communications: RS-232-C, asynchronous (start/stop) protocol, up to 9,600 bps
Diagnostics: Power-on self testing*, parity checking*

*Advanced features for personal computers

from your local EOS Dealer.....

A1 Computers,
56 Grove Road,
Sutton, Surrey
Tel: 01 661 0095

Amplicon Microsystems Ltd,
Richmond Road,
Brighton,
East Sussex BN2 3RL
Tel: 0273 608331

Business Office Links Ltd,
73, Albany Road,
Coventry CV5 6JR
Tel: 0203 78651

Clacton Computer Centre,
29/31 Pier Avenue,
Clacton-on-Sea,
Essex
Tel: 0255 422644

Computacenter Limited,
Theatre Square,
Swindon SN1 1QN
Tel: 0793 612341

Datum Ltd,
Church Road,
Great Yeldham,
Halstead, Essex
Tel: 0787 237008

Estate Computer Systems,
29/30 Carre Street,
Sleaford,
Lincs NG34 7TR
Tel: 0529 305637

Inverness Computers Ltd,
Dewar House, Avoch,
Ross Shire, Scotland
Tel: 0381 20276

Knowledge Ltd,
15 North Burns,
Chester-Le-Street,
County Durham, DH3 3TF
Tel: 0385 884782

Lux Computer Services,
108, The Parade,
Watford, Herts
Tel: 92 29513

M. J. & P. Bradley,
24, Lansdowne Terrace,
Gosforth,
Newcastle-upon-Tyne
Tel: 0632 846291

Open Computer Services Ltd,
24/25 Old Steine,
Brighton BN1 1EL
Tel: 0273 671666

Pettitts Rural Industries Ltd,
Camp Hill, Reedham,
Norwich, Norfolk
Tel: 0493 700243

Professional Data Systems,
Carne House,
Markland Hill, Chorley New Road,
Bolton, Lancs BL1 5AP
Tel: 0204 493816

Strathand Computers Ltd,
44 St. Andrews Sq.,
Glasgow G1 5PL
Tel: 041 552 6731

Vega Computers Ltd,
10, Essex House,
George Street,
Croydon, Surrey
Tel: 01 680 4484

Zak Computers,
Warwick House,
17, Warwick Road,
Manchester M16 0PJ
Tel: 061 872 8991

Plus sixty further Locations.

This coupon will be forwarded to your local EOS Dealer

Please send me further information about the IBM Personal Computer.

Please tick Dealer ☐ End User ☐

Name _____

Company _____

Address _____

_____

_____ Phone _____

Electronic Office Services (U.K.) Ltd.
29/31 Fleet Lane London EC4M 4YA
Tel: 01-248 6971 Telex: 886750 UNIHORG

Distributed by

ELECTRONIC OFFICE SERVICES

Electronic Office Services (U.K.) Ltd. 29/31 Fleet Lane London EC4M 4YA
Tel: 01-248 6971 Telex: 886750 UNIHORG

Tomorrow's Office Technology Today

Electronics Office Services (UK) Ltd. and the above named companies are not agents of IBM Inc.

The right software for your application from COMPUTECH

Authorised Dealer
Service Centre
System Consultancy

COMPUTECH FINANCIAL ACCOUNTING PACKAGES

Payroll	£375
Invoicing and Stock Recording	£295
Sales, Purchases and General Ledgers	each £295

Also costing and group consolidation

COMPUTECH UTILITIES DISK
for reliable error checking copying, diskette scan, interpret and patch, etc £20
VisiCalc, Applewriter and other Apple software (Prices on request)

COMPUTECH CHAIN MAIL
A mailing merging document processor which may be used with text files, Including random files and Applewriter 1.1 binary files £45

COMPUTECH GRAPHICS DISK
for printing Apple pictures and graphs on Epson and Microline (free with printers purchased from Computech) £30

COMPUTECH TERMINAL UTILITIES
Apple to Apple and Apple to mainframe from £130

COMPUTECH hardware...just plug it in and go!

switches and jumpers provide hardware options without soldering

DIPLOMAT VIDEO DIGITISER
store a frame from video camera in a fiftieth of a second, process and print £195
DIPLOMAT PARALLEL Interface £80
DIPLOMAT SERIAL COMMUNICATIONS Interface £85
DIPLOMAT RAM 16 Memory Expansion £95
DIPLOMAT CLOCK/CALENDAR £80
LOWER CASE Character Generator with Applewriter 1.1 enhancements £50
MICROMUX Data Exchange (Max 16 Ports) from £850
MATRIX PRINTERS, Microline and Epson with graphics and up to 200 cps from £230
MICROLINE Optional Character Generator £15
DAISY WHEEL PRINTERS, Olympia, Qume, Ricoh from under £1,000

Prices exclude VAT, Carriage and Packing

For full details phone for data sheets and a FREE demonstration

COMPUTECH SYSTEMS

168 Finchley Road, London NW3 6HP. Tel: 01-794 0202

● Circle No. 112

Card boosts Vic-20 to 80 columns

COMMODORE's new Stack card provides a 40- or 80-column format with the standard Vic-20. It costs £115 including VAT, but

should appeal to existing Vic owners who want to do word processing but wish they owned the Commodore 64 instead.

Contact Commodore U.K. or go direct to Stack Computer Services, 290-298 Derby Road, Bootle, Liverpool L20 8LN.

DCP Interspec

IN DECEMBER we published news of this interfacing unit for the ZX Spectrum. Unfortunately a couple of misprints crept into the article, and the company name and address appeared incorrectly. Cheques must be made out to DCP Microdevelopments Ltd or the bank will not cash them.

Contact DCP Microdevelopments Ltd, 2 Station Close, Lingwood, Norwich NR13 4AX. Telephone (0603) 712482.

Torch now approved by BT for direct link-up to Telex

Software director Ray Anderson developed the software-by-phone system.

THE TORCH was the first and is still the only computer to be approved by British Telecom for direct connection to the public switched phone system. Now is has also been approved for connection via a Hasler Modem to the Telex network. People using punched-tape please note that with a Torch you can download from disc.

Torch has also developed a system for delivering software by telephone. This is easy enough, given a Torch at each end of the line: the problem is to prevent free access to anyone on the Torchmail network.

The solution takes the form of a scrambler program coded by the customer's credit-card number. The scrambler will only unlock the program against the number, and it becomes a simple matter to bill the software to the customer's credit-card account.

Contact Torch Computers Ltd, Abberley House, Great Shelford, Cambridge. Telephone: Cambridge (0223) 841000.

Anglo American Computing Services has set up a mobile computer unit which will dash to the aid of firms who face ruin as a result of computer disaster. The cost is from £2,000 a year, and hardware options include Hewlett-Packard 3000, Vax and PDP, Digital systems and IBM machines.

Contact Anglo American Software, Anglo American House, Main Street, Shenstone, Staffordshire WS14 0FN. Telephone: (0543) 481042. There are no plans to equip men on bicycles to rush out and deal with disasters on Sinclair computers, as far as we know.

Inmos promotes new high-level language

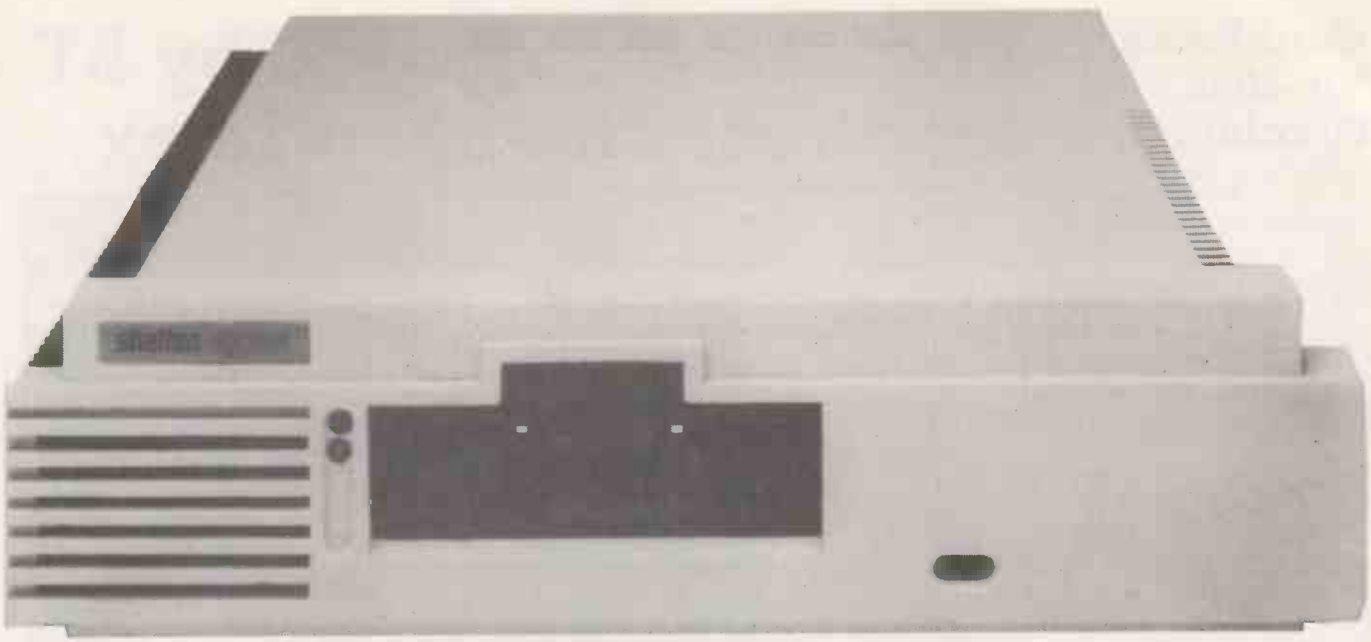
CHIP MAKER Inmos has launched a new computer language which has been specially designed for the complex multi-processor systems of the future. It has been developed with Professor Hoard, Director of the Programming Research Group at Oxford University, and is orientated for interactive use.

It has been named Occam — Inmos spells it with a small "o" — after the 14th-century philosopher William of Occam, who invented Occam's Razor. "Entia non sunt multiplicanda praeter necessitatum," he wrote, In modern parlance this has been replaced by KISS, or Keep It Simple, Stupid.

The basic data type in Occam is the word, which can stand for a number, character, truth value or bit pattern, and takes a range of logical and arithmetic operators. Program sections are combined using four constructors: sequence, parallel, conditional and alternative.

Immos has launched an Occam Evaluation kit consisting of a portable compiler and editor built on top of Softech's UCSD p-system, v.4, which generates p-code. The language and compiler manuals, installation instructions and sample programs are all supplied for £100. Disc formats are available to suit Apple II, Sirius 1 and Victor 9000, IBM PC and other computers.

Contact Inmos, Whitefriars, Lewins Mead, Bristol BS1 2NP. Telephone: (0272) 290861.



SIG/NET-
OFFERING DEALERS A GREAT DEAL

If you are an experienced dealer in the South-East looking for the right micro to handle, you will find it with Sig/net.

At DPLC, the South-East distributor for Sig/net, we feel that we offer dealers the perfect package: a micro system with limitless potential, at a very competitive price with generous dealer discounts and margins, combined with full hardware and marketing support. In return we expect our dealers to be skilled in the installation of packages — either for specific vertical markets or general business applications.

Sig/net 2 is a modular system, housed in a compact unit, to which a wide range of peripherals can be attached. A system may start with a single workstation with floppy disc and be expanded to a multi-user system with virtually no restriction to the number of workstations and hard disc capacity. There are already more than 1,000 users in the UK.

Because the Sig/net operating system is CP/M compatible, it enables you to provide bespoke software easily, in addition to the very wide range of proven business software already available on CP/M.

The successful British manufacturer, Shelton Instruments, is undertaking a programme of advertising, PR and exhibitions. Enquiries generated in the South-East from these promotional activities are passed on to the dealers, through DPLC. Comprehensive product brochures are also available.

To complement the Sig/net, we offer a range of terminals and printers. And there are appointed national and local organisations to provide after-sales maintenance to your customers.

To find out more details about a Sig/net dealership, fill in the coupon and return it to: DPLC Limited, 74-77 White Lion Street, London, N1. Telephone: 01-833 1111.

Please send me further details of the Sig/net dealership.

Name_____ Position_____

Company_____

Address _____

DPLC

DPLC Limited,
74-77 White Lion Street,
London, N1.
Telephone: 01-833 1111.

● **Circle No. 113**

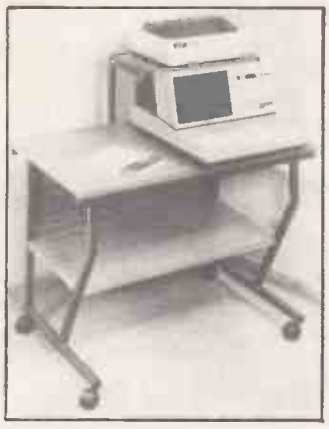
Creative Sanyo

SANYO DID NOT announce the MBC-4050 at Compec, but it was there on the stand. Called the Creative Comuter, it features an Intel 8086 microprocessor, 12K of ROM and 128K of RAM, plus two built-in floppy-disc drives with 600K of storage each.

The detached keyboard has 15 function keys, five cursor-control keys, and an 18-key numeric keypad. The monochrome VDU gives an 80-column by 25-line display. The price is expected to be about the same as for the Sirius 1.

Contact Logitek, Logitek House, Bradley Lane, Standish, Greater Manchester. Telephone: (0257) 426644.

Micro stands together



AT LAST someone has brought out a range of adaptable stands suitable for microcomputers. The standard models are 24in. or 30in. deep, and 26in. or 38in. high. An optional shelf is available for a VDU or printer. The stands are supplied packed flat for self assembly. Prices start at only £38 plus VAT.

Contact Prototype Development Systems Ltd, Enterprise House, 44-46 Terrace Road, Walton-on-Thames, Surrey KT12 2SD. Telephone: (09322) 45670.

Atari in business

SILICON CHIP of Slough claims to have produced the world's first business software package exclusively for the Atari 800 micro. Does this mean the various American packages were originally written for the Apple then converted?

The Chipsoft range is comprehensive and includes five modules: stock control, sales ledger, purchase ledger, mail shot and PAYE. They are all written in Microsoft Basic, not Atari Basic. Each module costs just under £150, and this includes VAT.

Hardware requirements are a 48K 800 plus two 810 disc drives, the 850 interface, a printer and Atari's Microsoft Basic on disc. Silicon Chip prices the whole lot — including software — at £2,054.57 plus VAT, which is not bad for a business system.

VisiCalc is also available for the Atari, plus a couple of databases and numerous word processors with mail merge

(continued on next page)

(contined from previous page)

facilities.

Contact Silicon Chip, 302 High Street, Slough. Telephone: (0753) 70639.

Atari has just made yet another cut in the price of the 800, presumably in response to our request — January issue, page 156. The 800 now costs £399

Preparing for power failure

SUDDEN SURGES and spikes in mains voltage can corrupt data or have worse effects on micro-

computers. The Microguard EPU-1000 is a new addition to a range of units which provide constant voltages and power back-up in case of mains failure.

Contact Microguard, 24 Foregate Street, Worcester WR1 1DN. Telephone: (0905-21541.

Friendly Optim

AT A TIME when most micros are called the SQRX-10041P or something similar — to distinguish them from home micros with names like Oric, Lynx and Spectrum — Optim Computers has given its machine a friendly name. However, the Amigo is a Z-80A micro with 64K RAM and CP/M 2.2 — an operating system not widely admired for user friendliness.

The Amigo is a smart, four-box system consisting of a central unit with display screen, a detached keyboard, dual floppy-disc drives and printer.

The display gives 80 characters by 25 lines on a 12in. green screen, and is controlled by a separate 6502 processor with 44K of display memory. Bit-mapped graphics are available with a resolution of 640 by 300 pixels.

The keyboard is Selectric style with 83 keys, including a numeric keypad and 27 programmable function keys. The 8in. floppies offer 400K of formatted storage. Double-density floppies and a 5Mbyte hard disc are optional extras.

The printer supplied is an 80-column Epson MX-80 III dot-matrix model, but other options are available.

Contact Optim Computers, Lawford House, Harrow Road, London W10. Telephone: 01-969 9768.

Microfinesse

MICROFINESSE is now available for the IBM Personal Computer running under the UCSD p-system. Microfinesse is a so-called decision-support program which runs on a wide range of mini and mainframe computers. While it is principally a financial-modelling program it can be applied in a number of other areas. It is aimed at financial executives and costs £550.

Contact Ferrari Software Ltd, 683 Armdale Road, Feltham, Middlesex TW14 OLW. Telephone: 01-751 5791.

Could anything be Finar?

FINAR is a financial-planning package used by over 100 corporations on PDP-11 and Vax minicomputers. Now a micro version has been launched, called Microfinar. It features such delights as sensitivity analysis and goal seeking, graphics and a separate report writer.

Early customers include United Biscuits, with an Altos-based package, and a Fisons and Boots company called FBC with a Systime 500 set-up.

Contact Corporate Modelling Consultants, Friendly House, 21-24 Chiswell Street, London EC1Y 4UD. Telephone: 01-628 4107.

Haywood 9000

WELL-PROVEN Z-80 technology is at the heart of Haywood's new British-made computer, the 9000 Composite. It has 64K of RAM, two built-in floppy-disc drives with 320K of storage each, and a 12in. monochrome screen.

The detached keyboard has 19 function keys and an 11-key numeric pad; or Haywood can supply versions with up to 34 function keys, including one configured for WordStar.

Contact Haywood Electronics, Electron House, Leeway Close, Hatch End, Pinner, Middlesex. Telephone: 01-428 0111.


sinclair
ZX Spectrum
BLUE
EDIT
RED
CAPS LOCK
MAGENTA
TRUE VIDEO
GREEN
INV. VIDEO
CYAN
YELLOW
WHITE
GRAPHICS
BLACK
DELETE
1 !
2 @
3 #
4 $
5 %
6 &
7 '
8 (
9)
0 _
DEF FN
FN
LINE
OPEN #
CLOSE #
MOVE
ERASE
POINT
CAT
FORMAT
SIN
COS
TAN
INT
RND
STR$
CHR$
CODE
PEEK
TAB
Q <= PLOT
W <> DRAW
E >= REM
R < RUN
T > RAND
Y AND RETURN
U OR IF
I AT INPUT
O ; POKE
P " PRINT
ASN
ACS
ATN
VERIFY
MERGE
[
]
IN
OUT
READ
RESTORE
DATA
SGN
ABS
SQR
VAL
LEN
USR
A STOP NEW
S NOT SAVE
D STEP DIM
F TO FOR
G THEN GOTO
H ↑ GOSUB
J − LOAD
K + LIST
L = LET
ENTER
~
\
CIRCLE
VAL$
SCREEN $
ATTR
LN
EXP
LPRINT
LLIST
BIN
IN KEY$
PI
CAPS SHIFT
Z : COPY
X £ CLEAR
C ? CONT
V / CLS
B * RND
N , INK
M . PAUSE
SYMBOL SHIFT
BREAK SPACE
BEEP
INK
PAPER
FLASH
BRIGHT
OVER
INVERSE

Sinclair ZX Spectr

16K or 48K RAM... full-size moving-key keyboard... colour and sound... high-resolution graphics...

From only £125!

First, there was the world-beating Sinclair ZX80. The first personal computer for under £100.

Then, the ZX81. With up to 16K RAM available, and the ZX Printer. Giving more power and more flexibility. Together, they've sold over 500,000 so far, to make Sinclair world leaders in personal computing. And the ZX81 remains the ideal low-cost introduction to computing.

Now there's the ZX Spectrum! With up to 48K of RAM. A full-size moving-key keyboard. Vivid colour and sound. High-resolution graphics. And a low price that's unrivalled.

Professional power– personal computer price!

The ZX Spectrum incorporates all the proven features of the ZX81. But its new 16K BASIC ROM dramatically increases your computing power.

You have access to a range of 8 colours for foreground, background and border, together with a sound generator and high-resolution graphics.

You have the facility to support separate data files.

You have a choice of storage capacities (governed by the amount of RAM). 16K of RAM (which you can uprate later to 48K of RAM) or a massive 48K of RAM.

Yet the price of the Spectrum 16K is an amazing £125! Even the popular 48K version costs only £175!

You may decide to begin with the 16K version. If so, you can still return it later for an upgrade. The cost? Around £60.

Ready to use today, easy to expand tomorrow

Your ZX Spectrum comes with a mains adaptor and all the necessary leads to connect to most cassette recorders and TVs (colour or black and white).

Employing Sinclair BASIC (now used in over 500,000 computers worldwide) the ZX Spectrum comes complete with two manuals which together represent a detailed course in BASIC programming. Whether you're a beginner or a competent programmer, you'll find them both of immense help. Depending on your computer experience, you'll quickly be moving into the colourful world of ZX Spectrum professional-level computing.

There's no need to stop there. The ZX Printer – available now – is fully compatible with the ZX Spectrum. And later this year there will be Microdrives for massive amounts of extra on-line storage, plus an RS232 / network interface board.

Key features of the Sinclair ZX Spectrum

- Full colour – 8 colours each for foreground, background and border, plus flashing and brightness-intensity control.
- Sound – BEEP command with variable pitch and duration.
- Massive RAM – 16K or 48K.
- Full-size moving-key keyboard – all keys at normal typewriter pitch, with repeat facility on each key.
- High-resolution – 256 dots horizontally x 192 vertically, each individually addressable for true high-resolution graphics.
- ASCII character set – with upper- and lower-case characters.
- Teletext-compatible – user software can generate 40 characters per line or other settings.
- High speed LOAD & SAVE – 16K in 100 seconds via cassette, with VERIFY & MERGE for programs and separate data files.
- Sinclair 16K extended BASIC – incorporating unique 'one-touch' keyword entry, syntax check, and report codes.

um

ZX Spectrum software on cassettes – available now

The Spectrum software library is growing every day. Subjects include games, education, and business/household management. Flight Simulation...Chess...Planetoids...History...Inventions...VU-CALC...VU-3D...Club Record Controller...there is something for everyone. And they all make full use of the Spectrum's colour, sound, and graphics capabilities. You'll receive a detailed catalogue with your Spectrum.

ZX Expansion Module

This module incorporates the three functions of Microdrive controller, local area network, and RS232 interface. Connect it to your Spectrum and you can control up to eight Microdrives, communicate with other computers, and drive a wide range of printers.

The potential is enormous, and the module will be available in the early part of 1983 for around £30.

sinclair

Sinclair Research Ltd, Stanhope Road, Camberley, Surrey GU15 3PS.
Tel: Camberley (0276) 685311.

The ZX Printer – available now

Designed exclusively for use with the Sinclair ZX range of computers, the printer offers ZX Spectrum owners the full ASCII character set – including lower-case characters and high-resolution graphics.

A special feature is COPY which prints out exactly what is on the whole TV screen without the need for further instructions. Printing speed is 50 characters per second, with 32 characters per line and 9 lines per vertical inch.

The ZX Printer connects to the rear of your ZX Spectrum. A roll of paper (65ft long and 4in wide) is supplied, along with full instructions. Further supplies of paper are available in packs of five rolls.

The ZX Microdrive – coming soon

The new Microdrives, designed especially for the ZX Spectrum, are set to change the face of personal computing by providing mass on-line storage.

Each Microdrive can hold up to 100K bytes using a single interchangeable storage medium.

The transfer rate is 16K bytes per second, with an average access time of 3.5 seconds. And you'll be able to connect up to 8 Microdrives to your Spectrum via the ZX Expansion Module.

A remarkable breakthrough at a remarkable price. The Microdrives will be available in the early part of 1983 for around £50.

How to order your ZX Spectrum

BY PHONE – Access, Barclaycard or Trustcard holders can call 01-200 0200 for personal attention 24 hours a day, every day. BY FREEPOST – use the no-stamp needed coupon below. You can pay by cheque, postal order, Barclaycard, Access or Trustcard.

EITHER WAY – please allow up to 28 days for delivery. And there's a 14-day money-back option, of course. We want you to be satisfied beyond doubt – and we have no doubt that you will be.

To: Sinclair Research, FREEPOST, Camberley, Surrey, GU15 3BR. **Order**

Qty	Item	Code	Item Price £	Total £
	Sinclair ZX Spectrum – 16K RAM version	100	125.00	
	Sinclair ZX Spectrum – 48K RAM version	101	175.00	
	Sinclair ZX Printer	27	59.95	
	Printer paper (pack of 5 rolls)	16	11.95	
	Postage and packing: orders under £100	28	2.95	
	orders over £100	29	4.95	
			Total £	

Please tick if you require a VAT receipt ☐

*I enclose a cheque/postal order payable to Sinclair Research Ltd for £ _____

*Please charge to my Access/Barclaycard/Trustcard account no.

*Please delete/complete as applicable

Signature

PLEASE PRINT

Name: Mr/Mrs/Miss

Address

PRC 902

FREEPOST – no stamp needed. **Prices apply to UK only.** **Export prices on application.**

Sinclair ZX Spectrum–technical data.

Dimensions

Width	233 mm
Depth	144 mm
Height	30 mm

CPU/ memory

Z80A microprocessor running at 3.5 MHz. 16K-byte ROM containing BASIC interpreter and operating system.

16K-byte RAM (plus optional 32K-byte RAM on internal expansion board) or 48K-byte RAM.

Keyboard

40-moving-key keyboard with full upper and lower case with capitals lock feature. All BASIC words obtained by single keys, plus 16 graphics characters, 22 colour control codes, and 21 user-definable graphics characters. All keys have auto repeat.

Display

Memory-mapped display of 256 pixels x 192 pixels; plus one attributes byte per character square, defining one of eight foreground colours, one of eight background colours, normal or extra brightness and flashing or steady. Screen border colour also settable to one of eight colours. Will drive a PAL UHF colour TV set, or black and white set (which will give a scale of grey), on channel 36.

Sound

Internal loudspeaker can be operated over more than 10 octaves (actually 130 semitones) via basic BEEP command. Jack sockets at the rear of computer allow connections to external amplifier/ speaker.

Graphics

Point, line, circle and arc drawing commands in high-resolution graphics.
16 pre-defined graphics characters plus 21 user-definable graphics characters. Also functions to yield character at a given position, attribute at a given position (colours, brightness and flash) and whether a given pixel is set. Text may be written on the screen on 24 lines of 32 characters. Text and graphics may be freely mixed.

Colours

Foreground and background colours, brightness and flashing are set by BASIC INK, PAPER, BRIGHT and FLASH commands. OVER may also be set, which performs an exclusive–or operation to overwrite any printing or plotting that is already on the screen. INVERSE will give inverse video printing. These six commands may be set globally to cover all further PRINT, PLOT, DRAW or CIRCLE commands, or locally within these commands to cover only the results of that command. They may also be set locally to cover text printed by an INPUT statement. Colour-control codes, which may be accessed from the keyboard, may be inserted into text or program listing, and when displayed will override the globally set colours until another control code is encountered. Brightness and flashing codes may be inserted into program or text, similarly. Colour-control codes in a program listing have no effect on its execution. Border colour is set by a BORDER command. The eight colours available are black, blue, red, magenta, green, cyan, yellow and white. All eight colours may be present on the screen at once, with some areas flashing and others steady, and any area may be highlighted extra bright.

Screen

The screen is divided into two sections. The top section – normally the first 22 lines – displays the program listing or the results of program or command execution. The bottom section – normally the last 2 lines – shows the command or program line currently being entered, or the program line currently being edited. It also shows the report messages. Full editing facilities of cursor left, cursor right, insert and delete (with auto-repeat facility) are available over this line. The bottom section will expand to accept a current line of up to 22 lines.

Mathematical operations and functions

Arithmetic operations of +, –, ×, ÷, and raise to a power. Mathematical functions of sine, cosine, tangent and their inverses; natural logs and exponentials; sign function, absolute value function, and integer function; square root function, random number generator, and pi.

Numbers are stored as five bytes of floating point binary – giving a range of $+3 \times 10^{-39}$ to $+7 \times 10^{38}$ accurate to 9½ decimal digits.

Binary numbers may be entered directly with the BIN function. =, >, <, >=, <= and <> may be used to compare string or arithmetic values or variables to yield 0 (false) or 1 (true). Logical operators AND, OR and NOT yield boolean results but will accept 0 (false) and any number (true).

User-definable functions are defined using DEF FN, and called using FN. They may take up to 26 numeric and 26 string arguments, and may yield string or numeric results.

There is a full DATA mechanism, using the commands READ, DATA and RESTORE.

A real-time clock is obtainable.

String operations and functions

Strings can be concatenated with +. String variables or values may be compared with =, >, <, >=, <=, <> to give boolean results. String functions are VAL, VAL$, STR$ and LEN. CHR$ and CODE convert numbers to characters and vice versa, using the ASCII code.

A very powerful string slicing mechanism exists, using the form a$ (x TO y).

Variable names

Numeric – any string starting with a letter (upper and lower case are not distinguished between, and spaces are ignored).
String – A$ to Z$.
FOR-NEXT loops – A-Z.
Numeric arrays – A-Z.
String arrays – A$ to Z$.

Simple variables and arrays with the same name are allowed and distinguished between.

Arrays

Arrays may be multi-dimensional, with subscripts starting at 1. String arrays, technically character arrays, may have their last subscript omitted, yielding a string.

Expression evaluator

A full expression evaluator is called during program execution whenever an expression, constant or variable is encountered. This allows the use of expressions as arguments to GOTO, GOSUB, etc.

It also operates on commands allowing the ZX Spectrum to operate as a calculator.

Cassette interface

The ZX Spectrum incorporates an advanced cassette interface. A tone leader is recorded before the information to overcome the automatic recording level fluctuations of some tape recorders, and a Schmitt trigger is used to remove noise on playback.

All saved information is started with a header containing information as to its type, title, length and address information. Program, screens, blocks of memory, string and character arrays may all be saved separately.

Programs, blocks of memory and arrays may be verified after saving to confirm successful saving.

Programs and arrays may be merged from tape to combine them with the existing contents of memory. Where two line numbers or variables names coincide, the old one is overwritten.

Programs may be saved with a line number, where execution will start immediately on loading.

The cassette interface runs at 1500 baud, through two 3.5 mm jack plugs.

Expansion port

This has the full data, address and control busses from the Z80A, and is used to interface to the ZX Printer, the RS232 and NET interfaces and the ZX Microdrives.

IN and OUT commands give the I/O port equivalents of PEEK and POKE.

ZX81 compatibility

ZX81 BASIC is essentially a subset of ZX Spectrum BASIC. The differences are as follows.

FAST and SLOW: the ZX Spectrum operates at the speed of the ZX81 in FAST mode with the steady display of SLOW mode, and does not include these commands.

SCROLL: the ZX Spectrum scrolls automatically, asking the operator "scroll?" every time a screen is filled.

UNPLOT: the ZX Spectrum can unplot a pixel using PLOT OVER, and thus achieves unplot.

Character set: the ZX Spectrum uses the ASCII character set, as opposed to the ZX81 non-standard set.

ZX81 programs may be typed into the ZX Spectrum with very little change, but may of course now be considerably improved. The ZX Spectrum is fully compatible with the ZX Printer, which can now print out a full upper and lower case character set, and the high resolution graphics; using LLIST, LPRINT and COPY.
ZX81 software cassettes and the ZX 16K RAM pack will not operate with the ZX Spectrum.

sinclair
ZX Spectrum

Sinclair Research Ltd, Stanhope Road, Camberley, Surrey, GU15 3PS. Tel: Camberley (0276) 685311.

One-day VisiCalc

Jack Schofield tries out one of MicroMark's courses

BACK IN THE OLD DAYS — say 1978 or 1979 — most microcomputers were bought by enthusiasts. They were (a) amazed that they could own computer at all, and (b) astonished that they could make it do anything useful. The fact that many programs were awful and the documentation even worse did not disconcert these enthusiasts. It was all part of the challenge, and how we loved it.

Nowadays microcomputers are bought by real people who have the idea — encouraged by the media and the Government — that all they have to do is plug the thing in and most of their problems will be solved. Good dealers need to disabuse their customers of this myth, and good dealers know they have to train their customers to make the best use of the products.

Customers, however, are often short-sighted, and tend to buy their micros from the dealer offering the lowest price. They will even buy goods they have never seen, from people they don't know, by mail! Unfortunately, training takes time, and time is money.

Training investment

As a result, many good dealers now offer training, and charge for it. Others, like MicroMark, organise formal courses on a professional basis. This has two advantages. People who bought discount equipment can get the training they need — ironically, by spending the money they thought was saved.

MicroMark started in 1979 as a specialist Apple dealer, though the firm now sells the IBM Personal Computer too. For some of the reasons already described, its own training division was launched last summer and by the end of 1982 had run over 30 courses. MicroMark offers three different courses, each lasting one day:

Learn VisiCalc — for beginners
Using VisiCalc — for people familiar with the package
Beyond VisiCalc — covers extensions such as Visiplot, -term and -trend.

There is no obligation to attend all three days, though obviously some would find it an advantage.

I went on the first course, conducted by Philip Stokes at a London hotel. The day began with coffee, biscuits and introuductions at 9 am, with the formal part of the course starting at 9.30. On this occasion there were only seven students, plus the lecturer and David Flook from MicroMark. We shared five Apple IIs, so there were two people per machine, three is MicroMark's limit.

The tuition alternated between Philip Stokes' lecturing, with all the students' Apples slaved to his, and hands-on

experience. We started with keyboard exercises, which were explained using charts and an overhead projector before being run through on the VDU.

Then we were given an exercise sheet to follow, and allowed control of the micros to actually try it. The two tutors came round the class to make sure we managed. In this way we covered the VisiCalc commands: it took all morning, not including the coffee break, and it still felt fast.

An excellent lunch, with wine, was followed by an afternoon session devoted to VisiCalc functions and applications. Functions included error reporting, look-up tables, Dif files and datagrams. Applications included inventory, bill of materials, cash flow, manufacturing plans, estimating and scheduling. The final session allowed time for a short personal experiment — starting a model from scratch — before the course ended after 5 pm.

At the start of the course you are given a 40-page handbook. Most of it is white space, but it does include all the charts and printouts of the overhead slide projections used in the lectures. They make it fairly easy to remind yourself of what you should have learned, and so find the piece of information you need.

You are also given an Apple disc of the 19 models and files used in the course. It provides another useful reminder of the course later, when you are trying to construct you own models. You can also use it as a source of ideas. I found this one of the most interesting parts of the course — not being one of the 300,000 or so people who actually own a copy, I had never realised just how useful and versatile VisiCalc could be.

Certainly it is possible to learn how to use VisiCalc from the manual, especially if you are already familiar with the Apple — or at least, a computer keyboard. But is it worth spending money on a course? The MicroMark courses cost £112 plus VAT for single days, which seems average.

Taking a course certainly does have advantages. First, it reduces the time-wasting you get with any new software package and computer. Recently I spent 15 minutes trying to follow the screen instruction "Press <Esc> to continue" because there was no <Esc> on the keyboard. The demo disc even had a section on the Esc key without saying which it was. Naturally it was not in the index of the manual. Multiply this confusion, and you can waste a lot of time learning how to use a micro.

Second, going on a course establishes the time slot necessary to learn at least the rudiments of the package. Let's face it, no business user has the time to learn how to use software properly, and no time to read the manual. In theory it is possible to devote a day in the office to learning the basics, but then the phone rings all day, and all kinds of crises come up which "must" be dealt with. Being shut away in a hotel where no one can reach you, and where you can spend all day learning one thing, is a much more efficient way of doing it.

Pool of experts

Third, it is useful to be able to draw on othe people's expertise. Almost everyone could learn at least something, even from the beginner's course. For example, I had not appreciated the power of the Datagram technique, where you can construct macros of several instructions — such as the column replication and multiplication needed to do a consolidated balance — then save the routine and apply it like a subroutine when needed.

In the end a course cannot replace studying the manual, and it has disadvantages compared to individual on-the-job training.

Certainly I am glad I had the chance to go on MicroMark's VisiCalc course. Perhaps the best thing I can say about it is that it persuaded me I should buy VisiCalc — though I will not want the Apple version, so the work disc will not be much use.

I shall also look with a new interest at details of the many other courses available. Picking a good course is probably the most difficult problem of all. Word-of-mouth recommendations must be the best way of deciding, though it should inspire confidence if a course has been run a number of times already. Most of the bugs should have been sorted out.

Small numbers of people and real hands-on experience are also important factors. MicroMark's own ceilings of three people per work station, one tutor per two work stations and eight work stations per course seem reasonable. You can contact MicroMark's Training Division at Ravenscroft Road, Henley, Oxfordshire RG9 2DH. Telephone: (04912) 77926 or 77085.

G. W. COMPUTERS LTD LONDON'S WEST END NATIONWIDE OVERNITE SERVICE MORE PRODUCT RANGES LOWER SYSTEM PRICES BETTER SERVICE

*****THE NEW DBMS III (series III of the world's first 'task-robot-programs')*****

*****FEATURES*****

Mbasic & word-star compatible
1400 character record sizes
mathematical scratchpad
record relational indexes
translateable to any language
User-defineable reporting
field protection/classification
sorts 'alpha or numeric' any window
either-or. same as. greater. smaller
32000 records per filename
20 main/200 sub fields per record
field and record related formulae
'Jump-to' any of 32000 records per file
random/binary/key/multiple field search
'if-then' questioning
file protection/password entry
speed of 500 records per 20 seconds
range match. not match. integer match
12 online file architectures
240 fields using cross-referencing
cross-record calculations
'Jump-to' any record in 12 files
User-defineable files/field words/sizes
endless 'either-or' matching
formulate/recall on selection criteria
12 interrogation question types
short filing output/audit trails

ONE OF THOUSANDS OF DIFFERENT TASKS ON WHICH THIS PROGRAM MIGHT BE EMPLOYED

DMS'S MACROS WORK FROM THE MOMENT YOU INSERT THE 'TASK DISK' IN THE COMPUTER DRIVE

Simply design your file, give its fields your words, setup your report mask, and then enter your records. Switch to 'automatic drive' and formulate any task you wish the program to fulfill, the task is stored as a macro. Take a copy of the program on another 'task disk' and from then on, the task disk will function without a single key-stroke. Think of a number of such 'task disks' such as "stock-re-order reports"; "stock-valuation reports"; "sale-mail-shots"; "production-process-analysis"; "patient history analysis"; "research-analysis"; "budgetting" "purchase/sales-analysis"; "personell-file-analysis"; "vehicle-location control"; "librarian analysis"; "plus more?"

Previous issues showed examples of 'employees-short-list', 'garage stock re-order', 'sales analysis' 'librarian's list' here is an example of a hospital's patient index and some reports it might generate.

The record may look like this:
1-record number (23)
2-patient (John Smythe)
3-date of birth (01.05.45)
4-date last visit (12.02.82)
5-symptom (epigastrium ache)
7-diagnosis (peptic ulcer)
8-test type (barium meal)
9-prescription (100 mg carbenoxolone sodium 3 * daily)
10-effect/other (minor improvement/test for surgical treatment)

One report might be: select ?? all records where patients have had symptoms of 'epigastrium ache' associated with nausea or vomiting not diagnosed as peptic ulcer. Print a list of those where there were barium tests made and the effect.

Another report might be: select ?? all records in the file where the where diagnosis of ailment was peptic ulcer or duodenal ulcer, and then where the treatment was carbenoxolone sodium and in the first instance list those where there was no improvement; after which list those where there was an improvement..

DBMS II (WITHOUT MACROS) AND DBMS III ARE FULLY IMPLEMENTED UNDER CPM-86 (tm) and MS-DOS (tm) ie: (SIRIUS/VICTOR/IBM)
DBMS II IS 395.00 (or 250.00 by mail order ex. training). DBMS III Is 575.00 (or 295.00 by mail order ex. training)

TELEPHONES: 01-636 8210 : 01-631 4818 TLX: 892031 TWCG (BOSTON 94-0890)

MICRO-COMPUTERS

G.W.L.	-G80 64K/interface ports/k'board	795.00
	-G80 V.D.U.	150.00
	-G80 Dual/drives enclosed	550.00
INTERTEC	-Superbrain 64K RAM/320K disks	1695.00
	-Superbrain 64K RAM/700K disks	2195.00
	-Superbrain 64K RAM/1.5M disks	2595.00
	-Superbrain 64K RAM/10M disks	call
	-Compustar 64K RAM/0K disks	1495.00
	-Compustar 64K RAM/320K disks	1995.00
	-Compustar 64K RAM/700K disks	2495.00
	-Compustar 64K RAM/1.5M disks	2895.00
NORTHSTAR	-Advantage 64K RAM/700K disks	£2095.00
	-Advantage 64K RAM/5.3M disks	£2995.00
	-Horizon 64K RAM/6.3M disks	3595.00
TELEVIDEO	-802 64K RAM/700K disks	1995.00
	-802H 64K RAM/7.3M disks	3250.00
	-806 64K RAM/10M disks	4595.00
	-816 256K/750K disks	£2950.00
ACT	-Sirius 1 128K/1.2M disks	£2395.00
	-Sirius 2 128K/2.4M disks	£2895.00
VICTOR	-9000 128K/1.2M disks	£2395.00
OSBORNE	-1 64K RAM/200K disks	1250.00
IBM	-PC 64K RAM/640K disks	£2695.00
	-PC1 330K/640K disks	£2995.00
PET	8032 32K RAM	795.00
	8050 1 Meg disks	795.00
	64 CBM personal computer	call
APPLE	II 64K/CPM/2 disk/Monitor	2395.00
ALTOS	ACS800-2 64K RAM/1M disks	1995.00
	ACS800-10 208K/10.5Meg disks	5495.00
NEC	PC8001/12 64K RAM/350K disks	1695.00
	APC 128K RAM/2M disks	call
CORVUS	Concept 16 bit pc	call
SANYO	G80 64K RAM/320K disks	1350.00
ABC	24 64K RAM/700K disks	2195.00
	26 64K RAM/2.2M disks	3250.00

All computer prices include mbasic as standard.
All prices marked £ are 8/16 bit machines.

SYSTEM DEALS

Choose any computer and any printer
add 10% for full 12 month warranty (12.5% mntnce)
add 150.00 for blank diskettes
add 175.00 for cables, delivery and installation
training optional extra 100.00

and get completely ****FREE****

cpm handbook	50 basic exercises	2000 sheets paper
DBMS II	magic wand w/proc	magic calc
mbasic 80	diagnostics	msort/dsort
recover	autoload	instant basic
cbasic	disk/games	library case

****total value 1480.00****

Buy a system including a hard disk and get FREE the G80/86 software package value 690.00 also

PRINTERS

OKI	-Microline 80	295.00
	-Microline 82A	395.00
	-Microline 83	695.00
	-Microline 84	895.00
EPSON	-MX80/FT-3	375.00
	-MX100/FT-3	495.00
ANADEX	-DP 9000	895.00
	-DP 9501	1045.00
	-DP 9501 (A)	1145.00
QUME	-9/45 R/O	1695.00
	-9/55 R/O	1795.00
	-9/35 R/O	1495.00
NEC	-3510 R/O	1395.00
	-7710 R/O	1795.00
	-5520 KSR	2250.00
DRE	-8820	1295.00
	-8830	1695.00
TEXAS	-810	1295.00
	-825	1395.00
DIABLO	-630	1695.00
RICOH	-RP1600	1495.00
OLYMPIA	-ESW 103 14 CPS	975.00
	-ESW ??? 55 CPS	1025.00

PERIPHERALS & ACCESSORIES

CORVUS	-6 Meg hard disk	1750.00
	-11 Meg hard disk	2750.00
	-20 Meg hard disk	3750.00
	-Multiplexor 7 station	695.00
	-Mirror backup card	695.00
INTERTEC	-Compustar 10 Meg hard disk	2750.00
	-CDC 96 Meg hard disk	7950.00
N'STAR	-16 Bit u/grade	325.00
	-18 Meg hard disk	2995.00
RODIME	-6 Meg hard disk	1495.00
	-12 Meg hard disk	1950.00
MORROW	-26 Meg hard disk	3295.00
GENIE	-5MG fixed/5MG removeable disk	3295.00
CDC	-s/sided floppy drives	150.00
	-d/sided floppy drives	225.00
	-d/sided d/track drives	375.00
MEMOREX	-soft/hard s/sided diskettes (10)	30.00
SCOTCH	-104/2D double sided (10)	50.00
S.S.E.	-Softbox PET to CPM (tm)	495.00
	-Sirius 8/16 bit 5MHz card	365.00
QUADRAM	-64K print spooler/copier	250.00
BIZCOMP	-RS232/auto-modem 1200 baud	450.00
AST	-Port expanders (4 tmnls to 1 prtr)	395.00
GIX	-Port expander (switches)	95.00

NOTE: Corvus drives with multiplexor may network sirius .. Superbrain .. Concept .. PET .. Victor .. IBM ..

SOFTWARE

G.W.L.	-BUS V8.00 (Accounts)	575.00
	-DBMS II (Database)	£395.00
	-DBMS II (by mail order only)	£250.00
	-DBMS III (database)	£575.00
	-DBMS III (by mail order only)	£295.00
	-DSORT & MSORT (MBasic Files)	£75.00
	-Sales Ledger	£95.00
	-Purchase Ledger	£95.00
	-Nominal Ledger	£95.00
	-Stock-Control	£95.00
	-Address-Mailer	£95.00
	-QASort/QNSort (500 Recs/14secs)	£95.00
	-Autoload & Recover	25.00
MICROSOFT	-Mbasic 80	150.00
	-Fortran 80	200.00
	-Cobol 80	320.00
	-Basic Compiler	190.00
	-MU lisp/mu star	95.00
MICROPRO	-Word-star	£250.00
	-Mail-merge	£55.00
	-Spelstar	100.00
	-Datastar	170.00
	-Super-sort	120.00
	-W-star/M-merge/Sp-Star	350.00
BYROM	-BStam (communications)	95.00
	-BStms (tele-comms')	95.00
DIGITAL	-Despool	30.00
	-CBasic	75.00
	-Pascal MT	225.00
F. GELLER	-Quickscreen	95.00
LEXISOFT	-Spellbinder	195.00
LIFEBOAT	-T/Maker	155.00
M'FOCUS	-CIS Cobol	420.00
	-Forms II	100.00
SORCIM	-Super Calc	185.00
	-Pascal M	250.00
STANDARD	-Quic-N-Easy	195.00
PEACHTREE	Magic Wand	190.00
	-Magic Calc	175.00
S'Soft	-Diagnostics	50.00
N'West	-Statpak	250.00
OASIS	-The Word	35.00
ITHACA	-Pascal Z	100.00
MICROSTUFF	-Cross-talk (Tele-comms')	95.00
WOOLFE	-Move-it (Micro to Micro)	45.00

Software formats on all micros in our hardware list.
All prices marked £ are available 8/16 bit formats.

TERMS & ETC

G. W. Computers Ltd (Grama (Winter) Ltd)
55 Bedford Court Mansions
Bedford Avenue
London W.C.1. England.
Tel: 01-636 8210: 01-631 4818: tlx 892031 twc g
Boston office tlx 94-0890
24 hour answerphone-leave address for 'infopacks'
We do not operate a reader's reply card service.
Terms: C.W.O. or C.O.D. Prices include V.A.T. No dealers. The above lists are not exhaustive.
Please call in only by prior appointment.

G80/86 SOFTWARE

Fully implemented on MS-DOS, CPM 2.2 and CPM 86 (tm)

Works on IBM, Sirius and Victor 9000 and all micro-computers in our price list

Sale ledger (95 pounds)
Purchase ledger (95 pounds)
Nominal ledger (95 pounds)
Aged analysis (25 pounds)
Stock control-valuation/re-order (95 pounds)
The invoicer (95 pounds)**
The address mailer (95 pounds)
The Spread-calc (95 pounds)
The sales/purchase order-book (95.00)**
The diary (95.00)**
Qasort/Qnsort (500 records/15 seconds) (95 pounds)

Each module is a set of 'tast disks' designed for minimal learning curve. This software derives from modules of 'DBMS III' and runs reports without your secretary having to touch a single key.

Consider the advantages in these features. The user manual is contained in FIVE pages. All reports are generated by robot functions. Reliability tested (benchtest PCW June). Works in a network multi-user environment. Fast easy data entry. Files are re-organised and sorted automatically.

Produced by the same people that originated 'BUSiness', 'DBMS II', 'DB-CALC', 'AUTOLOAD AND RECOVER' 'ETC' and sold successfully over the past five years.

Also see our advertisement next page, the software above comes free with a system purchase (excluding items marked ** and DBMS III).

The G80/86 networks

Based upon one hard disk and multiplexor module the G80/86 networks feature full network sharing of data resources by adding different stations that may be as various as Sirius/Victor 9000/IBMSuperbrain/Pet/N' star/Sanyo. The low-cost start-up of a network could be simply

1 hard-disk of 5 mgbytes	1 multiplexor	1-2 stations
2100.00	695.00	from 795.00

We also have a special 'spooler module' as well as software controllable port expanders and modems for output to telephones, printers, and screens so that a number of terminals may share the resources of one printer, as well as be able to send files over the telephone at any time (day/night) to both store on the hard disk and print out as well.

Imagine a terminal at a remote site, being able to send/receive its files to/from the main network's hard disk/printer overnight to be examined and processed the next day.

The commands are literal English. Like: (send file 'ledger' to port 'B' (the modem) at 11.30)

only from **G. W. Computers** (the leaders in database)

Call us on 01-636 8210 or 01-631 4818

and leave your address for our standard 'infopacks'

Purchasers of a network (h'disk, micro, printer) get the system deal and above software list . . . FREE

IMAGINE EVENTUALLY BEING ABLE . . .

With an IBM PC, Modem, dot matrix and daisy printer, to start your day with our robot task disks working under CONCURRENT CPM 86 (tm).

Enter virtual console 0 and telephone your head-office to call all yesterday's ledger files and store them locally on your hard disk.

Now switch to virtual console 1 and while console 0 runs concurrently for about an hour, get a 1000 mail-shot running to the daisy printer.

Now switch to virtual console 2 and while consoles 0/1 run concurrently, get the 'robot task' of producing a stock-re-order report out to the fast dot matrix.

Now switch to virtual console 3 and while consoles 0/1/2 run concurrently, do some programming, or file-reorganising, or any other task you might require.

Four virtual computers all running concurrently on one computer, batch processing to various devices or else queue-spooling their output through print buffers of up to 500K storage and spreading the load through time on fewer printers.

SPECIAL DEAL

This special deal has been constructed in order to balance out some of our existing suplus stock, it is therefore of a considerable equity advantage to the client who may be needing such a configuration.

ITEM 1
Micro-computer ABC 24 (VDU/twin disk 700K/64K ram) NORMALLY 2195.00
Dre 8830 fast dot matrix printer 180 cps
NORMALLY 1695.00
****** 2995.00 ******

ITEM 2
Micro-computer ABC 26 (VDU/Twin 8" disk 2.4mg/64K ram) NORMALLY 3250.00
Dre 8830 fast dot matrix printer 180 cps NORMALLY 1695.00
****** 3995.00 ******

ITEM 3
Micro-computer televideo 802 (VDU/2 drive 700K/64K ram) NORMALLY 2195.00
Dre 8830 fast matrix printer 180 cps NORMALLY 1695.00
****** 2995.00 ******

YOU ALSO GET FREE WITH THE ABOVE SYSTEMS
The SYSTEM DEAL SOFTWARE value 1480.00 also 20 disks, 90 day warranty and cables.
See our main advert for 'system deal info'.
Note: these are CP/M operating systems and priced ex. showroom only.
We do not have many available!
Telephone 01-636 8210 or 01-631 4818

● Circle No. 117

TTL's 74 SERIES

7406	18p
7407	18p
7416	18p
7417	18p
7425	18p
74121	25p
74128	36p
74150	50p
74159	75p
74182	40p
74184	90p
74185A	90p

74LS SERIES

74LS00	11p
74LS01	11p
74LS02	11p
74LS03	12p
74LS04	12p
74LS05	12p
74LS08	12p
74LS09	12p
74LS10	13p
74LS11	13p
74LS12	13p
74LS13	18p
74LS14	28p
74LS15	12p
74LS20	13p
74LS21	13p
74LS22	13p
74LS26	14p
74LS27	13p
74LS28	14p
74LS30	13p
74LS32	13p
74LS33	14p
74LS37	14p
74LS38	14p
74LS42	36p
74LS47	36p
74LS48	45p
74LS51	14p
74LS55	14p
74LS73	18p
74LS74	16p
74LS75	18p
74LS76	18p
74LS83	36p
74LS85	45p

74LS85	40p
74LS86	16p
74LS90	22p
74LS92	20p
74LS93	22p
74LS95	40p
74LS96	50p
74LS107	20p
74LS109	27p
74LS112	20p
74LS113	20p
74LS114	22p
74LS122	25p
74LS123	34p
74LS124	90p
74LS125	24p
74LS126	25p
74LS132	34p
74LS133	45p
74LS136	25p
74LS138	27p
74LS139	27p
74LS145	70p
74LS147	100p
74LS148	75p
74LS151	40p
74LS153	40p
74LS154	80p
74LS155	30p
74LS156	36p
74LS157	25p
74LS158	30p
74LS160	36p
74LS161	36p
74LS162	36p
74LS163	36p
74LS164	40p
74LS165	50p
74LS166	60p
74LS170	70p
74LS173	55p
74LS174	40p
74LS175	40p
74LS181	90p
74LS183	120p
74LS190	36p
74LS191	36p
74LS192	36p
74LS193	36p
74LS194	35p
74LS195	35p
74LS196	45p

74LS197	45p
74LS221	50p
74LS240	55p
74LS241	55p
74LS242	55p
74LS243	55p
74LS244	55p
74LS245	70p
74LS251	30p
74LS253	30p
74LS257	30p
74LS258	35p
74LS259	55p
74LS260	22p
74LS266	20p
74LS273	55p
74LS279	30p
74LS280	100p
74LS283	45p
74LS293	40p
74LS295	90p
74LS298	90p
74LS299	180p
74LS323	180p
74LS324	160p
74LS348	90p
74LS352	60p
74LS353	60p
74LS356	450p
74LS363	140p
74LS364	140p
74LS365	30p
74LS367	30p
74LS368	30p
74LS373	55p
74LS374	55p
74LS375	70p
74LS377	70p
74LS378	45p
74LS390	45p
74LS393	45p
74LS395	90p
74LS399	180p
74LS445	100p
74LS540	90p
74LS541	80p
74LS610	£19
74LS640	100p
74LS641	100p
74LS642	100p
74LS643	100p
74LS644	100p

74LS645	100p
74LS668	100p
74LS669	100p
74LS670	120p
74LS682	300p
74LS684	300p
74LS687	400p

74S SERIES

74S00	30p
74S02	30p
74S04	30p
74S05	60p
74S08	60p
74S10	40p
74S11	50p
74S20	40p
74S30	40p
74S32	70p
74S37	60p
74S38	70p
74S51	70p
74S74	75p
74S85	450p
74S86	180p
74S112	90p
74S113	90p
74S114	90p
74S124	300p
74S132	110p
74S133	60p
74S138	120p
74S139	120p
74S157	250p
74S163	300p
74S174	250p
74S175	320p
74S194	320p
74S195	500p
74S225	510p
74S240	300p
74S241	300p
74S244	300p
74S260	70p
74S261	300p
74S262	860p
74S373	400p
74S374	400p

VOLTAGE REGULATORS FIXED PLASTIC

	+ve		−ve	
1A				
5V	7805	40p	7905	45p
12V	7812	40p	7912	45p
15V	7815	40p	7915	45p
18V	7818	40p	7919	45p
24V	7824	40p	7924	45p
5V 100mA	78L05	30p	79L05	50p
12V 100mA	78L12	30p	79L12	50p
15V 100mA	78L15	30p	79L15	50p

OTHER REGULATORS

LM309K	140p	78H05KC	550p
LM317K	325p	78GU1C	200p
LM323K	450p	79GU1C	225p
LM337T	225p	79HGKC	700p
LM723N	30p	ICL7660	200p
TL494	300p	TL497	300p
78540	225p	LM305AH	250p
78HGKC	600p		

BBC MICRO COMPUTER

OFFICIAL DEALER

BBC Model B £399incl VAT Carr £8

Model A to Model B upgrade kit £50

Fitting charge £15

Partial Upgrades also available

BBC FLOPPY DISC DRIVES

FD Interface	£70	Installation £20
Single Drive	5¼"	100K £235 + £6 carr
Dual Drive	5¼"	800K £799 + £8 carr

BBC COMPATIBLE DRIVES

These are drives with TEAC FD50 mechanism and are complete with power supply.

SINGLE:	100K £190	200K £260	400K £340
DUAL:	200K £360	400K £490	800K £610

ACORN WORD PROCESSOR 'VIEW' £52
SECOND PROCESSOR 6502 £170
SECOND PROCESSOR Z80 £170
TELETEXT ADAPTOR £195
PRESTEL ADAPTOR £90

Full Range of Connectors in Stock

SOFTY II INTELLIGENT PROGRAMMER

The system micro processor development system for Engineers and Hobbyists. You can develop programs, debug, verify and commit to EPROMS or use in host computer by using softy as a romulator. Powerful editing facilities permit bytes, blocks of bytes changed, deleted or inserted and memory contents can be observed on ordinary TV. Accepts most +5v Eproms. Softy II complete with PSU, TV Lead and Romulator lead £169.

COMPUTER COMPONENTS

CPUs

1802CE	650p
2650A	£12
6502	350p
6502A	500p
6800	225p
6802	250p
68B09	£12
6809	650p
6809E	£12
68B09	£12
8035	350p
8039	£3
8080A	250p
8085A	450p
R0B6A	£22
8748	£18
INS8060	£11
TMS9980	£20
Z8	£24
Z80	290p
Z80A	320p
Z80B	£12
8088	£18
TMS9995	£12

SUPPORT DEVICES

3242	800p
3245	450p
6520	280p
6522	310p
6532	550p
6551	650p
6821	100p
68B21	220p
6840	375p
68B40	650p
6850	110p
68B50	280p
6852	250p
6854	£7
6875	500p
8154	950p
8155	350p
8156	350p
8205	225p
8212	110p
8216	100p
8224	180p
8226	250p
8228	220p
8243	280p
8250	850p
8251	250p
8253	390p
8255	250p
8256	£36
8257	£4
8259	£4
8271	£36
8279	440p
8284	350p
8288	£11
8755A	£15
9902A	300p
Z80PIO	250p
Z80APIO	280p
Z80CTC	250p
Z80ACTC	280p
Z80ADART	700p
Z80ADMA	£10
Z80AS10,0/1/2	£9
Z80SIO/1/2	£9

MEMORIES

2101A	400p
2101 2L	120p
21078	500p
2111A	300p
2114 2L	100p
2147	450p
4027 3	300p
4116 15	120p
4116 20	100p
4118 3	500p
4118 4	450p
4164-2	£5
4164-15 (TI)	£4
4416-15 (TI)	£6
4816AP3	280p
5101	210p
6116P 3	420p
6810	120p
7489	180p
74S189	225p
74S201	350p

ROM & PROM

74S188	325p
74S287	225p
74S288	225p
74S387	350p
74S471	650p
74S473	650p
74S474	400p
74S570	650p
74S571	650p
74S573	900p

EPROMS

2708	250p
2716	250p
2564	£12
2516	250p
2532	375p
2732 3	700p
2732 35	600p
2732 45	375p
2716 350	£5
2732 350	600

BAUD RATE GENERATORS

COM8116	£7
74MC14411	675p
47028	750p

UARTs

AY 3 1015P	300p
AY 5 1013P	300p
IM6402	450p
TR1602	300p
COM8017	300p

MODULATORS

6MHz UHF	375p
8MHz UHF	450p

INTERFACE ICs

AD558CJ	775p
AD561J	£20
AM25S10	350p
AM26LS2521	£2
AM26LS32	125p
COM8116	£8
DAC80	£28
DM8131	275p
DP8304	250p
DS8831	140p
DS8832	250p
DS8833	225p
DS8835	200p
DS8836	150p
LF13201	450p
MC1488	55p
MC1489	55p
MC14411	675p
MC3486	500p
MC3418	950p
MC3446	300p
MC3480	850p
MC3486	500p
MC3487	300p
MC4024	325p
MC4044	325p
MM58174	800p
ULN2003A	75p
ULN2004A	75p
75107	90p
75110	90p
75112	160p
75114/15	160p
75150P	120p
75182	90p
75324	375p
75361/63	150p
75365	150p
75451/2	72p
75491/2	85p
81LS95/96	80p
81LS97/98	80p
8T26 28	120p
8T95 96	90p
9602	220p
9637AP	160p
ZN425E 8	350p
ZN426E 8	350p
ZN427E 8	650p
ZN428E 8	£5

CRT CONTROLLER

COM5027	£18
COM5037	£18
SFF93634	£8
TMS9927	£18
6545	950p
6845	650
6847	650p
9365	£60
TMS9918	£60
TMS9929	£20
EF9366	£48

HITACHI

4864 RAMS for HI Res available.

CRYSTALS

32 768kHz	100p
100kHz	250p
200kHz	280p
1 0MHz	290p
1 008MHz	275p
1 8432MHz	210p
2 00MHz	225p
2 4570MHz	280p
5 068MHz	150p
3 5795MHz	100p
3 686MHz	300p
4 00MHz	150p
4 194MHz	200p
4 43MHz	110p
5 00MHz	175p
5 068 MHz	210p
6 0MHz	150p
6 144MHz	150p
7 0MHz	150p
7 168MHz	175p
8 86MHz	175p
10 00MHz	175p
10 7MHz	150p
12 00MHz	150p
14 318MHz	150p
16 00MHz	200p
18 00MHz	200p
18 432MHz	150p
19 968MHz	150p
20 000MHz	200p
24MHz	£3
26 690MHz	150p
27 145MHz	200p
38 667MHz	175p
48 00MHz	175p
55 5MHz	400p
116MHz	300p

KEYBOARD ENCODER

AY5 2376	700p
74C922	420p
74C923	450p

CHARACTER GENERATOR

RO-3-2513U	750p
RO-3-2513L	£7
74S262	£10

DISC CONTROL

FD1771	£20
FD1791	£22
FD1793	£23
FD1795	£28
FD1797	£28
WD1691	£15
WD2143	550p
8271	£36
8272	£22

TELETEXT DECODER ICs

SAA5020	600p
SAA5030	£9
SAA5041	£16
SAA5050	£9

TEXTOOL ZIF SOCKETS

24 pin	600p
28 pin	800p
40 pin	£10

LOW PROFILE DIL SOCKETS BY TEXAS

8 pin	9p	18 pin	16p	24 pin	24p
14 pin	10p	20 pin	18p	28 pin	26p
16 pin	11p	22 pin	22p	40 pin	30p

WIRE WRAP SOCKETS BY TEXAS

8 pin	25p	18 pin	50p	24 pin	70p
14 pin	35p	20 pin	60p	28 pin	80p
16 pin	40p	22 pin	65p	40 pin	100p

PRINTERS

NEW LOW PRICES

NEC PC 8023 BE-C

100 CPS, 80 cols Logic Seeking, Bidirectional, Forward and Reverse Line Feed, Proportional Spacing, Auto Underline, Hi-Res and Block Graphics. Greek Char. Set. Only £320 + carr. £8.00.

SEIKOSHA GP 100A 80 cols 30CPS Full ASCII & Graphics 10" Wide Paper Now only £175 + £6.00 carr. Ask for details on GP250A.

MICROTIMER

6502 Based Programmable clock timer with
* 224 switching times/week cycle
* 24 hour 7 day timer
* 4 independent switch outputs directly interfacing to thyristor/triacs.
* 6 digit 7 seg. display to indicate real time, ON/OFF and Reset times.
* Output to drive day of week switch and status LEDS.

Full details on request. Price for kit £57.00.

CONNECTOR SYSTEMS

JUMPER LEADS

24" cable with 25 way D. Conn. Male 550p Female 600p

24" Cable with DIP Headers

	14pin	16pin	24pin	40pin
Single	145p	165p	240p	380p
Double	210p	230p	345p	540p

Cable with Sockets

	20way	26way	34way	40way
Single 24"	185p	210p	270p	300p
Double 18"	290p	385p	400p	540p

ID CONNECTORS (SPEED BLOC TYPE)

	St.Pin	Ang. Pin	Recep-ticles	Edge Conn.
10 way	90p	90p	85p	200p
20 way	145p	160p	125p	240p
26 way	175p	190p	150p	300p
34 way	200p	215p	160p	380p
40 way	220p	230p	190p	550p
50 way	235p	260p	200p	600p

AMPHENOL CONNECTORS

36 way plug/socket	£5.50
24 way plug/socket	£5.50

Available in IDC or Solder version

EUROCONNECTORS

	Plug	Socket
DIN 41617 21 way	180p	180p
DIN 41617 31 way	200p	200p
DIN 41612 2 x 32 way		
Straight pins	290p	330p
2 x 32 way Ang. pin	325p	400p
2 x 32 way wire wrap	325p	375p
3 x 32 way St. pins	250p	400p
3 x 32 way Angled pins	350p	–
IDC Connector A + B	–	475p
IDC Connector A + C	–	525p

2 x 32 way U Connector = £15 (please specify a+b or a+c)

MIN D CONNECTORS

	9	15	25	37
MALE				
No. of ways				
Solder	95p	135p	160p	250p
Angled	160p	230p	210p	425p
FEMALE				
Solder	110p	160p	210p	350p
Angled	175p	240p	275p	500p
Hood (Top or Side Entry)	100p	100p	100p	130p

EDGE CONNECTORS

	0.1"	0.156
2x18 way	—	140p
2x22 way	200p	250p
2x23 way	200p	—
2x25 way	225p	300p
1x43 way	260p	—
2x43 way	395p	—
1x77 way	700p	—

DIP HEADERS

	14pin	16pin	24pin	40pin
Solder type	40p	50p	£1	£2
IDC type	120p	140p	£2	£2.25

RIBBON CABLE (Grey)

Price/meter	
10 way 50p	28 way 120p
14 way 60p	34 way 180p
16 way 70p	40 way 180p
20 way 80p	50 way 330p
24 way 115p	64 way 370p

DIL SWITCHES

4 way 70p	8 way 90p
6 way 80p	10 way 100p

SPECIAL OFFER

	1-24	25-99
2114-200nS	80p	75p
2716 (+5V)	250p	225p
2532	350p	335p
4116-2	80p	75p
4164-2	450p	435p
6116P-3	350p	335p

MONITORS

HI RES GREEN SCREEN ANTIGLARE 12" £99 + £6 Carr

BMC 14" COLOUR £265 + £8 Carr

UV ERASERS

UVIB up to 6 Eproms £47.50

UV140 up to 14 Eproms £61.50

UVIT with Timer £80.00

UV141 with Timer £78.00

(Carr £2/eraser)

All erasers are fitted with mains switches and safety interlocks.

ALSO AVAILABLE FROM STOCK FULL RANGE OF TTL's, CMOS and LINEAR IC's
FOR DETAILED PRICE LIST PLEASE SEND S.A.E.

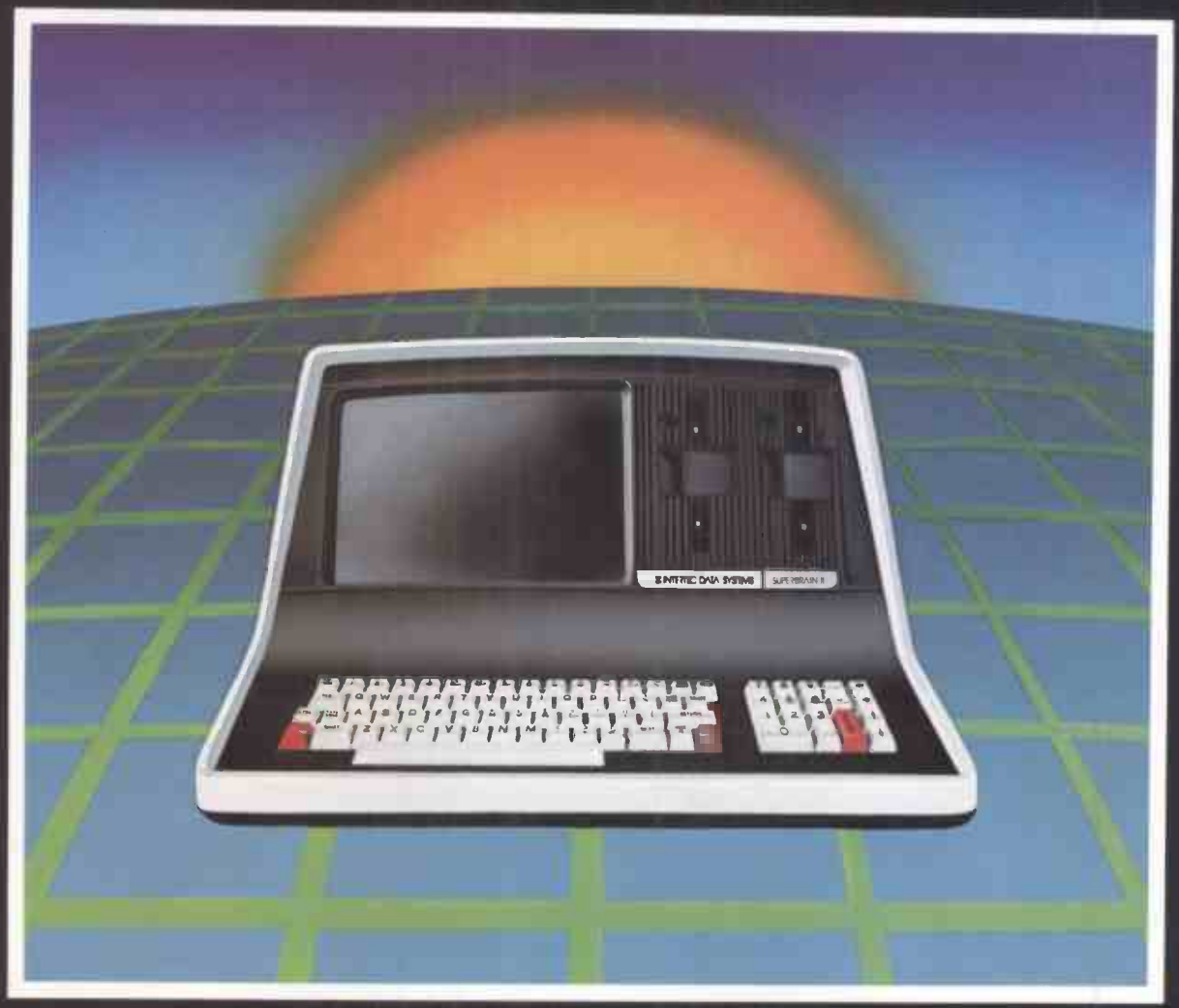
TECHNOMATIC LTD

MAIL ORDERS TO: 17 BURNLEY ROAD, LONDON NW10 1ED
SHOPS AT: 17 BURNLEY ROAD, LONDON NW10
(Tel: 01-452 1500, 01-450 6597. Telex: 922800)
305 EDGWARE ROAD, LONDON W2

PLEASE ADD 40p p&p & 15% VAT
(Export: no VAT, p&p at Cost)

Orders from Government Depts. & Colleges etc. welcome.

Detailed Price List on request.
Stock items are normally by return of post.



THE PERSONABLE BUSINESS COMPUTER™

Intertec announces what may well be the industry's first *personable* microcomputer–SuperBrain II.™

What's a *personable* computer? It's a computer with business application versatility at personal computer prices. It's a computer powerful enough to tackle even your toughest business jobs, yet at a price that won't put you out of business. But most importantly, it's a computer you can put to use right out of the box. That's because SuperBrain II™ boasts the industry standard CP/M* operating software. So whatever your business application, SuperBrain II can handle it. There are literally hundreds of ready-to-run business applications available "off-the-shelf."

Unlike many microcomputers, the SuperBrain II™ is time-tested and field-proven. It's built and backed by a company that's been around as long as the industry itself. A company you can count on for product support and customer satisfaction.

*Registered trademark of Digital Research.
†Microsoft is a trademark of Microsoft Corporation.

STANDARD FEATURES

- Dual 5¼" disk drives
- 350K/750K/1.5 MB disk capacities
- 64K RAM
- Twin Z80A microprocessors
- An easy-to-read 12-inch non-glare screen
- An 18-key numeric keypad
- 10 MB disk expansion capability (Optional)
- Microsoft† Basic

When you think about it–price, performance, and the reputation of the manufacturer–it's no wonder so many discriminating microcomputer users have become "personal" friends with our new SuperBrain II™–the industry's one and only *personable* desktop microcomputer.

INTERTEC DATA SYSTEMS®

CORPORATE HEADQUARTERS: 2300 BROAD RIVER ROAD • COLUMBIA, SOUTH CAROLINA 29210 • (803) 798-9100 • TWX 810-666-2115

● Circle No. 119

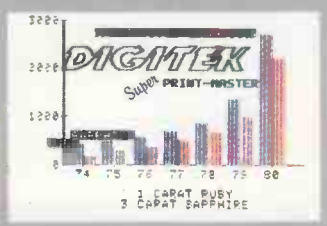
Compatible with the Apple 2E

Super PRINTMASTER III©

A revolutionary printer card for the Apple Computer.

The Super Printmaster III is so advanced there is no other like it in the world.

It means you now have the opportunity to operate with all the features of a word processing system and graphics,in colour. Sales letters will carry more impact, even graphics displays such as graphs, bar charts, can be printed in up to sixteen different colours and with a simple command,can be printed 16 times larger than normal size with as many copies as required.



It doesn't stop there! Used in conjunction with a Ram-Master you will be able to store all the data onto the ramcard, thereby freeing the computer during printing. This allows you to use the Apple for other functions — a real time saver. No additional software or hardware is required.

The Super Printmaster III, as well as having many hi-text features, also dumps from the screen both Hi-Res and Lo-Res graphics.

In the buffering mode your Super Printmaster III will 'cue' up to 255 of your print files; in fact it will take over the whole of your printer management.

So make the most of your Apple system, install the Super Printmaster III. You certainly won't be disappointed.

Dealer Enquiries Welcome

DIGITEK EXPANDER CARDS

Digitek (International) Ltd.,
37c West Street, Horsham,
West Sussex, RH12 1PP, England.

● Circle No. 120

You've really got our back up

The Intertec SUPERBRAIN microcomputer from Icarus

For a stand alone system, the SUPERBRAIN comes with a tremendous amount of support – from Icarus. Each machine is thoroughly tested before it leaves our premises and the nationwide network of Icarus dealers offers a full maintenance service and training programme at local level.

As for the machine itself, SUPERBRAIN is a smart, fully self-contained desk-top unit using the popular CP/M operating system. Twin Z80 microprocessors and an RS 232 communications port mean that you can never outgrow it – the SUPERBRAIN will expand to keep pace with your business.

320K, 680K and 1.5MB disc drives are offered as standard with hard discs available too – integral or separate.

Full technical details, software lists and the address of your nearest dealer on request.

The Icarus dealer network includes:

LONDON

DATA PROFILE, Lawrence Road, Green Lane, HOUNSLOW, Middx. Tel: 01-572 6381

J & F GROVER LTD., 10 Barley Mow Passage, LONDON W4 4PH. Tel: 01-994 6477

SISCO LTD., 4 Moorfields, LONDON EC2Y 9AA. Tel: 01-920 0315

TERMACRE LTD., 126 Woodwarde Road, LONDON SE22 8TU. Tel: 01-693 3037

HOME COUNTIES

COMPUTING CONSULTANCY, Lyngen, Oldhill Wood, Studham, DUNSTABLE, Beds. Tel: 0582 872463

CONQUEST COMPUTER SALES, 92 London Road, BENFLEET, Essex. Tel: 03745 59861

CULLOVILLE LTD., Thornfield, Woodhill Road, SANDON, Chelmsford, Essex. Tel: 024 541 3919

FOREST ROW COMPUTERS, 53 Freshfield Bank, FOREST ROW, East Sussex. Tel: 034 282 4397

MASS MICROS, Wellson House, Brownfields, WELWYN GARDEN CITY, Herts. Tel: 07073 31436

RANMOR COMPUTING LTD., Nelson House, 2 Nelson Mews, SOUTHEND-ON-SEA, Essex. Tel: 0702 339262

SAPPHIRE SYSTEMS, 19-27 Kents Hill Road, BENFLEET, Essex. Tel: 03745 59756

THAMES VALLEY COMPUTERS, 10 Maple Close, MAIDENHEAD, Berks. Tel: 0628 23532

WILDER & CO., 123 Goldsworth Road, Woking, Surrey. Tel: Woking 21552

SOUTH & SOUTH WEST

BARD COMPUTER SERVICES LTD., 24 Old Street, Clevedon, Nr. BRISTOL, Avon. Tel: 0272 878157

COMMONSENSE COMPUTING, PO Box 7, BIDEFORD, Devon. Tel: 02372 4795

DAYTA, Kingsbury Square, Wilton, SALISBURY, Wilts. Tel: 0722 74 3898

EMTEK COMPUTERS LTD., 40 South Furzeham Road, BRIXHAM, Devon. Tel: 080 45 3566

NICOMTECH LTD., The Old Mill, Anthony Passage, SALTASH, Cornwall. Tel: 07555 2719

OMEGA ELECTRICAL LTD., Flaxley Mill, Flaxley Road, MITCHELDEAN, Glos. Tel: 045 276 532

EAST

CAMBRIDGE MICRO COMPUTERS, Cambridge Science Park, Milton Road, CAMBRIDGE. Tel: 0223 314666

STUKELY COMPUTER SERVICES, Barnhill, STAMFORD, Lincs. Tel: 0780 64947

MIDLANDS & WALES

BASIC BUSINESS SYSTEMS LTD., 39/41 Trent Boulevard, WEST BRIDGEFORD, Nottingham. Tel: 0602 819713

BORDER COMPUTING & PROGRAMMING LTD., Dog Kennel Lane, BUCKNELL, Shropshire. Tel: 054 74 368

DRAGON SYSTEMS LTD., 37 Walter Road, SWANSEA, W. Glam. Tel: 0792 474498

DU PLEX COMMUNICATIONS, 2 Leire Lane, Dunton Bassett, LUTTERWORTH, Leicestershire. Tel: 0455 209131

FAST COMPUTING LTD., 52 High Street, HENLEY-IN-ARDEN, West Midlands. Tel: 05642 2714

JAEMMA LTD., Unit 24, Lee Bank House, Holloway Head, BIRMINGHAM. Tel: 021 643 1609

LAWMAR BUSINESS SYSTEMS, 1 Paterson Drive, Woodhouse Eaves, LOUGHBOROUGH, Leics. Tel: 0509 890900.

MICROAGE LTD., 53 Acton Road, LONG EATON, Nottinghamshire. Tel: 06076 64264

MICROCARE COMPUTING LTD., 18 Hawarden Road, NEWPORT, Gwent. Tel: 0633 278040

NORTH

AP LTD., Maple House, Mortlake Crescent, CHESTER CH3 5UR. Tel: 0244 46024

JENNINGS COMPUTER SERVICES, 55/57 Fagley Road, BRADFORD, West Yorkshire. Tel: 0274 637867

MICROSERVE (HUMBERSIDE) LTD., 39 Oswald Road, Scunthorpe, SOUTH HUMBERSIDE DN15 7PM. Tel: 0724 849696

NASTAR COMPUTER SERVICES LTD., Ashton Lodge, Abercrombie Street, CHESTERFIELD S41. Tel: 0246 207048

SORTFIELD LTD., E Floor, Milburn House, Dean Street, NEWCASTLE-UPON-TYNE. Tel: 0632 329593

SPOT COMPUTER SYSTEMS LTD., New Street, Kelham Street Indus. Estate, DONCASTER. Tel: 0302 25159

SCOTLAND

ESCO COMPUTING LTD., 40a Gower Street, GLASGOW. Tel: 041 427 5497

TURNKEY COMPUTER TECHNOLOGY LTD., 23 Calderglen Road, St. Leonards, EAST KILBRIDE. Tel: 03552 39466

OVERSEAS

GICC, PO Box 519, Manama, Bahrain.

KUWAIT COMPUTER CENTRE, PO Box 1196, Salmia, KUWAIT.

MICRO MANAGEMENT INFO SYSTEMS, 132 King Street, GIBRALTAR.

M G ENTERPRISES, 32 Rue Victor Hugo, 92800 PUTEAUX, France. Tel: 0103315060655

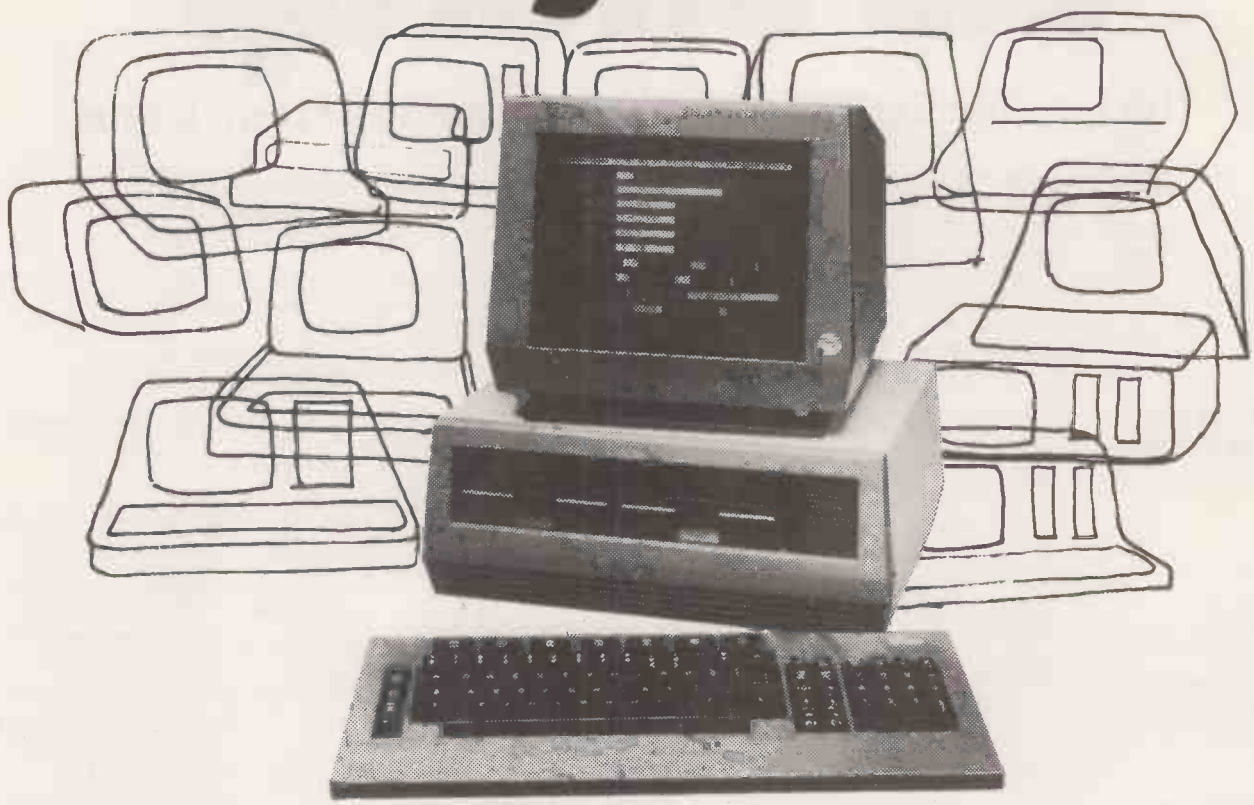
SUPERBRAIN

ICARUS
Computer Systems Ltd.

Icarus Computer Systems Ltd., Deane House, 27 Greenwood Place, London NW5 1NN. Tel: 01-485 5574. Telex: 264209.

● Circle No. 121

Which one's for you?



We choose the ACT Sirius 1

. . . and we make it our business to know just what the best options are in the micro jungle.
We specialise in Management Information Systems for large organisations offering a complete and comprehensive service to financial and business managers.

- **We will identify the hardware and software options**
- **We will design and develop systems to meet your needs**
- **We will train you and your staff**
- **And we back you up by giving ongoing support**

With a customer base that reads like the Times Top 1000, you can be sure that our systems specialists speak your language, no matter what the industry.

So if you want to plan a system, install a system, develop an existing system or just want to know more about Management Information Systems – speak to Applied Micros and find out why we choose the ACT SIRIUS I to give you the full service.

Applied Micros also offer the following technologies and products: dBASE II, MicroModeller, SuperCalc, Multiplan Wordstar . . . Networking, Communications, Hard Disks . . . We are also a PULSAR SOFTWARE CENTRE.

Applied Micros

Applied Micros Limited, The Genesis Centre, Birchwood Science Park, Warrington.
Tel: (0925) 819939

(SIRIUS is the registered trade mark of Applied Computer Techniques (Holdings) p.l.c.)

Cut out and post this coupon if you want to find out how your organisation can benefit from our experience in Management Information Systems.

Name _____

Position _____

Name of Company _____

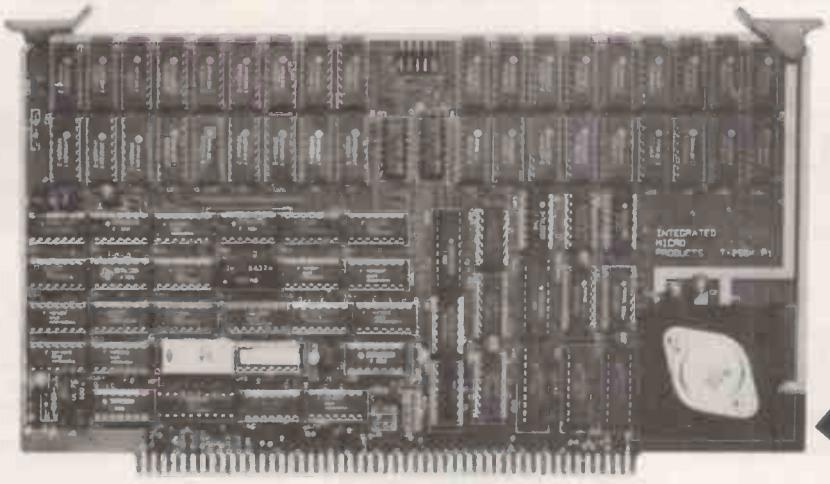
Address _____

_____

Tel. No. _____

● **Circle No. 122**

BRITISH MADE 68000 CPU AND 256K DYNAMIC RAM CARDS FOR THE S-100 BUS

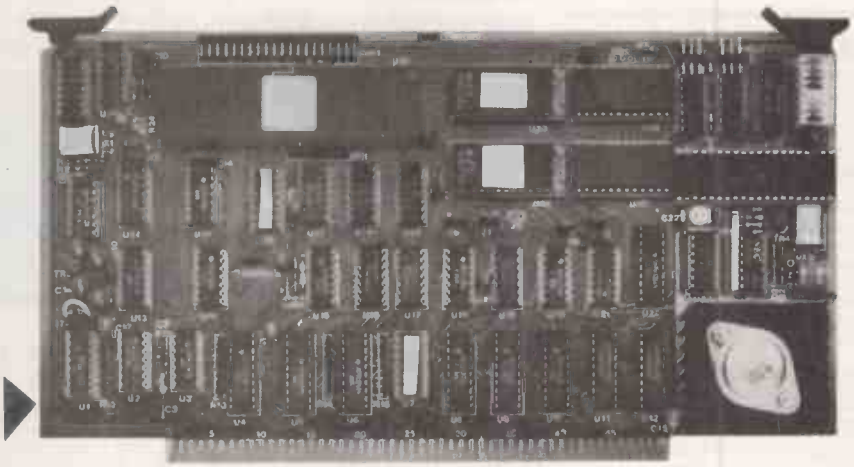


T-256K RAM

- Complies completely with the IEEE-696 standard.
- IEEE 696 Bus compliance: Slave, D8/16, LO/LE, M24, T225, W1, SH.
- Will support either 8 or 16 bit operations.
- Worst case access time 225 nS; typical access time 150 nS.
- Optional parity on both 8 and 16 bit operations. A parity error is signalled by a LED and either the ERROR* line or one of the interrupt lines.
- Full 24 bit addressing.
- Supports glitch-free TMA.
- Operates at 6 MHz.
- Worst case cycle time 350 nS.
- Jumper selectable A0 polarity.
- When used with the T-68000 card, will allow the 68000 processor to run at 8 MHz without wait states.
- Can be upgraded to give 1 Mbyte of memory when 256K DRAMs become available.

T-68000 CPU

- Complies completely with the IEEE-696 standard.
- 696 Bus Compliance: Master, D8/D16, LO, M24, I16, VI, AI, PM, F4, T280, SH.
- Full 8 MHz operation for the 68000. The S-100 bus runs at 4 MHz. Optionally the processor may run at 4 MHz and the S-100 bus at 2 MHz.
- Two on-board 28 pin EPROM sockets, which accept 2716, 2732, 2764 and 27128 EPROMs giving up to 32 K bytes of EPROM.
- Two serial ports each with an independent baud rate generator whose speeds are selected by a D.I.L. switch.
- Programmable timer for generating real time clocks.
- Time of day clock with a rechargeable battery.
- 8 bit general purpose parallel port.
- 8 or 16 bit parallel transfers can use 8 bit memory for data (not programme) storage.
- 24 bit addressing, giving 16 M byte address space.
- Memory management unit may be added using a 40-way ribbon connector.
- Will run at full speed without wait states using T-256 K RAM.
- Optional MWRT generation.
- POC and SLAVECLR generation.
- A wait state may be added to any I/O cycle.
- S-100 I/O and on-board I/O and EPROM may be positioned in any 64 K block using a bipolar PROM.
- Seven autovectored interrupts including NMI*. An interrupt controller may be added giving 192 vectored interrupts.
- Compatible with the IEEE-696 specified overlapped bus transfer for glitch free T M A.



These cards are as used in the IMP-68 computer system.

For further technical information and prices please contact:

INTEGRATED MICRO PRODUCTS LTD.
Number One Industrial Estate, Medomsley Road, Consett, Co. Durham, DH8 6SY, England.
TELEPHONE: 0207 503481 TELEX: 53429 PACE G

THE MOST DIFFICULT THING ABOUT GETTING A COMPUTER IS GETTING THE RIGHT ONE.

PRICES EXCL. VAT

DRAGON 32

Compact home computer designed for family use that nevertheless compares favourably with far more expensive models on the market. 170.00 ex.VAT

Dragon 32 Family Computer	170.00
Dragon Joysticks (Pr)	19.95
Dragon Printer GP100A	199.00
Dragon Cartridges from	17.35
Dragon Cassettes from	6.91

COMMODORE VIC

VIC 20 Home Computer	130.00
VIC 20 Starter Pack	215.48
VIC C2N Cassette Unit	39.09
VIC Printer	200.00
VIC Single Floppy Disk Drive	260.00
VIC Programmers Aid Cartridge	30.39
VIC Superexpander High Res. Cartridge	30.39
VIC Machine Code Monitor Cartridge	30.39
VIC Joystick	6.52
VIC Paddles (Pr)	11.74
VIC Games Cartridges from	17.35
VIC Games Tapes from	2.95
Commodore 64 Home Computer	299.00

Available from London, Nottingham & Glasgow shops only.

CROMEMCO C-10 PERSONAL COMPUTER

A full feature personal business computer system including software – for the price of a VDU. Also the entry point into the renowned Cromemco range. 1195.00 ex.VAT

C-10 SP Personal Computer Superpak inc. Z80A Processor, 64K Memory, Single 5¼" 390K Byte Floppy Disk, 24 x 80 Screen, CKBA Keyboard. CP/M Compatible Operating System, plus Word Processing, Financial Planning & 32K BASIC Software 1195.00
Additional 5¼" Floppy Disk Drive 450.00
120 Word/Min Daisy Wheel Printer 675.00

OSBORNE

Osborne Portable Computer inc. Standard Software – Wordstar, Mailmerge, Supercalc, MBASIC, CBASIC, CP/M – Plus Free Monitor 1250.00
Osborne Double Density Version inc. USDC-P System 1375.00
Osborne Starter Kit inc. Daisy Wheel Typewriter 'Printer' 1699.00

OSBORNE

Truly portable personal small computer system housed in a 'snap together' case complete with business programs, so you can start work almost anywhere.
Inc. Free Monitor 1250.00 ex. VAT

SINCLAIR

ZX81 Computer	43.43
ZX Printer	52.13
16K RAM Pack	26.04
Learning Lab	17.35
All Sinclair Software available from	3.43

BBC MICROCOMPUTER

BBC Micro Model B	419.00
Games Paddles	11.30
14" Colour Monitor	250.00
12" Monochrome Monitor	90.00
Single Disk Drive	230.00
Selection of business, educational, graphics & games software available from	3.50

Available from Birmingham, Manchester & Nottingham shops only.

PRINTERS – IMPACT

Anadex DP9500A 132 Cols., 150CPS Matrix Printer with Graphics. 10, 12.5, 13.3, 16.4 Char/In, Low Noise 1150.00
Anadex DP9501A 132 Cols, 150CPS Matrix Printer 10, 12, 15, 16.4 Char/In, Low Noise 1150.00
Anadex DP9620A 200CPS Printer, Low Noise, 10, 12, 15, 16.4 Char/In 100 CPS in Double Pass Enhanced Mode 1250.00
Anadex DP6000 Dual Mode Printer 132 Cols, 150/180CPS Correspondence Quality, 300/330CPS Draft and Graphics Mode. Diablo 630 Protocol Emulation 1950.00
Epson MX80T/3 Tractor only 80CPS 349.00
Epson MX80FT/3 Friction and Tractor 389.00
Epson MX100FT/3 Friction and Tractor 100CPS 499.00
Seikosha GP100A 30CPS, 80 COL 199.00

Interfaces and cables for all popular micros available – contact your nearest shop.

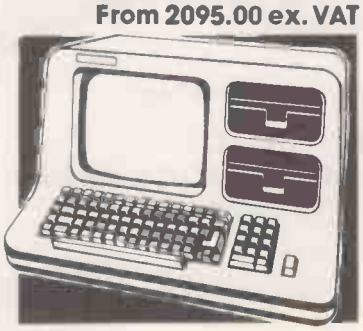
PRINTERS – DAISY WHEEL

Diablo 620RO 25CPS	995.00
Diablo 630RO	1575.00
Crown Ranier – Brother 19CPS	795.00
Brother 8300	458.00

NORTH STAR ADVANTAGE

Two versatile desk top options to choose from featuring high quality business graphics with either 720Kb floppy or 5Mb hard disk storage.

From 2095.00 ex. VAT



NORTH STAR ADVANTAGE

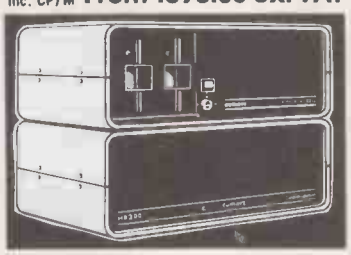
Advantage Desk-Top System inc. Keyboard, Graphics, Screen (Green), 64K Byte RAM, Z80A Processor, Serial Interface, Dual 350K Byte Diskette Drives and Busigraph Software 2095.00
Advantage Desk-Top System, as above except single 350K Diskette Drive + 5M Byte 5" Winchester Hard Disk 2995.00
Advantage upgrade to Intel 8088 Processor with 64KB Memory@ 320.00

NORTH STAR HORIZON

Horizon S100 Bus. Micro Computer inc. Z80A Processor, 64K Byte Memory, Dual 350K Byte Diskette Drives and DOS/BASIC 1995.00

COMART COMMUNICATOR

Clearly the most price competitive modular computer system on the market with built-in expandability – inside and out.
Inc. CP/M From 1895.00 ex. VAT



COMART COMMUNICATOR Z80A MODULAR SYSTEMS

Comart CP100 'Communicator' Micro Computer: Z80A Processor, 64K Byte Memory, Dual 5¼" Floppy Diskette Drives each storing 390K Bytes of Data. Dual Serial and Parallel Ports. 10 Slot S100 Bus. CP/M Version 2 included 1895.00
Comart CP200 as CP100 except Dual 790K Byte Diskette Drives 2195.00
Comart CP500 as CP100 except one 790K Byte Diskette Drive and one 5" Winchester Drive having 4.8M Bytes of Formatted Data 2995.00
Comart CP520 as CP100 except one 790K Byte Diskette Drive and one 5" Winchester Drive having 19M Bytes of Formatted Data 3995.00

COMART COMMUNICATOR 8086 MODULAR SYSTEMS

Comart CP1100 Communicator Micro Computer: 6MHz 8086 Processor, 128K Byte Memory with Parity, Dual 5¼" Floppy Disk Drives each storing 390K Bytes. Dual Serial and Parallel Printer Ports. 10 Slot S100 Bus inc. CP/M86 & MS-DOS 2295.00
Comart CP1102 CP1100 with 256K Byte Memory 2445.00
Comart CP1200 as CP1100 except Dual 790K Byte Diskette Drives 2595.00
Comart CP1202 CP1200 with 256K Byte Memory 2745.00
Comart CP1500 as CP1100 except Single 790K Byte Diskette Drive and Single 5" Winchester Hard Disk Drive having 4.8M Bytes of Formatted Data 3395.00
Comart CP1502 CP1500 with 256K Byte Memory 3545.00
Comart CP1520 As CP1500 except 5" Winchester Disk having 19M Bytes of Formatted Data 4395.00
Comart CP1522 CP1520 with 256K Byte Memory 4545.00

UPGRADE KITS

Wide range of 8 to 16 Bit and floppy to hard disk upgrade kits available for Communicator Systems

COMART MULTI USER CONFIGURATIONS

Comart CP500/M CP500 Communicator System with 256K Byte Memory and 6 Serial Interfaces. Includes CP/M and MP/M11 ..... 3995.00
Comart CP520/M CP520 Communicator System with 256K Byte Memory and 6 Serial Interfaces. Includes CP/M and MP/M11 ..... 4995.00
Comart CP1525M CP1520 Communicator with a total of 512K Byte Memory and 10 Serial Interfaces. Includes CP/M86 and MP/M86 ..... 5995.00

COMART SUBSYSTEMS

Comart CB200 Cartridge Tape Back-Up Subsystem for Hard Disk 2495.00
Comart HD200 8" Hard Disk (18M Byte) Subsystem (including HD10 Controller) 3895.00
Comart HD520 5" x 20M Byte Hard Disk Subsystem (requires HDCONT or can be added to a CP520 or CP1520) 1995.00
Comart HD522 Dual 20M Byte Winchester Hard Disk Subsystem (requires HDCONT) 3495.00
Comart HDCONT Winchester Disk Controller for 2, 20M Byte Drives 595.00
Comart FD800 8" Floppy Single Disk Drive Subsystem; Single Sided, Single Density IBM 3740 Compatible (requires C-IFDC) 995.00
Comart FD802 8" Floppy Dual Disk Drive Subsystem 1495.00
Comart MP/MSUB Hardware & Software to Upgrade Communicator to MP/M. Includes MP/M, two 48K Byte CRAM 48 Memory and 4SIO Serial Interface Cord 1150.00

S100 BOARDS

Comart CRAM64 64K Byte Dynamic RAM with Bank Select 200.00
Comart CRAM48 48K Byte Dynamic RAM with Bank Select 180.00
Comart CRAM256 256K Byte Dynamic RAM with Parity. 8 and 16 Bit Data. IEEE696 Compatible. Also supports 8 Bit Bank Switching 550.00
Comart CRAM128 128K Dynamic RAM with Parity, 8 and 16 Bit Data, IEEE696 Compatible. Also supports 8 Bit Bank Switching 400.00
Comart C-CPU86 8086 Processor Card, with Dual Serial and Parallel Ports. Monitor in 8K EPROM and 4K RAM 300.00
Comart C-IFDC Intelligent Diskette Drive Controller with Z80A Processor 295.00
Comart C-CPU Z80A system Processor Board incl. 2 Serial/1 Parallel Port 200.00
Comart 4SIO 4 Channel Synch/Asynch Interface Board 250.00
Dual Systems CLK24 Battery Supported Real Time Calendar Disk 295.00
Dual Systems CMEM32 32K CMOS Battery Supported Memory 1195.00
Dual Systems CMEM16 16K CMOS Battery Supported Memory 895.00

CROMEMCO 68000/Z80A SUPER MICRO SYSTEMS

Cromemco CS1D2E System 1 including Dual 390K 5" Floppy Disks, DPU, MCU, 256MSU and 16 FDC Cards in 8 Slot S100 Card, Table Top Enclosure 3620.00
Cromemco CS1D5E as CS1D2E but with 512 MSU 4280.00
Cromemco CS1HD2E System 1 including Single 390K 5" Floppy Disk, 5.5M Byte 5" Winchester Disk, DPU, MCU, 256MSU, 16FDC, WD12 ..... 5595.00
Cromemco CS1HD5E as CS1HD2E but with 512MSU 6255.00

PRICES EXCL. VAT

Cromemco CS3D5E System 3 including Dual 1.2M Byte Floppy Disk Drives, 21 Slot Card Cage, DPU, MCU, 512MSU, 16FDC 6585.00
Cromemco CS3HD5E as CS3D5E but with 5" 5.5MB Winchester Disk and WD1 .....8230.00

CROMEMCO Z80 COMPUTER SYSTEMS

Cromemco CS-1H System One including Z80A Processor, 64K Memory, 390K Byte 5" Floppy, 5.5M Byte 5" Winchester Disk and VDU/Printer Interfaces.....4595.00
Cromemco CS-1 8 Slot S100 Bus. Computer System One, with Z80A Processor, Dual 5" Diskette Drives, 64K Memory, VDU/Printer I/F 2630.00
Cromemco CS-2 21 Slot S100 Bus. Computer System Two, Z80A Processor, Dual 5" Diskette Drives, 64K Memory, VDU/Printer Interfaces (19" Rack Mount).....3095.00
Cromemco CS-3 21 Slot S100 Bus. Computer System Three: Z80A, 64K Memory, Dual High Speed 8" Diskette Drives (1.2M Byte each), VDU/Printer Interfaces (19" Rack Mount).....4495.00
Cromemco Z-2H 12 Slot S100 Bus. Hard Disk Computer System with Z80A Processor, Dual 5" Diskette Drives, 10M Byte Winchester Drive. 64K RAM & VDU/Printer Interfaces 6585.00
Cromemco Z-2H/GS Cromemco Graphics System based on Z-2H, together with additional Dual Ported 96K Byte Video Memory, High Resolution Graphics I/F and Bit Pad Interfaces CDOS and SGS Software Included 8560.00

CROMEMCO GRAPHICS OPTION

Cromemco SD1 High Resolution (754 x 482) Colour Graphics Interface Board.....595.00
Cromemco 48KTP 48K Byte Dual Port Graphics Memory 755.00

VDU'S & MONITORS

Comart WY100 Visual Display Terminal, Green Display, 24 x 80 and Status Lines. Detached 105 Key Keyboard with Numeric Pad, Function, Cursor and Editing Controls. Swivel and Tilt Display 675.00
Volkercraig 4404 .....595.00
Volkercraig 4404WS 695.00
Cromemco RGB14LP. High Resolution Colour Monitor 1395.00
12" Green Screen Monitor 99.00

BUG—BYTE SOFTWARE

All Tapes Available For Acorn, VIC, BBC, ZX81. Spectrum. Call for availability.

BOOKS

Very wide range of computer books stocked at all shops.

DISKETTES

Wabash 5¼" Single Sided, Single Density.....1.70ea
Wabash 5¼" Single Sided, Double Density.....2.13ea
Dysan 5¼" Double Sided, Double Density.....3.90ea
Dysan 8" Double Sided, Double Density 4.40ea
Full range of 5¼" & 8" Diskettes in stock

CP/M SOFTWARE

ACCESS MNGR Digital Research Programming Tool 186.00
ANIMATOR Microfocus Programming Tool 225.00
BASCOM Microsoft Basic Compiler 227.46
BASIC-80 Microsoft Basic Interpreter 205.27
BAZIC Micromikes Basic Language 120.00
BSTAM BYROM Software Communications Package between CP/M based machines. Both machines require BSTAM 115.00
BSTMS BYROM Software Communications Package. A commercially orientated, TTY Emulation Facility for CP/M Systems.....115.00
BT-80 Digital Research Programming Tool 126.00
CALCSTAR Micropro Financial Planning/Budgeting, Electronic Spread Sheet Package 90.00
CARDBOX Caxton Fast Store and Search System 155.00
CB80 Digital Research Basic Compiler...314.00
CBASIC Digital Research Basic Language 94.00
CBASIC/86 Digital Research Basic Language for 16 BIT Micro's (CP/M 86).....204.00
CIS COBOL Microfocus COBOL Language425.00
COBOL TRAIN Microcal Training Package for CIS COBOL 350.00
COBOL-80 Microsoft COBOL Compiler...421.63
CP/M Digital Research Operating System 94.00
CP/M for SBC Digital Research Operating System 126.00
CP/M-86 Digital Research Operating System for 16 Bit Micro's.....157.00
CP/M-86 DISPWR Digital Research Operating System 204.00
CP/M-86 + CB86 DW Digital Research Operating System + Language 350.00
CP/NET Digital Research Networking Operating System 126.00
CPFILT Jarogate Operating System Simulator 55.00
DATASTAR Micropro Database Package .175.00
DBASE II Ashton-Tate Relational Database + ZIP (ZIP is a Screen and Printout Form Writer for DBASE II) 435.00
DESPOOL DR Utility.....31.00
DISPLAY MNGR Digital Research Programming Tool 251.00
EDIT-80 Microsoft Editor.....72.12
EXTEND Jarogate Utility 55.00
FILESHARE Microfocus Utility.....250.00
FILESTAR Microsec's Disk Reformatter CP/M to IBM, DEC, Motorola and Intel Formats ...195.00
FMS-80 DJR Assoc. Database/FM 650.00
FMS-81 DJR Assoc. Database/FM 350.00
FMS-82 DJR Assoc. Database/FM 350.00
FORMS 2 Microfocus Table Maker. Useful with CIS COBOL 110.00
FORTRAN-80 Microsoft FORTRAN Compiler 288.48
GBS Bytesoft General Business System ..810.00
ISL Bytesoft Accounting Package.....1110.00
ITC CP/M Intelligent Terminals Corporation CP/M Operating System for Cromemco ..215.00
KSAM80 EMS Database.....350.00
LINK-80 Digital Research Programming Tool 63.00
MAC Digital Research Programming Tool 57.00
MACRO-80 Microsoft Macro Assembler 116.50
MAILMERGE Micropro Wordprocessing Enhancement to link with WORDSTAR ...145.00
MARS Sapphire Business System 400.00
MICROSTAT Ecosoft Statistics Package . 195.00
MILESTONE Organic Software Critical Path Package.....225.00
MP/M II Digital Research Multi-User Operating System 283.00
MP/M 86 Digital Research Multi-User Operating System for 16 Bit Systems.....409.00
MSORT Microsoft Sort Utility 83.21
PASCAL MT+ &SPP Digital Research Pascal Language with Speed Programming Tool 314.00
PASCAL/MT+ Digital Research Pascal Language 220.00
PASCAL/MT+86 Digital Research Pascal Language for 16 Bit Systems.....377.00
PEACHTREE Basic Accounting System per module.....325.00
PEACHTREE Business Management System per module.....600.00
PERSONAL PEARL Pearl Data Base/FM . 185.00
PLANNERCALC Comshare Financial Planning Package.....39.00
PL/I-80 Digital Research Language.....314.00
REFORM/DEC Microtech Disk Reformatter CP/M to and from Dec.....120.00
REFORM/IBM Microtech Disk Reformatter CP/M to and from IBM 120.00
RMAC,LINK Digital research Programming Tool 126.00
SID Digital Research Programming Tool . . 50.00
SID-86 Digital Research Programming Tool 94.00
SIM22 Wheatcroft Hards Operating Systems Simulator CP/M Simulator for CROMIX Version II 55.00
SPELLSTAR Micropro Proofreading Utility to link with WORDSTAR 145.00
SUPERCALC Sorcim Financial Planning/Budgeting Electronic Spread Sheet Package 190.00
SUPERSORT Micropro Sort Utility 145.00
SUPERVYZ Epic Application Control.....86.00
T/MAKER II Lifeboat Associates Financial Planning/Budgeting Electronic Spread Sheet Package 195.00
W/S TRAINING Micropro Training Guide for WORDSTAR 17.00
WORDSTAR Micropro Wordprocessing Package.....295.00
WORDMASTER-86 Micro Pro W/P Package 90.00
WP WORKSHOP MAC Ltd Training Guide for WORDSTAR or MAILMERGE.....75.00
X1802 Avocet Cross Assembler.....130.00
X3870 Avocet Cross Assembler.....130.00
X6502 Avocet Cross Assembler.....130.00
X6800 Avocet Cross Assembler.....130.00
X8048 Avocet Cross Assembler.....130.00
X BASIC Xitan Language.....185.00
X COPY Xitan Utility 50.00
X CP/M Xitan/DR Operating System 118.00
XLT86 Digital Research Programming Tool 94.00
ZSID Digital Research Programming Tool..63.00

SYSTEM SPOTLIGHT

EPSON HX-20 PORTABLE COMPUTER

Diminutive fully featured business computer that is small and light enough to slip into a briefcase. Specification includes integrated LCD screen, printer and microcassette; 16K RAM expandable to 32K and its own rechargable power supply. Ideal for people on the move – data can be subsequently 'down loaded' on to a larger machine when you return to base.

402.00 ex. VAT

Prices include configuration on machines supplied by ourselves. We are totally committed to after sales service and future support.

CROMEMCO SOFTWARE FOR 68000/Z80A SERIES

Cromemco CRO-D Cromix (Multi-User/Multi Tasking) Unix Based Operating System...395.00
Cromemco FOR-D Fortran '77 .....395.00
Cromemco PAS-D ISO Pascal.....395.00
Cromemco ASM-D 68000 Macro Assembler 395.00
Cromemco STB-D 32K Structured BASIC @ 395.00
Cromemco CCC-D C-Compiler @ 395.00
Cromemco COB-D Cobal Compiler @ ..395.00
Note: All 68000 Languages (Suffix D) require Cromix (CRO-D). All Software is available on 5" or 8" Floppy Disks – Please Specify.
@ = Availability early '83

CROMEMCO OPERATING SYSTEMS

Cromemco CROMIX Multi User/Multi Tasking Unix Based Operating System (Z80A Systems).....395.00
Cromemco KSAM KSAM File Management for CROMIX (Z80A).....195.00

CROMEMCO LANGUAGES (Z80A)

Cromemco FDB 16K BASIC Interpreter...130.00
Cromemco FDF Fortran IV Compiler 195.00
Cromemco FDC Cobol Compiler 395.00
Cromemco STB 32K Structured BASIC (includes KSAM).....130.00
Cromemco FDR RATFOR- Rational Fortran IV Compiler & Pre-Processor.....260.00
Cromemco FDA Z80 Macro Assembler ..195.00
Cromemco CCC C Compiler (Requires Cromix) 395.00
Cromemco RPG RPGII Report Generator .395.00
Cromemco LSP LISP List Processor.....260.00
Cromemco COL Overlay Link Editor 260.00
Cromemco IDS I.O.P. Development Software.....395.00
Cromemco CDS Diagnostic Systems Software.....130.00
All software is available on 5" or 8" Diskettes – please specify.

ALL PRICES EXCLUSIVE OF VAT

* Barclaycard Visa & Access cards taken in payment.
* Shop opening hours 9 – 5.30, check individual shops for details of Saturday opening times.
* Phone Mail Orders accepted. Please contact nearest shop for P.P. & Delivery Rates. Regret no C.O.D.

* Some items may be subject to a dollar surcharge if the dollar exchange rate changes more than 5 cents. Prices will be adjusted in line with the rate prevailing at the time of purchase.
* Prices subject to change without notice E. & O.E. and are valid for the cover date life of this magazine.
* Whilst we carry a vast range of stock, we cannot guarantee that every advertised item will be available in each shop.
* All goods are new and include factory warranties.
* No refunds on opened software.
* Orders from Government Depts. & Colleges etc. welcome.
* Leasing & HP facilities available – apply for written details.
* Detailed prices available on request.

CRA

MPI MICROCOMPUTER PRODUCTS INTERNATIONAL LTD.

SOFTWARE FOR CP/M COMPUTERS

Retailer and OEM terms available

ANTHONY ASHPITEL TYPING MASTERS

	Software & Manual	Manual Only
BASIC VERSION	50	
BUSINESS VERSION	125	25

BYROM SOFTWARE

BSTAM—Utility to link one microcomputer to another also using BSTAM	112	7
BSTMS—Utility to link a micro to a mini or mainframe	112	13

CP/M USER LIBRARY

51 Volumes—Price per volume		
8" disc (one volume per disc)	5	
5" disc (one volume per 2 discs)	10	
Index		2

DIGITAL RESEARCH

BT-80	165	24
CBASIC v 2.08	76	16
CB-80 1.3	312	21
CP/M86	171	32
CP/M 2.2	103	24
CP/NET	126	16
DESPOOL	31	7
MAC	62	16
MP/M 1.1	138	21
MP/M 2.0	288	35
PASCAL MT·	206	24
PASCAL MT· WITH SPP	297	35
PASCAL MT· LIB SOURCES	129	
PASCAL MT· SPP ONLY	147	12
PL/1-80	315	32
SID 1.4	50	16
TEX3.0	65	16
XLT86	94	8
ZSID 1.4	65	16

ELECTRONIC ACCOUNTING SERVICES

LINEAR & GOAL PROGRAMMING	200	10

FOX & GELLER

QUICKSCREEN FOR DBASE-II	103	14
QUICKSCREEN FOR CBASIC/CB-80	103	14
QUICKSCREEN FOR MBASIC	103	14
QUICKCODE FOR DBASE-II	182	21

GRAM BUSINESS SYSTEMS LTD.

DISKREV	65	13
DISKLENE	40	6
DISKORG	50	6
DISKED-2	65	8
DISKTOOLS-1 (DISKREV & DISKORG)	90	15
DISKTOOLS-2 (DISKTOOLS-1 & DISKED-2)	145	19

INFORMATION UNLIMITED

WHATSIT (Database Management System)	80	

KLH SYSTEMS

Spooler for CPM systems v3.0	82	7

MAGIC CIRCLE SOFTWARE

CPM SIM	141	

MICRO-AP

SELECTOR-V 1.6	324	29

MPI LTD.

FORTH	85	23
PAYROLL	500	15
SALES LEDGER	200	15
PURCHASE LEDGER	200	15
NOMINAL LEDGER	200	15
INCOMPLETE RECORDS	1200	20
MATHSPACK	120	
STATSPACK	120	

MICROFOCUS

CIS COBOL v4.5	425	25
FORMS 2	110	10
ANIMATOR	225	25
FILESHARE	250	20

MICROLOGY

FTNUMB (FORTRAN-80 RENUMBER & REFORMATTER)	50	

MICROPRO INC.

WORDSTAR 3.0	294	45
MAIL MERGE 3.0 (requires Wordstar)	88	12
SPELLSTAR 1.2 (requires Wordstar)	147	
WORDSTAR TRAINING MANUAL		21
WORDSTAR CUSTOMIZATION NOTES	59	
WORD-MASTER 1.7A	88	26
TEX-WRITER 2.6	44	20
SUPER-SORT 1.6	147	26
DATASTAR 1.101	206	29
DATASTAR CUSTOMIZATION NOTES	59	
CALCSTAR 1.2	176	29

APPLE VERSIONS

WORDSTAR 3.0	221	44
MAILMERGE 3.0 (requires Wordstar)	74	12
SPELLSTAR 1.2 (requires Wordstar)	115	
DATASTAR 1.101	174	29
SUPERSORT 1.6	118	26
CALCSTAR 1.2	115	29

MICROTECH EXPORTS

REFORMATTER CPM↔IBM	147	20
REFORMATTER CPM↔DEC	147	20

MICROSOFT INC.

BASIC-80 5.21	218	
BASIC Compiler 5.3	241	
FORTRAN-80 3.44	306	
COBOL-80 4.60	447	
M/SORT 1.012	88	
EDIT-80 2.02	76	
MACRO-80 3.43	124	
MULISP 2.12	124	
MUMATH 2.12	153	

OSBORNE & ASSOCIATES

ACCOUNTS PAYABLE & ACCOUNTS RECEIVABLE	50	15
GENERAL LEDGER	50	15

PHOENIX SOFTWARE ASSOCIATES

PLINK—Disc to disc link loader	85	18
PASM—Macro Assembler	85	18
PEDIT—Line editor with Macros	85	18
BUG—Very powerful debug	85	18
PDEVELOP Package with all the above	227	39
PLINK—2 Overlay Link Loader	218	18

SAPPHIRE SYSTEMS LTD.

MARS	295	25

STRUCTURED SYSTEMS (All converted to UK Standard)

SALES LEDGER	350	20
PURCHASE LEDGER	350	20
NOMINAL LEDGER	350	20
STOCK CONTROL	350	20
LETTERIGHT	112	13
ANALYST (File management Reporting System)	147	13
NAD (Name and Address selection system)	65	13
QSORT	65	13

SUPERSOFT INC.

DIAGNOSTICS 1	53	11
TERM	85	8

SYNTAX SOFTWARE LTD.

CP/M TUTOR	55	

TDL SOFTWARE (Technical Design Labs)

BUSINESS BASIC	80	
ZTEL (Text Editing Lang.)	35	
LINKER	35	

Full descriptive Catalogue: available £1 — deductable from first purchase

ORDER INFORMATION

When ordering CP/M software please specify the format you require. All software items are subject to VAT. Manuals, when purchased separately, are not subject to VAT. Please add £3.75 (plus VAT) for postage and packing for the first item purchased, and then £1.00 for each extra item. For overseas please add £6.50 per item and then £1.50 for each extra item required. Most software in this advertisement is available from stock and a 72 hour return service is thereby offered on most prepaid orders. These details and prices are all current as of November 1982. Our prices reflect an exchange rate of U.S. $1.7 to £1.00. (Telephone at time of purchase to confirm latest prices.) All payments must be in Sterling and drawn against a U.K. bank.

MAIL ORDER - TELEPHONE ORDER - VISIT - Send Cash, Cheque, Postal Order, IMO, Access or Barclaycard/Visa number to Microcomputer Products International Ltd., Room PC, 11 Cambridge House, Cambridge Road, Barking, Essex IG11 8NT.

*

ATTENTION ALL TORCH USERS! ALL OUR SOFTWARE IS AVAILABLE IN TORCH FORMAT

*

NEW PRODUCTS

For CP/M-86

ANTHONY ASHPITEL TYPING MASTERS

BASIC VERSION	50	
BUSINESS VERSION	125	25

MICROFOCUS

CIS COBOL	425	25
FORMS-2	110	10
ANIMATOR	225	25
LEVEL-2 COBOL	965	40
LEVEL-2 FORMS-2	110	10
LEVEL-2 ANIMATOR	475	25

SAPPHIRE SYSTEMS

MARS	295	25

For IBM PC-DOS

MICROPRO INC.

WORDSTAR	294
MAILMERGE (Requires WORDSTAR)	88
SPELLSTAR (Requires WORDSTAR)	147

For CP/M-80

ASHTON-TATE

d BASE-II v 2.3B	457

MICROFOCUS

CORAL-66	825	25
LEVEL-2 COBOL	965	40
LEVEL-2 FORMS-2	110	10
LEVEL-2 ANIMATOR	475	25

MICRO INTEGRATION

BISYNC 80/3780	525
BISYNC 80/3780 (ASCII)	525
BISYNC 80/3270 (BSC)	525
BISYNC 80/HASP	975

MICROPRO INC.

ALL-STAR WORD PACK	423
ALL-STAR DATA PACK	423

ORGANIC SOFTWARE

MILESTONE	263

PEARL INTERNATIONAL

PERSONAL PEARL	180
PEARL-3	275

MEDIA AND FORMATS

Altos	A1	Cromemco System 2 DD/SS	RX	IMSAI VDP-80	A1	Nascom/Lucas	N1
APPLE CP/M-80 13 Sector	RG	CSSN Backup	T1	Industrial Microsystems 5000	RA	NCR 8140/9010	A1
APPLE CP/M-80 16 Sector	RR	Cyfer 8"	A1	Industrial Microsystems 8000	A1	NNC-80	A1
Blackhawk Micropolis Mod II	Q2	Datapoint 1550/2150	A1	Intel MDS SD	A1	NNC-80W	A1
British Micros Mimi	RK	Dec VT 180 SSDD	RV	Intertec Superbrain SSDD	RK	North Star Advantage	P2
California Computer Sys 8 in	A1	Dynabyte DB8/4	A1	Intertec Superbrain QD	RS	North Star Horizon SSSD	P1
CDS Versatile 4	Q2	Exidy Sorcerer + CP/M-80	Q2	ISC Intercolor 8063/8360/8963	A1	North Star Horizon SSDD	P2
Columbia Data Products 8 in	A1	Exidy Sorcerer + Exidy CP/M-80 8"	A1	ITT 3030 DSDD	R1	North Star Horizon QD (MPI CP/M)	P3
Comart Communicator CP50	P2	Gemini Galaxy I	NI	Micromation	A1	North Star Horizon QD (Other CP/M)	P2
Comart Communicator CP100	P2	Heath H8 + H47	A1	Micropolis Mod II	Q2	Nylac Micropolis Mod II	Q2
Comart Communicator CP200	P2	Hewlett-Packard 125.8in	A1	Morrow Discus	A1	Osborne-I	RP
Comart Communicator CP500	P2	IBM PC-DOS SSDD	C1	Mostek	A1	Pertec PCC 2000	A1
Compal-80	Q2	IBM PC-DOS DSDD	C2	Multi-Tech 1	Q2	Rade 1000 SSDD	RL
CPT 8000	A1	IBM CP/M-86 SSDD	C3	Multi-Tech 2	Q2	Rade 1000 DSDD	RM
Cromemco System 3	A1	IBM CP/M-86 DSDD	C4	Micromation	A1	Rair Black Box	Q2
Cromemco System 2 SD/SS	R6	ICL-PC	RE	Micropolis Mod II	Q2	Research Machines 5.25in	RE
		ICL DRX Series	A1	Morrow Discus	A1	Research Machines 8in	RN
		ICOM 3712	A1	Mostek	A1	Robotron 5"	A1
				Nascom (Gemini Drives SSSD)	R3	Robotron 8"	N3
				Nascom (Gemini Drives DSSD)	R7		A1

SD Systems 5.25in	R3	Televideo DSDD	S5
SD Systems 8in	A1	Torch	N2
Sharp MZ-80B	R9	Toshiba T200 DSDD	SF
Sharp PC-3201	R8	TRS-80 Model I · Shuffle-board 8in	A1
Shelton Signet	RK	TRS-80 Model II	A1
Spacebyte	A1	Vector MZ	Q2
Tarbell 8in	A1	Vector Systems 2800	A1
TEI 8in	A1	Vector Systems B	Q2
		Vector VIP	Q2
		Xerox 820 5.25in	S6
		Xerox 820 8in	A1

ROOM PC, 11 CAMBRIDGE HOUSE, CAMBRIDGE ROAD, BARKING, ESSEX, IG11 8NT, ENGLAND
Telephone: 01-591 6511 Telex: 892395

QUALITY PRODUCTS FROM THE HOME OF MICROCOMPUTER SOFTWARE

MPI

2 MORE GOOD REASONS TO RING 01~591 6511

CP/M Tutor

As you can see, this set of programs will prove to be a useful and valuable asset to any users range of software.

The CP/M TUTOR is an interactive tutorial designed to teach you all about CP/M and your computer. You need have no previous computer experience or knowledge to use this trainer.

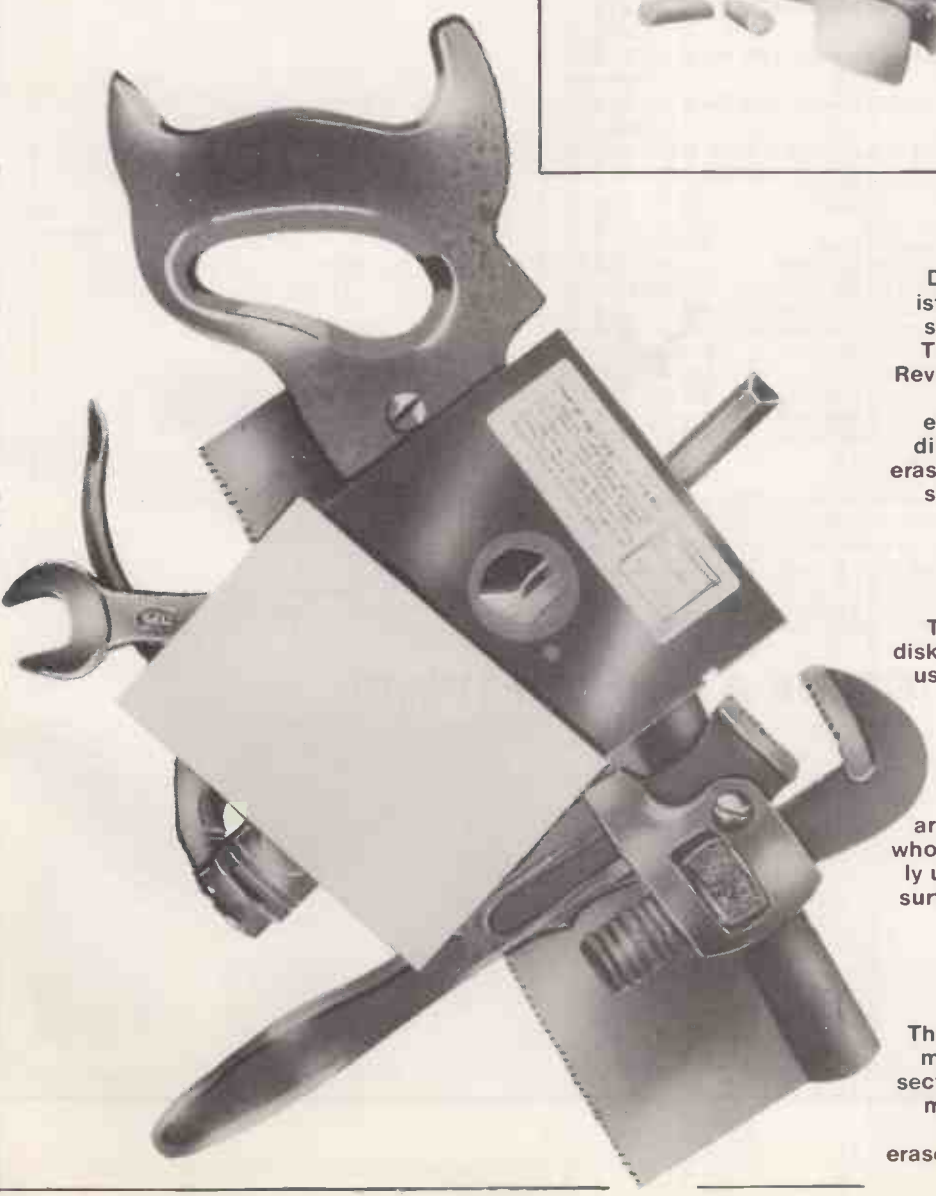
The tutorial will run at your own speed. There are comprehensive help messages if you get stuck, as well as a question and answer session at the end of each section. If you get the answers wrong, the computer will give you a hint.

This tutorial is invaluable for anyone who wishes to understand how to make the best use of CP/M, and thus make the most of their computer.

HELPFUL BOOKS:

We have a wide range of books, selected to support our comprehensive list of software. Four books which may interest you are:

CP/M User Guide £11.10
The CP/M Handbook with MP/M £12.10
CP/M Primer £10.95
Mastering CP/M £12.95



DISKTOOLS

Disktools are a family of sophisticated programs designed to support CP/M based systems. The family consists of the Disk Reviver (DISKREV) * A simple to use program for recovering erased or corrupted files from disk - anyone who has had files erased or made unrecoverable by system failures will know how useful DISKREV can be!

The Disk Organiser (DISKORG)

This reorganises the files on a disk to present the most efficient usage of disk space. A detailed manual is supplied with this.

The DISKLENE

This examines all of the disk surface and assigns the bad areas to a special file. Any user who has had to discard potentially usable disk because of media surface faults will appreciate the savings this can make.

The Disk Edit 11 (DISKEDIT 11)

This is a powerful tool, allowing modification of any byte in any sector on the disk surface. It has many uses ranging from being able to examine and restore erased files to edit corrupted files or directory entries.

MAIL ORDER
TELE-PHONE
CREDIT CARD ORDER
* VISIT *

Trade Enquiries Welcome

● Circle No. 124

INTEREST FREE

On Atari, VIC 20, Commodore 64 and

If your order contains over £120 worth of computer hardware apply now for interest free credit by telephoning: Mail-order: (0702) 552911. London Shop: 01-748 0926. Birmingham Shop: 021-356 7292. Southend Shop: 0702 554000 or write to P.O. Box 3, Rayleigh, Essex SS6 8LR.

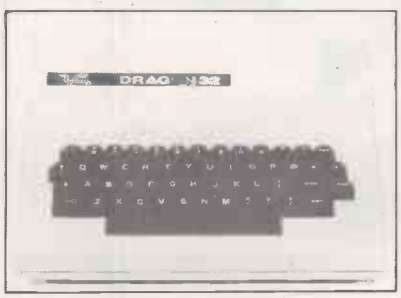
You pay 10% down, then 10% per month for a further nine months (to nearest penny). Example: VIC20 Colour Computer. Cash Price £169.99. Credit terms: £16.99 down then £17 per month for nine months: Total £169.99. Credit quotations on request.

THE NEW COMMODORE 64

The incredible new computer from Commodore comes with 64K RAM fitted! Plus 16 colours, hi-res graphics, 320 x 200 pixels, 40 columns by 25 lines, Z80 micro processor can be added — that means you can run CP/M software, 8 independently movable Sprites with collision detection, and a sound generator with 3 voices, 4 wave-forms, envelope and filter to rival some dedicated music synthesisers. And all this at the most incredible price ever.

(AF56L) Only £339.00

DRAGON 32



The amazing new British computer with a full-travel standard keyboard, a 16-bit microprocessor, 32K RAM fitted (expandable to 64K and later to 256K!!), 9 colours, hi-res graphics and Microsoft extended colour BASIC (the very best BASIC to learn with). It can be used with virtually any ordinary cassette recorder, it has a printer interface (Centronics-type), joysticks are available and it's incredible value for money. **(AF57M) Only £199.50**

THE AMAZING ATARI COMPUTERS

4 Consoles Available:

Atari 400 with 16K RAM (AF36P) £249.95

Atari 400 with 48K RAM (AF37S) £319.00

Atari 800 with 16K RAM (AF02C) £499.00

Atari 800 with 48K RAM (AF55K) £440.00

★ All above with BASIC & handbooks

Other hardware:

Cassette Recorder	(AF28F)	£50.00
Disk Drive	(AF06G)	£299.95
Thermal Printer	(AF04E)	£265.00
Epson MX80T Mk III	(AF38R)	£399.95
Epson MX80F/T Mk III	(AF40T)	£447.35
Printer Interface for 400	(AF41U)	£59.95
Printer Interface for 800	(AF42V)	£59.95
Interface Module	(AF29G)	£135.00
Versawriter	(AF43W)	£199.95
16K RAM Module	(AF08J)	£55.00
48K RAM Module for 400	(AF44X)	£125.35
48K Upgrade for 400	(AF45Y)	£75.00
Floppy Disk	(YX87U)	£2.50
Le Stick	(AC45Y)	£24.95
Joystick Controllers (Pair)	(AC37S)	£13.95
Paddle Controllers (Pair)	(AC30H)	£13.95

For full details ask for our hardware leaflet (XH54J) SAE appreciated

JOIN THE U.K. ATARI COMPUTER OWNERS' CLUB

An independent users' group. Four issues of the club magazine for only £3.00! Address your subscription to Ron. Issue 1 of the club magazine featured a tutorial on character set redefinition and contained a collection of demonstration and games programs and lots more. Issue 2 featured a tutorial on player/missile graphics, an article about graphics on computers, a selection of members' contributions to the program library and much more.

THE FINEST SELECTION OF ATARI SOFTWARE

Teach Yourself Programs

Conversational French	-5C-16K-YG44X	£39.95
Conversational German	-5C-16K-YG45Y	£39.95
Conversational Spanish	-5C-16K-YG46A	£39.95
Conversational Italian	-5C-16K-YG47B	£39.95
Touch Typing	-2C-16K-YG49D	£15.95
States & Capitals	-1C-16K-YG56L	£9.95
Euro Countries & Capitals	-1C-16K-YG57M	£9.95
Kids 1 (3 Programs)	-1C-16K-BG00A	£9.95
Kids 1 (3 Programs)	-1D-24K-BG01B	£9.95
Kids 2 (3 Programs)	-1C-16K-BG02C	£9.95
Kids 2 (3 Programs)	-1D-24K-BG03D	£9.95

Learn Programming

Invitation To Programming 1	-1C-8K-YG43W	£15.95
Invitation To Programming 2	-2C-8K-BQ67X	£22.95
Invitation To Programming 3	-2C-8K-BQ68Y	£22.95
Basics Of Animation	-1C-16K-BQ57M	£11.95
Basics Of Animation	-1D-24K-BQ58N	£11.95
Player Missile Graphics	-1C-32K-BQ59P	£18.95
Player Missile Graphics	-1D-32K-BQ60Q	£18.95
Display Lists	-1C-16K-BQ51F	£11.95
Display Lists	-1D-24K-BQ52G	£11.95
Horiz./Vert. Scrolling	-1C-16K-BQ53H	£11.95
Horiz./Vert. Scrolling	-1D-24K-BQ54J	£11.95
Page Flipping	-1C-16K-BQ55K	£11.95
Page Flipping	-1D-24K-BQ56L	£11.95
Sounds & Music	-1C-16K-BG04E	£11.95
Sounds & Music	-1D-24K-BG05F	£11.95
Tricky Tutorials	-3C-32K-BG06G	£59.95
Tricky Tutorials	-3D-32K-BG07H	£59.95

Business Programs

Visicalc	-1D-32K-YL39N	£119.95
Atari Word Processor	-1C&3D-48K-YG42V	£99.95
Text Wizard	-1D-32K-BQ99H	£69.95
Mini Word Processor	-1C-32K-BG08J	£11.95
Mini Word Processor	-1D-32K-BG09K	£11.95
Calculator	-1D-24K-YG50E	£16.95
Graph-It	-2C-16K-YG51F	£13.95
Statistics	-1C-16K-YG52G	£13.95
Personal Financial Management	-3D-32K-BQ65V	£49.00
Mortgage & Loan Analysis	-1C-16K-BQ66W	£13.95
Bob's Business	-1C-32K-BG11M	£9.95
Bob's Business	-1D-32K-BG12N	£9.95

Adventure Games

Galactic Empire	-1C-32K-BQ14Q	£14.95
Rescue At Rigel	-1C-32K-BQ21X	£22.45
Rescue At Rigel	-1D-32K-BQ80B	£22.45
Datestones Of Ryn	-1C-32K-BQ22Y	£14.95
Datestones Of Ryn	-1D-32K-BQ82D	£14.95
Star Warrior	-1C-32K-BQ24B	£28.95
Star Warrior	-1D-32K-BQ79L	£28.95
Invasion Orion	-1C-24K-BQ23A	£18.95
Invasion Orion	-1D-32K-BQ81C	£18.95
Star Trek 3.5	-1C-32K-BQ15R	£14.95
Star Trek 3.5	-1D-40K-BG26D	£18.95
Crush, Crumble & Chomp	-1C-32K-BQ83E	£22.45
Crush, Crumble & Chomp	-1D-32K-BQ84F	£22.45
Mission: Asteroid	-1D-40K-BQ91Y	£17.19
Wizard & The Princess	-1D-40K-BQ25C	£21.79
Ulysses & The Golden Fleece	-2D-40K-BQ92A	£20.64
Zork I	-1D-32K-BQ94C	£29.95
Zork II	-1D-32K-BQ95D	£29.95
Ali Baba & The 40 Thieves	-1D-32K-BQ78K	£27.95
Temple Of Apshai (Part 1)	-1C-32K-BQ85G	£28.95
Temple Of Apshai (Part 1)	-1D-32K-BQ86T	£28.95
Upper Reaches Of Apshai (Part 2)	-1C-32K-BQ87U	£14.95
Upper Reaches Of Apshai (Part 2)	-1D-32K-BQ88V	£14.95
Curse Of Ra (Part 3)	-1C-32K-BQ89W	£14.95
Curse Of Ra (Part 3)	-1D-32K-BQ90X	£14.95
Analog Adventure	-1D-32K-BQ33L	£16.95
Adventure Land	-1C-24K-BQ00A	£14.95
Pirates Adventure	-1C-24K-BQ01B	£14.95
Mission Impossible	-1C-24K-BQ02C	£14.95
Voodoo Castle	-1C-24K-BQ03D	£14.95
The Count	-1C-24K-BQ04E	£14.95
Strange Odyssey	-1C-24K-BQ05F	£14.95
Mystery Fun House	-1C-24K-BQ06G	£14.95
Pyramid Of Doom	-1C-24K-BQ07H	£14.95
Ghost Town	-1C-24K-BQ08J	£14.95
Savage Island I	-1C-24K-BQ09K	£14.95
Savage Island II	-1C-24K-BQ10L	£14.95
Golden Voyage	-1C-24K-BQ11M	£14.95
Softporn Adventure	-1D-40K-BQ93B	£20.64
Deadline	-2D-32K-BQ96E	£34.95
The Shattered Alliance	-1D-48K-BQ98G	£29.95
The Battle Of Shiloh	-1C-40K-BQ63T	£29.95
The Battle Of Shiloh	-1D-40K-BQ97F	£29.95
Energy Czar	-1C-16K-YG53H	£9.95
Kingdom	-1C-8K-YG55K	£9.95
Space Shuttle Module 1	-1D-32K-BG65V	£19.95

Arcade Games

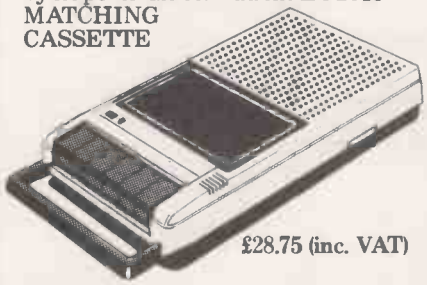
Star Raiders	-1E-8K-YG66W	£29.95

COLOUR GENIE – AVAILABLE NOW!

Colour Genie is the powerful new piece of home computing magic from Lowe Electronics, and it's available NOW from your local stockist, or by mail order in less than 3 weeks!

In no time at all you could be connecting the Genie to a standard colour TV. Its 16K RAM, 16K BASIC ROM and full size typewriter keyboard instantly connecting you to a whole new dimension of vivid colour, high resolution graphics and fabulous 3 channel music synthesiser, with pre-settable tempos.

The whole family will be enthralled by its possibilities. Add the EG2016 MATCHING CASSETTE



£28.75 (inc. VAT)

RECORDER for instance, and right away you can either load pre-recorded software onto your Genie, or store your own programs. Then, if you fancy a spot of intergalactic travel, or a battle for the planets Genie will lay on the transport. When you get tired of the kids beating you at Space Invaders you can always turn their attention to schoolwork. Colour Genie uses the popular Z80 Central Processing Unit, and is fully programmable in level II BASIC, the most popular home computer language in the Western world.

£49.49 (inc. VAT)

For the committed games player the next 'must' will probably be the EG2013 JOYSTICKS. They're sturdy, accurate and, with digital and manual operation, are a step up again from arcade controls.

However the more serious user might prefer to invest his money first on the addition of an EG2011 16K RAM CARD which slots in and effectively doubles the Random Access Memory £38.50 (inc. VAT). Or perhaps the EG2014 LIGHT PEN, which plugs straight into the side of the Genie £17.25 (inc. VAT). Both are extremely effective ways to enhance the colour graphics facility.

Finally, if you really intend to put your machine to work, at home or in your business, you'll need a printer like the EG603 MICROPRINTER. It's a quality dot matrix printer with an impressive specification... simple to operate, reliable and extremely versatile. Should you require it, the printer will accept paper whether in roll or single sheet form with one or even two copies attached. Full 80 column width in any of the 3 different typesizes available. £270.25 (inc. VAT)

To connect this, or any other compatible printer, you also need the EG2012 PRINTER INTERFACE CABLE. £39.50 (inc. VAT).

So there you have it – a home microcomputer system that expands a computer for the creative mind right up to a realistic business machine. We not only deliver the best specification but we deliver the ColourGenie fast, so why wait?

GENIE I

Tried and trusted! – The Genie I is still one of Britain's best-selling small computers, with over 14,000 sold, and it's easy to see why! Software compatibility with Level 2 BASIC means there are literally 1000's of programs on the market ready to run on the Genie, including educational, leisure and small business applications. It's easy to expand, with a vast range of accessories to perform many functions – you only have to read this ad!

Genie I is the ideal computer for the first time buyer, to use at home, at school or at work. The simple BASIC language enables you to write your own programs with ease, and the Microsoft Extended BASIC offers many powerful extra features.

So, if you are not lucky enough to own a Genie I, or if you have a less powerful small computer and want to upgrade, go along to your local Genie dealer, or phone us for advice. It could be your first step into the enthralling world of microcomputers. £330.05 (inc. VAT)

Genie
...ALWAYS AT

GENIE II

Equally popular and totally reliable! – The Genie II is a breakthrough for small business computers. Harnessing all the advantages of the Genie I, including its low price, Genie II adapts perfectly to commercial functions with the addition of the following features:

* Numeric Keyboard
* Four User-Definable Function Keys
* Expandable via the same Genie peripherals
* RS232 Terminal Driver.

Genie II is an ideal, first-entry, computer for the small business. Corner shops, professional practices and small manufacturers can all benefit from a Genie II business system.
£299 (inc. VAT)

GENIE III

The latest addition to the exciting Genie range! Genie III really is the key to successful business. A powerful 64K Micro with built-in screen, 700K each dual disk drives and a full size, detachable typewriter keyboard. Business software packages are available from most dealers, and the Genie III can be supplied with the option of a dot matrix or daisywheel printer.
£2,242.50 (inc. VAT).
For further advice, see your local dealer or contact Lowe Electronics direct for advice.

GENIE I & II ACCESSORIES

PRINTERS

e EG 3085 is quiet, fast and efficient.
speed is 120 characters per second and
ing is bi-directional with 6 different
acter pitches from 40 to 136 characters per
3K Print Buffer. Forward and Reverse Line
, Software adjustable line spacing, Bit
ge Graphics and Proportional Printing.
able for use with other systems, it has three
styles, adjustable pin or friction feed and
e sheet or roll paper facilities. £410.55 inc. VAT.
e EG 603 is an ideal choice if you don't want
y that much for a printer. It doesn't match
G 3085 in certain areas, but you will still
0 characters per second, a range of
acter styles, and pin/friction feed, with 96
acters and 64 graphic patterns.
.25 inc. VAT.

OTHER HR-1
sywheel Printer
u can now buy a superior daisywheel printer
price only previously associated with dot
ix models.
e Brother HR-1 is an enticing addition to
system. It has a print speed of 16 cps, bi-
tional, range of 8 typefaces, and a choice of
models with either parallel or RS232
faces. This model also enjoys a 2K PRINT
FER as standard.

omputers
OUR COMMAND

liability, durability and attractive
arance make the Brother HR-1 probably the
printer buy this year! £747.50 inc. VAT.

3016 PARALLEL PRINTER
TERFACE AND CABLE
he EG 3016 is an interface allowing a
tronics parallel compatible printer such as an
603, EG 3085 etc to be connected directly to
Genie keyboard without the need for an
ander box. £43.70 inc. VAT.

MONITORS

NIE MONITORS
o good performance, low priced 12"
itors, either to match your Genie or
patible with a wide range of other systems.
d resolution and band width and, of course,
free your television set for the other type of
rammes you like to watch!
e EG 100 12" in black & white cost £77.05
VAT.
e EG 101 12" with green phospher is £90.85
VAT.

T. MONITORS
vailable in 9" and 12" sizes, with white,
n or amber display, A.V.T. monitors are
dy, attractive, easy to operate and feature an
-view screen with smoked anti-glare display
. Compatible with most popular micros on
narket. From £98.90 inc. VAT.

NOVEX MONITORS
12", green, metal cased, high resolution monitor with an anti-glare screen. Excellent value at £113.85 inc. VAT.

EXPANSION BOX

The updated EG 3014 expansion box allows for up to four disk drives and printer with optional double density, RS232 or S100 interface. Not bad value at £218.50 inc. VAT. (16K version) or £230 inc. VAT (32K version).
*The EG 3014 will work with TRS 80 using the EG3023 Tandy Adaptor.

EXPANSION OPTIONS

EG3020 SERIAL INTERFACE
Allows the Genie owner to communicate with other computers, use serial printers and telephone modems; in fact to talk to the world!
The EG3020 is a bidirectional RS232 serial interface for the EG3014 allowing baud rate of 110 to 19200. Word length is selectable between 5 and 8 bits. Parity and stop bit settings are switch selectable. Price £45.54 inc. VAT.

DISK DRIVES

If you want fast reliable program storage, true random access to many computer languages, we can meet your needs. The EG 400T provides storage of up to 184320 bytes per floppy disk and comes complete and tested in a stylish colour-matched cabinet. £253 inc. VAT.
The EG 401 AT offers duel disk drive with 368640 bytes of useable storage and comes complete with a power supply ready to connect to an expansion box. £425.50 inc. VAT.

DOUBLE DENSITY ADAPTOR
Allows the use of standard minidisk drives in double density, with virtually double storage capacity. The EG 3021 is equally at home in the Genie or TRS–80 expansion boxes. Double Density Adaptor £82.80 inc. VAT.
For the above, a double density disk operation system will be required. One such system is Smal-LDOS.
Powerful, yet reasonably priced, the Genie Smal-LDOS contains 21 library commands, 7 utilities, LBASIC, disk basic and bags of information, including a reference manual and 40 page beginners guide to disk usage £40.25 inc. VAT.

EG3022 BUS ADAPTOR

Gives full S100 capability to the Genie computers. The EG3022 supports any two S100 cards. Price £73.37 inc. VAT.

BUS EXTENDER

A most useful accessory, allows two bus using devices to be connected simultaneously to the Genie – when using the Hi Res and expander for instance. £24.15 inc. VAT.

EP1, EP3

Are 1.5 K additional EPROMS for Genie I & II.
EP1 Adds all Genie I software facilities to other Genies: lower case driver, machine language monitor, renumber facility, keyboard repeat and screen print.
EP3 Has HI-RES driver software with 10 extra HI-RES commands which prevent the need to load HI-RES software from tape. All at £13.80 inc. VAT. For Video Genie Systems, the LE-19 connects direct to the Genie bus and allows one of these EPROMs to be fitted externally. £30.47 inc. VAT.

TANDY BASHER

If you are a TANDY user read on! The EG 3023 is bus converted to allow Genie peripherals to be used with Tandy Model I computers. £18.40 plus VAT.
(Just in case there might be a few strange souls who want to convert in the the opposite direction there is the 50/40 converter which generates a Tandy compatible 40 way bus from a Genie. £21.16 inc. VAT.

BUSINESS SOFTWARE

Specifically written for the Genie II computer, with disks and a suite of packages from the renowned house TRIDATA. The suite includes SALES LEDGER, PURCHASE LEDGER, PAYROLL and STOCK CONTROL Each package is a very reasonable £155.25 inc. VAT. Full details on request.

TECHNICAL MANUALS

Full technical details of Genie Hardware (all you ever wanted to know about Geuie).
Genie I/II Technical Manual £10 – No VAT.
Expander and accessories (EG3014). £10 – No VAT.

EQUIPMENT COVERS

Beat the dirt, coffee spills and sticky fingers when your computer and monitor are not in use with these top quality black pvc covers.
Genie CV1 £5.75 inc. VAT.
12" monitors CV6 £7.13 inc. VAT.
9" monitors CV3 4.83 inc. VAT.
Centronics Printer CV5 – £4.83 inc. VAT.

SYSTEMS DESK

Even a compact modular computer system like the Genie benefits from being used on a custom designed system desk. The SD1 system desk is designed to accommodate a complete Genie System and has a special upper shelf to support the display monitor at the best level. The desk is flat packed for easy delivery and finished in attractive teak and charcoal colours. £93.61 inc. VAT.

U.K. Distributors

LOWE electronics

Chesterfield Rd, Matlock Derbyshire DE4 5LE.
Tel: 0629 4057 Telex: 377482 Lowlec G.

We have over 100 dealers throughout the U.K. (including Northern Ireland). For advice on your nearest stockist ring us on 0629 4995. In cases of local difficulty, we will supply direct AND FAST! Just fill in the coupon below. * LOWE ELECTRONICS HAVE NEVER YET FAILED TO DELIVER WITHIN 3 WEEKS! Some Microcomputer Companies, mentioning no names, are reputed to take more than three months to deliver your computer. Buy direct from us, and we guarantee not to cash your cheque until 7 days prior to the despatch of your order (this is to satisfy cheque clearance requirements). If, in the *extremely* unlikely event we, for the first time in our company's history, cannot deliver within 3 weeks, we'll contact you immediately and offer to return your cheque *uncashed*.

Unlike most of our competitors, all our prices shown *INCLUDE* VAT. *No* hidden extras, just *great* value.

ease send me details of my nearest Genie dealer ☐
enclose 30p p&p for
enie Colour Brochure ☐
enclose Cheque/PO
r _____
ease debit my
redit Card No:
_____

Please send me the following items:
_____
_____
_____
_____

All items are despatched via Securicor, please add £5 p&p and delivery to your total bill.

Name _____
Address _____
_____
_____
Tel: _____

LOWE VISA

PC2/83

● Circle No. 126

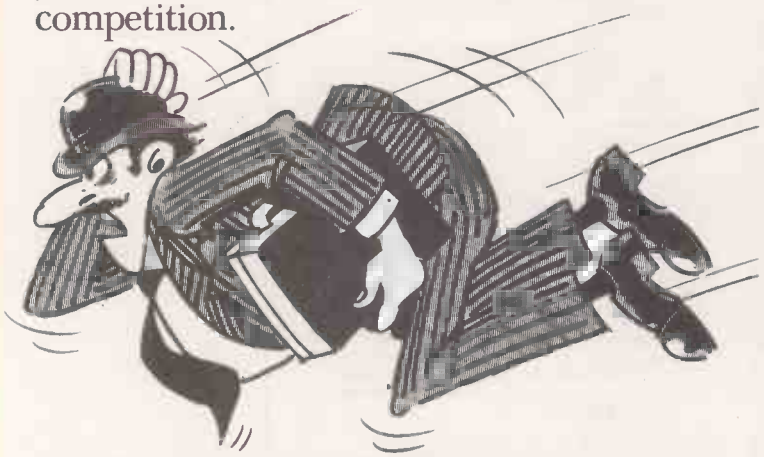
Our spreadsheet sy
But let's start with

There was a time when you could run a business by the seat of your pants.

But the days of trusting to luck and following hunches are gone.

Today, computers, micros and more importantly business planning systems are no longer considered luxuries.

They allow you to keep one step ahead of your business, and one step ahead of the competition.



So it seems odd that most software companies still expect to solve all the problems with one system.

A "jack-of-all-trades" if you like.

Fortunately Comshare are not like most companies. We saw the need for different systems to suit different people.

NEW USERS START HERE

PlannerCalc at £39.00* is now accepted as the first choice for people new to financial planning.

Designed for 8-bit micros, it boasts the kind of features that you'd expect to pay three times as much for. (Buy PlannerCalc's nearest rival and you'll have to.)

Unlike all other 'calc' products it allows you to enter calculation in a language you understand. Plain English.

So it's much easier to use.

It uses the popular "spreadsheet" approach with a window that can be rolled in all directions.

Which means you can enter new figures and rules and immediately see their effect on everything else in the model.

It comes with the best manual on the market and it's suitable for most micros wit a ™CP/M 2.2 operating system, 64K of memory, giving at least 900 cells, minimur screen width of 80 characters and floppy disc drives.

MUCH MORE POWER, NOT MUCH MORE MONEY

MasterPlanner is the most powerful spreadsheet system currently available with its increased matrix size, 2000-3000

COMSHARE DEALERS

Aberdeen
Abtext Ltd
(0224) 647074

Aldershot
EMS (UK) Ltd
(0252) 313551

Altrincham
Mercator Tech Services Ltd
(061) 941 4225

Aylesbury
Hellstaar Systems Ltd
(0296) 630364

Barnsley
Brook Office Supplies Ltd
(0226) 88916

Blackburn
BEC Systems Services Ltd
(0254) 677215

TDS Bus Systems Ltd
(0254) 676915

Bradford
Compbright Ltd
(0274) 668890

Raven Computers Ltd
(0274) 306966

Bristol
Belmondo Research Ltd
(0272) 427428

Mercator Computer Systems Ltd
(0272) 731079

Transtec Ltd
(0272) 277462

Bury St. Edmunds
S.I.R.C.S. Ltd
(0284) 62022

Canterbury
Kent Micro Systems
(0227) 50200

Cardiff
Bowstrings Computer Services Ltd
(0222) 36825

Clevedon
Bard Computer Systems Ltd
(0272) 878 157

Cranbrook
The Soft Option
(058080) 310

Doncaster
Briarstar Computer Centre
(0302) 67135

Dublin
Transtec Ltd
(0001) 718521

Glasgow
The Prospectus Partnership
(0236) 211294

Hereford
Honeysett Computers Ltd
(0432) 279404

Ipswich
Anglia Microsystems
(0449) 740046

Leicester
Leicester Micro Centre
(0533) 551869

Lisburn
MKM Electronic Ltd
(08462) 3184/3665

Liverpool
BEC (Liverpool) Ltd
(051) 263 5738

London
BD Computer Systems
01-435 4442

Business Information Systems
01-373 3408

Clenlo Computer Systems Ltd
01-670 4202

Computer Aided Systems Ltd
01-487 3869

Computer Aided Systems Ltd
01-518 1414

Corporate Modelling Consults
01-628 4107

Dantedale Ltd
01-519 7004

Equinox Computers Ltd
01-739 2387

Ferrari Software Ltd
01-751 5791

Jarrogate Ltd
01-671 6321

Ludhouse Computing Ltd
01-679 4321

Mayfair Business Systems Ltd
01-588 3836

MGE Systems Ltd
01-439 9617

Micronics Telesystems Ltd
01-263 6926

P.W. Hare & Associates
01-551 1988

Salmon Electronics
01-223 1688

Software Ltd
01-387 9927

Spectrum Systems Ltd
01-405 1250

Stag Terminals Ltd
01-943 0777

Statacom Ltd
01-661 2266

Sumlock Bondain Ltd
01-250 0505

Sun Business Services Ltd
01-739 7949

Transam Computers Ltd
01-402 8137

Whispix Ltd
01-556 9151

Louth
Comput-A-Crop
(0507) 604271

Melksham
ICEN Ltd
(0225) 702133

Midhurst
Wordskill Automation Ltd
(073081) 6641

Milton Keynes
Pericom Data Systems Ltd
(0908) 614242

Navan
S. Triple S Ltd
(046) 28472

Nottingham
Micropeople Ltd
(06074) 69117

Oxford
Choice Business Systems
(049161) 2697

Redcar
Applestop
(0642) 474707

Richmond
Tritech Computer Services
01-948 4213

Rickmansworth
A1 Microcomputers
(09237) 71428

Rutland
Microspecific Ltd
(0572) 2528

Slough
KGB Micros Ltd
(75) 38581

Southampton
Xitan Systems Ltd
(0703) 38740

St Helier
The Processor Centre
(0534) 77070

West Byfleet
Fergusson Computers Ltd
(91) 41810

Weston-Super-Mar
Eastfern Ltd
(0934) 418346

Winchester
Modular Office Systems Ltd
(0962) 55759

Yeovil
Dale Computer Systems Ltd
(0935) 72000

tems start at £39.00.
why you need one.

cells on most 64K micros. (But at £245* it certainly isn't the most expensive.)

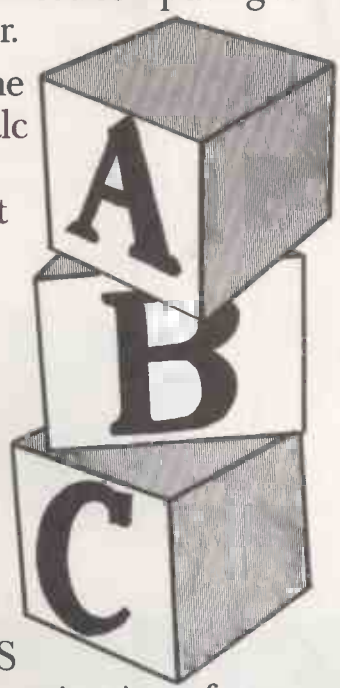
Consolidation of models, allows you to create separate plans for each department and then combine them into an overall company plan. Data transfer to word processing and other systems lets you incorporate figures in reports and output to a data base. It also has extensive formatting facilities which means you can produce reports that wouldn't look out of place in the board room.

It can store up to 25 standard reports to run when you need them. It's got full WHAT IF? analysis and direct editing of both spread sheet and logic display.

JUST AS EASY TO USE

All this increased power doesn't mean you'll need a degree in advanced computing to understand MasterPlanner.

It works on exactly the same system as PlannerCalc and models written on PlannerCalc run without modification on Master-Planner.



16 BIT VERSION

A new version of MasterPlanner has been specifically designed for the 16 bit micros like the Sirius 1 under ™CP/M-86 or the IBM personal using either CP/M-86 or ™MS DOS 1.1. With a vast matrix size of over 7000 cells on 128K and even more with larger memory, you'll at last be able to make the most of your micro.

OVER 10 YEARS EXPERIENCE

When you invest in MasterPlanner or PlannerCalc you're not just getting the best software money can buy.

You're also getting the kind of back up and after-sales service that only a company of Comshare's track-record can guarantee.

If you'd like to know more about either product call in at your local dealer or fill in the coupon and send it to us.

*Plus VAT and post & package.

COMSHARE

Making the computer make sense.

CP/M and ™CP/M-86 are the registered trade marks of Digital Research Inc.
Comshare Ltd., 32-34 Great Peter Street, London SW1P 2DB. Telephone: 01-222 5665.

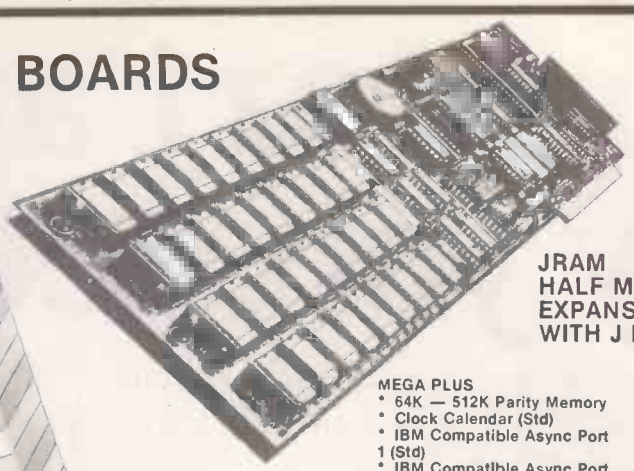
To: Department PC/2, Comshare Ltd., 32-34 Gt. Peter Street, London SW1P 2DB.
Please send me:

Qty	Product	Micro	Op System	Disc Size	K	Amount £	p.
	PlannerCalc @ £46.05 (8 bit only)		CPM 2.2	8"/5¼"			
	MasterPlanner @ £282.95		CPM 2.2	8"/5¼"			
	MasterPlanner	IBM PC	MS DOS 1.1	8"/5¼"			
	MasterPlanner		CPM/86	8"/5¼"			
All prices include VAT and postage & packing				TOTAL			

I enclose a cheque/postal order for £_____ made payable to Comshare Ltd.
Please debit my Access Card No._____ for £_____
Barclaycard No._____ for £_____
Signature_____
Name_____
Address_____
Tel. No._____
Please allow 28 days for delivery. VAT No. 238418649. Registered No. 980406.

Comshare reserve the right not to accept any orders. Any acceptance will be subject to Comshare's terms and conditions.

BOARDS



JRAM
HALF MEGABYTE MEMORY
EXPANSION BOARD COME
WITH J FORMAT £695.00

MEGA PLUS
- 64K — 512K Parity Memory
- Clock Calendar (Std)
- IBM Compatible Async Port 1 (Std)
- IBM Compatible Async Port 2 (Opt)
- IBM Compatible Printer Port (Opt)
- 512K with Mega Pak Option
- Super drive included (disc emulator Prog)
- Super spool Included (prin spooler prog)
- Split memory addressing

COMBO PLUS
- 64K — 256K Parity Memo
- Clock Calendar (Std)
- IBM Compatible Async Po (Opt)
- IBM Compatible Printer P
- Super Drive Included
- Super Spool

SOFTWARE

IBM Pascal Compiler, IBM Cobol Compiler, IBM Fortran Compiler, IBM Basic Compiler, IBM Macro Assembler, IBM UCSD P-system Pascal, IBM UCSD P-system Pascal Compiler, IBM UCSD P-system Fortran 77, IBM Fortran 77 Compiler, IBM CP/M 86, IBM Asynchronous Communicatio Support, IBM Technical Reference Manual, IBM Hardware Maintenance & Service Manual (Advanced Diagnostics), IB DOS 1.1 — Enhanced version of DOS 1.0.

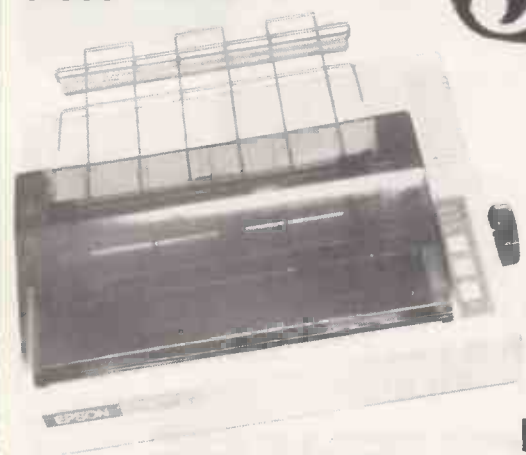
DYSAN DISKETTES

Full range of discs available

dysan

OSBORN

Free with eve machine



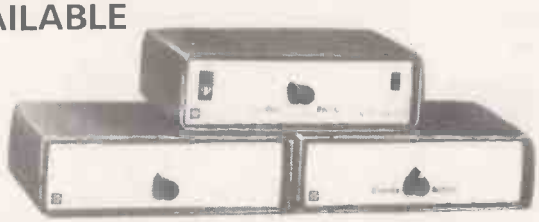
MONITOR 10 DISCS
mBasic cBasic CPM, word star, mail merge super calc

DISK DRIVES 250K-IMB

PRICES EXCLUDE VAT
SUBJECT TO CURRENCY AND AVAILABILITY

NEC, TEC and EPSON printers

DOT MATRIX & DAISY WHEELS AVAILABLE



Full range of CDC drives from 250K to 1MByte sub systems/Bare drives Winchester available. BBC, NASCOM, GEMINI, TANDY, VIDEO GENIE AND MANY MORE.

PRINTER SWITCHES (from £79)

RS232 — CONT PARA MULTIPLE PRINTER SWITCHES.

All offers subject to currency fluctuation availability

Microware

01-278 6399

01-278 6237

The IBM Personal Computer

(£2,395)

320K Memory 700K Floppy all configurations available. Winchester upgrade kits add on boards including Z80 Card and full range of software available.

NEW Colour Monitor for IBM PC £595.00

* Styled for IBM PC
* 80 × 26 display
* 690 dot Horizontal Resolution
* NEC 0.31mm dot pitch CRT

ACT Sirius 1

EPSON HX-20

Z80 Card + full range of software available

£1,495

Prices exclude VAT

SUPERBRAIN™

Full range available from 320K to 15MByte 6MByte hard disc models from £2795.

Microware

01-278 6399

01-278 6237

● Circle No. 129

LONDON COMPUTER CENTRE

ACT sirius 1

1.2 Mb Disk Storage £2395
2.4 Mb Disk Storage £2895

Now available
Z 80 CP/M Add-on board to run all CP/M 8 bit or 16 bit software

NEW

Sirius Hard Disk 10 Mb Available Now!

Wordstar Magic Wand Spellbinder
Spellstar D Base II T/Maker Calcstar
Milestone Datastar Microstar
Fortran Cobol Pascal or any CP/M software

TELE-VIDEO SINGLE-USER TO MULTI-USER

NOW UPGRADED NO EXTRA CHARGE

802E 100K EXTRA DISK STORAGE **£2170**
Superbrain compatibility
Faster disk access
Green Screen. True descenders
22 Function Keys
802DE 2 Mb Disk Storage **£2295**
802HDE 14 Mb Hard Disk 1 Mb Floppy **£3990**
806 6 User 20 Mb Hard Disk **£4095**
816 16 User 40 Mb Hard Disk **£7385**
800 64K User Station **£1025**

Prices above based on exchange rate $2 = £

800 64 K user station **£1025**

CP/M Software

Wordstar	**£195**
Spellstar	**£130**
Grammatik	**£65**
Foot Note	**£75**
CPM/IBM	**£99**
CPM/DEC	**£99**
T Maker II	**£150**
D Base II	**£395**
Autocode	**£120**
Milestone	**£195**
Task	**£195**

NEW

EPSON HX20 the Portable Computer £402

Epson Type 3 MX 80/FT MX 100

NEW

New Superbrain 2 from £1595
Dedicated Wordstar Keypad

AUTO SHEET FEEDER £580
New! 12" Wide Automatic Sheet Feeder fits all below

NEW

5Mb Hard Disk Model 111 £1095

Model I
48K System
2 Disk Drives
Green Screen
Complete **£995**

Model II
with TRS DOS and CPM at no extra charge from **£1995**

Model III
16K **£599**
48K **£649**
48K with 2 disk drives **£1395**

DAISY WHEEL PRINTERS LETTER QUALITY PRINTING

* **FLOWRITER RP 1600. 60 CPS** The most intelligent Daisy. Proportional spacing with Right Justification on WORDSTAR, WORDPRO, APPLE WRITER, SCRIPSIT etc. **£1500.**
* **TEC 40. 40 CPS** JAPANESE DIABLO 630 uses Diablo Daisy Wheel & Ribbons **£1135.**

HARD DISKS

for Superbrain, TRS 80 Model II, Apple

Model 6 6 Mb Formatted **£1595**
Model 12 11.5 Mb Formatted **£1895**
* Specially designed Hybrid heavy duty power supply
* Data Error Recovery

All prices are Exclusive of VAT and Delivery. Dealer Enquiries invited on all Products.
Large range of CPM Software available. Please phone for Prices.
Demonstrations on all models.

43 GRAFTON WAY, LONDON W1P 5LA (Opposite Maples)
OPENING HOURS: 11-7 MON-FRI 12-4 SAT Tel: 388 6991/2
24 hour answer phone: 01-388 5721

● Circle No. 132

You'll be glad you chose a personal computer with power enough to grow with your needs.

The ICL Personal Computer with power to grow as you need it.

Choosing the wrong personal computer can work out very costly, because though they grow to meet your needs, they just don't grow enough.

The new ICL Personal Computer gives you more.

It's a versatile, professional personal computer. It can start with a single Visual Display Unit, naturally, and it has a wide range of functions to meet your increasing requirements. And it can grow larger than most other personal computer systems, because its capacity for additional hardware is greater.

Starting at £2,895 with one VDU

The ICL Personal Computer provides a range of options enabling you to have a system tailored to meet your changing needs.

For example, by adding a fixed-disc, you can have eight times the original storage capacity, and support up to 4 VDUs. And there is an extensive range of Personal Computer hardware.

Wide range of integrated accounts and other application software available, providing limitless possibilities.

So your secretary can do her word processing, you can do your forecasts, your accountant can do the invoicing, and your programmer can do his own thing, all at the same time. Thats what makes ICL Personal Computer more than just a personal computer.

And because ICL is Europe's leading computer company, with thousands of satisfied users in over 80 countries worldwide, **we can offer ICL Trader Point service and maintenance back-up that's second to none.**

What more could you ask for, apart from a demonstration?

ICL

trader point

To: **Johnson microcomputers** Johnson House · 75-79 Park Street · Camberley · Surrey

Please send me further information on the new ICL Personal Computer.

Name Position

Company Name & Address

Telephone

Type of Business

Peachtree Software

Johnson microcomputers

Johnson House · 75-79 Park Street · Camberley · Surrey
Telephone 0276 20446

Robophone Answering 24 hrs. Prestel page No. *200632
Mailbox No. 027620448

48 Gloucester Road · Bristol · Telephone 0272 422061
113 Stratford Road · Shirley · Birmingham B90 3AY
Telephone (021) 745 3246

● Circle No. 133

WORLD'S SMALLEST COMPUTER SYSTEM?

Breast Pocket Computer — A5 Book Size System
More powerful than pocket computers costing up to twice as much.

Sharp PC-1251 Computer
Plus FREE £10 software voucher **£79.95**

CE-125 Printer/Micro Cassette
Plus FREE £10 software voucher **£99.95**

Custom made for Sales Executives. Ideal for Engineers and Hobbyists, or as a starter computer that grows into a powerful, reliable system.

PC-1251. Massive memory:— 4.2K RAM (3.7K user) and 24K ROM for extended BASIC, including DIM, STRING and INKEY$. Up to 18 programs stored in memory at once, each with its own execute key, plus reserve mode for frequently used commands. One-touch mode selector for Reserve/Program/Run. Full range of maths and science functions. QWERTY keyboard. 24 digit dot matrix display. Auto power-off, with memory protection.

CE-125. Half the size of this page and less than 1 inch thick!
24 character thermal printing of data, computation results, programs, etc. Integral micro cassette recorder for error-free saving/loading, plus built-in interface for standard cassette recorder. Will run existing PC-1211 software but many times faster! Powered by rechargeable NiCad batteries, or mains adaptor (supplied).

MiCROL AND SHARP SOFTWARE AVAILABLE SOON
SEND FOR DETAILS

System Price £179.90
Including VAT and FREE £20 software voucher

Dimensions
PC-1251. 135 × 70 × 9.5mm (5-5/16 × 2¾ × ⅜ inch). Weight: 115g (4oz).
CE-125. 205 × 149 × 23mm (8-1/16 × 5⅞ × 29/32 inch). Weight: 550g (1.2lb).

SHARP PC-1500 COLOUR COMPUTER

The world's most powerful pocket computer?

PRICES, including VAT and FREE software vouchers
PC-1500 Pocket Computer plus £20 software voucher £169.95
CE-150 Colour Printer/Cassette interface plus £20 voucher £149.95
CE-155 8K RAM Expansion Module plus £10 voucher..£79.95
CE-159 8K RAM/ROM with battery back up + £10 voucher £89.95
CE-152 Custom Cassette Recorder plus £5 voucher.....£39.95
CE-153 140 key Software Board plus £10 voucher.....£79.95
CE-158 RS-232C Interface plus £20 voucher.....£149.95

SOFTWARE AND ACCESSORY LIST ON REQUEST

PRICES include VAT, P&P. Offers are subject to availability. Send cheques, P.O. or phone your credit card no. to:—

THE THOUGHT PROCESSOR **MiCROL MAIL ORDER**

Dept. PC, 38 Burleigh St
Cambridge CB1 1DG
Telephone: 0223 312453

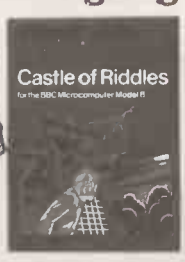
● Circle No. 286

WANTED!

PROFESSIONAL ADVENTURERS TO UNDERTAKE THREE DANGEROUS MISSIONS

You will need a quick agile mind, a rock-steady hand, and nerves of steel to survive. Your reward will be treasure beyond the dreams of man and the satisfaction of going where no man has gone before.

Special Competition with over £3,000 in prizes.



CASTLE OF RIDDLES

Win over £3,000 in prizes in the fabulous Acornsoft/ Your Computer competition. Entry form on every pack.

Enter the warlock's castle, solve the riddles, and regain the ring to become 'King of the Ring'.

PHILOSOPHER'S QUEST

A fascinating adventure in a world of fiendish puzzles to be solved. To complete your quest—think hard about everything you do.

SPHINX ADVENTURE

A full-sized classic adventure game in which you move through caves, fight with trolls, collect treasure and finally make your way to the sphinx to collect your reward.

All the adventures can be run on the BBC Microcomputer Model B and cost £9.95 including post and packing.

Acornsoft Limited c/o Vector Marketing Ltd, Denington Industrial Estate, Wellingborough, Northants NN8 2RL.

To: Acornsoft Limited c/o Vector Marketing Ltd, Denington Industrial Estate Wellingborough, Northants NN8 2RL.

Please send me the following adventure games.
Philosophers Quest SBG01 ... (qty) at £9.95 =
Sphinx Adventure SBG07 ... (qty) at £9.95 =
Castle of Riddles SBG17 ... (qty) at £9.95 =

Total _____

I enclose cheque no _____ or please debit my Access or Barclaycard no

Please Print
Name:

Address:

Postcode:

Signature

● Circle No. 287

apple PROGRAMS WITH A DIFFERENCE *from* Data Warrior

WORD HANDLER II — SILICON VALLEY SYSTEMS, INC. — LIST HANDLER

!! 66 COLUMNS ON-SCREEN!!

PLUS Full and Powerful Word Processing **WITHOUT ANY EXTRA HARDWARE** Will run on standard 48K Apple with one or two disk drives. With direct-to-disk editing its possible to have single documents larger than memory. PLUS all underlining, justification etc appears on the screen. **£109**

(£125.35 Inc.VAT)

upto3000 records on ONE DISK

PLUS sorting on up to **8 DRIVES** allowing say, a Mailing List of **24000!!** Lists are totally user defined and can have as many as 255 fields! PLUS full merging with Text files to produce form-letters, price-list, in fact the only restriction is the users imagination. **£65**

(£74.75 Inc.VAT)

STUDYING FOR EXAMS?

Simply type your notes into our **E-Z LEARNER** program, and the computer will throw random questions at you until you have learned each subject thoroughly. **£25**

(£28.75 Inc.VAT)

LOTS OF READING TO DO?

Then you need a copy of our **RAPID READER** You decide on the speed you want to practice at and the computer will give you words sentences and paragraphs to read and then tests you for comprehension. **£25**

(£28.75 Inc.VAT)

Apple III — FREE WITH THESE APPLES! — Apple II

TABS

SALES LEDGER

PURCHASE LEDGER

PLUS APPLEWRITER III

SYSTEM COST (as illustrated) £2418

FREE SOFTWARE VALUE £659

Complete start-up business systems at the same cost as the hardware only

Unlike the 'discount boys' this offer includes **ON-SITE INSTALLATION**

2 hours BASIC INSTRUCTION and FULL AFTERSALES BACK-UP

WORD HANDLER II

LIST HANDLER

THE LAST ONE

VISICALC

SYSTEM COST (with Hitachi monitor) £1602

FREE SOFTWARE VALUE £519

OFFER ENDS 24th February 1983

24-hour ON-SITE MAINTENANCE AVAILABLE

(Prices quoted DO NOT INCLUDE VAT)

NewBrain AT LAST . . . SOME SOFTWARE!

GAMES

All NEWBRAIN PRICES Include VAT

GOBBLER The well-known Arcade game of eat and be eaten **£10.00**

TYCOON/PELMANISM TYCOON requires you to buy and sell shares with the computer throwing in random factors that affect prices. PELMANISM is the game that test your memory making cards into pairs. **£12.00**

WORMS Chasing your own tail can be very tricky **£9.95**

HOME & BUSINESS

HOME BUDGET **£12.00** Keep track of the family finances quickly and easily.

DIARY **£12.50** 12 months appointments birthdays etc.

WORD WORKER **£29.95** A very efficient word processor. Ideal for students and people who write

DATA BASE **£31.50** Store up to 800 records and sort on up to 11 fields.

INVOICE & CREDIT NOTE Issues and keeps track of all your Invoices. **£69.95**

INVOICE REVIEW Analyses and reports all Invoices issued. **£27.50**

(if both programs bought together, DEDUCT £12.45 from total)

NEWBRAIN

Model AD £263.35 *(with LCD display)*

Model A £228.85

Full product support and Guarantee

TABS Accounting Business Systems — WE ARE ACCREDITED DEALERS We will assist you all the way through with installation

FULL STAFF TRAINING BY TABS IS AVAILABLE IF REQUIRED

MARS

MANAGEMENT ACCOUNTING & REPORTING SYSTEM

FOR POWERFUL FINANCIAL MODELLING

For ALL CP/M systems £295

(£339.25 Inc.VAT)

Mail Order

Prices include Post & Packing

Full after-sales service is included with all Software

Callers very welcome.

Our retail shop is open from 10till 6 (Closed Wednesday all day)

10 Eastfield Parade
Forbes Avenue Potters Bar
Herts. EN6 5ND
Potters Bar (0707) 44808

24hr Telephone ordering service on 0707 59669

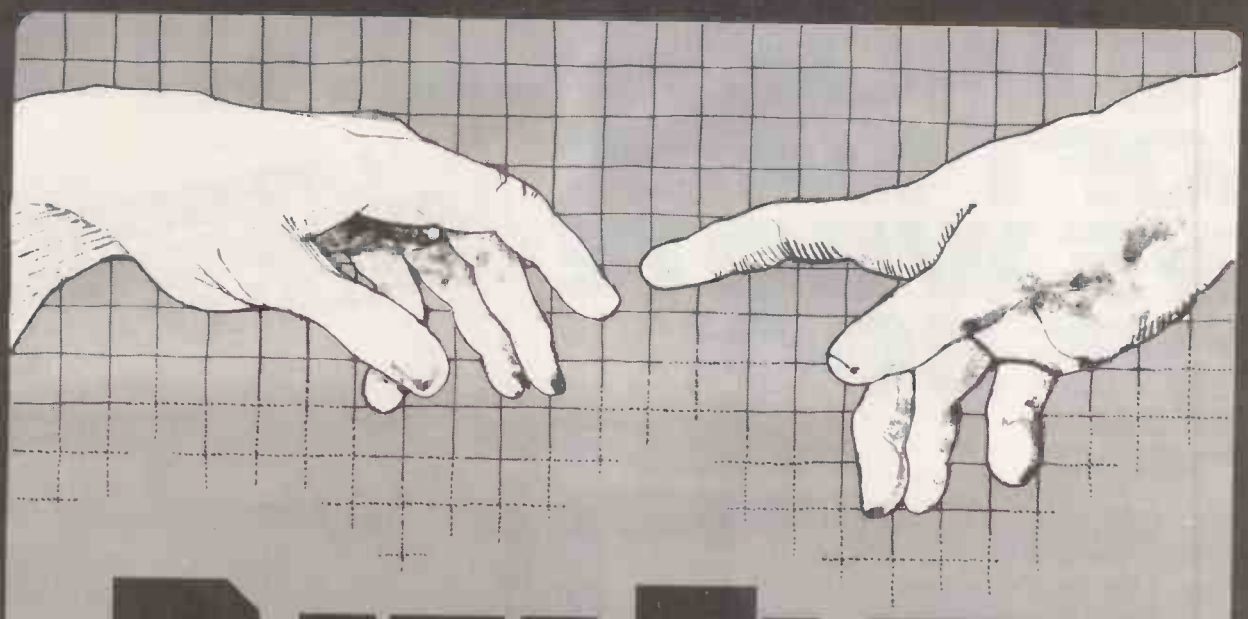
NAME	Qty.	Item	Cost	P&P
ADDRESS				
Postcode				
Telephone				
MAKE				
MODEL		Sub-totals		
ACCESS BAR'CARD				
		Cheque/P-Order/Cash/Card No. for		

NO STAMP REQUIRED! just place in an envelope and post to:-

Potters Bar computers

FREEPOST 9005 Potters Bar, Herts., EN6 2BR

● Circle No. 288



DATAFLEX™

SOFTWARE FOR CREATORS

Bring your CP/M software applications to life with DataFlex.

From menu to multi-key ISAM, DataFlex has the features and power you need to create complete turn-key software applications in a RELATIONAL DATA BASE ENVIRONMENT.

Compare . . . what else gives you up to 125 data files with 4 indexes each, fast on-line multi-key ISAM file maintenance, a multi-file report generator, on-line multi-file transaction processing, an easy-to-use Query, even a "soft" menu to replace the CP/M command mode. All of this using DataFlex's configuration utilities, and NO PROGRAM CODE!

It is easy to use, You can type in a Screen format "image" of a file with your text editor. Then DataFlex's AUTODEF utility will create the file definition from the screen image . . . in about five seconds.

DataFlex will handle your multi-user requirements too! It runs under the TURBOdos networking operating system with full data protection.

If the 16-bit world is your domain, an 8086 version of DataFlex will be available in early 1983. You can develop now on your Z80 system and transport completed applications to the 8086/8088.

If you need applications now, a Library of DataFlex applications is being developed by other users. For highly specialised requirements, DataFlex's PASCAL Library is available to application developers.

DataFlex can change the way you do business. And at £495, (excl. VAT), with all its facilities we consider it the best value in the business. A demo package, which limits file sizes internally, is available for computer professionals.

Get the full system, or get the demo, but get your hands on DataFlex – software for creators.

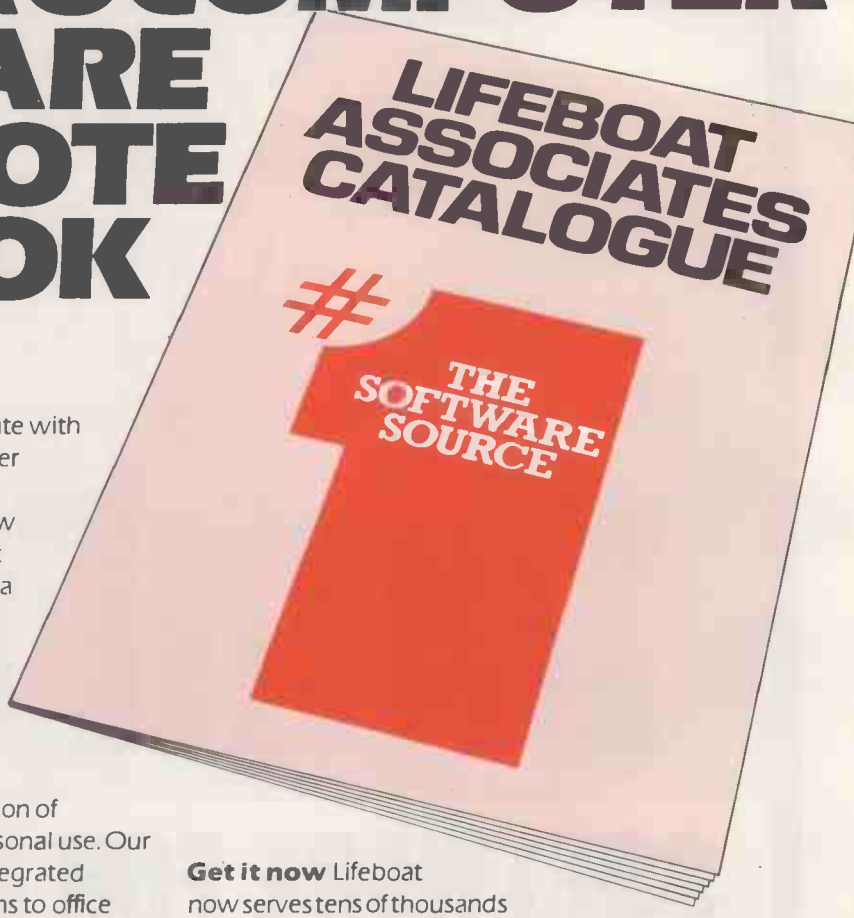
Trademarks:
CP/M; Digital Research **DataFlex;** Data Access.
TURBOdos; Software 2000

OEM, SYSTEM HOUSE AND DEALER ENQUIRIES INVITED.

EQUINOX
MULTI-USER SOFTWARE
16 Anning Street, New Inn Yard,
London EC2A 3HB. Tel: 01-739 2387
Telex: 27341

● Circle No. 134

WHEN IT COMES TO MICROCOMPUTER SOFTWARE WE WROTE THE BOOK



How do you stay up-to-the-minute with the rapidly changing world of microcomputer software? Get the Lifeboat Catalogue.

The latest innovations The new Lifeboat Catalogue is packed with the latest state-of-the-art software. And if we publish a new program after the latest catalogue has gone to press, we enclose a flash bulletin in your copy.

The greatest selection Because Lifeboat is the world's largest publisher of microcomputer software, our catalogue offers you the greatest selection of programs for business, professional and personal use. Our more than 200 programs range from the integrated accounting and professional practice systems to office tools for book-keepers and secretaries to sophisticated tools for programmers. Included are business systems, word processors, programming languages, database management systems, application tools and advanced system utilities.

We specialise in software that runs on most small business computers. Our more than 60 media formats, including floppy disks, data cartridges, magnetic tape and disk cartridges, support well over 100 different types of computer.

Get full service We give the crucial dimension of after-sales service and full support to everything we sell.

That includes:

- An update service for software and documentation.
- Telephone, telex and mail-order services in the London office and at overseas offices in the United States, France, Switzerland, West Germany and Japan.
- Subscriptions to Lifelines,™ the monthly magazine that offers comparative reviews, tips, techniques, identified bugs and updates that keep you abreast of change.

Get it now Lifeboat now serves tens of thousands of satisfied customers with our breadth of up-to-date, fully tested, fully supported and competitively priced software.

You may not need all we offer, but we offer just what you need. After all, we wrote the book.

Lifeboat Associates
World's foremost software source

Mail coupon to: Lifeboat Associates
PO Box 125, London WC2H 9LU or call 01-836 9028

☐ Please send me a free lifeboat catalogue.

Name

Title

Company

Address

Postcode

Lifeboat Worldwide offers you the world's largest library of software. Contact your nearest dealer of Lifeboat.

USA Lifeboat Associates 1651 Third Ave. New York NY 10028 Tel (212) 860-0300 Telex 640693 (LBSOFT NYK) TWX 710 581-2524 **JAPAN** Lifeboat Inc. OK Bldg. 5F 1-2-8 Shiba-Daimon Minato-ku Tokyo 105 Japan Tel 03-437-3901 Telex 2423296 (LBJTYO) **ENGLAND** Lifeboat Associates Ltd PO Box 125 London WC2H 9LU England Tel 01-836 9028 Telex 893709 (LBSOFTG) **SWITZERLAND** Lifeboat Associates GmbH Hinterbergstrasse Postfach 251 6330 Cham Switzerland Tel 042-36-8686 Telex 865265 (MICO CH) **W GERMANY** Intersoft GmbH Schlossgartenweg 5 D-8045 Ismaning W. Germany Tel 089-966-444 Telex 5213643 (ISOFD) **FRANCE** Lifeboat Associates SARL 10 Grande Rue Charles de Gaulle 92600 Asnieres France Tel 1-733-08-04

● Circle No. 135

Practical Computing Back Issues

Each month Practical Computing examines personal computers, peripherals and software packages, providing unbiased critical comment on the strengths and weaknesses of the products reviewed. This, together with descriptions of programming techniques, and the Open File Section which contains hints and items for users of Apple, Pet, Tandy, BBC and Sinclair Computers, makes Practical Computing an invaluable source of information and advice. So if you've missed a particular issue make sure that you're not missing out on information which could be of real value to you. Just check through the Contents of our Back issues, then fill in and return the coupon below.

March 1982
Reviews: Sirius; Kontron; Ricoh printers; Sales Ledger package. Apple software; Adventure — history of the game and its offshoots; Patsy — how to asses your skill as a programmer.

April 1982
Reviews: Oki IF-800; HP-83; Hornet — critical path package. Computer-aided design; 3-D graphics; Education — reading program. Sorting; Computing on the farm.

May 1982
Reviews: PBM-1000; Genie I and II; Arfon light pen; MBasic; Superscale. Will personal computers oust main frames? Education — Learning multiplication tables. Sampling.

June 1982
Reviews: North Star Advantage; Percom; Hard-disc Superbrain; MBasic. Education — Schools' Software; Testing language ability. Stock control on a micro; Income tax assessment; CP/M explained.

July 1982
Reviews: Sinclair Spectrum; Sord M-23; Atari 800; Qume Sprint 9 printer. Structured programming in Basic; CP/M file copying; Power — utility package for the Pet. Clive Sinclair interview.

August 1982
Reviews: Sharp PC — 1500; Televideo 802; Graph pac for high res graphics. Towards intelligent programs; Stock control on Apple II; APL described.

September 1982
Reviews: New Brain; Superbrain II; Clearway — low cost networking; Superfile for data base management. Town planning — a role-playing game; Data posts explained; Cryptanalysis.

October 1982
Reviews: CCS — 300; Dragon 32; Sound chaser — synthesiser system for Apple II. Monte Carlo methods; Applesoft compilers; Wordpro revisited; Graphics for BBC micro; Applications programming for beginners Chris Curry interview.

November 1982
Reviews: Commodore 64; dBase II; Bit Stik high-resolution graphics for the Apple; Microcache. Using the BBC Micro as a graphics terminal. Fourier transforms with VisiCalc. Education — timetable planning.

December 1982
Reviews: Eagle II and TMK 330 business micros; GraForth on the Apple; Wordcraft on the Vic-20; games on the Atari. Micros under £200 — the essential facts. How to manipulate memory on the BBC Micro. Plus - a complete listing of a Monopoly program for the Pet.

Fill in the coupon and return it with your remittance to

Practical Computing

Address as on coupon

To obtain any of these back issues please complete and return the coupon. Prices per copy including post and packing are UK £1.50, Europe £2.00, Rest of world £2.50 (Air Mail).

Issue (month)	Year	Quantity required

To: General Sales Dept., Room 108, IPC Business Press Ltd., Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

Please send me the back issues detailed left – for which I enclose cheque/PO for £ ..... payable to IPC Business Press.

Name .....

Address .....

.....

PC

VICTOR 9000

Aimed at the office market, the Victor 9000 has a wide range of packages to support it. Jack Schofield takes a look at this "new" machine.

THE VICTOR 9000 is a new machine that is not really new: it is, in fact, the Sirius 1 wearing a different box. Both these microcomputers are made on the same production line by Victor United, which used to be called Sirius Technology.

The difference in styling does, however, indicate a difference in marketing ideas, The Sirius was styled as a futuristic new micro to sell through computer dealers against established products like the Apple II and III and Commodore micros. The Victor 9000 was styled for the Victor business-equipment subsidiary of the giant Walter Kiddie conglomerate, to sell as part of a range of office products.

In the U.K. the Victor is marketed by DRG Business Machines, which is part of the Dickinson Robinson Group. DRG is a public company with a turnover of more than £600 million, and is particularly known for stationery products, including Sellotape and Basildon Bond.

Victor software

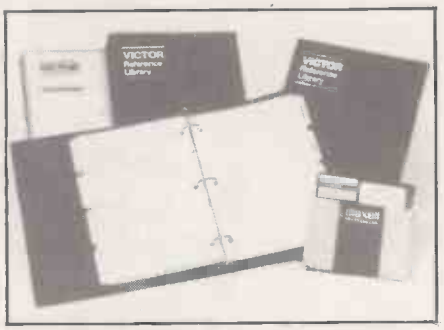
Part of the "office equipment" philosophy is the provision of a range of Victor software to go with the machine. The Victor 9000 supports CP/M-86 and MS-DOS, of course, just like the Sirius 1, so there is a wide range of general packages available. The person who wants WordStar, for example, can have it. The office equipment buyer will probably be encouraged to purchase Victor software including VictorWriter and VictorCalc. Ideally these should have been configured to make optimum use of the Victor's facilities, including the soft keyboard and function keys, but they have not.

The main unit and VDU of the Victor are essentially identical to the Sirius 1, except for being cream coloured instead of brown. For a full review see the ACT Sirius test in the March 1982 issue of *Practical Computing*, pages 54-56.

The Victor's display is memory mapped and refreshed from main memory. The maximum definition is 800 by 400 pixels, which allows very fine character definition and outstanding graphics.

The Victor 9000 keyboard differs in several respects from the one originally supplied with the Sirius. The most obvious difference between the two keyboards is the styling. Where the Sirius keyboard is low and tapered, the Victor version is small and boxy.

The Victor has 10 assignable function keys where the Sirius had seven. One of these is the Help key, number 8. However, function keys 9 and 10 do not appear in the manual which



Full documentation is available.

was supplied with our machine, nor were they used by the Victor software.

Several of the keys are labelled differently on the two versions, though functionally they seem to be the same. The key confusingly labelled Cont — which might tempt the unwary to think it stood for control, Ctrl — now carries the Pause label too. The key which is effectively Ctrl is still labelled Alt.

The Victor has been launched with two operating systems and a small amount of software. The operating systems are CP/M-86 version 1.0 (I/O 2.2) and MS-DOS version 1.25H; each takes up 40K of RAM. The software includes VictorWriter, VictorCalc and the Tabs set of financial packages. Independent software like BusiPost is becoming available too.

In theory, anything which runs on the Sirius 1 should also run on the Victor. However, ACT's Pulsar programs use a special password-protection system which will prevent them from being run on the Victor.

VictorCalc is an electronic spreadsheet program which uses function keys 1 to 7 for commands like Value and Label. It seemed slower and less convenient to use than VisiCalc, but perhaps familiarity with that ubiquitous package prevented the Victor version from getting a fair review. The lack of a manual did not help.

Specification

Microprocessor: Intel 8088; 16 bit with eight-bit input/output; 5MHz
Operating system: CP/M-86, MS-DOS
Memory: 128K RAM, 4K video RAM, 16K ROM
Disc storage: two 5.25 in. floppy drives with 600K storage each
Keyboard: detached QWERTY with keys including 10 function keys and numeric keypad. All keys programmable
Display: 11in. green screen with 80 characters by 25 lines or 132 by 50 lines
Sound: Codec volce synthesiser
Ports: two RS-232C and one Centronics

VictorWriter is actually a version 2.12 of the well-known Select word-processing package. With it you select the function you want — such as Create, Edit, Delete, List, Print, Spell, etc — by pressing the first letter of the word. The special function keys are not used at all. — Even for Help you press H.

VictorWriter is a reasonably versatile word processor which is menu-driven, and screens are clearly labelled so you know where you are. The best thing about it, however, is the Teach program supplied on the same disc. It takes you through the main commands in 26 easy lessons, and it is interactive and offers praise or blame according to how well you do the exercises.

Laugh a minute

The writer has a sense of humour, and uses files called, for example, Whatsup.Doc. If you later get stuck when using VictorWriter, and ask for Help, this calls up the relevant step-by-step instructions from the Teach program. It is therefore possible to become quite proficient after only about two hours use, which compares very favourably with most packages of similar power.

The Victor keyboard is completely "soft" and the Keygen utility allows any character to be assigned to any key. Also, the character set is held in 4K of RAM, not in ROM, so using the Cedit utility it is possible to create new character sets and overwrite the usual ones.

Further, RAM keeps a 16-bit word for each scan line of each character. As characters use a 10-by-16 pixel grid, which means 32 bytes per character instead of the usual eight. Only 10 bits of each scan line are displayed, but other bits can be used for other things like reverse video, underscore, subscript and superscript, etc.

Finally, the Victor provides a range of display options from 80 characters by 25 lines up to 132 by 50. In the highest resolution mode, 40K of RAM is used to address each of the 320,000 pixels individually.

Prefis has used all these facilities in The Book Machine. It is essentially a sophisticated word processor, but is designed to produce discs that can be read directly by a typesetting machine. Thus the screen display needs to match the look of the typeset text — and this must include various typefaces, a range of type sizes, proportional spacing and proper justification. It must also be possible to view the text both with and without the various typesetting commands. This is what The Book Machine does.

It offers up to seven different type styles in a range of sizes from 6 points to 48 points and they can all be displayed on the screen simultaneously. Inter-line spacing is variable

The Teach program helps gain proficiency.

and as well as the standard character set some 250 extra characters are included to cater for foreign-language and scientific publishing.

Being a complex program it is relatively difficult to use, and it makes extensive use of the function keys. The definitions of these keys, which change according to where you are in the program, are displayed along the bottom of the screen.

You can also set up your functions or macros very easily. A convenient way to do this is to use the ten keys 0 to 9 on the numeric keypad. Thus a macro of a sequence of half a dozen keystrokes can be memorised, then entered simply by pressing one key. The technique is useful for entering sequences for frequently used typesetting commands. In fact, the ideal approach would be to customise the whole keyboard as though it was a dedicated word processor. Even as it stands, The Book Machine represents a major advance in word processing for authors, at a price estimated at £6,000 including hardware.

Conclusions

- **The Victor 9000 should be successful since it is the same as the Sirius 1, but this will depend on DRG's marketing approach.**
- **It should expand the Sirius/Victor market by offering a second source of software.**
- **Current software does not fully exploit the facilities of the hardware, but this situation can be expected to improve.**
- **To judge by a pre-release, unfinished version, The Book Machine on the Victor 9000 could make a major impact on the book publishing field in particular.**

TOSHIBA

TOSHIBA already has two offerings on the U.K. market, the T-200 microcomputer and the EW-100 word processor — both uncompromising business machines with twin floppies built into a massive VDU casing. By contrast the T-100 or "Pasopia", as it is called in Japan, is transportable if not quite portable.

It arrives in four boxes containing the PA-7161 colour monitor, PA-7200 twin 5.25in. floppy disc drive, PA-7251 dot-matrix printer and, in the smallest of the packages, the computer console itself. An extra box provided a step-down transformer to cope with U.K. mains, the prototype not being designed for 240V.

It takes only a couple of minutes to connect the system together, and on powering-up it worked first time. There are only two problems. First, it is difficult to find room for the machine because it does not stack easily. Each component will generally stand alone, so the system really needs a desk to itself. Second, it produces bad RF interference, making it impossible to listen to the radio, though it did not affect TV reception. Presumably the problem will be taken care of in the forthcoming production versions.

While the system was used with a colour monitor, a Pal TV option may be offered with production versions. The converter is currently being designed by Toshiba Europe. Thus it will be possible to market the T-200 console on its own as an entry point to the larger system.

The console is about 16.5in. by 10in. in area and slopes from 2in. to 4in deep. The keyboard has 90 typewriter-style keys divided into three main groupings. First there is the QWERTY keyboard containing 57 keys. The normal typewriter layout has been preserved and the Shift keys are exactly where you would expect to find them. The keyboard is therefore very suitable for touch-typing.

One nice point is that the alphanumeric keys are light-grey while the other keys such as Shift, Ctrl and Return are in a contrasting dark tone.

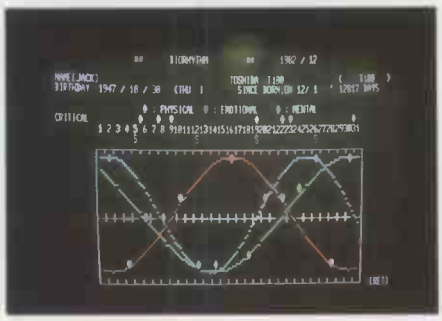
The second main group is a numeric keypad on the right of the console. It contains 19 keys in a calculator layout: a decimal point and numbers from 0 to 9 plus Cursor control, Return and other keys. Finally along the top of the keyboard are 14 extra keys, including eight assignable function keys.

One of the extra keys is labelled Label, and pressing it displays the current assignments of the eight function keys along the bottom of the monitor screen. Assignments used on test included Files, Load, Save, Time, Edit List and Run. It certainly makes life convenient to be able to load, list and run programs by pressing only three keys.

The key next to Label is labelled Kanji, for the Japanese character set, and the next one is labelled Copy. When pressed along with the Ctrl key, Copy performs the very useful function of dumping all the contents of the screen directly to the printer. The last key is red and marked Stop. Pressing it only breaks the program; to reset you have to locate a small, white button hidden from view on the back of the console.

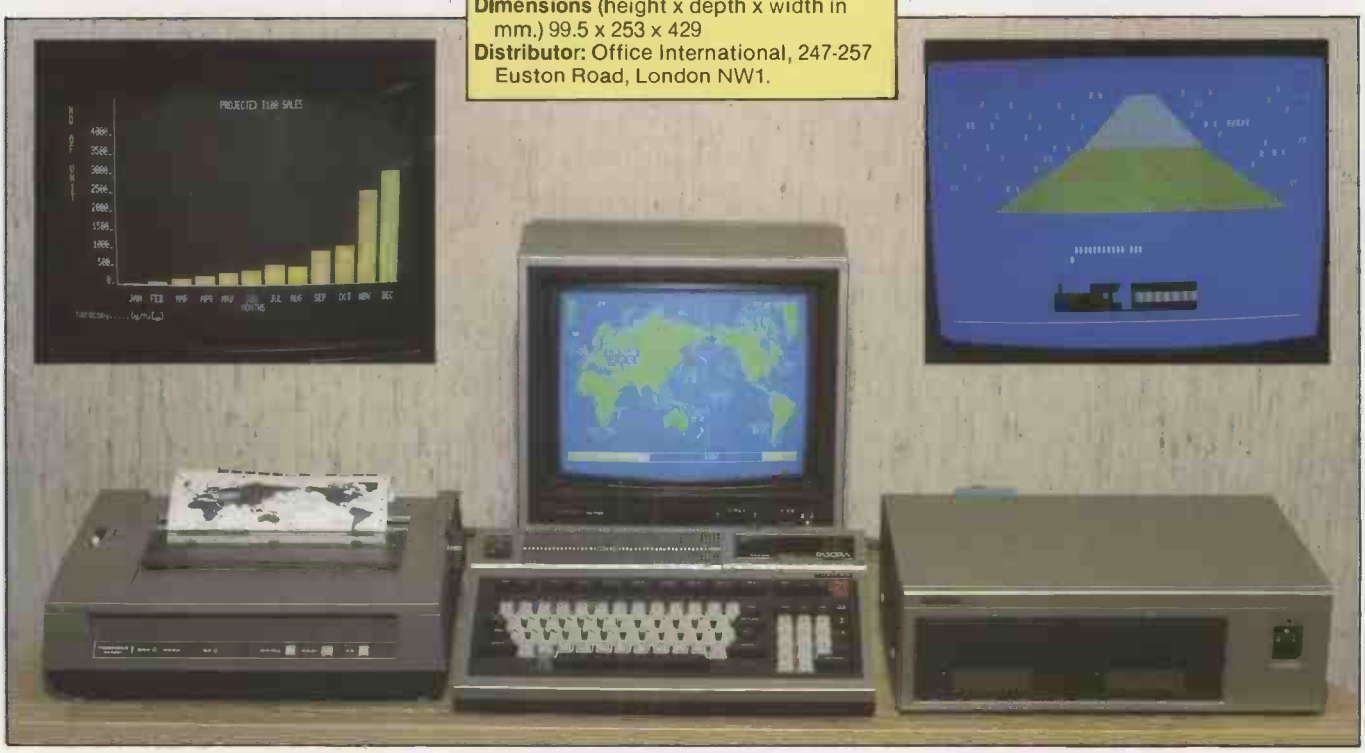
The remaining features of the console are an On/Off switch with green LED in the top-left and a hinged door in the top-right corner. Lifting the door reveals two different connections for plug-in RAM or ROM packs. There are ports on the back of the console for connections to the printer, disc drives, mains and VDU, plus three ports, for example, cassette I/O, only identified in Japanese characters.

The twin disc drive and printer are both about the same size as the console but



Specification

Microprocessor: Z-80A, 4MHz
Memory: 64K RAM, 32K Mask ROM, 16K video RAM
Disc storage: 5.25in. dual disc drive; 280K per drive, 254K formatted
Keyboard: QWERTY with 90 typewriter keys, including numeric keypad and eight function keys
Display: green screen or colour monitor; eight colours, Mode 0: 80 characters by 25 lines, or 36 characters by 24 lines
Mode 1: 160 by 100 graphics and text
Mode 2: 640 by 200 pixels
Ports: RS-232C, 600-9,600 baud plus ports for monitor, disc drives and cassette, two slots for ROM cartridges
Dimensions (height x depth x width in mm.) 99.5 x 253 x 429
Distributor: Office International, 247-257 Euston Road, London NW1.



T-100

The forthcoming offering from one of the Japanese consumer-electronics giants is inspected by Jack Schofield, who pronounces it a versatile if rather large piece of equipment.

somewhat thicker. The printer is about 4.5in. deep and the disc drives about 5in. Both have green power-on LEDs and, like the colour monitor, are finished in the same silver and deep-brown colours as the console itself. All the units are extremely solidly built and the quality of construction and finish puts some British-made microcomputers to shame.

The disc capacity is 254K of formatted storage per disc, of which the console will run up to four. The dual-disc unit includes a fan, and the noise of that is tiresome — as it is with most such fans. The drives themselves are phenomenally quiet in operation — at least for those of us used to Apple, Atari and Sirius drives. Often one is not sure that anything is actually happening, which means looking at the red Disc in Use warning light for confirmation.

The printer is an 80-column model which prints an eight by nine matrix. Type styles available include pica and elite faces, condensed characters and proportional characters, with the usual enhanced versions produced by double striking. A range of block graphics is included as part of the Toshiba Basic — including signs for playing cards — and the printer handles them quite happily. The colour monitor has only two controls, for brightness and power.

Powering-up the console produces the question "How many files (0-15)?" and then the information that you are using Toshiba T-Basic version 1.1 ©1982 by Microsoft. There are 25,595 bytes free. This version uses OK to mean ready.

The cursor is a flashing underline, but one key press changes it to a flashing block. The initial screen contains 36 characters by 24 rows. However this can be changed to an 80-character screen by typing Width 80. If you type Width 40 you do get a screen 40 characters wide, but it does not occupy the full screen width. TBasic is an enhanced version of Microsoft and includes numerous extra commands such as BSave and BLoad, Chain, Print Using, Input, On Error Goto, TRon and TRoff, If-Then-Else and While-Wend.

There is auto line numbering and the even more useful renumber function — yes, it renumbers your Gotos as well. Graphics functions include Circle, Draw, Line, Colour and Paint. The T-100 offers eight colours numbered from 0 to 7: black, blue, red, purple, lime green, pale blue, yellow and white. There is also a keyboard sounder which can be made to beep or play a note from 0 to 255. It covers a wide range, but could hardly be called musical.

TBasic is an extremely well thought-out language and anyone used to more limited versions of Microsoft will greatly enjoy using it. Its more practical advantage from the point of view of the T-100 is that it is the same language as is already used with the T-200 business micro. T-100 discs are compatible with T-200 discs so Toshiba's standard business software can be run on the new machine. As the Toshiba will also run CP/M version 2.2 the range of business software available is quite respectable.

The alternative Basic language supplied is called OA Basic, and comes in two versions — one ROM based and the other disc based. Plugging in the OA Basic ROM pack without the drives produces Toshiba's copyright logo. The number of bytes free is now 32,738. Curiously, booting up the disc version of OA Basic leaves 32,758 bytes free — 20 bytes more.

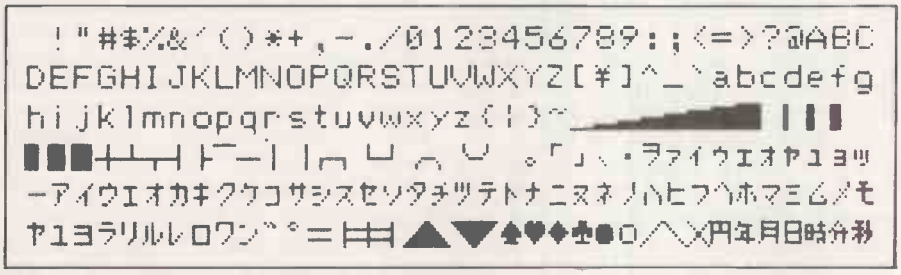
OA Basic seems to have most of the same commands as TBasic, except that it probably has easier disc operation. The file-handling commands include Build, Open, Close, Get and Put, Input, and Search. You can use the Build command to create 41 files on each mini-floppy.

Files can be password protected using the Build # statement and an automatic Load/Run utility is also included. The other disc utilities are Initialisation or Formatting, Copying, Sort, Packing of indexed sequential files to rearrange records for the effective use of disc space, and Recovery to restore partly destroyed sequential files. OA Basic also includes a machine-language monitor, and the Term command can be used to convert the T-100 to a terminal. Parity and baud rate, etc. can then be specified.

To sum up, when you power-up the T-100 it first looks to see if the disc drive is switched on and a disc is in drive A. If the disc contains CP/M, enhanced OA Basic or enhanced TBasic it boots that. If not it looks at the ROM slot to see if the OA Basic ROM — or the promised mini-Pascal — is plugged in. If so it boots that, if not it defaults to the built-in TBasic.

In many ways this is very useful but in others it is quite confusing. For example, you are using OA Basic and you type Cls, thinking this clears the screen. It does, but only in TBasic, so instead you have to type

(continued on next page)



Japanese graphics characters and card symbols are in the standard character set.

Basic is built in, but an enhanced version can be added via a plug-in ROM pack.

TOSHIBA T-100

(continued from previous page)

Screen 0. If you are using OA disc Basic you might type Dir, thinking this will give you the disc directory: it does, but only in CP/M. In OA Basic you must type Cat. Similarly in TBasic you can use the cursor-control keys to do full-screen editing of your program, but in OA Basic you can't. It is easier to type, say, Edit 10 when you want to edit line 10, whereupon this line is reprinted with the cursor on it. The story of the Tower of Babel has certainly not lost its relevance.

The internal organisation of the T-100 seems quite complex. The specification notes that 64K of RAM is fitted as standard, while a further 16K is provided as video RAM. There is also a 32K masked ROM, and RAM packs from 8K to 32K can be inserted in the slots provided.

Programs can be entered in upper or lower case, or a mixture of both. When a program is listed all the lower-case instructions except those in quotes are converted into upper case. Reserved words are stored as tokens so they do not need to be typed out in full, you just need enough of the word to make the reserved word clear. If you use additional spaces to indent statements to make your program structure clearer, your spacing is saved along with the tokenised lines.

Numbers can be integer from -9,999 to +9,999 or floating point. Numeric variables can be either integer, single-precision or double-precision. An integer variable is marked by a % sign and takes up three bytes of memory. A single-precision number up to eight digits long takes up five bytes of memory. A double-precision number, marked with a # and up to 14 digits long, takes up eight bytes of memory. A character string, marked $ is usually up to 32 characters long and takes up memory space equal to its maximum length plus one byte.

It seems that for convenience all strings are automatically dimensioned to 32 characters. Longer strings can be used by using a Dim statement, and when only short strings are being used memory can be saved by using a Dim statement that is less than 32. The maximum character-string length is 255 characters. Dim is also used for declaring a one to 15-dimensional arrays. Long variable names are allowed, but as they take up quite a lot of room in memory they probably should not be too long.

There are three distinct graphics modes for the T-100 with OA Basic. In Text mode only characters can be displayed; in graphics mode both characters and dots can be displayed; and in the fine-graphics mode pixels are addressed individually. The colour resolution of the fine-graphics mode is eight dots wide by any number of single dots deep.

If a single character has a resolution of 1 in the basic mode, then the text/graphic mode has a definition of 8 and the fine-graphics mode of 64. However, because colours are addressed in eight-bit widths the colour resolution of the fine-graphics screen is only 80 horizontal by 200 vertical, even though this number of pixels is 640 by 200.

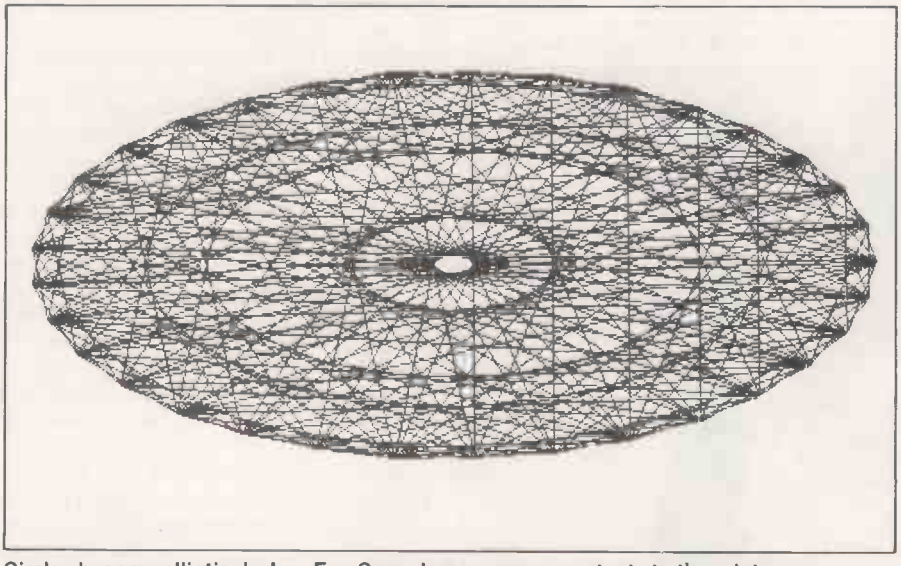
The T-100 takes quite a long time to redraw a colour screen, and it lacks any version of sprite graphics, so it is not particularly good for action drawing. However, all of the colours produced are pure and brilliant — quite unlike the sad colours of the Dragon, for example — and on the Toshiba colour monitor the visual sharpness is outstanding.

The graphics are extremely good when used for thinking games such as chess, Othello and Mastermind; it is only when a moving object has to be continually drawn and erased that the limitations of this straight bit-mapped approach really show up. However, the T-100 is really a business not a games machine. The sheer brilliance of the colours could be used to great effect in business programs. Nonetheless, most buyers will be watching their cash and will plump for the cheaper option of a green screen.

Unfortunately, all the printed documentation on the T-100 is still in Japanese. There is quite a lot of it and it looks extremely thorough. The OA Basic guide includes a separate section on each of the reserved words with worked examples. It also contains a useful guide to the couple of dozen codes for error messages. The documentation is currently being translated and corrected in England, which should compensate for Toshiba's occasional lapses when it comes to English spelling.

The T-100 is sold in the U.K. by Office International Ltd, the sole distributor. Office International is a substantial company with an annual turnover of around £40 million and some 2,000 employees including about 700 technicians, and already sells Toshiba's T-200 micro and EW-100 word-processor, and provides nationwide support.

Office International says it is not yet able to give a price on the T-100, but including the colour monitor and 80-column printer the price is expected to be under £2,750. This will put it out of range of most home users and personal computer buyers, but it is by no means expensive in comparison with less sophisticated products from other large corporations providing such a wide range of office equipment and consumer goods.



Circles become elliptical when Esc-Copy dumps screen contents to the printer.

Benchmarks

Standard benchmark tests reveal that T-Basic runs a lot faster than OA Disc Basic on the T-100. All timings are in seconds, and average three runs.

	1	2	3	4	5	6	7	8
T Basic	1.2	3.7	11.1	10.9	11.6	20.3	32.0	59.0
OA Disc	2.0	4.2	12.8	17.6	20.5	28.0	40.5	158.5

Conclusions

● The T-100 is a well-designed and well-finished microcomputer which is small enough to be transportable. However, the system as a whole has a large "footprint" and will probably require its own desk.

● It is a versatile machine already capable of running several languages, and the ROM sockets offer possible expansions including RAM "discs".

● OA Basic is large and extremely easy to use, though its execution speed is relatively slow.

● The T-100 offers an excellent display and brilliant colour though it is not particularly suitable for moving graphics.

● The price may not be low enough to tempt home buyers, but with distribution through a major office-equipment supplier it could well find buyers among the existing T-200 user base and in larger businesses.

EPSON QX-10

Ian Stobie takes a look at another eight-bit CP/M micro from Japan.

THE WORLD'S LARGEST supplier of dot-matrix printers and liquid-crystal displays is about to launch itself into the mainstream of the microcomputer market with a desk-top CP/M machine. Epson's new machine will not go on sale in the U.K. before April, but I was able to take a good look at it on a recent visit to Epson's U.K. headquarters in Wembley.

The QX-10 is a conventional CP/M machine built around the eight-bit Z-80A chip. But it has a very modern appearance and will sell at a low price — under £2,000 for a complete system, less the printer and application software. The ergonomic standard of the whole system is high, as it will clearly have to be if the QX-10 is to compete successfully in a market made more demanding by the arrival of the generally very good-looking and well-designed 16-bit machines, like the IBM, DEC and Olivetti microcomputers.

Epson's decision to go for a standard eight-bit CP/M system rather than follow the 16-bit path needs some explanation. Back home in Japan, both Epson and its parent company Seiko market a range of several different desk-top computers. But in selecting the best machine for the crucial attempt to break into the world desk-top market Epson has clearly been swayed by its perceptions of what European and American consumers actually want, and in particular by the realisation that it is dealers who sell machines.

The QX-10 is aimed at giving the dealers what they want: a modern-looking machine with good keyboard and display, running CP/M because that is what the customers are actually asking for, with a large standard memory and a low price. Epson has proved that it can innovate with the HX-20, the 4lb. portable computer; this time it is doing what it thinks another segment of the market requires by being conservative.

Epson has about 100 dealers in the U.K., and they reportedly like the new machine.

(continued on next page)

(continued from previous page)

After all, why should any dealer start asking customers to pay more for a barely understood technical mystery ingredient and an operating system the dealers themselves are unfamiliar with? An eight-bit CP/M machine gives access to the wealth of tried and tested CP/M application software packages, and requires less effort and new learning.

Externally the QX-10 follows the design approach of recent 16-bit machines like the Sirius, IBM and DEC microcomputers in being housed in three boxes. The CPU and discs go in one "system" box, while the screen and keyboard are each on the end of their own single-strand cables.

The keyboard uses the standard typewriter layout and has a nice feel to it. It has a separate numeric keypad and 18 carefully grouped function keys. The cursor-control keys are laid out logically with up above down, and left to the left of right; for some reason this natural pattern is rare even on otherwise well thought-out keyboards. The keyboard unit is light enough to be comfortable resting on your lap on the end of its coiled, telephone-style cable, but heavy enough to stay in one place on a table under heavy pounding. It represents a good attempt to put into practice the current consensus on what a good keyboard should be like.

The display is also modern in appearance; the 12in. monochrome green screen occupies a large proportion of the front surface, keeping down the space occupied by the unit on the desk. It can show 25 lines of 80 characters, 400-by-640 point high-resolution graphics, or mixed text and graphics. The standard character set makes up characters using a 14-by-18 dot matrix, giving a very readable display. The U.K. machine will probably come with an add-on multi-fount ROM board included in the price, which will allow up to 16 different type founts to be displayed.

The QX-10 uses a separate NEC 7220 processor chip to handle the display, with its own dedicated 32K memory area allowing the Z-80A to continue processing while the display is being updated. This does have some disadvantages compared to a straightforward memory-mapped approach, but the compensation comes in the high-level graphics routines built into the firmware. These provide high-speed drawing of lines and circles, together with rapid block filling, screen panning and scaling. The results displayed on the screen can be dumped directly to an Epson printer plugged into the parallel port.

The standard system comes with a light-pen socket together with supporting firmware. All that is necessary is an add-on light-pen. An optional colour board allowing eight-colour graphics will be available for use with an RGB monitor. The only disappointment is that the standard monochrome monitor supplied with the Epson QX-10 will only be available in green; given the general attention to meeting the customer's ergonomic preferences the current fashions for amber or white on black screens are overlooked.

The system box itself is fan-cooled, and will work satisfactorily either upright or mounted sideways. This means it can be moved out of the way, attached to the side of the desk or built into it, for instance, leaving only the keyboard and display unit to take up space on the desk top.

The system box is fairly compact considering it contains the main circuit board with the processor and up to 256K of RAM, five expansion slots and two floppy-disc drives. It looks rather like the system box of the multi-user Fortune system. The two slim-line 5.25in. floppy-disc drives take up little space. They are manufactured by Epson, and are to be sold on their own to other manufacturers. Each disc holds 320K when formatted, giving the user 640K of on-line disc storage as standard.

An Epson hard disc is not available, but Epson is encouraging other disc manufacturers to provide them. Epson already has a suitable high-speed interface card so only the appropriate disc controller is needed. Talks with Corvus to link the QX-10 into the hard-disc based Omninet local area network are at an advanced stage.

A panel on the left-hand side of the system box pulls off to reveal five expansion slots for all these hardware add-ons and, on the machine we saw, three unpopulated banks of RAM sockets. The U.K. machine will come with 192K as standard, so only one bank of eight sockets will be free, allowing expansion up to 256K. Epson has used 64Kbit chips, which is another reason why the system is so much more compact than older Z-80 based CP/M systems.

Software supplied with the machine is CP/M 2.2 from Digital Research, and a full version of Microsoft MBasic with machine-specific extensions added by Epson. The Basic will support up to 16 different typefaces if the character-generating ROM board is fitted, and has been dubbed Multifont Basic.

A 4MHz Z-80 based machine running MBasic will not process most Basic routines much more slowly than most of the 16-bit machines currently on the U.K. market. Machines like the ACT Sirius, Victor 9000 and IBM PC use the Intel 8088, which fetches and processes data and instructions in chunks no bigger than the Z-80 does. If the speed of language processing really matters, which is unlikely in most applications, it is only machines like the Zilog Z-8000 based Olivetti or the Motorola M68000-based Fortune which are likely to be significantly quicker.

Specification

SYSTEM BOX
Dimensions: 508 × 340 × 103mm.
CPU: Z-80A running at 4 MHz, assisted by NEC 7220 graphics controller
Memory: 192K RAM expandable to 256K
32K dedicated video RAM arranged as one-high resolution graphics page of 16K and eight text pages of 2K
2K of battery protected CMOS RAM
Clock: battery-powered day, date and time
Discs: twin slim-line Epson-manufactured 5.25in. floppies, 320K each
Bus: five free expansion slots
Standard interfaces:
light-pen connector
parallel printer interface
RS-232C communications interface

DISPLAY
Dimensions: 340 × 312 × 270mm.
Type: monochrome green on black 12in. CRT.
Displays: 25 lines by 80 characters or 640-by-400 point high-resolution graphics

KEYBOARD
Dimensions: 508 × 224 × 48mm.
Type: Detachable with standard QWERTY layout and spacing
Features: 103 keys in all, with 16-key numeric keypad, eight-key cursor control block, 14 function keys in four blocks; all keys software redefinable

Software included in price: CP/M 2.2 from Digital Research; Multi-fount Basic, version of Microsoft MBasic
Hardware options:
colour board displays eight-colour 640-by-400 dot graphics to monitor
high-speed optical-fibre interface; two channels to support two hard discs at 500Kbits per second
multi-fount character-generator ROM board
RS-232 interface board; four additional channels supporting synchronous or asynchronous communication
IEEE-488 interface;
AD/DA convertor
universal breadboard
Omninet board
direct-coupled Modem
Distributor: Epson (U.K.) Ltd, Dorland House, 388 High Road, Wembley, Middlesex HAG 6UH. Telephone: 01-900 0466. Available from April 1983.

Conclusion

● The QX-10 is a thoroughly modern machine despite the use of an eight-bit Z-80A processor and the standard CP/M operating system. In particular, the standard of the keyboard and display is similar to more expensive 16-bit machines.

● CP/M still provides the greatest choice of application software packages. For this reason many users, adopting the sensible approach of selecting their software first, will be looking around for an up-to-date machine to run it on. The QX-10 looks like being an excellent choice, and certainly cheaper than any 16-bit machine, especially since many of the leading brands require modifications to run eight-bit CP/M.

● Documentation was not available for review, but is an important part of any system.

● The price is expected to be in the £1,700 to £2,000 range, in which case the system is a clear winner. Epson is aiming to establish its machine as the standard, budget CP/M computer, in the place of the Superbrain, Televideo and similar machines.

Welcome to the ICE Age

ICE

5¼in. Winchester Sub Systems with a tape streamer back up

From 3 to 42 Megabyte configurations

Compatible with

Apple II • Apple III • Superbrain • Sirius/Victor • I.B.M.P.C. • S100 • Z80 based Systems

Tapestreamer backup now available for Profile. Apple III hard disc.

Retail from £1350

For further information or a demonstration contact:– ICE 16/18 Littleton Road, Ashford, Middlesex TW15 1UQ. Telephone Ashford (07842) 47271/47171 Telex 8952042 (DP CUST G)

● Circle No. 136

CLOSE!

NORTHSTAR	APPLE
OLYMPIA	DATA GENERAL
OSBORNE	DIGITAL
PET	HEWLETT PACKARD
PHILIPS	I.B.M.
SIRIUS	I.C.L.
WANG	. . .

You almost made it

CHECK THESE OUTSTANDING FEATURES

VERSATILE AND HIGHLY ADAPTABLE By using the S100 bus the Minstrel will keep up to date with the latest developments, with over 1,000 boards available from numerous manufacturers covering every conceivable application. So you know the Minstrel will not become obsolete and that you don't have to rely on one manufacturer to bring you the latest innovations.

RELIABILITY AND SERVICING Many years' experience has enabled the Minstrel's designers to avoid the reliability problems encountered by many earlier systems. The Minstrel is specially designed for easy servicing and is outstandingly reliable.

HORIZON COMPATIBILITY The Minstrel is compatible with the North Star Horizon, so that Horizon software will run on the Minstrel.

SUPERLATIVE SOFTWARE We have a superlative range of application and system software including CP/M,® TurboDOS® and MINOS.®

BRITISH MANUFACTURE British manufacture brings you the benefits of U.K. hardware and software support, highly competitive prices (protected from currency fluctuations) and the assurance of readily available spare parts.

® CP/M Registered trade mark of Digital Research Inc.
® TurboDOS Registered trade mark of Software 2000 Inc.
® MINOS Registered trade mark of Hotel Microsystems Ltd.

The New British Minstrel *FROM* £2,455
with Winchester Drive

Generous Dealer and
Local Authority Discounts

.but not quite!

TECHNICAL

Standard System

S100,
5-20 Mb Winchester Drive,
Z80A processor,
64K RAM
Horizon compatible,
400 Kb-1.6 Mb floppies.

Other configurations available

- Multi-user systems
- Multi-processor systems
- 16-bit processor, using powerful 68000 processor.

Invitation

For more information about the brilliant new British Minstrel computer or to find out your nearest U.K. or European Dealer, write or telephone:
Andrew Ward or Tony Harris

HOTEL MICROSYSTEMS LTD. **01-328 8737**

69 Loudoun Road, London NW8 0DQ. Telex: 266828

Minstrel

THE WORLD OF BOS

BUSINESS OPERATING SOFTWARE

Choosing the right software... is the first and most important decision you have to make when choosing a computer.

Choose BOS, and you're choosing the most advanced business software for micro and mini computers available today.

BOS Reliability... BOS software has been tried and tested for over four years with 1000's of satisfied users all over the world—small firms, big businesses, DP departments, schools, accountants, doctors, solicitors and government departments. BOS software provides that assurance of maturity and reliability which no new software can hope to match.

BOS Portability... Now, for the first time, you can change or upgrade your computer and avoid the costs of software conversion. BOS software is equally at home working in single-user, multi-user or local networking mode and the unique BOS concept allows identical software to run on over 50 different computers including Apple II, Casu, Comart Communicator, DG Enterprise, DEC PDP-11 range, DMS 3/4, Durango, Equinox, IBM Series/1, IBM Personal, ITT 3030, MicroFive, Onyx, Panasonic, Northstar, Pertec, SD, Sharp PC3201, Sirius, Sord 223, Systime 500, Tandy TRS-80, TI model 1/2/4, Transdata, Trivector Triton 4, Triumph Adler 1600 range, Victor 9000.

BOS Quality... Designed and built in Britain by top software professionals and accountants for use by British business, there is a fully integrated range of BOS software to match all your business needs.

Choose from:—

BOS Sales Ledger
BOS Invoicing
BOS Purchase Ledger
BOS Nominal Ledger
BOS Inventory Control
BOS Payroll
BOS Fixed Assets
BOS AutoWriter
BOS AutoIndex

BOS Nationwide Support... BOS software is written by MPSL, a world leader in microcomputer technology, and supplied and supported by over 50 selected independent BOS dealers throughout the country.

Remember, when you choose a computer, what you get out depends on the software you put in. So choose the best—choose BOS.

THE RIGHT SOFTWARE CHOICE

I'd like to know more about BOS software, BOS dealers and BOS compatible computers. ● Circle No. 138

Name _____ Title _____

Company _____ Address _____

_____

_____ Telephone No. _____

Please return to David Blandford, Sales Director, MPSL, 87-89 Saffron Hill, London, EC1. Tel: 01-831 8811. PC 3

LVL DUAL DISC DRIVES for the BBC Microcomputer

John Leach looks at Leasalink Viewdata's disc drives which appear to bridge the gap between Acorn's own drives.

LVL HAS DECIDED on a very sensible compromise configuration between the Acorn/BBC official versions of one-by-100K and two-by-400K drives. The single drive is fairly cheap, but a single-disc drive is really rather like a monocycle: you can get around on it, but two wheels are better than one. The double drive is doubtless excellent but costs about £900, which is something of an overkill for the domestic environment.

Do it yourself

Installation is very easy. By arrangement with Leasalink I made the necessary modification myself. All you have to do, apart from plugging in a handful of chips, is cut one clearly indicated track on the circuit board, cut one soldered-in pin on a chip and link it to the other side of the cut track.

After checking that the right chips were in the right places I plugged in the disc drive and switched on. There was a click and a whirr and the screen showed:

ACORN DFS
Language?

Despite all my checks it would display nothing else.

I had to get on the telephone and ask what was going on. "Have you plugged in the Basic chip?" Lesalink said. "No" was the shamefaced reply. While still on the phone I plugged it in, pressed Shift-Break and there was a multicoloured greeting message from the utility disc.

The instruction leaflet failed to mention that Basic had to be plugged in, and it would not have been easy to decide what to do as three empty sockets remained on the board after putting in the new operating system and the disc-controller software.

With the LVL disc-drive kit you receive the rare and famous version 1.0 operating system. It includes all the exciting *FX calls described in the handbook, and they really do work. This is an EPROM version, with two chips on a carrier board, but in due course it will be replaced with the fully debugged version 1.2.

You also receive the disc software programs, the 8271 disc-controller chip and various gates as shown on the circuit diagram in the handbook. Last but not least you get the drive unit itself, a neat buff-coloured metal box matching the BBC's case, standing on rubber feet. The drive doors are aligned vertically. It is plugged into the BBC disc interface socket via a long ribbon cable; a four-wire ribbon cable links up to the power-supply take-off at the back of the micro's case.

A utility disc is supplied, containing a disc formatting program and a short program describing the utilities, which comes up when Shift-Break is pressed. Auto-booting is achieved by the operating system looking for a file called !Boot which, if present, is immediately executed. Normally it contains the name of a program to be Chained into memory.

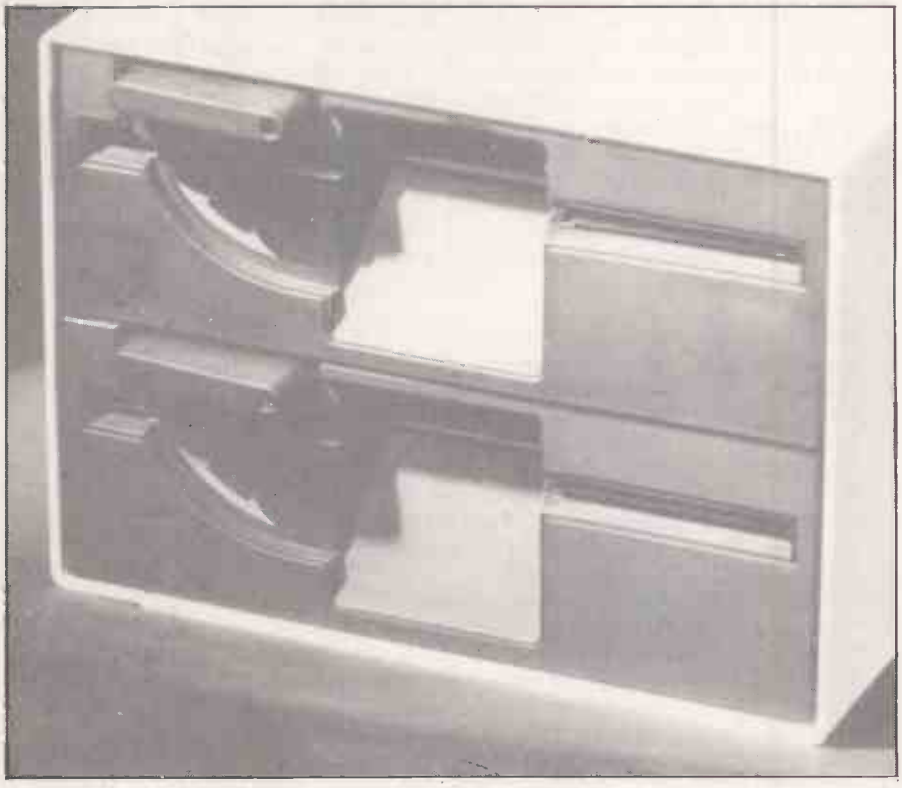
Also on the disc is an intriguing file called Contents, which when listed contains the names of all the programs on the standard Welcome tape. Alas, the programs were not actually there.

The operating instructions supplied are LVL's own version, culled from the Acorn disc handbook. The copy I received appeared to be a draft in photostat which, while providing plenty of information, had many spelling errors, suggesting that it had been sent out in a hurry. Doubtless the full guide will be issued in due course.

The next step is to format a couple of discs on the other drive. This is simply done, using the utility program, and the disc can then be Verified using another of the utility disc programs.

With the system up and working I spent an hour or so using the *Tape command to copy a collection of programs off tape. They can then be copied to disc after returning to disc mode with *Disk. This is made simpler

(continued on next page)



LVL DISCS

(continued from previous page)

by using a couple of the red function keys. At first I thought something had gone wrong, because a moment after entering

>SAVE "XYZ"

the > prompt reappeared. Yet the program had been saved properly, and showed up when *Cat was used to get a catalogue.

The catalogue is displayed in alphabetical order — a nice touch — and just shows the names of the files as well as some information about the disc. File names can be up to seven letters long.

If you want more detailed information you enter *Info followed by a file name, a * to show all the files or, for example, C* which will give all the files beginning with C. *Info gives the file size in hex, the disc sector where it starts, and the loading position if this is relevant. The wild-card facility using * can be used for all the disc file commands.

The command

>LOAD "XYZ"

is just as fast as Save, taking about two seconds for a 16K program.

Actually if you are doing all these operations manually there is a slight extra delay. The drives are normally switched off, and it takes a moment for them to get up to speed and move the heads into position with a loud click. When the job is done the drive stays on for only a few seconds before switching off again, so unless you are quite nimble-fingered with a series of operations it keeps clicking away. The delay before switching off could well be increased to 15 seconds or so.

Having loaded my tape collection on to the disc I tested them all out and wrote a hosting program, called Demo. It auto-boots by creating a !Boot file which contains Chain Demo. Demo simply consists of a series of Teletext mode menus, each menu number representing a Chain command to one of the other programs on disc. Adding the line

1 ON ERROR CHAIN "DEMO"

to each program allows you to return to the menu program simply by pressing Escape.

To one brought up on micros with tapes, the respnse time of the discs seems miraculous under this regime. There is a delay of about one second between pressing Escape and redisplaying the menu, including the time needed to start up the disc drive.

Table 1. Bench-mark timings for LVL disc system.

Write action	Data type	Time (s.)	Data/s.
PRINT#F, "HELLO"	five-byte string	167.67	60 = 315 bytes/s.
PRINT#F,A	real number	144.85	70
PRINT#F,I%	integer number	123.78	82
BPUT#F,B%	byte	31.80	333
Nothing	loop only	1.76	[5,682]

Facilities to suit

The disc operating system contains many other facilities, both necessary and nice to have. For example

*BACKUP 0 1

copies the disc on drive 0 to drive 1; *Copy allows selected files to be passed across. You cannot execute *Backup without entering *Enable first, to protect you against obliterating a valuable disc.

To access one drive or another you just enter *Drive 0 or 1. Another good command is

*ACCESS PROGS L

which will lock a file called Progs, while *Access Progs unlocks it. Here and elsewhere the wild-card facility can be used, so you could do

*ACCESS * L

to lock all the files on the disc.

The command *Save will overwrite a file of the same name unless it is locked. Some systems prompt you with a message like

File exists — continue?

if you try to do this, which would have been a good idea on the BBC. Other irreversible commands, protected by locking, are *Wipe, *Destroy and *Delete; *Rename is also prevented.

Yet both *Form40, to format a 40-track disc, and *Backup take no notice of locked files, so users beware. Another command to do with disc structure is *Compact, which removes surplus spaces between files if there are any.

Like other disc systems, two tracks are reserved for directory information, and up to 31 files can be taken into account. Trying to add one more gives a Catalogue Full message. If you overdo it you are presented with "Disk Full", which means that you have tried putting nearly 100K on the disc.

Another potentially useful command is *Dump which gives a complete hex dump of the file, showing hex and ASCII where possible. Any of these commands can be output to a printer at the same time as they are executed, which will be appreciated by anyone who has struggled with trying to list *Cat output from tape on an RS-423 output to a printer. It cannot be done directly as the cassette and serial printer output share the same buffer area.

Friendly orders

Among the "nice to have" commands is *Build Myfile which allows you to enter data on to a file directly from the keyboard. It is useful when creating command files to be run later with an *Exec command, as for tapes.

When a *Build instruction is executed, line 1 appears on the screen and you just type in your text. Press Return and a new line number is prompted. You can carry on creating text until Escape is pressed, at which time your text is copied over to the disc file. While typing in text the disc activates from time to time as the memory buffer fills up. You can use the cursor keys to copy parts of one line to another, but unlike a Basic program, you cannot insert or delete lines. This facility provides a very crude word-processing capability, provided you do not need to amend any line after Return has been pressed.

After a file has been created with *Build it can be displayed later either with the *List command to print the line numbers, or

Table 2.
Summary of Commands

*Access	Locks/unlocks files
*Backup	Copies complete disc
*Build	Creates line-numbered text file
*Cat	File names in alphabetical order
*Compact	Squeezes disc files if possible
*Delete	Deletes file, or files with * wild card
*Destroy	Deletes after list and (Y/N ?) prompt
*Dir	Sets directory for subsequent actions
*Drive n	Assigns drive 0 or 1
*Dump	Hex/ASCII dump of a file
*Enable	Allows *Backup, user protection
*Exec	Reads a file as if from keyboard
*Help	Displays information about the system
*Info	Lists file attributes and size
*Lib	Accesses a library, previously set by *Dir
*List	Displays an ASCII file with line numbers
*Load	Loads a file at a specific memory location
*Opt 1	Sets file message display category
*Opt 4	Determines what happens on auto-start
*Rename	Allows name change, on same drive
*Run	Runs a machine-code program
*Save	Copies a chunk of memory; not Basic Save
*Spool	Copies displayed screen contents to a file in ASCII
*Title	Allows naming of a disc
*Type	Displays a text file without line numbers
*Wipe	Removes a file from the catalogue

Utility programs on disc

*Form 40	Formats a 40-track disc
*Verify	Verifies a disc for track integrity
*DConv	Converts Acorn Atom disc files

*Type which leaves them out. The disc handbook warns against using *List for displaying Basic programs on the disc, as all the keywords are tokenised and will cause havoc from time to time as obscure commands to the VDU driver are obeyed. Naturally this is one of the things one tries out, and a Break is usually required to get things going again.

Just as on the tape filing system, you can use the *Spool command which copies over a Basic program as a text file, and then use *Exec to put it back into memory. This is the best way of merging two or more Basic programs — a Procedure library, for instance — with a new program. Ignore anything you may have read about resetting Page, etc; what you do is:

```
>*SPOOL "PROG1"
>LIST
>*SPOOL [this closes the file]
>*SPOOL "PROG2" etc.
```

Everything Listed goes on to the output file in ASCII format, so to get the files back into memory:

```
>*EXEC "PROG1"
>*EXEC "PROG2"
```

This will read the files — either tape or disc — as though they had been entered from the keyboard. Provided there is no line-number conflict in the two programs they will be effectively merged.

The disc system supports *Run for loading machine-code programs; this command can be abbreviated to *Prog, making the syntax consistent with the operating system * commands.

What happens if your program has the same name as one of the system commands? It would probably be lost forever until *Renamed, as the operating system programs would have priority. The *Save command is the same as for tape, allowing machine-code programs to be located at a specific area of memory when loaded back.

The operating system also allows *Dir followed by a single letter, which sets the directory. Any files subsequently saved will be labelled as belonging to that directory. Conversely

*Lib *<drive>.<directory>

sets up the system to look for a file in the specified directory. In this way it is possible to have files of the same name on the disc in different directories, such as directory B for backup versions and W for work in progress.

The disc can be given a name with the

*TITLE "A NAME"

command, and finally there is another *Opt command, not to be confused with the Basic Opt keyword, used in assembler programs. The command *Opt 1 n controls the type of message sent out on disc error conditions, as for a tape system. The handbook states that n can have any value between 1 and 99 — though one wonders what for.

The *Opt 4 command, on the other hand, is clearly useful. It sets up the disc to respond differently to the auto-start routine when a !Boot file is present on the disc: *Opt 4 0 does nothing, *Opt 4 1 Loads it, *Opt 4 2 Runs it and *Opt 4 3 Execs it — so you have a wide choice.

With this selection of commands at your disposal you can venture forth and build up a database, subroutine libraries or collections of data, save pictures and diagrams, and store Beethoven's Fifth symphony played as three-note chords.

The system's most serious deficiency is an Append facility, which would allow sequential files to be updated with extra information. There is no direct means of merging files and, unlike large computer systems, it is not possible to have files of the same name but in different version numbers.

I am also unhappy about how easy it is to overwrite a file if data is Saved to a file of the same name, without any warning being issued. Doubtless utility programs can be written to undertake some extra functions, and perhaps it is not really reasonable to expect a mainframe operating system on a single chip.

If you want to write records sequentially to a file you do it exactly as you would on a tape, using Print # N, A% B, C$, etc. The well-known bug that prevents writing of strings across file blocks has been disposed of.

A simple benchmark test was carried out to see how fast data could be written to a disc drive from Basic, using the program in listing 1. Obviously the data-transfer rate, shown in table 1, is much slower than the very fast operating system Save of programs. If you wish to work at this speed the method is described in the handbook, using Osfile to transfer a complete block of memory. The practical implication for the Basic programmer is that files can be written sequentially at about 330 bytes per second, but this is not the best way to use disc files.

One of the main advantages of a disc system over tapes is the opportunity of using random-access files. When a program comes to a statement such as

100 F = OPENOUT("A__FILE")

64 disc sectors out of a total of 400 are allocated automatically. It is possible, using a special technique, to extend this area on a newly formatted disc, by saving blocks of garbage, to be overwritten later. Using

*SAVE A__FILE 0000 8000

will allocate 128 sectors, for example.

Having opened a file you can write fixed-length records to it using the Basic PTR # instruction, which tells the disc system where to write the next record. So in order to write a series of 20-byte records you simply increment PTR # F by 20 and write the next record.

Carry on until you have written all the data, and then close the file. Note that OpenOut diabolically deletes without warning any previously written file of the same name, so some care must be taken if you have valuable information stored away. To read a file you use

F = OPENIN("A__FILE")

and by setting PRT # F you can read any record. Bytes can be written with Bput # and read with BGet # , otherwise use Print # and Input # .

The Openin command also makes a file updatable, so that you can both read and write records within the previously allocated file space, as once a file is Opened, written to and Closed it will thereafter remain of fixed size. You should always close a file in your program when you have finished with it, but if a program bombs out for some reason you will end up with an improperly closed file on disc, which cannot be opened again with your program. Conveniently the Close # 0 instruction closes all files on the disc, so this should be one of the first statements in a file-handling program.

(continued on next page)

Listing 1.

```
10 A= 123.4: B%=123

20 F=OPENOUT("TEST")

30 TIME=0

40 FOR I% = 1 TO 10000: 'write to file':

NEXT

50 PRINT TIME/100 : REM time in seconds

60 CLOSE #F
```

Listing 2.

```
10   REM       Assembler variables
20   REM
30   top       = &12      :REM  2 bytes
40   pageset   = &18      :REM  1 byte
50   pageptr   = &1C      :REM  2 bytes
60   progto    = &70      :REM  2 bytes
70   progfrom  = &72      :REM  2 bytes
80   cli       = &FFF7    :REM Command line
90   REM                       interpreter
100  REM
110  FOR I%= 0 TO 3 STEP 3 :REM 2 passes
120  P%=&0900 :REM RS423 transmit buffer
130  [
140  OPT I%
150            JMP BEGIN \ Bypass CLine
160  .CMD                \ Start of CLine
170  ]
180  $P%="TAPE" :REM The Command
190  P%=P%+6    :REM Reset counter
200  [
210  OPT I%
220  .BEGIN
230            LDX #CMD MOD 256 \LO
240            LDY #CMD DIV 256 \HI
250            JSR cli   \ Set *TAPE
260            LDA #&00  \ Reset PAGE
270            STA pageptr \LO
280            LDA #&0E
290            STA pageptr+1 \HI
300            STA pageset \HI
310            STA progto+1 \ Destination HI
320            LDA #&19
330            STA progfrom+1 \Source HI
340            LDA #&00
350            STA progto \LO
360            STA progfrom \LO
370            LDY #&00 \ Indirect index
380  .LOOP     \ Shift a byte
390            LDA (progfrom),Y
400            STA (progto),Y
410            INC progto \ Adr. LO
420            INC progfrom \ Same as progto
430            BNE CHECK \ Test for end
440            INC progto+1 \ Adr. HI
450            INC progfrom+1 \ ditto
460  .CHECK    \ Is progfrom = TOP ?
470            LDA progfrom+1
480            CMP top+1
490            BNE LOOP \ Not HI Adr.
500            LDA progfrom
510            CMP top
520            BNE LOOP \ nor LO Adr.
530            LDA progto \ Reset TOP
540            STA top
550            LDA progto+1
560            STA top+1
570            BRK \ Exit to BASIC
580  ]
590  NEXT I%
600  END
```

LVL DISCS

(continued from previous page)

The filing system can be changed with a * command, like *Tape to load and save to a cassette. At some time in the future it will be possible to use *Net for Econet, *Rom to get at the empty rectangular hole on the left of the keyboard and even *Teletext to add Prestel costs to your computer budget.

Under the BBC Micro Disc operating system, Basic programs start at memory location 1900 hex. The tape operating system starts Basic at &0E00, so with discs nearly 3K of memory is lost to the user. Many large programs written for tapes and using graphics modes will not run when loaded from discs because of this reduction in memory.

However the short machine-code program in listing 2 will allow you to Save programs on disc and Load them into memory under Dos, and then move the Basic to 0E00, at the same time resetting the necessary zero-page locations to change Page and Top. This allows programs to be run from the new position. As a protection for the user, Tape mode is also invoked, so subsequent requests for Save and Load will assume the use of tapes.

Specification

Number of tracks:40
Sectors per track:10
Bytes per sector:256
Bytes per disc:102,400
Maximum files per disc:31
Data transfer rate from Basic:330bytes/s
Assignment on OpenOut:64 sectors
Concurrent open files:5
Memory available:

Modes 0, 1, 2	5,888bytes
Mode 3	9,984bytes
Mode 4,5	16,128bytes
Mode 6	18,176bytes
Mode 7	25,344bytes

Tape programs

This situation will continue until Break is pressed, which will return the system to disc operation. It is assumed that mode 7 is used during the Loading, and that the program will in fact fit into memory using this mode under the disc system. If it will not there is little that can be done.

To install the program, enter it under Dos and Save the source file with a suitable name, for example:

```
>SAVE "MOVE.PR"
```

Now Run the program, which will locate the machine code starting at 0900 hex, the RS-423 transmit buffer. It is now necessary to save the program in executable form on the disc, so

```
> *SAVE "MOVE" 0900 094A
```

User programs can then be Loaded from a disc and shifted with the command:

```
> *Move
```

which will instantly shift the program and set the system to tape mode.

With very fast Chaining of programs and rapid reading and writing of chunks of data to temporary disc files, a completely different philosophy of program writing can be used. Menu options can be used to execute various sub-programs on disc. Long series of Data statements become redundant, as all the information can be held on a file and either read from disc when needed, or copied into an array for fast access.

To some extent this represents a parting of the ways between tape and disc users. Disc owners will want to exploit their new-found freedom, at the expense of making their programs unavailable to users of the snail-paced tapes.

Conclusions

- **Acorn has come up with an excellent operating system which operates more quickly than most micro disc systems.**
- **Far more operating-system commands are built in than in CP/M, where numerous commands exist as separate disc programs.**
- **It does not have all the facilities standard on mainframes, but busy programmers will soon find ways to enhance the operating system as supplied.**
- **Leasalink Viewdata has cleverly filled in a gap between the two Acorn/BBC products, providing and ideal system for home micro users.**
- **The disc drive costs £338.26 and the operating system an additional £82.61. It is supplied by Leasalink Viewdata Ltd, 230-6 Derby Road, Stapleford, Nottingham NG9 7BL.**

'Now the world's most ingenious database program writes letters, you've found the ultimate business solution. And the Delta is a true transactional database – this is the biggest breakthrough for microcomputer users to date'

Nick Horgan, Managing Director, Compsoft Ltd.

If part of your microcomputer's job is to store information, you need Compsoft's Delta.

Compsoft DMS is already Britains No. 1 record keeping program. And with 4000 users to our credit, we can honestly say we know more about information storage & retrieval than anyone else. We listen to your comments & requests and now we've produced a world first – the Delta – a true transactional database.

If you'd like to know more, we have general brochures, full technical specifications & free guides to DMS handling a multitude of business situations from order processing, invoicing & stock recording, through to library, personnel & hospital record management.

Find out more about the database revolution. Either telephone the office or clip the coupon now.

Compsofts Delta – taking microcomputers into the third dimension.

Compsoft Limited
Hallams Court
Shamley Green
Nr Guildford, Surrey
England GU4 8QZ
Telephone: Guildford (0483) 898545
Telex: 859210 CMPSFT
● Circle No. 140

COMPSOFT

Please send me further details
Company
Contact
Address

Tel No.

NEC turns 28 years of computer experience to your personal advantage.

It takes a great computer company to make a great personal computer. And from the start, NEC has been a pioneer in computer technology. In fact, we invented the all-semiconductor computer in 1959. Now, hundreds of innovations later, we've made it personal.

We present the PC-8000, a powerful and friendly business tool that can help you get more done in a day than you ever could before. It combines some of the most reliable hardware on the market with application packages designed to make the most of its unique features. In addition, the PC-8000 accepts popular CP/M® business software, making its possibilities virtually limitless.

The entire PC-8000 system is now available through better computer dealers across the country. And that means more than hardware. It means effective software, the finest documentation and extensive training to help you get the most from your personal computer. So why not turn our system to your personal advantage now.

(CP/M is a registered trademark of Digital Research Inc.)

NEC
Nippon Electric Co., Ltd.
Tokyo, Japan

NEC BUSINESS SYSTEMS (EUROPE) LTD.
NEC House, 164/166 Drummond Street,
London N.W.1 3HP UK
Telephone: 01-388-6100 Telex: 261914.

Write for more information about the NEC PC-8000.

NAME _____

COMPANY _____

ADDRESS _____

Attach this coupon to your letterhead and mail it to NEC BUSINESS SYSTEMS (EUROPE) LTD., NEC House, 164/166 Drummond Street, London N.W.1 3HP, U.K.

● Circle No. 142

ADCOMP X-80SP

Chris Bidmead tries out a dot-matrix printer which doubles as a graphics plotter.

DOT-MATRIX PRINTERS have a twofold advantage over daisywheel devices: they can be driven considerably faster, and are capable of producing almost infinitely variable character sets at the whim of internal or external software. As a logical development from this they ought to be able to plot graphs. The Adcomp X-80SP is the first low-cost dot-matrix printer we have seen designed to do this.

On the one hand the Adcomp is a fairly ordinary low-speed printer with one or two nice features; on the other it is a pretty sophisticated draftsman with the ability to construct graphs, circles, rectangles and so forth out of a few simple, high-level commands. The two personalities can be overlayed, producing graphs with explanatory text.

Rather remarkably, the text can climb axes vertically as well as horizontally, or run off at 45 degrees to the normal print direction. The very comprehensive software to support all this has obviously been put together by someone keen to emulate the traditional pen plotter, and a pretty good job they have made of it too.

Some good industrial design has gone into the rounded contours of the black case. From the look of it the Adcomp's origins could be Italian — not British, and certainly not American. In fact the Adcomp's home base is Munich, West Germany, and the review machine arrived directly from there because the manufacturer is still in the process of looking for a distributor in this country.

As a printer the Adcomp is well-behaved, with some clever software features like bidirectional printing and character-set swapping. Unfortunately PROM space, crowded no doubt with crafty software to support the plotting functions, seems to have left limited room for motion minimalisation. Working across the line the print head does the intelligent thing and avoids full carriage-returns if there is nothing at the beginning of the line to print. But it moves sluggishly into position, with no way of skipping quickly over spaces.

In the vertical direction it has a similar problem, being unable to wind rapidly past blank lines to get to the next piece of text. As a result the Adcomp goes about its business in rather a leisurely way, accompanied by some untuneful juddering as it cranks itself over blank lines. Our speed trials gave it a rating of 48 characters per second printing a page of solid text, a modest speed for a printer of this kind. Data exchange from the computer is smoothed by a 2K buffer, large enough to hold something like an ordinary A4 sheet of typed text.

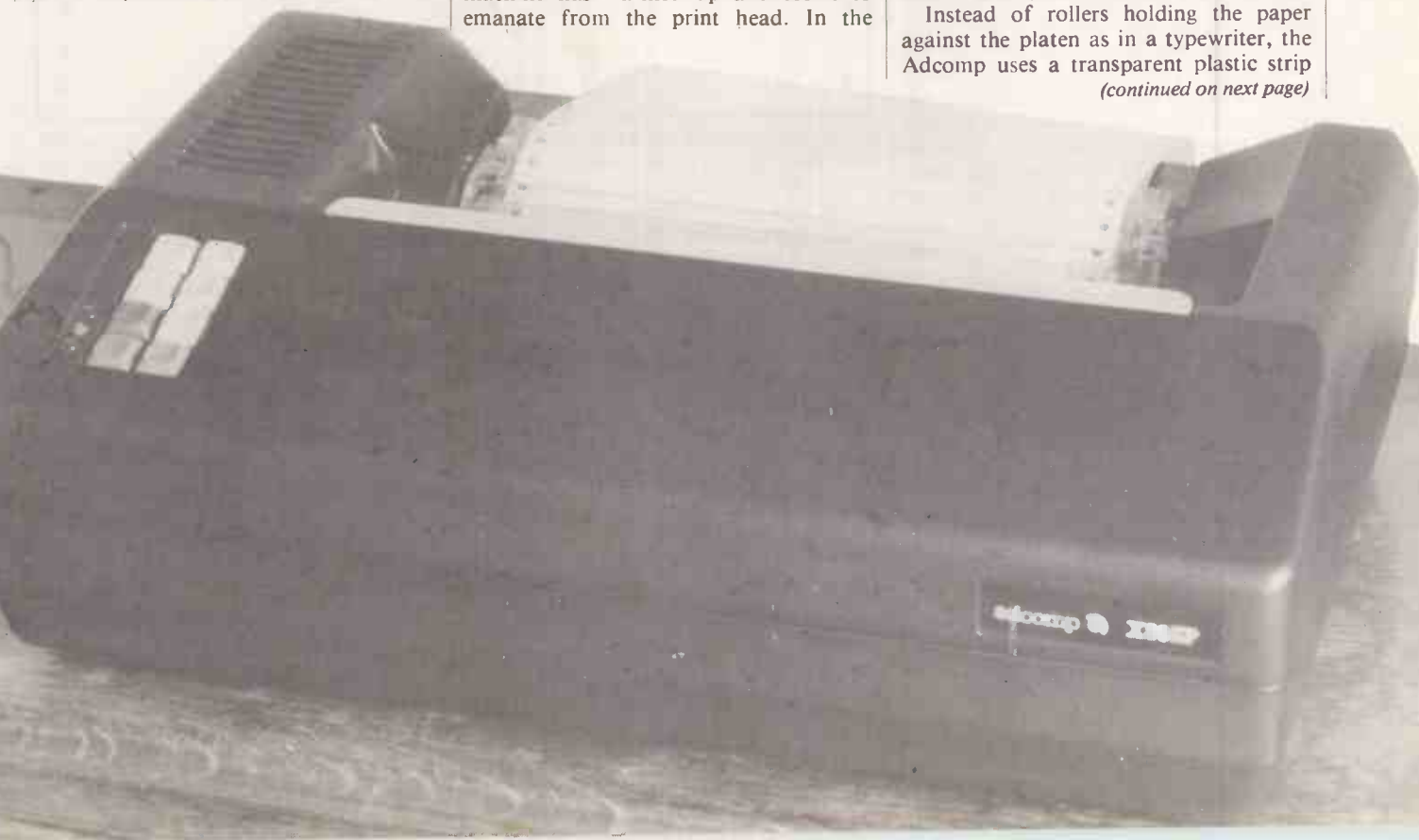
The printing action is quiet for a dot-matrix machine, but this advantage is rather spoiled by a persistent gnat-like whine that goes on the whole time once the machine has warmed up and seems to emanate from the print head. In the normal, noisy office environment this will not be noticed consciously, but it could still be deleterious as it seems to be tuned to headache-frequency.

The paper-transport system uses a pin-wheel platen rather than the more familiar tractor drive. The difference is that the tractor, at its name implies, pulls the paper from a position somewhere above the platen. The pin-wheel system consists of two circles of stubby spokes actually mounted on the platen, one on each edge of the paper. This approach has the advantage of being able to wind the paper backwards as well as forwards which, of course, is essential for plotting.

It will also save you paper. An ordinary tractor feed will require you to form feed an additional blank sheet before you can tear off the last sheet you printed, and needs to be left with a stretch of paper ahead of the print head in order to have something to pull on when it prints the next item. The pin-wheel system works much more like the simple friction feed of a typewriter, and is almost as easy to thread the paper on to.

Instead of rollers holding the paper against the platen as in a typewriter, the Adcomp uses a transparent plastic strip

(continued on next page)



(continued from previous page)

equipped with a serrated edge for tearing off sheets. A limitation is that the pin wheels cannot be brought close together to handle narrow paper, although a thumb-wheel adjustment is provided for fine tuning the width between the European and U.S. standards which are — wouldn't you know it — a couple of millimetres apart.

The paper-handling hardware is complemented by buttons on the top panel that enable you to move the paper up and down a line at a time or, by touching the same buttons lightly, to adjust the paper by fractions of a line. This is very useful for setting up top of form. Oddly, there is no front-panel button for sending a form feed.

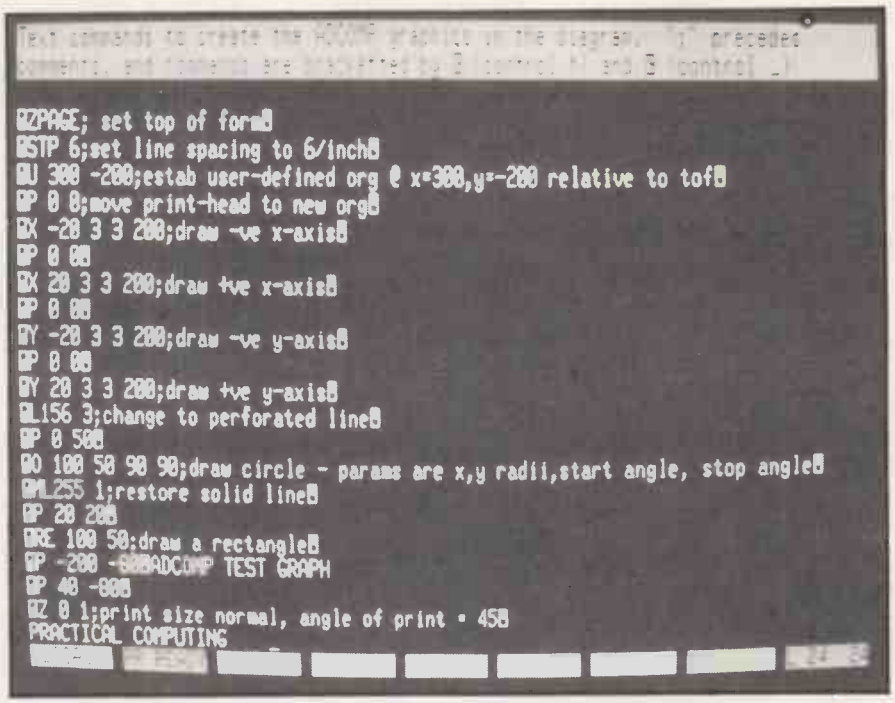
The basic Adcomp character set is clear, with true descenders; the print head is actually only eight needles deep, though nine seems to be becoming the standard. Characters can be expanded to double width with the command Escape-A. Instead of the more usual contraction to half width, allowing 130 characters to a line, the Adcomp only gives a choice of 80 or 96 characters per line.

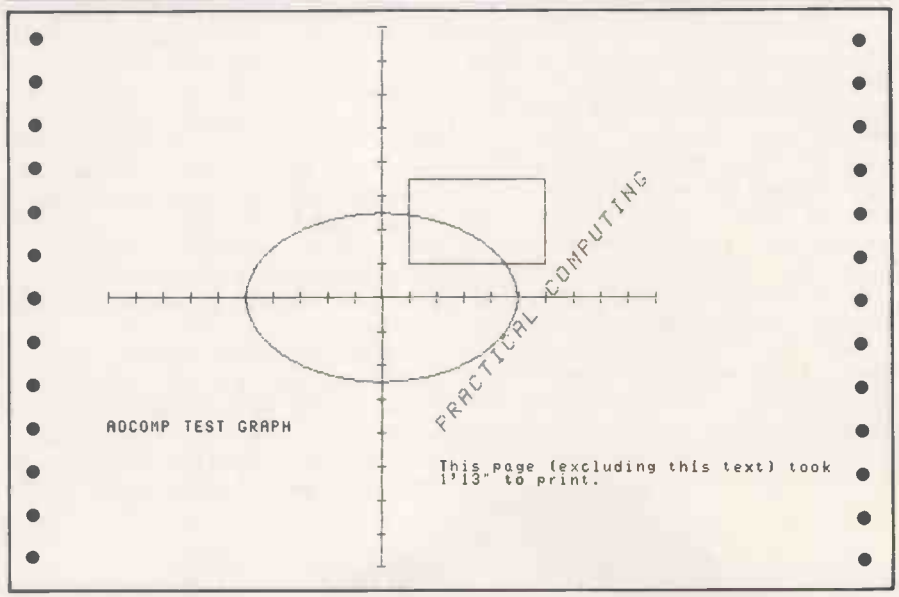
Auto-bidirectional printing is built in, and there is a hard switchable option to skip the paper over perforations, with a choice of paper lengths and bottom margins. One particularly interesting firmware dodge is a print formatter that works rather like Basic's Print Using statement. Figures or text can be right or left justified within defined fields; decimals can be aligned and padded with leading or trailing asterisks or zeros, and standard text can be incorporated as part of the format. Oh yes, and you can set up horizontal and vertical tabs by sending a string of values.

The graphics side of the machine's capabilities is illustrated in the diagram and accompanying screen display. Simple text-and-parameter instructions create each of the arms of the axes and the ellipse itself. A similar system can be used to draw rectangles. Other plot instructions include Draw, Move without Drawing, Store or Recall current plot position, and Send current co-ordinates back to the host computer. A selection of nine pre-programmed symbols can be called on as position markers.

There is a little-known clause in the law of diminishing returns that states that as features of a product increase in arithmetic progression, the quality of the documentation must increase in geometric progression otherwise user confusion increases exponentially. As these things go, the Adcomp documentation is average to good — apart from some crucial garbling of the baud-rate setting table that involved us in a long afternoon of head-scratching, followed by some desperate trans-continental telexing.

Apart from that there was the usual crop of minor inaccuracies, crucial facts buried like hidden clues in strange places. For example, the manual described an alternative character set which seemed not to be fitted in the review machine.





The firmware will set left-hand margins, which is a great blessing when printing direct from CP/M utilities like Pip or Type, but the two crucial sentences that tell you how to do this are buried in a paragraph headed "Co-ordinates and Internal Registers".

All this means that the user will probably spend a lot of time on trial-and-error testing before taming the more sophisticated features of the machine. Of course, dealers should bear this burden but in our experience this often doesn't happen even where a proper distribution network has been established.

Conclusions

● The Adcomp's paper handling is the friendliest we have experienced on a dot-matrix printer.

● Mechanical and firmware provision has been made to accommodate either A4 or U.S. Legal standard paper sizes.

● It is a pity that compression to 130 character lines, an option on many other 80 character per line printers, is not available on the Adcomp.

● The ribbon is a standard Burroughs cassette so there should be no difficulty in finding replacements.

● As an ordinary dot-matrix printer the Adcomp is not particularly nimble: our speed trials showed its print speed as being only 12 percent better than the fastest of our daisywheels.

● The documentation is accurate, but does not communicate as clearly as it might.

● Care has been taken over the outward design. The machine looks good and is easy to use.

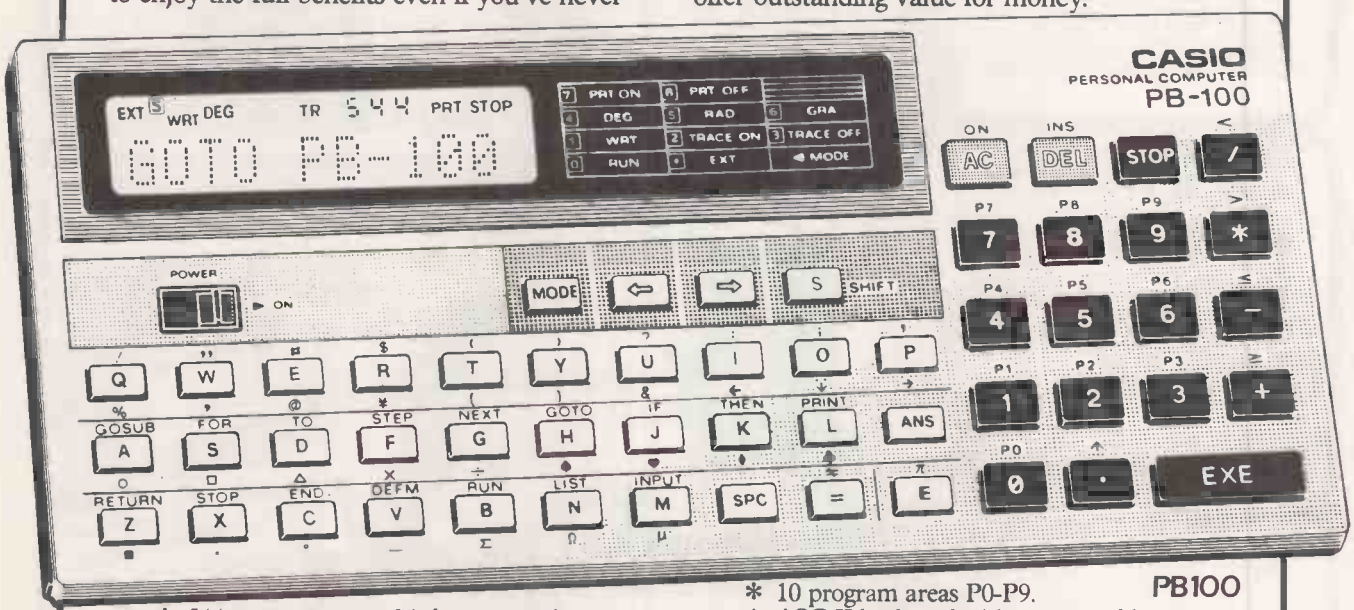
● The Adcomp is not yet available in the U.K. In West Germany the 80-column version costs about £1,100; the 132-column version is about £1,400.

The best way to put 1,568 steps in your pocket.

Once again Casio takes the giant step forward – with a pocket computer package able to fulfil a wide range of business and personal demands yet doesn't demand an expert to operate.

The Casio PB100 comes complete with our 'Learn as you go' system manual that enables you to enjoy the full benefits even if you've never operated a computer before. Making easy sense of the BASIC computer language, the PB100 is capable of an amazing variety of functions – plus a variety of computer games to extend your versatility.

The PB100 is just one of Casio's amazing range of high technology products all of which offer outstanding value for money.



PB100

* 544 program steps, 94 data memories (expandable to 1568 steps or 222 data memories with optional RAM pack).
* Auto power-off function with programs/data preserved with power off.
* Many convenient user functions built in, inc: trigonometrics/inverse trigonometrics, logarithms/exponentials, powers, symbolization, random numbers.
* 10 program areas P0-P9.
* ASC II keyboard with upper and lower case characters display.
* 8 levels of sub routines and 4 levels of "FOR-NEXT" looping.
* Compact, lightweight.
* System can be upgraded with cassette tape recorder interface (FA3) and memory expansion RAM pack (OR1).

CasioMagic!

CALCULATORS
WATCHES
KEYBOARDS
CASH REGISTERS

CASIO

Casio Electronics Co. Ltd., Unit 6, 1000 North Circular Road, London NW2 7JD.

To: Casio Electronics Company Limited, 2/PC 83
Unit 6, 1000 North Circular Road, NW2 7JD.
Please send me full details of the Casio PB100.

Name_____

Address_____

● Circle No. 144

YOU'VE SEEN THE PICTURES, NOW SEND FOR THE WORDS

BBC Microcomputer or Acorn Atom

Acornsoft is the software division of Acorn Computers, designers and manufacturers, of the BBC Micro and Atom. We know better than anyone the capability of the machines, we know how to get the very best from the hardware. And we have produced a range of exciting games, exacting business and useful household software.

The Biggest Range Available

Acornsoft software ranges from authentic arcade games like Snapper to Algebraic Manipulation to Desk Diary to other languages like FORTH and LISP. Striking colour, amazing sound effects and powerful graphics are all used to the full. And it does not stop there. There is a complete range of manuals, accessories and plug-in ROMs.

Free Brochures

Just clip the coupon or write to us and we will rush our catalogue absolutely free. Can't wait for the post ring 01-930 1614 now! Don't delay – do it today. Let Acornsoft help you get the best from our machine and open the doors to your imagination.

Acornsoft and Atom are registered trade marks of Acorn Computers Ltd.

ACORNSOFT

4A Market Hill,
CAMBRIDGE CB2 3NJ.

Please rush me my free literature from Acornsoft.
☐ Atom
☐ BBC Please tick

Name

Address

Postcode

● Circle No. 146

SOLIDUS SYSTEMS

THE MODERN WAY TO CONDUCT YOUR BUSINESS

STOCK CONTROL WITH STOCKFILE

* 9486 on-line items, TWO SECOND access.
* Part numbers up to 20 characters long, alpha or numeric.
* Complete report generation facility plus 5 pre-defined master reports.
* Any report can be printed in any sequence.
* Provides the data-base for STOCKSELLER and STOCKMAKER.

TOTAL SALES CONTROL WITH STOCKSELLER

* Up to 1750 customers, unlimited number of invoices.
* Produces customised invoices, quotes, packing slips, credit notes, statements and backorders.
* Complete sales and profit analyses, summaries, month & year-to-date statistics, customer aged trial balance.
* Individual discounts for each line item on an invoice.
* Up to 9 V.A.T. rates and full V.A.T. reporting.

MANUFACTURING CONTROL WITH STOCKMAKER

* Processes 980 assemblies with up to 90 components per assembly and six levels of sub-assembly.
* Determines availability of stock for production.
* Calculates cost prices of finished goods.
* Updates stock levels of raw materials & finished goods.
* Reserves stock for future production.

designed for the Apple II Plus* microcomputer

SOLIDUS INTERNATIONAL CORPORATION (UK) LTD **Tel: (01) 688 5164**
Mill House, Wandle Road, Beddington, Croydon, CR0 4SD.

● Circle No. 147

Mode 7 colour on BBC Micro

Philip O'Shea explains how control codes can be used to manipulate eight-colour text and graphics in the BBC Micro's Teletext mode.

EVEN IF YOU DO NOT have a special teletext/viewdata receiver you will probably have seen the type of displays possible. It can quite easily be produced by the BBC Microcomputer, models A or B, in the Teletext mode, mode 7. Seven different colours can be mixed on the screen for text or graphics, double-height characters, coloured backgrounds, automatic symbol flashing, 80-by-75 low-resolution graphics and concealed symbols which can be revealed easily and quickly. Mode 7 is ideal for very long programs as it only uses 1K of screen memory.

The key to the working of this mode is control characters. Each of the 1,000 screen locations has one byte relating to it in the screen memory. A flashing, green letter. A, for example, is stored in its particular screen memory location in the same way as a steady, blue letter A on a yellow background. The difference is whether the computer has discovered previously, along the line the A is on, the control characters for the colours green or blue, to make characters flash or to produce a coloured background. When it does find these control characters a space on the screen at the place corresponding to where it found them in screen memory will appear, but if this space gets in the way it can be overwritten in a special manner.

The code numbers that can be placed in screen memory locations are shown in figure 1, along with their meanings. The characters corresponding to symbols are mainly normal ASCII codes, but the control codes from 128 to 159 are quite unique.

The modes referred to here have nothing to do with the screen modes of the BBC computer; everything goes on within screen mode 7. Neither do they apply to the whole screen, but only to the characters following them in screen memory up to another control character signalling the computer to change, or the end of the line they are on.

There are several complementary modes, alphanumeric or graphic, flashing or steady, for example. Different pairs may be intermixed — perhaps flashing graphic or alphanumeric — but the computer is always in just one mode of each pair.

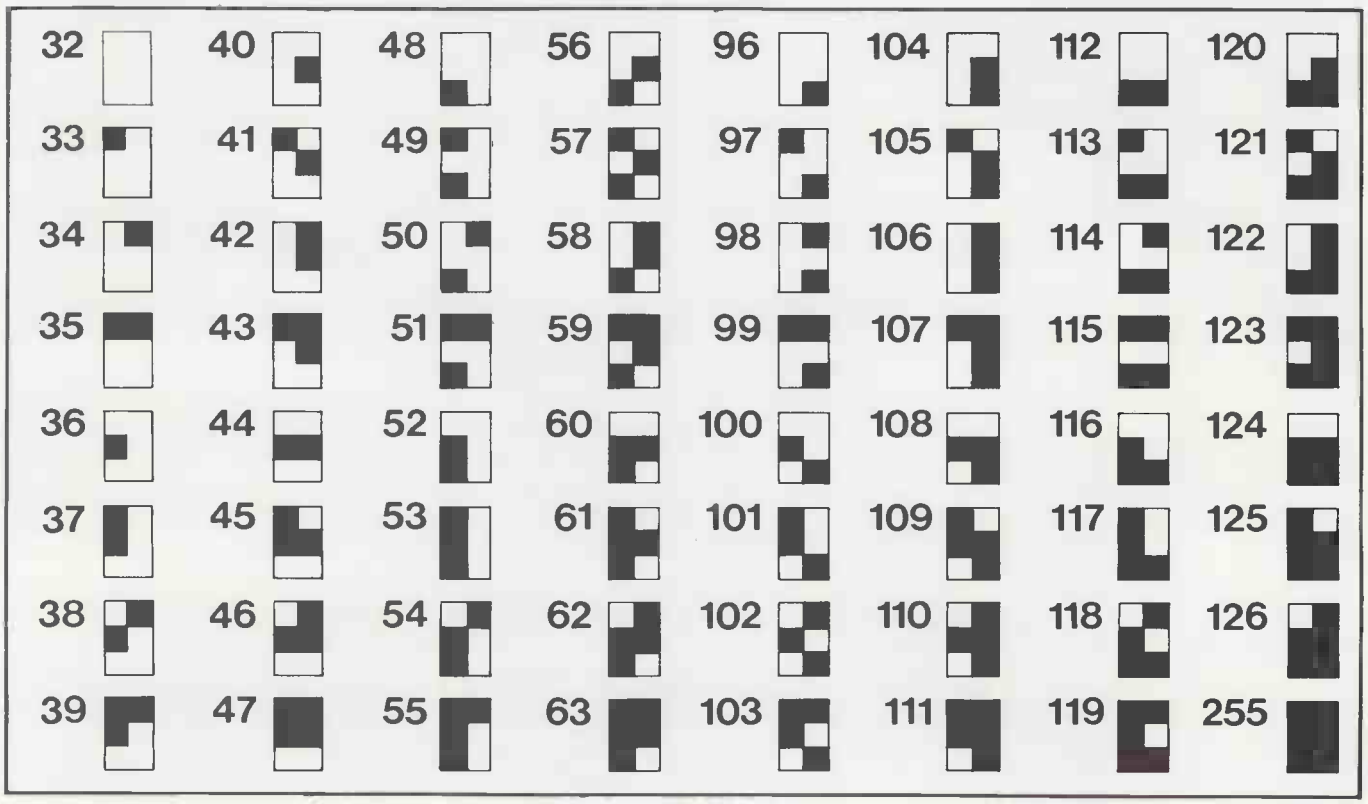
Alphanumeric mode is the default mode of the graphic/alphanumeric pair. Every new line starts in this mode, allowing all the symbols on the character chart in figure 1 to be used, including upper- and lower-case letters, numbers and punctuation signs. One control character does the job of entering alphanumeric mode and selecting a colour. Characters 129 to 135, labelled Alpha Red to Alpha White, are used to select this mode and the appropriate colour.

To print a red word on the screen, character 129 will have to be printed before the word. The command

```
PRINT CHR$ (129);
```

will do this, but VDU 129 means exactly the same thing.

(continued on page 85)



0	Nul	80	P
1		81	Q
2		82	R
3		83	S
4		84	T
5	ENQ	85	U
6		86	V
7		87	W
8	BS	88	X
9	HT	89	Y
10	LF	90	Z
11	VT	91	←
12	FF	92	½
13	CR	93	→
14		94	↑
15		95	#
16		96	-
17	DC1	97	a
18	DC2	98	b
19	DC3	99	c
20	DC4	100	d
21		101	e
22		102	f
23		103	g
24	Cancel	104	h
25		105	i
26		106	J
27	ESC	107	k
28		108	l
29		109	m
30	C Home	110	n
31		111	o
32	Space	112	p
33	!	113	q
34	"	114	r
35	£	115	s
36	$	116	t
37	%	117	u
38	&	118	v
39	'	119	w
40	(	120	x
41	)	121	y
42	*	122	z
43	+	123	¼
44	,	124	‖
45	—	125	¾
46	.	126	÷
47	/	127	←
48	0	128	Nul
49	1	129	Alpha Red
50	2	130	Alpha Green
51	3	131	Alpha Yellow
52	4	132	Alpha Blue
53	5	133	Alpha Magenta
54	6	134	Alpha Cyan
55	7	135	Alpha White
56	8	136	Flash
57	9	137	Steady
58	:	138	End Box
59	;	139	Start Box
60	<	140	Normal Height
61	=	141	Double Height
62	>	142	
63	?	143	
64	@	144	Dle
65	A	145	Graphics Red
66	B	146	Graphics Green
67	C	147	Graphics Yellow
68	D	148	Graphics Blue
69	E	149	Graphics Magenta
70	F	150	Graphics Cyan
71	G	151	Graphics White
72	H	152	Conceal
73	I	153	Contiguous Graphics
74	J	154	Separated Graphics
75	K	155	
76	L	156	Black Background
77	M	157	New Background
78	N	158	Hold Graphics
79	O	159	Release Graphics

Codes 32 to 63 and 96 to 127 are replaced by graphics in graphics mode.
Codes 160 to 254 are repeats of codes 32 to 126.

Figure 1 (left). Codes and characters available in alphanumeric mode; codes above 128 are control characters. Figure 2 (facing page). Codes and characters available in graphics mode.

Now a hard disc system for the same price as a floppy

The Shelton signet

It's here! The new hard disc system that really means business.

From the bewildering range of computers, all claiming a technical advantage, Micropute have selected the machine best suited to the needs of small and medium sized businesses. The requirements of such a system were: Integral Hard Disc, Compact Design, Extremely Competitive Price, The CP/M Operating System giving access to a vast range of programmes for data and word processing, and The Capacity For Ease Of Upgrading To Multi-User. Which all adds up to a fully comprehensive and sophisticated computer.

The price?
From an incredible £2,695 (ex V.A.T.)

Micropute Supercover

As an extra bonus to this amazing package Micropute Supercover will provide a 12 month on site maintenance for only £99.00 parts and labour.

Faster Than a 16 BIT

BENCHMARK TIMINGS			
	PRODUCT		
	SIG/NET 8 BIT	IBM 16 BIT	SIRIUS 16 BIT
BM. 1.	1.1	1.5	2.0
BM. 2.	3.7	5.2	7.4
BM. 3.	9.9	12.1	17.0
BM. 4.	9.8	12.6	17.5
BM. 5.	10.5	13.6	19.8
BM. 6.	18.7	23.5	35.4
BM. 7.	29.6	37.4	55.9
BM. 8.	5.1	3.5	4.3

These figures are extracted from a recent article in, 'Personal Computer World' Publication.

Micropute Ltd Catherine Street, Macclesfield, Cheshire SK1 6QY Tel: (0625) 615384.

Name _____ Position _____

Company Name _____

Company Address _____

_____

_____

Tel. No. _____

MICROPUTE

Micropute Ltd., Catherine Street, Macclesfield, Cheshire SK1 6QY Tel: (0625) 615384.

MODE 7 COLOUR

(continued from page 82)

Try the following line in mode 7:

PRINT CHR$ (129); "HELLO"

The word will be printed in red with a blank space on the far left; nothing can be done about this in alphanumeric mode. It is not usually a handicap: different words can still be in different colours if no space is included at the end of the first word or the start of the second. For example

PRINT CHR$(129);"HELLO";CHR$(130); "THERE"

Graphics mode is the complementary mode to alphanumeric. It is selected in the same way, the colour being defined using characters 145 to 151, labelled Graphics Red to Graphics White. In this mode, a different character set is available with the columns indicated in figure 1 replaced by the graphics characters of figure 2. Upper-case letters — known as "blast through" alphabetic characters — are still available.

Each of the graphics characters is made up of six small squares — see figure 3. To choose a particular character, add up the numbers in brackets found in each square that must be lit up on the screen. Add 160 to the total for the code that must be printed on the screen.

For example, the shape in figure 4 is one character high and four long, as shown by the arrows. A quick calculation shows the four numbers to be 250, 171, 167 and 245. One way to print out the shape would be:

PRINT CHR$(151);"z+'u"

The ASCII codes for z, +, ' and u in figure 1 are the same as the four calculated numbers for the shape. While the computer thinks it is printing these symbols, the CHR$(151) which put it in graphic mode and selected the colour white has made it swap character sets so that the required shape appears on the screen.

A shorter method, and an easier one if you only have four numbers in front of you is:

VDU 151,250,171,167,245:PRINT

The Print command makes the cursor go down a line, as the VDU command would have left it immediately after the printed shape and the graphics form of the > cursor prompt.

The character 151 must be left on the screen. If at any time it is changed, and a different code written in the same position, the line will revert to alphanumeric mode and the symbols z+'u will be displayed even if the other four symbol codes are left. To test this, type VDU 30, which moves the cursor to the top-left position. Press and hold down the Return key and allow it to repeat, which will have the effect of writing a > symbol into the left-hand column of the screen as it moves down. When it is level with the shape on the screen the graphics revert to alphanumeric because the screen is continually being scanned, many times a second, and the screen memory is printed as it goes.

A change in the screen memory at a particular place will not be displayed on the screen until the scan comes round to it once more after a fraction of a second's delay. As soon as the scan meets the line which has been changed, the computer has no reason to go into graphics mode and the line is displayed as for normal ASCII code.

A very long program which uses up too much memory for high-resolution graphics may have to use these graphics as an output. A routine to plot points on an 80 by 75 grid is shown in the listing along with a program to plot a sine wave. Lines 5 to 80 plot the graph, calling the plotting routine at line 65. The second half of line 5 is a useful command to get rid of the flashing cursor that would otherwise be present constantly; the cursor is reinstated by redefining the screen mode.

The routine uses the fact that each lit square of a graphics character can correspond to a binary bit to make up one binary number, from which the ASCII code can easily be found. This is another version of the method used earlier to draw a shape. Lines 10 to 30 produce character 146 all the way down the left column of the screen, so the lines are all in graphics mode and produce a green display.

After running the program, press Escape and again press and hold down the Return key. As it repeats, the display again reverts to alphanumeric characters. From the memory maps in the User Guide you can see that the screen memory is found just above Himem, which is a pseudo-variable in Basic. The screen memory can therefore be addressed directly — a process referred to as Peeking and Poking in other machines. A fast version of

PRINT TAB(x,y);"A"

or

PRINT TAB(x,y);CHR$(65)

and one which does not interfere with the position of the cursor is

?(HIMEM + (40*y) + x) = ASC("A")

The contents of the memory location on the left become 65, the ASCII code of A. The x,y co-ordinates can be checked by

L = ?HIMEM + (40*y) + x)

This capability is used in the program. The variables for it are:

X — Y value, 0-79, with which the routine is called.
Y — Y value, 0-74, with which the routine is called.
SX — X value, 0-39, of the appropriate screen position.
SY — Y value, 0-24, of the appropriate screen position.
SL — memory location of the appropriate screen position.
EX — contents of location SL, the ASCII code of the existing character on the screen
YM — Y value, 0-2 of the appropriate small square within the screen position
VL — the number 1,2,4,8,16 or 64, corresponding to the square that must be lit up, as in figure 3
NW — the ASCII code of the graphics character that must replace the existing character on the screen; equal to the existing plus that of the square being lit up.

(continued on next page)

Listing 1.

```
    5 MODE7:VDU 23;8202;0;0;0;
   10 FORI=0TO24
   20 PRINTTAB(0,I);CHR$(146);
   30 NEXTI:VDU30
   40 FOR A=0 TO 360
   50 Y=37+SIN(RAD(A))*35
   60 X=2+(A/360)*75
   65 PROCplot(X,Y)
   70 NEXTA
   80 GOTO 80
10000 DEF PROCplot(X,Y)
10010 SX=INT(X/2):SY=24-(INT(Y/3))
10020 SL=HIMEM+(40*SY)+SX
10030 EX=?(SL)-32
10035 IF EX=223 THEN EX=95
10040 YM=Y MOD 3:IF YM=0 THEN VL=16 ELSE IF
      YM=1 THEN VL=4 ELSE IF YM=2 THEN VL=1
10050 IF (X MOD 2)=1 THEN VL=VL*2 :IF VL=32
      THEN VL=64
10060 NW=EX OR VL
10065 NW=NW+32:IF NW=127 THEN NW=255
10070 ?(SL)=NW
10080 ENDPROC
```

MODE 7 COLOUR

(continued from previous page)

Due to a quirk of the character set, codes 160 to 255 are repeats of codes 32 to 127, except for the last character. Graphics character 127 is blank, though to match those from 32 to 126 it should be a full square. Character 255, at the end of the 160 to 254 sequence is a full square, so the sequence fits with the given rules, which is why 160 is added to the total when choosing a character; 32 could be added instead, but the sequence would be broken for a full square. So do the 32 to 126 graphic characters have any uses?

Ellipse and circle

There is a good reason for using them in the program to draw a curve: a clear screen is automatically filled with spaces, character 32. When plotting a point within a screen location, the character to be plotted is combined with what is already there so if a space, character 32, is found it fits in neatly with the graphics sequence as the code for a graphics blank. Special provision is made at lines 10035 and 10065 for the case of a full square. To make the program draw a circle, change line 60 to:

```
60 X = 40 + COS(RAD(A)) * 35
```

The 35 at the end of lines 50 and 60 specifies the radius of the circle. Two different values in the positions draw an ellipse or neutralise the distorting effect of the small squares being slightly rectangular. Do not increase them by more than 35.

Background colours may be chosen in graphics or alphanumeric modes. Printing control character 157 will set the background colour to the last specified text/graphics colour on the same line. Default is white.

The coloured background extends from the control character to the end of the line. A colour change will then have to be made so that the words or pictures do not appear in the same colour as the background colour. After the message the background colour to the end of the line can be reset to black with character 156. Try:

```
VDU 129,157,135:PRINT"TEXT"
  ;CHR$(156)
```

Character 129 selects alphanumeric mode and colour red. Character 157 produces the background, red in this case as the last colour was red. Character 135 changes colour for the letters to white.

As each control character occupies a memory location, the cursor will be three spaces out. Figure 5a shows what these three spaces look like to the computer and the user. Two spaces have been put at the beginning of the red background, so the message printed has two spaces at the end to balance it. Character 156 reverts the display to normal black background. The line now looks like Figure 5b.

Flashing mode is one of the complementary pair, flashing and steady. Character 137 initiates flashing mode, and 136 makes it steady again. Control characters occupy a space so, as with colours, a whole word can be made to flash using control characters instead of normal spaces to separate it from words behind and ahead. It only applies up to the end of the line it occurs on. An example, try:

```
PRINT"THE ALIEN IS";CHR$(136);
  "DEAD";CHR$(137);"NOW."
```

The word "DEAD" will flash steadily.

Graphics characters can be used to produce large letters for titles, and often are with teletext or viewdata. The double-height mode can be used to make letters, numbers or graphic characters twice as high without affecting their width.

Double-height mode is initiated with character 141; the following line becomes reserved for the lower half of the letters. Printing a message produces the top half of the display and printing the same on the line below gives the lower half, so it is convenient to have a For-Next loop which operates twice. Try:

```
FOR I = 1 TO 2:PRINT CHR$(141);
  "LARGE Letters":NEXT I
```

The top line can also be used for normal letters following character 140, which turns off the double-height mode. It will only work on the top row, as the bottom is reserved for the lower half. Trying to print the letters below does no damage — they just do not print — so they can go in with the loop:

```
FOR I = 1 TO 2: PRINT CHR$(141);
  "LARGE";CHR$(140);"SMALL";CHR$
  (141);"LARGE":NEXT I
```

If you are producing pictures or patterns in the graphics mode, space left by a control character can be a problem. Graphics hold mode allows it to be easily overcome. Character 158 starts this mode, which holds in memory the last graphics character printed on the line. Then every time a control code is met along the line the character will appear in the current colour in the space.

To produce a line a colours with no spaces in between, try:

```
PRINT CHR$(158);:FOR I = 145 TO 151:
  PRINT CHR$(I);"";;;";:NEXT I:PRINT
```

There are two blank spaces on the left to accommodate the control character 158 and the first colour, 145. Although only three graphics characters were printed in each band, four actually appear as they are also written at the position of the colour change. At the colour-change position itself the character does not appear in the colour being changed to, but in the preceding one. Thus the colour-change position is on the right of each band.

Mixed modes

The rightmost band is only three characters long as it is not followed by a colour change or other control character. Character 159 turns off graphics hold mode before the end of each line.

Printing character 152 before a line will conceal what is on it as far as any other control character. It will be stored in screen memory, accessible by the function described earlier to Peek the screen, but will not be displayed. To make it appear instantly, another character must be put in the location of character 152. Character 128, the flashing control character or a change of colour are all suitable.

The modes described here can all be mixed. For example, you can have coloured, double-height backgrounds with graphics characters, concealing coloured flashing words or holding double-height flashing graphics. You can separate the graphics characters with character 154, so that they do not touch each other, and bring them back together with character 153.

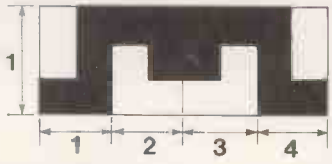
B1 (1)	B2 (2)
B3 (4)	B4 (8)
B5 (16)	B6 (64)

Figure 3.

Example:

Code = 2 + 8 + 16 + 160 = 186

Figure 4.



A

Computer;	129	157	135	
User;	Black	Red	Red	

B

Computer;	129	157	135	84	69	88	84	32	32	156	32	32	....
User;	Black	Red	Red	T	E	X	T	Red	Red	Black	Black	Black	....

Figure 5.

PORTABLE MICROS

TAKING THE COMPUTER A STEP FURTHER

EPSON HX20

A computer small enough to fit into a briefcase yet with a full size typewriter keyboard, LCD virtual screen, printer and microcassette facility actually built in. High speed serial communication with other computers plus the Epson reliability – a world beater.

A FULL SIZE QWERTY KEYBOARD WITH 68 KEYS INCLUDING 5 FUNCTION AND 13 SPECIAL KEYS. LCD DISPLAY WINDOW SHOWING ANY 20 COLUMN BY 4 LINE PART OF A VIRTUAL SCREEN UP TO 255 CHARACTERS WIDE. 50 HOURS BATTERY LIFE WITH MAINS ADAPTER FOR OVERNIGHT CHARGING. BUILT IN PRINTER 5 x 7 MATRIX, 24 COLUMN WITH BIT ADDRESSABLE GRAPHICS. OPTIONAL BUILT IN MICROCASSETTE OR ROM PACK.

HX20UA PORTABLE MICRO UNIT WITH OPERATING MANUAL £402.00
HX20MC-SA MICROCASSETTE DRIVE £75.00

NEWBRAIN

You thought it would never arrive, but here it is with all those promises fulfilled. We never appreciated the full computing potential of the NEWBRAIN but suffice to say, it's a machine with a great future. We'll be able to tell you how to fully utilize the considerable power of the NEWBRAIN and take advantage of all that CP/M software.

THE NEWBRAIN IS A FULLY SPECIFIED PROFESSIONAL COMPUTER BUILT TO THE HIGHEST STANDARDS OF ENGINEERING AND RELIABILITY. CHOSEN BY LEADING OEM SUPPLIERS DESIGNED TO FACILITATE EASY EXPANSION FOR USE WITH THE CP/M OPERATING SYSTEM AND THE ADDITION OF 5¼" FLEXIBLE AND WINCHESTER DISKS; 12" GREEN PHOSPHOR PROFESSIONAL STANDARD MONITOR; 80 CPS PROFESSIONAL QUALITY DOT MATRIX PRINTER WITH PIN ADDRESSABLE GRAPHICS.

NEWBRAIN MODEL A £199.00
NEWBRAIN MODEL AD £229.00

HEWLETT PACKARD

HP75C A TOTALLY NEW PORTABLE PERSONAL COMPUTER.
An executive tool for the man in a hurry. 600 appointments can be held in memory. Never miss a board meeting or a birthday. In addition, – an impressive scientific aid to engineers and Scientists with magnetic card strips for handy programs and a magnificent BASIC.

HP75C SPECIFICATION 5" x 10" x 1" WEIGHING 26 oz. 16K RAM EXPANDABLE TO 24K. 48K OPERATING SYSTEM WITH 187 KEYWORDS AND FULL SCIENTIFIC BASIC. 8 BIT CPU, 32 CHARACTER LCD DISPLAY WITH SCROLLING TO 96 CHARACTERS; FULL INSTRUMENT AND PERIPHERAL CONTROL USING THE HPIL INTERFACE LOOP. 30HR BATTERY LIFE WITH RECHARGER. 3 PLUG IN 16K ROM MODULES. A FULL REDEFINABLE TOUCH TYPE 'QWERTY' KEYBOARD WITH EDITING KEYS AND HIDDEN NUMERIC PAD. A BUILT IN PROGRAMMABLE ALARM/TONE GENERATOR AND APPOINTMENT CALENDAR. THIS IS ONE OF THE MOST COMPACT AND POWERFUL PORTABLES WITH HP's SCIENTIFIC AND TECHNICAL BACKGROUND AND SUPPORT DOCUMENTATION. ITS POWER IS YOURS TO APPLY.

HP75C PORTABLE COMPUTER £728.40
HP-82700A 8K MEMORY MODULE £142.75

SHARP PC1500

This machine is the least expensive portable on the market. It is ideal for salesmen, contract engineers and anyone wanting to produce figures or small graphics for clients. Its 4 colour printer is a masterpiece of simplicity and it offers a medium speed BASIC for keeping standard programs in RAM. It is particularly useful for engineers who wish to do 'set calculations' on site and produce results on the spot. Great value for money.

WITH 16K BYTES OF ROM AND UP TO 11.5K BYTES OF RAM MEMORY, WITH BATTERY PROTECTION, UP TO 36 PROGRAMS STORAGE CAPACITY. BASIC PROGRAM LANGUAGE WITH TWO DIMENSIONAL ARRAYS AND VARIABLE STRINGS. QWERTY KEYBOARD WITH UPPER AND LOWER CASE. FULL RANGE OF SCIENCE AND MATHS FUNCTIONS (STATISTICS WITH MICROL SOFTWARE) ALARM CLOCK AND CALENDAR, MULTI TONE GENERATOR, MINI GRAPHIC 7 x 156 DOT MATRIX DISPLAY, ALL UNDER BASIC PROGRAM CONTROL. LINE WIDTH 26 CHARACTERS.
CE-150 FOUR COLOUR GRAPHIC PRINTER/TWO CASSETTE INTERFACE.

PC 1500 COMPUTER £147.78
CE150 PRINTER/TAPE INTERFACE £130.39
CE155 8K RAM MEMORY MODULE £69.52

Visit our Portable Micro Centre or contact us for further information.

Transam
Microsystems Limited

Telephone and mail orders accepted on Barclaycard or Access
All prices exclude carriage and VAT

59/61 Theobald's Rd. London WC1X 8SF. Tel: 01-405 5240/2113. Telex: 24224 (Ref. 1422).

For full proposed range of Portable Computers and typewriters, including the Osborne, Kaypro II, Teleram, Panasonic, Toshiba, Andromeda, Brother, Husky, please contact us for price and availability. Not all items are yet in production so it is best to telephone for delivery details.

● Circle No. 149

Multiple blocking

Frank van der Riet has come up with a variation of the economical method for storing high-resolution graphics with which you can save yet more memory.

IN HIS ARTICLE on storing high-resolution graphics — *Practical Computing* November 1982, page 96 — Graham Kirby provides an interesting explanation of the technique of multiple blocking. The method certainly is useful, but it does have one disadvantage.

As the number of lit pixels increases so, very rapidly, does the amount of storage space, even when most of the lit pixels are joined in one block. The cause is the method of going to a lower level when a lit pixel is found. If a program has to store an eight-by-eight pixel block, with all the pixels lit, it needs 85 bits: one for the whole block, four for the sub-blocks, 16 for the sub-sub-blocks, and 64 for each separate pixel. The conventional method only needs 64 bits.

When one-half of the screen is lit, you only save 30 percent of storage space compared to the conventional method, so there has to be a better way. Graham Kirby's listing of the block procedure in figure 12 provides for only one bit to be stored at a time. Depending on whether a block is lit or not, a 1 or a 0 is stored. If two bits at a time are stored, it can be changed to:

00 when all the pixels in a block are lit
01 when all the pixels in a block are unlit
10 when a block contains lit and unlit pixels.

11 is free, and so this can be used for error checks in the readblock procedure.

This may seem strange, but if you take another look at the eight-by-eight pixel block, you can see that now it only takes two bits to store it, and it does not matter whether all the pixels are lit or unlit. If you store a picture two bits at a time, you will have to reproduce it the same way. A little adjustment in the read(thing) procedure is then required. Thing now has to get a two-bit value instead of one bit.

A procedure has to be added to the block procedure to check if all the pixels are lit. Consequently you may have to scan several blocks twice. If you think that this will take too much time, you could combine the new checking procedure with the blockempty procedure. You will then need two Boolean operations to decide whether to store 00, 01 or 10. The combined procedure has to be part of the doblock procedure itself, because a subroutine cannot pass down two Booleans to the main procedure.

Another procedure has to be added to the readblock procedure. It has to light all the pixels in a block when thing is 01. Neither the doblock nor readblock procedures now need the blocksize check. The revised procedures are shown in listings 1 and 2. If you cannot store, read and process two bits at a time, it is not difficult to split them up for use one bit at a time.

Suppose you want to store a chessboard, 64 small surfaces of which 32 are lit and 32 unlit. When you vary the size of the chessboard from eight by eight pixels to 1,024 by 1,024 pixels, the number of bits required for conventional storage increases enormously. Table 1 shows the space saved by the multiple-blocking method.

Though the figures appear to suggest that the amount of storage space occupied to store a picture with two-bit multiple blocking is independent of the resolution of the picture, that is only true when the picture remains the same. It really depends upon the number of blocks with all the pixels lit or unlit.

This method can also be adapted to colour pictures by replacing the two-bit code by a colour code. When you have eight colours, you will need a four-bit colour code to allow for a code for a block with all pixels unlit and one for a block with more than one colour.

Further adjustments are concerned with store and read (thing) to allow them to handle four-bit codes. Blockempty and blockfull have to be changed into a procedure that recognises the colour of the first pixel in a block, then checks all the other pixels for their colour. The right colour code then has to be stored. Clearblock and fillblock have to be changed into a procedure that recognises the code and that can send the main program to the next level, or fill the right block with the right colour.

A disadvantage of two-bit multiple blocking is that it is an inefficient method of storing pictures that consist of many thin lines all over the screen. It is also difficult to combine it with other methods like frame or line storage.

Listing 1.

```
procedure doblock(blocksize,cornerx,cornery:integer);
var smallblock:integer;
begin
      if blockempty(blocksize,cornerx,cornery)
      then store(00)
      else if blockfull(blocksize,cornerx,cornery)
            then store(01)
            else begin
                        store(10);
                        smallblock: = blocksize/2;
                        doblock(smallblock,cornerx,cornery + smallblock);
                        doblock(smallblock,cornerx + smallblock,cornery + smallblock);
                        doblock(smallblock,cornerx,cornery);
                        doblock(smallblock,cornerx + smallblock,cornery)
                  end
end;
```

Listing 2.

```
procedure readblock(blocksize,cornerx,cornery:integer);
var thing,smallblock:integer;
begin
      read(thing);
      if thing = 00
      then clearblock(blocksize,cornerx,cornery)
      else if thing = 01
            then fill block(blocksize,cornerx,cornery)
            else beginsmallblock: = blocksize/2;
                        readblock(smallblock,cornerx,cornery + smallblock);
                        readblock(smallblock,cornerx + smallblock,cornery + smallblock);
                        readblock(smallblock,cornerx,cornery);
                        readblock(smallblock,cornerx + smallblock,cornery)
                  end
end;
```

chessboard size (pixels)	conventional storage space (bits)	multiple-blocking storage space (bits)	percengage saving	two-bit multiple-blocking storage space in bits	percentage saving
8 x 8	64	85	– 32,8	170	– 165,6
32 x 32	1,024	725	29,2	170	83.4
128 x 128	16,384	10,965	33,1	170	99.0
1,024 x 1,024	1,048,576	699,093	33,3	170	99.98

Table 1. Storage space required for eight-by-eight chessboards of increasing size.

Here's your Future

And there's nothing like it in the world.

For the first time a range of microcomputers has been born from a new concept we call "Future Evolution."

Future Evolution

A unique Local Area Network facility has been built into our new range of advanced 16 and 32 bit micros.

It means you can grow from a single powerful stand alone micro to a large multi-user network simply by plugging in as many Future Computers and terminals as you need.

Eight Models

And there are many to choose from. Low cost terminals, intelligent work-stations, stand alone micros and powerful 300 Mbyte network pro-cessors – probably a wider choice of planned options than has ever before been available.

Designed for People

They don't just look beautiful. The three-box format is a treat to use, too. The sculptured keyboard gives fast, error-free data entry. The special low-profile processor can be slung from the side of your desk. And the VDU tilts and swivels at a touch.

Works Harder and Faster

We reckon the Future Computer range is 60% faster than any other 8088-based micro on the market.

And with probably more features supplied as standard. Like between 128K and 1 Mbyte of memory, that's super fast 150ns RAM, with direct memory access and independent refresh control.

IBM Think-alike

We give you CP/M 86, Concurrent CP/M 86, or MP/M operating systems, or the option of MS.DOS. And that makes the Future Computer a perfect IBM Personal Computer "Think-alike."

Prices that'll shock you

This could be the lowest priced micro range on the market today. The FX 20 stand alone 128K micro retails at £1800. With other models starting at £1500 – or less for volume.

And it's British

Designed and built in the UK, the Future Computer range incorporates the best in computer technology including continuous "CheckGuard" diagnostics.

Get the full facts about the Future – phone or write today.

FUTURE COMPUTERS

Britain's Future in Microcomputing.

Future Computers Ltd., PO Box 306, Purley, Surrey.
Telephone: 01-689 4341 Telex: 947788 CONTRL

When the British make something, it's really something.

SPECIAL INTRODUCTORY OFFER

Order your HAYWOOD Word Processor within 4 weeks for a FREE in depth three day 'hands on' training course for your secretary.

Maximum Word Processing. Minimum cost.

Meet the Haywood 9000 COMPOSITE Microcomputer. Unbeatable and real value-for-money.

It's CP/M* based, which means the very highest Word Processing standards and a capability for more than 1000 other established business programs.

Your choice of four different models – Twin floppy disks, 5Mb, 15Mb or 20Mb Winchester hard disks – so that it can grow with you.

We've given it a non-reflective screen and you have a choice of either green or amber characters, setting new standards in clarity.

Our professional keyboard has the look and touch of a normal office typewriter so, whoever operates it, will feel instantly 'at home'.

All this plus many other advanced features, in a machine designed and built in Britain to standards still envied by the rest of the world.

The COMPOSITE for an unbeatably low price. From

£1795 exc. VAT

We'll be very pleased to send you the full details. They're really something.

*Copyright Digital Research

HAYWOOD

Makers of British Microcomputers.

Haywood Electronic Associates Ltd.
Electron House, Leeway Close, Hatch End,
Middlesex, HA5 4SE.
Telephone: 01-428 0111 Telex: 896819 Keyhay G

● Circle No. 151

INNOVATIVE
TRS 80-GENIE SOFTWARE
from the professionals

AJEDIT

.....a new, simple to use, moderately priced word processor..

AJEDIT was introduced as a new word processor some months ago, having been written with ease of use as a prime design requirement. Since then it has achieved market success, so much so that it has gone through two additions, together with the introduction of a Manual specifically aimed at the first user. The documentation now totals about 60 A4 pages.

Arrangements have now been made with Logical Systems, Inc. of the United States, the authors of the LDOS disk operating system, for the inclusion in AJEDIT of a stripped-down version of this disk operating system, called smal-LDOS. This gives to AJEDIT a number of major benefits. For instance it now incorporates "type ahead". This means that if you are typing into the word processor whilst the machine is looking at something else, input is stored and then accepted by the program at its own convenience. One of the major advantages of this, of course, is that it is now pretty well impossible to outstrip AJEDIT in speed, particularly at the most critical end of line time, when the program is very busy tidying up. A further improvement given by the marriage between AJEDIT and smal-LDOS is the key repeat function. If the user's finger is kept on a key for longer than a certain time, then that key will repeat on the screen or, if it is a control key, its function will repeat. Both the delay time before the repeat starts, and the rate of repetition is adjustable. Yet another improvement is the addition of a screen print facility so that at any time the operator may (for instance) print out his source file from the screen, complete with all control characters.

To some users these additional functions and others, such as double density support, will not be of the greatest importance and as the smal-LDOS version of AJEDIT is higher in cost, we will be continuing the previous version.

Both versions of AJEDIT contain close to 100 commands, covering most word processor requirements, including two sets of dedicated printer commands for the Epson MX series and Centronics 737 machines. Three principle advantages of AJEDIT over some other word processors are the ability to access DOS commands from within AJEDIT, the facility to mail merge (whereby a names, addresses and salutations file can be married up to a standard letter), and most important of all, the fact that AJEDIT commands are so constructed that they are easily remembered by intermittent users.

AJEDIT needs 48K and one disk minimum, and is presently suitable for the TRS-80 Models I and III together with the Video Genie Models I and II.

Standard AJEDIT **£49.95**

smal-LDOS AJEDIT **£79.95**

Both prices inclusive of V.A.T. and P. & P.

MOLIMERX LTD

A J HARDING (MOLIMERX)

1 BUCKHURST ROAD, TOWN HALL SQUARE, BEXHILL-ON-SEA, EAST SUSSEX.

TEL: [0424] 220391/223636 **TELEX 86736 SOTEX G**

TRS-80 & VIDEO GENIE SOFTWARE CATALOGUE £1.00 [**refundable**] plus £1 postage.

● **Circle No. 154**

Getting it right with WP

Word processing is one of the most obvious applications of the micro, and one of the easiest to implement. In this introduction to our special 19-page section, Jack Schofield looks at the possibilities and the pitfalls.

IN THE RUBAIYAT OF OMAR KHAYYAM, Fitzgerald wrote

The Moving Finger writes; and, having writ,
Moves on: nor all thy Piety nor Wit
Shall lure it back to cancel half a Line,
Nor all thy Tears wash out a Word of it.

Obviously he wasn't using a word processor.

The essence of word processing — WP for short — can be summed up in three words: store, edit, format. When using a typewriter there is a direct connection between action and result: you press a key, and a letter appears directly on the paper. Though this is very useful — few businesses still use quill pens — it has its limitations.

You have to press the right keys in the right order, and the paper has to be in the right place. Further, if you want two copies of your typing, possibly to send to different people, you normally have to press all the keys again. This is slow, wasteful and boring.

Common typing mistakes include misspelling words, missing out words or even whole paragaphs, and getting the spacing wrong, making a report is less readable than it should be, while areas of the paper are unused. Although some of these mistakes can be corrected, the corrections slow down the job, and corrections nearly always show. The end result tends to look unprofessional, so in business things often have to be retyped. WP helps to solve all these problems.

With WP the keystroke does not produce an impression on paper directly. The keystroke is stored in a memory instead. The typist does not have to worry about errors, as they can be corrected later. After a first draft has been completed, the text can be edited, missing words inserted, and pieces of text swapped about. With all these corrections the alteration is invisible: the finished text looks exactly as though the mistake had never been made in the first place. Finally the text can be formatted, so you can check the spacing and arrangement before it is printed out on paper.

Further, once a text is stored it can be used time and time again. If you want to send more or less the same letter to several different people, the same text can be used, with different names and addresses added later. The recipients should not be able to tell that their letter is not a unique original. Perhaps the worst examples of personalised form letters — usually selling goods by mail order — are now obvious to everyone, but the technique is still very useful for correspondence and invoicing.

Modern business micros can be used to run effective word-processing software.

The simplest word processors and memory typewriters allow the storing, editing and reprinting of text. A dedicated word processor or WP package on a micocomputer may offer much more. The panel on page 95 shows some typical features, though not every set-up will offer all of them.

There are some things it is possible to display on the screen, but not to print. Other things can be printed, but not displayed. This depends on the WP package being used, on the micro which is running it and the printer fitted, so it is not possible to generalise. The uncertainty of not knowing what will happen when is the best argument for buying the micro, the package and the printer from a single source. If you need a particular facility, write this into the contract.

These facilities include superscripts and subscripts, overstriking of letter, underlining, bold or emphasised text, italics, graphics characters and diagrams. Proportional spacing is essential for proper justified text; many printers can provide it, though few micros can display it properly.

Then there is paging, which involves headers, footers and page numbering. Some WP packages are word orientated, and treat the text as one long string of words. Others are page orientated. Whichever approach is applied, it is useful to be able to set the page length — that is, the number of lines on each sheet of paper — and have headings and/or page numbers inserted at the top of each page, and footnotes added to the bottom of the correct page.

Page length can be adjusted automatically to allow for footnote length. With page-orientated packages, adding a paragraph near the beginning of the text can be tedious if later paragraphs then have to be carried over on to the next dozen pages. On the other hand, with page systems what you see on the screen often more closely resembles what is printed on the paper.

Multiple printing is useful if you need several copies of a text.

Finally there is concurrent printing. A micro can send text to the printer much

(continued on next page)

Keyboards

In one way, the keyboard is the most important part of a WP system, as it is — literally — the user's main point of contact with the system. Yet as long as a keyboard reaches a certain mechanical and ergonomic standard, the precise details do not seem to matter very much. In time, users can become accustomed to almost anything.

The mechanical and ergonomic standards include key spacing and the amount of travel of the key. The keys should feel positive in use, and must not "bounce" to produce double letters when single ones are required.

Good modern keyboards tend to be very low and relatively flat, rather than steep like office typewriters. The keys should give an audible — if electronic — click when pressed home, and this click should have a volume adjustment. Each key should give auto-repeat if it is held down for more than half a second. This facility is sometimes user-programmable — as on the Acclaim microcomputer, for example.

Most keyboards nowadays conform more or less to the *de facto* standard of the IBM Selectric typewriter. At least, they conform in the positioning of the alphanumeric keys in a QWERTY arrangement.

Unfortunately there is a tendency for designers to put punctuation marks and other incidentals in different places. The quotation mark, for example, may appear as Shift-2, or on the middle row of letters next to the Return key. Neither is really wrong, though the Shift-2 position is now considered somewhat old-fashioned.

One of the problems is that a computer normally requires more characters than a typewriter. Where a typewriter may have 88 characters on as few as 52 keys, a computer may have 128 characters on from 57 to 90 keys. There is the temptation to squeeze extra keys into the QWERTY layout, though this is wrong and should be resisted. IBM, DEC, Sony and other companies have made the mistake of inserting extra keys into the standard layout next to the right or left Shift keys.

Another bad error is to move the Backspace key to an odd position, and a worse one is to reduce the size of the Return key, or insert an extra key next to it. Anyone familiar with a standard keyboard — which means most WP operators — will continually make annoying mistakes when using such keyboards.

The most important extra keys on the computer keyboard are the four cursor-control keys. Using two keys, as on the Apple II and Vic-20 micros, is much less convenient.

Even designers who find room for four keys often fail to get them in the best order, in the shape of a cross. The Epson QX-10, Fortune 32:16 and Adler Alphatronic P-3 and P-4 are among the micros with keyboards where the cursor controls have been sited correctly.

Function keys and numeric keypads are now common additions to the standard keyboard. Both of these groups of keys should be placed well away fromthe standard QWERTY arrangement. Numeric keypads on computers normally have 9 in the top right-hand corner, while telephone keypads have 1 in the top left. The difference does not seem to confuse.

Alternative keyboards

The QWERTY keyboard has been around since the last century, at which time there were many alternative layouts. Since then, numerous new keyboards have been designed, all claiming superiority to QWERTY.

An early example was the Ideal keyboard, launched in the 1890s. It was based on the idea that more than 70 percent of English words are made up of the letters D,H,I.A,T,E,N, S,O and R, so putting these keys in a line should make typing easier.

The most interesting alternative was suggested by August Dvorak in 1943. His idea was to place the five vowels under the left hand and the five most common consonants — D,H,T,N, and S and — under the right hand. As before, the idea he failed to catch on. The QWERTY keyboard was already too entrenched.

A more recent suggestion has come from Lillian Malt and Stephen Hobday in Farnborough, who read in an article in *Ergonomics* in November 1974 about the physical stresses caused by the conventional keyboard. They studied the way the hands and fingers worked when typing, and researched the most comfortable positions. They analysed 1,000,000 words of text to find the most common letters, and placed them so that 90 percent of the 100 most-used words can be typed with the fingers on the "home" line.

The result of all this research is a radically different keyboard, which users are said to find very comfortable. But the same old problem remains: people who have learned on the QWERTY keyboard do not see why they should learn to type all over again.

To counter this objection, the Maltron keyboard is ROM-switchable between QWERTY and the new layout, so QWERTY users can still benefit from the improved ergononmics. Hobday argues that learning a new keyboard is like learning a new language. Users who know both can happily switch between them without confusion.

Soft keyboards

Some modern keyboards are now often fully programmable so that any character can be assigned to any key. This is the case with the Victor 9000/Sirius 1 and Epson QX-10, for example. It is also a simple matter to exchange one set of keycaps or labels for another. Thus the way is now open for people to choose their own keyboard layout, and even to switch between different layouts.

It seems likely that only a few people will take advantage of these facilities. Most will continue with the QWERTY layout, and complain bitterly when computer keyboards vary from this, even if only slightly.

The Maltron keyboard is ROM-switchable between QWERTY and the new layout.

(continued from page 93)

faster than the printer can print it, so you cannot continue working while a long document is being printed out. The best WP packages have concurrent printing, which allows you to start a new text while the last one is printed. Some packages will also allow a print queue of, say, three or four documents, which await printing in their turn. One way round the problem is to fit the printer with a large buffer to hold the text, and thus free the micro for further use.

Word processing can be done either with a dedicated word processor or using a WP program on a general-purpose computer. A year or so ago the dedicated machines were the most user friendly and had the most facilities, but were more limited than micros and cost around twice as much. But now most dedicated word processors can also support CP/M — or they soon will — which makes them more versatile, and the prices have come down a lot.

Word-processing packages for micros have improved somewhat, and some are excellent — Omega Level B on the Compucorp and For:Word on the Fortune 32:16 are examples.

Some dedicated word processors from big companies are still a rip-off, but many are now a good buy if the machine is to be used mostly for word processing. The dedicated keyboard is a big advantage, and most are of far better ergonomic design than general-purpose micro keyboards. On the other hand, dedicated keyboards can be supplied for some micros — Haywood does one for WordStar, for example — and many new micros are a huge advance on old stalwarts like the Apple II.

In the near future it seems most likely that the two technologies will converge. The only difference between dedicated word processors and micros will then be the way they are sold. Companies selling word processors should also sell support and operator training, and at the moment companies specialising in WP seem to do this better than micro dealers.

When selecting a system the old advice is still the best advice: choose the software first, then choose the hardware to suit. Even so there are some areas to watch when it comes to hardware. The three main considerations are keyboard, discs and screen.

Discs are used to store text with most systems, both dedicated and general-purpose micros. Cassettes are too slow, and it is too difficult to find texts on them. The main points to watch with discs are the total storage capacity, and the speed of input and output. Some dedicated word processors have only limited storage per disc, so check this as well. If the money is available, a hard

(continued on next page)

Usual WP functions

- **Automatic word-wrap. You should be able to enter text without watching the line length. Words that are too long should automatically be taken over to the next line. Some packages offer a soft-hyphen feature, where long words will, if necessary, be hyphenated and split over two lines when printed. Hard hyphens are those which are actually typed in and are fixed.**
- **Tab settings. As on a typewriter, a WP package should allow tabs to be set within the text, not just margins on printing out. This is invaluable for tables. A decimal tab function is useful: it automatically aligns decimal points in tables of figures, so £10.96 can be accurately positioned underneath £1,096.24, etc.**
- **Margin settings. Left and right margins should be variable within the document. For some texts it is useful to be able to have right justification, so all the lines line up on the right as well as on the left, as in the printed columns in the main part of this article.**
- **Automatic centring: useful for headings.**
- **Block move. Sometimes you may need to move a whole block of text, such as one or more paragraphs or a whole page. Pointers are used to mark the beginning and end of the block. Useful functions include Move Block, Copy Block, Print Block, Save/Load a block to or from disc.**
- **Search and Replace automatically finds one character, word or text and replaces it with another. For example, this article uses WP to stand for "word processing". Using Search and Replace it would have been possible to change all cases of this abbreviation to the full phrase. The operator can use very simple entries to save typing out repetitive phrases, saving much time and efforts. Search and Replace can be global, as in this example, or for single occurences, under operator control. A useful extra feature is the choice of Exact Search and Hazy Search. An Exact Search for "the" would not find "The", but a Hazy Search would. Hazy Replace will preserve the original capitalisation. This is useful for changing between U.K. and U.S. spellings and similar tasks, if you don't have a spelling-checking program.**
- **Spelling checker. A spelling checker scans the text and stops at or lists all the spellings it does not recognise. That is to say, words that are not in its dictionary. Some of these will be spelt wrongly, and can be corrected. Others will be obscure words. A useful feature of some spelling checkers allows you to add these words to the dictionary, to customise the dictionary to your own special interests. The spelling check is usually run as a separate routine after the text has been completed. Often it is not part of the WP program itself, but an add-on extra.**
- **Forms entry allows you to set up a form on the screen to match a preprinted or pre-established form set-up. The cursor is moved automatically from one entry point to the next. Sometimes this is used with a Typewriter mode, where anything typed on the WP keyboard is automatically output straight to the printer; however, this deprives you of the chance to corrrect errors before printing the form.**
- **Mail Merge may be a built-in or extra program which takes names and addresses or other information from a separate file and inserts it in a form letter or invoice. It is most useful if the package also allows searching and sorting. A merge facility might also be used to produce letters assembled from standard paragraphs — a useful facility for solicitors, etc.**
- **Macros. A macro is a routine which can be set up by the operator and called separately, or else assigned to a function key, if available. It allows multiple keystrokes to be reduced to a single keystroke and is useful for adding, say, a series of signature lines to a document, or setting up chapter headings, etc.**
- **Maths. A calculator function allows you to do maths within the WP program, instead of having to do it beforehand or separately.**
- **Disc utilities. With a disc-based WP program it is useful to have access to disc utilities from inside the WP program. It saves the horror of having a long text in memory and no formatted disc to save it on. Some packages will allow other programs to be run from inside the WP program.**

(continued from previous page)

disc is valuable because storage and retrieval is so much faster than with floppies; the amount of storage space is much greater too.

Screen displays vary a great deal, and can greatly affect the usability of a system. The screen should give a sharp image and have an anti-glare finish. Both brightness and contrast should be adjustable. Most importantly, the screen should be placed somewhere where it does not reflect a window, but where both the keyboard and workspace are well lit. It is the neglect of these points rather than the hardware itself, that leads to problems with WP installations.

The number of characters displayed also depends on several factors, but some set-ups offer the choice of either half-page or full-page screens. A half page is usual — 80 characters by 20 to 25 lines. A full-page display usually means a vertical screen showing 80 characters by 60 lines, which is what will be printed on a full sheet of paper. Some screens are switchable and can be rotated to allow both choices.

Some systems carry the imitation of a sheet of paper to absurd lengths, printing black letters on a white screen display. This can be very fatiguing, though no doubt some operators will like it. In some countries, legislation enforces the use of particular colours for screen backgrounds.

The 80-character width is now established. It originates partly from the 80-column width of the punched cards used by early word processors, but 80 characters is, as it happens, a good width for printing on A4 paper.

The choice of printer is particularly important, and will be dealt with in a special feature in a future issue. Briefly, the traditional choice is between an expensive and slow daisy wheel printer and a cheap, fast dot-matrix model. A daisy-wheel printer gives top-quality printing, often better than an electric typewriter. A dot-matrix printer normally gives a low-quality image, the letters being made up of a number of dots.

The dot-matrix printer, however, has the further advantage of being able to handle graphics, and can easily offer a wide range of type styles within a single text. Condensed, extended, emphasised letters and italics are all possible.

At the moment two significant developments are taking place: the image quality provided by dot-matrix printers is improving, and some now approach daisywheel quality; and the price of daisywheel printers is coming down. Daisywheels are still the choice for letter-quality results, and dot-matrix printers for everyday use, but for businesses this often means buying both. The future development of low-cost ink-jet or laser printers — or even something as yet unheard of — may solve this problem, but it hasn't yet.

Communications is another area where future developments are likely to prove extremely important, though not many manufacturers have yet got the show on the road. It is not just a matter of networking so that a group of WP work stations can share hard discs and printers: networking is likely to prove important in encouraging the growth of electronic mail.

So far only the Torch micro has British Telecom approval for direct connection to the public telephone system, and many micros still lack Modems and terminal facilities. Yet if both sender and recipient have microcomputers, it is silly to print a text out on paper, put it it in the post — at great expense — and wait one or more days for it to be delivered when it could be shot down the phone line in a few minutes.

Communications could also be very important for authors and publishers who are preparing texts for typesetting. At the moment a magazine article might be typed three or more times: by the author, by the publisher, and again by the typesetter. This is not only cumbersome, it is expensive and introduces many unnecessary errors.

Some printers are already adopting microcomputers for use for text entry, as being much cheaper than dedicated typesetting machines. Some typesetters — Verbatim Graphics in London and Worsmiths in Bath, for example — already accept WP copy down the phone. With a facsimile machine, a proof of your typeset text could be sent back to you within minutes. Typesetting costs can be cut by 50 percent or more.

In the long term, so many small companies, individual authors and home users will run WP on their own account that the problem will disappear. The unions and companies that do not automate will go bust, leaving the field open for WP.

A word processor should ideally be easy to use. Most of them are easy to use for entering and printing text, but some of the less often used commands can be harder to learn. Ideally, therefore, the documentation should have four distinct parts:

- A key-by-key guide to getting started, so you can start using the program straight away.
- A thorough guide to all the facilities — the manual proper
- An alphabetical reference guide to the commands used
- A single-page crib sheet for use as a memory jogger

Very few packages have good documentation. The Atari word processor is an exception, and it is worth looking at if only to see how these things can be done. The package also includes two master discs, a six-chapter tutorial, a data disc, and a teaching tape, plus much else. Altogether it weighs 5.25lb. A self-teaching disc and/or built-in help routines can also help with learning how to use WP properly.

The two worst problems that can occur with WP are the loss of text, and difficulty in interfacing printers. Loss of text can be a disaster, and WP software must be designed to protect against it. You can help to protect yourself, of course, by taking frequent back-up copies of texts as you work on them

Cassette, disc or ROM

A WP program might come on a cassette, on a floppy disc, or in a read-only memory or ROM. A cassette-based program is OK for a home user, but not for serious use or for business. The problem is not that it takes longer to load such a program, but that it takes a long time to save and recall texts.

As tape is a serial medium, it can be difficult to find the beginning of a particular text for loading — just as it can be hard to find the start of a particular song on an audio cassette. Cassette-based WP programs have the single advantage of being cheap. Many home micros do not have discs available, and in these cases you generally have to make the best of a bad job.

Disc-based WP is the most common, and provides fast saving and recall of texts. A disc system can only make filing easier by providing a list of all the files — or texts — on your work discs. The best WP packages provide their own disc-directory routines, and allow file names of, say, 35 characters rather than eight. The chance to use meaningful file names makes finding the texts you need much easier.

A good WP disc system will also record, perhaps, the author's initials, the date a file was created, and when it was revised or last printed. In some cases it even records how long it was worked on and how many keystrokes were used. Such information can be invaluable. With disc-based WP packags it is best to have a back-up copy of the program, plus back-ups of all work discs stored in a different place from the work discs themselves.

A ROM-based WP program loads fastest of all, and is therefore the most convenient to use, but texts will normally be stored on disc as before. ROM packs are normally very reliable, but have the disadvantage of being more expensive than discs. As an example, the ROM version of Letter Perfect for the Atari costs almost 50 percent more than the disc version. ROM-based WP programs are also available for the Vic-20, Exidy Sorcerer and BBC Micro, among others. A ROM is generally seen as a substitute for a cassette system for the home user, but may also be the choice for dedicated word processors for use by people who are not computer experts.

— in fact this can be done automatically.

You are obliged to protect yourself against power failures, coffee spills and other natural disasters, but the software must protect you against erasing text by accident. For example, it could ask: "Are you sure?" and wait for confirmation. It must also be pretty much crash-proof.

Before you buy a package, try saving to disc with the drive door open, try printing without the printer turned on, and other things which people do by accident all the time. If the machine dumps your text — and perhaps the program too — into the void where it is lost forever, then don't buy it.

There is also this myth that, say, a Centronics port on a micro will always connect with a Centronics port on a printer, and that if they do, a word that goes in at one end of the cable will result in the same word on the paper. Sometimes it does, and sometimes it doesn't.

Sod's law proves that either one of the plugs has to be totally rewired, or the printer reconfigure, or both, and then only the software needs rewriting . . .

The same myth underlies the idea that all, or at least most, CP/M programs will run on most CP/M machines. This conveniently forgets the half hour it can take to configure the thing to the terminal you are actually using. And so on. The way to avoid such problems is to buy all the items from one shop. Let the dealer worry about connecting them up.

The final choice of package will depend partly on the kind of WP you do, and therefore what facilities you need. A manager, for example, usually needs the simplest possible system or perhaps one that checks spelling and does maths too. A secretary, by contrast, will often need merge facilities and elaborate formatting commands.

A journalist will want a system with a large print buffer that will hold all of a 5,000-word article. A book author will generally prefer a paged system, so as to be able to call up page 37 while working on page 240, without scroling through masses of text.

The accountant will want at least the decimal tab facility, and probably a WP package that will integrate with a spreadsheet program. The home user will probably want a cheap package with a good teaching manual, as a substitute for proper training and dealer support.

There are hundreds, if not yet thousands, of WP programs to choose from, and most well-established micros will run at least half a dozen. With so many to choose from it is impossible to survey them all, but the remaining articles in this section will provide the information you need to choose something that should suit you.

Touch-typing

Ten fingers are better than two when it comes to word processing. The "hunt and peck" approach to typing is very slow and inefficient when compared to touch-typing. Speeds of 30 to 40 words per minute are quite easy to achieve and experienced typists can work from two to three times as fast.

While a typewriter will never teach you to type, a micro or CP/M word processor can. All you need is a touch-typing program and the will to learn. Programs are available to run under CP/M and there are several others for small micros including the Atari and Dragon.

Usually they work by providing drill for you to practise, starting with aaaa or something equally simple, and ending with whole paragraphs of text. The micro logs your errors and times you, so that after each drill you can be given a rating for accuracy and your typing speed in words per minute — something you cannot get in a typing class using ordinary typewriters. It allows a precise degree of feedback which makes for rapid progress in learning.

Versions written for particular machines can display the keyboard layout on screen; the Atari touch-typing course does this very well in colour graphics. CP/M versions may not have a screen display, and the one in The Typing Master is "admittedly poor" because of the impossibility of providing one for a wide range of different display terminals. Caxton Software's Touch'n'Go does not display the keyboard layout at all.

Another important point is the way errors are checked. The Atari program demands that you type exactly what you are shown on the screen, letter for letter and space for space. It evaluates the result by making a direct string comparison. You have to be careful that an error at the beginning of a line is not continued so that your later correct typing is marked as wrong.

The Typing Master offers a choice of either position-dependent or universal error checking at the higher levels. The universal checking takes more account of what you actually typed correctly, but it can be deceived by anagrams and transpositions. It does not distinguish between hewn and when. Touch'n'Go uses a very sophisticated error-checking routine which compromises between the two choices.

In the end it is best to aim for complete accuracy. As the author of The Typing Master points out, accuracy comes first and speed comes later.

All three programs will take you to 30 to 40 words per minute in some 30 half-hour sessions. They can also be used for revision practice. The Atari has a neat random-sentence generation function. Most of the sentences it produces are quite ridiculous as English, but for typing practice this is no great drawback.

Both Touch'n'Go and The Typing Master keep good records of your performance on each test so they could be used for serious classroom teaching. The Atari is only for home or personal use, but there is a separate version of The Typing Master for business and classroom work, called the Configurable Business Version.

Atari International (U.K.) Ltd, 185-195 Ealing Road, Wembley, Middlesex HA0 4QU. Telephone: 01-900 0511

The Typing Master, Anthony Ashpitel, 56 London Road, Harleston, Norfolk IP20 9BZ. Telephone: (0379) 852807

Touch'n'Go, Caxton Software, 10-14 Bedford Street, London WC2E 9HE. Telephone: 01-379 6502

Differences in Apple words

Elderly and fundamentally ill-suited it may be, but the Apple II is still the basis for numerous WP packages. John Dawson tackled the task of comparing them.

ON THE FACE OF IT, the Apple is not ideal for use as a word processor. The standard machine has no separate cursor or numeric keypad arranged so that keys point to the top, bottom and each side of the screen. There are no dedicated function keys and the screen display is only 40 columns wide and lacks lower-case letters. The original machine needs software modification before the shift keys work in a way that would be familiar to a typist. However, additional hardware is available that will correct all these problems.

So why choose the Apple II for a comparative review of word processing programs?

First, the Apple is probably the most popular small business computer of all. About 650,000 Apples have been sold world-wide, and the software base has to be seen to be believed. It means that a large number of word-processing packages are available. Also, someone who buys an Apple to run a specialist program — say, to design concrete beams for buildings, or to record details of patients' medical history — will probably want to do word processing as well.

Second, many of the programs which run on the Apple are also available for other machines, so the review is not only for Apple users. For example, the review also includes the most popular CP/M word processor, WordStar, running on the Apple with a Z-80 Softcard.

The following equipment was used to examine the programs: Apple II Europlus Revision 7 with 48K RAM, 16K expansion RAM board, M+R Sup'r'Term card, 80-column display, DOS 3.3 16-sector disc drives, Microsoft Z-80 Softcard with CP/M, parallel printer card, Epson MX-80F/T printer, and a Philips monitor. With this configuration it is impossible to examine the interaction between the programs and daisywheel printers or how the programs worked with other 80-column cards.

All the programs in this review include the core functions in table 3. The distinction between packages is the extra function incorporated in the package and the manner in which the various functions are performed.

The way in which a word processor interacts with the user is of greater importance than in most other microcomputer software. Very few other packages offering complex command choices are designed to be used continuously for hours on end. Terminals for finding information and confirming a transaction — say airline reservation computers — are used only intermittently by the operator.

The design of the dialogue between the computer and the user can make or break a package. At the most fundamental level the program should be written to take account of the job that it is to do. A word-processor program should respect your appreciation of the language you write in, it should not attempt to distort the way you view a document.

All the packages in the review will search through a text for a specified set of characters. This function allows you to find a word or phrase and replace it with another. However, most of the packages will find the set of characters inside a word and carry out the exchange with bizarre consequences. If you want to change "format" to "layout" and this problem occurs, you will find yourself with "inlayoution", which is not very informative. Most of the packages allow you to avoid this problem in one way or another but the default operation of the program, the way if operates if you leave it alone, should correspond with the way you look at words — as a whole, not as a set of strings of characters.

Easywriter Professional

Easywriter Professional has been developed out of an earlier version which used the standard Apple 40-column display. The program is popular and should be fast in operation as it is written in Forth. Unfortunately, the instruction manual although superficially friendly omits large sections of important information. For example, there is no description of the error messages that the system may generate and how to correct the fault.

The hard carriage-returns put into the

Table 1.

Name of program	Supplier	Telephone	Price (1)	Max.file size in RAM (2)	Cursor	Manual	Help	Phone (7)	P/E (8)	80-col boards
Applewriter II	Apple Computers	—	85	30,460 chars.	*	***	yes	no	no	1 7
Easywriter Professional	—	—	140	12,287 chars.	**	*	yes	no	no	1 3 4 5
Executive Secretary	Keen Computers	0602 412777	235	3,100 words	**	****	no	yes	no	1 3 5
Format 80	Personal Computers	01-377 1200	300	900 words	***	****	no	yes	no	1 2 3
Letter Perfect	Pete & Pam	01-769 1022	100	42,239 chars.	**	***	no	yes	no	1 3 5 6
Supertext II	Village Com. Serv.	01-743 9000	85	14,904 chars.	**	***	no	no	no	3
WordStar	Pete & Pam	01-769 1022	145	Irrelevant	****	*****	yes	no	yes	1 3 5
Zardax	Rocon Ltd.	0235 242306	170	31.5K chars.	**	****	no	no	no	1 3 4 5 6

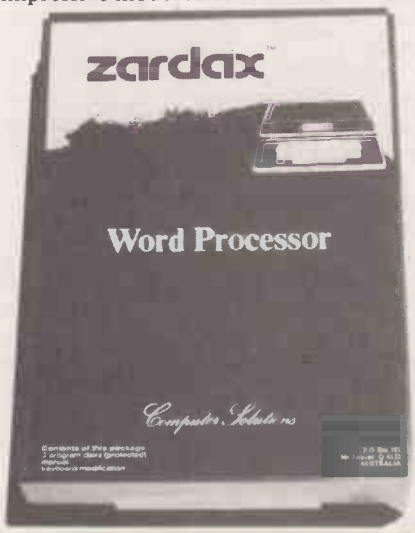
80 column boards key: M+R Sup'r'Term, 1: Omnivision, 2; Videx Videoterm, 3; Doublevision, 4; Smart Term, 5; Vision 80, 6; U Term, 7. The list and the codes are not necessarily definitive. Check with your dealer before buying.
For notes see panel on the right.

text with the Return key do not prevent other Return characters from appearing on the same line until the text is realigned when a blank line is presented. It produces a certain insecurity; for example, it becomes impossible to guarantee a double-line space underneath a heading.

Finally when I attempted to read the text back into the computer the program insisted that the disc on which the file was stored was not formatted. The program refused to budge and the only way to overcome the problem was to reformat the disc, losing 800 words in the process. The organisation that supplied the program asked not to be named, but said that it never recommended anyone to buy Easywriter Professional as it was difficult to obtain help from Information Unlimited Software, the makers, and this problem was typical.

Zardax

Apparantly this program was written because nobody in Australia could find a friendly and effective word processor for the Apple. Zardax comes in a rigid plastic case containing two program discs, the manual, and a clip lead to carry out the Shift key modification. Installing Zardax is fun as the program works out for itself what sort of keyboard you have. It asks you to press certain keys and configures itself according to the results it gets back. It is an impressive model to follow as it is a closed



loop, which will reduce the incidence of problems caused by operator error or ignorance. There are specific installation options for the Epson range of printers in addition to the more usual Diablo, Qume and NEC daisywheel printers.

Zardax will work with either the 40-column screen — lower-case characters are generated by the software — or an 80-column card. The manual contains a lot of information, particularly for programmers who may wish to modify the Zardax system to their own needs.

The cursor controls keep the cursor one or two lines above the bottom of the text area and move the text instead. Thus Control-U, cursor up one line, moves the text down one line. The cursor controls use mnemonics rather than a north, south, east, west layout on the keyboard and Control-L, which moves cursor left one character, is to the right of Control-R. Set against these critisms, you may move a paragraph very easily up or down the text.

There are a number of unusual print commands including: one-and-a-half line spacing for draft purposes, conditional page break, and seven user-definable commands. With an 80-column screen and 48K RAM Zardax will hold a document 21.5K long. With 64K the maximum text size is 31.5K.

The Zardax information manual seems honest, informative and easy to use. The main problem is the lack of word-wrap on text input and editing and the design approach to cursor movement. Although it is possible to merge two files while printing, I was unable to find any way of searching through a list of records to find a selection that matched the user's criteria.

WordStar

WordStar is the reference point against which other packages are measured. That does not mean it is better in every respect than other programs. It is the basis for several dedicated systems and feels like a solid and well-designed piece of software.

WordStar is not user friendly, but neither is it actively hostile. It is, instead, "user indifferent": the facilities are there and, if you use them, the program responds to the level of skill you have achieved.

Table 2 illustrates the approach to controlling the cursor used by the program designers. There are 17 cursor movements and, additionally, commands to scroll the screen up or down one line at a time or by the screenful. You may make the program repeat a command at a variable rate by entering ^ QQ and the command letter. The ^ sign represents the control key.

WordStar has no footnote instructions, cannot add a binding margin to alternate pages for the production of reports and the basic package does not include facilities for merging text with names and addresses. On the other hand WordStar can be used to edit Forth and Basic programs directly, as can Letter Perfect, has no memory-based limitation on the size of files that can be edited at one time, and can be extensively customised and adapted to a user's requirements. WordStar is the only word processor in the group that will print one document while you are editing another on the VDU — P/E column in table 1. The screen width can be increased to 255 characters and the screen scrolls automatically as you enter text.

(continued on next page)

40 cols	WYSIWYG	Print merge	Search	Sort	Recover deleted material	Glossary	Decimal tab
yes	no	yes	yes	no	yes	yes	no
no	yes	yes	yes	no	yes	no	no
yes	no	yes	yes	yes	no	no	yes
no	yes	yes	yes	yes	no	no	yes
yes	yes(4)	yes	yes	no	no	no	no
yes(5)	no	yes	yes	no	no	no	yes(6)
no	yes	no(3)	no(3)	no(3)	no	no	yes
yes	yes(4)	yes	no	no	no	yes	no

Note 1 — The price shown, in £, is approximate and is intended to give a rough price guide for comparison.

Note 2 — Commands in Format 80 allow you to save a page while typing a text. The page number is increased by one without intervention by the user. WordStar acts as a window on the whole text file held on disc, consequently the size of text held in RAM is irrelevant and the maximum file size is about half the disc capacity.

Note 3 — Mailmerge, SuperCalc and Datastar will all work with WordStar to provide these functions, albeit at extra cost.

Note 4 — Videoprint or a similar feature is a way of displaying the text in the computer as it will print on paper. The output from the print section of the program is diverted to the visual display unit rather than the printer. Unfortunately, in Zardax you cannot edit the displayed text.

Note 5 — Supertext II will work with the standard 40-column screen on the Apple but requires a lower-case adaptor; without the extra chip the screen displays meaningless ASCII characters instead of lower-case letters.

Note 6 — Supertext II is unique in this collection of programs in offering maths functions + − * / and column total. As part of this package you may align a column of figures.

Note 7 — Y indicates that the program has the facility to transmit and receive files by telephone using either an acoustic coupler or a hard-wired Modem.

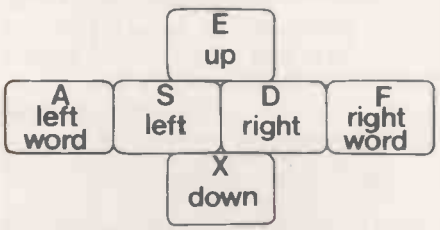
Note 8 — Y indicates that the program will print one file while another is being edited. The response time of WordStar to editing commands remains the same but the printing speed falls considerably.

Apple words

(continued from previous page)

WordStar runs under CP/M, an ageing and abominable operating system. The CP/M operating system requires a Z-80 microprocessor and the Softcard costs about £200. On first running the master CP/M disc supplied with the Microsoft Z-80 card the screen displayed a flashing P and refused to initialise the 80-column card properly. When I installed WordStar and changed the initial help level the program crashed. Only by phoning Pete and Pam Computers could I find the solution — CP/M requires you to switch your printer on before loading the operating system.

Cursor-control keys with WordStar.



None of the CP/M manuals mention this, which is absolutely characteristic of the system and a strong reason for buying your programs from a reputable source who will provide willing and skilled after-sales service.

WordStar now runs without fault and is the most attractive of the systems in the review.

Using WordStar, the printer will always produce what you see on the screen. Print-formatting commands such as justification, double-line spacing, page breaks and centred lines of text work immediately as you type and edit a document. The program has sophisticated Find and Replace commands that will work on some or all of the occurrences of a phrase, in upper or lower case and on a string of characters wherever it appears, or only when it forms a complete word.

Like Super-Text, there are other characters that will carry out special functions in the Find operation; for example, you may match any single character, any character that is not a letter or a digit, any character other than a marked character in the Find phrase, or the two characters Carriage-return, Line feed at the end of each line. The last feature is useful for forming boxes round tables — read the manual to see how it's done.

You can define four printer control code sequences directly using the Install program and some others can be modified to cope with the annoying absence of one-and-a-half line spacing. WordStar is so general purpose that installation is more complex, but not necessarily more difficult, than other programs in the review. Other criticisms include the lack of a command to reform a complete file and the unattractive design of the help messages.

However WordStar is remarkable value for money provided that you are prepared to learn how to get the most out of the system. The WordStar training manual is well designed and takes an operator through a series of lessons. Three books supplement the full instruction manual; *WordStar made Easy* by Ettlin appears to be informative and simple to use.

Table 2. WordStar cursor-motion commands.

^S — Cursor left character. Moves the cursor to the previous character in the file, going to the end of the preceding line if at the beginning of the current line. One common use of this command is to back-space over characters just entered to make a correction. ^H and back-space are equivalent to ^S.

^D — Cursor right character. Moves the cursor to the next character in the file, going to the beginning of the next line if at the end of the current line.

^E — Cursor up line. Moves the cursor up to the preceding screen line. The cursor remains as nearly as possible in the same print column, moving left if it needs to avoid landing beyond the end of a line.

^X — Cursor down line. Moves the cursor down to the next screen line. The cursor remains as nearly as possible in the same print column, moving left if necessary to avoid landing beyond the end of a file line.

^A — Cursor left word. Moves the cursor back to the beginning of a word.

^F — Cursor right word. Moves the cursor forward to the beginning of the next word. This is a fast way to get the cursor to the desired position in a line.

^QS — Cursor to left side. Moves the cursor to the left-most column of the current screen line.

^QD — Cursor to right side. Moves the cursor right to the position after the last character displayed on the current screen line, usually this is not the right edge of the screen.

^QE — Cursor to top. Moves the cursor to the top line of the text area, remaining as nearly as possible in the same column.

^QX — Cursor to bottom. Moves the cursor to the bottom line of the text area, similar to ^QE.

^QR — Cursor to beginning of file. Moves the cursor to the beginning of the document. For a long document, doing a Save, ^KS, is faster and uses less diskette temporary file space if the cursor is currently near the end of the document.

^QC — Cursor to end of file. Moves the cursor to the position after the last character of the document.

^Q0-9 — Cursor to place marker. Moves the cursor to one of 10 place markers. Place markers are set by the operator with the commands ^K0 to ^K9.

^QB — Cursor to beginning of block. Moves the cursor to the beginning of the marked block, and displays the marker if it is presently undisplayed.

^QK — Cursor to end of block. Moves the cursor to the end of the currently marked block, similarly.

^QP — Cursor to position before previous command. Moves the cursor to its position before the preceding command. This command is particularly useful after Saves, to get back to where you were editing, and after ^B paragraph reform, to get back to the point where you were making changes.

^QV — Cursor to start of last find. Cursor to source of last block. Moves the cursor to its position before the last Find or Replace command or to the position of the source of the last block of text moved, copied or deleted, whichever has been used most recently.

Format 80

Format 80 is very nearly very nice. It may be expensive but it is a complete package for writing reports and bulk personal letters, complex mail shots, electronic mail, and card indexing information. The system is supplied with a neat Shift key modification lead that clips into place without any soldering.

Prompt lines at the bottom of the screen set out the commands and functions available to you at any time. Recent additions to the program allow you to save a page of text while typing, simply by pressing Control-Q and the Return key. Format 80 stores text in fixed-format pages on the disc; each page will hold up to 900 words and a disc will hold 17 pages. The text can have consecutive page numbers allocated automatically on the disc or may consist of separate but linked pages on one or both discs. The Search and Replace facility will work automatically on all the pages in a document.

The screen is cleverly organised. It is not possible to scroll the screen horizontally to show a line length in excess of 80 characters. However, you may enter and edit two columns of text on the screen simultaneously before saving them both as a single page. This is useful where material is prepared in both French and English.

The printer-control section of the program, the "installation", is flexible and clearly laid out. It would be useful to be able to keep more than one printer installation on the program disc to cope with draft texts and finished material. The installation contains information about the layout of the document as well as the software control of the printer.

Sorting a list of addresses or other information can be done on any field in the record in ascending ASCII order of priority. A data file can be searched by the

program when it is printing to select only certain records. Format 80 will search on one or more fields within each record and the keywords can be linked by Boolean operators. These facilities are comparable to those in Executive Secretary.

Unfortunately word-wrap does not work when you are inserting text, and the manual instructs you to enter a return character at the end of each line. Most of the time this is unnecessary as the words seem to wrap on to the next line when needed. If they don't you will have to put some time and effort into eliminating the broken word, which breaks the flow of your typing.

Format 80 is not perfect but it is one of the word processors that I would feel confident about using for important work.

Letter Perfect

Letter Perfect is delightfully primitive. The cursor is controlled by the two arrow keys for movement backwards and forwards along a line and Control-V and Control Y are used to move the cursor down and up one line respectively. So far so good. But Control-K moves the cursor to the beginning of a line and Control-Z to the end. If you think that is logical because Z is at the end of the alphabet, what about Control-X which takes you to the beginning of the text?

Despite these eccentricities Letter Perfect behaved consistently. It is not

particularly easy to use because there are many low-level functions that must be carried out one after another in order to achieve the result that you want, but each command or function did what was promised in the manual.

Let me quote from the instructions to illustrate what I mean by primitive: "When you edit, you will cause the text to be pushed around ... As you insert or delete characters, you may find that you cause a single word to be partly at the end of one line and partly at the beginning of the next line. After you have edited a text for a period of time, you may find the text difficult to read. To correct this you will use the improve text feature. The screen will turn blank and then go back to the beginning of the text. As you advance through the text, you will find that all the words have been reparsed. Words that did not fit on the end of a line have been put at the beginning of the next line. This will allow you to read the text with ease."

But why does that have to be a special function that takes you back to the beginning of the text, losing the place at which you were editing? Reformatting the screen, which is your window on to the document held in the computer memory, is a straightforward piece of programming that should be used automatically after any command that alters the text. If you delete a word the text should close up; if you insert a new sentence the screen should look as though it has been there all the time — as though nothing had changed. In the same way you must manually open up the text by typing Control-I for each letter that you wish to insert, unless you want a whole line to write in. If you do open up a blank line you must improve the text when you have finished or the screen will not reflect the actual spacing between words or sentences.

Like most of the other programs Letter Perfect uses a format line, equivalent to a series of dot commands, to control the printer and the layout of the finished document. You can set one or as many Format lines as you like in a text and the printer will be reconfigured in terms of line spacing and type fount, while the layout can be changed by altering the margins, whether or not the text is justified, turning the page numbering on or off, and so on.

Letter Perfect has some database features that you should explore carefully before deciding that they will do what you want. Overall, I could write with Letter Perfect. The program would not help me to write very fast and editing a text would be a chore after using a dedicated word processor. I would not feel anxious, however, about losing text or being unable to recover from a complex series of editing commands. Letter Perfect seems to offer a reasonable price-to-performance ratio.

Applewriter II

This program is the official word processor for the Apple II. People tell me that it was a great improvement on the original Applewriter. Applewriter II "uses a simple but powerful computer language called WPL, Word Processing Language, to automate the process of text manipulation and document creation."

One dealer said that he used WPL extensively to write specialised word-processing programs for his customers; he said it took very little time to create a particular function that could be called up from the program disc. Fair comment, but for an ordinary commercial office or for a person who wishes simply to use the computer as a tool for writing WPL is wholly inappropriate. WPL programs are supplied on the master disc to link files to print a long document automatically, to replace a word or phrase in more than one document on the disc, and to print a number of personal letters using an address file and a standard letter. Most of the other word processors in the review have these functions built into the program as a matter of course.

The cursor controls in the Applewriter II program are not very impressive for three reasons. First, the cursor splits a line of text, becoming a character on the line — a quirk unique to Applewriter II. All the other programs superimpose the cursor on the character that will be affected by the next command. Secondly, it is impossible to move the cursor into the bottom half of the screen when you are writing or editing using an 80-column card. Finally, when you move the cursor vertically it wanders to an arbitrary position on the line to which it is directed. This is intolerable if you are trying to work under pressure. Coupled with the erratic cursor, Applewriter II sometimes lags several characters behind when you are entering text — like a cartoon hero the screen catches up with itself in a rush after you have stopped typing.

It is possible to work with almost any program that behaves consistently; I found Applewriter II an infuriating program to use because I was never certain where the cursor would go next.

As well as offering the normal search and replace facilities Applewriter II has a glossary function. You may have to enter a long word or phrase many times, adenosine diphosphate aspartic acid is a good example. The phrase can be entered into the glossary with a single key letter at the beginning of the first word. When you are entering text you need only type Control-G followed by the key letter. The phrase in the glossary is automatically entered into the text and displayed on the screen. Applewriter II allows you to save a glossary of words on disc for use at a later date.

Applewriter II is the cheapest program in this review and if you have only enough money for this program then you will be able to edit text, store and retrieve what you have written and print it, using as many layout and printer control features as most of the more expensive programs. With the exception of initial text entry, the program works more quickly than Executive Secretary and comes with a manual that is produced to the usual high Apple standards. There are several good features in the program; you can append a document from the disc to the text you are typing, for example, simply by pressing Control-L and the name of the text you want.

However, if you can afford it I think that Letter Perfect is a better buy — at least try to compare the two before making up your mind.

Executive Secretary

Probably the most user-friendly of the bunch, Executive Secretary is slow. I think the program is written in interpreted Basic and if it was rewritten and compiled it might run at a reasonable speed. The high-level facilities offered by the program rival Format 80. The electronic card-index facilities and the Print Merge functions are

(continued on next page)

Apple words

(continued from previous page)

different from those in Format 80, but just as useful. Executive Secretary will allow you to specify index entries while you are typing a book. As the manual says: "An alphabetical index is one of the last things produced for a book since it can't be completed until page numbers are known, and its completion can delay final publication. Indexes are difficult, and indexes are often omitted."

The indexing commands in Executive Secretary record the number of the page on which an entry occurs and, at the end of printing, the entries are sorted alphabetically, combined and formatted. Marvellous.

Unfortunately the cursor controls are unimpressive. The cursor returns to the beginning of the same line when it reaches the end of a line, rather than following the text on to the next line down. When using an 80-column board you have to press the command to return the cursor to the start of the line twice for it to be effective, the first entry places the cursor in the centre of the line. Unlike Applewriter II you can always see text as you enter it on to the screen, but if you want to type a line of characters that is longer than the width of the screen a word processor should recognise that this is a special case and should not wrap the line on to the next line down.

If you have the time and are aware of the failings of the program, Executive Secretary has a charming dialogue with the user and some unique facilities that you may find invaluable.

Super-Text

Super-Text appears to be a straightforward program, a hybrid of Letter Perfect and Applewriter II. I was unable to use the program sensibly in the 40-column mode as I had no lower-case adaptor, and Super-Text will not work with the M+R Sup'r'term board. Nevertheless, the manual makes the program look fairly easy to use.

Super-Text is unique in offering maths functions. The program will act as a 15-digit calculator and will also work on figures contained in a document. You may total columns of figures and perform other calculations using the standard four functions, + − * /, and exponentiation. The results of calculations can be inserted into the text. Values greater than nine digits are expressed in scientific notation.

The program has a form of decimal tab and you can align a column of figures before adding them together. The maths operators cannot be incorporated into the text and there is no facility to automatically recalculate a total if you change one of the constituent entries.

Super-Text has a feature known as Autolink that connects a number of files for the purpose of printing a very long document or searching for and replacing defined phrases in more than one file.

Conclusions

● If you buy a word processor for the Apple II it is worth going to a shop that will back up the sale. All the companies listed in table 1 answered my questions patiently, sent replacement discs promptly when something appeared to have gone wrong, and provided support for the products they supplied.

● The poor quality of several expensive programs for the Apple II is surprising.

● Executive Secretary had a tendency to crash with the fateful words, Break in line, a sign of inadequate error trapping. Easywriter locked up and would not use a disc with an Easywriter text on it after it had loaded it successfully at least once — apparantly not uncommon. Format 80 requires you to change your method of typing when you are inserting text. These errors are elementary program design faults. Zardax at least has the grace to admit that bugs do occur and recommends that you should keep your files up to date by saving them to disc at short and frequent intervals — sound advice.

● The speed at which the program operates is another fundamental criticism of some of the packages. Executive Secretary is slow in operation. Easywriter Professonal and WordStar were also slow in parts. Whether or not this is important is a matter you much decide. When you examine a program make sure you have a text in the machine that is representative of your work in terms of length.

● It is almost impossible to press the Left-arrow key and the Repeat key simultaneously with two fingers on your right hand. Most of the programs used the arrow keys to control the movement of the cursor along a line. You will use the Repeat key frequently when you are editing text and should check the cursor control thoroughly with the Repeat key before choosing one of the programs.

● Technical writing is not easy but the manual for Executive Secretary is excellent. Less friendly but still well written are the instructions for Format 80, followed closely by WordStar and then perhaps, Zardax.

● I would rank the programs roughly as follows:

1= WordStar and Format 80
3 Letter Perfect
4= Zardax, Executive Secretary and Super-Text
7 Applewriter II
8 Easywriter Professional

Table 3. Core functions present in all the word processors.

- Write a new text
  - Word-wrap available while text is entered
  - Use ordinary tabs
  - Format the text by indenting and centering lines
- Store a text on disc or tape
- Retrieve a text from disc or tape
- Add a text or part of a document on disc to an existing text in the computer
- Change or edit the text in the computer
  - Move the cursor to any part of the document
  - Insert and delete text
  - Find and replace words or phrases
  - Realign text after changes are complete
  - Copy or move a block of text
  - Set and clear tab stops
  - Word-wrap should operate throughout the editing function unless you make a decision to turn it off
- Print a text in the computer or on disc
  - Dot commands or an equivalent to set:
    - Left and right margins
    - Top and bottom margins
    - Page numbering
    - Heading and footer text
    - Page break
    - Form length
    - Justification
    - Line spacing
- Continuous stationery or cut sheets
- Link files to print documents larger than the computer memory
- The program should accept material typed at the keyboard. The keyboard should behave as nearly as possible like a standard typewriter. This review is not about alternative-chord keyboards such as that on the Microwriter. The Shift and Shift-lock keys should function normally — Format 80 is the only program in the review to achieve this. Dedicated keys should be used for special functions where possible, particularly for editing where the peripheral position of the keys will not slow text entry.
- Most common paper sizes allow between 60 and 80 characters on each line. For some word-processing tasks it is not essential that the full 80 columns should be displayed but it is easier to edit text and prepare tables on a screen that is wide enough so that "What You See Is What You Get", WYSIWYG.
- True lower-case descenders in which the down-stroke of letters, such as q, y and g, is below the line of the text makes a display far easier to work with for long periods. The 80-column boards available for the Apple II vary in their ability to display descenders.
- Dot commands are special non-text lines entered into a document for purposes such as setting the paper length, specifying a heading or the current page number. A full stop in the first column of the line is assumed to be impossible in normal text and signifies to the computer that the rest of the line is to be treated as a printer command. Zardax uses Control-0 instead of a full stop — the effect is identical but less prone to error.

Perfect Writer

```
Perfect Writer 1.03 (Fill) perfect: PERFECT.MSS -100%-  +
Switch to Buffer (CR): 
```

Chris Bidmead looks at Perfect Writer, a package to challenge WordStar.

WHEN CONFRONTED by a word-processing product called Perfect Writer one might pause for a moment's contemplation of the meaning of the word "hubris", and then pass on to more serious matters. After all, who needs a new word processor when we already have an old favourite like WordStar?

Perfect Writer embodies a minicomputer text-handling philosophy call Emacs, which was developed in the Massachusetts Institute of Technology. Emacs design has matured over years of use and is full of good things, but inevitably they tend to clutter up the image of the product for the first-time user. For example, there are over six different ways of moving the cursor; seven completely separate chunks of text can be edited simultaneously; and the screen can be split if necessary for simultaneous viewing of two different sections of the same text, or sections of two different texts.

Back on the shelf

You will already have gathered that there is a great deal to explain about Perfect Writer, and the manual tackles the job thoroughly, but without undue redundancy. It works well as a source of retrospective reference as well as leading you up the learning curve and into the operation. So it was not the manual's fault that within a couple of days I had put the software back on the shelf and returned to my regular word processor.

Two things seemed patently wrong with Perfect Writer as a usable tool. In the first place it appeared too wordy. In WordStar you can change from Insert mode to Overwrite mode by toggling Control-V; in Perfect Writer you have to type Control-X Control-M, which calls up the prompt asking for a mode name, to which you then respond with the word

Overwrite

In WordStar you can include a non-printing comment in a text by introducing it with two dots at the beginning of the line. Perfect Writer insists that you wrap up your comment in brackets and precede it with @comment — the in-built commands in Perfect Writer all begin with @.

The second unpleasant surprise is that printing out a text is a two-stage operation if you want the normal embellishments like underlining. First you have to run it through a format program called PF.Com, and only then is it ready for PP.Com, the program that sends text to the printer. It all makes a major chore out of knocking off a single A4 missive to the tax inspector.

The real strength of Perfect Writer did not strike me until much later, when curiousity and the need to cope with the novelisation of a TV script eventually drew me back to the package. WordStar is often celebrated — by those who do not use it much — for its ability to scroll files of any length through the screen area. This is supposed to be superior to systems like Vector Graphic's Memorite where the work file has to be small enough to fit into what is left of the transient program area once the program is loaded. With Memorite this leaves about 30K of workspace — say 15 minutes worth of a spaced-out TV script, or about 6,000 words of packed prose.

```
(Perfect Writer) Perfect Printer Selection Menu
(C) 1982 Perfect Software, Inc.

      Available options for Perfect Printer are:
        N - Start printing at a page other than page 1
        O - Send to a different output port than the default
        P - Pause for manual insertion of each sheet of paper
        C - Print mutiple copies of the file
        G - Start Printing the file now
        X - Return to the top level of the menu

pp PERFECT
Your pleasure: (N, O, P, C, G, X) 
```

Too big to handle

A file of this size is handled speedily by in-core systems, but in WordStar is already large enough to show signs of sluggishness, particularly when you try to scroll backwards through it on a dual-floppy system. Perfect Writer's virtual-memory approach is potentially much slicker. One section of the program manages a notional internal buffer that is mapped in 1K segments on to a large disc file, called a swap file. The mapping is done in such a way as to pretend to the rest of Perfect Writer that the whole space is available as core memory.

This is not a million miles from the WordStar idea, except that true random access is used in the mapping. When you scroll to a piece of text that is not actually in memory the memory-management system brings in the relevant block, quietly writing another section of recently revised text back to disc to make room. Segments of text that have been scrolled through the screen but not revised are recognised as not needing recommital to disc and are left alone.

The memory manager keeps trying to anticipate your next move by checking the text in core to see if it differs from comparable sections of the swap file. In the intervals between your keyboard entries it nips in and squirrels revised sections back to disc.

All this is supposed to happen unobtrusively, but of course a lot will depend on how well your backing store behaves. On my stately twin Micropolis drive system the effect was sometimes like that recurrent dream of trying to swim through creme caramel. Before it can go into operation on a text file Perfect Writer has to transfer all the data into the swap file, and with the Micropolis drives this seemed to take forever. Once loaded the system was usable, although the Swapping message it sent whenever there was internal housekeeping to be done tended to hold things up.

Pefect Writer was working well enough to give a picture of how it ought to behave with a speedy disc behind it. Happily at this point the office acquired a very fast hard-disc machine, the Almarc Series 8, and I was able

(continued on next page)

(continued from previous page)
to transfer Perfect Writer and my text files across to it. Since then, as they say in the ads, I have used no other.

Why? You may well ask, if the package is so off-putting initially. The answer lies largely in the speed of the new computer. Experience is already showing that the advent of low-cost Winchester disc technology far outweighs in practical importance the much-advertised arrival of 16-bit machines. Perfect Writer exemplifies this rather well.

The "feel" of Perfect Writer is far more organic than other word processors I have used. The cursor moves in natural text units; not just by line or column in the ordinary way, but also by word, both forwards and backwards. So, you may say, does the WordStar cursor, but Perfect Writer goes further. You can skip through the text sentence by sentence or paragraph by paragraph in either direction. That may not sound particularly impressive, but when you are engaged in heavy revision of long texts you gratefully discover you can get the cursor to where you need it just about as fast as you can think.

Step forward

This alone would be worth the price of admission, but there is more. You can delete by those same text units: by word, by sentence and by paragraph. The responsiveness of being able to put the cursor anywhere inside a paragraph and just hit Control-H Control-W to remove it makes you realise what a chore it used to be to have to set markers fore and aft as a prelude to every Block Delete, Move or Copy operation.

What happens when you want to operate on sections of text that are bigger or smaller than the basic units? Here you will need markers, but the process is simple. Position the cursor at one end of the block and hit <Esc> <Spacebar>. A flag comes up on the bottom line saying Marker Set. Now position the cursor at the end of the block. Hit Control-W and the block has gone.

Compare this with WordStar, where you have to set a pair of markers explicitly, <B> at the beginning of the block and <K> at the end. And you'd better make sure they are the right way round or WordStar objects.

In the Emacs lifestyle there is no essential difference between deleting text or moving it. Every time you make a deletion that is larger than a single character the text is stored in an invisible buffer called the Kill Buffer, until the time of the next deletion. This has two advantages: careless deletion can be repaired instantly, and moving text is simply a matter of repositioning the cursor and hitting Control-Y.

Once you are used to this you can induce the kill Buffer to accumulate chunks of text by inserting <Esc> Control-W before you make each deletion. Provided you know what you are doing you can use this technique to mount a very fast cut-and-paste operation; for example, zipping though a large text to gather together the bones of a synopsis.

This accumulation will not be visible until you yank it back with the Control-Y command. If you prefer to see the assembly in progress you can use another major feature of Emacs and switch in a completely separate area of memory, or rather of the swap File/Core virtual memory combination. Just send Control-X Control-B, and the prompt Switch to Buffer will appear, inviting you to type in a name.

Two texts together

As this is a new buffer you type Newbuff, or whatever, by way of identity and after confirming that you are not trying to access a buffer already in existence Perfect Writer presents you with a blank screen that represents the new work-area. A Control-Y at this point will deposit the contents of the Kill Buffer on to the screen. From here on you flick back and forth between your two work areas, picking up text from one and depositing it in the other.

The system allows up to seven of these separate buffers, and the command Control-X 2 splits the screen into two halves, enabling you to do a side-by-side comparison of texts. The total quantity of text the buffers can handle is defined by the size you choose for the swap file.

On a dual-floppy system 64K is about the practical limit, but on the Winchester-based machine I work with the ultimate ceiling, a 256K swap file. I can happily juggle files of up to 40,000 words before the Out of Memory flag goes up.

Text filter

Once your text is edited, step 1, you have to feed it through a filter program, step 2, to ready it for printing. I have already mentioned the disadvantages of this, but on the positive side the process allows you to include a variety of format directives in the text, which the filter converts from ASCII instructions into code that will be understood by the printer program, step 3.

In this respect the formatter works rather like a compiler. An initial header to set up parameters like margins and line spacing will look something like this:

```
@style (top margin 3 lines,
bottommargin 3 lines, leftmargin 10 char)
```

This is wordy, but clear in its intent. If your documents never depart from a standard layout you can set up the defaults when you install Perfect Writer on your system.

If you have several established standard layouts that you use for different kinds of document you can make each header a separate file and use the appropriate one by beginning your text with, for example:

```
@include(Tvscript.hdr)
```

where the file Tvscript.hdr contains the header you always use for TV scripts.

The header can also define constants to be printed at the top and bottom of each page in the same way as WordStar's .he and .fo commands. To set up a chapter heading your text will read:

```
@chapter(The Die Is Cast)
```

which will force a new page before printing, and centre and boldface the title. It will also number the chapter for you. If the document is a technical manual the chapter might be divide into sections, in which case the instruction:

```
@section(Replacing your Dynamo)
```

will produce an underlined, numbered heading in the familiar cc.ss format, where cc is the chapter number and ss is the section number. This process can be continued through @subsection down to @paragraph level.

The one thing missing in all this is WordStar's enviable ability to show you on the screen exactly where the pages are going to break. There is no way round this other than tediously printing out an initial rough draft, but if you have WordStar already it is easy to cheat and transfer the file across to it for the final printing.

Final touches

Perfect Writer produces a standard CP/M text file, with no high bits set and hard carriage-returns at the end of each line. If you want to do a last-minute polish in WordStar you may have trouble readjusting the formatting. And of course none of the @ format commands will make any sense.

The only other thing wrong with Perfect Writer is that the vendors seems to have vanished from their New York offices without a forwarding address. Mail to them remains unanswered, and a transatlantic phone call is met by the metallic tones of a computer voice telling you the number has been disconnected. Can it be that hubris has met its nemesis?

There is little point in lauding the praises of a product you cannot get hold of, but some detective work behind the scenes has revealed that Perfect Software bought the source code for its product from Mark of the Unicorn. This firm sells an almost identical word-processing system in two separate packages as Mince, the editor, and Scribble, the formatter and printer.

You will not get the luxurious blue-bound manual that accompanies Perfect Writer, but the Mince documentation comes with an extensive discussion about Emacs text editors in general. For the programmer it provides substantial sections of source code in case you want to emend existing functions or add new ones. Mark of the Unicorn is to be found at: PO Box 423, Arlington, Massachusetts 02174.

Conclusions

- **Perfect Writer embraces the Emacs philosophy, which is initially less attractive than more familiar word processors.**
- **The system is not particularly easy to use for small quantities of text, but can handle very large files with ease and speed.**
- **Extensive formatting intelligence is built in, which makes it ideal for technical writing.**
- **Perfect Writer, Mince and Scribble are all written in C language, which means the system should become available on 16-bit machines.**

WP packages

OVER THE PAGE is a table listing some of the main word-processing packages and their special features. They will all do the basic WP tasks, as described on page 95.

The table does not claim to be comprehensive. Practically every micro has its own special or recommended WP package, but these are only really of interest to owners of the particular machine. We have tried to list the newer and the more interesting packages, but the fact that a package has not been listed does not imply that it is not useful or interesting.

Special features

List Processing. The ability to place into a standard document details taken from a separate list — for instance placing names and addresses into a form letter to generate a whole number of personalised letters.

Maths Facilities. Offered by some WP packages, allowing numbers to be placed neatly in columns and permitting limited arithmetic processing.

Spelling Checkers. Built in as standard in a few packages; dubious spelling is detected and either displayed for the user's approval or, on request, altered to whatever seems plausible to the software. The Spelling-Checker table covers separate stand-alone spelling packages. They will generally work with any word processor which uses the standard file type of the machine in question, although it as well to check before purchasing.

Dictionary size. The number of pre-defined words the package will recognise.

Suppliers

Adds U.K. Ltd, 137-141 High Street, New Malden, Surrey KT3 4BH. Telephone: 01-949 1272.

Alan Pearman Ltd, Maple House, Mortlake Crescent, Chester CH3 5UR. Telephone: (0244) 46024.

Apple Computer (U.K.) Ltd, Finway Road, Hemel Hempstead, Hertfordshire HP2 7PS. Telephone: (0442) 48151

Acornsoft Ltd, 4A Market Hill, Cambridge CB2 3NJ. Telephone: (0223) 316039

Cambrian Software, Gwynllys, Croeslon, Caernarfon, Gwynedd LL54 7ST. Telephone: Llanwnda (0286) 831072

Commodore U.K., 675 Ajax Avenue, Trading Estate, Slough, Berkshire. Telephone: 01-997 6666

Compucorp Ltd, Cunningham House, Westfield Lane, Kenton, Middlesex. Telephone: 01-907 0198

Dataview, Radix House, East Street, Colchester, Essex C01 2XB. Telephone: (0206) 869414

Encotel Systems, 7 Imperial Way, Croydon, Surrey CRO 4RR. Telephone: 01-680 6040

EOS Electronic Office Services, 235-241 Blackfriars Road, London SE1 8NN. Telephone: 01-928 3377

Graffcom Systems Ltd, 102 Portland Road, London W11 4LX. Telephone: 01-385 9422

Intelligence (Ireland) Ltd, Nagor House, Dundrum Road, Windy Arbour, Dublin 14. Telephone: Dublin 788555

Interface Microsystems, 57 High Street, Gread Baddow, Chelmsford, Essex CM2 7HJ. Telephone: (0245) 76766

IBR Microcomputers, Unit 57, Suttons Industrial Park, London Road, Earley, Reading, Berkshire. Telephone: (0734) 664111

Kuma Computers, 11 York Road, Maidenhead, Berkshire. Telephone: (0628) 71778

Microtechnology, 51 The Pantiles, Tunbridge Wells, Kent. Telephone: (0892) 45433

Molimerx Ltd, 1 Buckhurst Road, Bexhill-on-Sea, East Sussex. Telephone: (0424) 223636

MPSL Microproducts Software Ltd, 87-89 Saffron Hill, London EC1N 8QU. Telephone: 01-831 8811

Microtrend, PO Box 51, Pately Bridge, Harrogate, North Yorkshire HG3 5DF. Telephone: (0423) 711878

Moffat Rose Ltd, 16-26 New Oxford Street, London WC1A 1EH. Telephone: 01-405 3400

Microcomputer Applications, 41 Queen's Road, Blandford Forum, Dorset DT11 7LA. Telephone: (0258) 55100

Micropro International, 31 Dover Street, London W1

NEC Business Systems (Europe) Ltd, 164-166 Drummond Street, London NW1 3HP. Telephone: 01-388 6100

Pete & Pam Computers, New Hall Hey Road, Rossendale, Lancashire BB4 6JG. Telephone: (0706) 22011

Peachtree Software International Ltd, 43-53 Moorbridge Road, Maidenhead, Berkshire SL6 8LT. Telephone: (0628) 32711

Personal Computers Ltd, 220-226 Bishopsgate, London EC2A 4JS. Telephone: 01-377 1200

Precision Software Ltd, 4 Park Terrace, Worcester Park, Surrey KT4 7JZ. Telephone: 01-330 7166

Redwood Bureau Services, 2 High Street, St Albans, Hertfordshire AL3 4EH. Telephone: (0727) 38138

SBD Software, 15 Jocelyn Road, Richmond, Surrey TW9 2TJ. Telephone: 01-948 0461

Silica Shop, 1-4 The Mews, Hatherley Road, Sidcup, Kent. Telephone: 01-301 1111

Systematics International Microsystems Ltd, Cleves House, Hamlet Road, Haverhill, Suffolk. Telephone: (0440) 61121

Tabs Ltd, Sopers House, Chantry Way, Andover, Hampshire SP10 1LU. Telephone: (0264) 58933

Wisbech Computer Services Ltd, 10 Market Street, Wisbech, Cambridge PE13 1EX. Telephone: (0945) 64146

Spelling checkers

	Price	Manufacturer	Origin	Runs on	Dictionary size	American spelling	U.K. spelling	Source
Dictionary	£65	Sierra Online	U.S.	Apple II Dos 3.3	28,000	yes	no	SBD, EOS, Pete & Pam
Easyspeller	£125	Information Unlimited	U.S.	MS-DOS, CP/M-86	90,000	yes	no	Pete & Pam
Hexspell	£52	Hexagon	Canada	Tandy I, Genie I & II	30,000	yes	yes	Molimerx
Proof	£120	Cambrian	U.K.	Apple II Dos 3.3	45,000	yes	yes	Cambrian
Red Pencil	£60	IJG	U.S.	TRS-80 I, III, Genie	50,000	yes	no	Micro Applics
Spellcheck	£200	Lexisoft	U.S.	CP/M, Oasis, Exidy	10,000	yes	no	Encotel
Spelling Proofreader	£100	Peachtree	U.S.	CP/M, CP/M-86	20,000	no	yes	Peachtree
Spellguard	£179	Sorcim	U.S.	CP/M	23,000	no	yes	Microtrend
Spellstar	£120	Micropro	U.S.	CP/M	20,000	yes	no	Micropro

	Price	Manufacturer	Machine or operating system	List processing	Math
Ajedit	£43	Molimerx	TRS-80 I or Genie	yes	no
Apple Writer II	£89	Apple	Apple II	yes	no
Apple Writer III	£133	Apple	Apple III	yes	no
ATP-80	£260	Redwood	CP/M	yes	yes
Autowriter	£400	MPSL	BOS	yes	no
Benchmark	£232	Metasoft	NEC PC-8000	yes	yes
Easywriter 40	£50	Information Unlimited	Apple II	yes	no
Easywriter II	£235	Information Unlimited	IBM PC-DOS	no	no
Electric Pencil	£70	IJG	TRS-80 I or III, Genie	yes	no
Format-80	£199	Elite Software	Apple II	no	yes
For:Word	£380	Fortune Systems	Fortune 32:16	yes	yes
Jot	£95	Alan Pearman Ltd	CP/M-86, MS-DOS	yes	yes
Letter Perfect	£99	LJK Enterprises	Apple II	no	no
Letter Perfect		LJK Enterprises	Atari	no	no
Lexicom	£350	Microtrend	CP/M	yes	yes
Microscript	£275	Intelligence (IRL)	CP/M, MP/M		yes
MVword	£500	Adds	Multivision	yes	no
Omega B	£700	Compucorp	Compucorp 600	yes	yes
Peachtext	£250	Peachtree	CP/M, CP/M-86	yes	no
Rosewood I	£350	Moffat Rose	CP/M	yes	yes
Screenwriter II	£75	Sierra Online	Apple II	yes	no
SI Word processing	£175	Systematics International	UCSD P-System	yes	no
Spellbinder	£289	Lexisoft	CP/M, Oasis, Exidy	yes	yes
Super Text II	£85	Muse	Apple II	no	yes
Superscript	£249	Precision	Commodore	yes	no
Superwriter	£249	Sorcim	CP/M-80, MS-DOS	yes	no
Tabwriter	£125	Tabs	Apple II, CP/M, MS-DOS	yes	no
Uniplex	£450	Redwood	Unix with compiled C	yes	no
View	£52	Acornsoft	BBC model A or B	no	no
Wdpro	£80	Kuma	Sharp MZ-80A, B and K	no	no
Word Handler	£109	Silicon Valley	Apple II	yes	no
Wordcraft	£425	Dataview	Commodore	yes	no
WordStar	£250	Micropro	CP/M, CP/M-86, MS-DOS	yes	no
WP System	£200	ML Systems	CP/M with COS	no	no
WP-2020	£290	Graffcom	CP/M	yes	no

Spelling	Training	Comment	Source
no	no	straightforward beginner's WP	Molimerx
no	no	needs Sup'R'term 80-column card	all Apple dealers
no	yes	powerful stored-command featue	most Apple dealers
no	yes	powerful stored-command feature	Intelligence, Microtechnology
no	yes	multi-user version £750	MPSL
no	yes	uses colour, for example when moving block	NEC
no	no	40-column WP for unexpanded Apple	Pete & Pam
no	yes	matching list and spelling programs	EOS
no	yes	cassette version £60	Microcomputer Applications
no	yes	works with most 80-column cards	Personal Computers Ltd
yes	yes	90,000-word U.S. speller, index-building	IBR
no	yes	APL founts, plotter-driving version £295	APL
no	no	80 cols with Videx or Sup'R'term, 40 without	Pete & Pam
no	no	£110 disc or £150 ROM version	Silica Shop
no	yes	index compiling, table of contents	Microtrend
no	yes	has 40 memories for margins, numbers, commands, etc.	Intelligence (IRL)
no	yes	links to other Adds packages	Adds
yes	yes	foreign dictionaries available for speller	Compucorp
no	yes	available for most 16-bit machines	Peachtree
no	no	includes form-design package	Moffat Rose
no	no	gives 70 columns without add-on card	SBD, Pete & Pam
no	yes	links to other Systematics International packages	SI
yes	yes	multiple founts with some printers; sort	Encotel
no	no	40-column WP for unexpanded Apple	Pete & Pam
no	yes	file compatible with Silicon Office	Precision
yes	no	powerful mailing list and form letter	Pete & Pam
no	yes	available for wide range of machines	Tabs
yes	yes	multi-user WP with electronic mail	Redwood
no	no	comes on ROM, uses cassette or disc files	Acornsoft
no	no	cassette version £40	Kuma
no	no	gives Apple 66 columns without card	Pete & Pam
no	yes	can use VisiCalc data, maths add-on	Dataview
add	yes	best-selling CP/M word processor	most CP/M dealers, Micropro
no	yes	requires COS at £260	Interface Microsystems
yes	yes	built-in 25,000 word U.K. spellings	Graffcom

Form letters on

WORDSTAR IS one of those programs which you either love or hate. After the initial shock at the size of the manual I discovered that this was the word-processing program for me.

My WordStar came with an Osborne 1 computer which I had bought to use in direct-mail applications. When I came to examine the manual I found that it did not include any listings of exactly what I wanted so I wrote an extra suite of programs to tailor the package to my needs.

A form-letter system enables you to send the same letter to a large number of addressees taken from a file of names and addresses. Many packages — including the American Postmaster and NAD which I have used in the past — are of limited use since they cannot cope easily with long, unusual or overseas addresses. The Formlet system solves this problem by using sequential files for the names and addresses. It also addresses envelopes but dispenses with the extraction and sorting of records, which I do not find necessary.

The suite of programs consists of three command files Form.Cmd, Let.Cmd and Env.Cmd. which will normally be on drive B. The user will provide two additional files, the first with the text of the letter and the second a data file containing the addresses and other information.

Demonstration

The first file is entered in the normal way using WordStar, but the data file is best entered and maintained using a CBasic program Formlet.Bas. Demonstration listings Demo.Let. and Demo.Adr are included as an example of what is required to complete the suite.

The command files contain Dot commands to the printing routines inside Mailmerge. They are explained in more detail in the WordStar manual, but I have added comments using two dots to clarify them. These comments may be omitted, if you wish, when you copy the listing.

Small data files can be entered directly using WordStar's N command. It is difficult to do this accurately, and I would recomend using the CBasic program listed here to enter, change and delete records.

To use the program, type in the listing, using WordStar's N command and the file name

B:FORMLET.BAS

Do not type in the sequential line numbers in the left-hand margin, which are supplied by CBasic during compilation, only those in increments of 100 which are used as labels.

When you have finished, put CBasic in drive A and your program in drive B. Type

A:CBAS2 B:FORMLET

and the program Formlet.Bas will be

Formlet.Bas program, used for maintaining data files.

```
A>A:C 2.07  COMPILATION OF B:FORMLET

   1:        REM             FORMLET.BAS  VER 1.0
   2:        REM             OSBORNE 1   CBASIC
   3:
   4:        REM             A PROGRAM TO MAKE
   5:        REM             AND MAINTAIN FILES OF
   6:        REM             NAMES AND ADDRESSES
   7:        REM             FOR FORM.CMD VER 1.0
   8:        REM
   9:        REM             C D.R.GREEN 1982
  10:
  11:        REM  ************************************
  12:        REM  THIS CODE IS SYSTEM SPECIFIC AND MAY
  13:        REM  NEED TO BE CHANGED FOR OTHER SYSTEMS
  14:
  15:        CLS$ = CHR$(26)          REM CLEAR SCREEN
  16:        US = CHR$(27)+"l"        REM UNDERLINE ON
  17:        FS = CHR$(27)+"m"        REM UNDERLINE OFF
  18:
  19:        REM     END OF SYSTEM SPECIFIC CODE
  20:        REM  ************************************
  21:
  22:                        CS = CLS$
  23:
  24:
  25:        REM                     MENU
  26: 100    PRINT CS
  27:        PRINT TAB(12);US;"FORM-LETTER VERSION 1.0";FS
  28:        PRINT
  29:        PRINT
  30:        PRINT TAB(20);US;"MENU";FS
  31:        PRINT
  32:        PRINT
  33:        PRINT "  M.  Make a new address file."
  34:        PRINT "  A.  Add records to an existing file."
  35:        PRINT "  E.  Edit records in an existing file."
  36:        PRINT "  P.  Print out formatted listing of file."
  37:        PRINT "  X.  Exit to CP/M."
  38:        PRINT
  39:        PRINT
  40:        PRINT TAB(8);US;"ENTER M,A,E,P or X TO CONTINUE";FS
  41:        PRINT
  42:        PRINT
  43:        INPUT "    "; LINE A$
  44:
  45:
  46:        MENU% = MATCH(UCASE$(A$),"MAEXP",1)
  47:        IF MENU% = 0 THEN 100  REM REPEAT MENU
  48:
  49:        ON MENU% GOSUB 200,200,1000,1700,1800
  50:
  51:        GOTO 100                        REM MENU
  52:
  53:
  54:
  55:        REM  ********  ENTRY ROUTINE  ********
  56:
  57: 200    GOSUB 2700          REM INPUT FILENAME
  58:        A$ = "Y"
  59:        ON MENU% GOSUB 2100,2200  REM TEST IF FILE EXISTS
  60:        IF UCASE$(A$) = "Y" THEN 300
  61:
  62:        RETURN     REM TO MENU IF WRONG OPTION
  63:
  64: 300    FILE FILENAMES      REM OPEN THE FILE
  65:
  66:
  67:        RECORD.NO% = 1
  68:        IF END #1 THEN 500
  69:
  70: 400            READ #1;DUMMY%,NAME$,COMPANY$,ADDRESS1$,ADDRESS2$,\
  71:                        TOWN$,POSTCODE$,COUNTRY$,TITLE$
  72:
  73:                RECORD.NO% = RECORD.NO% + 1
  74:                GO TO 400          REM GET TO END OF FILE
  75:
  76: 500            GOSUB 2400         REM INPUT DATA
  77: 600            GOSUB 2300         REM PRINT OUT RECORD
  78:
  79:                PRINT
  80:                INPUT"  Is this correct? (Y/N)";LINE A$
  81:                IF UCASE$(A$) = "Y" THEN 700
  82:
  83:                GOSUB 2500 : GOTO 600  REM PRINT OUT AGAIN
  84:
  85: 700            PRINT #1;RECORD.NO%,NAME$,COMPANY$,ADDRESS1$,ADDRESS2$,\
  86:                        TOWN$,POSTCODE$,COUNTRY$,TITLE$
  87:                PRINT
  88:                PRINT
  89:                INPUT"  Do you wish to continue? (Y/N)";LINE A$
  90:                IF UCASE$(A$) = "Y" THEN GOTO 800 \
  91:                        ELSE GOTO 900
  92:
  93:
  94: 800            RECORD.NO% = RECORD.NO% + 1
  95:
  96:                GO TO 500     REM INPUT NEXT RECORD
  97:
  98: 900    CLOSE 1          REM GET HERE WHEN FINISHED
  99:
 100:        RETURN     REM TO MENU
 101:
 102:
 103:
 104:        REM  *******  AMMENDMENT ROUTINE  *******
 105:
 106: 1000   GOSUB 2700        REM INPUT FILENAME
 107:        FLAG% = 0
 108:        IF SIZE% = 0 THEN PRINT :\
 109:        PRINT US;"THIS FILE DOES NOT EXIST";FS :\
 110:        PRINT : INPUT "Press Return to restart";LINE A$ :\
 111:        RETURN           REM TO MENU
 112:
 113:        GOSUB 2600       REM MAKE TEMPORY FILENAME
 114:        PRINT
 115:        INPUT "  Start at record number?";LINE A$
 116:        REC% = VAL(A$)
 117:
 118:        FILE FILENAMES           REM #1   OLD FILE
 119:        FILE TEMP$               REM #2   NEW FILE
 120:        IF END #1 THEN 1600
 121:        NEW.RECORD.NO% = 0
 122:
 123: 1100       READ #1;RECORD.NO%,NAME$,COMPANY$,ADDRESS1$,ADDRESS2$,\
 124:                   TOWN$,POSTCODE$,COUNTRY$,TITLE$
 125:
 126:             IF FLAG% = 1 THEN 1500
 127:            IF RECORD.NO% < REC% THEN 1500
 128:
 129: 1200        GOSUB 2300       REM PRINT ON SCREEN
 130:
 131:            PRINT
 132:            INPUT"  Accept? (A), Change? (C), Delete? (D), eXit? (X)";\
 133:                   LINE A$
 134:
 135:            A$ = UCASE$(A$)
 136:            ON MATCH(A$,"ACDX",1)+1 GOTO 1200,1500,1300,1100,1400
 137:
 138: 1300       GOSUB 2500               REM CHANGE
 139:            GOTO 1200
 140:
 141: 1400       FLAG% = 1             REM EXIT
 142:
 143: 1500       NEW.RECORD.NO% = NEW.RECORD.NO% + 1
 144:
 145:            PRINT #2;NEW.RECORD.NO%,NAME$,COMPANY$,ADDRESS1$,ADDRESS2$,\
 146:                   TOWN$,POSTCODE$,COUNTRY$,TITLE$
 147:
 148:            GOTO 1100
 149:
```

WordStar

For his direct-mail operation David Green chose an Osborne, but anyone can use his suite of programs to develop their own mailing-list facility.

compiled to Formlet.Int. To run, type

A:CRUN2 B:FORMLET

The program is menu driven, and allows you make a new file, add new items to an existing file, amend or delete individual records, list the file, and return to CP/M. Options M and A are really the same, except that an error message warns that you may be doing the wrong thing if you use the wrong one unintentionally. Option E allows you to review each record, and Accept, A; Change, C; Delete, D; or Exit, X to return to the menu.

When replying to the request for a file name and when entering address data in all the options, a single backslash followed by Return will enter the same value as previously entered to that question. This is particularly useful when entering many addresses from the same town or county, and in changing records when only one field is in error.

The maximum number of characters in any field is 255. The data is stored sequentially in the file with a record number and eight fields. The names are arbitrary, and of course more fields could be added provided all references to it are changed in the program and in the command files.

Partial amendments

When the file is edited using the E option the whole file is copied together with any amendments, as it is sequential. The copy is given a CP/M file type of $$$ and renamed at the end of processing with the original name after the old version is deleted. You must check that there is sufficient space left on the disc to make the temporary file, or a run-time error will be produced. If this occurs, the original file will be intact.

Once all the necessary files are present on disc B, load WordStar in drive A and ask for option M at the no file menu. The file to Mergeprint is B.Form.Cmd. The questions may all be answered by default, or avoided by entering the file name with Esc instead of Return. The computer will then ask you for the names of the text and data files and the date of the letters.

Insert the first sheet of letterhead paper in the printer, and the screen will display the address of the first letter to be printed. Press the space bar, followed by P and the first letter is printed out; repeating the procedure will print every letter.

You are then warned to insert the envelopes for addressing. The program will halt in the same way between envelopes, but if you use continuous stationery remove every C from the Cmd files. The printing may be aborted at any time using P unless WordStar is waiting for a P to restart, in which case two in quick succession are needed to stop.

(continued on next page)

```
150: 1600   PRINT C$
151:        PRINT TAB(5);U$;"PROCESSING FILE ";FILENAME$;" COMPLETED";F$
152:
153:        DELETE 1
154:
155:        CLOSE 2
156:
157:        DUMMY% = RENAME(FILENAME$,TEMP$)
158:
159:        RETURN   REM TO MENU
160:
161:
162:        REM ********     EXIT TO CPM    ********
163:
164: 1700           STOP
165:        REM NO RETURN HERE
166:
167:
168:        REM ********  PRINT OUT FILE  ********
169:
170: 1800   GOSUB 2700        REM INPUT FILENAME
171:
172:        IF SIZE% = 0 THEN PRINT :\
173:        PRINT U$:"THIS FILE DOES NOT EXIST";F$ :\
174:        PRINT : INPUT "Press Return to restart";LINE A$ :\
175:        RETURN            REM TO MENU
176:
177:        FILE FILENAMES           REM OPEN FILE
178:        IF END #1 THEN 2000
179:
180:        PRINT
181:        PRINT TAB(5);U$;"READY THE PRINTER AND PRESS RETURN";F$
182:        INPUT "";LINE A$
183:
184:        LPRINTER WIDTH 80
185:        C$ = ""         REM KILL SCREEN CLEAR
186:
187: 1900           READ #1;RECORD.NO%,NAME$,COMPANY$,ADDRESS1$,ADDRESS2$,\
188:                        TOWN$,POSTCODE$,COUNTRY$,TITLE$
189:
190:                GOSUB 2300            REM PRINT
191:                PRINT
192:
193:                GOTO 1900
194:
195: 2000   C$ = CLS$
196:        CLOSE 1
197:        CONSOLE
198:
199:        RETURN   REM TO MENU
200:
201:
202:        REM *******  SUBROUTINES  *********
203:
204: 2100   IF SIZE% = 0 THEN RETURN
205:
206:        PRINT C$;TAB(5);U$;"WARNING THIS FILE EXISTS ALREADY";F$
207:        PRINT
208:        PRINT
209:        INPUT"  Do you wish to add to it? (Y/N)";LINE A$
210:
211:        RETURN
212:
213: 2200   IF SIZE% > 0 THEN RETURN
214:
215:        PRINT C$;TAB(5);U$;"WARNING THIS FILE DOES NOT EXIST";F$
216:        PRINT
217:        PRINT
218:        INPUT"  Do you wish to create one? (Y/N)";LINE A$
219:
220:        RETURN
221:
222:
223:        REM PRINT OUT CURRENT RECORD
224:
225: 2300   PRINT C$
```

```
226:        PRINT TAB(5);U$;"RECORD No.";RECORD.NO%;F$
227:        PRINT
228:        PRINT "  Name        "; NAME$
229:        PRINT "  Company     "; COMPANY$
230:        PRINT "  Address 1   "; ADDRESS1$
231:        PRINT "  Address 2   "; ADDRESS2$
232:        PRINT "  Town        "; TOWN$
233:        PRINT "  Postcode    "; POSTCODE$
234:        PRINT "  Country     "; COUNTRY$
235:        PRINT "  Title       "; TITLE$
236:
237:        RETURN
238:
239:        REM INPUT NEW DATA
240:
241: 2400   PRINT C$
242:        PRINT TAB(5);U$;"RECORD No.";RECORD.NO%;F$
243: 2500   PRINT
244:        INPUT "  Name        "; LINE A$
245:        IF A$ <> "\" THEN NAME$ = A$
246:        INPUT "  Company     "; LINE A$
247:        IF A$ <> "\" THEN COMPANY$ = A$
248:        INPUT "  Address 1   "; LINE A$
249:        IF A$ <> "\" THEN ADDRESS1$ = A$
250:        INPUT "  Address 2   "; LINE A$
251:        IF A$ <> "\" THEN ADDRESS2$ = A$
252:        INPUT "  Town        "; LINE A$
253:        IF A$ <> "\" THEN TOWN$ = A$
254:        INPUT "  Postcode    "; LINE A$
255:        IF A$ <> "\" THEN POSTCODE$ = A$
256:        INPUT "  Country     "; LINE A$
257:        IF A$ <> "\" THEN COUNTRY$ = A$
258:        INPUT "  Title       "; LINE A$
259:        IF A$ <> "\" THEN TITLE$ = A$
260:        RETURN
261:
262:        REM MAKE TEMPORARY FILENAME
263:
264: 2600   POINT% = MATCH(".",FILENAME$,1)
265:
266:        IF POINT% = 0 THEN TEMP$ = FILENAME$ + ".$$$"\
267:        ELSE TEMP$ = LEFT$(FILENAME$,POINT%) + "$$$"
268:
269:        RETURN
270:
271:        REM  INPUT FILENAME AND CHECK LEGAL
272:
273: 2700   PRINT C$
274:        INPUT "  What is the filename";LINE A$
275:        IF A$ <> "\" THEN FILENAME$ = UCASE$(A$)
276:
277:        IF FILENAME$ = "" THEN PRINT :\
278:        PRINT TAB(5);U$;"ENTER FILENAME IN FULL";F$ :\
279:        FOR I% = 1 TO 1000 : NEXT : GOTO 2700
280:
281:        ERROR% = 0
282:        FOR I% = 1 TO LEN(FILENAME$)
283:        A$ = MID$(FILENAME$,I%,1)
284:        X% = MATCH("E",A$,1) + MATCH("!",A$,1) \
285:                + MATCH(".",A$,1) + MATCH(":",A$,1)
286:        IF X% = 0 THEN ERROR% = 1
287:        NEXT
288:
289:        IF ERROR% = 1 THEN PRINT :\
290:        PRINT TAB(5);U$;"BAD FILENAME:  RE-ENTER";F$ :\
291:        FOR I% = 1 TO 1000 : NEXT : GOTO 2700
292:
293:        SIZE% = SIZE(FILENAME$)
294:        RETURN
295:
296:        END
NO ERRORS DETECTED
CONSTANT AREA:      8
CODE SIZE:       2439
DATA STMT AREA:     0
VARIABLE AREA:    208
```

WordStar

(continued from previous page)

CBasic features

The programs were written in CBasic because of its easier file because of its easier file handling, but it should be possible to convert to Microsoft MBasic. The following features of CBasic may be unfamiliar:

CBasic only requires line numbers when a line is referenced in a Goto, Gosub, etc. Use the sequential line numbers in MBasic and change references to them in the main text.

Backslash is used to continue on a new line. MBasic uses form-feed without a carriage-return.

C$, U$ and F$ are defined for the Osborne 1; you will have to redefine for your system. If U$ and F$ are undefined, no harm will befall most systems.

The Match (A$,B$,N) function finds the position as an integer of the first occurrence of A$ within B$, starting at position N. If no match is found then 0 is returned; it is similar to MBasic's Instr function. The operator £ matches any number and ! matches any letter.

UCase$ is a function which converts a string to upper case.

The File command creates a new file if one does not exist, and opens it for reading or writing sequentially. It will need to be recoded in MBasic, as opening an existing file in Write mode destroys its contents. The MBasic manual outlines the procedure to follow in the section on disc I/O.

If End £1 Then 100 is similar to If EOf (1) Then 100, but appears in a different place. The latter should appear inside the loop reading the file — see MBasic manual.

Size (A$) measures the size in blocks of the file name A$.

LPrinter and Console switch subsequent output to the line printer and screen respectively. The Width command sets the width of the printer according to your system.

Delete and Rename delete and rename disc files.

Input-Line is equivalent to Line Input.

the computer works

microcomputer consultancy

p.o. box 50973
nairobi
kenya
phone:

20th April 1982

The Editor
Practical Computing
IPC Electrical Electronic Press Ltd.
Quadrant House, The Quadrant
SUTTON, Surrey
SM2 5AS
England

Dear Mr. Laurie,

FORM-LETTER PROGRAMS

I have pleasure in sending a demonstation copy of my form-letter programs for use in conjunction with the "Wordstar" and "Mailmerge" programs which are produced by Micropro.

They enable the user to send individually typed letters to a large number of addressees, with a minimum of effort. The programs consist of a CBASIC program called FORMLET.BAS, three Wordstar command files: FORM.CMD, LET.CMD and ENV.CMD, and two demonstration files.

If you would like more information, please contact me at the above address, and I will be glad to be of assistance.

Yours sincerely,

David R. Green

DRG/occ

Sample output of program suite.

Demo.Let sample listing.

```
..
.. This is a demonstration text for a form letter
..

                    FORM-LETTER PROGRAMS


I have pleasure in sending a demonstation copy of my form-letter
programs for use in conjunction with the "Wordstar" and
"Mailmerge" programs which are produced by Micropro.

They enable the user to send individually typed letters to a
large number of addressees, with a minimum of effort.  The
programs consist of a CBASIC program called FORMLET.BAS, three
Wordstar command files: FORM.CMD, LET.CMD and ENV.CMD, and two
demonstration files.

If you would like more information, please contact me at the
above address, and I will be glad to be of assistance.

Yours sincerely,



David R. Green


..        End the file with a carriage return!
..
DRG/occ
```

Demo.Adr sample listing.

```
1,"D. R. Green","The Computer Works","P.O. Box 50973","","Nairobi","","Kenya","David"
2,"Mr R Maughan","Adda Computers Ltd.","154 Victoria Road","Acton","LONDON W3","","England","Mr. Maughan"
3,"","Computer Interfacing and Equipment Ltd.","The Mico-spares shop","19 Roseburn Terrace","Edinburgh","EH12 5NG","England","Sir"
4,"The Editor","Practical Computing","IPC Electrical Electronic Press Ltd.","Quadrant House, The Quadrant","SUTTON, Surrey","SM2 5
AS","England","Mr. Laurie"
```

20th April 1982

Mr R Maughan
Adda Computers Ltd.
154 Victoria Road
Acton
LONDON W3
England

Dear Mr. Maughan,

FORM-LETTER PROGRAMS

I have pleasure in sending a demonstation copy of my form-letter programs for use in conjunction with the "Wordstar" and "Mailmerge" programs which are produced by Micropro.

They enable the user to send individually typed letters to a large number of addressees, with a minimum of effort. The programs consist of a CBASIC program called FORMLET.BAS, three Wordstar command files: FORM.CMD, LET.CMD and ENV.CMD, and two demonstration files.

If you would like more information, please contact me at the above address, and I will be glad to be of assistance.

Yours sincerely,

David R. Green

DRG/occ

20th April 1982

Computer Interfacing and Equipment Ltd.
The Mico-spares shop
19 Roseburn Terrace
Edinburgh
EH12 5NG
England

Dear Sir,

FORM-LETTER PROGRAMS

I have pleasure in sending a demonstation copy of my form-letter programs for use in conjunction with the "Wordstar" and "Mailmerge" programs which are produced by Micropro.

They enable the user to send individually typed letters to a large number of addressees, with a minimum of effort. The programs consist of a CBASIC program called FORMLET.BAS, three Wordstar command files: FORM.CMD, LET.CMD and ENV.CMD, and two demonstration files.

If you would like more information, please contact me at the above address, and I will be glad to be of assistance.

Yours sincerely,

David R. Green

DRG/occ

Suite of three command files.

```
.. FILENAME LET.CMD
.. Sets up the variable heading of the letter
..
.. Repeats until the data is used up
.RP
..
.. Record No. and 8 data items expected
.. Print on screen
..
.RV RECNO,NAME,COMPANY,ADDRESS1,ADDRESS2,TOWN,POSTCODE,COUNTRY,TITLE
.CS RECORD No. &RECNO&
.DM Name        &NAME&
.DM Company     &COMPANY&
.DM Address 1   &ADDRESS1&
.DM Address 2   &ADDRESS2&
.DM Town        &TOWN&
.DM Postcode    &POSTCODE&
.DM Country     &COUNTRY&
..
.. The ^C is a control character entered using the
.. ^P menu, and halts printing until P is pressed
.. on the keyboard
..
.. Print letter
.. If you are not using letterhead paper, you could
.. make a letterhead below to be printed on plain
.. paper
..
&DATE&


&NAME/O&
&COMPANY/O&
&ADDRESS1/O&
&ADDRESS2/O&
&TOWN/O&
&POSTCODE/O&
&COUNTRY/O&

Dear &TITLE&,

..
..  Includes the text of the letter here on your file
..
.FI &TEXTFILE&
..
..  Finish with a carriage return after PA
.PA



..FILENAME ENV.CMD
..Prints addresses on envelopes from a data file
..
.. Repeat until data finished
..
.RP
..
.. Page offset 40 columns Page length 20 lines
..   - modify to suit size of envelopes
..
.PO40
.PL20
..
.. Record-number & 8 variables are expected in the data
.. Print out on screen first
..
.RV RECNO,NAME,COMPANY,ADDRESS1,ADDRESS2,TOWN,POSTCODE,COUNTRY,TITLE
.CS RECORD No. &RECNO&
.DM Name        &NAME&
.DM Company     &COMPANY&
.DM Address 1   &ADDRESS1&
.DM Address 2   &ADDRESS2&
.DM Town        &TOWN&
.DM Postcode    &POSTCODE&
.DM Country     &COUNTRY&
..
..  Now print envelope.  /O ignores blank fields
..  N.B. letter O not number zero
..  ^C halts printing until P is pressed on keyboard
..
&NAME/O&
&COMPANY/O&
&ADDRESS1/O&
&ADDRESS2/O&
&TOWN/O&
&POSTCODE/O&
&COUNTRY/O&
.. finish with a carriage return
.PA


.. FILENAME  FORM.CMD
.. Command file to print out form letters and
.. address envelopes from a data file
..
.MT0                    set top margin to zero
.OP                     turn off page no.
..
.. The file which prints the letter heading is LET.CMD
.. The file which prints envelopes is ENV.CMD
.. if you wish to modify, alter these lines
..
.SV ENVFILE,B:ENV.CMD
.SV LETFILE,B:LET.CMD
..
..  Input variables from console
..
.CS
.DM                FORM LETTER VERSION 1.0
.DM
.AV" What is the filename of the text? ",TEXTFILE,14
.DM
.AV" What is the filename of the addresses? ",ADDFILE,14
.DM
.AV" What is the date? ",DATE
..
..  Define data file and print letters
..
.DF &ADDFILE&
.CS
.DM          READY TO PRINT LETTERS
.FI &LETFILE&
..
..  Define data file and print envelopes
..
.DF &ADDFILE&
.CS
.DM          READY TO PRINT ENVELOPES
.FI &ENVFILE&
.CS          FORM LETTER 1.0 FINISHED
```

Linear regression

What is it? What principles lie behind it? And what kind of problems can it be applied to? John Hudson discusses what is in fact a useful statistical technique.

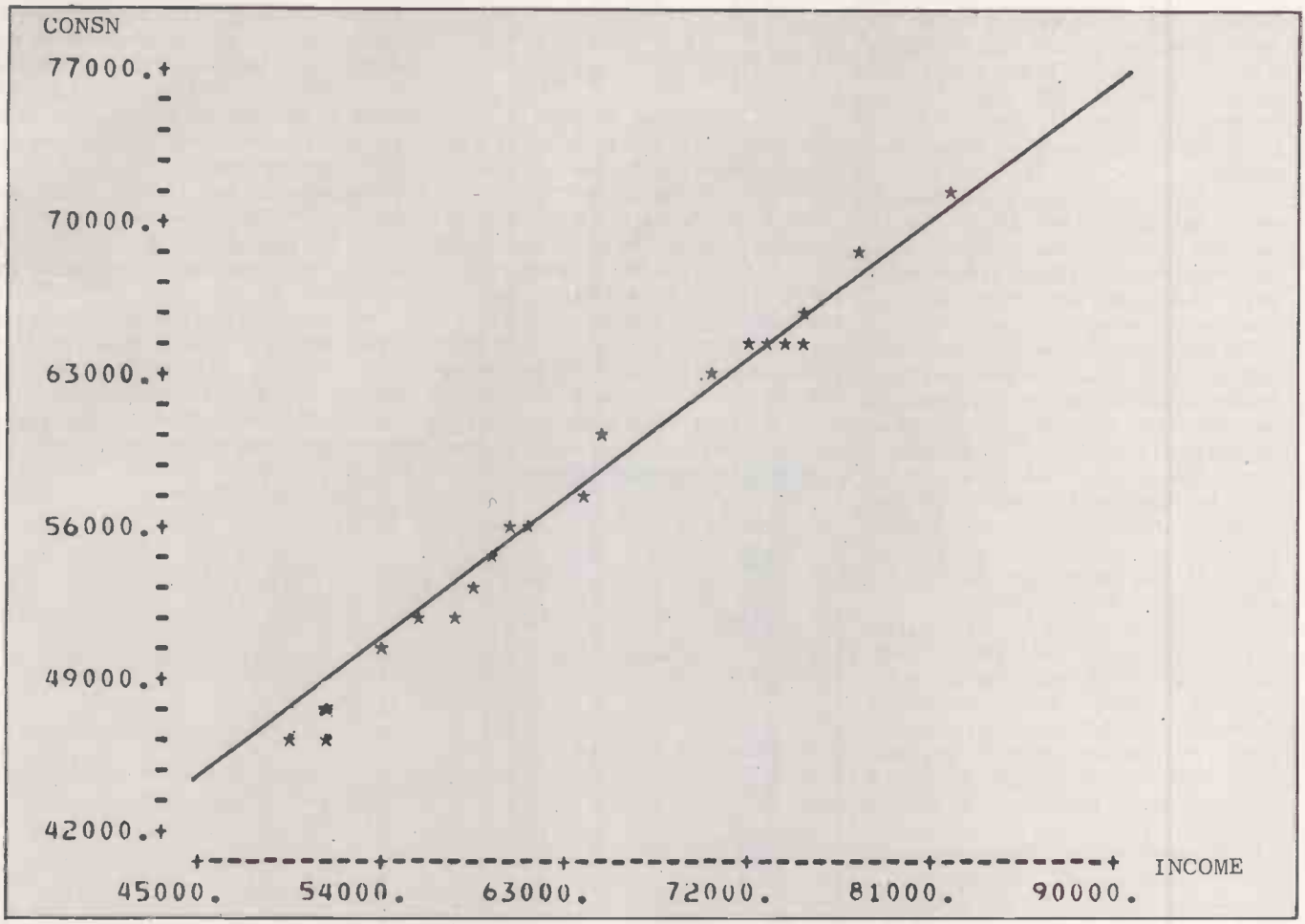


Figure 1. Consumers' expenditure and personal disposable income 1960-1979. The regression equation is $C_t = 8403 + 0.76943Y_t$

MULTIPLE LINEAR REGRESSION is one of the most powerful items in the statistician's toolkit. It has found widespread application in such varied fields as economics, the social sciences and the medical and natural sciences. It is, in fact, the basis of many of the sophisticated statistical software packages in these areas, such as TSP, ESP and BMDP.

First principles

The principles behind regression can best be illustrated by looking at the simplest case, where one variable is being used to explain another variable. Take the case of consumer expenditure — the amount people spend on goods and services. At its simplest you might suppose this to be related to personal disposable income, the amount of money people have left in their pockets after paying income tax and national insurance.

Dr John Hudson is a lecturer in econometrics at the University of Bath.

The equation to be estimated can be written as:

$$C_t = a + bY_t$$

where C_t and Y_t denote aggregate expenditure and disposable income in the economy as a whole, in year t.

Figure 1 shows the relation between these two variables for the years 1960 to 1979, a total of 20 observations. The problem is to fit a line to these observations, that is, to find values for a and b in the equation for C_t. You could, of course, do this by eye, but one person's estimate would give a different line to another person's, and such arbitrariness is obviously unsatisfactory.

The principle behind regression is to fit the line so as to minimise the sum of squared residuals — hence its other name, ordinary least squares or OLSQ. It can be explained by further reference to figure 1, where d_1 represents the distance between the first observation of consumption and income and the fitted line. This is called the residual or error term. Similarly d_2 represents the distance between the second observation and the fitted line, and so on.

The line is chosen so as to minimise the sum of the squared residuals, $d_1^2 + d_2^2 + d_3^2 + \ldots$. There is only one line which will do this for a particular set of observations.

Returning to the equation for C_t you can see that the value of a represents the position where the line cuts the vertical axis; b is the slope of the line, which indicates how much spending will increase for a given increase in income.

So far so good, but you hardly need a computer to estimate such a line; many inexpensive hand calculators have a facility to do the job. It is when there is more than one explanatory variable on the right-hand side of the equation, that the problem becomes more difficult.

For example, you might wish to estimate a slightly more sophisticated version of the equation

$$C_t = a + bY_t + cC_{t-1} + dP_t$$

(continued on next page)

Linear regression

(continued from previous page)

Two further variables have been added to the basic equation. C_{t-1} is lagged consumption, or consumption in the previous year and is there to reflect the inertia in people's actions. They are used to a certain standard of living, and if their income suddenly falls they do not immediately react to their changed circumstances, but attempt to maintain this standard.

P_t is the rate of inflation. Economists are not yet too sure why this should be in the equation, but in repeated estimations both here and in the United States its importance seems undeniable. To estimate such an equation a computer program is required.

The program in listing 1 was written in basic for a TRS-80 system II level II micro. It was designed to handle up to 15 explanatory variables and 100 observations. More explanatory variables could be handled at the expense of some observations, or vice versa, by changing the values in the Dim statements. Similarly those with smaller computers can pare the program down by reducing the possible number of observations or variables, or both.

Lines 20 to 140 load the data in two stages. First the independent or right-hand side variables are loaded and form an n-by-m matrix X, where n is the number of observations and m the number of variables. When a constant intercept term is included in the regression, as is often the case, a column of 1s is included as part of this matrix.

If you are estimating the equation over 60 time periods, X is a 60 × 4 matrix with the first column consisting of 1s and the second, third and fourth the observations on Y_t, C_{t-1}, and P_t respectively. In this case there are four coefficients to estimate, using the formula

$$\begin{bmatrix} a \\ b \\ c \\ d \end{bmatrix} = B = (X'X)^{-1}X'Y$$

where Y is a column vector containing data on the dependent variable, X′ denotes the transpose of the matrix X and $(X'X)^{-1}$ the inverse of $(X'X)$.

As an example of the program in use I have estimated the equation for C_t using annual data from 1960 to 1979, a total of 20 observations. The results will appear on the screen or printer, in the form shown in table 1.

The figures under the Coeff heading relate to the coefficients in the equation, which may be written as

$C_t = 2344.75 + 0.541431Y_t + 0.386002C_{t-1} - 135.355P_t$

Thus if inflation goes up by one percent spending by consumers will fall by £135 million. The remaining two columns tell you how accurate this and the other coefficients are. You can use the figures under SE or standard error heading to construct confidence intervals or upper and lower estimates for these coefficients.

A rough rule of thumb at the five percent significance level is:

upper limit to the value of the coefficient = Coeff + 2 SE

lower limit to the value of the coefficient = Coeff − 2 SE

In the case of the coefficient on the income variable these limits are

$$.541431 \pm 2 \times .0951742$$

or

.7317794 to .3510826

You can then say that there is only a five percent chance of the true value of the coefficient lying outside these values.

The figures in the fourth column are t statistics. They can be used to determine whether the respective variables can be judged to be a significant factor in determining the dependent variable or not. Again as an approximation, if its absolute value exceeds 2 you can be 95 percent certain that the variable does influence the dependent variable. So in this case only the constant term would have to be rejected as a significant determinant of consumers' expenditure, and you could conclude with only a five percent chance of being wrong in each case, that income, lagged consumers' expenditure and inflation all affect consumers expenditure in the current period.

The figures printed next to the four columns tell you how good the regression as a whole is. RBSQ, the adjusted R^2, tells you the proportion of the variations in the dependent variable which can be explained by the regression equation. If it takes the value 0 then the regression equation is explaining none of the variations in the dependent variable; if it is 1 then it is explaining all of the variations. In this case RBSQ is .993263, so encouragingly more than 99 percent of the variation in consumers' expenditure is explained by this regression.

DW is the Durbin Watson statistic, and ideally should be about 2. As a very rough rule of thumb if it is below 1.2 or above 2.8 then there are likely to be problems with the regression. To begin with there is a strong

Listing 1. The regression program.

```
10 DIM X(100,15),Y(100),N$(15)
20 INPUT "NUMBER OF VARIABLES AND NUMBER OF
   OBSERVATIONS";M,N
30 FOR I= 1 TO M
40 PRINT "INPUT NAME OF INDEPENDENT
   VARIABLE";I
50 INPUT N$(I)
60 FOR J = 1 TO N
70 PRINT "INPUT VARIABLE";I;"OBSERVATION";J
80 INPUT X(J,I)
90 NEXT J:NEXT I
100 INPUT "NAME OF DEPENDENT VARIABLE";N$(M
    +1)
110 FOR J=1 TO N
120 PRINT "INPUT OBSERVATION";J;"ON THE
    DEPENDENT VARIABLE"
130 INPUT Y(J)
140 NEXT J
150 DIM Z(15,100),R(15,100),A(100,15),F(15
    ),B(15),H(100),S(10),G(15),T(15),F(100
    )
160 FOR I= 1 TO M
170 FOR J= 1 TO N
180 Z(I,J)=X(J,I)
190 NEXT J:NEXT I
200 FOR I=1 TO M
210 FOR J=1 TO M
220 FOR K=1 TO N
230 R(J,I)=R(J,I)+Z(J,K)*X(K,I)
240 NEXT K:NEXT J:NEXT I
250 FOR I=1 TO M
260 FOR J=1 TO M
270 A(I,J)=1-ABS(SGN(I-J))
280 NEXT J
290 NEXT I
300 FOR I=1 TO M-1
310 FOR J=I+1 TO M
320 D=R(J,I)/R(I,I)
330 FOR K=1 TO M
340 R(J,K)=R(J,K)-D*R(I,K)
350 A(J,K)=A(J,K)-D*A(I,K)
360 NEXT K
370 NEXT J
380 NEXT I
390 FOR I=M TO 1 STEP -1
400 FOR K=1 TO M
410 FOR J=I+1 TO N
420 A(I,K)=A(I,K)-R(I,J)*A(J,K)
430 NEXT J
440 A(I,K)=A(I,K)/R(I,I)
450 NEXT K:NEXT I
460 REM A=INV(X'X)
470 FOR J=1 TO M
480 FOR K=1 TO N
490 P(J)=P(J)+Z(J,K)*Y(K)
500 NEXT K:NEXT J
510 FOR J=1 TO M
520 FOR K=1 TO M
530 B(J)=B(J)+A(J,K)*P(K)
540 NEXT K
550 NEXT J
560 FOR J=1 TO N
570 FOR I=1 TO M
580 F(J)=B(I)*X(J,I)+F(J)
590 NEXT I
600 H(J)=Y(J)-F(J)
610 S(1)=S(1)+H(J)*H(J)
620 S(2)=S(2)+H(J)
630 S(7)=S(7)+Y(J)
640 NEXT J
650 S(5)=S(1)/(N-M)
660 LPRINT "OLSQ WITH DEPENDENT VARIABLE "
    ;N$(M+1)
670 LPRINT "VAR","COEFF", "S.E.","T STAT"
680 FOR I=1 TO M
690 S(3)=A(I,I)*S(5)
700 G(I)=SQR(S(3))
710 T(I)=B(I)/G(I)
720 LPRINT N$(I),B(I),G(I),T(I)
730 NEXT I
740 FOR I=1 TO N
750 S(8)=S(8)+(Y(I)-(S(7)/N))^2
760 IF I=1 THEN 780
770 S(6)=S(6)+(H(I)-H(I-1))^2
780 NEXT I
790 S(9)=1-(S(1)/S(8))
800 S(4)=S(6)/S(1)
810 LPRINT "ASR=";SQR(S(1))
820 LPRINT "SR=";S(2)
830 LPRINT "DW=";S(4)
840 LPRINT "RBSQ=";1-(1-S(9))*(N-1)/(N-M)
850 INPUT "DO YOU WANT A PLOT OF THE
    RESIDUALS, TYPE 1 FOR YES AND 0 FOR
    NO";A
860 IF A = 0 THEN 910
870 LPRINT "ACTUAL", "PRED","RESIDUAL"
880 FOR I=1 TO N
890 LPRINT Y(I),F(I),H(I)
900 NEXT I
910 END
```

Listing 2. Program used for forecasting.

```
10 DIM X(100)
20 X(82)=126.2
30 X(81)=126.9
40 X(80)=113.6
50 X(79)=115.3
60 FOR J=83 TO 90
70 X(J)=14.4368+0.174438*J+0.673987*X(J-1)
   +0.130049*X(J-2)+0.149864*X(J-3)-
   0.181923*X(J-4)
80 LPRINT X(J)
90 NEXT J
100 END
```

Table 1.
OLSQ with dependent variable CONSN.

VAR	COEFF	S.E.	T STAT		
CONSTANT	2344.75	2176.66	1.07723	ASR =	2517.18
INCOME	.541431	.0951742	5.68885	SR =	− 105.281
CONSNL	.386002	.140561	2.74614	DW =	1.71225
INF	− 135.355	47.5855	− 2.84447	RBSQ =	0.993263

Table 2.
OLSQ with dependent variable Y.

VAR	COEFF	S.E.	T STAT	ASR =	88.05
CONSTANT	14.4368	5.38378	2.68153	SR =	− 0.0203781
T	.174438	.084246	2.07056	DW =	1.95698
YL1	.673987	.115470	5.83688	RBSQ =	0.80838
YL2	.130049	.139270	.93379		
YL3	.149864	.139811	1.07191		
YL4	− .181923	.115470	− 1.57541		

possibility that the standard errors will be biased downwards and the t statistics upwards making it likely that you will accept as significant variables which in reality are not.

These problems can have several different causes. A strong possibility is that the equation has been incorrectly specified; for example, that there are one or more further explanatory variables which should be added to the regression. In this case the Durbin Watson statistic is 1.71225, which is reasonably satisfactory.

The final two statistics provide information on the accuracy of the algorithm used to calculate the results. In most cases the algorithm will give perfectly satisfactory results, but on occasions when there are many independent variables with considerable differences in the average values the rounding errors introduced in the calculations can cause problems.

This can be detected by the SR or sum of residuals statistic. In most cases it should approximate to zero; indeed when a constant term is included in the regression the approximation should be exact. That it is not equal to zero is due to rounding errors.

In judging how serious these errors are this figure should be compared to ASR, the absolute sum of residuals. The larger is the ratio SR/ASR the more serious the problems of rounding errors are likely to be. It will only be in exceptional cases that this becomes a problem, but when it does corrective action can be taken by appropriate scaling of the variables. Each of the explanatory variables should be divided by its own mean or average value and multiplied by the mean of the dependent variable. The regression equation can then be estimated using these transformed variables.

Linear regression can also be used in forecasting. I have analysed new car registrations, although the same technique can be used for other problems with little or no modification.

The technique first calls for an estimate of an equation which can explain new car registrations for an initial sample period — in this case from the first quarter of 1958 to the second quarter of 1978. You can then use this equation to forecast beyond the sample period.

The equation chosen to fit is an example of an "autoregressive" equation, a type widely used in forecasting work. Part of its charm lies in the simplicity with which it can be set up. If you denote new car registrations in period t by Y_t, then you can write the equation as

$$Y_t = a + bT + cY_{t-1} + dY_{t-2} + eY_{t-3} + fY_{t-4}$$

The term a is again a constant which should be interpreted as before. Y_{t-1} represents new car registrations in the quarter immediately before t, Y_{t-2} new car registrations two periods before t, and so on.

T, the second variable on the right-hand side of the equation is a time tend. It takes the value 1 in the first quarter of the estimation period, 2 in the second and so on. So in the example the time trend takes the value 1 in the first quarter of 1958, 2 in the second quarter until in the second quarter of 1978 it equals 82.

Estimating the equation gives the values shown in table 2. Not all the coefficients are significant, and you may care to experiment with alternative specifications. Try removing some autoregressive Y_{t-1} terms or adding some more.

Forecasting can be done with the help of the simple program in listing 2. Lines 20 to 50 input the four lagged values for car registrations which are necessary to calculate the first prediction. Lines 60 to 90 calculate the predicted values and print the results.

Table 3. Forecasts for new car registration.

Period	actual	forecast
1975 3	102.0	
4	89.9	
1976 1	100.7	
2	107.1	
3	95.5	
4	115.3	
1977 1	100.5	
2	99.0	
3	115.3	
4	113.6	
1978 1	126.9	
2	126.2	
3	139.3	126.5
4	128.1	129.1
1979 1	131.7	128.6
2	171.8	128.9
3	114.8	129.5
4	140.3	129.6
1980 1	138.8	130.1
2	112.6	130.7

Data in perspective

The predicted values are shown in table 3, together with the actual figures for the previous 12 quarters to give the predictions some perspective. Overall they are reasonably good. Though some quarters are subject to considerable error, they tend to cancel out. For example, the forecast for the second quarter of 1979 underestimates actual registrations by 42,900, but in the following quarter this boom in car sales was followed, as you might expect, by a temporary slump. The average underprediction throughout the period as a whole was just four percent of total sales. This is reasonably satisfactory, considering that the final forecast was made with data two years old.

The program presented here is a rudimentary one which can easily be embellished in several ways. Most importantly, instead of inputting data directly every time a regression is run the program can be modified to read it from a data file. The data would, of course, have already been entered into this file. In addition it is possible that prior to doing this some variables could be transformed, thus reducing the amount of data that has to be read into the computer.

Thus for the equation for estimating car registrations, for example, having input Y_t it is a simple matter to lag it up to four quarters to create Y_{t-1}, Y_{t-2}, Y_{t-3} and Y_{t-4}. At the same time, both the column of 1s for the constant term and the time trend could be created.

The listing itself hinges around the algorithm to calculate $(X'X)^{-1}X'Y$. X' is the transpose of X: the first row of X becomes the first column of X', the second row of X becomes the second column of X' and so on. This is done in lines 160 to 190 where X' is called Z.

$(X'X)^{-1}$ denotes the inverse of $(X'X)$. This is defined so that $(X'X)(X'X)^{-1} = I$, where I is the identity matrix with 1s on the left-to-right diagonal and 0s everywhere else. This is done between lines 200 and 450 where $(X'X)^{-1}$ is called A.

Lines 470 to 500 calculate $X'Y$ — called P in the listing. Lines 510 to 540 calculate the coefficient vector B, which is equal to AP or $(X'X)^{-1}X'Y$. It is then used in lines 560 to 590 to calculate the vector of predicted values for the dependent variables. The remainder of the program is concerned with calculating the statistical measures which are output with the results.

Just another day

by Paul Wilson

It was ten past eight when the alarm went off, rudely hauling Paul Rawlins back to wakefulness.

"It's eight o'clock Paul, time to get up." The voice started as a mellow contralto, gradually deepening and coarsening to a New Jersey drawl as it went remorselessly on.

"Your first appointment is in 75 minutes."

The covers on the other side of the bed moved back to show a mane of auburn hair and a pair of sleepy green eyes.

"If you don't fix that audio link I'll lobotomise it," grumbled Steph.

As Paul filled an ancient electric kettle from the tap, he wondered for the hundredth time how many of his customers would desert him merely for seeing him using anything that archaic. An area softfware support engineer was expected to be up to date. As he plugged in the kettel the radio switched to the technology channel.

". . . and with the commercial acceptance of the Gilbertson mono-molecular gate, single chip, multi-megabyte systems with full virtual storage are an estimated five to 10 years away. The Ministry of Technology . . ."

Paul grunted disgustedly: 2017 and still the same old rubbish as 45 years ago.

Later as Paul strolled across the living room towards the office, he stopped on impulse and crossed to Steph's audiovisual console, powered it up and played the start of her latest composition. The AVC was a part of the house network he rarely used.

Paul switched it off with a sigh, making a mental note to ask for a private performance before it was published, and went into the office, where he sat down in front of the bulk of the house computer net.

"Diary. First two appointments."

Again, the contralto migrated to New Jersey.

"Nine-fifteen, Matheson Brothers for an annual system check; 10.30, Mrs Jamieson wants advice about the new Continentex adaptors."

"Engineering software. Audio link test. Execute."

The screen facing the chair glowed with green letters.

PAGE 176
ENGINEERING SOFTWARE 160706.0
AUDIO LINK TEST

Two orthogonal axes appeared, then a light-blue line — the ideal frequency response. Seconds later a deep-blue line was almost exactly superimposed.

AUDIO LINK
TEST COMPLETE
RESULTS ACCEPTABLE

"New program. Audio link duration test."

SPECIFY PLEASE

Paul pulled the keyboard towards him. It was easier and safer to define the sequence of tests he needed manually, especially when it was a non-working audio link which was going to be tested. Ten minutes later he sat back and pulled at his beard reflectively, then after a pause: "Complete."

TO BE SAVED?

"Defer. Execute."

AUDIO LINK DURATION TEST

Again the orthogonal axes and the light-blue line were drawn. This time the darker line was 30 seconds in coming.

FREQUENCY DETERIORATING WITH TIME.

A slight pause.

GATE F2B17, ACTIVATION VOLTAGE LOW.

"Reconfigure."

DONE. **WARNING — SYNTHESISER MODULE F2,
RECONFIGURATION CAPABILITY 12%.

Paul frowned, 12 percent, that was far too low.

"Configuration summary."

6 PROCESSORS, 4MBYTE RAM,
204 PAGES OF SOFTWARE
3 AUTO-LOADING VIDEO DISCS, 2 FAST PRINTERS
8 SCREENS, COMMS LINKS, AVC
SYSTEM RECONFIGURATION POTENTIAL 20.96%

"Hardware failure summary showing manufacturer."

There it was, the uncommitted logic array chips from the new Korean-European conglomerate had an astrononical failure rate. He added a footnote to the diary, wondering how many other areas were having similar troubles. Perhaps he'd call a couple this afternoon.

"Mr Matheson is calling." The contralto stayed well away from New Jersey as the system interrupted his broodings.

"Hold. Save audio link duration test."

SAVED
PAGE 176, ENGINEER — AUDIO LINK — DURATION TEST.

"Connect." He frowned, glancing at the clock. It was unlike Peter Matheson to be early.

"Morning Paul, you're not usually late — it must have been a good party last night."

"It was Steph's birthday." he said defensively, making himself a note to check the machine's clock later on.

Matheson laughed good-naturedly. "Tell Stephanie that we saw her Starlight symphony the other evening, will you? It was brilliant, Jan was almost in tears."

"Thanks I will. Now how's your system behaving?"

"In remote for you. By the way, the VAT people don't like the breakdown they get from the Systez package. Do you have anything else that's more suitable?" Paul grinned sympathetically. Peter Matheson's battles with the VAT centre were almost legendary.

The best I can offer you is Systez 5.7; you're running with 4.1, I think. It's their own fault anyway, 17 VAT rates and five exception conditions. The whole thing's ludicrous." He glanced at the screen in front of him.

SYSTEM RECONFIGURATION
CAPABILITY 13.7%

He typed a few characters.

ULA FAILURE 1,724% ABOVE NOMINAL.
EU-KOR SUPPLIES.

Again those damn chips.

"Peter, I'll have to ask a hardware engineer to call. You're having trouble with those Korean chips, like a lot of other people. I'll make an official complaint, so your insurance won't have to pay. Any particular time suit you?"

"Late afternoon if he can. Can I have 5.7 to try?" He paused. "Oh yes, Jamie says have you got the latest version of Avatar, or a new game called Timedrop?"

Paul turned slightly towards the chair microphone: "Query, games, Avatar and Timedrop."

The reply came on the screen.

GAMES — AVATAR 2.3
TIMEDROP — NO REFERENCE FOUND

"Avatar 2.3 I have, Timedrop I don't. I'll try and trace it for him if you like. I'd like to see him win the championship."

He turned to the speaker again, "Avatar 2.3 and Systez 5.7, transmit."

Twenty minutes later, his system check complete, a satisfied Matheson rang off. Glancing at the clock, Paul muttered darkly to himself and began a thorough check of his own system, starting with the real-time clock.

Paul, Mrs Jamieson is on the line." The voice broke into his thoughts some time later.

"Connect." He stole a look at the clock, 10:29:56; as usual the old dragon was irritatingly precise. "Good morning Mrs Jamieson, how are . . ."

Politeness was brushed aside by a loud, penetrating voice belonging to an equally

un-ignorable person. Aged 62 and weighing 16 stone, Mrs Jamieson moved through the community with the consideration and finesse of a medium-sized asteroid. Universally disliked but held in some kind of awe by those who failed to make a dent in her self-confidence, she was obviously in a fighting mood. Paul groaned inwardly.

"Since my rates are paying for this, let's keep it as straightforward as possible, shall we? My husband and I have decided to invest in a new Conintental Prestel adaptor, a Conintex model 6, and we would like you to check the connection to our system."

"I do think that the distributor's engineers can do as good a job installing the unit when it comes as I can, Mrs Jamieson."

"When? Young man, the unit was delivered last week, and Frank and I installed it over the weekend. Now I need your test facilities to confirm our complaint."

"Very well Mrs Jamieson, now if you will put your system in Engineer mode, I can give you a full fault diagnosis." The old fool must have screwed it up. Installation consisted of plugging in two multilayer optical cables. Surely even she could get that right.

"I'm afraid the Engineer switch is broken at the moment. You'll have to do it from your end."

Switch? What switch? he caught a glint in the woman's eye, and it was worrying him.

"Your audio link?"

"Is being used for something else. Please get on with it, I don't have all day, you know."

"Very well, Mrs Jamieson."

Paul dragged the keyboard on to his knees again and began to build up the command sequences needed to force entry to another system. He noticed that he had been unconciously shielding his actions from the monitor where a larger-than-life Mrs Jamieson seemed to be intent on studying his keystrokes.

He pressed Send and turned to the screen.

"Is there anything on your main monitor?"

The face suddenly looked startled, worried, then settled on suspicious. "Security breach. Just what are you doing, young man?" Then, "It won't work. Frank and I installed security monitors on all the inputs to the system."

Paul ignored her, staring at his own screen.

SUSPECTED ENCRYPTION DEVICES
BACK-DOOR?

He typed Yes and began chewing his beard again. That should fix the old bat, he muttered to himself, I bet she doesn't know you can connect to another machine by modulating the mains power. Slow but reliable.

The penetrating voice began again "Engineer mode?" It was noticeably worried now. "Just what have you done? I demand to be told."

"Sorry, Mrs Jamieson, industrial security. I'm sure you understand." He typed a few more codes.

ENCRYPTION CONFIRMED.
ALL COMMS INPUTS CONNECTED TO
DATA FILE>STEALENG14<
ALL MANUAL CONTROLS NOW
DISABLED

Paul looked up. The phone screen was showing an orderly kitchen with no one in sight. He used the keyboard again.

ENCRYPTION DISCONNECTED
RESPONDERS ABANDONED
FILE>STEALENG14< DESTROYED
FILE DIRECTORY TRANSMITTED
SECURITY SYSTEM INSTALLED AND
IDLING

Now that things were as they should be, he used vocal commands again.

"Transmit and execute configuration check."

The mellow contralto confirming the order was almost drowned by the 16-stone voice.

"Why can't I control my machine? What have you done? I insist on being told, I have my rights you know. You have no legal right . . ."

For the first time since he had taken the job, Paul was close to losing his temper.

"I have a taped request from you that I effect a forced entry to your system and check for some unspecified fault. I have done and am doing just that. Now if you would care to look at screen 2 I will go through the report with you.

"First, your speech synthesiser appears to have some 17 components missing. Second you appear to have disabled your reconfiguration controller which, as you are aware, invalidates your hardware maintenance clause. Your reliability is currently 47.2 percent, and reconfiguration capacity nil. Finally, the connector for your Continentex adaptor apppears to upside down.

"Copies of this report are being sent to area hardware support and the local Technology Centre as well as being printed here and in your home. An engineer will contact you to arrange a time and fee for making the repairs. If there is nothing else?"

He typed Destroy on the keyboard and hovered over Send.

The face on the phone tried to rally some strength.

"I am not in the habit . . ."

He pressed Send to remove all trace of the test software from the other machine and switched off the phone. The clock said 11.37 as he stood and stretched, then turned to the door for more coffee. Software piracy, he thought, she should have been more sensible. After all, where did she think his software came from?

Computerised

NO.	PATIENT NAME		D.O.B.	DATE	TIME	CONS.	SEEN BY	COMPLAINT	FOLLOW UP
H0001	JOHNSON LINDA	(MISS)	12-02-1955	08-02-82	09.51	TAE	Dr.WALTERS	INJ FOOT	DISCHARGED
H0002	KELLY TINA	(MISS)	12-03-1896	08-02-82	09.57	TAE	Dr.WALTERS	INJ HIP	ADMIT UNIT
H0003	RODGERS FIONA	(MISS)	12-03-1969	08-02-82	09.20	TAE	Dr.WALTERS	INJ HEAD/LEG/ABDO	ADMIT OTHER UNIT
H0004	MOORE GRETA	(MISS)	12-07-1968	08-02-82	10.26	TAE	Dr.WALTERS	INJ ANKLE	DISCHARGED
H0005	PARKES MICHAEL BRIAN	(MR)	12-08-1937	08-02-82	10.45	TAE	Dr.WALTERS	PAIN IN TOE	G.P DEFINITE
H0006	GOODING ANGELA	(MISS)	12-03-1954	08-02-82	11.15	TAE	Dr.WALTERS	PAIN IN FOOT	G.P. IF REQUIRED
H0007	THORN BILLY	(MR)	02-06-1959	08-02-82	11.37	TAE	Dr.		*REVISIT* G 1555
H0008	THOMAS MARY JONES	(MRS)	02-03-1950	08-02-82	12.00	TAE	Dr.WALTERS	CHEST INJ	ADMIT UNIT
H0009	SMITH ALLAN PARKES	(MR)	12-02-1955	08-02-82	10.20	TAE	Dr.WALTERS	INJ HEAD/SHOULDER	ADMIT UNIT
H0010	PARRY ELIZABETH	(MISS)	12-03-1969	08-02-82	13.06	TAE	Dr.AUNG	INJ ANKLE	FRACTURE CLINIC
H0011	GRIFFITHS JOHN MICHAEL	(MR)	12-03-1957	08-02-82	13.16	TAE	Dr.AUNG	HEAD INJ	G.P DEFINITE
H0012	BROWN BRIAN	(MR)	12-03-1955	08-02-82	11.00	TAE	Dr.WALTERS	ABSCESS	ADMIT OTHER UNIT
H0013	WILLIAMS MONA	(MRS)	12-06-1921	08-02-82	13.55	TAE	Dr.		*REVISIT* G 1514
H0014	JONES THOMAS JOHN	(MR)	12-03-1946	08-02-82	12.46	TAE	Dr.AUNG	BACK INJ	DISCHARGED
H0015	DAVIDSON RUTH	(MRS)	12-03-1921	08-02-82	14.19	TAE	Dr.AUNG	CHEST INJ	DISCHARGED
H0016	EVANS GERAINT JOHN	(MASTER)	15-02-1969	08-02-82	14.30	TAE	Dr.AUNG	CUT EYEBROW	DISCHARGED
H0017	BRUCE ANNE	(MRS)	12-09-1960	08-02-82	15.17	TAE	Dr.AUNG	NOSE BLEED	RETURN A.U. IF REQ.
H0018	JONES JANET ANNE	(MRS)	12-03-1922	08-02-82	12.30	TAE	Dr.WALTERS	COLLAPSED	ADMIT OTHER UNIT
H0019	JACKSON MYRA JANE	(MISS)	12-03-1970	08-02-82	15.31	TAE	Dr.AUNG	CUT FINGER	DISCHARGED
H0020	ASHTON THOMAS SMILIE	(MR)	19-06-1951	08-02-82	15.49	TAE	Dr.AUNG	REMOVAL SUTURES	DISCHARGED

Logbook printout for a six-hour period; the medical staff and further details after treatment.

"NAME PLEASE" asks the casualty receptionist.

"Edward Parry" an anxious parent replies, restraining a toddler with a badly grazed arm.

"Date of birth? Age? How did it happen? Who's your own doctor?", asks the receptionist, taking down details of the incident.

"Take a seat over there. The doctor will see you shortly."

As the anxious group is sitting down in the waiting area, a daisywheel printer begins printing a casualty card and a floppy disc whirs into action as the information is stored, ready for the next patient. The first on-line casualty record system in the U.K. has gained another entry. And so it goes on for up to 20,000 cases each year at the C and A Hospital, Bangor, North Wales.

It is obvious that an important part of a casualty department is an efficient records system. If Joe Bloggs comes back six months after an initial injury, it is important to access the old record readily. One drawback of the accident unit in Bangor is its very limited size for storing manual records.

To alleviate the problem David Jones, a consultant in charge of the accident unit, was keen to introduce a locally developed casualty record system using a microcomputer. While computers were not by any means new to casualty departments, two new directions were planned. Firstly it would be a micro that would be used, and secondly the collection of data would be on-line as the patient attended at the reception desk asking for treatment. After David Jones had initiated the concept, the task of supervising the development from a medical angle was taken by Rhys Gray, then an Orthopaedic Registrar. General hardware and software developments were undertaken by Douglas Clarkson of the local medical physics department.

In previous applications, the department had opted for Pets with Computhink floppy discs, and in mid-1980 a Computhink system running on a 3032 Pet and incorporating twin 80-track double-sided MPI-92 drives giving 1.6Mbyte of disc storage had been obtained as a general-purpose machine. It was decided to begin developments around this system so that no time would be lost waiting for a specific set of equipment to be assembled as and when funds became available to the accident unit. A second-hand 1620 Diablo daisywheel printer was added to complete the system. Eventual funding for the project was provided by the local health authority research committee.

Duplication thwarted

Plans to obtain a duplicate system of Pet and floppy drives were thwarted when ACT, then sole U.K. agent for Computhink drives, gave up its dealership. Part of the problem seemed to be the introduction by Commodore of Basic 4 which delayed Computhink bringing out a compatible disc operating system. After a delay of several months, Stack Computers managed to obtain a disc system, this time with Tandon 80-track drives which could run on an 8032 Pet.

A significant feature of the first system was the remarkable stability of the MPI disc unit, which was in use 24 hours a day seven days a week in its on-line role. With its dust and general human abuse, the environment in the accident unit can only be described as hostile.

Choice of language for the application was academic. Pet Basic was found to lend itself remarkably well to the complex task of implementing the system. To keep things simple no machine-language routines were used to tweek system performance.

Patients' records

Figure 1 describes the items of information which can be stored for each patient. Initially there is the need to identify the patient, to record details of where and how the incident happened and what the complaint is. After treatment, input from the casualty doctor as regards type of injury, diagnosis and outcome of the visit are added to the initial entry. It is obvious, however, that the longer the list of data items the greater the burden on the reception clerk and the more dubious the data will become. In typical busy departments, the on-line data gathering would only seem to be practical when done as a by-product of the normal registration procedure.

Up to 3,400 patient records, each 233 bytes long, can be stored on one floppy disc. A small file which keeps a record of the next new casualty number to be allocated is updated after each new patient registration. The absolute position of each patient record on disc is determined directly by the casualty number, which acts as the main key to the system.

While all the data files are structured for random-access use, for the purpose of analysis they can be read in sequential mode. This greatly increases the speed of reading of data: 1,000 full records can be brought into memory in about 100 seconds.

After two months of spasmodic development, the system was actually alive and well and registering patients just before Christmas 1980. The success of the venture is due in no small way to Linda Roberts, the full-time receptionist at the unit. We did not really hit her with an all-singing all-dancing

casualty

It may sound like fiction, says Douglas Clarkson, but the on-line casualty record system at this hospital in Bangor, North Wales stores up to 20,000 cases each year.

Up to 3,400 patients' records can be stored on one floppy disc, available for instant recall and analysis.

package on day one: it took about three months before things had settled down and we had got around to ironing out various procedural difficulties.

Subsequently, a program incorporating various modes of analysis was developed, based on the design of a package previously written for a microbiology department. Various other smaller programs were written in due course, mainly for transferring data betwee discs and systems.

For most of the day the system churns out casualty cards, automatically storing the data on floppy disc. Another result of the system is that neat, legible casualty cards are available for everyday use. The log book is printed automatically by the system in batches of 50 entries.

One main area where the micro has made a useful contribution is the preparation of sorted lists in alphabetical order of name. In order to produce a sorted list of about 15,000 entries, data was transferred between an 8032 Pet with Computhink disc system and a Cromemco Z-2D system. Floppy discs were then taken to a Cromemco Z-2H system where, eventually, the final print was prepared using hard-disc facilities.

Even this more powerful machine took a total of 24 hours of continuous processing and printing to complete the task. The Pet system, because of practical difficulties, is only really able to sort up to 3,400 entries at a time. Information about previous visits of patients is now more readily available — "hospital hoppers" beware.

When data on disc is analysed, up to 6,800 entries can be scanned together. The user can select options from a lit of eight general types. A feature of the system is that an array of up to 10 command strings can be built up, permitting a set of such questions to be generated and allowed to run without subsequent user intervention. The first three characters of each command string alert the program to the specific function requested.

Recall of details of road-traffic accident cases is provided by the system. An analysis of the workload of the department by age is available.

The second figure shows a national pattern which is repeated locally. It tends to be the young, fit person between 15 and 35 who limps into the unit rather than the more placid senior citizen. A separate analysis can recall patients in selected age-groups.

The coded entries for place of incident, residential code, referred by, mode of transport and follow-up can be summarised in five neat tables. Another mode of analysis allows the recall of entries of a specific coding from a main group. For example, it is possible to select for recall all playground incidents from the place of incident category, or all follow up/admit unit cases.

(continued on next page)

Casualty

(continued from previous page)

There are 62 possible variations on this one mode of analysis. Injuries treated in the unit can be coded using a simple set of injury codes, usually in the form of a three-digit number, each digit coding in turn the type of hospital emergency, the type of injury and the site of injury. One mode of analysis produces an overall summary of this information. A separate routine allows a researcher to pick out cases matching a specified set of injury codes.

One of the problems with operating the system is that not just one person, but a group of people must be adequately familiar with the system. Normally the resident clerk is on duty from 9am until 5pm, Monday to Friday. Cover in the evening till 10pm is provided by part-time staff and there is a rotation for Saturday and Sunday working. Taking into account holidays and sick leave, at least five people have to be familiar enough with the system to operate it.

Many of the difficulties encountered in the operation of the system centre round simple things such as incorrect insertion of floppy discs or inadvertently switching off the printer. Printers have been found to be the weakest link in the system. Fortunately there has always been a spare one to swap in as and when required.

After about 10 months of operation of the Computhink/MPI-92 unit, the drives became unstable and the Tandon unit was swapped in. The fault was eventually traced to an arcing contact on the Computhink power-supply board. To keep on top of possible disc problems, facilities were developed locally to align the disc systems. Once the initial aura of mystery of the floppy drive is overcome, the procedure is straightforward. Happiness is recovering lost programs and data. We found that excellent service facilities are available in the U.K. for both the Tandon and MPI drives through Hal Computers and Rack Data

It is typical for reports on medical computing applications to begin, "Our present system, though entirely adequate, is soon to be upgraded to a XYZ system to improve its performance". What this probably means is that the first system was never in operation long enough in a constant form to serve its intended purpose. The plans at present for the Bangor system are to maintain it in operation and make as much use as possible of the information it

In satisfying both of these aims, the concept of duplicate systems is of great importance, since useful analysis of data cannot really be done on the dedicated system used for patient registration, and it is convenient to have a spare system to swap in if required. For departments with a significantly greater workload — large centres can treat up to 100,000 patients a year — more than one registration unit would be required. Options of a multi-user system or a network of independent micros would be more appropriate there. A network would probably be the more flexible solution, taking into account the need to have facilities operating 24 hours a day, seven days a week.

The combination of the IT-82 initiative, the Körner Report on Health Service Information and general interest in the Bangor system has paved the way for the development of a "national" system. Such a task will be undertaken within Yorkshire Health Region, using also experience gained with an off-line accident and emergency system developed over several years at Leeds Royal Infirmary.

It has become evident from the experience gained at Bangor that a micro has all the inherent attributes needed for the success of a reasonably thought-out system. The weakest link in the chain is not the clock rate of the 6502 processor but the human organisation trying to use effectively its undoubted resources.

	Bytes	Comment
Consultant on duty	1	coded 1 of 3, set once each day
Time of presentation	2	coded (updated from Pet clock)
Date of presentation	3	coded
Patient name	25	24 characters text, plus one code for title
Patient address	30	all text
Telephone number	13	12 bytes text, code for home/work, etc.
Date of birth	4	coded, allows for 19th century
Age	2	coded : allows weeks, months or years
GP name	14	text
GP address	21	text
Occupation	14	text
Place of incident	1	coded, 31 options
Residential code	1	coded, six options
Referred by	1	coded, eight options
Complaint	20	text, input by receptionist
Revisit code	4	coded, includes previous visit number
Mode of transport	1	coded, four options
Casualty doctor	14	text
Medical coding	12	coded, allows for three injuries
Multiple injuries?	1	coded yes or no
Local anaesthetic?	1	coded yes or no
Diagnosis	37	text
Follow up	1	coded, 13 options
Unit Number	4	text
Clinic Date	3	coded
Spare	3	

Figure 1. Items of information stored in each patient record.

AGE GROUP(YEARS)	NUMBER	% OF VALID SAMPLES
0 <AGE< 5	231	7.84
5 <AGE< 10	272	9.23
10 <AGE< 15	368	12.5
15 <AGE< 20	379	12.8
20 <AGE< 25	310	10.5
25 <AGE< 30	250	8.49
30 <AGE< 35	197	6.69
35 <AGE< 40	184	6.25
40 <AGE< 45	148	5.02
45 <AGE< 50	105	3.56
50 <AGE< 55	108	3.66
55 <AGE< 60	91	3.09
60 <AGE< 65	86	2.92
65 <AGE< 70	64	2.17
70 <AGE< 75	54	1.83
75 <AGE< 80	36	1.22
80 <AGE< 85	27	.917
85 <AGE< 90	19	.645
90 <AGE< 95	10	.339
95 <AGE< 100	2	.067
100 <AGE< 105	1	.033

Figure 2. Analysis of workload by age for a two-month period.

If you're good at selling computers...

We could help you sell more

Becoming an Encotel Dealer means we are behind you with one of Britain's most powerful dealer support packages.

Also joining the Encotel Dealer Network opens up a whole new market for your products and software too.

HARDWARE	SOFTWARE	ENGINEERING	PROMOTION
Companies chosen for their support	dBase	Nationwide service through Software Sciences — part of THORN EMI	NATIONWIDE ADVERTISING
 TELEVIDEO® 8-bit & 16-bit family	Spellbinder		CO-OPERATIVE ADVERTISING
 SUPERBRAIN™ Hard disk	Bisync	Technical Support Team	EXHIBITIONS
 BMC Complete Workstation	Multiflex	Engineering Workshops	PROMOTIONAL LITERATURE
 E-STORE Winchester sub-system	ProPascal	User Training	PRESS RELATIONS
	Operator Guide	Service and Technical Staff Training	
	Autocode		
	Technical support SOFTWARE REGISTER		

Contact Susie Allwood, Dealer Relations Manager, for full details of an Encotel dealership

SYSTEMS

ENCOTEL

Britain's specialist microcomputer distributors

ENCOTEL SYSTEMS LIMITED 7 IMPERIAL WAY CROYDON AIRPORT INDUSTRIAL ESTATE CROYDON SURREY CRO 4RR
Tel 01-686 9687/8 01-680 6040 (six lines) Telex 8951921 ENCO G

● Circle No. 156

HONEYFOLD BOOKLIST

Over 1000 Titles

We have concluded agreements with some major book suppliers around the world that allow us to offer immediately the biggest computer book list in Europe. We have a shortform price list of all our titles that we will send you and we also have a 200-page, cross referenced, catalogue with editorial on hundreds of titles that will give you a bookshop of your own. This catalogue costs £1.00. We know our prices are better than elsewhere and we can still offer a monthly service of new books to those on our mailing list.

In early 1983 we will start a book club and hope to offer you even better purchasing power. Let us hear from you. We are equally willing to talk to computer shops where our range and customer use of our catalogue will allow them to offer a much greater service to their customers.

LIST OF PUBLISHERS

ADDISON WESLEY
BRADY
CAMELOT
COMPUSOFT
CORD
COMPUTER SCIENCE PRESS
DESIGN
DILITHIUM PRESS
HARRIS
HAYDEN
IJG COMPUTER SERVICES
JOHN WYLIE & SON
LEXINGTON
LITTLE
McGRAW HILL
MIT PRESS
MATRIX PRESS
OSBOURNE
PETROCELLI
PRENTICE HALL
RESTON
ROBOTICS PRESS
SAMS
SENTURY
SPECTRUM
SYBEX
TAB PUBLICATIONS
VAN NOSTRAND REINHOLD CO

NOW AVAILABLE

DR. WATSON
Computer Learning Series

VIC 20 SPECTRUM DRAGON BBC PET

The Dr. Watson Computer Learning Series

A new series of books on computer languages, carefully graded to suit different abilities and written specifically for the new micros. The whole series is presented in a consistent style and each book comes with a cassette containing all the major programs developed in the book.

Learning BASIC is FUN. Learning assembly language is FUN – ask Dr. Watson!

Learn BASIC with your Spectrum, Dragon or BBC by writing your own games, your own music program and – yes – an Adventure game designed by you! Just in case though, if you can't wait to learn, the good Doctor provides a cassette. So you can run and enjoy the games and then settle down to see how they work – and add YOUR improvements.

Learn ASSEMBLY-LANGUAGE with your PET, VIC 20, Spectrum or BBC, using your own assembler – supplied in a cassette with the book and used throughout in all the demonstration routines. Just in case, too, there's a tutor to show you how the noughts and ones of binary and the E's and F's of Hex work. A book to make sure you learn assembly-language EASILY. Crammed full of sample programs and exercises.

BOOK AND SOFTWARE
£14.95 INC VAT & POST

VIC 20
TOTL PROFESSIONAL SOFTWARE

TOTL TEXT

SIMPLY THE BEST: Page numbering • Right and left margins • Skip to top of page • Centered title lines • Character and line spacing • Graphics characters • Full curser control in editing • Add, change, delete characters • Specify printer device number • Print mailing labels • Paragraph control • VIC 1515 exponded characters • Single, double, triple spacing • Tab position control • Upper and/or lower case • Full screen editing • Scroll up and down through text • Insert, delete blocks of text • Multiple copies of document

Up to 4 heading lines per page • Footing line at bottom of page • Up to six 80 column lines may be entered and printed within the body of a document • Footnotes • Keyboard inputs

£16.95

TOTL LABEL

A completely practical program for computerising address books or business mail lists. You define width, number of lines and number of characters. The program alphabetizes and you can assign account or customer numbers for further search control. You can print the whole list or selected labels. Make full use of your computer.

£14.95

TOTL TIME

Easy to use, menu driven • Add, change, delete • Browse, (display on screen) • Inquiry display, (date range, Person, Project) • Save and load files on tape or disc • Use of full colour in screen display

Time report • 56 different bar chart report formats • Organise by Person, Project, activity • Sequence beginning or ending date or activity number • Four years, one year, six months, seven weeks, six 9 hour days, two 24 hours

£16.95

RESEARCH ASSISTANT

It takes a competent programmer to write the program to create and control the necessary data files that will let you recall specific data at will. Here are three programs that will allow you to compile information from books, periodicals, accounts, dates in fact any data you wish to keep, to organise it and, most important of all, to create cross reference lists by feyword to help you locate the right reference when you need it.

£16.95

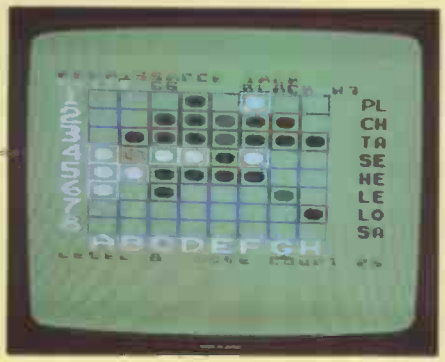
HONEYFOLD

Honeyfold Software Limited
Standfast House, Bath Place,
High Street, Barnet, London.

• Circle No. 157

Vic-20 games

Jack Schofield plugs in to three ROM-based games.



Renaissance

ACTUALLY THE WELL-KNOWN board game of Othello, under another name, Renaissance is well endowed with facilities. To play, you use the cursor-control keys to move a cursor to the square you want, then press Return. Once your move has been accepted you have to press Return again to start the computer "thinking". This is somewhat tedious and could have been avoided.

The graphics are quie acceptable, considering the limitations of the Vic itself. The sound, however, consists of electronic beeps which are only just this side of bearable. Quick players will probably turn down the TV sound.

The only other critical points are that the display does not give a score, and that you are not told if you have no legal move, or if you have only one legal move, or if the move you have made is illegal. Renaissance does not accept illegal moves, but neither does it help unless asked.

Renaissance does play a very good game of Othello. At the highest of its eight levels it wiped the floor with this reviewer — admittedly a beginner, but used to beating micros at the game. Unlike most microcomputer versions, Renaissance does not work through the board square by square when "thinking", but jumps around the main lines of play. Obviously some in-depth analysis takes place, and it would be interesting to see the algorithm used. Its playing strength makes Renaissance one of the better Vic games.

Specification

Type: Real-time board game with colour graphics and limited sound
Format: Plug-in ROM pack, VP-049
System: Unexpanded Vic-20
Manufacturer: Audiogenic (Software) Ltd, PO Box 88, Reading, Berkshire
Price: £19.95
Rating: 14/20

Spiders of Mars

LIKE CENTIPEDES, Spiders of Mars is bug-filled, but the two games are not alike in other respects. Spiders is much more like Defender, except that you don't have to rescue people.

Spiders of Mars is played within the confines of the normal Vic screen, with a wide coloured border. You control one sort of insect, and you are attacked by a lot of other insects. The spiders of the title lower themselves on threads from the top of the screen. Your task is to blast them all out of the sky, while dodging bullets and tiny white mines which converge on your blaster and destroy it.

You have three blasters for each game. The program keeps your score and the highest score. Ten levels of play are possible.

The great attraction of the game is that the action is fast and furious. The sound routines are quite good: the Vic makes a passable attempt at a phrase from Bach's Toccata and Fugue in D minor.

There are two main problems with the game. First, the enemies are detailed, multicoloured characters, but the inherent coarseness of the Vic's graphics, means they are too big for the limited screen area available for play. Smaller, simpler characters would have made a better game.

The ROM pack optimistically lists keyboard controls such as A for up and Z for down. The game is quite impossible to play this way, but with a joystick it becomes enjoyable.

Specification

Type: Arcade game with colour and sound
Format: Plug-In ROM pack, VP-014
System: Unexpanded Vic-20 plus joystick
Manufacturer: Audiogenic (Software) Ltd, PO Box 88, Reading, Berkshire
Price: £19.95
Rating: 13/20

Road Race

The game is misnamed: it should be called Time Trial. Road Race is actually a driving simulation, with the screen used to display a crude impression of a road at night. The objective is to cover as many kilometres as possible in the 100 time units allowed. Pressing the four function keys enables you to change up through the gears, while pressing Return — the accelerator — keeps up the revs. Steering is done with the A and D keys.

At the bottom of the screen is an instrument panel with a speedometer dial, a rev counter, gear indication and the distance covered. Road Race is quite realistic: if you change up with too few revs the engine dies, and you have to press I — the ignition — to start again.

The graphics are adequate but not very colourful. The road is a mere token, and lacks even a white line down the middle, which would have been useful.

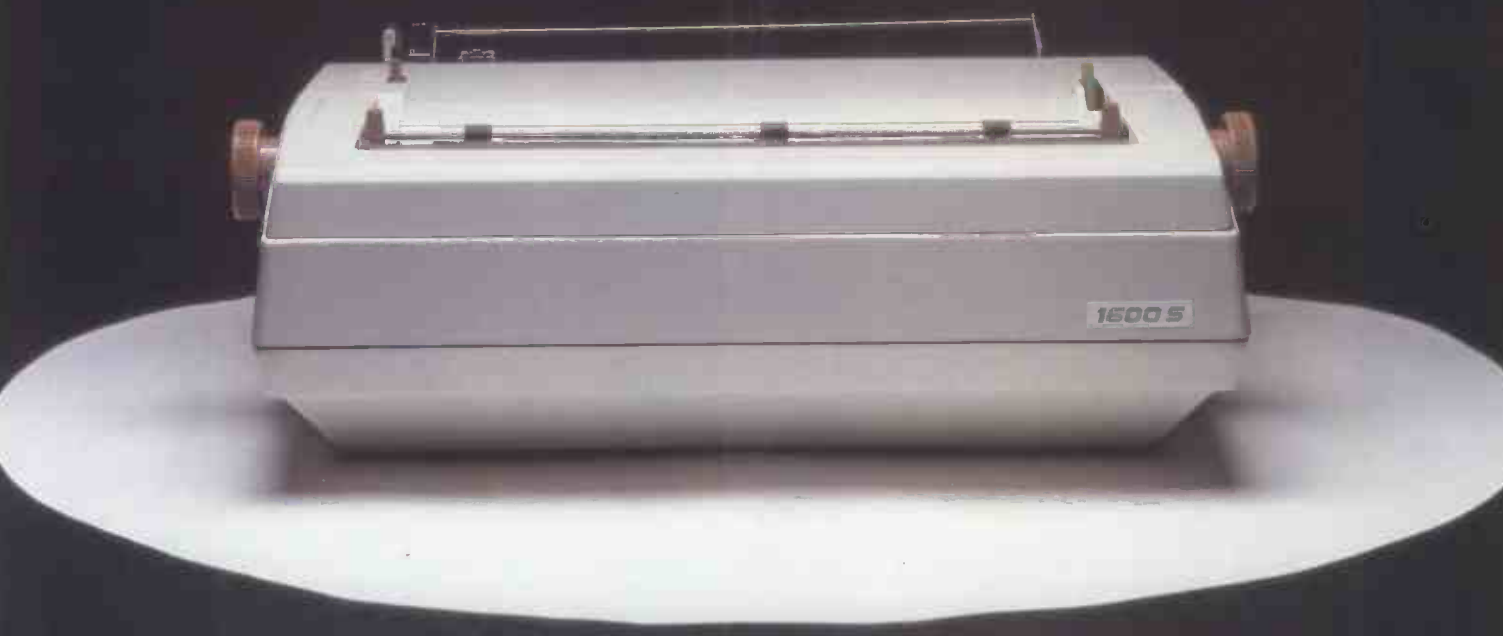
The sound is also adequate but lacks excitement and invention. Crashing the car gives a disappointingly quiet bonk. After completing the course you are rewarded with a one-line tune, and it is a wretched little thing.

Road Race's main attraction is that it provides reasonably accurate simulation of driving, which should make it both interesting and educational for young children. Once this has been mastered, however, the game does not provide enough in terms of excitement or visual interest to make it gripping.

Specification

Type: Real-time driving simulation with graphics and sound
Format: Plug-in ROM pack Vic-1909
System: unexpanded Vic-20
Manufacturer: Commodore, 675 Ajax Avenue, Slough, Berkshire SL1 4BG
Price: £19.95
Rating: 9/20

THE BEST SELLER OF 1982



In 1982 the RICOH 1600S outsold every other comparable printer because of its speed, reliability, intelligence, flexibility and sophistication.

Because it is compatible with all known systems and software packages.

Because of the 12 month warranty that Micropute offer.

Because Micropute are a company who care, who are constantly aware of changing needs and who can fulfill any special requirements.

Not least of all, because of the price—**£1450.**

In 1983, there will be thousands more satisfied customers. We hope that you will be one of them.

ONLY MICROPUTE GIVE YOU SUPERCOVER

As an extra bonus Micropute Supercover will provide a 12 month on site maintenance for only £99.00 parts and labour.

DON'T FORGET THE RICOH 1300S

...a little bit slower but every bit as clever.

only **£1075**

Please send details of the RICOH 1600S and 1300S

Name: _____

Position: _____

Company: _____

Address: _____

_____

_____ Telephone: _____

● Circle No. 158 RP2

MICROPUTE

Micropute, Catherine Street, Macclesfield, Cheshire SK11 6QY. Tel: (0625) 615384.

Open File

This regular section of *Practical Computing* appears in the magazine each month, incorporating Tandy Forum, Apple Pie, Sinclair Line-up and other software interchange pages.

Open File is the part of the magazine written by you, the readers. All aspects of microcomputing are covered, from games to serious business and technical software, and we welcome contributions on CP/M, BBC Basic, Microsoft Basic, Apple Pascal and so on, as well as the established categories.

Contributors receive £30 per published page and pro rata for part pages, with a minimum of £6. Send contributions to: Open File, *Practical Computing*, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

Guidelines for contributors

Programs should be accompanied by documentation which explains to other readers what your program does and, if possible, how it does it. It helps if documentation is typed or printed with double-line spacing — cramped or handwritten material is liable to delay and error.

Program listings should, if at all possible, be printed out. Use a new ribbon in your printer, please, so that we can print directly from a photograph of the listing and avoid typesetting errors. If all you can provide is a typed or handwritten listing, please make it clear and unambiguous; graphics characters, in particular, should be explained.

We can accept material for the Pet, Vic and Sharp MZ-80K on cassette, and material for the larger machines can be sent on IBM-format 8in. floppy discs.

COMMODORE CORNER

by Mike Todd

One liners

SIMPLE ROUTINES that will fit into a single line in Basic have always been popular with Pet enthusiasts. Not only do they take up little space, but they are often reasonably speedy in execution.

I have listed two of my own favourite one-line routines which I have been using for a long time. They convert a hex number to decimal and vice versa and are intended to be used as subroutines.

The routine to convert a decimal set up in variable D to hex in H$ is given in line 100. Note that for this routine to work, H$ must be a null string on entry. The routine for converting the hex number in H$ to decimal in D is given in line 200 and assumes no initial conditions set.

The routines are easily modified to convert from or to any other base simply by changing every occurrence of 16 to the base required. But be careful, if you want to convert to a base greater than 16 then the string of digits in line 100 will have to be extended and the whole thing may no longer fit on one line.

These are surely the shortest possible hex to decimal and decimal to hex routines — unless of course, you know any which are shorter still.

Dog fight

J R Wilson of Benfleet, Essex has written a simple game which can be played by two players. Each is piloting a

(continued on next page)

```
100 IF D THEN A=INT(D/16):H$=MID$("0123456789ABCDEF",1+D-A*16,1)+H$:D=A:GOTO100
200 D=0:IFH$>""THENFORI=1TOLEN(H$):A=ASC(MID$(H$,I,1))-48:D=D*16+A+(A>9)*7:NEXT
```

Dog fight.

```
1 DIM C(8),Y(8),X(8)
2 FOR I=1 TO 8 READ C(I) NEXT
3 DATA 22,254,62,251,30,236,60,252
4 FOR I=1 TO 8 READ X(I),Y(I) NEXT
5 DATA 0,1,1,1,0,1,-1,0,-1,-1,-1,0,-1,1
10 FOR T=920 TO 946 READ H POKE T,H NEXT
20 DATA 162,0,173,16,232,41,240,141,16,232,173,18,232,
30 DATA 73,255,157,132,3,232,238,16,232,224,10,208,240,96
40 PRINT "□"
50 PRINT"■■■■■■■■■■■■■■■■■■■■■■ D O G F I G H T"
60 PRINTTAB(25),"■BY J.R.WILSON"
70 PRINT "■■DO YOU WANT INSTRUCTIONS"
80 GETA$:IF A$="Y" THEN GOSUB 970
90 IF A$="" THEN 80
100 PRINT "□"
110 LX=INT(RND(1)*40) LY=INT(RND(1)*25)
120 RX=INT(RND(1)*40):RY=INT(RND(1)*25)
130 LK=INT(RND(1)*8):RK=INT(RND(1)*8):LS=20:RS=20
140 GOSUB 750
150 LX1=LX LY1=LY RX1=RX:RY1=RY
165 TI$="000000"
169 IF LC=1 THEN  POKE 32768+LY1*40+LX1,102:GOTO 175
170 POKE 32768+LY1*40+LX1,32
175 IF RC=1 THEN POKE 32768+RY1*40+RX1,102:GOTO 190
180 POKE 32768+RY1*40+RX1,32
190 SYS 920
200 IF (PEEK(906)AND1)THEN LK=LK+1
210 IF (PEEK(907)AND1)THEN LK=LK-1
220 IF (PEEK(908)AND128) THEN RK=RK-1
230 IF (PEEK(909)AND64) THEN RK=RK+1
240 IF LK<1 THEN LK=8
250 IF RK<1 THEN RK=8
260 IF LK>8 THEN LK=1
270 IF RK>8 THEN RK=1
275 LX1=LX:RX1=RX:LY1=LY:RY1=RY
280 LY=LY+Y(LK):LX=LX+X(LK)
320 IF LY<0 THEN LY=24
330 IF LY>24 THEN LY=0
340 IF LX<0 THEN LX=39
350 IF LX>39 THEN LX=0
360 RY=RY+Y(RK): RX=RX+X(RK)
400 IF RX<0 THEN RX=39
410 IF RX>39 THEN RX=0
420 IF RY<0 THEN RY=24
430 IF RY>24 THEN RY=0
435 RC=0:LC=0
440 IF PEEK(32768+RY*40+RX)=102 THEN RC=1
450 IF PEEK(32768+LY*40+LX)=102 THEN LC=1
460 IF RC=0 THEN POKE 32768+RY*40+RX,C(RK)
470 IF LC=0 THEN POKE 32768+LY*40+LX,C(LK)
480 IF (PEEK(906)AND2) THEN GOSUB 510
490 IF (PEEK(909)AND128) THEN GOSUB 620
500 GOTO 169
510 IF LS=0 THEN RETURN
520 LS=LS-1
530 A=Y(LK):B=X(LK):Y=LY+A:X=LX+B
540 FOR R=1 TO 10
550 C=0 IF PEEK(32768+Y*40+X)=102 THEN C=1
560 IF C=0 THEN POKE 32768+Y*40+X,46
565 X1=X: Y1=Y
570 Y=Y+A:X=X+B
571 IF Y<0 THEN Y=24
572 IF Y>24 THEN Y=0
573 IF X<0 THEN X=39
574 IF X>39 THEN X=0
580 FOR I=1 TO 20 NEXT
590 IF C=0 THEN POKE 32768+Y1*40+X1,32
591 IF Y=LY AND X=LX THEN GOSUB 650:GOTO 650
592 IF Y=RY AND X=RX THEN GOSUB 650 GOTO 720
600 NEXT R
610 RETURN
620 IF RS=0 THEN RETURN
630 RS=RS-1
640 A=Y(RK):B=X(RK):Y=RY+A:X=RX+B
645 GOTO 540
650 FOR I=1 TO 500
660 PRINT"□■■■■■THE RIGHT PLAYER IS THE WINNER!■"
665 M=VAL(MID$(TI$,4,1)):S=VAL(RIGHT$(TI$,2))
670 PRINT"■■■ IN ";M;" MINUTES ";S;" SECONDS."
680 PRINT"■■ANOTHER GAME?"
690 GETA$:IF A$="Y" THEN RUN
700 IF A$="N" THEN END
710 GOTO 690
720 FOR I=1 TO 500
730 PRINT"□■■■■■THE LEFT PLAYER IS THE WINNER!■"
740 GOTO 665
750 FOR I=1 TO INT(RND(1)*3)
760 S=INT(RND(1)*3)+1
770 X=INT(RND(1)*40) Y=INT(RND(1)*25)
780 IF X<S+S OR X>40-S-S THEN 770
790 IF Y<S+S OR Y>25-S-S THEN 770
800 FOR Y1=Y-S TO Y+S
810 FOR X1=X-S TO X+S
820 POKE 32768+Y1*40+X1,102
830 NEXT X1,Y1,I
840 RETURN
850 IF Y=0 THEN Y=1
851 IF Y=23 THEN Y=22
852 IF X=0 THEN X=1
853 IF X=39 THEN X=38
859 P$=LEFT$("■■■■■■■■■■■■■■■■■■■■■■■■■",Y)
860 FOR I=1 TO 5
870 PRINT P$;TAB(X-1);"\ /"
880 PRINT TAB(X-1);"—●—"
890 PRINT TAB(X-1);"/ \"
900 FOR J=1TO50:NEXT
910 PRINT P$;TAB(X-1);"■\ /■"
920 PRINT TAB(X-1);"■—●—■"
930 PRINT TAB(X-1);"■/ \■"
940 FOR J=1TO50:NEXT
950 NEXT I
960 RETURN
970 PRINT "□              ■D O G F I G H T ■"
980 PRINT:PRINT
990 PRINT"   THIS IS A GAME FOR TWO PLAYERS WHERE"
1000 PRINT"EACH PLAYER CONTROLS AN AIRPLANE ABOUT"
1010 PRINT"TO ENTER INTO COMBAT.THE IDEA OF THE "
1020 PRINT"GAME IS TO SHOOT YOUR OPPONENTS PLANE"
1030 PRINT"OUT OF THE SKY BEFORE HE GETS YOU."
1040 PRINT"THE LEFT PLAYER USES THE FOLLOWING "
1050 PRINT"CONTROL KEYS:       Z ROTATE LEFT"
1060 PRINT"                    X ROTATE RIGHT"
1070 PRINT"                    C FIRE."
1080 PRINT"  THE RIGHT PLAYER USES THE FOLLOWING"
1090 PRINT"CONTROL KEYS:     . ROTATE LEFT"
1100 PRINT"                  - ROTATE RIGHT"
1110 PRINT"                  = FIRE."
1120 PRINT"   EACH PLAYER HAS A MAXIMUM OF 20 "
1130 PRINT"SHOTS WITH WHICH TO GET THE OTHER"
1140 PRINT"PLAYER.ALSO.WATCH OUT FOR THE CLOUDS"
1150 PRINT"YOUR OPPONENT MAY BE HIDING IN THEM."
1155 PRINT:PRINT:PRINT
1160 PRINT"          ■PRESS SPACE TO START■"
1170 GETA$:IF A$<>" " THEN 1170
1180 RETURN
```

(continued from previous page)

plane and must try to out-manoeuvre and shoot down his opponent. There are clouds shown on the screen and either plane can fly around in the clouds without being seen by its opponent, although it can still fire at enemy craft.

The game is based around a short machine-code routine which appeared in *Practical Computing*, December 1980, and allows any number of keys to be pressed simultaneously and still be detected by the program.

A couple of notes to help typing the program. First, there is a Home and 26 Cursor-downs in line 859, and 10 Cursor-downs and 10 Cursor-rights in line 50. Secondly it is important that all the Data statements are typed correctly, especially those in lines 20 and 30. If these two lines contain any errors, the Pet could hang up when the Sys920 in line 190 is executed. Saving the program on cassette or disc before you run it will at least ensure that you can recover if you have made a mistake.

You might also like to note that lines 150 and 275 are redundant as they are simply the same as having LX = LX and so on, and if you are feeling particularly enthusiastic some speed improvements could be made by changing all the occurrences of 32768 to SC and setting SC to 32768 at the start of the program.

Bordering on boxes

On the subject of routines and things which work on different machines, David Barratt of Blackpool has provided a short

Bordering on boxes.

```
100 REM     SUBROUTINE TO PLOT A CENTRALISED BORDER FOR 8032
110 REM     ------------------------------------------------
120 REM
130 REM   PARAMETERS REQD.  C = NO. COLS        L = NO. LINES
140 :
150 IF C<3 OR C>80 OR L<2 OR L>25 THEN RETURN : LIMITS EXCEEDED.
160 :
170 SC =32768+INT((80-C)/2)+80*INT((25-L)/2)
180 TL =SC          : TR =SC+C-1       : BL =SC+(L-1)*80 : BR =BL+C-1
190 POKE TL,112     : POKE BR,125
200 FOR  I=1 TO L-2 : POKE TL+80*I,93 : POKE BR-80*I,93 : NEXT
210 POKE TR,110     : POKE BL,109
220 FOR  I=1 TO C-2 : POKE TR-I,64    : POKE BL+I,64    : NEXT
230 RETURN
```

routine to draw a centralised box on the screen of an 8032.

It is written as a subroutine and requires C to be set to the number of columns and L the number of lines, including the border, that the box will contains.

By changing all occurrences of 80 to 40 the routine will work on a 4032 as well. It could even be modified to work on the Vic but would need an additional routine on the same lines to Poke the colour of the border, otherwise it would not be seen.

Vic colours

On the subject of the Vic, Michael Taylor of Bishop's Stortford has written a simple routine which will fit into one line and will flip the character and background colours on the Vic:

N = PEEK(36879):
POKE 36879, (N OR 8) AND NOT (N AND 8)

Tax payer

It's not long now before the end of the tax year. George Raven of Walton-on-the-Naze, Essex has sent a timely reminder in the form of a short program to help check that you have not paid too much tax.

The program asks for your taxable income, building society interest, where tax has already been paid at standard rate, and also for any charitable deeds of covenant you may have to take into account. It then asks for details of any allowances which you can set against tax and from this it calculates the net amount chargeable to tax and displays the amount of tax you should have paid.

By entering the amount actually paid the program will show you how much you have under- or over-paid. The details of rates of tax are in the Data statement of line 38 showing the tax bands and the percentage rate and these can be changed as the tax rates are adjusted by the Chancellor.

Although the program is fairly simple, it demonstrates one of the ways of getting round the problem of the Pet aborting the program and returning to the Ready mode if the return key is pressed without there being any input. It simply puts a decimal point where the input will start and then does three Cursor-left characters. When the Pet then prompts and waits for input it has a decimal point under the cursor and pressing the Return key immediately will return a value of zero to the input variable. So if you have nothing to enter against a particular item in the program just press Return and the program will continue with the next item.

The other programming trick is in line 16 where the horizontal (H) and vertical (V) co-ordinates of the input are Poked and a Sys is executed which will position the cursor at this position. The Input in line 17 then starts at these coordinates.

The Pokes and Sys are given for a 4032 small-screen Pet. For Basic 2 or 3 the Sys is

SYS57979

for Basic 4 on a large-screen 4032 it is

SYS57457

and on an 8032 it is

SYS57447.

On very early Basic 1 Pets it is

SYS58843

The Pokes are

POKE226,H

and

POKE245,V

There is a small bug in the program, affecting the screen layout. Because of the way the screen is cleared in line 14, the first line of allowances has a gap below it. The program works correctly, but it does look messy.

The string of spaces in line 8 contains 18 spaces, while in line 9 it contains 39.

Tax payer.

```
1 REM**********************************
2 REM*                                *
3 REM* INCOME TAX CALCULATIONS       *
4 REM*                                *
5 REM**********************************
6 DIMAL$(11),AL(11),TP(6),RT(6):TA=0:TT=0:TX=0:H=30:V=8
7 FORJ=1TO11:READAL$(J):NEXT:FORJ=1TO6:READTP(J),RT(J):NEXT
8 FORJ=1TO11:AL$(J)=LEFT$("■"+AL$(J)+"■                    ",29):NEXT
9 SP$="                                    "
10 PRINT"■"SPC(13)"■INCOME TAX■■■"
11 INPUT"TOTAL TAXABLE PAY FOR YEAR  .■■■";TT:PRINT
12 INPUT"GROSS BLG.SOCIETY INTEREST  .■■■";BS:PRINT
13 INPUT"AMOUNT OF CHARITY DEED      .■■■";CD
14 PRINT"■■■■■"SP$SP$SP$SP$SP$:PRINT"■■■■■ENTER YOUR ALLOWANCES":PRINT
15 FORJ=1TO11:PRINTAL$(J):NEXT
16 FORJ=1TO11:POKE198,H:POKE216,V:SYS57471
17 INPUT".■■■";AL(J):V=V+1:NEXT
18 PRINT"■■■■■ENTER ALLOWANCES AGAINST OTHER INCOME"
19 INPUT"■■■UNTAXED INTEREST        .■■■";A3
20 INPUT"OCCUPATIONAL PENSIONS   .■■■";A4
21 INPUT"NAT.INS. BENEFITS       .■■■";A5
22 INPUT"OTHER ADJUSTMENTS       .■■■";A6
23 FORJ=1TO11:TA=TA+AL(J):NEXT:TA=TA-A3-A4-A5-A6:TX=TT-TA
24 PRINT"■■NET AMOUNT CHARGABLE TO TAX■ =  "TT-TA
25 TP(1)=TP(1)+CD-BS
26 FORJ=1TO5:IFTX<TP(J)THENT6=T6+TX*RT(J):GOTO29
27 IFTX>TP(J)THENT6=T6+TP(J)*RT(J):TX=TX-TP(J):NEXTJ
28 IFTX>0THENT6=T6+TX*TP(6)
29 T6=T6/100:PRINT"■■■TOTAL TAX DUE = ";T6
30 PRINT"■■":INPUT"TOTAL TAX PAID  .■■■";XP
31 IFXP>T6THENXO=XP-T6:TT$="OVERPAID"
32 IFXP<T6THENXO=T6-XP:TT$="UNDERPAID"
33 PRINT"■■YOU HAVE ";TT$;XO
34 DATA"EXPENSES","DEATH & SUPERAN.BENEFITS","BUILD.SOC.INTEREST PAYABLE"
35 DATA"LOAN ETC INTEREST PAYABLE","PERSONAL","AGE ALLOWANCE","WIFE'S INCOME"
36 DATA"ADDIONAL PERSONAL","DEPENDANT REL.","WIDOWS BEREAVEMENT"
37 DATA"OTHER     "
38 DATA12800,30,2300,40,4000,45,6200,50,6200,55,0,60
```

TANDY FORUM

by John Wellsman

Racing certainty

LAST MONTH I wanted to offer you a program which claims to help you pick out the winners on the turf. Caution prevailed, and before setting it before the world at large I tried it out very carefully, and strictly according to the author's ideas, on five races. I am not much of a punter, and would not ordinarily know where to get the information required, but with the help of a friend we got the necessary data and fed it in. To our surprise, the first, fourth and fifth came home and I showed a profit of £3.66.

I think I should remind you that the next five could easily have gone down. So Beware! Something more than computer programs are required to show a profit with the horses. We are indebted for this program to Mr G Smith of Farnham, Surrey.

Mr Smith says, "I feel it only fair to state that the program does not guarantee to find the winner for every race. What it does do when combined with a little common sense is to provide a reasonable chance of making an overall profit over a number of races."

The forecast depends upon a number of factors, two of which are the current position in the odds and the number of forecasts. From a purely mathematical point of view, other people's opinions — which is what these two factors consist of — do not in any way improve a horse's chances of winning.

I would have liked to see Mr Smith's program a little more compact, though he may say, justifiably, that its present form makes it easier to understand. But no one can dispute the fact that he has been too economical in the use of the CLS command.

I am a great believer in good presentation, though in the throes of composition this aspect tends to be forgotten. But once the program is finished you should run through it as objectively as possible, trying to see it as if for the first time. Make sure that the screen is frequently cleared and that it does not become cluttered with the answers to past Inputs unless it is necessary, and that instructions and unrelated Inputs are attractively positioned.

Page storage

The next program could be very useful to games writers and others who use visual displays. It is a routine which will enable you to store a screen or page of display and recall it instantly whenever needed. It was sent to me by Simon Goodwin of Hereford.

(continued on page 132)

Racing certainty.

```
1 CLEAR 1000
10 REM ** HORSE RACING FORECAST **
20 REM COPYRIGHT (c) G.SMITH MAY
1981
30 DIM NA$(50),VA$(50)
40 CLS:PRINT"** HORSE RACING
FORECAST **"
50 CO=1: GOSUB 10000: OC=CG
60 PRINT"TYPE IN THE NAME OF RUNNER
NUMBER";CO;:INPUT NA$(CO)
70 INPUT"TYPE IN THE LISTED
POSITION IN THE ODDS - 1 = FAV
ETC";PO:
80 PRINT"YOU HAVE NOW GOT TO ENTER
VARIOUS FACTORS TO CALCULATE HOW
WELL THE HORSE RUNS ON THIS
GROUND":FC=0
90 INPUT"ANY MORE PAST RACES FOR
DATA(Y/N)";AA$
100 IF LEFT$(AA$,1)()"Y" THEN 220
110 GOSUB 10000
120 INPUT"TYPE IN THE POSITION IN
THAT RACE";AA
130 IF OC=CG AND AA=1 THEN
FC=FC+2:GOTO 90
140 IF OC=CG AND AA<4 THEN
FC=FC+1:GOTO 90
150 IF OC=CG AND AA<6 THEN 90
160 IF OC=CG AND AA>8 THEN
FC=FC-2:GOTO 90
170 IF OC=CG THEN FC=FC-1:GOTO 90
180 IF ABS(OC-CG)>1 THEN 90
190 IF AA=1 THEN FC=FC+1:GOTO 90
200 IF AA<6 THEN 90
210 FC=FC-1: GOTO 90
220 IF FC>10 THEN FC=10 ELSE IF
FC<-10 THEN FC=-10
230 INPUT"TYPE IN THE POSITION IN
THE LAST RACE RUN";P1
240 INPUT"TYPE IN THE POSITION IN
THE LAST RACE BUT ONE";P2
250 INPUT"TYPE IN THE POSITION IN
THE LAST RACE BUT TWO";P3
260 INPUT"TYPE IN THE POSITION IN
THE LAST RACE BUT THREE";P4
270 INPUT"TYPE IN THE CLASS OF
JOCKEY 1ST TO 4TH (1-4)";JC
280 INPUT"TYPE IN ZERO IF THE HORSE
IS CARRYING WEIGHTS AND 10 IF HE IS
NOT";WE
290 INPUT"TYPE IN THE NUMBER OF
TIPS THIS HORSE HAS BEEN GIVEN";TI
300 IF P1=0 THEN 320
310 P1=12/P1
320 IF P2=0 THEN 340
330 P2=12/P2
340 IF P3=0 THEN 360
350 P3=6/P3
360 IF P4=0 THEN 380
370 P4=6/P4
380 PO=PO+3
390 PO=60/PO
400 JC=12/JC
410 TI=TI/2
420 OT=P1+P2+P3+P4+PO+FC+JC+WE+TI
430 VA(CO)=OT
440 PRINTNA$(CO);" HAS BEN ASSIGNED
THE RATING OF";VA(CO)
450 INPUT"ANY MORE HORSES(Y/N)";AA$
460 IF LEFT$(AA$,1)="Y" THEN
CO=CO+1:GOTO 60
470 OT=0:FOR X=1 TO
CO:OT=OT+VA(X):NEXT
```

(listing continued on page 132)

When it's time to stop playing games and get down to business...

Unfortunately, many of today's desk top computers are designed with too much emphasis on home use. That's fine, if you want to balance your checkbook, play "space war" or draw pictures. But when you have serious business requirements for a computer, you want one designed specifically for business.

The RAIR Business Computer is just that. A computer designed specifically for business applications, incorporating a host of features—optimised for the business environment. 8- and 16-bit microprocessors allow users to run available 8-bit—plus newer 16-bit—applications software simultaneously. And an integral high-capacity Winchester disk drive—plus provision for additional hard disk support—provides sufficient on-line storage for virtually any business application.

Advanced communications software allows the RAIR Business Computer to connect to mainframe systems and networks. And expanded RAM memory supports simultaneous access from up to four user workstations, each including an ergonomically designed, detached keyboard, high-resolution colour display, and optional workstation printer.

So if you're serious about a computer for business, call RAIR for details about our Business Computer. We're not playing games.

RAIR Limited
6-9 Upper St. Martins Lane
London WC2H 9EQ
Phone (01) 836 6921, Telex 298452

● **Circle No. 159**

SYSTEM SPECIFICATION
Microprocessors: Concurrent 16-bit 8088 plus 8-bit 8085
RAM Memory: 256 kbytes expandable to 1024 kbytes
Integral Disk Storage: 19-Mbyte Winchester drive plus 1-Mbyte floppy drive
Storage Options: Up to 4 add-on Winchester drives plus streaming tape backup
Communications: 4 workstation ports (RS-422-compatible), plus 2 synchronous/asynchronous programmable RS-232 ports

WORKSTATIONS (up to 4)
Keyboard: Ergonomic, low-profile, 83 keys, 10 programmable function keys, 10-key numeric keypad (with cursor/editing functions)
Color Display: High-resolution, 80 characters x 25 lines, upper and lower case, 8 programmable foreground/background colors
Printer: Bidirectional, 80 characters-per-second, friction and tractor feed

SOFTWARE
Operating System: User-friendly, multi-tasking, CP/M, MP/M, PC-DOS compatible
Languages: BASIC, COBOL, Pascal
Applications: Spreadsheet, Database, Text Processing Communications

CP/M and MP/M are trademarks of Digital Research
PC-DOS is a trademark of IBM

the RAIR Business Computer.

Samurai means to
Samurai is built to s

Out of the world's most powerful economy comes the world's most performance-orientated executive computer. It's the Samurai from Micro Networks, a 16 bit business machine with a capability, features and a price that gives it a decisive edge over the competition from the other side of the Pacific.

As well as the thrust of the Intel 8086 power, there's an impressively engineered reliability that's wholly Japanese. 128K bytes of memory, 2.4 megabytes formatted floppy disk storage with standard IBM format compatability, communications

RRP £2795 e

erve. The new 16 bit
've today's executive.

and printer interfaces all come as standard. And on top there is a superb range of options.

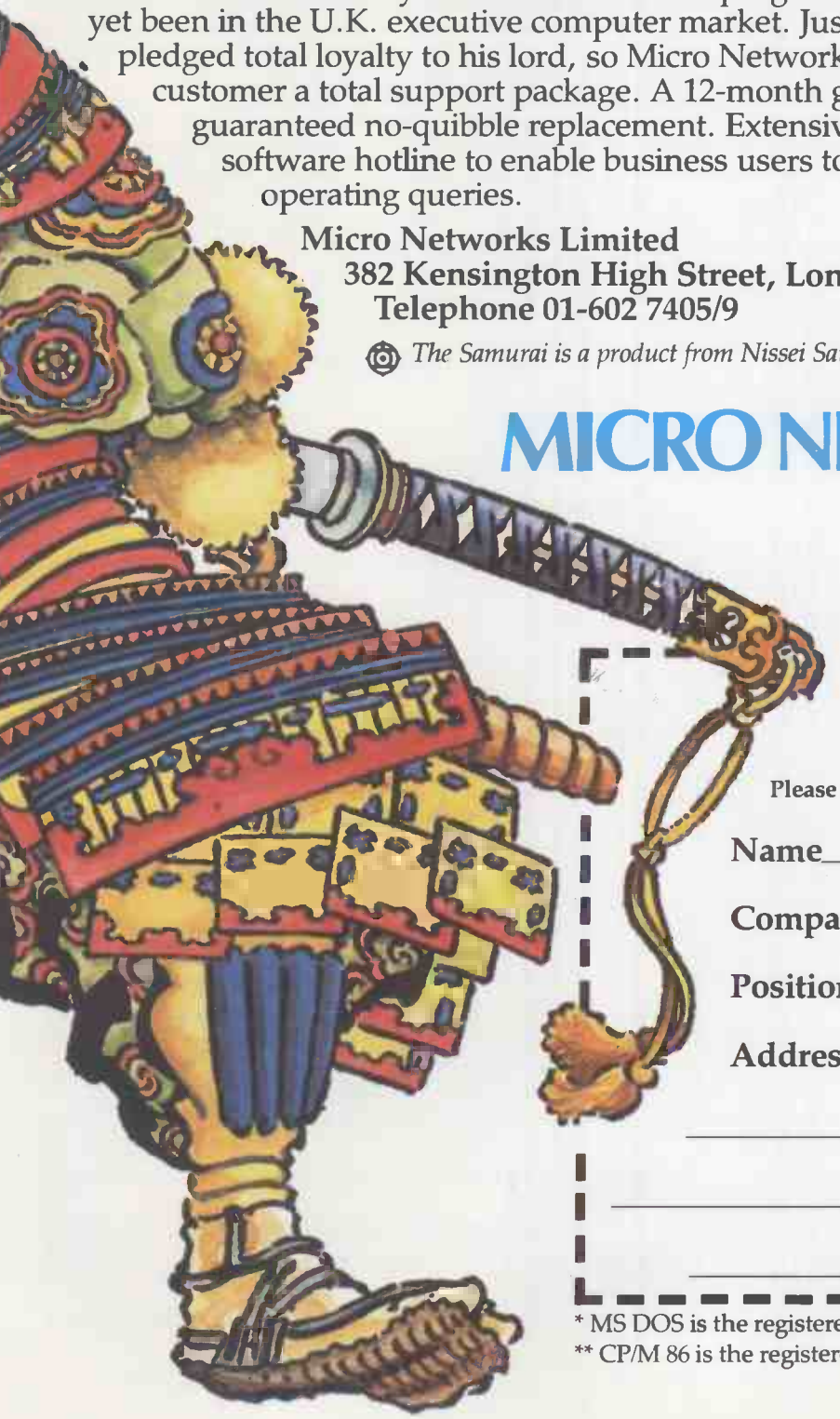
The software available to Samurai users is extensive. A full library has been developed by Peachtree the world's largest microcomputer software house, for MS DOS* and CP/M86** Samurai's operating systems. It all indicates that here's a machine that's built to work alongside you in the toughest business environment.

The Samurai is backed by an aftersales service programme, the like of which has not yet been in the U.K. executive computer market. Just as an ancient Samurai warrior pledged total loyalty to his lord, so Micro Networks pledges every Samurai customer a total support package. A 12-month guarantee of course, but also a guaranteed no-quibble replacement. Extensive training is available, and a software hotline to enable business users to get fast answers to operating queries.

Micro Networks Limited
382 Kensington High Street, London W14 8NL
Telephone 01-602 7405/9

The Samurai is a product from Nissei Sangyo which is a subsidiary of Hitachi.

MICRO NETWORKS



To: Micro Networks Limited
382 Kensington High Street
London W14 8NL

Please send me more details of the 16 bit Samurai.

Name_____

Company_____

Position_____

Address_____

_____

_____

Phone_____ PC1

* MS DOS is the registered mark of Micro Soft
** CP/M 86 is the registered mark of Digital Research

● Circle No. 160

(listing continued from page 128)

```
480 PRINT"** FORECAST RESULT **"
490 PRINT"FIRST IS ";:GOSUB 20000
500 PRINT"SECOND IS ";:GOSUB 20000
510 PRINT"THIRD IS ";:GOSUB 20000
520 INPUT"ANY MORE RACES TO
FORECAST (Y/N)";AA$
530 IF LEFT$(AA$,1)="Y" THEN RUN
540 END
10000 PRINT"TYPE IN THE COURSE
CONDITIONS:
1=HEAVY,2=SOFT,3=GOOD-SOFT,4=GOOD,5=
GOOD-FIRM,7=HARD";
10010 INPUT CG:CG=INT(CG)
10020 IF CG(1 OR CG)7 THEN 10000
10030 RETURN
20000 HI=0:WH=0
20020 FOR X=1 TO CO
20030 IF VA(X))HI THEN
WH=X:HI=VA(X)
20040 NEXT
20050 PRINT NA$(WH);" WITH ODDS OF
ABOUT";:OD=(OT-HI)/HI:IF OD(1 THEN
30000
20060 PRINT OD;"TO 1"
20070 VA(WH)=0
20080 RETURN
30000 OD=HI/(OT-HI):PRINT"1 TO";OD
30010 GOTO 20070
```

(continued from page 128)

If you are familiar with machine code and the inner workings of memory, you will need no instruction about how it works, but for those who are a little puzzled by things like Varptr (S5$), a few words of clarification may help you to use this subroutine.

First, you must declare the five string variables in line 400 before any other variables are defined. Line 400 only clears 1,100 bytes, but you will probably have to increase this for other parts of your program. Secondly, you must not use or redefine these strings. Lines 410 to 440 get things organised, and they can follow line 400 or go anywhere else, but they must do their thing before you start to save or call back a display.

Then get your display on to the screen and make a Gosub to line 600. The display is now saved into the space which memory is reserving for the five strings. You can now clear the screen and go on to some other operation in the program. All that has to be done to recall the display is to make a Gosub to line 700. You could reserve a number of pages, depending on the memory that you have available, to produce an animated display.

In this program the machine-language routine and the screen block are stored in memory reserved for them by the five dummy strings. This avoids the necessity of reserving memory and can be used for any relocatable machine-language routines.

Time waster

Mr S Andrews of Lowestoft, Suffolk has sent in a fun program for you to punch in and run. People can watch this sort of thing for hours, but how did it come to be written? Perhaps Mr Andrews thought it out in cold blood, worked out a flowchart and then typed it in. Or was he just messing about when something happened which gave him an idea to develop?

Date checker

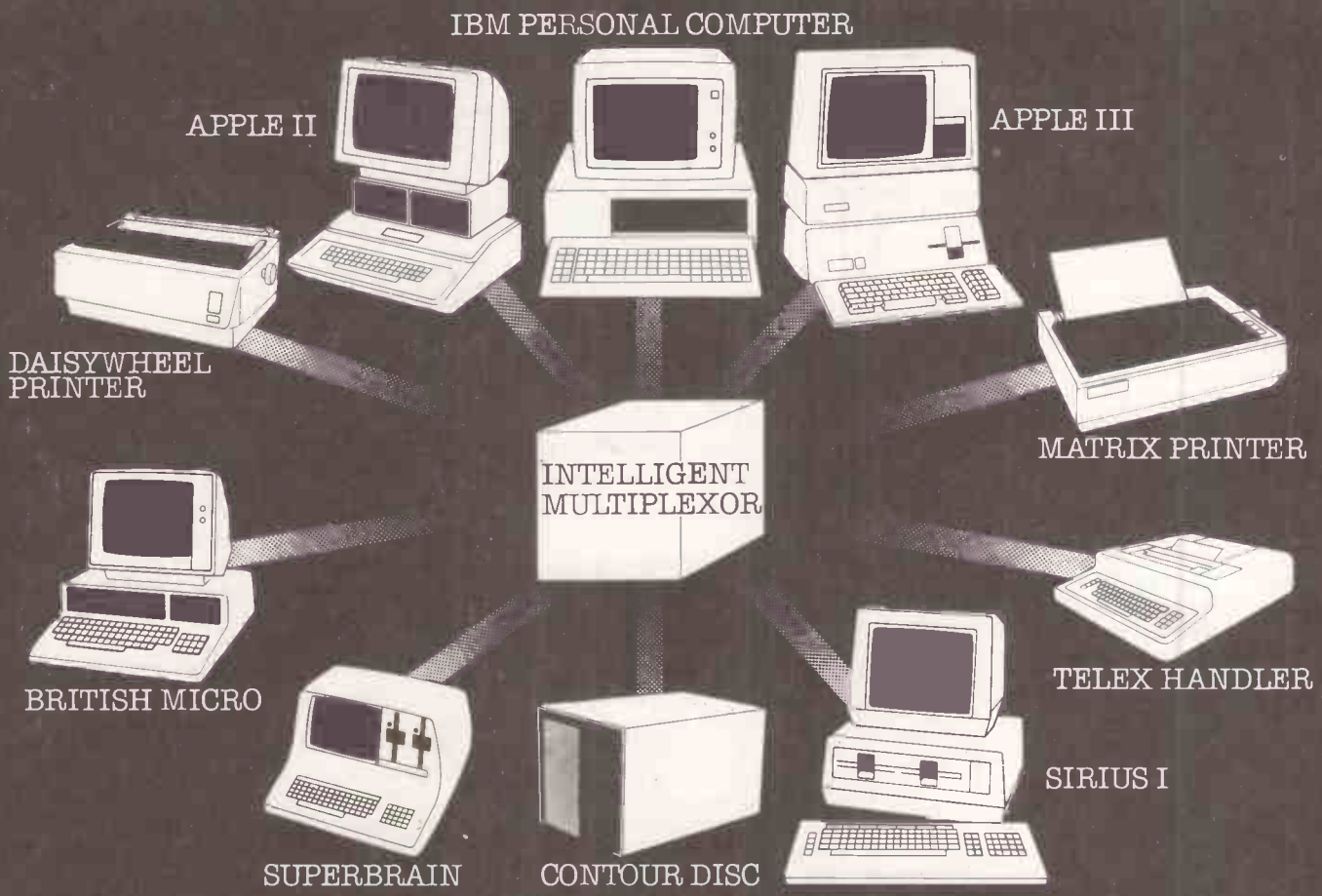
One of the most important features of a

(continued on page 134)

Page storage.

```
400 CLEAR
1100:CLS:S1$=STRING$(210,32):
S2$=STRING$(210,33):S3$=STRING$(210,
34):S4$=STRING$(210,35):S5$=STRING$(
210,35)' CLEAR BUFFER - DONT CHEAT
410 SIZE =VARPTR(S5$):
ADDRESS=PEEK(SIZE+1)+PEEK(SIZE+2)*25
6:MSB=ADDRESS:IF ADDRESS)32767 THEN
ADDRESS=ADDRESS-65536
415 DEFUSR0=ADDRESS
420 FOR BUFFER=ADDRESS TO
ADDRESS+11:READ MACHINECODE:POKE
BUFFER,MACHINECODE:NEXT BUFFER
430 POKE 16526,ADDRESS AND 255:
POKE 16527,MSB/256
440
PAGESPACE=ADDRESS+12:LSB=PAGESPACE
AND 255: MSB=INT(PAGESPACE/256): IF
MSB(0 THEN MSB=256+MSB
450 PRINT@960,"******* YOU CAN DRAW
A GRAPH ON ONE 'PAGE' ...";:FOR X=0
TO
378:SET(X/3,SIN(X/30)*22+22):SET(X/3
,22):NEXT X: PRINT@1010,"PRESS A
KEY";
460 A$=INKEY$: IF A$="" THEN 460
470 GOSUB 600:CLS:PRINT@0,"YOU CAN
SWITCH TO NOTES":PRINT:PRINT"OR
EVEN A MENU OF
GRAPHS/DIAGRAMS":PRINT:PRINT"TO BE
SUPERIMPOSED -
INSTANTLY":PRINT@960,"TRY IT !";
480 IF INKEY$="" THEN 480
490 GOSUB 700:GOTO 460
500
DATA33,0,0,17,0,0,1,0,4,237,176,201
510' The Assembler code is a humble
Z80 block move, IE:
     21 ?? ??          LD
HL,WHEREFROM
     11 ?? ??          LD
DE,WHERETO
     01 00 04          LD
BC,1024
     ED B0             LDIR
     C9                RET
600 POKE
ADDRESS+1,0:POKEADDRESS+2,60 ' FROM
VIDEO RAM
610 POKE ADDRESS+4,LSB:POKE
ADRESS+5,MSB' INTO SAVE RAM
620 DUMMY=USR(0):RETURN
700 POKE
ADRESS+1,LSB:POKEADRESS+2,MSB 'FROM
SAVED RAM
710 POKE ADDRESS+4,0:POKE
ADDRESS+5,60 'TO THE DISPLAY
720 DUMMY=USR(0)
```

GOODBYE TO FLOPPIES
C/WP BRINGS YOU A LOCAL NETWORK FOR £495
(+ £150 PER STATION)



C/WP announces a new solution to the network problem, the C/WP STARNET, based on an intelligent multiplexor serving up to 64 microcomputers.

STARNET allows each station to access up to 42 megabytes of CONTOUR Winchester disc storage (soon to be increased to 84 megabytes).

STARNET can include a wide variety of microcomputers in a single network, including APPLE II, APPLE III, SUPERBRAIN, OSBORNE, SIRIUS, IBM PERSONAL.

STARNET handles many operating systems in the same network – DOS 3.3, CP/M, CP/M 86, PASCAL, BOS, MSDOS. PCDOS.

STARNET will support printer spooling, electronic mail, and a communications gateway to mainframes and other networks.

C/WP STARNET offers extraordinary value for money. A six station network with 12 megabyte shared disc storage, tape streamer back-up (2.5 minutes for whole disc), Qume Sprint 5 shared printer with CP/M and WordStar, and multiple print spooling costs less than £10500 ie. £1750 per station.

Write or telephone for full details of this great price breakthrough. Now you can afford the luxury of a network.

(All prices exclude VAT)

C/WP PRICES STILL TURN OTHERS GREEN

C/WP

C/WP Computers
108 Rochester Row, London SW1P 1JP
TELEPHONE: 01-828 9000

Date checker.

```
    10 CLS:PRINT@448, "A Date in
format DD/MM/YY":INPUTD$: IF
LEN(D$)<>8 THEN 500
15 M$="JanFebMarAprMayJunJlyAug
SepOctNovDec"
20 D=VAL(LEFT$(D$,2)):
M=VAL(MID$(D$,4,2)):
Y=VAL(RIGHT$(D$,2))
30 IF D<1 OR D>31 OR M<1 OR M>12
THEN 500
50 A=(M=4)+(M=6)+(M=9)+(M=11)+
(M=2): IF A=0 THEN 80
55 IF D>30 THEN 500 ELSE IF M=2 AND
D>29 THEN 500
56 IF M=2 AND D=29 THEN IF
Y/4<>INT(Y/4) THEN 500
80 M$=MID$(M$,(M+(M-1)*2),3)
81 IF D=1 THEN DD$="st." ELSE IF
D=2 THEN DD$="nd." ELSE IF D=3 THEN
DD$="rd." ELSE DD$="th."
82 D$=STR$(D)+DD$:
Y$="19"+RIGHT$(STR$(Y),2):
90 CLS:PRINT@460,D$;" ";M$+".";"
";Y$
100 END
500 CLS:PRINT@448,"You have entered
the date incorrectly":FOR X= 1 TO
500:NEXT: GOTO 10
```

(continued from page 132)

program that requires users to enter data is to make sure that they enter valid data. One of the most common items entered is the date, and the following subroutine will make sure that it is entered correctly.

It will both check the validity of the date as entered in a DD/MM/YY format, using 0s to make up each pair as necessary, and translate it into English. After receiving the date in line 10, the string is checked to see that it is the right length. Line 20 takes from the string the value of the day, month and year. Line 30 checks that the value of the day is greater than 0 and less than 32 and the month is greater than 0 and less than 13.

Line 50 uses logical statements to check whether the month is a 30-day month. If so line 55 checks that D is not greater than 30, or if it is February and the day is 29 then line 56 checks that it is a leap year.

If the data passes all these tests line 80 selects the correct portion of M$ in line 15 for the month, line 81 chooses appendages for the day and line 90 prints the full date.

Arithmetical Input

P G Speller of Bingley, West Yorkshire points out that one of the few advantages that Level I Basic has over Level II is the ability to Input an arithmetical expression.

Time waster.

```
10 CLS:X=990: A$=CHR$(91):
B$=CHR$(8): D=1:H=1:Z=1
20 D=D*-1
21 V=V+1:IF V/10=INT(V/10) THEN Z=
Z+H: IF Z=8 OR Z=0 GOSUB 100
30 FOR C=1 TO Z: PRINT@X,A$:
PRINT@X-66,B$:
PRINT@X-62,B$:X=X+D:NEXT:GOTO 20
100 H=H*-1: A$=CHR$(RND(63)+128):
B$=CHR$(RND(63)+128):RETURN
```

His program lets you do just that on a Level II machine.

Any expression containing predefined variables or real values can be Input at line 10 as a string. The address of the last line of the program is found in locations 16633 and 16634. The string is dissected into its ASCII components with the operators translated into their Basic token forms in lines 65440 to 65480. For instance, the character + '' is represented by ASC code 43 but the operation represented by + is held in a program as ASC code 205 — see line 65450. Line 65520, the final line, looks rather odd but type it in exactly as it is as it acts as a dummy. In line 65390 the 16 dots are cleared, and the series of ASC codes is then Poked into place and looks to the computer exactly as if the expression entered in line 10 had been typed into the 16 spaces following the = sign in line 65520. The operators *,/,+,– and exponent are all translated, and it is possible by slightly modifying the program to translate logical And — Basic ASC code 210 — and logical Or Basic ASC code 211 — as well.

One little thing about Mr Speller's account of his program puzzles me. He says that the line number chosen for the action line is the highest permitted in his 16K Level II machine to ensure that the program can find the right address. But locations 16633/4 give the program the right address anyway.

Arithmatical Input.

```
5 REM * LINES 10 - 20 ARE FOR
DEMONSTRATION USE.
6 REM * WHEN TYPING IN ROUTINE AUTO
LINE NUMBERING WILL
7 REM * NOT ACCEPT THE LINE NUMBER
65520: NUMBER IT BY HAND
10 CLS: INPUT"EXPRESSION";C$
20 GOSUB 65370
30 PRINT"VALUE RETURNED";C
40 END
65370 K1=PEEK(16633):K2=PEEK(16634)
 ' FIND PROGRAM END
65380 LE=K1+K2*256: ' COMPUTE
ADDRESS
65390 FOR N=1 TO 16:
POKELE-22+N,32:NEXT ' CLEAR ACTION
1INE
65400 LC=LEN(C$)
65410 FOR N=1 TO LC ' LOOP
TRANSFERS
65420 M$=MID$(C$,N,1)' THE
EXPRESSION
65430 M=ASC(M$)  ' BYTE BY BYTE

65440 IF M=42 THEN M=207' TO THE
ACTION
65450 IF M=43 THEN M=205' LINE (£
65520)
65460 IF M=45 THEN M=206' AMENDING
TO BASIC
65470 IF M=47 THEN M=208' INTERNAL
CODES
65480 IF M=91 THEN M= 209'AS
NECESSARY
65490 POKE LE-22+N,M
65500 NEXT N
65510 REM * ACTION LINE COMES NEXT:
LAST IN PROGRAM
65520 C=.................:RETURN
```

BBC BYTES

by John Harris

VDU23 designs

PUTTING THE LITTLE green man on to the mode 4 games screen has up to now involved me putting the dots on the eight-by-eight matrix through a paltry utility I cobbled together when the machine arrived. This has now passed on to that great archive in the sky whence no bit returns, and I have settled instead on a utility sent in by P Davidson of County Down.

Since he uses both mode 4 and 5 and allows both model A and B use, his listing has data names of more than average brevity, but the product runs in a very friendly way. When run, the program first asks which character you wish to alter, 224 to 255. It then uses mode 5 to handle a large-format eight-by-eight grid and also shows the character being built or amended in normal size to the right.

Active keys are cursor-up, right, down and left, C to colour a pixel and B to blank it. F is for finish, when you can go to another character or run out a VDU23 code string.

If you want to, it is easy to save the defined characters using

* SAVE name C00 D00

For those wishing to declare characters as an option within the games program itself I print a routine from J P Riggs of Gosport. This program draws the eight-by-eight matrix and allows you to turn pixels on or off with Y or N. The values for VDU23 are calculated and the character is defined for us. In order to allow you to define the character again, the values are printed on the right of the matrix before exiting the routine.

Tangle

The world used to be an analogue place which we handled with analogue processes. Since then we have seen a digital world which we handled with analogue processes, then with digital processes, and which we are coming round to handling with analogue processes once more.

In the days of the mainframe computer, before the white heat of the technological revolution enabled the affluent as well as the corporate among us to dabble, games programmers were fewer than today. Some were students making good use of their educational facilities, a very few were commercial programmers making illicit use of their employers' machines, but the majority built software for the manufacturers.

One result was the creation of games packages. A sales rep demonstrating the full capabilities of a machine to potential customers had the option of showing them existing sites and systems, existing available commercial software, or the games — and the games frequently won. Existing systems and commercial applications might take for ever to understand and appreciate, but the games rang the changes quickly and enjoyably, besides often being the only fully debugged programs to be had.

Consequently, among the ever-expanding library of games implemented on today's micros there exists the historical core of the old mainframe games. Some spread rapidly to every manufacturer's machines: programs like Startrek, Golf and the Cambridge-invented Life game. Some existed almost as a trade mark on a particu-

(continued on page 141)

VDU design 1.

```
>LIST
   10MODE4:DIM C(8,8),D(8):X=447:Y=575
   20INPUT"What is the character code of
 the""character you wish to redefine (>
223)"'chr
   30IF chr(224 OR chr()INT(chr) OR chr>
255 THEN PRINT " INVALID INPUT":GOTO20
   40MODE5
   50VDU5
   60PROCscreen
   70*FX4,1
   80PROCreadchr(chr)
   90PROCind:PROCshow
  100*FX15,0
  110REPEAT dir=INKEY(0):UNTIL dir>0
  120IF NOT ((dir(100 AND dir>97) OR (di
r(68 AND dir>65) OR (dir(140 AND dir>135
) OR dir=70) THEN100
  130IF dir=70 THEN MODE4:PROCfin:RUN
  140IF dir=67 OR dir=99 THEN PROConoff(
85):GOTO90 ELSE IF dir(100 THEN PROConof
f(87):GOTO90
  150PROCshift:GOTO90
  160END
  170DEFPROCscreen
  180GCOL0,1
  190DRAW1023,0:DRAW1023,1023:DRAW0,1023
:DRAW0,0
  200FOR I=1 TO 7:MOVE I*128,0:DRAW I*12
8,1023
  210MOVE0,I*128:DRAW1023,I*128
  220NEXT:GCOL0,7:ENDPROC
  230DEFPROCind
  240MOVE X-16,Y:PLOT6,X+16,Y
  250MOVE X,Y-12:PLOT6,X,Y+12
  260ENDPROC
  270DEFPROConoff(fc)
  280MOVEX+52,Y-40:MOVEX-44,Y-40
  290PLOTfc,X+52,Y+52:PLOTfc,X-44,Y+52
  300C(INT((X+65)/128),INT(Y/128+1))=-1*
(fc=85)
  310PROCdef
  320ENDPROC
  330DEFPROCdef
  340I=INT(Y/128+1):D=0:FOR J=8 TO 1 STE
P -1
  350D=C(J,I)*(2^(8-J))+D
  360NEXT J:I=8-I
  370?((chr-224)*8+&C00+I)=D
  380PROCshow
  390ENDPROC
  400DEFPROCshow
  410VDU4
  420PRINT TAB(18,10);" ":PRINT TAB(18,1
0);CHR$(chr)
  430VDU5
  440ENDPROC
  450DEFPROCshift:PROCind
  460X=X+128*(dir=136)-128*(dir=137)
  470IF X(63 THEN X=63 ELSE IF X)959 THE
N X=959
  480Y=Y+128*(dir=138)-128*(dir=139)
  490IF Y(63 THEN Y=63 ELSE IF Y)959 THE
N Y=959
  500ENDPROC
  510DEFPROCfin
  520PRINTchr"="CHR$(chr)'"Do you wish t
o define any other""characters (Y/N)?";
  530PROCyn
  540IF ANS$="No"THENPROCs
  550ENDPROC
  560DEFPROCs
  570PRINT"Do you want the 'VDU 23' code
s (Y/N)?";:PROCyn:IF ANS$="Yes" THEN 600
  580*FX4,0
  590RUN
  600INPUT "For which character",c
  610IF c(224 OR c)255 THEN 600
  620PROCco(c):GOTO570:ENDPROC
  630DEFPROCreadchr(A):A=(A-224)*8+&C00
  640FOR I=0 TO 7:D(I+1)=?(A+I):NEXT
  650FOR I=8 TO 1 STEP -1:res=D(9-I):FOR
 J=8 TO 1 STEP -1
  660C(J,I)=res MOD 2:IF C(J,I)=1 THEN P
ROCdisplay(J,I,1)
  670res=res DIV 2
  680NEXT J:NEXT I
  690ENDPROC
  700DEFPROCdisplay(x,y,o)
  710MOVEx*128-16,y*128-108:MOVEx*128-10
8,y*128-108
  720PLOT85-2*(o=0),x*128-16,y*128-16:PL
OT85-2*(o=0),x*128-108,y*128-16
  730ENDPROC
  740DEFPROCco(c)
  750c=(c-224)*8+&C00
  760FOR I=0 TO 7:v=?(c+I):PRINTv:NEXT
  770ENDPROC
  780DEFPROCyn:REPEAT ANS$=GET$:UNTIL AN
S$="Y" OR ANS$="y" OR ANS$="N" OR ANS$="
n"
  790IF ANS$="Y" OR ANS$="y" THEN ANS$="
Yes" ELSE ANS$="No"
  800PRINT ANS$:ENDPROC
```

VDU design 2.

```
>LIST
   10*FX11,0
   20ON ERROR RUN
   30DIM ROW(8),COLOUMN(8)
   40MODE4:VDU5:PROCbox:PROCinput:PROCfi
g
   50VDU23,CHAR,ROW(1),ROW(2),ROW(3),ROW
(4),ROW(5),ROW(6),ROW(7),ROW(8)
   60MODE4:INPUT LINE"ANOTHER CHARACTER
"A$:IF A$="Y" OR A$="y" RUN
   70*FX12,0
   80VDU12;4:END
   90DEFPROCbox
  100VDU12:PRINT"******     CHARACTER
 DEFINING     ******"
  110FOR X=150 TO 950 STEP100:MOVE X+50,
150:DRAW X+50,950
  120MOVE 200,X:DRAW 1000,X:NEXT
  130ENDPROC
  140DEFPROCinput
  150MOVE 50,100:INPUT"WHICH CHARACTER,
INPUT ASCII CODE ",CHAR
  160FOR ROW=1TO8
  170FOR COLOUMN =1TO8
  180MOVE(100+COLOUMN*100),(950-ROW*100)
  190DRAW(200+COLOUMN*100),(1050-ROW*100
)
  200in=GET:IF in=89 OR in=121 PROCfillc
alc:NEXT:NEXT:ENDPROC
  210 IF in=78 OR in=110 NEXT:NEXT:ENDPR
OC ELSE GOTO200
  220DEFPROCfillcalc:ROW(ROW)=ROW(ROW)+2
^(8-COLOUMN)
  230FORX=(100+COLOUMN*100) TO (200+COLO
UMN*100) STEP2
  240MOVEX,(950-ROW*100):DRAWX,(1050-ROW
*100)
  250NEXT:ENDPROC
  260DEFPROCfig:FOR ROW=1TO8:MOVE1005,(9
99-100*ROW):PRINT;ROW(ROW):NEXT
  270G=GET:ENDPROC
```

GOODBYE TO FLOPPIES C/WP INTRODUCES A HARD DISC FOR £995.

C/WP have done it again. We proudly announce the C/WP CONTOUR, a range of British-made high technology 5-inch Winchester discs at prices starting below £1000.

Suddenly your micro-computer has come of age. One little box, not much larger than a floppy disc drive, stores up to 21 million characters. That size costs £1995 and stores the equivalent of more than 160 floppy discs, or 35 full-length books. And in a maximum of around a fifth of a second the C/WP CONTOUR finds any piece of information your computer asks for.

C/WP CONTOUR is available now for your APPLE II, IBM Personal, Sirius, Superbrain and many other CP/M and S100 machines. On APPLE the C/WP CONTOUR supports DOS 3.3, Pascal and CP/M operating systems.

Write or telephone for full details of this great price breakthrough. Now you can afford the luxury of a Winchester.

C/WP CONTOUR PRICE LIST	
3Mb (formatted)	£995
6Mb (formatted)	£1195
12Mb (formatted)	£1595
21Mb (formatted)	£1995
Tape streamer back-up (21Mb 4min)	£1495
All prices exclude VAT	

C/WP FOR BIG VALUE IN HARD DISCS

C/WP

C/WP Computers
108 Rochester Row, London SW1 1JP
Telephone 01-828 9000

● Circle No. 163

THE GENIUS YOU CAN TAKE TO BREAKFAST.

Now, at last, real portable computer power. The new Sharp PC1500 pocket computer. A pocket-sized genius that will travel with you to conferences, seminars and business breakfasts.

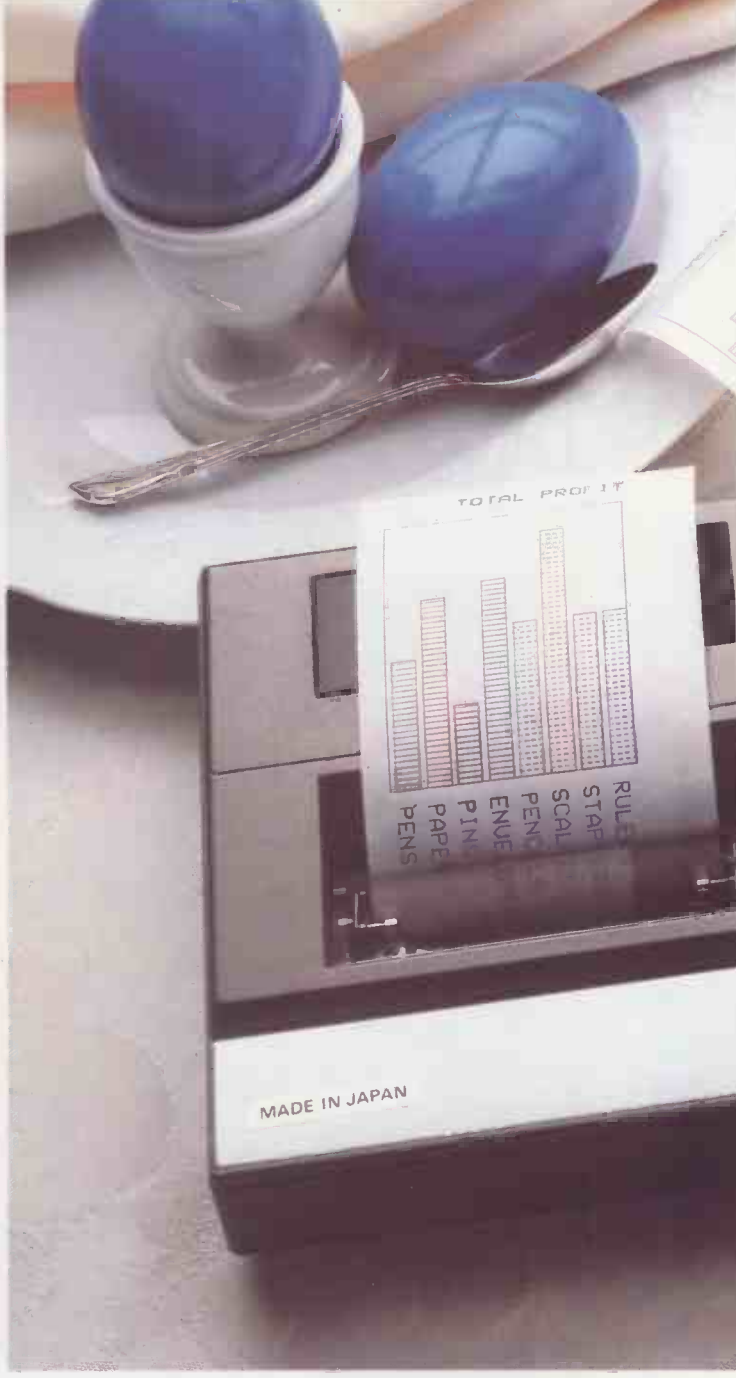
The PC1500 has the capacity and BASIC language usage that is very nearly that of the desk-size Personal Computer. When fitted with the optional 4-colour graphic printer, it is one of the most powerful pocket computers on earth.

Chores can be handled swiftly and accurately any time of day, wherever you happen to be. Estimates, records and charts of sales, billings and other important data can be re-programmed, calculated and summoned at the touch of a button. It can even play blackjack, analyse your biorhythms or give you a beeped reminder of a scheduled meeting.

Large memory capacity, up to 11.5K bytes. 4-colour print-out. Six user-programmable keys.

The incredible new PC1500. A revolution in pocket computers.

From Sharp. Where great ideas come to life.



SPECIFICATIONS PC 1500

Number of calculations	10 digits (mantissa) + 2 digits (exponent)
Program language	BASIC
CPU	C-MOS 8-bit CPU
Capacity	ROM: 16K bytes RAM: 3.5K bytes expandable to 11.5K bytes
Memory protection	C-MOS battery back-up
Display	7 x 156 dots mini-graphic display (English upper- and lower-case letters, numbers, special signs, etc.)

CE 150 Colour Graphic Printer/Cassette interface (Optional)

Colour Graphic Printer	
Power source	Built-in rechargeable battery
Printing digits	Standard 18 digits (36, 18, 12, 9, 7, 6, 5, 4 digits selectable)
Printing system	X-Y axis plotter system
Printing mode	Graph/Text switchables
Character sizes	9 different sizes from 1.2 x 0.8 mm to 10.8 x 7.2 mm (from 1/16" x 1/32" to 7/16" x 9/32")
Printing colours	Red, blue, green, black
Printing directions	Right, left, up, down
Minimum step width	0.2 mm (1/64")
Cassette Interface	Up to two cassette tape recorders can be connected

CE 151 Memory Module (Optional)

Capacity	4K-byte C-MOS RAM

CE 155 Memory Module (Optional)

Capacity	8K-byte C-MOS RAM

ASIC LANGUAGE SPECIFICATIONS
C 1500

ommands	RUN, NEW, LIST, CONT, TR ON, TR OFF, LOCK, UNLOCK, STATUS, MEM
atements	INPUT, PRINT, GPRINT, CURSOR, GCURSOR, PAUSE, USING, WAIT, CLS, IF . . . THEN, STOP, GOTO, ON . . . GOTO, GOSUB, ON . . . GOSUB, RETURN, ON ERROR GOTO, FOR . . . TO . . . STEP, NEXT, END, DIM, LET, REM, DATA, READ, RESTORE, BEEP, AREAD, ARUN, CLEAR, RANDOM, DEGREE, RADIAN, GRAD, BEEP ON, BEEP OFF
nctions	SIN, COS, TAN, ASN ACS, ATN, LN, LOG, EXP, DEG, DMS, RND, SQR (√), SGN, ABS, INT, PI (π), LEFT$, RIGHT$, MID$, ASC, VAL, LEN, CHR$, STR$, POINT
iables	A ∼ Z, A$ ∼ Z$, two-letter variables possible, two-dimensional arrays applicable
erations	+, —, *, /, (,), >, <, >=, <=, <>, =, ^, AND, OR, NOT, &
ners	INKEY$, TIME, , ; : "

150 Printer

mmands	LLIST, TEST
tements	LPRINT, TAB, LF, ROTATE, COLOR, GLCURSOR, SORGN, LINE, RLINE, CSIZE, TEXT, GRAPH, LCURSOR

ssette Interface

mmands	CSAVE, CLOAD, CLOAD?, MERGE
tements	INPUT#, PRINT#, CHAIN, RMT ON, RMT OFF

To: Sharp Electronics (UK) Ltd, Computer Division, Sharp House, Thorp Road, Newton Heath, Manchester M109BE. Tel: 061-205 2333.

Please send me details of the Sharp PC 1500

Type of application: _____

_____

Name: _____

Address: _____

_____

_____

_____

_____ Tel No: _____

PC3

The world of
SHARP
where great ideas come to life.

Design and specifications subject to change without notice

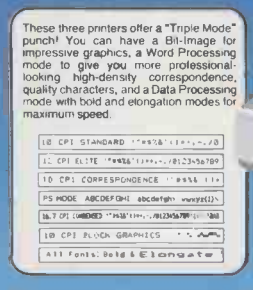
● Circle No. 164

Tandy® TRS-80™ Means...

A. £1099 Inc. V.A.T.

B. Inc. V.A.T. £499

These three printers offer a "Triple Mode" punch! You can have a Bit-Image for impressive graphics, a Word Processing mode to give you more professional-looking high-density correspondence, quality characters, and a Data Processing mode with bold and elongation modes for maximum speed.



C. £699 Inc. V.A.T.

A. New! All-Business Printer. DMP-500. Prints original, plus three copies. Adjustable tractor adjusts from 4" to 15". Line feed in 1/6, 1/8, 1/72, 1/216 increments. Paper advance in fine-line increments for aligning preprinted forms. Parallel interface. **26-1252**

B. New! Full Performance 9½" Printer. DMP-200. A versatile, compact dot-matrix impact printer! Prints 80 characters at 16.7 on an 8" line. Features selectable parallel and serial interfaces (600/1200 baud). Line feed in 1/6, 1/8, 1/72 increments. On/off line, restart and paper feed controls. Power-on indicator. **26-1254**

C. New! Superb 15-Inch Wide Printer. DMP-400. Cover design aids in noise reduction. Line feed in 1/6, 1/8, 1/72, 1/216 increments. Tractor allows use of 4" to 15" fanfold paper. Friction platten for single-sheet paper. Selectable parallel and serial interfaces (600/1200 baud). **26-1251**

...A Full Range of Printers

HERE IS A SELECTION

A. £249 Inc. V.A.T.

£149 Inc. V.A.T.

D.

- DMP Means Dot Matrix Printer
- DWP Means Daisy Wheel Printer

A. New! Low-Cost Printer With Dot Addressable Graphics. DMP-100. Prints high-density graphic information or standard 10 cpi alphanumerics. 480-byte full-line dot-buffer, selectable parallel and serial interfaces (600/1200 Baud) and adjustable tractor, 4½ to 9½". Uses fanfold paper. With ribbon cassette. **26-1253**

B. New! Low Cost Daisywheel Printer. Select 10 or 12 characters per inch or proportional spacing. Features ½ line feed, underline, boldface and programmable backspace. You also get 1/120" space and 1/48" line feed. With Courier 10 print wheel and carbon ribbon. **26-1250**

B. £999 Inc. V.A.T.

C. Our Finest Word Processing Printer. Allows 10 or 12 cpi or proportional spacing, 43 characters per second (500 plus words per minute), forward and reverse paper feed and ½ line feed, underline, boldface, backspace, interchangeable print wheels. Adjustable for up to five carbons. 15" platten. Includes ribbon. **26-1158**

£1299 Inc. V.A.T.

C.

D. New! CGP-115 Colour Graphics Printer. Creates beautiful graphics in red, blue, green and black, plus prints alphanumerics. Built-in commands simplify drawing and plotting. Text mode prints 40 or 80 characters per line at 12 characters/sec. Software controls additional character sizes and rotation. **26-1192**

Tandy COMPUTER CENTRES

YOUR NEAREST COMPUTER CENTRE

Birmingham:	021-455-9175 021-643-5368 1 162-5380	Glasgow:	041-221-4132 9378 041-333-9531	Manchester:	061-832-2242/ 9314 061-833-0259 061-834-0053 061-236-2122
Bradford:	0274-728431/2	Liverpool	051-708-0133		
Bristol:	0272-214721/2 0272-298101	London:	01-836-1327 01-826-1423 01-242-9425 01-626-6688/9	Nottingham:	0602-412144
Croydon:	01-680-1852			Sheffield:	0742-782858 752848
Dundee:	0382 25026		01-236-6453	St. Helens:	0744-30774
Edinburgh:	031 225 9377/ 8854/8985		01-348-5134 01-236-1326/7/8	Southampton:	0703-36492
				Tunbridge Wells:	0892-46120

YOUR NEAREST COMPUTER DEALER

Abergele:	0745-826020	Dublin:	0001-730698
Ashford:	07842-53024	Guildford:	0483-504801
Bangor:	0247-66656	Hadleigh:	0702-556522
Blandford Forum:	0258-53737	London W.1.:	01-388-5721
Brixham:	08045-6565	St. Helier:	0534-74000
Cambridge:	0223-65334	Windsor:	07535-58077
Cork:	Cork 27954		

Send For Your FREE 1982/3 TRS-80 RSC-8 Computer Catalogue

Computer Marketing, Tandy Corporation (Branch U.K.), Tameway Tower, Bridge Street, Walsall, West Midlands. WS1 1LA

Name _____

Address _____

_____ Postcode _____ PC4

● Circle No. 165

(continued from page 136)

lar machine — like the NCR-315, with never an integrated circuit to its name, sitting between banks of Cram units playing *A walk in the Black Forest* through the output transistor of its line printer.

One program from the days of the mainframe, Tracks, is an old favourite of mine, and when I saw Tangle by Mark Callaway of Alnwick, Northumberland, I first thought that this was an implementation of it.

Tracks was played on a 22 by 39 board, while Tangle is high-resolution. That difference makes a completely different game of it, and demonstrates the change in the handling of information representations which high resolution has brought in. The world is still digital, but it is starting to look and feel analogue again.

Space Invaders

On receiving a listing from P McLean of London I found myself in a curious position. The author has assumed that anyone interested in keying up his Space Invaders program knows the original game, and here I have been remiss; I have played neither the original nor any imitation or offshoot.

Notwithstanding, I keyed it in and the results of my keying I present. The prime difference between the master copy and what you see here is my addition of line 411. You may omit it if you wish, but I assume that the object of the game is to overlap the beasties and, while in that state, to "G" them off the screen. I found it easier to merely approach them to within my arbitrary three-space units.

Putting it another way, I failed miserably to raise my score above zero without some such fudge. Devotees who are laughing themselves silly at this point can omit the line, and good luck to them.

Bridge-hand generator

I thank John Leach of Great Mongeham, Kent for the tape of this card shuffler and dealer — a very kind thought, that tape — which permits me to present an example of

(continued on next page)

Tangle.

```
   10REM **** TANGLE ****
   20REM by Mark Callaway
   30REM          1983
   40 rscore=0:lscore=0
   50MODE7
   60PRINTCHR$141;"Welcome to TANGLE"
   70PRINTCHR$141;"Welcome to TANGLE"
   80PRINT"The idea of the game is to.st
eer your      player and to avoid hitting
 any lines."
   90INPUT"Name of left hand Player ",lp
layer$
  100INPUT"Name of right hand Player ",r
player$
  110PRINT'lplayer$;" you use these keys
: W(up) D(right) A(left) X(down)"
  120PRINT'rplayer$;" you use these keys
: I(up) L(right) J(left) ,(down)"
  130INPUT'"Size of board (100 to 500) "
,size
  140 MODE4:MOVE640-size,512-size:DRAW64
0+size,512-size:DRAW640+size,512+size
  150DRAW640-size,512+size:DRAW640-size,
512-size
  160lxp=640-(size/2):lyp=512-(size/2):l
xd=0:lyd=4
  170rxp=640+(size/2):ryp=512+(size/2):r
xd=0:ryd=-4
  180a$=INKEY$(0):IFa$=""THEN270
  190 IFa$="W"THENlxd=0:lyd=4:GOTO270
  200IFa$="I"THENrxd=0:ryd=4:GOTO270
  210IFa$="L"THENrxd=4:ryd=0:GOTO270
  220IFa$="D"THENlxd=4:lyd=0:GOTO270
  230IFa$="A"THENlxd=-4:lyd=0:GOTO270
  240IFa$="J"THENrxd=-4:ryd=0:GOTO270
  250IFa$=","THENrxd=0:ryd=-4:GOTO270
  260IFa$="X"THENlxd=0:lyd=-4:GOTO270
  270lxp=lxp+lxd:lyp=lyp+lyd
  280 IF POINT(lxp,lyp)=1THENPRINTlplaye
r$;" has crashed."!rscore=rscore+1:GOTO3
50
  290rxp=rxp+rxd:ryp=ryp+ryd
  300 IF POINT(rxp,ryp)=1THENPRINTrplaye
r$;" has crashed."!lscore=lscore+1:GOTO3
50
  310PLOT69,lxp,lyp
  320PLOT69,rxp,ryp
  330SOUND1,-10,(lxp+rxp)/10,1:SOUND2,-1
0,(lyp+ryp)/8,1
  340GOTO180
  350FORX=12TO15:SOUND0,-15,X,10:NEXT
  360PRINTlplayer$;" has ";lscore;" poin
ts"
  370PRINTrplayer$;" has ";rscore;" poin
ts"
  380PRINT"Another game?";
  390a$=GET$:IFa$="n"THEN END ELSE GOTO
140
```

Space Invaders.

```
    1REM. . . . . .
    2REM. .                    . .
    3REM. .        P. MCLEAN   . .
    4REM. .                    . .
    5REM. .  SPACE INVADERS TYPE . .
    6REM. .       GAME         . .
    7REM. .                    . .
    8REM. . . . . .
   10INPUT"SKILL LEVEL",TT
   20SC=0:W=TT+1:SCR=1
   30MODE5
   50DIMX%(7),Y%(7)
   60N1=2:ST=3+5*TT
   70PROCinit
   80GCOL4,0:PRINTTAB(10,10);"+"
   90ND=0
  100FORI=1TONI
  110B$=INKEY$(0)
  120IFB$="G"THENPROCfire
  130IFX%(I)=-1THENGOTO150
  140PROCinv(X%(I),Y%(I))
  150SOUND&10,-15,3,1
  160GOSUB170:GOTO250
  170B$=INKEY$(0)
  180XX=X:YY=Y
  190IFB$="W"THENY=Y-1:PROCmove
  200IFB$="A"THENX=X-1:PROCmove
  210IFB$="D"THENX=X+1:PROCmove
  220IFB$="X"THENY=Y+1:PROCmove
  230IFB$="G"THENPROCfire
  240RETURN
  250NEXT
  260GOSUB170
   270IF ND = NI THEN GOTO 1090
  280GCOL0,2:PLOT4,FU,15:PLOT5,FU,45:PLO
T85,FU+ST,45:PLOT4,FU,15:PLOT5,FU+ST,15:
PLOT85,FU+ST,45
  290FU=FU-ST
  300IFFU<300THENGOTO1200
  310COLOUR1:PRINTTAB(6,29);SC:PRINTTAB(
11,29);SCR:PRINTTAB(14,29);W
  320GOTO100
  330DEFPROCmove
  340COLOUR0:PRINTTAB(XX,YY);"+";
  350COLOUR1:PRINTTAB(X,Y);"+";
  360ENDPROC
  370DEFPROCfire
  380COLOUR2:PRINTTAB(X,Y);"X"
  390FORQ=1TO255STEP4:SOUND1,-15,Q,1:NEX
T
  400FORQ=1TO1
  410IFX%(Q)=X AND Y%(Q)=Y THENGOSUB570
  411IF ABS(X%(Q)-X)<3 AND ABS(Y%(Q)-Y)<
3 THEN GOSUB 570
  420NEXT
  430COLOUR1:PRINTTAB(X,Y);"+";
  440ENDPROC
  450DEFPROCinv(X1,Y1)
  460X2=X1:Y2=Y1
  470X1=X1+(INT(RND(1)*3)-1)
  480Y1=Y1+(INT(RND(1)*3)-1)
  490IFX1<1THENX1=1
  500IFX1>19THENX1=19
  510IFY1<1THENY1=1
  520IFY1>20THENY1=20
  530COLOUR0:PRINTTAB(X2,Y2);CHR$(230);
  540COLOUR3:PRINTTAB(X1,Y1);CHR$(230);
  550X%(I)=X1:Y%(I)=Y1
  560ENDPROC
  570ND=ND+1:GCOL4,0:PRINTTAB(6,29);SC:S
C=SC+5*Q
  580COLOUR0:PRINTTAB(X%(Q),Y%(Q));CHR$(
230);
  590IFW>3ANDINT(RND(1)*8)=W=1THENFU=97
0:GOSUB970
  600SOUND0,-15,6,20
  610X%(Q)=-1
  620FORZ=1TO400:NEXT
  630RETURN
  640DEFPROCinit
  650GCOL0,3
  660FORI=1TO200
  670PLOT69,RND(1)*1280,RND(1)*1024
  680NEXT
  690VDU29,150;900;
  700A=(2*PI)/30
  710GCOL0,2
  720B=A
  730FORC=1TO31
  740B=B+A
  750PLOT4,0,0:PLOT5,SIN(B)*40,COS(B)*40
:PLOT85,SIN(B-A)*40,COS(B-A)*40
  760NEXT
  770H=0
  780B=2*A
  790GCOL0,1
  800PLOT4,SIN(B)*100,COS(B)*15
  810FORC=1TO26
  820B=B+A
  830PLOT5,SIN(B)*100,COS(B)*15
  840NEXT
  850VDU29,150;895;:H=H+1:IFH<2THENGOTO7
80
  860VDU29,640;-800;
  870GCOL0,2
  880A=(2*PI)/100
  890B=11*A
  900FORC=1TO24
  910B=B-A
  920PLOT4,0,0:PLOT5,SIN(B)*1000,COS(B)*
1000:PLOT85,SIN(B+A)*1000,COS(B+A)*1000
  930NEXT
  940VDU23,230,65,62,107,62,28,36,66,129
  950VDU29,0;0;
  960GOSUB970:GOTO1000
  970GCOL0,1
  980PLOT4,290,10:PLOT5,990,10:PLOT85,99
0,50:PLOT4,290,10:PLOT5,290,10:PLOT85,29
0,50
  990RETURN
 1000X=10:Y=10
 1010XX=X:YY=Y
 1020FORI=1TONI
 1030X%(I)=INT(RND(1)*19):Y%(I)=INT(RND(
1)*22)
 1040COLOUR1
 1050PRINTTAB(X%(I),Y%(I));CHR$(230)
 1060NEXT
 1070FU=970
 1080ENDPROC
 1090VDU19,2,14;0;
 1100COLOUR1:PRINTTAB(6,29);SC
 1110IFNI<>7THENPRINTTAB(3,10);"NEW SCRE
EN"
 1120NI=NI+1:IFNI>7THENNI=2:ST=ST+5:PRIN
TTAB(3,10);"NEW WAVE":SCR=0:W=W+1
 1130FORG=1TO4000:NEXT
 1140CLG
 1150GH=INT(RND(1)*8):IFGH=1ORGH=0THENGO
TO1150
 1160VDU19,2,GH;0;
 1170PROCinit
 1180SCR=SCR+1
 1190GOTO80
 1200PRINTTAB(4,10);"SCORE=";SC
 1210FORD=150TO&STEP-3:SOUND1,-15,D,1:NE
XT
 1220SOUND0,-15,6,20
```

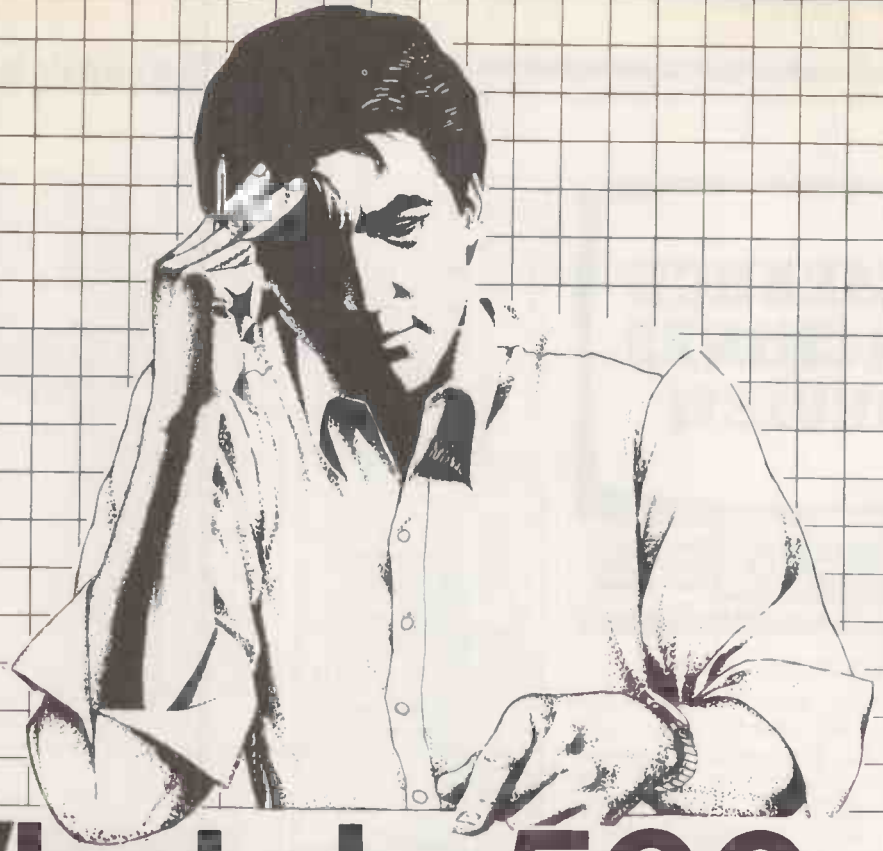
(continued from previous page)

BBC Basic with both style and assembler code. Some bridge clubs have competitions which involve the same hand being played in different rooms at the same time, and the preparation of two deals of hands in their original unsorted order is doubtless a pig of a job which this program would simplify.

Well pleased with myself at having found a use for the program, I happened to run it later to show my wife. We spent the next couple of hours arguing over the way each hand should be bid. But even if you do not play, the code is well worth browsing through for ideas and coding technique.

Bridge-hand generator.

```
  10 REM Card Shuffle in Machine Code
  20 REM Shuffle consists of 100 random
  30 REM Cuts and 100  riffles, which
  40 REM interleaves the deck. Before
  50 REM leaving the Machine Code
  60 REM Subroutine, the four hands are
  70 REM sorted into descending order.
  80 REM With 100 cuts the operation
  90 REM takes 180 ms.
 100 REM The program is relocatable.
 110 REM
 120 REM J.M. Leach, July 1982
 130 REM
 140 DIM DECK 52:DIM WORK 52
 150 CUT=&70:REM Random Cut position
 160 NSHUFF=&71:REM Number of cuts
 170 CUTFLG=&72:REM Flag for INC or DEC
 180 HANDLO=&73:REM Start of Hand sort
 190 HANDHI=&74:REM End of Hand sort
 200 SFLAG =&75:REM Sort Flag for swaps
 210FOR I%=0 TO 3 STEP 3
 220 P%=&0D00:REM Uses Disk buffer
 230[ OPT 0 \ Use OPT I% for List
 240.shuffle LDX CUT  \ Get random seed
 250         LDY #1   \ 1st half of Cut
 260.move1   JSR shift\ Do 1st half cut
 270         CPX #53  \ Finished ?
 280         BNE move1\ No - continue
 290         LDX #1   \ 2nd half of cut
 300.move2   JSR shift\ Do 2nd half
 310         CPX CUT  \ Finished yet ?
 320         BNE move2\ No - continue
 330         LDX #27  \ Now interleave
 340         LDY #1   \ by moving back
 350.move3   JSR riffle\WORK byte array
 360         CPX #53  \ to DECK array
 370         BNE move3
 380         LDX #1
 390         LDY #2
 400.move4   JSR riffle
 410         CPX #27
 420         BNE move4 \ Complete riffle
 430         DEC NSHUFF\ Shuffle over ?
 440         BNE next  \ No - Alter CUT

 450         JSR save  \ Save unsorted
 460         LDA #1    \ Sort Hand 1
 470         STA HANDLO\ DECK position
 480         LDA #13   \ from 1 to 13
 490         STA HANDHI
 500         JSR sort  \ Sort the hand
 510         LDA #14   \ Hand 2
 520         STA HANDLO
 530         LDA #26
 540         STA HANDHI
 550         JSR sort
 560         LDA #27   \ Hand 3
 570         STA HANDLO
 580         LDA #39
 590         STA HANDHI
 600         JSR sort
 610         LDA #40   \ Hand 4
 620         STA HANDLO
 630         LDA #52
 640         STA HANDHI
 650         JSR sort
 660         RTS       \ Sorting ended
 670.next    LDA CUTFLG \ INC or DEC ?
 680         BEQ decut  \ DEC if zero
 690         INC CUT    \ INC and then
 700         LDA CUT    \ compare with
 710         CMP #43    \ preset Max.
 720         BMI shuffle\ for CUT
 730         LDA #0     \ At Max., so
 740         STA CUTFLG \ set flag for
 750         BEQ shuffle\ next time!
 760.decut   DEC CUT    \ DEC and test
 770         LDA CUT    \ against pre-
 780         CMP #10    \ set Min.
 790         BPL shuffle
 800         LDA #1     \ At Min., so
 810         STA CUTFLG \ set flag and
 820         BNE shuffle\ continue
 830.shift   LDA DECK,X \ Move 1 Byte
 840         STA WORK,Y \ from DECK to
 850         INX        \ WORK and INC
 860         INY        \ the X and Y
 870         RTS        \ registers
 880.riffle  LDA WORK,X \ Move 1 Byte
 890         STA DECK,Y \ from WORK to
 900         INX        \ DECK and INC X
 910         INY        \ once and Y
 920         INY        \ twice
 930         RTS
 940.sort    LDA #0     \ Bubble Sort
 950         STA SFLAG  \ Flag at zero
 960         LDX HANDLO \ Get position
 970.sort1   LDA DECK,X \ Get 1st byte
 980         INX
 990         CMP DECK,X \ Test v. 2nd
1000         BMI sort2  \ Late ) early
1010         TAY        \ Swap; save 1st

1020         LDA DECK,X \ Get 2nd byte
1030         DEX        \ Save 2nd in
1040         STA DECK,X \ place of 1st
1050         INX        \ 2nd position
1060         TYA        \ Restore 1st
1070         STA DECK,X \ Place at 2nd
1080         STA SFLAG  \ Flag <> 0 !
1090.sort2   CPX HANDHI \ End of test ?
1100         BMI sort1  \ No - continue
1110.check   LDA SFLAG  \ Any swaps ?
1120         BNE reset  \ Yes - Re-do
1130         RTS        \ No - sort ends
1140.reset   DEC HANDHI \ Reduce range
1150         BNE sort   \ for next time
1160         RTS
1170 .save   LDX #52
1180 .sloop  LDA DECK,X
1190         STA WORK,X
1200         DEX
1210         BNE sloop
1220         RTS
1230]
1240 NEXT I%:REM 2nd Assembler pass
1250 MODE 7: SEED%=RND(-TIME):NHAND%=0
1260 PROCBIG(5,4,131,"Card Dealing Prog
ram")
1270 PROCBIG(5,8,133,"Written by J.M. L
each")
1280 PROCBIG(5,12,130,"Deals a hand and
 sorts it")
1290 PROCBIG(5,16,134,"Press"+CHR$136+C
HR$131+"SPACE BAR"+CHR$137+CHR$134+"to c
ontinue")
1300 PROCBIG(5,20,130,"and to show a ne
w hand")
1310 X=GET
1320 REM
1330 REM Set up card deck as bytes
1340 REM Bits 0 1   2 3   4 5 6 7
1350 REM        x x   Suit  Value
1360 REM
1370 I%=0:FOR S%=0 TO 3:SUIT%=S%*&10
1380FOR V%=1 TO 13:CARD%=SUIT%+V%
1390I%=I%+1:DECK?I%=CARD%:REM 'POKE' DE
CK
1400NEXT V%:NEXT S%
1410 REM Set up Suits with colours
1420suit$=CHR$132+"S"+CHR$129+"H"+CHR$1
29+"D"+CHR$132+"C"
1430 REM
1440 REM Value from bits 4,7: A=1, 2=13
1450 REM
1460val$=" A K Q J10 9 8 7 6 5 4 3 2"
1470 DIM XPOS%(3):DIM YPOS%(3):DIM PLAC
E$(3)
1480 REM Set up places with colours
1490 PLACE$(0)=CHR$130+"North":PLACE$(1
)=CHR$131+"East":PLACE$(2)=CHR$133+"Sout
h":PLACE$(3)=CHR$134+"West"
1500 REM
1510 REM Deal out a hand and display it
1520 REM
1530 REM First set CUT seed position
1540 REM and number of shuffles
1550 REM
1560 ?CUT=RND(25)+15:?NSHUFF=100
1570 CALL shuffle:REM Machine Code call

1580 CLS
1590 REM Create a white background
1600 FOR I%=0 TO 24: PRINT CHR$157;CHR$
158;CHR$151;:IF I%<24 THEN PRINT ELSE VD
U30
1610 NEXT I%
1620 REM Initialise the cursor position
s
1630 REM and label places
1640 FOR I%=0 TO 3:XPOS%(I%)=10:YPOS%(I
%)=I%*2
1650 PRINT TAB(1,2*I%);PLACE$(I%);
1660 NEXT I%
1670 REM Display unsorted hand from WOR
K
1680 FOR I%=1 TO 13:FOR J%=0 TO 3
1690 PRINT TAB(XPOS%(J%),YPOS%(J%));:PR
OCDECODE(I%+13*J%,1,1):XPOS%(J%)=POS:IF
POS>35 THEN XPOS%(J%)=10:YPOS%(J%)=YPOS%
(J%)+1
1700 REM Generate note from card value
1710 note%=4*(V%+13*S%):PROCSOUND(note%
,1)
1720 X=INKEY(11):REM Delay for sound
1730 REM Show Hand No. flashing
1740 NEXT J%:NEXT I%:VDU30
1750 NHAND%=NHAND%+1
1760 H$="Hand "+STR$(NHAND%)
1770 PRINT TAB(25,8);CHR$136;CHR$132;H$
;
1780 REM Show places for sorted hands
1790 FOR J%=0 TO 3:YPOS%(J%)=9+4*J%:XPO
S%(J%)=11:PRINT TAB(1,YPOS%(J%));PLACE$(
J%);
1800 REM Show suits for sorted hands
1810 FOR K%=0 TO 3:PRINT TAB(7,YPOS%(J%
)+K%);MID$(suit$,2*K%+1,2);LEFT$(PLACE$(
J%),1);:NEXT K%:NEXT J%
1820 REM Show sorted cards from DECK
1830 FOR J%=0 TO 3:Y%=YPOS%(J%)-1:X%=11
:SS%=-1:FOR I%=1 TO 13
1840PROCDECODE(I%+13*J%,2,0):IF S%<>SS%
THEN X%=11:Y%=Y%+S%-SS%:SS%=S%
1850 REM Strip out Card value
1860 L%=LEN(card$):card$=LEFT$(card$,L%
-1):card$=RIGHT$(card$,L%-2)
1870 PRINT TAB(X%,Y%);card$+"  ";:X%=POS

1880 PROCSOUND(4*(V%+13*S%),1):X=INKEY(
3)
1890 NEXT I%:NEXT J%
1900 X=GET:GOTO 1560
1910 REM Convert DECK or WORK to Card
1920 DEF PROCDECODE(N%,PACK%,PR%)
1930 IF PACK%=1 THEN K%=WORK?N% ELSE K%
=DECK?N%:REM 'PEEK' for coded Card
1940 S%=(K% AND &F0)/&10:V%=K% AND &0F:
REM Get Suit and Value
1950 card$=CHR$132:IF S%=1 OR S%=2 THEN
 card$=CHR$129:REM Blue or Red
1960 Q%=(V%=5):REM Test for '10'
1970 card$=card$+MID$(val$,2*(V%-1)+2+Q
%,1-Q%)+MID$(suit$,2*S%+2,1):IF PR%<>0 TH
EN PRINT card$;
1980 ENDPROC
1990 Print Double sized text
2000 DEF PROCBIG(XCOL%,YROW%,HUE%,A$)
2010 HUE%=HUE% MOD 8 + 128
2020 PRINT TAB(XCOL%,YROW%);CHR$141;CHR
$HUE%;A$;:PRINT TAB(XCOL%,YROW%+1);CHR$1
41;CHR$HUE%;A$;:ENDPROC
2030 DEF PROCSOUND(NN%,del%)
2040 LOCAL NS%:NS%=240-NN%
2050 SOUND1,-10,NS%,del%:SOUND2,-10,NS%
+16,del%:SOUND3,-10,NS%-24,del%
2060 ENDPROC
```



What do 500 computer dealers know that you don't?

They know that they have found an unbeatable combination – Pete & Pam Computers' service, with the Pete & Pam Price Promise, "We will not be undersold" Over 500 dealers throughout the UK, Europe and the Gulf States buy from Pete & Pam Computers. They choose from over 900 products in our catalogue. Products from 146 different companies such as Apple, BASF, Epson, Microsoft MicroPro, NEC, Saturn Systems, Sirius Software, Versa Computing, Videx, VisiCorp and Zenith – and all at highly competitive prices. Products which are backed by our comprehensive service facilities, with same-day shipping. Over 500 dealers know our reputation for sound advice, and for being well informed in what's new in microcomputing. They know our service is friendly, fast and efficient. In short – they know us. Isn't it time you were "in the know" and opened an account with Pete & Pam Computers? We have a lot to offer you.

Send for our free Price List and our product literature. We promise you that you will not be disappointed.

Pete & Pam Computers

Head Office: New Hall Hey Road, Rossendale, Lancashire, BB4 6JG Tel 0706 227011 Telex 635740 PETPAM G

London Office: 103-5 Blegborough Road, London, SW16 6DL Tel 01-769 1022/3/4 & 01-677 2052 Telex 923070 PPCOMP G

● Circle No. 166

Graphics editor

HERE IS a graphics utility by D C Hamilton of Belfast that will enable the user to create, edit and save low-resolution graphics screens on the 380-Z. Screens can be saved in two different formats, either as a list of 800 ASCII codes or as a list of 20 strings, and then recalled by a Basic program using one of the recall routines.

Obviously, saving the screen as strings will mean a smaller file and a faster recall time, and this will be the most popular format. But if you have used codes below 32 you may have problems saving the screen as strings: for example, if you have used code 28 and saved the file as strings, when you try to recall the screen this will be interpreted as an End of File marker and you will lose part of the screen. In these cases the screen must be saved as ASCII codes.

The main features of the program are:

1000-1160, main editor loop, get command and operate. Print data on screen — X and Y co-ordinates of cursor and ASCII code of character under cursor.
1500-1540, X : test routine.
2000-2240, A : macro command routine.
2500, recall screen, for example, after Help routine.
3000-3100, F : fill command routine.
4000, N: plot next key routine.
5000-5040, C : input code routine.
6000-6070, P : pixel character routine.
7000-7040, H : Help routine.
8000-8030, Save screen routine; for example, before Help routine.
8500-8510, ! : Clear Screen routine.
9000-9090, error-trapping routine.
10100-10200, main menu.

(continued on page 149)

Graphics editor — recall routines.

ASCII Codes

```
1000 OPEN#10,"FILENAME.TYP"
1010 FOR YY=0 TO 57 STEP 3
1020 FOR XX=0 TO 78 STEP 2
1030 INPUT#10,CC : PLOT XX,YY,CC
1040 NEXT XX
1050 NEXT YY
1060 CLOSE#10
```

Strings

```
1000 OPEN#10,"FILENAME.TYP"
1010 FOR YY=0 TO 57 STEP 3
1020 INPUTLINE#10,CC$ : PLOT 0,YY,CC$
1030 NEXT YY
1040 CLOSE#10
```

Graphics editor

```
1 REM ************************
2 REM *** GRAPHICS UTILITY ***
3 REM ***  (c) C.Hamilton  ***
4 REM ************************

10 PUT17:PUT12:CLEAR5000:DIM SCREEN$(19),MC$(9),MN(8),PG(8),PL(8)
20 FORI=1TO9:MC$(I)="*No auto number"+STR$(I)+" in memory yet.":NEXTI
30 GRAPHI:PLOT24,33,"GRAPHICS UTILITY":PLOT26,30,"(c) C.Hamilton"
40 FORT=0TO2000:NEXTT:GOTO10100

1000 ONBREAK:Q=GET(1):Q=Q+32*(Q>90)
1005 PLOTX,Y,M
1010 IFQ=27THENGOSUB8000:GOTO10100
1015 IFQ=33THENGOSUB8500
1020 IFQ=73THENY=Y+3:IFY>57THENY=57
1025 IFQ=84THENY=57
1030 IFQ=74THENX=X-2:IFX<0THENX=0
1035 IFQ=66THENY=0
1040 IFQ=75THENX=X+2:IFX>78THENX=78
1045 IFQ=76THENX=0
1050 IFQ=77THENY=Y-3:IFY<0THENY=0
1055 IFQ=82THENX=78
1060 IFQ=70THENGOSUB3000:GOTO1130
1065 IFQ=88THENGOSUB1500
1070 IFQ=72THENGOSUB7000
1080 IFQ=78THENGOSUB4000
1090 IFQ=67THENGOSUB5000
1100 IFQ=80THENGOSUB6000
1105 IFQ=65THENGOSUB2000
1110 M=POINTS(X,Y):IFM=43THENPLOTX,Y,128ELSEPLOTX,Y,"+"
1120 IFQ=0THENFORP=0TO50:NEXTP:GOTO1000
1125 PUT12
1130 ?" X"," Y","CODE":?X,Y,M
1150 IFFF=1THEN?"FILL on, press F to finish."
1155 IFPF>0GOTO2110
1160 GOTO1000

1500 PLOTX,Y,"@":C=GET(10)
1505 IFC=0THENPLOTX,Y,M:FORT=0TO50:NEXTT:GOTO1500
1510 IFC=13THENPLOTX,Y,M:RETURN
1520 IFC=10THENPLOTX,Y,M:X=0:Y=Y+3*(Y>0):GOTO1540
1525 IFC=127THENPLOTX,Y,128:X=X-2:IFX<0THENX=78:Y=Y-3*(Y<78):GOTO1500ELSE1
500
1530 PLOTX,Y,C:X=X+2:IFX>78THENX=0:Y=Y+3*(Y>0)
1540 M=POINTS(X,Y):GOTO1500

2000 PUT12:?"Which auto <1-9,0 to return>?";
2010 MN=GET():IFMN<48ORMN>57GOTO2010ELSE?
2015 IFMN=48THENRETURN
2018 MN=MN-48
2020 PUT12:?MC$(MN):?"Operate?";:GOSUB2200:ONINGOTO2100,2030
2030 PUT12:?MC$(MN):?"Change it?";:GOSUB2200:ONINGOTO2050,2040
2040 PUT12:?"Another auto?";:GOSUB2200:ONINGOTO2000,2020
2050 PUT12:?"Type in auto (RTN).";:INPUTMC$(MN):GOTO2030
2100 PF=1:MN(PF)=MN:PG(PF)=0:PL(PF)=LEN(MC$(MN(PF)))
2101 ONBREAKGOTO2150
2105 IFLEFT$(MC$(MN(PF)),1)="*"THENPF=PF-1:IFPF=0GOTO2150
2110 PG(PF)=PG(PF)+1:IFPG(PF)>PL(PF)THENPF=PF-1:IFPF=0GOTO2150ELSE2110
2120 Q=ASC(MID$(MC$(MN(PF)),PG(PF),1)):IFQ<49ORQ>57GOTO1005
2125 IFQ=45ORQ=97GOTO2110
2130 PF=PF+1:IFPF>8THEN?"Too complex.":GOTO2150
2140 PG(PF)=0:MN(PF)=Q-48:PL(PF)=LEN(MC$(MN(PF))):GOTO2110
2150 PF=0:PLOTX,Y,M:RETURN
2200 IN=0
2210 QQ=GET():QQ=QQ+32*(QQ>90)
2220 IFQQ=78THENIN=2:?:RETURN
2230 IFQQ=89THENIN=1:?:RETURN
2240 GOTO2210

2500 FORI=0TO19:PLOT0,I*3,SCREEN$(I):NEXTI:RETURN

3000 IFFF=1GOTO3040
3010 PUT12:?"FILL on, press F to finish.":?:XO=X:YO=Y:FF=1:RETURN
3040 X1=X:Y1=Y:FF=0:PLOTX,Y,"+":PLOTXO,YO,"+"
3050 PUT12:INPUT"What code (or H for help)(RTN)";CD$
3055 IFCD$="H"THENGOSUB7000:GOTO3050
3060 CD=VAL(CD$):IF(CD=0ANDCD$<>"0")ORCD>255GOTO3050
3070 IFXO>X1THENTX=XO:XO=X1:X1=TX
3075 IFYO>Y1THENTY=YO:YO=Y1:Y1=TY
3076 PLOTXO,YO,128:PLOTX,Y,M
3080 FORI=XOTOX1STEP2:FORJ=YOTOY1STEP3
3100 PLOT1,J,CD:NEXTJ:NEXTI:PUT12:M=CD:RETURN
4000 PLOTX,Y,"+":L$=GET$():PLOTX,Y,L$:M=ASC(L$):RETURN

5000 PLOTX,Y,"+"
5005 PUT12:INPUT"What code (or H for help)(RTN)";CD$
5010 IFCD$="H"THENGOSUB7000:GOTO5005
5020 CD=VAL(CD$):IF(CD=0ANDCD$<>"0")ORCD>255GOTO5000
5040 PLOTX,Y,CD:M=CD:RETURN
```

(listings continued on page 149)

The 16-bit Micro

Zenith Z-120 "All in one" monochrome computer.

with 8-bit compatibility and colour graphics

Microprocessors	8088 for 16-bit power 8085 for 8-bit compatibility
Memory	128 Kb expandable to 768 Kb
Storage	320 Kb to 10 Mb (floppy and Winchester disk)
Operating Systems	CP/M-85, CP/M-86, Z-DOS (MS-DOS)
Graphics	High resolution 640 x 500 pixel
Colour	High definition 8 colour pixel
Communications	2 RS 232 ports, expandable to 10, and 1 parallel port. (IEEE 488 available soon) Signetics 3661 chip ensures hardware compatible communications with most mainframes

Zenith Z-110 "Low profile" colour computer and optional monitor.

Expansion	5 slot S-100 bus structure
Power supply	300W switched mode; ensures high stability and regulation

Application Software
Word processing, financial modelling, business management, integrated accounting - all from leading software houses.

For further information, contact:

ZENITH | data systems

Bristol Road Gloucester GL2 6EE Telephone: (0452) 29451 Telex: 43179

• Circle No. 167

TRIUMPH ADLER makes it all refreshingly simple

with the arrival of the 8/16 bit Alphatronic micro

The Alphatronic P3 micro: the latest, most powerful addition to the outstandingly successful Alphatronic family. An addition that makes Alphatronic the largest range of 'ready to use' micros on the market, priced from £1,895 to £2,345.

The dual purpose 8/16 bit processor means you can make use of the wealth of proven 8 bit software now. As 16 bit software becomes more widely available, we can upgrade your P3 to 16 bit operation.

The P3 is a micro version of a larger system - rather than a 'blown-up' hobby computer. It's a high quality, engineered computer, designed to cope easily in the business environment.

Triumph Adler is a world leader in business products and committed to simplifying business procedures and reducing business costs. We provide a helping hand to our customers and our dealers. With over 80 years' experience in the business market our single source philosophy is second to none. We actually do what everyone else claims. We test software, educate your staff, supply high quality staticnery and supplies and ensure your system runs smoothly.

In short, we at Triumph Adler are dedicated to making your life refreshingly simple and to providing successful computing for your future.

To get the full story, simply clip your letterhead or business card to the coupon, or ring the Triumph Adler hotline on 01-250 1717 and ask for department MMD.

TA TRIUMPH ADLER

Computing for your future

Triumph Adler (U.K.) Limited, 27 Goswell Road, London, EC1M 7AJ. Tel. 01-250 1717 A member of the Volkswagen Group.

Please tell me in simple terms the benefits I can expect from the most extensive range of business micros. • Circle No. 168

Name _____ Company _____

Address _____ Telephone _____

The printer that thinks it's a computer!

FACT With internal microprocessor, 8K buffer store and total compatibility, the Ricoh Flowriter range has proved itself the most intelligent and reliable range of printers on the world market.
FACT Ricoh Flowriters can assume the characteristics of **any** popular 'intelligent' printer and plug into **any** hardware configuration.
FACT Ricoh Flowriters perform **all** your processing and printing needs while leaving the host computer free for other work.
FACT Ricoh Flowriters do all this, give you exceptional print quality, yet **cost the same as ordinary daisy wheel printers!**

FEATURES
- Internal microprocessor
- 8K buffer under full program control
- Includes RS232, Centronics and IEEE 488 interfaces
- 60cps print on the RP1600, 37cps on the RP1300
- Qume, Diablo and NEC Spinwriter wp commands-compatible
- Auto-bidirectional and logic seeking high-speed printing
- Graphics capability down to 1/120"
- Built-in proportional spacing tables
- Automatic margin justification, even on proportional spacing
- 128-character printwheels, wide choice of fonts
- Wide range of accessories – sheetfeeds, tractor feeds, ribbons, printwheels
- Detachable keyboard option for using Flowriter as an intelligent typewriter or KSR terminal

For intelligent printing that frees the host computer **and** gives you exceptional print quality and speed, find out more about the Ricoh Flowriter – the printer that **knows** it's a computer, yet costs the same as those that aren't!

The RP1300 Flowriter

The RP1600 Flowriter

Dealer Enquiries welcome.
The Ricoh/Flowriter range is only available from APTEC and their authorised dealers, backed by a nationwide service network.

APT EC

APPROPRIATE TECHNOLOGY LTD.
2-4 Canfield Place
London NW6 3BT
Tel: 01-625 5575/5134
Telex 264538 SSE G

The Ricoh FLOWRITER

● Circle No. 170

Table 1. Graphics Editor commands.

Esc	return to menu
!	clear screen
I	move cursor up
J	move cursor left
K	move cursor right
M	move cursor down
T	move cursor to top of screen
B	move cursor to bottom of screen
L	move cursor to left edge of screen
R	move cursor to right edge of screen
C	input ASCII code to be plotted at cursor
N	character of next key pressed to be plotted
P	pixel character — input by pattern
F	fill rectangle with character; lines are thin rectangles
H	help find ASCII code of characters
X	plot text, automatic wrap-round; press Return to finish or Line Feed to move cursor to the beginning of next line; cursor is a @
A	string of above commands automatically operated; Ctrl-Z to abort

(listings continued from page 144)

10210-10230, new screen, initialise variables and branch to Editor.

10300-10440, edit old screen, Get old screen from file, display and branch to Editor.

10500-10650, Save screen, create new file and Save screen, Return to main menu.

10700, continue, redisplay screen and branch to editor.

The commands for using the routine are shown in table 1. To fill a rectangle with a character, line the cursor up with one of the corners of the rectangle and press F. A message will be displayed reminding you that the Fill routine is on.

Now move the cursor to the diagonally opposite corner and press F again. Two cursors will now be displayed, one at each of the corners that you have indicated. Input the ASCII code of the character that you wish to use — or H for help to find it — and the rectangle will be filled with it.

To set a macro command press A, then press one of the nine digits 1 to 9 and answer N to the Operate? prompt. If the message is No Auto you may answer Y to create a new one; if there already is one it will be displayed and you can choose to leave it or to change it.

If you answer N to the Change It? prompt you will be given a chance to choose another auto or to return to Editing mode. If you answer N to the Another Auto? prompt you will be asked if you want to operate with the existing one.

To create a macro simply type in a string of commands, except A, and they will be operated automatically when you choose to operate that macro. One macro may call another; to do this use the number of that other macro in the string. A macro may not call itself or another macro that in turn calls it.

The X commands enables you to type passages of text on the screen with the cur-

(continued on next page)

(listing continued from page 144)

```
6000 PLOTX,Y,"+":PUT12:?"Grey or white";
6020 GW=GET():GW=GW+32*(GW>90)
6025 IFGW<>71ANDGW<>87GOTO6020
6030 IFGW=71THENPX=128ELSEPX=192
6035 PLOTX,Y,M
6040 PUT12:?"Enter pattern    1 2":?TAB(17);"3 4    - to restart"
6045 ?TAB(17);"5 6    0 to finish."
6050 PLOTX,Y,"+";P=GET(10):PLOTX,Y,M:IFP<48ORP>54ANDP<>45GOTO6050
6060 PX=PX-(P=49)-2*(P=50)-4*(P=51)-8*(P=52)-16*(P=53)-32*(P=54)
6065 IFP=45THENPX=192+64*(GW=71)
6070 PLOTX,Y,PX:M=PX:IFP=48THENRETURNELSE6050

7000 PG=0:GOSUB8000:PUT12:GRAPH1:PLOT36,51,"Press"
7005 PLOT12,48,"< to decrease    > to increase":PLOT30,45,"R to finish"
7010 HP=0
7020 PLOT0,30,128:LINE78,30:PLOT30,30,STR$(HP):PLOT40,30,HP
7025 H=GET()
7030 IFH=60ORH=44THENHP=HP-1:IFHP<0THENHP=255
7035 IFH=62ORH=46THENHP=HP+1:IFHP>255THENHP=0
7036 IFH=82ORH=114THENGOSUB2500:RETURN
7040 GOTO7020

8000 PUT12:?"Saving screen, please wait."
8005 FORI=0TO19:SCREEN$(I)="":FORXX=0TO78STEP2
8020 SCREEN$(I)=SCREEN$(I)+CHR$(POINTS(XX,I*3))
8030 NEXTXX:PLOT0,I*3,128:LINE78,I*3:NEXTI:RETURN

8500 PUT12:?"Clear screen, are you sure <Y/N>(RTN)";
8510 INPUTCL$:IFCL$="Y"THENGRAPH1:RETURNELSERETURN

9000 B=ERR
9010 IFB=27THEN?:?"Read error - possible hardware fault.":RETURN
9020 IFB=34THEN?:?"Invalid device name, try again.":RETURN
9030 IFB=35THEN?:?"Invalid file name, try again.":RETURN
9040 IFB=36THEN?:?"Write error - possible hardware fault.":RETURN
9050 IFB=38THEN?:?"Sorry can't find ";FL$:RETURN
9060 IFB=40THEN?:?"Sorry the disc is full, replace it and try again.":RETU
RN
9070 IFB=20THEN?:?"This file should have been saved as":?"codes.":RETURN
9080 IFB=14THEN?:?"You specified the wrong type of file":?"eg. strings ins
tead of codes.":RETURN
9090 ?"ERROR ";B:END

10100 TEXT:PUT12:IN$="NESCB":IN=0
10110 ?"The following options are available:":?
10120 ?"      < N >  create a new screen"
10130 ?"      < E >  edit an old screen"
10140 ?"      < S >  save the current screen"
10150 ?"      < C >  continue current screen":?
10152 ?"      < B >  bye.":?:?:?
10155 ?"Which do you want?";
10160 Q=GET():Q=Q+32*(Q>90):Q$=CHR$(Q)
10170 FORI=1TO5:IFQ$=MID$(IN$,I,1)THENIN=I
10175 NEXTI
10190 IFIN=0GOTO10160ELSE?
10200 ONINGOTO10210,10300,10500,10600,10800

10210 PUT12:GRAPH1:FL$=""
10220 X=0:Y=0:M=128:PLOTX,Y,"+":GOTO1125

10300 PUT12
10310 ?"What is the file called (RTN)"
10315 INPUT"          ";FL$
10320 ONERRORGOTO10390
10330 OPEN#10,FL$:GRAPH1
10335 ?"Is the file strings or ASCII codes?";
10336 Q=GET():Q=Q+32*(Q>90)
10337 IFQ<>65ANDQ<>67ANDQ<>83GOTO10336ELSE?
10338 IFQ<>83GOTO10800
10340 FORI=0TO19:INPUTLINE#10,SCREEN$(I)
10345 PLOT0,I*3,SCREEN$(I):NEXTI:CLOSE#10
10360 X=0:Y=0:M=POINTS(X,Y):PLOTX,Y,"+":GOTO1125
10390 GOSUB9000:GOTO10310
10400 FORI=0TO19:SCREEN$(I)="":FORJ=0TO78STEP2
10420 INPUT#10,Z:PLOTJ,I*3,Z:SCREEN$(I)=SCREEN$(I)+CHR$(Z)
10440 NEXTJ:NEXTI:CLOSE#10:GOTO10360

10500 PUT12:GOSUB2500
10510 ?"What shall the file be called (RTN)"
10515 INPUT"          ";FL$:IFFL$=""GOTO10515
10520 ?:?"Do you want the screen saved as strings"
10521 ?"or ASCII codes. Nb.if you have used an"
10522 ?"End of File code you must use codes.":?
10523 ?"Strings or Codes?";
10525 Q=GET():Q=Q+32*(Q>90):IFQ<>67ANDQ<>83GOTO10525ELSE?
10526 IFQ=67GOTO10600
10530 ONERRORGOTO10590
10535 RESET:CREATE#10,FL$:QUOTE#10,0
10550 FORI=0TO19:PRINT#10,SCREEN$(I):NEXTI:CLOSE#10:GOTO10100
10590 GOSUB9000:GOTO10510
10600 ONERRORGOTO10490:PUT12:GRAPH1:GOSUB2500:CREATE#10,FL$:QUOTE#10,0
10620 FORYY=0TO57STEP3:FORXX=0TO78STEP2
10640 Z=POINTS(XX,YY):PRINT#10,Z
10650 NEXTXX:NEXTYY:CLOSE#10:GOTO10100

10700 GRAPH1:GOSUB2500:GOTO1125

10800 TEXT:PUT12:END
```

(continued from previous page)

sor being moved automatically to the next position. When you come to the end of a line the cursor will be moved to the beginning of the next or you may move to the beginning of the next line at any time by pressing Line Feed. Pressing Return will return you to the editing mode.

The P command enables a pixel character to be intput by its pattern instead of its ASCII code. After pressing P you will be asked if the character is to be grey or white; answer G or W. Now you will be shown a representation of a pixel character:

1 2
3 4
5 6

Press the keys of the cells that you want lit. For example, the cell at position 3 is lit by pressing 3. When you have finished press 0.

Cesil interpreter

THE PROGRAM by Chris Thompson of Walsingham School, Orpington, Kent, interprets the learning programming language Cesil. The program was written for a Research Machine 380-Z with dual disc drives, but can be simply changed to work with a 480-Z with cassette.

Walsingham school uses the program in 48K RAM but it should just fit in a 32K machine. Research Machines has alredy produced a machine-code version of Cesil but it lacks the advantage of being able to record or load the finished program.

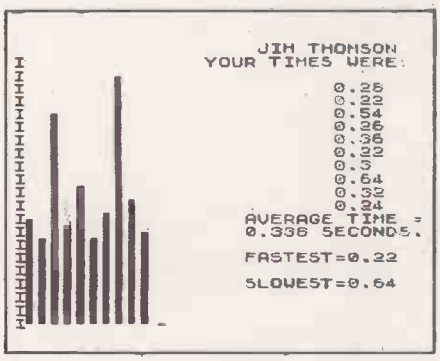
Cesil interpreter.

```
10 REM ********************************
20 REM *                              *
30 REM *          "Cesil"             *
40 REM *   Written by C.A.Thompson     *
50 REM *  Written for RML Disk-basic   *
60 REM *     (C) Copyright 1982       *
70 REM *                              *
80 REM ********************************
90 REM
100 REM
110 REM Clear string space
120 CLEAR 1000
130 REM Abort routine
140 ON BREAK GOTO 2140
141 ON ERROR GOTO 2141
150 REM Dimension arrays
160 DIM ID$(100),IN$(100),LA$(100),PR$(100),A(540),DS(100)
170 REM Set data variable & Underlining
180 YH=1:FOR L=1 TO 17:UL$=UL$+CHR$(131):NEXT
190 REM Clear screen & set non flashing cursor
200 PUT 31,23,17
210 REM Set up heading
220 LR=0:?:? TAB(9);"Cesil Interpreter"
230 ? TAB(9);UL$
240 REM Print out prompt
250 ?:?"Ready"
260 LR=0:GOTO 540
270 ?:IF C$="" THEN 250
280 REM Check that command is not in lower case
290 IF ASC(C$)>90 THEN ?"* Command in lower case":GOTO 250
300 REM Interpret command
310 IF C$="SELECT" THEN GOSUB 2930:GOTO 250.
320 IF C$="DIR" THEN GOSUB 2650:GOTO 250
330 IF C$="DELETE" THEN GOSUB 2390:GOTO 250
340 IF C$="X" OR C$="DATA" THEN 2160
350 IF C$="NEWDATA" THEN YH=1:GOTO 2160
360 IF C$="LISTDATA" THEN GOSUB 2300:GOTO 250
370 IF C$="LLISTDATA" THEN GOSUB 2340:GOTO 250
380 IF C$="LRUN" AND X()0 THEN LR=1:GOTO 960 ELSE IF C$="LRUN" AND X=0
    THEN ?"* No program resident":GOTO 250
390 IF C$="CHANGE" THEN GOSUB 2240:GOTO 250
400 IF C$="EXTRA" THEN GOSUB 2530:GOTO 250
410 IF C$="NEW" THEN RUN
420 IF C$="LOADPROG" THEN GOSUB 1520:GOTO 250
430 IF C$="SAVE" THEN GOSUB 1260:GOTO 250
440 IF C$="ERASE" THEN GOSUB 1750:GOSUB 250
450 IF C$="LIST" THEN GOSUB 1900:GOTO 250
460 IF C$="LISTN" THEN LI=1:GOSUB 1900:GOTO 250
470 IF C$="LLISTN" THEN LI=1:LR=1:GOSUB 1900:GOTO 250
480 IF C$="LLIST" THEN LR=1:GOSUB 1900:GOTO 250
490 IF C$="HELP" THEN GOSUB 2690:GOTO 250
500 IF C$="RUN" AND X()0 THEN 960 ELSE IF C$="RUN" AND X=0 THEN ?"*
    No program":GOTO 250
510 REM Print out error message if not understood
520 ?:?"* Syntax error in command"
530 GOTO 250
540 X=X+1
550 REM Program input routine
560 ID$(X)="":IN$(X)="":LA$(X)="":PR$(X)=""
570 ?")";
580 REM Enter Label/Command
590 A=GET()
600 IF A=13 AND LEFT$(ID$(X),1)<>"(" THEN C$=ID$(X):X=X-1:GOTO 270
610 IF A=40 THEN ZN=1
620 IF A=127 AND LEN(ID$(X))>0 THEN ID$(X)=LEFT$(ID$(X),LEN(ID$(X))-1):?
    CHR$(127);:GOTO 590 ELSE IF A=127 THEN 590
630 IF A=32 AND ZN<>1 THEN 680
640 IF A=27 AND ZN<>1 THEN ?:GOTO 560 ELSE IF A=27 AND ZN=1 THEN 590
650 IF A=13 AND ZN<>1 THEN X=X-1:GOTO 250 ELSE IF A=13 AND ZN=1 THEN 910
660 ID$(X)=ID$(X)+CHR$(A):? CHR$(A);:GOTO 590
670 REM Enter the Instruction
680 ? TAB(17);
690 A=GET()
700 IF(A<65 OR A>90)AND A<>27 AND A<>32 AND A<>127 AND A<>13 THEN ?:
    ?"* Instuction error":GOTO 560
710 IF A=127 AND LEN(IN$(X))>0 THEN IN$(X)=LEFT$(IN$(X),
    LEN(IN$(X))-1):? CHR$(127);:GOTO 690 ELSE IF A=127 THEN 690
720 IF A=32 THEN 770
730 IF A=27 THEN ?:GOTO 560
740 IF A=13 THEN 910
750 IN$(X)=IN$(X)+CHR$(A):? CHR$(A);:GOTO 690
760 REM Enter the Identifier
770 ? TAB(33);
780 A=GET()
790 IF A=127 AND LEN(LA$(X))>0 THEN LA$(X)=LEFT$(LA$(X),LEN(LA$(X))-1):? CHR$(127);:GOTO 780
    ELSE IF A=127 THEN 780
800 IF A=32.THEN ?:GOTO 860
810 IF A=27 THEN ?:GOTO 560
820 IF A=13 THEN 910
830 LA$(X)=LA$(X)+CHR$(A):? CHR$(A);:GOTO 780
840 ?
850 REM Enter the Print
860 A=GET()
870 IF A=127 AND LEN(PR$(X))>0 THEN PR$(X)=LEFT$(PR$(X),LEN(PR$(X))-1):? CHR$(127);:GOTO 860
    ELSE IF A=127 THEN 860
880 IF A=27 THEN ?:GOTO 560
890 IF A=13 THEN 910
900 PR$(X)=PR$(X)+CHR$(A):? CHR$(A);:GOTO 860
910 IF ZN=1 THEN ZN=0:ZN=0:RETURN
920 ZN=0
930 X=X+1:?:GOTO 560
940 GOTO 250
950 REM Interpret the program
960 ?"* Program running":?:?:?:CA=0:H1=0:FOR G=1 TO X
970 IF LEFT$(ID$(G),1)="(" THEN 1210
980 IF IN$(G)="ADD" THEN GOSUB 2100:CA=CA+A(WE):GOTO 1210
990 IF IN$(G)="SUBTRACT" THEN GOSUB 2100:CA=CA-A(WE):GOTO 1210
1000 IF IN$(G)="MULTIPLY" THEN GOSUB 2100:CA=CA*A(WE):GOTO 1210
1010 IF IN$(G)="DIVIDE" THEN GOSUB 2100 ELSE 1040
1020 IF A(WE)=0 THEN ?"* Can't divide by zero at line";G:GOTO 1210
1030 CA=CA/A(WE):GOTO 1210
1040 IF IN$(G)="LOAD" THEN GOSUB 2100:CA=A(WE):GOTO 1210
1050 IF IN$(G)="STORE" THEN GOSUB 2100:A(WE)=CA:GOTO 1210
1060 IF IN$(G)="LINE" AND LR=1 THEN LPRINT:GOTO 1210 ELSE IF IN$(G)="LINE"
     THEN ?:GOTO 1210
1070 IF(IN$(G)="PRINT" AND LEFT$(PR$(G),1)<>CHR$(34)) OR (IN$(G)="PRINT" AND
     RIGHT$(PR$(G),1)<>CHR$(34)) THEN  1200
1080 IF IN$(G)="PRINT" AND LR=1 THEN LPRINT LEFT$(RIGHT$(PR$(G),LEN(PR$(G))-1),
     LEN(PR$(G))-2);:GOTO 1210
1090 IF IN$(G)="PRINT" THEN ? LEFT$(RIGHT$(PR$(G),LEN(PR$(G))-1),LEN(PR$(G))-2);
     :GOTO 1210
1100 IF IN$(G)="OUT" AND LR=1 THEN LPRINT INT(CA);:GOTO 1210 ELSE IF IN$(G)=
     "OUT" THEN ? INT(CA);:GOTO 1210
1110 IF IN$(G)="IN" THEN 1120 ELSE 1150
1120 H1=H1+1
1130 IF H1>YH-1 THEN 2220
1140 CA=DS(H1):GOTO 1210
1150 IF IN$(G)="HALT" THEN 1220
1160 IF IN$(G)="JIZERO" AND CA=0 THEN 2000 ELSE IF IN$(G)="JIZERO" AND CA<>0 THEN 1210
1170 IF IN$(G)="JINEG" AND CA<0 THEN 2000 ELSE IF IN$(G)="JINEG" AND CA)=0 THEN 1210
1180 IF IN$(G)="JUMP" THEN 2000
1190 REM Error message if intruction not understood
1200 ?:?:?"* Syntax error at line";G:GOTO 250
1210 NEXT
1220 IF LR=1 THEN LPRINT
1230 REM Execution finished
1240 ?:?:?:?"* Finished":H1=0:GOTO 250
1250 REM Save program routine
1260 ?:INPUT"Filename:",F$
1270 RESET
1280 REM Error message if filename too large
1290 IF LEN(F$)>8 THEN ?"* Filename too large":GOTO 250
```

```
1300 REM Add 'CES' suffix to filename
1310 F$=F$+".CES"
1320 REM Check another program is not being erased
1330 IF LOOKUP(F$)<>0 THEN GOSUB 2510:GOTO 250
1340 REM Output the program
1350 CREATE£10,F$
1360 PRINT£10,X
1370 FOR P=1 TO X
1380 IF PR$(P)="" THEN 1440
1390 REM If quotation marks are used change them to apostraphies
1400 TV$=RIGHT$(PR$(P),LEN(PR$(P))-1)
1410 AV$="'":AV$=AV$+TV$
1420 TV$=LEFT$(AV$,LEN(AV$)-1):TV$=TV$+"'"
1430 PR$(P)=TV$
1440 PRINT£10,ID$(P)
1450 PRINT£10,IN$(P)
1460 PRINT£10,LA$(P)
1470 PRINT£10,PR$(P)
1480 NEXT
1490 CLOSE
1500 GOTO 1580
1510 REM Input a program
1520 ?:INPUT"Filename:",F$
1530 RESET
1540 REM Add 'CES' suffix
1550 F$=F$+".CES"
1560 REM Check that file exists
1570 IF LOOKUP(F$)=0 THEN ?"That file is non-existant":GOTO 250
1580 OPEN£10,F$
1590 INPUT£10,X
1600 FOR P=1 TO X
1610 INPUT£10,ID$(P)
1620 INPUT£10,IN$(P)
1630 INPUT£10,LA$(P)
1640 INPUT£10,PR$(P)
1650 IF PR$(P)="" THEN 1710
1660 REM If an apostraphy is found change it to a quotation mark
1670 TV$=RIGHT$(PR$(P),LEN(PR$(P))-1)
1680 AV$=CHR$(34):AV$=AV$+TV$
1690 TV$=LEFT$(AV$,LEN(AV$)-1):TV$=TV$+CHR$(34)
1700 PR$(P)=TV$
1710 NEXT P
1720 GOSUB 1900
1730 RETURN
1740 REM Erase program routine
1750 PUT 12:?"Enter passcode:";?:?
1760 ?"!!!!!";:FOR W=1 TO 4:? CHR$(8);:NEXT
1770 FOR W=1 TO 4:A$=GET$():CD$=CD$+A$:?"*";:NEXT:?:?
1780 REM If passcode does not equal the proper passcode print error message
1790 IF CD$<>"KILL" THEN CD$="":?"You aren't authorised to erase a program":RETURN
1800 CD$=""
1810 ?:INPUT"Filename:",F$
1820 RESET
1830 REM Add 'CES' suffix
1840 F$=F$+".CES"
1850 IF LOOKUP(F$)=0 THEN ?:?"* File does not exist":RETURN
1860 ERASE F$
1870 RETURN
1880 REM List program if LI=1 then print the line numbers
1890 REM If LR=1 then print out on the printer
1900 IF X=0 THEN ?"* No program":RETURN ELSE PUT 19,12:?:?:IF LR=1 THEN ?"Program being printed":
     FOR P=1 TO X ELSE FOR P=1 TO X
1910 IF LI=1 AND LR=1 THEN LPRINT P;TAB(3); ELSE IF LI=1 THEN ? P;TAB(3);
1920 IF LR<>1 THEN 1950
1930 LPRINT ID$(P);TAB(17);IN$(P);TAB(33);LA$(P):IF PR$(P)<>"" THEN LPRINT " ";PR$(P)
1940 GOTO 1960
1950 ? ID$(P);TAB(17);IN$(P);TAB(33);LA$(P):IF PR$(P)<>"" THEN ?" ";PR$(P)
1960 NEXT
1970 LI=0:LR=0:PUT 17
1980 RETURN
1990 REM Print error message if there is no identifier
2000 IF LA$(G)="" THEN ?:?:?"* Missing identifier at line";G:GOTO 250
2010 REM Find the matching label
2020 FOR P=1 TO X
2030 IF ID$(P)=LA$(G) THEN IG=P:B=1
2040 NEXT P
2050 IF B=1 THEN B=0:G=IG-1:IG=0:GOTO 1210
2060 REM If there is no matching label print an error message
2070 ?:?:?"* Missing label at line";G
2080 GOTO 250
2090 REM Find if the identifier is a constant or a variable
2100 WE=0:D$=LEFT$(LA$(G),1)
2110 IF D$="+" OR D$="-" THEN 2130
2120 FOR L=1 TO LEN(LA$(G)):WE=WE+ASC(MID$(LA$(G),L,1)):NEXT L:RETURN
2130 WE=1:A(WE)=VAL(LA$(G)):RETURN
2140 ON BREAK GOTO 2140:?"* Aborted":GOTO 250
2141 IF UY=0 THEN ?"*External error - ignoring":UY=1 ELSE ?"*Permanent error - restarting":A$=GET$(500):RUN
2142 ON ERROR GOTO 2141
2143 GOTO 250
2150 REM Data input routine
2160 PUT 12:?"Type '*' when you have finished data":VA=1
2170 ?"Press RETURN after each item of data"
2180 INPUT"£",DS$
2190 REM Check it isn't the end of the data
2200 IF DS$="*" THEN 250
2210 DS(YH)=VAL(DS$):YH=YH+1:GOTO 2180
2220 ?:?:?"* Data exhausted at line";G:GOTO 250
2230 REM Change line routine
2240 INPUT"Which line:",AQ:?"LINE";AQ:?TAB(2);ID$(AQ);
     TAB(17);IN$(AQ);TAB(33);LA$(AQ):?PR$(AQ):?:?
2250 ?"Enter new line"
2260 TV=X:X=AQ:ZM=1:GOSUB 550
2270 X=TV:RETURN
2280 END
2290 REM List data routine
2300 IF VA<>1 THEN ?:?"* No data":RETURN
2310 ?:?"X";
2320 FOR L=1 TO YH-1
2330 ? DS(L);:NEXT:?:RETURN
2340 IF VA<>1 THEN LPRINT:LPRINT"* No data":RETURN
2350 LPRINT:LPRINT"X";
2360 FOR L=1 TO YH-1
2370 LPRINT DS(L);:NEXT:LPRINT:RETURN
2380 REM Delete routine
2390 INPUT"From:",S
2400 INPUT"To:",E:E=E+1
2410 N=E-S
2420 FOR L=1 TO X
2430 ID$(S+PS)=ID$(E+PS)
2440 IN$(S+PS)=IN$(E+PS)
2450 LA$(S+PS)=LA$(E+PS)
2460 PR$(S+PS)=PR$(E+PS)
2470 PS=PS+1
2480 NEXT
2490 X=X-N
2500 PS=0:RETURN
2510 ?"* That file already exists":RETURN
2520 REM Extra line routine
2530 INPUT"At:",A
2540 FOR L=X TO A STEP -1
2550 ID$(L+1)=ID$(L)
2560 IN$(L+1)=IN$(L)
2570 LA$(L+1)=LA$(L)
2580 PR$(L+1)=PR$(L)
2590 NEXT
2600 ?"Enter extra line"
2610 ZM=1
2620 TV=X:X=A:GOSUB 550
2630 X=TV:X=X+1:RETURN
2640 REM Disk directory
2650 RESET
2660 DIR"*.CES"
2670 RETURN
2680 REM Help routine
2690 PUT 12
2700 ?"Command";TAB(12);"Purpose"
2710 ? LEFT$(UL$,7);TAB(12);LEFT$(UL$,7)
2720 ?"'ESC' key";TAB(12);"To delete whole line"
2730 ?"LIST";TAB(12);"To list program on screen"
2740 ?"LLIST";TAB(12);"To list program on printer"
2750 ?"LISTDATA";TAB(12);"To list data on screen"
2760 ?"LLISTDATA";TAB(12);"To list data on printer"
2770 ?"NEWDATA";TAB(12);"To input a new set of data"
2780 ?"X or DATA";TAB(12);"Enter data"
2790 ?"RUN";TAB(12);"Executes your program"
2800 ?"LRUN";TAB(12);"Executes program on printer"
2810 ?"NEW";TAB(12);"Deletes the existing program"
2820 ?"DELETE";TAB(12);"Delete program line"
2830 ?"EXTRA";TAB(12);"Insert an extra program line"
2840 ?"CHANGE";TAB(12);"To correct a program line"
2850 ?"LISTN";TAB(12)"Listing with line numbers"
2860 ?"LLISTN";TAB(12);"LISTN on the printer"
2870 ?"DIR";TAB(12);"Output disk directory"
2880 ?"LOADPROG";TAB(12);"Input a program from disk"
2890 ?"SAVE";TAB(12);"Record a program onto disk"
2900 ?"ERASE";TAB(12);"To erase a program from disk"
2910 RETURN
2920 REM Select printer option
2930 PUT 12
2940 INPUT"Enter printer type:",PT
2950 INPUT"Enter printer baud rate:",PB
2960 PRINTER PT,PB
2970 RETURN
```

Reaction timer

WRITTEN FOR the ZX-81 this program by Eric Smith of Grangemouth, Stirlingshire uses 3K of memory. It times the reactions of



contestants 10 times, then displays the average, fastest and slowest time, as well as a plot of the contestants' names and times.

Reaction timer.

```
  10 REM **REACTION COUNTER**
  20 PRINT "[illegible]"
  30 PRINT AT 1,5; "[illegible]"
  40 PRINT
  50 PRINT "IN REACTION COUNTER
THE      COMPUTER DISPLAYS A
WORD ON THE  SCREEN AND MEASURES
YOUR     REACTION TIME."
  60 PRINT "THIS IS DONE TEN TIM
ES AND AN   AVERAGE TIME IS GIVE
N."
  70 PRINT "WHEN THE WORD ""STAR
T"" APPEARS   ON THE SCREEN PRES
S ANY KEY TO  STOP THE CLOCK."
  80 PRINT AT 21,0;"[illegible]
[illegible]"
  90 IF CODE INKEY$<>118 THEN GO
TO 90
 100 CLS
 110 LET M=0
 120 LET L=999
 130 LET AV=0
 140 DIM T(10)
 150 FOR A=1 TO 10
 160 FOR W=1 TO INT (RND*300)
 170 IF INKEY$<>"" THEN GOTO 200
 180 NEXT W
 190 GOTO 250
 200 PRINT AT 5,0;"WILL YOU PLEA
SE STOP CHEATING.."
 210 FOR E=1 TO 20
 220 NEXT E
 230 PRINT AT 5,0;"
 240 GOTO 160
 250 PRINT AT 12,10;"[illegible]"
 260 POKE 16437,255
 270 POKE 16436,255
 280 IF INKEY$="" THEN GOTO 250
 290 LET R=PEEK 16436
 300 LET P=PEEK 16437
 310 LET T=((254-R)+256*(255-P))
/50
 320 PRINT AT 12,10;"      ";AT 0
,0;"
    ";AT 0,0;"YOUR TIME WAS ";T;"
SECONDS"
 330 LET T(A)=T
 340 IF M<T THEN LET M=T
 350 IF L>T THEN LET L=T
 360 LET AV=AV+T
 370 NEXT A
 380 CLS
 390 PRINT "PLEASE ENTER YOUR NA
ME. (NOT MORE THAN 12 LETTERS)"
 400 INPUT A$
 410 IF LEN A$>12 THEN GOTO 380
 415 CLS
 420 PRINT AT 0,19;A$
 430 PRINT AT 1,15;"YOUR TIMES W
ERE:"
 440 FOR A=1 TO 10
 450 PRINT AT A+2,25;T(A)
 460 NEXT A
 470 PRINT AT 13,18;"AVERAGE TIM
E =";AT 14,18;AV/10;" SECONDS."
 480 PRINT AT 16,16;"FASTEST=";L
;AT 18,18;"SLOWEST=";M
 490 FOR A=1 TO 21
 500 PRINT AT A,0;"I"
 510 NEXT A
 520 FOR A=1 TO 15
 530 PRINT AT 21,A;"-"
 540 NEXT A
 550 FOR X=1 TO 10
 560 FOR Y=1 TO T(X)*(38/M)
 570 PLOT X*2,Y
 580 NEXT Y
 590 NEXT X
 600 PRINT AT 21,12;"[illegible]
[illegible]"
 610 IF INKEY$="Y" THEN GOTO 640
 620 IF INKEY$="N" THEN STOP
 630 GOTO 610
 640 PRINT AT 21,12;"
                    "
 650 LPRINT "REACTION TIMER BY E
.SMITH"
 660 LPRINT
 670 COPY
 680 STOP
```

Number formatter.

```
9000 LET A$="LEN (STR$ (INT N))"
9010 LET N$=("**********"+(STR$
N)+(".00000000")((N<>INT N)+1 TO
 ))(VAL A$+11-D1-(ABS N<.1) TO V
AL A$+11+D2-(ABS N<.1)-(D2=0))
9020 RETURN
```

Number formatter

A THREE-LINE SUBROUTINE to format a number on the ZX-81 comes from P A Smith of Dundee. The number stored as the variable N is converted to a string N$. The positions before and after the decimal point are specified by the variables D1 and D2 respectively, which can have values from zero to 10 or 8 respectively. The decimal point is suppressed if D2 is set to zero.

The sign is printed for a negative number, and occupies one printing position. There is no check on whether the number can be printed in the space available.

The listing shows a string of asterisks in line 9010; they should be replaced by spaces.

Determinant evaluation

A BASIC PROGRAM to evaluate a determinant by the method of pivotal condensation has been submitted by Alan Mackay of London. The method is to find the largest term in the array and to reduce other terms in the corresponding column to zero by subtraction of appropriate multiples of other columns.

The program may be used as the basis of a subroutine for longer programs. It is convenient for versions of Basic which do not have the matrix operations which were seen as an essential feature of the original Dartmouth College Basic.

On a ZX Spectrum approximate times for determinants of order N were:

N = 5, 7 s.
N = 10, 39 s.
N = 20, 350 s.
N = 40, 2,275 s.

No doubt the program could be packed more tightly, if necessary, but at present it simply follows the standard procedure.

Determinant evaluation.

```
100  REM read in test data
110  DIM D(8,8)
120  LET N = 4
130  FOR I = 1 TO N
140  FOR J = 1 TO N
150  READ D(I,J)
160  NEXT J
170  NEXT I
180  GOSUB 1000
190  STOP
200  DATA 2,9,9,4,2,-3,12,8,4,8,3,-5,1,2,6,4
210  REM determinant for test data is 147

1000 REM calculation of determinant by pivotal condensation
1010 REM det. of order N is in D(N,N). Result is in S
1020 REM matrix is destroyed. Uses A(N*N),B,I,J,A,P,Q,V,W. N is altered.
1030 DIM A(64)
1040 LET S = 1
1050 REM begin
1060 LET B = 0
1070 REM find largest element = pivot = D(P,Q)
1080 FOR I = 1 TO N
1090 FOR J = 1 TO N
1100 LET A = ABS(D(I,J))
1120 IF A<B THEN GOTO 1160
1130 LET P = I
1140 LET Q = J
1150 LET B = A
1160 NEXT J
1170 NEXT I
1180 REM multiply by largest element with sign W as plus 1 if P+Q is even
1181 REM and minus 1 if odd
1188 LET W = INT((P+Q)/2)
1189 LET W = 1 + 4*W -2*(P+Q)
1190 LET S = S*D(P,Q)*W
1200 IF S = 0 THEN GOTO 1440
1210 LET V = 1
1220 REM reduce other terms to zero by subtraction of
1221 REM columns of pivot
1230 FOR I = 1 TO N
1240 IF I = P THEN GOTO 1320
1250 FOR J = 1 TO N
1260  IF J=Q THEN GOTO 1310
1270 LET D(I,J) = D(I,J)-D(P,J)/D(P,Q)*D(I,Q)
1280 LET A(V) = D(I,J)
1290 LET V = V+1
1300 REM run out non-zero elements into det. of lower order
1310 NEXT J
1320 NEXT I
1330 LET N = N-1
1340 IF N = 0 THEN GOTO 1440
1350 LET V = 1
1360 FOR I = 1 TO N
1370 FOR J = 1 TO N
1380 LET D(I,J) = A(V)
1390 LET V = V+1
1400 NEXT J
1410 NEXT I
1420 REM repeat until det. has order 1
1430 GOTO 1060
1440  PRINT "determinant="; S
1450 RETURN
```

The box is not always black...

At Rair we're continually enhancing and upgrading our Black Box microcomputer range to meet the ever-changing, ever-growing needs of our customers.

That's why you'll often find our systems turning up under different names, different colours—not always black.

Our current Black Box range includes 8- and 16-bit micro-processors, that can be configured from simple single-user floppy disk systems right up to powerful multi-user systems with Winchester hard disks and tape backup.

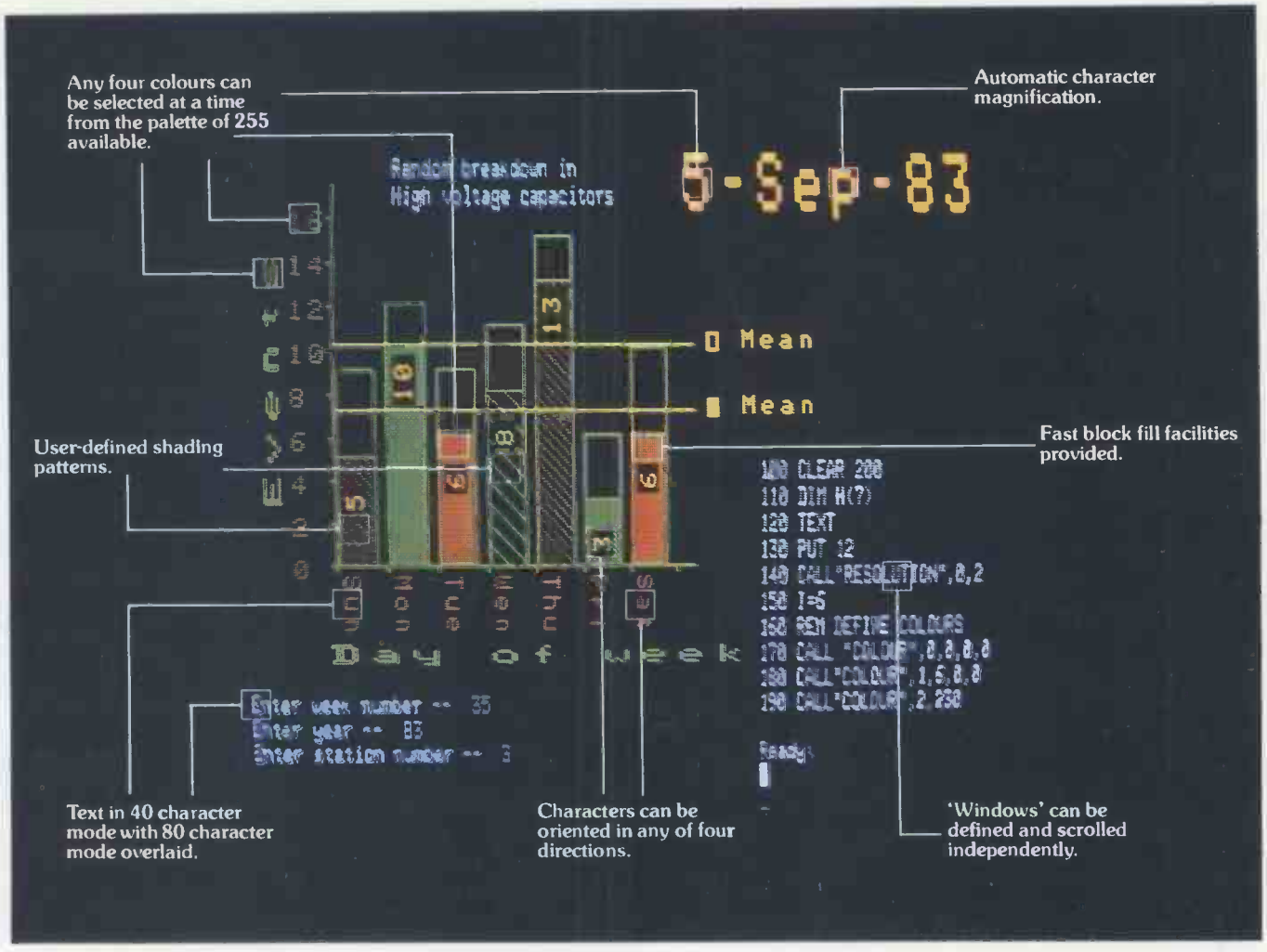
So next time you're choosing a micro-computer for a new application, remember to call us first. With Rair, you can have any colour you like, including black.

RAIR

United Kingdom
RAIR Limited
6-9 Upper St Martins Lane
London WC2H 9EQ

Telephone (01) 836 6921
Telex 298452

● Circle No. 171



GRAPHICS MACHINE

A picture may be worth a thousand words but it still tells only half the story about graphics on the 380Z.

For a start, our standard graphics functions include point plotting, line drawing, instant block fill, block copying, offsetting, and Exclusive Or Plotting.

Then there is the important fact that our Level 2 High Resolution Graphics is supported by Basic, Algol, and Fortran. And since it is contained in an additional 16K of RAM, every byte of user memory remains available for applications programs.

It is also worth noting that 380Z graphics are equally effective in monochrome — for 'colour' just read 'shades of grey'. Again there are 255 shades available, and there's also a very useful facility for fading up and down throughout the grey scale.

There are also the special effects — such as moving between graphics 'pages' for pseudo-animation, or the ability to produce 'instant' graphics by drawing them with the colour 'switched' off and then 'switching' on.

Next, not only can 380Z graphics pictures be saved on and retrieved from disc, they can also be output to one of a range of popular dot matrix printers.

Remember, too, that HRG is not a third-party add-on but designed, developed, and supported by Research Machines itself as an integral part of the 380Z.

And finally, we've now implemented GINO. So for the first time this well-established, professional suite of flexible, device-independent graphics software from the CAD Centre is available on a micro.

If you are interested in graphics — for scientific, technical, and industrial research; or in secondary or higher education; or for design, engineering, or control, then you will be interested in the 380Z.

RESEARCH MACHINES
MICROCOMPUTER SYSTEMS

RESEARCH MACHINES LTD Mill Street, Oxford OX2 0BW, Tel: (0865) 249866

● Circle No. 172

APPLE PIE

by John Harris

Security password

GRAHAM WILSON of Bristol maintains an Apple II in his office and finds it proves a popular toy, with drastic results when discs are mishandled. This password program has been incorporated in the initialised program on each disc, and as a subroutine on some of his more important programs.

By using Get statements and a subroutine it requests a pre-specified password before allowing the program to continue execution. Admittedly the program does not stop the determined, nor pacify the violent, but it does stop those most likely to damage the discs. It certainly makes a hideous racket if you get the password wrong.

Security password

```
10  GOSUB 9900
20  PRINT "WELL DONE"
30  END
9900  REM *** SECURITY SUBR
9902  REM ***G.B.WILSON 1982
9904 PWD$ =  CHR$ (18) +  CHR$ (1
     5) +  CHR$ (4) +  CHR$ (5) +
      CHR$ (14) +  CHR$ (20)
9906 PWL =  LEN (PWD$)
9908  GOSUB 9990
9910  IF PSL = PWL THEN : IF PS$ =
     PWD$ THEN : RETURN
9912  IF  LEFT$ (PS$,PSL) <  > LEFT$
     (PWD$,PSL) THEN : HOME : FOR
     PCT = 1 TO 100: PRINT  CHR$
     (7): NEXT PCT: END
9914  GOTO 9908
9990  HOME : INVERSE : PRINT "SEC
     URITY SYSTEM": NORMAL
9992  PRINT : PRINT "PASSWORD=";:
      GET P$
9994 PS$ = PS$ + P$
9996 PSL =  LEN (PS$)
9997  HOME
9998  RETURN
9999  END
```

Gilt complex

The iniquity stakes, operating over a scale from one to 10, has always been crowded toward the top end, the regular high scorers being Imperialist Running Dog at 9.62, Stockbroker 9.68 and Investment Consultant 10. The system falls down only through its inability to cater for bookmakers, but I refer you to Tandy Forum in this issue for further news on that front.

The warning given, I present a program from S D Collier of Llangollen, Clwyd which enables you to analyse the gilt market to select the best-valued stock. It takes into account your own tax position and investment income surcharge liability, though perhaps if you have one of those you will not be needing the program.

This kind of investment is used to generate a fixed income for a known period, for making a capital gain if you pay high rate income tax, or for gambling on a falling interest rate when the share price will rise in relation to the price you paid. You can read all about it in *Which?*, September 1982, or on form SL-605 from the Post Office.

Gilt complex

```
10  HOME : REM (CLEAR SCREEN)
20  INVERSE : REM (INVERSE VIDEO)

30  PRINT "G I L T   E D G E D
     S T O C K"
40  PRINT "       A N A L Y S E R
                "
50  PRINT "
                "
60  PRINT "              B Y
                "
70  PRINT "    S . D . C O L L I
     E R      "
80  PRINT "
                "
90  PRINT "          N O V   8 2
                "
95  PRINT "
                "
100  NORMAL : REM (RETURN TO NORM
     AL VIDEO)
110  PRINT : PRINT : PRINT : PRINT
     : PRINT : PRINT "PRESS RETUR
     N WHEN READY";: GET A$
120  HOME
130  PRINT "USING THIS PROGRAM YO
     U CAN ANALYSE AS"
140  PRINT "MANY GILT EDGED STOCK
     S AS YOU WISH."
150  PRINT
160  PRINT "THE COMPUTER WILL ASK
      YOU QUESTIONS"
170  PRINT "ABOUT YOUR OWN TAX PO
     SITION, AND FROM"
180  PRINT "THIS INFORMATION WILL
      ADVISE YOU OF THE"
190  PRINT "BEST STOCK TO SELECT"

200  PRINT : PRINT : PRINT : PRINT
     : PRINT
210  PRINT "PRESS RETURN WHEN REA
     DY.";: GET A$
220  HOME
230  PRINT "YOU WILL NEED A COPY
     OF THE FINANCIAL"
240  PRINT "TIMES, IN WHICH THE R
     ELEVANT STOCKS ARE"
250  PRINT "LISTED"
260  PRINT
270  PRINT "YOU SHOULD SELECT ARO
     UND FIVE OR MORE"
280  PRINT "-UNDERLINE THEM, AND
     THEN WORK THROUGH"
290  PRINT "THE PROGRAM"
295  PRINT : PRINT : PRINT : PRINT
     : PRINT
298  PRINT "PRESS RETURN WHEN REA
     DY.";: GET A$
300  HOME : REM  (DATA INPUT)
310  INPUT "HOW MANY STOCKS
     ";N
315  PRINT
320  INPUT "ENTER YOUR TAX RATE
     ";BT
325  PRINT
330  PRINT "DO YOU PAY INCOME"
340  INPUT "TAX SURCHARGE (Y/N)
      ";S$
350  IF S$ = "Y" OR S$ = "N" THEN
      GOTO 360
355  GOTO 340
360  PRINT
```

(continued on next page)

(continued from previous page)

```
361  IF S$ = "Y" THEN BT = BT + 1
     5
370  PRINT
400  REM (INPUT STOCKS DATA)
410  DIM SK$(N),SC(N),SY(N),SF(N)
     ,SR(N),SP(N),SG(N),NY(N)
415 BR = 0:P = 0: REM (VAR. FOR F
     INDING BEST STOCK)
420  FOR I = 1 TO N
430  HOME
440  INPUT "NAME OF STOCK          "
     ;SK$(I)
450  PRINT
460  INPUT "YEARS TO MATURE        "
     ;SY(I)
470  PRINT
480  INPUT "COUPON RATE            "
     ;SC(I)
490  PRINT
500  PRINT "REDEMPTION YIELD   (T
     HE MOST RIGHT"
510  INPUT "HAND COLUMN            "
     ;SR(I)
520  PRINT
530  INPUT "STOCK PRICE            "
     ;SP(I)
540 SF(I) = SC(I) * 100 / SP(I)
550 SG(I) = SR(I) - SF(I)
560  NEXT I
570  HOME : REM (CALCULATE RESULT
     S)
580  FOR I = 1 TO N
600 NY(I) = SF(I) * BT / 100 + SG
     (I)
610  IF NY(I) > BR THEN P = I
620  NEXT I
630  PRINT
640  INPUT "PRINTER OR SCREEN (P/
     S)  ";Q$
650  IF Q$ = "P" THEN  GOSUB 1000

660  IF Q$ = "S" THEN  GOSUB 2000

670  PRINT "END,START,OR RE-PRINT
       (E,S,R)  ";: GET Q$
675  PRINT
680  IF Q$ = "E" THEN  HOME : END

690  IF Q$ = "S" THEN  RUN
700  HOME : GOTO 640
1000  REM (PRINTER ROUTINE)
1010  REM (INSERT YOUR OWNHERE.)
1020  PR# 1: REM (PERIPHERAL SLOT
      #1)
1030  GOSUB 3000
1040  PR# 0: PRINT
1050  RETURN
2000  REM (SCREEN RESULTS)
2010  REM (IF YOU DO NOT HAVE A P
     RINTER)
2020  REM (INSERT A PAUSE BETWEEN
      EACH STOCK)
2030  GOSUB 3000
2040  PRINT "PRESS RETURN WHEN RE
     ADY.  ";: GET A$
2050  PRINT
2060  RETURN
3000  REM (OUTPUT RESULTS)
3030  FOR I = 1 TO N
3040  PRINT "STOCK - ";SK$(I)
3045  PRINT
3048  PRINT "STOCK PRICE
      ";SP(I)
3050  PRINT "COUPON RATE
      ";SC(I)"%"
3060  PRINT "FLAT RATE
      ";SF(I)"%"
3070  PRINT "REDEMPTION YIELD
      ";SR(I)"%"
3080  PRINT "CAP GAIN/ANNUM
      ";SG(I)"%"
3090  PRINT "NET REDEM YIELD
      ";NY(I)"%"
3100  PRINT : PRINT : PRINT
3101  NEXT
3110  PRINT "BEST YIELD STOCK FOR
      YOUR TAX"
3120  PRINT "POSITION IS:-"
3130  PRINT
3140  PRINT SK$(P)" WITH A NETT R
     EDEMPTION YELD"
3150  PRINT "OF ";NY(P)"%"
3160  PRINT
3170  RETURN
```

Nine man morris

A high-resolution graphics game has been sent in by M C Prior of Aldershot, Hampshire which provides two players with a board and rule checking for this ancient and celebrated pastime. The board display uses various intensity levels to display black and white counters to the required maximum of nine per side. It then impartially drops them one by one as each side achieves the stipulated strategic state of three up or across, and you remove an opponent's piece.

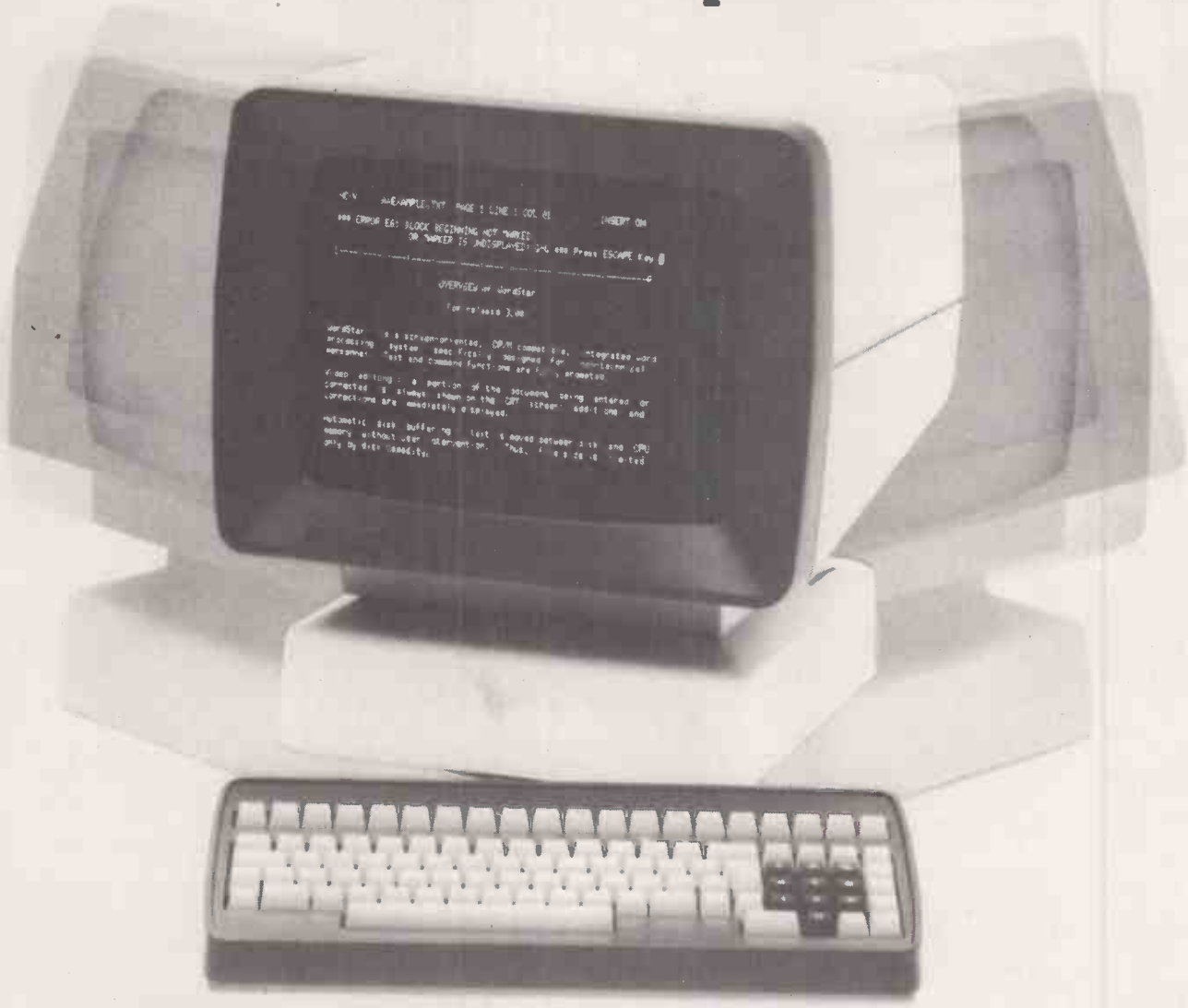
The display is quite clear and uncluttered, and the rules are simple enough, though they allow forward thinking beyond the point I can manage. The only conflict with common sense is whether you should be allowed a null move — lift from x,y; replace at x,y — which on occasion proves desirable and in this implementation is possible too. You might enjoy applying a patch for that particular quirk — unless you want to retain it as a program feature.

Nine man morris

```
1  REM  NINE MAN MORRIS
2  REM  AUTHOR M.C.PRIOR
3  REM  DATE CREATED:- 8-SEPT-82
4  HOME : VTAB 4
5  HTAB 10: FLASH : PRINT "NINE M
     AN MORRIS": NORMAL : PRINT :
      HTAB 9: PRINT "AUTHOR :- M.
     C.PRIOR": PRINT : PRINT
6  PRINT "THE OBJECT OF THE GAME
     IS TO GET THREE  MEN IN A LI
     NE ON A LINE"
7  PRINT "EITHER VERTICAL OR HORI
     ZONTAL, "
8  PRINT : PRINT : HTAB 10: PRINT
     "BUT ";: FLASH : PRINT "NOT"
     ;: NORMAL : PRINT " DIAGONAL
     "
9  PRINT : PRINT "ON ACHIEVING TH
     IS YOU MAY REMOVE AN     OPP
     ONENTS MAN"
10  VTAB 22
11  PRINT "PRESS RETURN WHEN READ
     Y  ";
12  GET Z$: IF Z$ = "" THEN 12
13  IF Z$ <  > CHR$ (13) THEN 12

14  HOME
15  VTAB 2: HTAB 7: PRINT "-": VTAB

      3: HTAB 6: PRINT "!";: HTAB
      9: PRINT 1;: HTAB 21: PRINT
      2;: HTAB 33: PRINT 3
16  VTAB 4: HTAB 6: PRINT "!": VTAB

      5: HTAB 6: PRINT "!"
17  VTAB 6: HTAB 4: PRINT "T-!";:
       HTAB 13: PRINT 4;: HTAB 21:
       PRINT 5;: HTAB 31: PRINT 6
18  VTAB 9: HTAB 6: PRINT "!": VTAB

      8: HTAB 6: PRINT "!"
19  VTAB 9: HTAB 7: PRINT "-";: HTAB
     17: PRINT 7;: HTAB 21: PRINT 8;:
       HTAB 25: PRINT 9
```

(continued on page 158)

The Big Screen Micro from KCB at under £1800 is the best buy around!



Videcom Apollo

15 inch green screen, Full tilting and swivelling VDU, Detachable keyboard, Optional 132 column screen, 25 function keys dedicated to Wordstar. Two models: 750K or 1.5MB disk drives, CP/M based.

KCB MICROS LIMITED

word processing + accountancy + financial modelling + calculation
record keeping + sales office management + accounts + payroll + graphics
engineering + communications + languages + solicitors + CAD

14 Windsor Road Slough SL1 2EJ Tel: Slough (0753) 38581/38319. Telex 23152 KMICRO
and in Scotland: Micro Change Ltd. Telfer House, 74/78 Miller Street, Glasgow Tel: 041 554 1462

● Circle No. 173

(continued from page 156)

```
20  VTAB 12: HTAB 4: PRINT "M---"
     ;: HTAB 9: PRINT 1;: HTAB 13
     : PRINT 2;: HTAB 17: PRINT 3
     ;: HTAB 25: PRINT 4;: HTAB 2
     9: PRINT 5;: HTAB 33: PRINT
     6
21  VTAB 14: HTAB 7: PRINT "-"
22  VTAB 15: HTAB 6: PRINT "!";: HTA
B 17: PRINT 1;: HTAB 21: PRINT 2:
     : HTAB 25: PRINT 3
23  VTAB 16: HTAB 6: PRINT "!": VTAB
'17: HTAB 6: PRINT "!"
24  VTAB 18: HTAB 4: PRINT "B-!";
     : HTAB 13: PRINT 4;: HTAB 21
     : PRINT 5;: HTAB 29: PRINT 6

25  VTAB 19: HTAB 6: PRINT "!": VTAB
 20: HTAB 6: PRINT "!"
26  VTAB 21: HTAB 6: PRINT "!";: HTA
B 9: PRINT 7;: HTAB 21: PRINT 8;:
     HTAB 33: PRINT 9
27  VTAB 22: HTAB 7: PRINT "-": PRIN
T : PRINT "PRESS RETURN WHEN READ
     Y  ";
28  GET Z$: IF Z$ = "" THEN 28
29  IF Z$ <  > CHR$ (13) THEN 28

30  HOME
31  DIM CC(2),MC(1),FL(1),LOC(6,2
     4),PL(7),K(1)
32 K(0) = 0:K(1) = 0
33 FL(0) = 9:FL(1) = 9:CC(0) = 15
     :CC(1) = 0:CC(2) = 13:TURN =
     1
34  FOR J = 1 TO 24:LOC(0,J) = 2:
     NEXT
35  FOR I = 1 TO 4: FOR J = 1 TO
     24: READ LOC(I,J): NEXT J,I
36  FOR I = 1 TO 7: READ PL(I): NEXT

37  FOR I = 5 TO 6: FOR J = 1 TO
     24: READ LOC(I,J): NEXT J,I
38  REM  LOC(0,Z):- W=0, B=1, NOB
     ODY=2
39  REM  LOC(1 & 2,Z)=ADJACENT DO
     TS ONE DIRECTION
40  REM  LOC(3 & 4,Z)=ADJACENT DO
     TS OTHER DIRECTION
41  REM  LOC(5,Z)=X AXIS PLOT
42  REM  LOC(6,Z)=Y AXIS PLOT
43  REM  DRAW BRD.
44  GR : COLOR= 12: FOR I = 0 TO
     39: HLIN 1,32 AT I: NEXT : COLO
R= CC(2)
45  PLOT 4,4: PLOT 16,4: PLOT 28,
     4: PLOT 8,8: PLOT 16,8: PLOT
     24,8: PLOT 12,12: PLOT 16,12
     : PLOT 20,12
46  PLOT 4,16: PLOT 8,16: PLOT 12
     ,16: PLOT 20,16: PLOT 24,16:
     PLOT 28,16: PLOT 12,20: PLOT
     16,20: PLOT 20,20
47  PLOT 8,24: PLOT 16,24: PLOT 2
     4,24: PLOT 4,28: PLOT 16,28:
     PLOT 28,28
48  REM  GET WHOSE TURN
49  GOSUB 89
50  REM  GET INPUT
51  IF K(TURN) = 1 THEN 78
52  PRINT A$;"'S TURN  ";
53  GOSUB 94
54  REM  VERIFY DOT VACANT
55  IF LOC(0,Z) <  > 2 THEN 50
56  REM  OCCUPY DOT
57 LOC(0,Z) = TURN: COLOR= CC(TUR
     N): PLOT PL(X),PL(Y)
58  IF K(TURN) = 1 THEN 78
59 MC(TURN) = MC(TURN) + 1: IF MC
     (TURN) > 8 THEN  PRINT "THAT
     'S ALL YOUR MEN USED.  ":K(
     TURN) = 1
60  REM  CHECK HERE ADJACENT DOTS

61  IF LOC(0,LOC(1,Z)) = TURN AND
     LOC(0,LOC(2,Z)) = TURN THEN
     64
62  IF LOC(0,LOC(3,Z)) = TURN AND
     LOC(0,LOC(4,Z)) = TURN THEN
     64
63  GOTO 48
64  PRINT "WHAT MAN TO REMOVE?  "
     ;
65  GOSUB 94
66  IF LOC(0,LOC(1,Z)) = OP AND L
     OC(0,LOC(2,Z)) = OP THEN 70
67  IF LOC(0,LOC(3,Z)) = OP AND L
     OC(0,LOC(4,Z)) = OP THEN 70
68  IF LOC(0,Z) = TURN THEN 70
69  GOTO 71
70  PRINT "SORRY, NOT HIM": GOTO
     64
71  COLOR= CC(2): PLOT PL(X),PL(Y
    ):LOC(0,Z) = 2
72 FL(OP) = FL(OP) - 1: IF FL(OP)
    < 3 THEN 74
73  GOTO 48
74  PRINT A$;"'S THE WINNER. PLAY
     AGAIN?  ";
75  GET Z$: IF Z$ = "" THEN 75
76  IF Z$ = "Y" THEN  TEXT : HOME
     : CLEAR : RUN
77  GOTO 108
78  PRINT A$;" MOVE FROM  ";
79  GOSUB 94
80  IF LOC(0,Z) <  > TURN THEN 78

81 LOC(0,Z) = 2: COLOR= CC(2): PLOT
     PL(X),PL(Y)
82  PRINT A$;"MOVE TO  ";
83  GOSUB 94
84  IF LOC(0,Z) <  > 2 THEN 82
85 LOC(0,Z) = TURN
86  COLOR= CC(TURN): PLOT PL(X),P
    L(Y)
87  GOTO 60
88  REM  SET WHOSE TURN
89 OP = TURN
90 TURN =  ABS (TURN - 1)
91  IF TURN = 0 THEN A$ = "WHITE
    "
92  IF TURN = 1 THEN A$ = "BLACK
    "
93  RETURN
94  REM  GET INPUT
95  GET Z$: IF Z$ = "" THEN 95
96  IF Z$ =  CHR$ (13) THEN 108
97  IF Z$ = "P" THEN 48
98  IF Z$ <  > "T" AND Z$ <  > "M
    " AND Z$ <  > "B" THEN 95
99  PRINT Z$;
100  GET Y$: IF Y$ = "" THEN 100
101  IF Y$ < "1" AND Y$ > "9" THEN
     100
102  IF Z$ = "M" AND Y$ > "6" THEN
     100
103  PRINT Y$
104 Z =  VAL (Y$): IF Z$ = "M" THEN
     Z = Z + 9
105  IF Z$ = "B" THEN Z = Z + 15
106 X = LOC(5,Z):Y = LOC(6,Z)
107  RETURN
108  TEXT : HOME : END
109  DATA  2,1,1,5,2,4,8,7,7,1,10
     ,7,9,13,3,17,20,16,4,17,6,1,
     17,22
110  DATA  3,3,2,6,8,5,9,9,8,22,1
     2,16,18,15,24,18,23,17,11,23
     ,14,10,20,23
111  DATA  10,5,15,11,4,14,12,2,1
     3,11,4,10,14,6,13,7,16,9,20,
     19,19,23,22,3
112  DATA  22,8,24,19,6,21,16,5,
     18,12,19,11,15,21,14,12,18,1
     3,21,21,20,24,24,15
113  DATA  4,8,12,16,20,24,28
114  DATA 1,4,7,2,4,6,3,4,5,1,2,3
     ,5,6,7,3,4,5,2,4,6,1,4,7
115  DATA 1,1,1,2,2,2,3,3,3,4,4,4
     ,4,4,4,5,5,5,6,6,6,7,7,7
```

WINCHESTER KILLER - £750

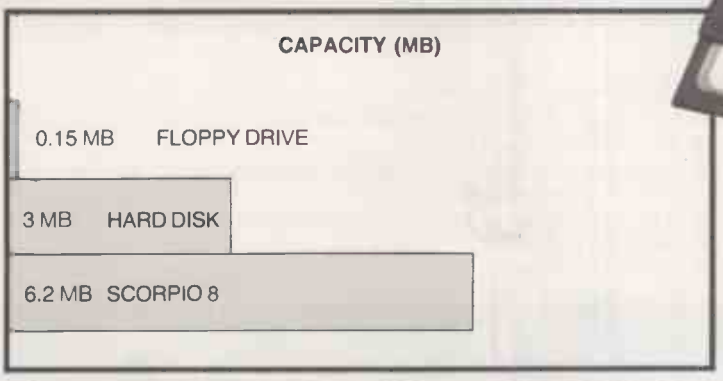
The incredible Scorpio 6.2 Mbyte hard disk alternative from HAL Computers annihilates small capacity Winchesters.

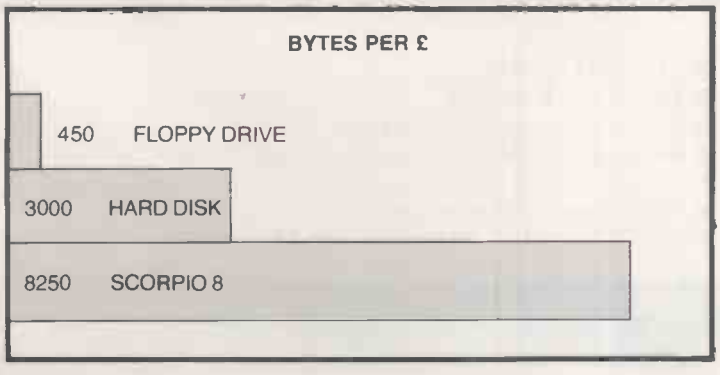
DISTINGUISHING CHARACTERISTICS

Hard disk capacity and speed with the capability of interchangeable media. Scorpio 8 eliminates the worries of head crashes, drive alignments, lost data or backup, with a new application of field proven floppy technology.

Fully Apple II compatible – DOS 3.3, Pascal 1.1 and CP/M. Uses all standard Apple DOS commands – appears to Apple as a massive 8 inch floppy.

HOW SCORPIO 8 IS KILLING THE SMALL WINCHESTER





REWARDS

- Winchester capacities on floppy disks.
- Removeable media – a cartridge pack of five 5.25 inch diskettes each of 1.2 Mb capacity.
- High speed DMA data transfer.
- Cost effective and software compatible disk memory expansion.
- Removeable media means separate packs can be kept for different applications.
- All this for £750, complete with power supply, interface, cables and software.

To claim your rewards contact us at the address shown below.

HAL

HAL Computers Limited
Invincible Road, Farnborough
Hants. GU14 7QU
Telephone (0252) 517175
Telesales (0252) 517171

EP4000

EPROM EMULATOR PROGRAMMER

- EP4000 emulates/programs all NMOS EPROMs up to 4k × 8.
- *2564/2764/Bipolar PROMs programmable with adaptors
- 300ns access time in emulation mode
- Editing facilities — data entry, match, display, shift, move, clear, define, block program, etc.
- Input/Output as standard — RS232C (ASCII Hex and binary), 20mA, printer, cassette, parallel handshake and DMA
- Video output for memory map display
- Fully buffered cold ZIF socket
- Price £545 + VAT + £12 delivery
- Ex-stock delivery. Write or phone for more details

2564*, 2764*, 2732A*, 2732, 2532, 2716, 2516, 2758, 2508 2716(3), 2708, 2704

P8000

THE PRODUCTION PROGRAMMER TO HANDLE ALL NMOS EPROMS

NEW PRODUCT

- Checks, Programs, Compares up to 8 devices simultaneously
- Handles all NMOS EPROMs up to projected 128K designs with no personality modules of characterisers — See list below
- Easy to use, menu driven operation for blankcheck, program, verify, illegal bit check, checksum, self-test
- Constant display of device type, mode and fault codings
- Individual socket LED indicators for EPROM status
- Comprehensive EPROM integrity checks — Illegal bit check, data and address shorts, constant power line monitoring
- Full safeguard protection on all sockets
- Automatic machine self test routine
- Powered down sockets
- Cost effective price — £695 + VAT
- Available from stock. Write or phone for more details

2564, 2764, 68764, 68766, 68732-1, 68732-0, 2732A, 2732, 2532, 48016, 2716, 2516, 2758A, 2758B, 2508, 2716(3), 2708, 2704

SOFTY 2 2716 EMULATOR PROGRAMMER

- 2716 Emulator/Programmer
- Can program 2532/2732 in two halves
- Multifunction touch keypad
- Editing facilities: Data entry/deflection, block shift, block store, match byte, displacement calculation
- High speed cassette interface and serial interface
- Direct output to T.V.
- Price £169 + VAT

MODEL 14 EPROM ERASERS

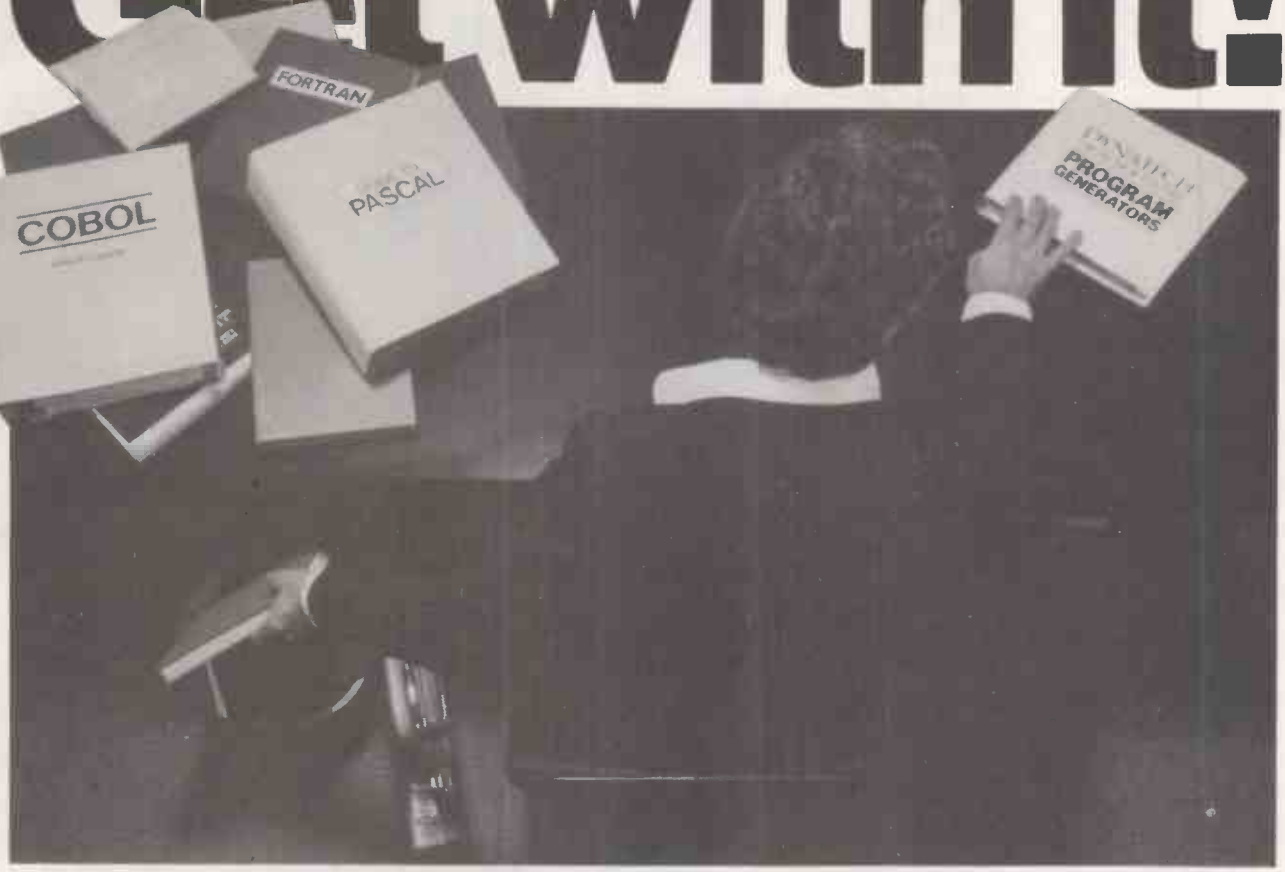
- 14 EPROM Capacity
- Fast reliable erase time
- Built-in 5-50 minute timer (UV141)
- Safety interlocked to prevent eye and skin damage
- Convenient slide tray loading of devices
- UV141 available ex-stock £78 + VAT
- UV140, similar to UV141, but without timer £61.50

GP Industrial Electronics Ltd

Unit E, Huxley Close, Newnham Ind. Estate, Plymouth PL7 4JN
Tel: Plymouth (0752) 332961 Telex: 42513 SHARET

● Circle No. 175

Get with it!



COBOL, FORTRAN, PASCAL & other complexities of the past ... forget them!

Design and write your own systems in ENGLISH with

DYNATECH'S PROGRAM GENERATORS

Professionals can increase their output tenfold and novices can learn how to write professional programs in minutes using Codewriter* or Techwriter* - now selling worldwide.

What are the benefits?

- Save time..,up to 90%
- Improves efficiency
- Provides information, faster
- Any member of staff can operate them
- User modifiable programs can be compiled for high speed operation

Seminars are held in London and other major cities throughout the year.

We have Program Generators available now for Apple II, III*, CP/M*, CBM Pet*, Sirius* and Osborne* - with more to come.

DYNATECH MICROSOFTWARE LTD

Summerfield House, Vale, Guernsey, Channel Islands
Telephone: 0481 45934 Telex: 4191130

*Registered Trademarks

Please send me details on Dynatech's Program Generators.
What type of micro-computer do you have or are considering purchasing?
Name
Address
Tel
PC2

● Circle No. 176

Carry away the best personal business computer deal ever.

The Osborne® 1 package £1,375

with dBase II data base software free.*

The best buy in a personal business computer is now even better.

With its new double density disk drives, the portable Osborne 1 has increased its data storage capacity.

That means you can use your Osborne 1 for all those jobs involving a large volume of data.

And to get you started, we're including the best selling data base management program, Ashton Tate's dBase II® (worth over £450 retail) entirely free. (*Offer open until 31st January 1983.)

With dBase II,® you can put your Osborne to work on a whole range of the information handling jobs that previously took up so much of your valuable time.

Everything from address lists and sales journals, to time billing and inventory control.

And don't forget that at £1,375 (plus VAT) the Osborne 1 already includes SUPERCALC® for electronic spreadsheets, WORDSTAR® for word processing, CP/M® the control program that gives you access to the world's biggest library of software options, plus CBASIC® and MBASIC® for programming.

That's software worth a total of over £1,250. No other computer company can offer you anything like this value for money.

So see your local Osborne Authorised Dealer now and carry away the greatest deal ever.

To the Osborne Computer Corporation (UK) Ltd., 38 Tanners Drive, Blakelands North, Milton Keynes MK14 5LL, Bucks. Tel: (0908) 615274. Telex: 825220. Please send me full details of the Osborne 1.

Name_____

Address_____

Company_____

Nature of Business_____

OSBORNE 1

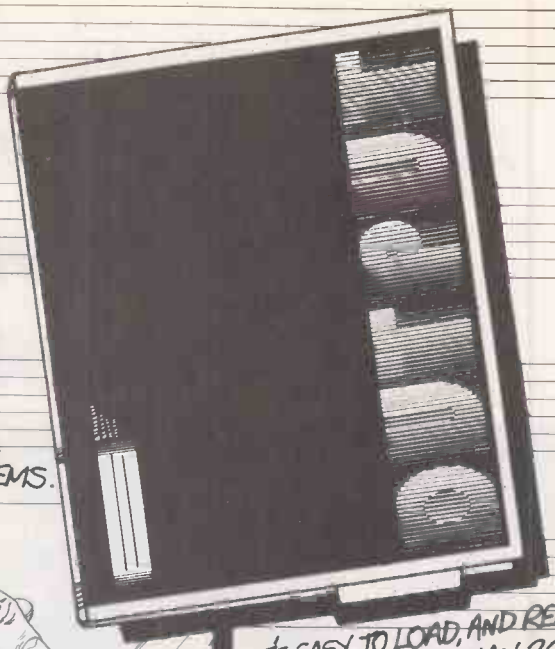
The £1,375 suggested retail price for the Osborne 1 (a registered trademark of Osborne Computer Corporation) includes a full business keyboard, built-in CRT display, two built-in double density floppy disk drives, CPU and 64 kilobytes of RAM memory, RS-232 and IEEE 488 interfaces, and the following software packages: WORDSTAR® word processing with MAILMERGE® (a trademark and a registered trademark of MicroPro International Corporation of San Rafael, California); SUPERCALC® electronic spreadsheet system (a trademark of Sorcim Corporation); CBASIC® (a registered trademark of Compiler Systems); MBASIC® (a registered trademark of Microsoft); CP/M® (a registered trademark of Digital Research); and dBase II® (a registered trademark of Ashton Tate Inc.).

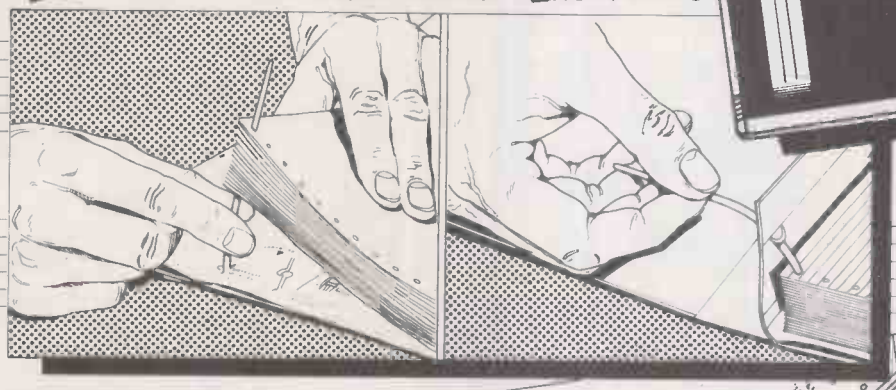
● Circle No. 177

THE SAMSON DATABINDER

A BRAND NEW CONCEPT IN FAST FILING!...

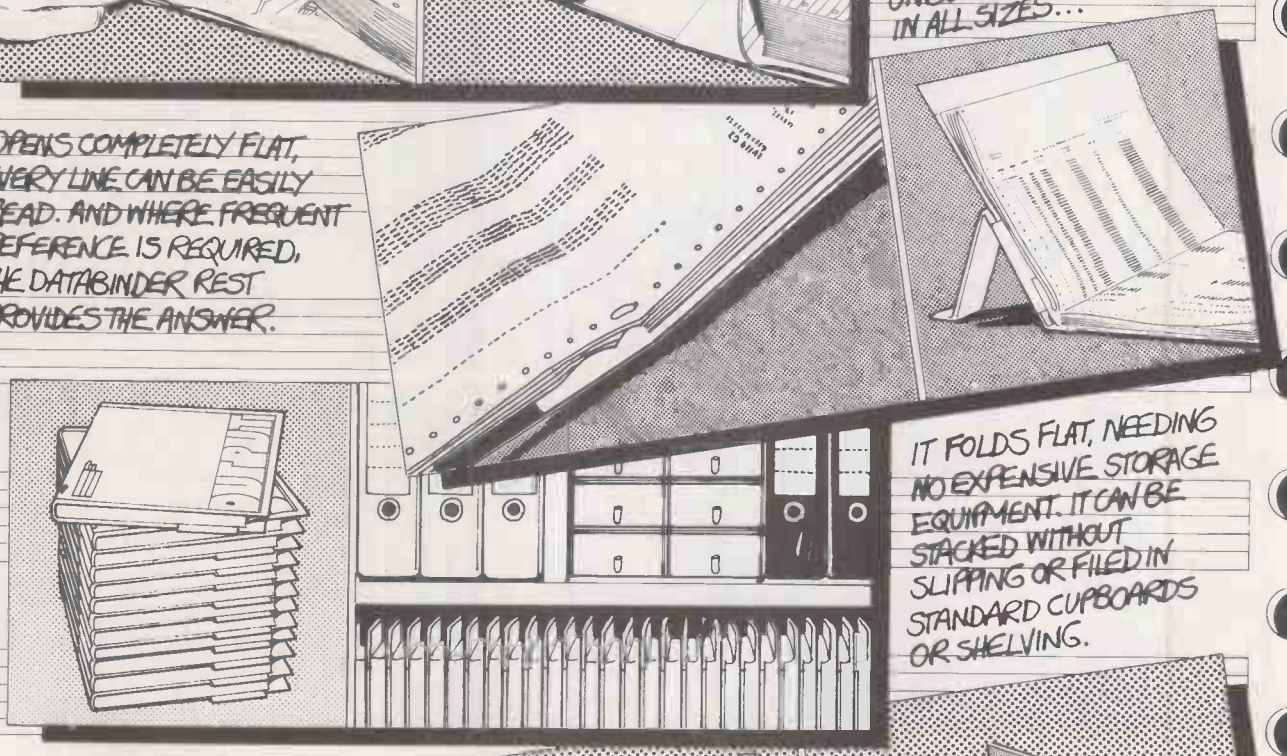
IT SAVES SPACE, TIME AND COSTS A LOT LESS THAN OTHER PRINTOUT FILING SYSTEMS.





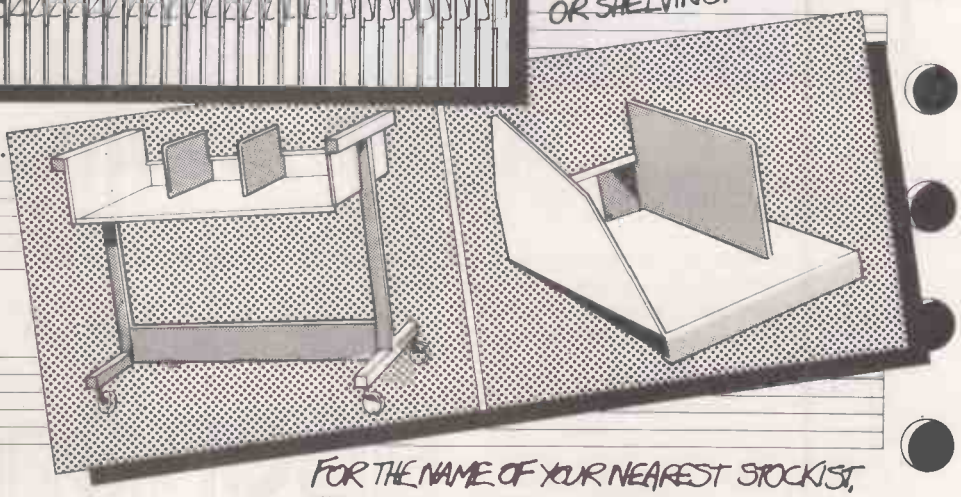
IT'S EASY TO LOAD, AND READY TO USE IN LESS THAN 20 SECONDS. FILES BURST OR UNBURST PRINTOUT — IN ALL SIZES...

OPENS COMPLETELY FLAT, EVERY LINE CAN BE EASILY READ. AND WHERE FREQUENT REFERENCE IS REQUIRED, THE DATABINDER REST PROVIDES THE ANSWER.



IT FOLDS FLAT, NEEDING NO EXPENSIVE STORAGE EQUIPMENT. IT CAN BE STACKED WITHOUT SLIPPING OR FILED IN STANDARD CUPBOARDS OR SHELVING.

THE SAMSON DATABINDER. ON YOUR DESK OR MOBILE TROLLEY. THE INTELLIGENT WAY TO FILE PRINTOUT AT A COST YOU CAN AFFORD.



DRG BUSINESS MACHINES

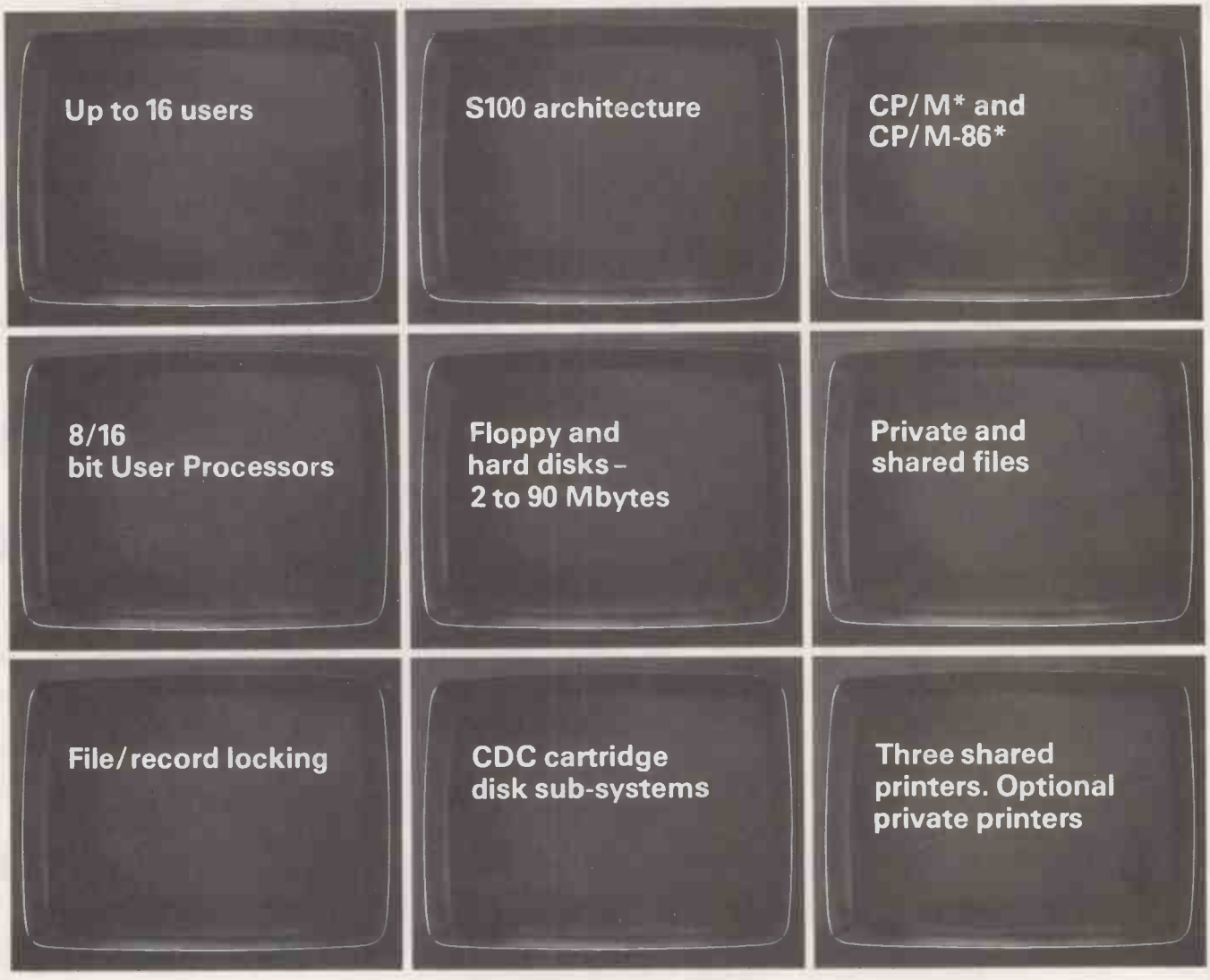
FOR THE NAME OF YOUR NEAREST STOCKIST, TELEPHONE 0934 416392.
(DEALER AND DISTRIBUTOR ENQUIRIES WELCOME.)

SYSTEMS SUPPLIES DIVISION, LYNX CRESCENT, WINTERSTOKE ROAD, WESTON-SUPER-MARE, AVON BS24 9DN.

● Circle No. 178

ACCRON. Multi-processor. Multi-user.

The system for today. And tomorrow.



And tomorrow.

Start with an ACCRON single-user floppy disk system.

Add the ACCRON-MPS Service Processor and as many more User Processors as you need.

Keep on adding users, to a maximum of 16.

With ACCRON, planned expansion is as simple as that.

No CPU throughput degradation as the system grows. No loss of investment, in equipment, software or staff training.

Each User Processor is complete in itself, with Z80A, 64KB RAM and RS232 interface. Standard CP/M guarantees sensibly priced, readily available system and applications software.

The System Processor, with its own dedicated Z80A and 64KB RAM, provides simultaneous access to shared data files. And access to shared resources like floppy or hard disks, magnetic tapes and spooled printers. Private or shared disk space. Interprocessor communications. Scheduling or batch submit facilities.

Made in Britain by Newtons Laboratories. Fully supported. ACCRON is designed to take care of you now. And for years to come.

ACCRON

Technology today, and tomorrow

Need to know more? Mail this coupon today.

Please send me details of the ACCRON Multi-Processor System.

Name .....

Position .....

Company .....

Address .....

.....

Tel. No. .....

NEWTONS LABORATORIES

Mail to: Newtons Laboratories, Box 789, FREEPOST, London SW18 4BR. PC

* CP/M and CP/M-86 are trademarks of Digital Research Inc.

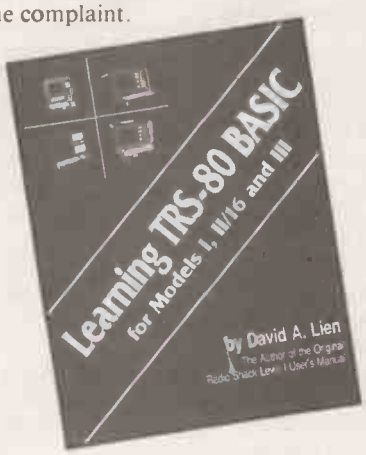
Newtons Laboratories, PO Box 789, 111-113 Wandsworth High Street, London SW18 4JB. Tel: 01-874 6511. Telex: 21768 (Newton G).

● Circle No. 179

All about Tandy

Michael Trott surveys the literature on the well-established TRS-80 family.

THE TRS-80 is certainly showing its age. Not only does it lack colour but also other facilities of the latest generation of micros. Unfortunately, part of this collection of recent publications is suffering from the same complaint.



It seems appropriate to start with *Learning TRS-80 Basic* by David Lien, the author of the original users' manual. He opens with a short self-congratulatory passage, likely to raise the hackles of all but the least discriminating reader, in which he reminds us of the success of the original manuals. They were reasonable for their time but not that good.

The style of the book will certainly be familiar to those who have used the TRS-80 manuals, indeed at first glance it would appear that several large thin books have been reprinted as one short fat one covering the various TRS-80 models. Lien is honest enough to admit that he quotes freely from the original text. Parts of the book have been rewritten, though, and there is some additional information.

Tandy has not yet stopped issuing copies of the users' guides to purchasers of the TRS-80, which makes one wonder why anyone should bother to purchase this book, especially at the ridiculous price of £14.95. Unless you acquire a secondhand machine with no manual I would give this one a miss.

Explore Computing with the TRS-80 by Richard and Josephine Andree is rather better. It is not intended to replace the users' guide but to complement it. After a brief introduction to the computer the authors tackle elementary programming, providing many well-structured examples that are quite thoroughly explained. There is a heavy bias towards mathematical examples unneccessary in an introductory book, but a close examination of the content leads me to believe that this text would be extremely useful in teaching mathematics with the aid of a computer. Whether this is what it was intended for or whether authors hoped for a more general audience is unclear.

There is a heavy bias towards using the computer for problem solving and the book describes the approach to this clearly and competently. Throughout the book many suggestions for programs are made, ranging from simple to fairly complex, which would satisfy the needs of many new micro users.

Additional information on saving programs, editing, more advanced programming and brief sections on games and simulations are also provided, which makes this an excellent extension to the users' guide

Aimed at the same level, *Programs for Beginners on the TRS-80* by Fred Blechman has much less emphasis on mathematics. It is also rather cheaper. While containing fewer programs it provides more information on each one and aims to teach the reader how to use the essentials of the Basic language.

For each of the 21 programs Blechman explains what the reader will learn, describes the program and explains how it works. Listings, which are not very clearly printed, are provided along with a descriptive list of variables and suggested modifications. Information is also provided for double saving, merging programs and listings for keyboard debounce, and screen printing programs.

The book includes details for building a monitoring box to overcome the loading problems associated with the model I, and a useful table on the final page provides a quick reference guide to whether programs contains operations or statements.

Singularly less impressive is Howard Berenbon's *Mostly Basic: Applications for your TRS-80, Book 2* which provides listings for programs under the headings: education, home applications, money and investment, ESP testing and a fantasy game. The programs are longer than those in the two previous books but the applications are both uninspiring and repetitious, giving the impression that the book contains more programs than it actually does. This combined with the lack of originality and the absence of graphics makes it a book to be avoided at all costs.

The Soft Side Sampler has no pretensions towards teaching, it simply provides listings of 29 entertainment programs reprinted from *Soft Side* magazine. Many of the programs use graphics and some

(continued on next page)

(continued from previous page)

provide sound through a cassette recorder or an external amplifier. One allows speech input to fire torpedoes and another controls voice messages on tape for a spelling test.

The programs are short enough to be typed in without frustration and are introduced by brief and often amusing explanations. The routines employed would be helpful to novices in their own programs.

The really serious programmer will need more help than any of the previous books can provide. *Intermediate Programming for the TRS-80* by David Heiserman aims to fulfil this need, explaining how to get the most from Basic and introducing machine code. Heiserman leads the reader in easy steps through video addressing and cursor controls, keyboard inputs and user-memory organisation to T-Bug and editor/assembler tapes.

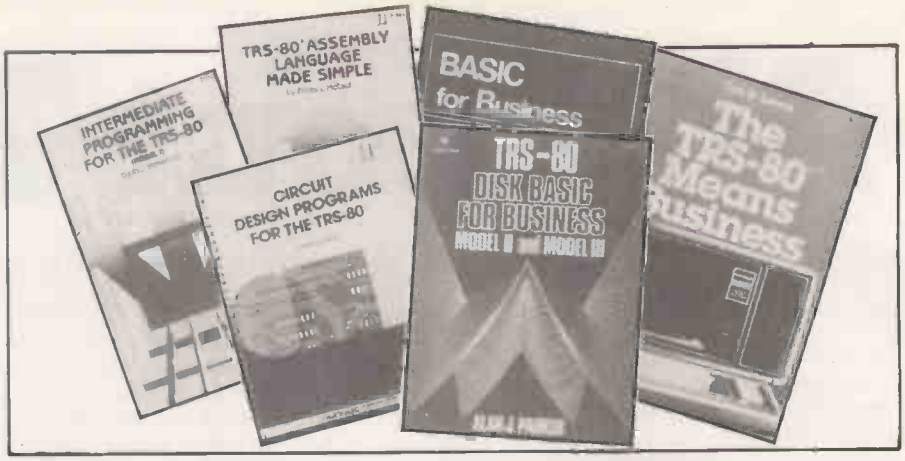
Various examples and demonstrations are used to illustrate the operations described and each topic is fully explained in a clear and reassuring manner. To get the most from the book the reader will also need the T-Bug and editor/assembler tapes and a Z-80 reference manual. Yet even without these Heiserman has produced a really worthwhile guide that will help to build advanced programming skills.

The T-Bug tape is also essential to gain anything from *TRS-80 Assembly Language Made Simple* by Earles McCaul. In addition to providing a guide to the use of assembly language McCaul supplies tables of the Z-80 instruction set, flag effects, a summary of resident Basic ROM subroutines and a decimal-to-hex conversion.

The book has an interesting section covering useful tips for overcoming problems that may be encountered and for obtaining undocumented information. A program is also given to enable the writing of system tapes.

The emphasis of the book is on the use of assembly language rather than on programming. This is achieved through accessing the Level II Basic ROM subroutines; the programming task is reduced to moving the operands into the proper locations and retrieving the results. With such an approach, the author explains, it is possible to write more efficient programs, effectively expanding the available memory. McCaul tackles the task competently in a careful and detailed manner, making this a useful addition to the bookshelf of any intending serious programmer with a limited budget.

Computers can, of course, be used to perform long, complex calculations that would previously have been done by hand, thereby releasing engineers and designers, among others, for more interesting and creative tasks. *Circuit Design Programs for the TRS-80* by Howard Berlin is intended for just this purpose. It provides a variety of program listings for those



wishing to design electronic circuits without the inconvenience of calculating component values. Berlin has produced a useful and interesting aid which includes information for appending subroutines to a program from tape, programs which can be employed for graphs and mathematical routines and tables of standard resistor and capacitor values. Though requiring a good understanding of Level II Basic, the book is, nevertheless, one which is highly recommended.

Finally three business applications books — well, two really since *Basic for Business* and *TRS-80 Disk Basic for Beginners* by Alan Parker are the same book in different covers. Why? Well the author gives this away in the introductory passages. In the first book he claims to be writing for students and in the second to be writing for businessmen: perhaps Mr. Parker and David Lein both feel that the way to make a quick buck is to write one book and keep republishing under different titles — or am I being uncharitable?

Parker starts with an introduction to Basic and leads the reader through data entry, files, writing reports, records and producing lists to using and designing complex programs. His style is sound and the programs useful, until you realise that you will have to convert the later programs from the American tax system. However, it is a practical introduction to business applications.

TRS-80 Means Business by Ted Lewis is aimed at the model II use or potential user and outlines the functions of a computer and how it may be employed in the business world. The costs outlined are based on U.S. prices and are therefore misleading but the general principles are sound enough.

Ted Lewis's style is less clear than Parker's, but the content is more comprehensive. There is less emphasis on programming and rather more on the underlying concepts involved. The programs discussed in the book are said to be available on disc but you would be well advised to check this before purchasing the book. This book can be recommended, but only if you are considering the purchase of a model II machine. Unfortunately, the TRS-80 range is becoming obsolete.

Learning TRS-80 Basic by David A Lien. Published by Compusoft, 544 pages, £14.95. ISBN 0 932760 08 2

Explore Computing with the TRS-80 by Richard and Josephine Andree. Published by Prentice-Hall International, 230 pages, £8.95. ISBN 0 13 296137 7

Programs for Beginners on the TRS-80 by Fred Blechman. Published by Hayden Book Company, 150 pages, £6.95. ISBN 0 8104 5182 4

Mostly Basic; Applications for Your TRS-80, Book 2 by Howard Berebon. Published by Prentice-Hall, 217 pages, £9.05. ISBN 0 672 21865 8

The Soft Side Sampler edited by Jean Witham. Published by Hayden Book Company, 119 pages, £7.00. ISBN 0 8104 5496 3

Intermediate Programming for the TRS-80 by David L Heiserman. Published by Prentice-Hall, 238 pages, £6.95. ISBN 0 672 21809 7

TRS-80 Assembly Language Made Simple by Earles L McCaul. Published by Prentice-Hall, 190 pages, £9.70. ISBN 0 672 21851 8

Circuit Design Programs for the TRS-80 by Howard M Berlin. Published by Howard Sams, 138 pages, £10.90. ISBN 0 672 21741 4

Basic for Business by Alan J Parker. Published by Prentice-Hall, 276 pages, £11.95. ISBN 0 8359 0352 4

TRS-80 Disk Basic for Business by Alan J Parker. Published by Prentice-Hall, 276 pages, £11.95. ISBN 0 8359 7872 9

The TRS-80 Means Business by Ted G Lewis. Published by John Wiley, 194 pages, £8.80. ISBN 0 471 08239 2

LET YOUR MICRO TAKE OFF WITH GEMINI

USING GEMINI FUNCTIONAL CASSETTE SOFTWARE FOR JUST £19.95

Fully compatible with

TI – 99/4A
VIC 16K
Oric
Dragon 32
SHARP MZ – 80K/A/B
BBC Micro
Sinclair Spectrum
ATARI 400/800

Here's the software to run your budgeting, your business, your stamp collection, your car costs . . . even to plan your next meal and help you choose a wife. Tested programs that come with all the documentation back-up you need from Gemini who are experts in practical software. So mail us the coupon – and put your micro to work . . . fast.

SPECIAL LIMITED OFFER
Any 3 programs at £19.95 for the price of two with all orders received before 31st March 1983.

DATABASE The Program that everyone needs. Facilities include sort, search, list, delete, change, totals, save file, line print if required, etc. etc. Can be used in place of any card index application. **£19.95**

STOCK CONTROL All the necessary for keeping a control of stock. Routines include stock set up, user reference no., minimum stock level, financial summary, line print records, quick stock summary, add stock, delete/change record and more. **£19.95**

MAILING LIST A superb dedicated database to allow for manipulation of names & addresses & other data, with selective printing to line printer. Features include the facility to find a name or detail when only part of that detail is known. Will print labels in a variety of user-specified formats. **£19.95**

INVOICES AND STATEMENTS Ideal for the small business. A complete suite of programs together with generated customer file for producing crisp and efficient business invoices and monthly statements on your line printer. All calculations including VAT automatic and provision for your own messages on the form produced. *Not Spectrum **£19.95**

COMMERCIAL ACCOUNTS A gem of a program, all for cassette, with the following features:–
Daily Journal • Credit Sales • Cash Sales • Credit Purchases • Purchases – other • Sales Ledger • Purchase Ledger • Bank Account • Year to Date Summary
A fully interactive program suitable for all businesses. Files can be saved and loaded and totals from one file carried forward to another on cassette. Particularly useful from a cash flow point of view, with an immediate accessibility to totals for debtors and creditors. Bank totally supported with entries for cheque numbers, credits and, of course, running balance. **£19.95**

HOME ACCOUNTS Runs a complete home finance package for you with every facility necessary for keeping a track of regular and other expenses, bank account, mortgage, H.P. etc. etc. etc! You'll wonder how you ever managed without it. **£19.95**

Gemini Marketing Limited.
Functional Software Specialists
9, Salterton Road Exmouth, Devon.
Telephone orders welcome. (03952) 5832
Please quote Access/Diners Card Number

For Functional Software

Dealer Enquiries Welcome

ZX81 16K – Database available – Only £7.50 including FREE Decision Maker Programme.

GEMINI MARKETING LIMITED

Tick the box for Program you require. Prices include V.A.T and Package and Postage.
Please supply the following cassette software.

Database	£19.95 ☐
Stock Control	£19.95 ☐
Mailing List	£19.95 ☐
Invoices and Statements	£19.95 ☐
Commercial Accounts	£19.95 ☐
Home Accounts	£19.95 ☐
ZX81 16K Database	£7.50 ☐

Name _____

Address _____

Machine Type _____ Memory Size _____

I enclose _____

Make cheques and postal orders payable to Gemini Marketing Ltd.

Diners Card Number _____ Access Number _____

Signature: _____

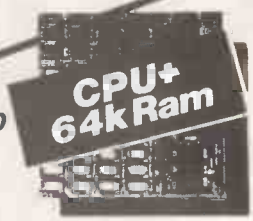
Gemini. Functional Software Specialists 9, Salterton Road, Exmouth, Devon. (03952) 5832
Telephone orders welcome. Please quote Access/Diners Card Number

PC2

• Circle No. 180

BITS & P.C.S

Alive and well and living in LEEDS

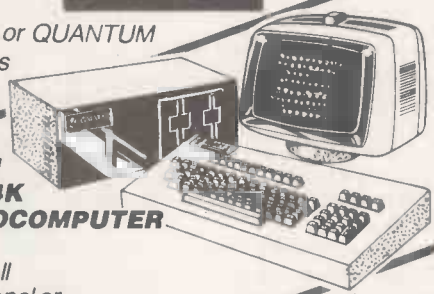


CPU £125.00 plus V.A.T.
CPU plus 64k RAM **£225.00** plus V.A.T.
64k RAM £125.00 plus V.A.T.
COMPLETE TWIN DISK SYSTEM £675.00 plus V.A.T.
I/O Card £125.00 plus V.A.T.

MULTIBOARDS use 80-Bus and are fully Nascom compatible e.g. disks, enhanced video, Input/Output or Ram expansion.

MULTIBOARDS make computers **MULTIBOARDS** enhance:–
GEMINI, Nascom or QUANTUM
Send for full details

The QUANTUM 2000 is ideal for business applications. It can have up to THREE drives giving 2.4 megabytes of disk storage. Its expansion capabilities are almost infinite, thanks to the flexibility of Multiboard plus 80-Bus.



GEMINI GALAXY 64K 2.2 CP/M MICROCOMPUTER
A cost effective solution to the small business, educational or home user requiring a reliable Z80 based CP/M computer
From **£1,450.00** plus V.A.T.

BITS & P.C.S. have been in the MICROCOMPUTER business for several years. We believe in giving good service at competitive prices.

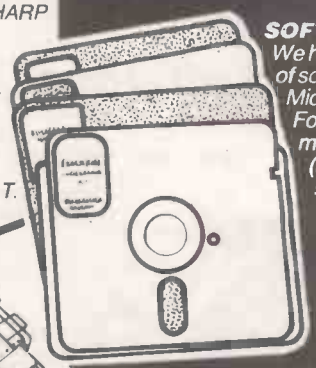
We have never sold anything else but Microcomputers, we believe in giving our customers all the help we can, both before and after sales.

On display and available from our LEEDS showroom are:– GEMINI, NASCOM, QUANTUM, SHARP, TEXAS, DRAGON, SINCLAIR, EPSON, SEIKOSHA, RICOH, etc. Also available is a full range of BOOKS, INTERFACES AND PERIPHERALS.

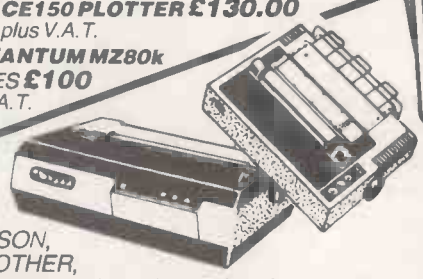
We are an official Sharp computer centre

As one of **SHARP'S** biggest distributors, we always have stocks. We have the expertise to advise you on interfaces and software. We developed the QUANTUM MZ 80k Hi-Res which gained official SHARP approval.

PLEASE CALL FOR LATEST PRICES.
MZ80A with £75.00 free software **£475.00** plus V.A.T.
MZ80B with 64k plus GRAPHICS RAM **£850.00** plus V.A.T.
PC1211 £65.00 plus V.A.T.
CE122 PRINTER £60.00 plus V.A.T.
PC1500 £145.00 plus V.A.T.
CE150 PLOTTER £130.00 plus V.A.T.
QUANTUM MZ80k HI-RES **£100** plus V.A.T.



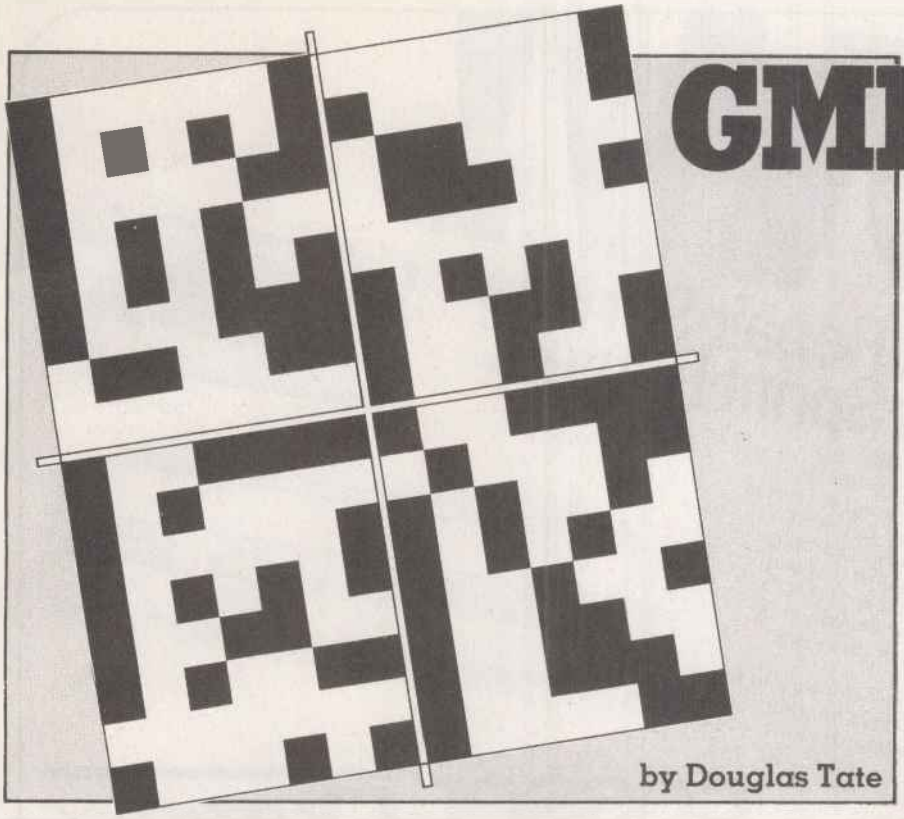
SOFTWARE
We have a comprehensive range of software available for all Microcomputers sold by us. For the CP/M based machines we have:–
(a) The full CP/M software suite
(b) All CP/M languages
(c) WORD PROCESSING PACKAGES
(d) AURORA BUSINESS PACKAGES
(e) Data Bases



We stock the following printers:– EPSON, NEC, SEIKOSHA, BROTHER, RICOH, and more important, we know how to interface them to a variety of computers.

Please call or write for full details
Bits & P.C.S. Computer Products Ltd., Leeds Computer Centre, The Balcony, 60/62 Merrion Centre, LEEDS.
Tel: 0532-458877

● Circle No. 181



by Douglas Tate

GMRa'AnA

I WILL NEVER eat a late-night supper of cheese and pickles again. I am sure you know the result — bad dreams.

I was a modern Moses in the mountains but instead of the expected out of the sky came a hideous alien beast.

"I am GMRa'AnA", he shouted. Now a quick "Take me to your leader" would not have come amiss but no he hands over this four-page book and says, "Ask Kirk to translate this for all your peoples", and disappears back into space.

The scene changes, the translator translates. Suddenly that slight, knowing smile touches his lips. He turns to his companion.

"Amazing Spock, when will people learn that in intergalactic information interchange they should behave with the old American code of conduct?

"Yes Captain", Spock replies, "except that now we must always add space to everything in the equation."

The smile changes to a hideous leer as Kirk transforms, the face of GRMa'AnA reappears softly mouthing "remember me and in the end you shall learn the word of the Gods."

Solution to January puzzle

Fred	John	Steve	Jeff	Joe	Dave	
Axion	Zincon	Furvon	Hot-	Crobon	Jinkon	**Computer**
16K	48K	1K	Dogs	5K	10K	**Memory**
Spella	Writa	none	—	Linka	Letta	**Printer**

Northern Amateur Radio Societies Association

The Society is holding its 21st Exhibition at Pontins Holiday Village, Southport on Saturday 19th March and Sunday 20th March 1983. This was formerly the Belle Vue Exhibition. The Exhibition will open at 11.00 a.m. each day.

It will include an inter club quiz, construction contest, grand raffle, R.S.G.B. bookstall, amateur computers, N.A.R.S.A. stands and trophy. Trade stands featuring all types of Radio/Electronic equipment. Demonstration Station.

The following traders will be present J. Birkett, Radiotronics, Amateur Radio Exchange, John's Radio, New Cross Radio, Wilson Valves, CB Electronics, S.O.T.A., The Computer Junk Shop, W.H. Westlake, D.S. Electronics, Arrow Electronics Ltd, Green's Telecom, Royd Electronics, Newton Engravers, Leeds Amateur Radio, Macro Trading, R.A.I.B.C., Micro Print Ltd, Z.J. Sound, Gemini Communications, Radio Surplus, B.N.O.S. Electronics, D. Currie (Printer), G. Jackson, W.E. Griffiths, Waters & Stanton Ham Radio Today, Garex Electronics, P.L.M. Communication, Supplies, Tricon Supply Co., Electro Supplies.

Admission to the Exhibition will be 60p per day or £1 for the two days.

Lots of 20 tickets or more booked in advance from Mike Bainbridge G4G57, 7 Rothbury Close, Bury BL8 2TT, Lancs. can be obtained at a 20% discount by sending the appropriate cash and s.a.e.

Chalets are available if booked direct from Pontins Tel. 0704 77165 and can be equipped for self-catering if you so wish. Charges vary from £10 + VAT (for 2 person chalet) to £26 + VAT (for a six person chalet) and larger family chalets are available.

Family entertainment will be available during the day while 'Residents' will be able to enjoy evening entertainment.

Talk in will be on 522 and other available simpler channels.

Car parking is free but please follow the parking attendants instructions and the notices to prevent congestion.

Enjoy yourself at this family Week-End Exhibition.

● Circle No. 183

In tests, most pets preferred it

If you're getting a Commodore Pet, then shouldn't you feed it the best?

Silicon Office is the biggest selling software package for Commodore, with over 3,000 already in use.

That is because Silicon Office is the first totally flexible software system. It does away with separate packages for different functions. Accounts, calculations, invoicing, filing, word processing, whatever your need, whatever your business or profession, Silicon Office will fit all your needs, and perform virtually any office function on its own.

It is also extremely easy to use so you don't have to be a trained expert or even Barbara Woodhouse to get it to do what you want.

If you're buying a pet, or would like to teach your old dog new tricks, find out about Silicon Office. Send in the coupon now, or call your local Commodore dealer.

commodore COMPUTER

SO/PCO/FE2

NAME _____ POSITION _____

COMPANY _____ ADDRESS _____

_____

COUNTY _____ POSTCODE _____ TEL. NO: _____

CONTACT: SILICON OFFICE INFORMATION CENTRE
675 AJAX AVENUE, TRADING ESTATE, SLOUGH, BERKSHIRE SL1 4BG. TEL: SLOUGH (0753) 79292

SILICON OFFICE

THE OFFICE COMPUTER THAT SPEAKS YOUR LANGUAGE

● Circle No. 186

PRINTERS

SEIKOSHA GP-100

New Design unbelievably low price printer

80 columns. 30cps 5 x 7 dot matrix. Adjustable tractor up to 10ins. Graphics double & standard width printing. Parallel interface as standard. RS232, Apple, IEEE & TRS-80 interface options.

EPSON RANGE

Probably the most popular printers in the world

The new MX Type III series combines quality graphic printing with high reliability, improved performance and greater flexibility.
Choose from five models.
MX80 and MX82 with tractor or tractor/friction (F/T) and MX100 tractor/friction *(now boosted to 100cps!)*

STAR DP-8480

High quality printing at remarkably low cost

Bidirectional 80-132 column, 80cps, 9 x 7 matrix, friction and tractor feed, 96 ASCII set plus block graphics and double width ch, programmable page length. serial or parallel interface models.

CONTROL DATA 9334

Compact, heavy duty, full specification, 150cps printer

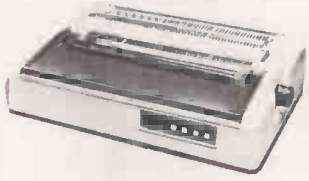
Bidirectional. Buffered. 136 columns at 10cpi,condensed, double density, expanded & elongated print. Superscript, subscript, underline & overprint. Full forms control & multiple copy. Tractor feed. Less than 60dBa. RS232 serial or parallel interface models.

ANADEX RANGE

High Quality Fast, Versatile Printer Range

11 models. Up to 15 inch paper width. Lower case descenders. 160-220 cps bi-directional printing RS232 current loop & parallel interface. X on X off. Optional 2K buffer. Multiple print densities. Fast print of high-density bit image graphics. Available with new style, low noise case.

TOKYO ELECTRIC



Best Buy Daisy Wheel Printers

Choice of 3 models.

FP-1500: 25cps bi-directional, RS232 or parallel interfaces.
F10 - 40: 40cps, auto proportional spacing, full forms control and all industry standard interfaces.
F10 - 55: 55cps & as above.

AND OTHER TERMINALS...

VDU's	ADDS DEC Lear Siegler	**PRINTERS**	Anadex CDC DEC Epson GE Lear Siegler Okidata Seikosha Star Teletype
GRAPHIC	ADDS DEC Digital Engineering Lear Siegler Televideo Texas instruments	**KEYBOARD**	GE DEC Teletype
COLOUR	Datamedia		
VOICE	Interstate		
TOUCH	Sunflex		
COUPLERS	A-J K & N	**LETTER**	Diablo TEC

FROM

Prices ex VAT one-off CWO

RIVA

RIVA TERMINALS LTD. Head Office: 9, Woking Business Park, Albert Drive, Woking, Surrey GU21 5JY PSA Member

Head Office: Tel: Woking (04862) 71001 Telex: 859502
Northern Office: Tel: Harrogate (0423) 509577
Scottish Office: Tel: Strathaven (0357) 22678
Dublin Office: Tel: 952316

● Circle No. 191

NOW in Birmingham – the centre of industrial Britain . . .

THE Midland Computer Fair

Personal computers
Home computing
Small business systems

Bingley Hall, Birmingham.
April 28-30, 1983

Sponsored by Practical Computing and YOUR COMPUTER

This exhibition is the ideal showcase for companies who need to demonstrate their products to the fast expanding market for home and personal computers, small business systems and associated software. When you consider that the markets for personal computers are regional and that Birmingham has a developing computer awareness with a great deal of computer expertise in the area, you'll appreciate the need for The Midland Computer Fair. The public has already demonstrated its appreciation of The Computer Fair in London by sheer volume of numbers. We know the success will continue in Birmingham.

Personal computers are part of everyday life.

Make Sure Your Computer Products And Services Are Seen At The Midland Computer Fair.

For the full story contact the Exhibitions Manager, The Midland Computer Fair, IPC Exhibitions Ltd, Surrey House, 1 Throwley Way, Sutton, Surrey SM1 4QQ.

Please contact me with further information about exhibiting at The Midland Computer Fair.

Name _____

Position in Company _____

Company _____

Address _____ Tel _____

THE Midland Computer Fair
Personal computers
Home computing
Small business systems

>NEXT MONTH

>16-BIT SPECIAL

Over the last year the established world of eight-bit CP/M microcomputing has been upset by sales of the 16-bit Sirius 1 and IBM Personal Computer. Now other manufacturers are fighting back by launching their own 16-bit machines. Some use new chips and some have dual processors; nearly all need new and relatively untried operating systems and new software.

Practical Computing's 16-BIT SPECIAL cuts through the confusion by comparing the relative merits of the main competing chips and operating systems, and by testing some of the new micros, including the Almarc Series 16 and Columbia's IBM PC look-alike. To show what the new business software is like, several nominal ledger packages are compared. The world's most complete listing of 16-bit machines and other features make the 16-BIT SPECIAL essential reading for everyone involved in personal and small-business computing.

>BRIEFCASE MICROS

Computing on the train? New portable micros make it possible to do computing or word processing almost anywhere — or so the manufacturers claim. We've train-tested the Epson HX-20 and Sony Typecorder to see if this is true.

>AND MUCH MORE!

● DIY Digitiser: Many people would like a digitiser or plotting tablet, but commercial ones tend to be expensive. Now you can build your own.

● Predicting the Future: How to use the KSIM method for predicting future behaviour, complete with a program listing for the Basic-E compiler running under CP/M.

● Plus: All the usual reviews and departments, including BBC games, Apple books, all the programs in Open File, news and your letters.

Make sure you don't miss the March issue of

Practical Computing

On sale at W H Smith and all leading newsagents after February 16.

HOW MUCH?

Includes £1000 worth of software.

THE MICRO DECISION

£1095*

Yes! Only £1095 (or only £895 with one disk drive) will buy you the Morrow Designs Micro Decision. As advanced and sophisticated as those costing several times the price, the Micro Decision comes packaged with a comprehensive variety of software.

Micro Decision features:–

* 64K bytes of RAM
* Z80A processor at 4Mhz
* Two RS232C serial ports
* Floppy disc controller for up to 4 drives
* 200K bytes formatted per drive
* Format compatible with Osbourne, Xerox, IBM PC
* Compact; 16.7" wide, 5.3" high, 11.3" deep

Software supplied as standard:–

* WORDSTAR: *Word Processing System*
* CORRECT-IT: *Checks and corrects spelling*
* LOGICALC: *Financial modelling and forecasting*
* CP/M 2.2: *Disk Operating System*
* BASIC-80: *MicroSoft BASIC language*
* BAZIC: *North Star compatible BASIC*
* PILOT: *Programming learning language*
* MICRO MENUS: *Operators CP/M roadmap*

Add a suitable VDU and printer, and you have all the hardware and software you need. Example shown – complete business system with VDU, Printer and the Exact Accounting System, guaranteed for one year – £2295.

* Prices exclusive of VAT and carriage. Prices subject to change. Dealer enquiries welcome.

Return this coupon for further details of The Micro Decision.

Name Position

Address

Tel. No.

PC

INTERAM

Microcomputer Specialists

46 Balham High Road London SW12 9AQ Tel: 01-675 5325/6/7

The new philosopher's stone

Alchemy and the intelligent computer — the quest for both is futile says Boris Allen.

MANY PEOPLE are worried about the effects of computers on their jobs. So far such worries have been confined to what we might call the more mundane occupations — workers on assembly lines, secretaries and typists, book-keepers and similar. Now those who have rather more prestigious occupations are worried because many such occupations are appearing to become equally at risk from what are termed expert systems, an offshoot of artificial intelligence.

Expert systems attempt to codify expert knowledge and turn it into a form which can be used by the less expert. Expert systems promise a great deal, including the redundancy of many experts who at one time thought that they were safe — computer programmers among them. Artificial intelligence, of which expert systems are an outgrowth, has more than a touch of alchemy to it — AI is an attempt to produce an intelligent computer, about which there have many promises of things to come but relatively few real results.

AI into gold

There have been a few results in AI, and they have been sufficient to keep the subject going as a success. Just as with alchemy, though it was never possible to change base metal into gold sufficient other discoveries were made to keep the alchemists in business. These discoveries then reinforced the alchemists and their backers in further researches. In the case of AI there have been many predictions of what will be achieved "in the near future", yet many are still unfulfilled.

There have been many spin-offs from AI research which have been successful — some of the industrial robots, for example — and so, as with alchemy, we are encouraged to support even more AI research. In 1961 it was confidently predicted that a computer in use then, an IBM 704, if properly programmed, would be able to read printed letters faster than a human. The programs did not then exist; 20 years later I was at a conference during which we were told that there now existed a computerised system for reading books but that the computer had to spend up to an hour learning the printed alphabet used.

The existence of chess machines is often used as a vindication of the power of AI and an indication that a machine can have real intelligence. The program is more complex in that, for example, the methods of looking several moves ahead or retrieving information are more sophisticated. However, the way in which the program decides on the next move is scarcely more sophisticated. The program looks more moves ahead, but does so almost as stupidly as in the past.

To claim that a chess machine exhibits real intelligence because it can beat a person at chess is almost like saying that a pocket calculator is more intelligent because it can multiply more quickly. In many instances the seeming improvement in sophistication of things to do on computers is due more to improvements in the hardware, than they are to the quality of the ideas involved in the software where any intelligence must lie.

The alchemists' search for the philosopher's stone which turned base metals into gold by chemical means was, as we now know, bound to be fruitless because of the atomic nature of matter. Yet the alchemists did achieve some useful results and laid the basis for later chemistry, though their main reason for being alchemists was pointless.

Thinking about thinking

It is argued that AI has set itself an impossible task this will be true for expert systems. There is a mathematical principal, called Gödel's theorem, which implies that a machine cannot be truly intelligent as the computer cannot think about itself. If a computer were programmed to think about itself, then the computer could not think about itself thinking about itself. This may explain why, despite protestations to the contrary, artificial intelligence has not yet created artificial intelligence.

In Britain's Information Technology Year, 1982 there was a vogue for AI expert systems which are supposed to be something like an intelligent assistant, full of specialised knowledge and able to copy some of the ways of thinking humans apply when using such knowledge. In a few cases such systems have been running since the early 1960s. Dendral, for example, is used for mass spectroscopy, and many such systems are used to monitor production of commodities from computer systems programs to cars.

Another example of an expert system is in medicine, where apart from monitoring some blood characteristics the expert system supplies diagnostic advice along the lines of "This reading indicates that the patient is dead." To have an expert system like this has been taken by some enthusiasts to mean too much. They think that because such simple things have been done — which is not to say that they are not useful and time-saving — it follows that the complex diagnoses performed by medical experts can already be done more quickly and more accurately by computer!

Unlikely consultant

To have an expert system which could replace a consultant means that the system has to be intelligent: even ignoring Gödel's theorem, it is still clear that there is a large gap in knowledge between simple monitoring and the work of a medical expert. To give or confirm a diagnosis is quite often a minor part of a consultant's work: many people go to a consultant for advice on the best treatment.

It is possible to construct a computer-assisted learning package for a simple, mainly factual topic such as anaesthetics. It has happened at Glasgow Medical School and it is not very difficult. To find, as they did at Glasgow, that students who used CAL instead of going to tutorials did better at examinations begs many question. What type of examination did the students take, essay or multiple choice? How were the students selected for each type of teaching? How did those who did not attend any teaching, or very little, perform in the examinations? If we test understanding merely by multiple-choice questions in an examination, then the test will fit with CAL tuition.

To suggest — as some of the ES fanatics do — that a couple of years' work is all that is needed to do most of the teaching in schools by CAL, or that in a few years time there will be no need for lecturers, is remarkably unrealistic. Such suggestions are laughable, and more in keeping with promises of AI salesmen of the past.

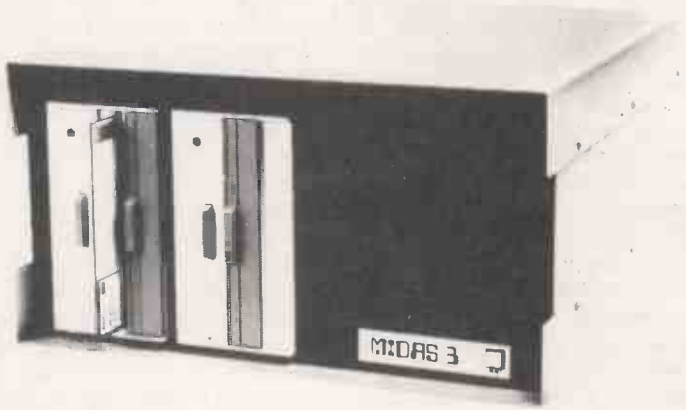
People worry about the future and new technology, when quite often there is no need to worry. Expert systems are not really expert, artificial intelligence is not really intelligent. The true initiator of our present advances in computing has been nuts and bolts technology, that is better computers. To succeed in the future, be an expert — but best not be a computer expert, they are becoming far too populous — and also learn some computing. It's easy.

sirton computer systems

THE SPECIALISTS IN S100 SYSTEMS

MIDAS S100 SYSTEMS

MIDAS 1: From £895
MIDAS 2: From £1,890
MIDAS 3D: From £3100
MIDAS 3HD: From £5,495
MIDAS 86 — 16 Bit: From £3520



- Our versatile **Z80** Microcomputers are available as standard units or custom configured to your exact specification from a comprehensive range of stocked **S100** boards.
- Disc storage capacity of the **MIDAS 3** can be 2M Bytes, expandable to over 80M Bytes with a Winchester Hard Disc Unit in our **MIDAS 3HD** range.
- **MIDAS** runs **CP/M** and MP/M. Other Software includes M-BASIC, C-BASIC, FORTRAN, COBOL, CIS-COBOL, PASCAL and Word Processing.
- A **MIDAS 3D** with 64K RAM and 2M Bytes storage on two 8" drives with two Serial I/O Ports and CP/M only **£3,100.**
- Printers, VDUs and other peripherals stocked to give complete package system at keen prices.

BOARDS

We stock over 50 different S100 Boards all from quality manufacturers: Advanced Micro Digital, Godbout, SSM, Micromation, Dual, CCS, S.D. Systems, Morrow, Pickles & Trout, etc.

PROCESSOR
Z80 Starter Kit
Single Board Computers
8085/8088 CPU
Z80A CPU 4MHz (4 types)
8086

EPROM
2716 EPROM (2×16K)
2708/2716/2732 Programmer

VIDEO BOARDS
24×80 I/O Drive
24×80 Memory Mapped

DISK CONTROLLERS
Single Density 5" or 8
Double Density DMA
Floppy or hard Controllers

RAM
Static RAM 16-64K 24 Bit addressing
Static RAM 8×64K or 16×32K RAM/Battery Back-up
Memory Manager

I/O BOARDS
2S/2P or 4S/2P or 3P/1S etc
A/D & D/A 8 or 12 bit
IEEE 488 Interface

MISCELLANEOUS
Real Time Clocks
Graphics 512 ×256 (B/W)
Colour Graphics 312×290
Maths Board AMD 9511
Extender Boards/Logic Probe
Motherboards 7-20 slot

MAINFRAMES
We are the sole UK Distributor for Integrand Mainframes and Disc Enclosures, available in nine models including Desk Top and Rack Mounting, with or without provision for Disc Drives. All units totally enclosed, painted on all external surfaces and complete with power supply etc.

SOFTWARE
CP/M 1 & 2, MP/M, PL/1, C-BASIC 2, M-BASIC V5, XYBASIC, FORTRAN 80, COBOL 80, CIS-COBOL, PRO-PASCAL, Forth, MAC, ZSID, Disassembler, Wordstar, Datastar, Supercalc, Wordmaster, Supersoft etc etc.

Prices exclusive of VAT

We are pleased to discuss your requirements and will advise you as to whether your needs can be met with one of our computers.

All of our systems are specials as they are configured to suit your specification, thus ensuring that you get what you want rather than what happens to be available.

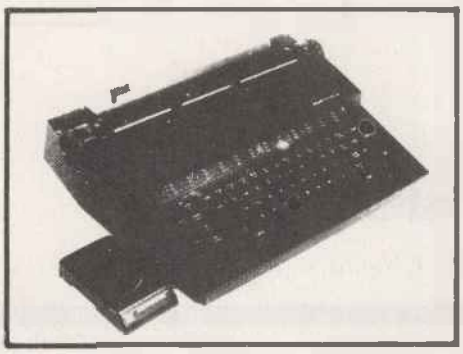
Write or phone for a catalogue.

Unit 14, 29 Willow Lane, Mitcham, Surrey
Telephone: 01-640 6931/2/3

sirton computer systems

● Circle No. 195

Buy our £475* Daisy Wheel Printer for your computer and you have an Electronic Typewriter absolutely FREE



The T/Printer 35 is the lightest weight and lowest cost daisy wheel printer you can buy for your computer. So it will fit within your budget and you can carry it wherever you take your micro. Yet it is tough enough to give years of reliable service. Interchangeable typefaces (standard Olivetti 100 character daisy wheels), variable pitch, multiple copies—all the features you would expect of more expensive word processing printers.

Yet the T/Printer 35 costs only £475 with parallel interface. Operating speed under computer control is approximately 120 words per minute of letter perfect output. What typist can equal that?

Then when you're finished using it as a computer printer, the T/Printer 35 is ready to go right on working as an electronic typewriter.

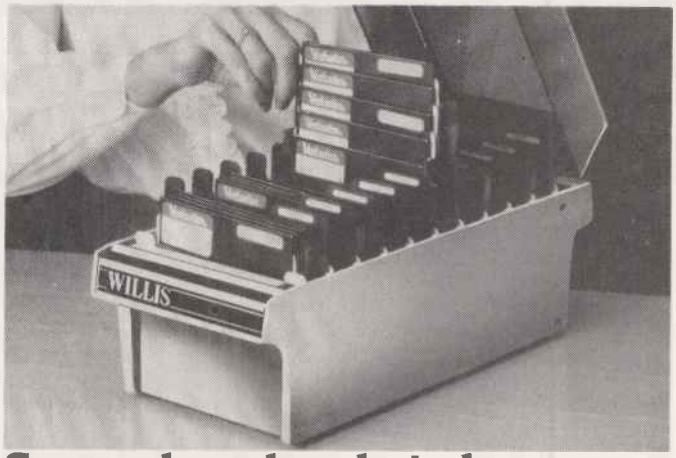
That's the dual-purpose T/Printer 35—the versatile computer printer that fits your budget.

Orders are shipped within the UK carriage-free. To order or for more information about the T/Printer 35:

**The T/Printer 35 costs £475 with Centronics compatible parallel interface. With RS-232C interface it costs £535. Prices listed are exclusive of VAT.*

Datarite Terminals Ltd
Caldare House
144-146 High Road
Chadwell Heath, Essex RM6 6NT
Tel: 01-590 1155

● Circle No. 204



Somewhere handy to keep your Mini-Disks Only £35 (Plus £2p&p)

The Willis Mini Disk File is a handsome, virtually indestructible filing system for your valuable programs and data files.

Disks are stored in 10 sections, each with an ingenious lift mechanism, which enables you to display them five at a time, using only the thumb and forefinger.

The file holds fifty 5¼" mini-disks and can be locked for security.

Just one of the items from the Willis catalogue.

To: Willis Computer Supplies Ltd, FREEPOST PO Box 10, Southmill Road, Bishop's Stortford, Herts CM23 1BR. Telephone: Bishop's Stortford (0279) 506491.

I enclose £ _____ for _____ Mini Disk File(s) at £35 + £2 p&p (Cheque/PO).

Name _____

Address _____

_____ Post Code _____

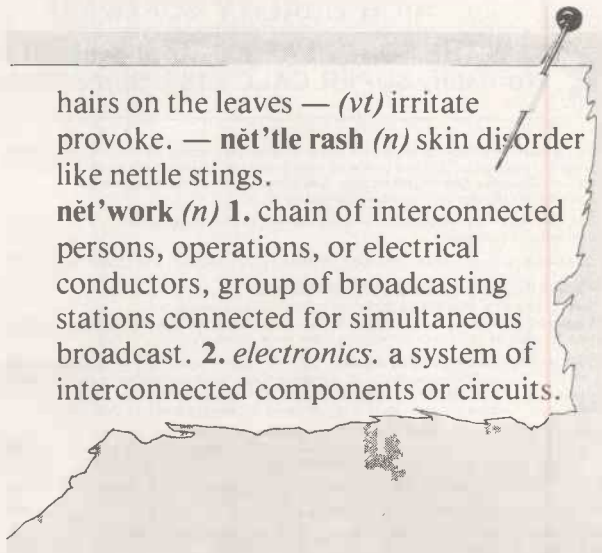
Or debit my Access/Barclaycard No.

Signature _____

Please send your colour catalogue (tick box) ☐

WILLIS Computer Supplies

● Circle No. 205



PASCAL DOS APPLE IBM PC

● Circle No. 206

If you have purchasing responsibility in the Computer Peripherals fields you can't afford to miss the . . .

VDU's, printers, plotters, memory products, graphic displays, tape and disc drives – all the latest equipment you need to see will be featured at Peripherals '83. Sponsored by Systems International in association with the Peripherals Suppliers Association, the show is larger than ever before. This is the ideal opportunity for those requiring computer peripherals to discuss their needs with specialist suppliers.

February 2-4, 1983

10.00-17.30 (closing 16.00 on the last day)

Cunard International Hotel, Hammersmith, London

Admission by business registration, is free of charge. Plan your visit now and save time on arrival by sending for your registration in advance.

Visitors to the exhibition will also be given the opportunity to attend seminars organised by the Peripherals Suppliers Association. Details of these should be obtained in advance from:
Mrs. Helen Gibbons,
Peripherals Suppliers Association,
Owles Hall, Buntingford,
Herts. SG9 9LP. Tel: 0763 71209

Post to: The Exhibition Manager, Peripherals '83, IPC Exhibitions Ltd, Surrey House, 1 Throwley Way, Sutton, Surrey SM1 4QQ.

PC

PERIPHERALS 83 SUPPLIERS EXHIBITION

Please send ..... copy/copies of the Peripherals '83 visitor registration leaflet(s) to:

Name _____

Position in Company _____

Company _____

Address _____

_____

Telephone _____

symb/net. *(n) (see fig 1)* **1.** speedy long range, local area network system, capable of ranges to 9km. utilises fibre optic cable and semi conductor laser to transmit data; **symbnet** enables user to link various microcomputers supported by **symbfile** *(see below)* **2.** compatible with DOS,PASCAL,CP/M; transfer rate 50 kHZ, transmission power 800 micro W cable, fire retardant P.V.C. grade 32, signal insensitive to electrical noise, ∴ cannot be corrupted; system nucleus **symbfile** *(see below).*

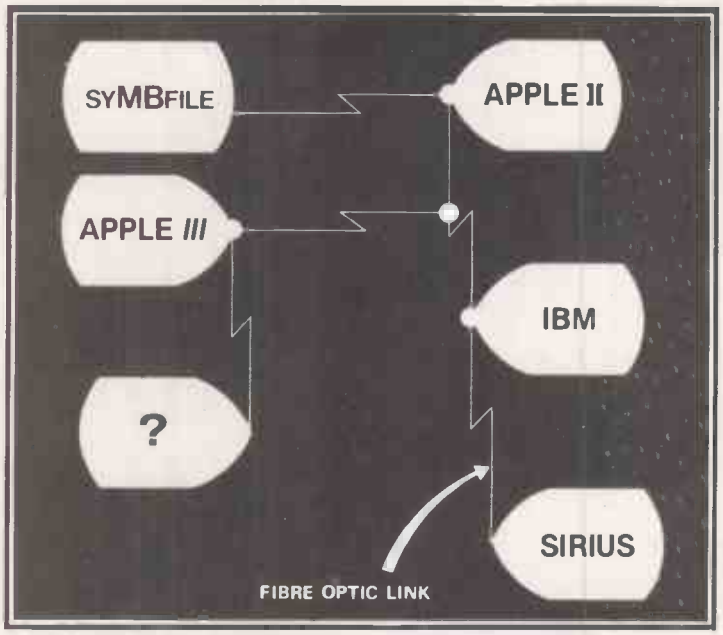


fig 1 **symb/net.**

symb/file *(n) (see fig II)* **1.** high capacity, high quality, $5\frac{1}{4}$" Winchester sub-system, compatible with most microcomputers including APPLE II, ///, IBM PC, and SIRIUS. Other features include **2.** a cold booting facility **3.** one year's full warranty. Also available on **symbfile** top quality software including database, word processing and accounting packages. **4.** capacities range from 3-84 megabytes; average speed of access 90ms, 32 sectors per track; rotational speed 3600 (rpm) **5.** used at the centre of network system — **symbnet** (*see above*).

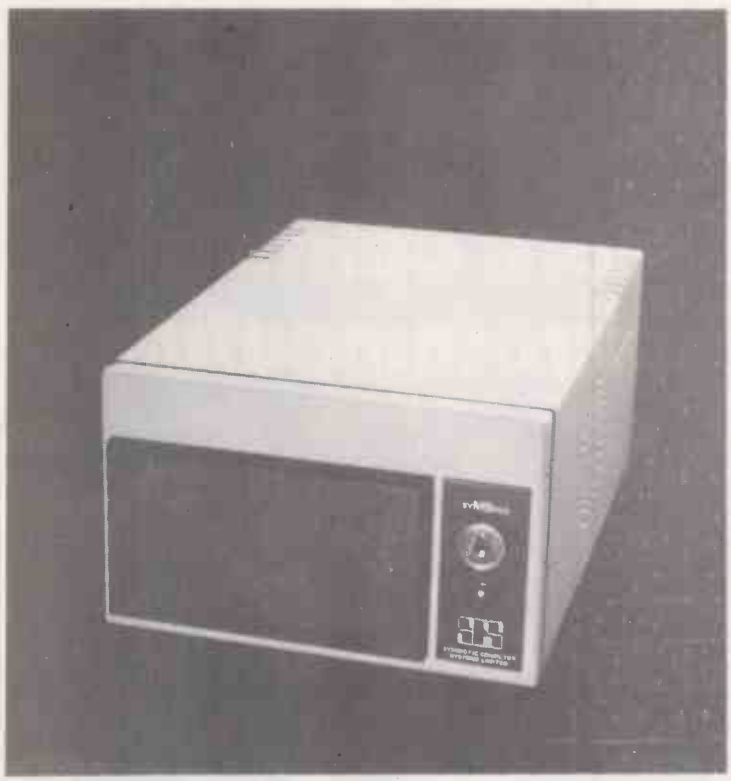


fig II **symb/file**

ATA THE PRICE BEATERS

apple

A Fresh new 48K Apple

Only £499

(While stocks last)

Software

PFS	£75
PFS Report	£59
DB Master 3	£139
Data Factory 5	£199
Mathemagic	£55
Graphmagic	£55
Locksmith 4.1	£65
Dos Tool Kit	£42
Apple Pascal	£149
Applewriter	£39
Applewriter II	£85
Wordstar 3.0	£155
Mailmerge	£59

Visac Orbit Accounting Modules: Prices on application - Please phone for list.

Visicalc

Latest packaging versions

Visicalc	£121
Visitrend / Plot	£149
Visidex	£149
Visifile	£159
Visischedule	£180

Disk Drives

Apple disk drives at these incredible low prices!

With Controller	£270
Without Controller	£220

Apple III

128K	£1995
256K	£2495
Secondary Disk Drive	£240
Profile Hard Disk	£2095

Please phone for comprehensive list.

Stop Press
New Apple Rev 'E'
Available now!
Phone for details

Hitachi 12" Green Screen Monitors only £90 FREE Anti-Glare Screen

Interfaces

Parallel Printer Card	£70
Serial Printer Card	£105
Pascal Card	£105
Digitek Colour Card	£99
Z80 System (New version)	£220
80 Col System (Videx)	£200
Soft Switch (Videx)	£25
16K RAM Card	**£48**
128K RAM Card	**£350**

Epson Printers Unbeatable Value!

MX80T (Type 3) £290
MX80F/T (Type 3) .. £315
MX100F/T (Type 3) £420
Other printer prices on application

Accessories

Numeric Keypad	£75
Joystick (TKC)	£29
Paddles	£19
Cooling Fan	£55
10 BASF 5¼" Disks	£20
Listing Paper	£18
Locking Disk Box	£20

IBM

Unbeatable Value

IBM PC 64K UK Spec - 240v power supply £2749

System Expansion

64K Memory Board	£277
128K Memory Board	£382
192K Memory Board	£476
256K Memory Board	£572
512K Memory Board	£980
Baby Blue	£392
Big Blue	£392

Hard Disks

5 mb Winchester	£1648
12 mb Winchester	£2197
20 mb Winchester (with tape backup)	£2699

Other Accessories

Mono Graphics Monitor	£155
Colour Monitor	£625
Colour / Graphics Card	£340
Asynchronous Comms Card	£170
Printer adapter	£63
IBM Joysticks	£42
Light pen	£159

Phone for details

IBM Software

IBM Pascal Compiler	£359
IBM Cobol Compiler	£838
IBM Fortran Compiler	£420
IBM Basic Compiler	£409
IBM Macro Assembler	£119
UCSD P-System Pascal	£749
UCSD P-System Pascal Compiler	£210
UCSD P-System Fortran 77	£749
Fortran Compiler 77	£210
CP/MC86	£287
Visicalc 256K	£159
Supercalc	£175
Time Manager	£108
Volkswriter	£146
Easywriter II	£229
Wordstar	£245
Mailmerge	£89
dBase 2	£329
Desktop Plan	£196
Graph Magic	£99
Visitrend / Plot	£189
Visidex	£166
Visifile	£156
Micro-finesse	£499

Phone us for a Better Deal

All M.P.S.L. Business Accounting Software in stock at unbeatable prices, please phone for list.

While Stocks Last

Games

Championship Black Jack	£28
Microsoft adventure	£42
Deadline	£42
Zorks I to 3 (each)	£29

Hewlett Packard 7470A Plotter

RS 232 or HPIB Interfaces

Outstanding Value

@ £975

Complete range of Desktop Computers in stock

SIRIUS 1

ACT Sirius I 128K with 1.2 mb S/S Disks	£2095
ACT Sirius I 128K with 2.4 mb D/S Disks	£2549
ACT Sirius I 128K with 1.2 mb D/S Disks and 10 mb Winchester	£3995
External 10 mb Winchester Hard Disk	£2549
128K Additional Memory	£349
384K Additional Memory	£795

Software

C Basic 86	£159
Level II Cobol with forms 2	£549
Microsoft Basic Compiler	£239
Microsoft Pascal Compiler	£299
Microsoft Fortran Compiler	£299
Microsoft Cobol Compiler	£439
CP/M Programmers Kit	£169
MS 6 Dos Programmers Kit	£169
IEEE 488 Package	£169
Graphix / Bisigraf Graphics Pack	£169
ACT Pulsar Software at unbeatable prices	

commodore

COMPUTERS

4016 16K	£495
4032 32K	£625
8032 32K	£799
8096 96K	£1075
Super Pet 9000	£1345

DISK DRIVES

2031 171K Single D/Drive	£349
4040 343K Dual D/Drive	£625
8050 950K Dual D/Drive	£799
8250 2 mb Dual D/Drive	£1195
9060 5 mb Hard Disk	£1795
9090 7.5 mb Hard Disk	£2245
C2N Cassette Unit	£56

Software prices on application

Please phone for free price list.

Delivery

Please add 1.5% to your order for UK delivery charge. Payment accepted by cash, bankers draft, building society cheque for immediate despatch.

All goods are normally in stock, however please confirm before collecting.

We are open from 9.30am to 5.00pm Mondays to Saturdays. Credit of 30 days is available on official orders from PLCs, Hospitals and educational establishments, subject to a 5% surcharge.

Otherwise cheque with order. Please allow 10 days for cheque clearance.

Export orders welcome!

Come in & Take Away

Mail Order

We accept both Access and Barclaycard subject to a 5% surcharge. Telephone orders are welcome on 01-278 3838

All prices plus 15% VAT

E. & O.E.

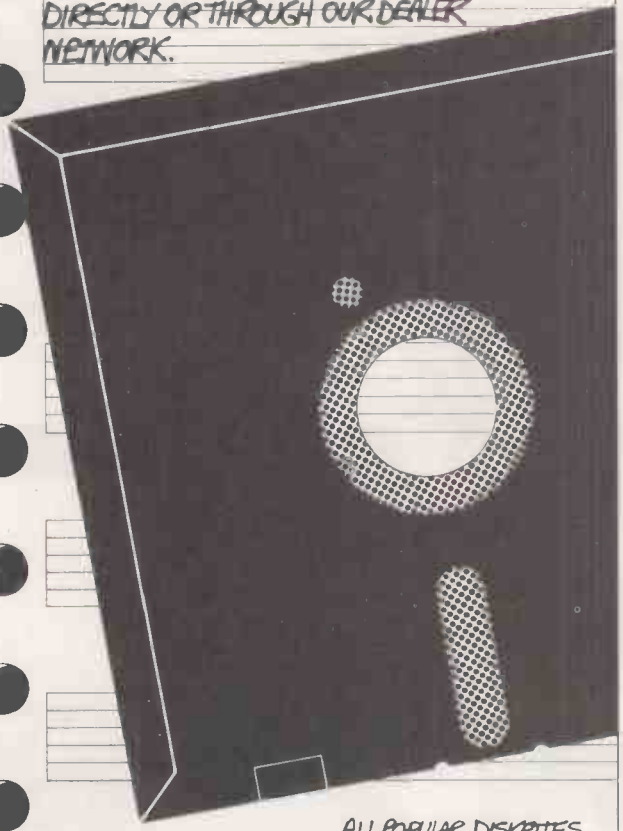
ata systems

4, ALBION HOUSE, 1, BACK HILL LONDON EC1
01-278 3838/01-278 5285 Telex 25102 Albeta G

● Circle No. 219

FLOPPY BARGAINS

AS MAJOR DISTRIBUTORS OF WABASH MEMOREX AND DYSAN WE ARE ABLE TO OFFER YOU COMPETITIVE PRICES AND FAST DELIVERY ANYWHERE IN THE UK AND IRELAND. WE CAN SUPPLY EITHER DIRECTLY OR THROUGH OUR DEALER NETWORK.



ALL POPULAR DISKETTES ARE EX-STOCK. SPECIALLY FORMATTED DISKS FOR PCS. WORDPLEX ETC. ARE AVAILABLE.

FOR PROMPT, PERSONAL ATTENTION TELEPHONE: 0934-416392.

CREDIT CARD ORDERS ACCEPTED. BARCLAYCARD VISA

DEALER ENQUIRIES WELCOME.

DRG BUSINESS MACHINES

SYSTEMS SUPPLIES DIVISION,
13/14 LYNX CRESCENT, WINTERSTOKE ROAD,
WESTON-SUPER-MARE, AVON BS24 9DN.

● Circle No. 220

SHARPSOFT

WITH THE SHARP USER IN MIND

JOIN NOW!

The SHARPSOFT USER NOTES THE 1983 SUBSCRIPTION ONLY £5.50 (10.00 OVERSEAS) Three information packed publications a year, with programming tips, program listings, and problems pages. Whether you have a Sharp MZ80K, MZ80B or MZ80A this is a must for every Sharp owner.
Back issues still available:-

1981 issue Nos 1, 2 & 3 £3.00 UK (£6.00 overseas)
1982 issue Nos 4, 5 & 6 £7.50 UK (12.00 overseas)
(issue No 4 is complete with two tapes containing the language forth).

SHARP MZ-80A 48K RAM Micro Computer	£499.00
SHARP MZ-8080AEU Expansion Unit for MZ-80A	£100.00
SHARP MZ-80FB Dual Floppy Disc Drives for MZ-80A complete with interface card, cables, CP/M operating system and Sharp Disc BASIC & Manual	£799.00
SHARP MZ-80B 64K RAM Micro Computer 320 x 200 High Res. screen Software controlled cassette unit	£50.00
SHARP MZ-80FB Dual Floppy Disc Drives for MZ-80B complete with interface card, cables, CP/M operating system and Sharp Disc BASIC & Manual	£799.00
SHARP MZ-80P4 150 cps Dot Matrix Printer	£845.00
SHARP MZ-80P5 80 cps Dot Matrix Tractor Feed Printer	£415.00
SHARP MZ-80P6 80 cps Dot Matrix Tractor & Friction Feed Printer	£475.00

The SHARP MZ-80 P4, P5 and P6 PRINTERS come complete with Interface card, printer cable and ROM. Just specify which computer it is required for.

For further information send a stamped addressed envelope for "Connecting a Printer to my SHARP" an easy to understand information sheet.

SHARPSOFT DUST COVERS

Keep out harmful dust and grime

SHARP MZ-80K	£5.25
SHARP MZ-80A	£6.00
SHARP P3 Printer	£4.95
SHARP Dual Disc Drive	£4.50
SHARP MZ80K Expansion Box	£4.00
EPSON MX 80 F/T Printers	£4.95

SHARP PC 1500 POCKET COMPUTER AND ACCESSORIES

SHARP PC 1500 Pocket Computer	£149.95
SHARP CE 148 RS232 & Centronics Interface Unit	£149.95
SHARP CE 15A Application Tape	£14.95
SHARP CE 150 4 Colour printer/dual compact cassette interface	£132.25
SHARP CE 151 4K Add on memory module	£49.95
SHARP CE 152 Cassette Recorder/Player	£39.95
SHARP CE 153 Add on Soft Card	£79.95
SHARP CE 155 8K Add on memory module	£79.95
SHARP CE 158 8K Add on memory module with battery backup	£89.95
SANYO Small portable compact cassette recorder compatible with PC 1500/CE 150	£29.95
SANYO Small portable mini cassette recorder compatible with PC 1500/CE 150 and Philips dictating machines	£45.95
SHARP CSR 150 Paper rolls (packed in 10s)	£2.92
SHARP EA 950B 4 Spare black pens for CE 150 printer	£3.09
SHARP EA 850C 4 Spare pens one of each colour red, black, blue & green	£3.09

UTILITIES

ZEN ASSEMBLER (22.50) ZEN TOOL KIT (17.85)
ZEN DEBUG (14.50) RELOCATE (11.50)
TAPE COPY (11.50) SHORT COMPRESSOR (5.85).

BOOKS

Peeking & Pokeing the Sharp MZ-80A	£4.30
Peeking & Pokeing the Sharp MZ-80K	£4.30
Beginners Guide to MZ-80K Micro Computer	£3.95
DISCOVER FORTH	£10.95
INTRODUCTION TO FORTH	£6.95
BASIC for BUSINESS	£11.50
BASIC Programs for Scientists & Engineers	£11.50

ALL PRICES inclusive of V.A.T.

Please send a stamped addressed envelope for FULL Software/Hardware details or phone: 01-739 8559 (24 HRS) leaving your name, address and telephone number with particulars of your interest.

SHARPSOFT

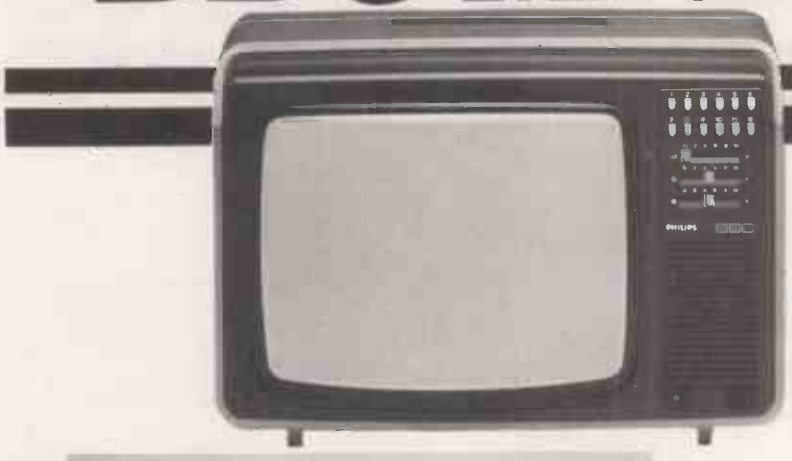
WITH THE SHARP USER IN MIND

SHARPSOFT LTD, CRISALLEN HOUSE, 2ND FLOOR,
86/90 PAUL STREET, LONDON, EC2.
TEL. 01-739 8559

● Circle No. 221

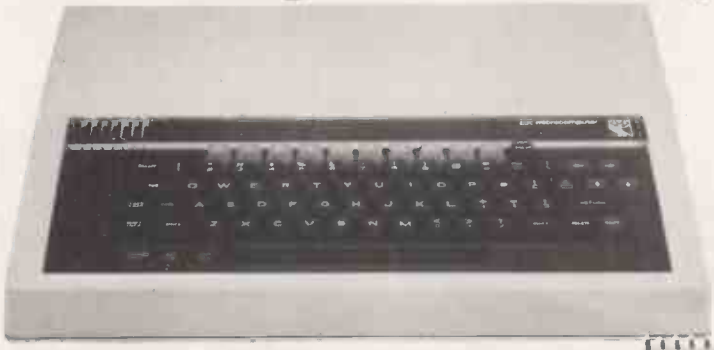
PLEASE TEAR ME OUT – YOU MAY NEED ME LATER

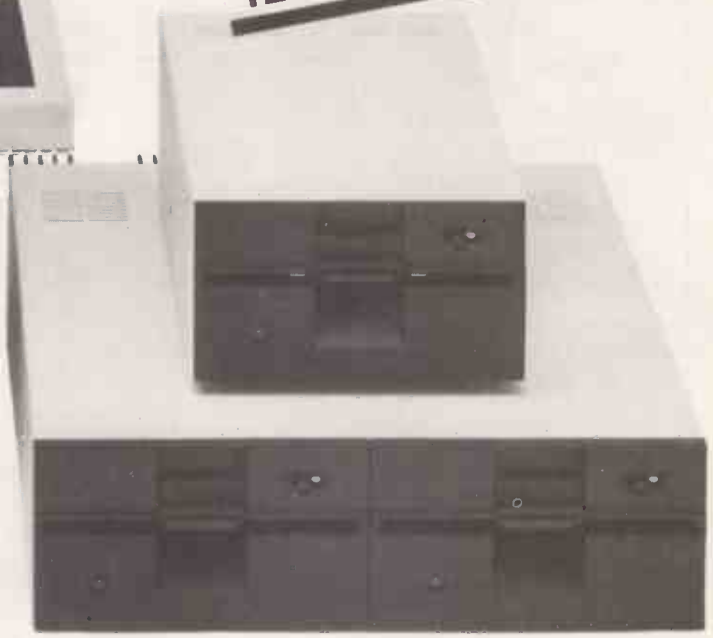
Cumana drives BBC Micro best!



CUMANA DRIVES + OWN POWER SUPPLY = BIG PLUS FOR BBC MICRO USERS . . . JUST FOR STARTERS

. . . PLUS NO HASSLE 12 MONTH WARRANTY





The 'ice on the cake' is that, because the Cumana Drive has its own power supply, it can be used with many other Micros when connected via the appropriate cable. Cumana supply a Drive connecting cable which has a standard 34 way edge connector plus 34 way BBC connector in the same cable length. This allows the Cumana Drive to be connected to numerous makes of micro without the need to change connecting cable. And the Japanese manufactured disk drives are quiet and utterly dependable.

CS50A	Single sided 40 track TEAC drive in a cabinet with own power supply 100K	**£199**
CD50A	2 single sided 40 track TEAC drives in a cabinet with own power supply 200K	**£369**
CS50E	Single sided 80 Track TEAC Drive with cabinet and own power supply 200K	**£265**
CD50E	2 single sided 80 Track TEAC Drives in cabinet with own power supply 400K	**£495**
CS50F	Double sided 80 Track TEAC Drive with cabinet and own power supply 400K	**£345**
CD50F	2 double sided 80 Track TEAC Drives with cabinet and own power supply 800K	**£619**
	2 drive Cable for BBC Micro	**£15**
	2 drive Cable for BBC Micro plus TRS80, Video, Genie etc.	**£18**
UPGRADE KITS	**A → B**	**£90**

Please add VAT to all prices

DEALER & EDUCATIONAL ENQUIRIES WELCOME – GENEROUS DISCOUNTS AVAILABLE

CUMANA LTD

Unit 1, The Pines Trading Estate, Broad Street, GUILDFORD, Surrey. GU3 3BH. Tel: (0483) 503121. Telex: 859380 CUMANA.

● Circle No. 223

The Portable Electronic Office is here at last

Ask Midlectron about the Epson HX-20, and you'll soon see it's not just another advanced calculator.

It's got a printer, cassette storage, and a unique virtual LCD screen built in. Plus a full-size typewriter keyboard. Yet it actually fits into any briefcase.

It runs professional software too. Like word processing and sales forecasting packages. So busy salesmen, engineers and managers can take advantage of real business computing – anywhere.

The amazing HX-20 is available off the shelf from Midlectron. At a price that's even more amazing.

The Briefcase Computer for £486

MIDLECTRON
Computer Systems and Terminals

Midlectron House, Nottingham Road, Belper, Derby DE5 1JQ.
Telephone: Belper (077 382) 6811 Telex: 377879

Southern Sales Office: Balfour House, 390-398 High Road, Ilford, Essex. Telephone: 01-514 1188

● Circle No. 224

HISOFT PASCAL 4
INCREDIBLE SPEED
INCREDIBLE PRICE

Hisoft are pleased to announce their latest Pascal compiler, the fastest and most powerful so far, at an amazingly low price.

Hisoft Pascal 4 is an almost complete implementation of the Pascal language as given in the Pascal User Manual and Report (Jensen/Wirth) including POINTERs, RECORDs and (for disk systems) FILEs. All major Pascal statements and data structures are supported together with many useful additions such as PEEK, POKE, USER, ADDR (returns the memory address of a variable) and, for tape, TOUT and TIN to store and retrieve variables to and from tape.

The compiler produces Z80 object code directly (i.e. no P-codes) and hence the resultant code runs very quickly indeed.

Hisoft Pascal 4 requires only a 32K system in which to run (with plenty of room to spare) and can be supplied on cassette tape or 5¼" or 8" diskette to run under CP/M. The cassette tape version comes with its own tokenising editor and in a form which is easily adaptable to any Z80 system.

Hisoft Pascal 4 is a powerful and high quality piece of software which can be used for serious program development — we offer it at such a low price because we believe that such software is normally overpriced and out of reach of the individual.

Prices:

HISOFT PASCAL 4 tape version (NASCOM, SPECTRUM etc.)	£35
HISOFT PASCAL 4 disk version (NASCOM, SUPERBRAIN, RML380Z etc.)	£40
ZDEV (a Z80 development system for Gemini G805 or G809 disk systems)	£45

*Special offer for ZX SPECTRUM, HISOFT PASCAL for only £25 Please add 15% VAT

Send for more details from:

HISOFT,
60 Hallam Moor, Liden, SWINDON, SN3 6LS.
Tel. (0793) 26616 (24hr ansaphone).

● Circle No. 235

PRINTERS

The OKI MICROLINE Range
Speeds from 80-200 CPS
Prices from under £200
For details and demonstration contact:

MICROFARM

The Old Farmhouse, Jasons Hill, CHESHAM, Bucks. HP5 3QW
Tel. 0494-783915

● Circle No. 236

northern computers offer even more

Apple II
Apple III
BBC micro computers
Acorn Atom
VIC 20
Newbrain
Prestel adaptors
Software
Disk Drive
Printers
Second Hand Computers
Tape Recorders
Books
ALL ACCESSORIES SALES AND SERVICE

Easy parking off the M56 (Junc. 12)

northern computers
micro computer systems for all applications

Tel: Frodsham (0928) 35110

Churchfield Rd., Frodsham, Cheshire WA6 6RD

● Circle No. 237

BRAIN SURGEON

Anita Electronic Services (London) Ltd are specialists in the repair and service of Superbrain I and II and associated printers including Apple silent type, Centronic, Anadex, NEC, QUME, Ricoh and Empson.

We also specialise in the repair of Commodore and Apple computers.

We offer a fast on-sight service or alternatively repairs can be carried out at our workshops should you wish to bring in your machine.

Maintenance contracts are available at very competitive prices. Trade enquiries welcome.

For further information telephone or write to:

MR D. WILKINSON
Anita Electronic Services Ltd.,
15 Clerkenwell Close,
London E.C.1.
01-253 2444

● Circle No. 238

SCIENTIFIC SUBROUTINE LIBRARY

Volume 2 — LINEAR PROGRAMMING
Reduction of a Simplex Tableau: Integer Programming: Partial Integer Programming: Inverted Matrix Method: Conversational Linear Programming System: Least Cost Mix Problem.

Manuals including full source listings with implementation notes and documentation — Volume 2B (BASIC) £25, Volume 2P (PASCAL) £30. Software in CP/M (8" SSSD) or DEC RX01 (RT-11), Formats £75 + VAT.

MICRO LOGIC CONSULTANTS LTD.
57, Station Rd., Southwater, Horsham, W. Sussex.
Telephone: 0403 731818

● Circle No. 239

OSBORNE 1

South London, Surrey

ERA Consultants Ltd.

Grove House Grove Road,
Sutton, Surrey SM1 1BQ

Tel: 01-661 2060

● Circle No. 240

PROTEK

22 Sussex Street,
London SW1V 4RW
Tel: 01-834 3602

5MByte MSC 9800D WINCHESTER DISC

Fully compatible with HP1000L, 9835/45, 9826/36, 9825T, 85/86/87 and 125

- Emulates two HP9895 systems
- Small 17x25x30cm/6¾"x10"x12"
- Lightweight (less than 9kg/20lbs)
- Low Cost – Fast Delivery

HEWLETT-PACKARD SPECIALISTS

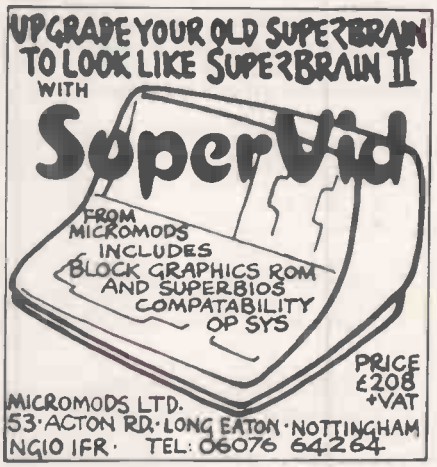
● Circle No. 241

TPS80 — VIDEO GENIE SOFTWARE LIBRARY

25 Super programmes, machine code Arcade games, simulations, competetive games, Adventurers, Dungeons & Dragons, Puzzles & Ball games; plus a few Education & Business programmes. Including Amazing 3D Mazes, Trap It, Gambling Machine, Star Wars, Breakout & Corridors of Doom, to name just a few. All 25 on one C48 cassette for only £8.95 inclusive or send a s.a.e. for full details.

J. T. WILSON. (DEPT. PC),
9 Cotswold Terrace,
Chipping Norton, Oxon. Tel. 0608-3059

● Circle No. 242



MicroMods Ltd.

● Circle No. 243

ASHFORD COMPUTER CENTRE

Most makes of Micros and Accessories supplied. Courses in Computer Programming for the Complete Novice. Free Computer Club most Sundays 10 am — 3 pm. Micro Hospital £25.00 + parts repairs most Micros.

NO REPAIR — NO CHARGE
Write or ring for details

2 STATION PARADE, CLARENDON ROAD, ASHFORD, MIDDLESEX TW15 2RX
Telephone: ASHFORD (Middx) 44955

● Circle No. 244

VDU DESK

TEAK LAMINATE FINISH

Assembly in seconds without tools

Other sizes

TRADE ENQUIRIES WELCOME

£37.97 + VAT WITHOUT TOP SHELF
FOR 24"x24" size
Details available

OFCO LTD
65 TREDEGAR SQ.
LONDON E3 54E
Tel:01-981 7301

● Circle No. 245

SHOPWINDOW

SCIENTIFIC SUBROUTINE LIBRARY

VOLUME 1 —
STATISTICS AND FITTING FUNCTIONS

Mean, standard deviation, normal distribution, partial expectation, Chauvenets criterion, least squares fit to polynomial, least squares fit to an arbitrary function, least squares fit optimised for repetitive fits to same function, covariance matrix, chi-squared statistic, matrix inversion, solution of simultaneous equations by Gaussian reduction and Gauss-Seidel iterative methods.
Manual including full source listings with implementation notes and documentation — Volume 1B (BASIC) £25 Volume 1P (PASCAL) £30 Software in CP/M (8" SSSD) or DEC RX01 (RT-11) Formats £75 + VAT.

MICRO LOGIC CONSULTANTS LTD.
57, Station Rd., Southwater,
Horsham, W. Sussex.
Telephone: 0403 731818

● Circle No. 246

OSBORNE 1

● praxis daisywheel	£425
● NEC/Epson/OKI	£call
● Monitors + cable	£ 99
● OSBORNE	£call
● Games for Osborne from	£19

We specialise in Osborne & hold large stocks of above.
CALL FOR SUPERB PRICES

FRASER ASSOCIATES
Buckingham (02802) 6087

● Circle No. 247

calcsheet78

financial planning and modelling for the CBM 8032 and CBM 8096

NOT JUST ANOTHER SPREADSHEET PROGRAM BUT A COMPREHENSIVE SUITE OF PROGRAMS

IT WILL sense automatically if you have a 32K or 96K machine
IT WILL create dt (TM) data transfer files which can be accessed directly, via the calcsheet78(TM) or word processing programs (eg WordPro)
IT INCLUDES a specimen VAT spreadsheet which will calculate tax paid and received and how much tax due to or from the Customs for each quarter
IT INCLUDES examples of invoicing and book-keeping using the spreadsheet
Concise, comprehensive manual supplied
All this for just £75 inc VAT (plus £1 p&p)
Manual only £5 plus 50p p&p (deductible if calcsheet 78(TM) is ordered subsequently)
Also available: USING VISICALC, a simple guide to the world's most famous spreadsheet program (£5 plus 50p p&p)
Available soon: VICtory over B*A*S*I*C, a programming manual for the VIC20 user
(£2.50 plus 50p p&p if ordered now, £4 plus p&p if ordered after publication)

ESSENTIAL SOFTWARE
4 Fanshaw Avenue, Barking, Essex

● Circle No. 248

MicroMods Ltd.

● Circle No. 249

CAN YOUR MICRO READ THIS?

S 000201 460790

Bar-code identification for . . .

PET/CBM APPLE BBC

Bar-codes give a speedy and error free means of data entry and provide a foolproof method of identification for any item or document. Typical uses include stock control, libraries, filing systems, security & checkpoint verification, point of sale terminals, spare parts identification, etc., etc. Many organisations are adopting bar-coding as a way of introducing computer techniques into the work environment. Already most grocery products are bar-coded at source and many other areas of industry and commerce are following. Bar-codes will soon be commonplace.

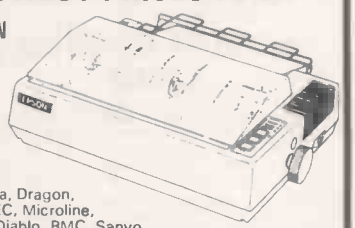
Our system contains all the hardware & software needed to implement a bar-code system on your computer now. Software to print bar codes on an Epson printer is included. More information on request . . . please state your micro & area of interest.

Price £199.00 + VAT

Special systems can be designed . . . contact consultant Lee Allen.

LOWEST PRICES IN UK

EPSON
MX80
FT3



Epson,
Seikosha, Dragon,
NEC, TEC, Microline,
Qume, Diablo, BMC, Sanyo,
Anadex, Centronics, Mannesmann-Tally etc. etc. . . All these famous name computer products and more at guaranteed lowest UK prices. Most can be delivered to your door within 24 hours. Send SAE for full lists or phone for a quote.

ALTEK (PC) 1 Green Lane
Walton-on-Thames, Surrey
Please phone before calling (093 22) 44110

● Circle No. 250

STILL *the lowest prices anywhere*

FLOPPY DISK DRIVES

5¼" TANDON + CDC
Shugart Compatible
SINGLE SIDED–DOUBLE DENSITY £95
DOUBLE SIDED–DOUBLE DENSITY £165

SYSTEMS ENCOTEL

ENCOTEL SYSTEMS LTD, 7 IMPERIAL WAY
CROYDON AIRPORT IND EST, CROYDON
Tel: 01 686 9687/01 680 6040 (6 lines)
Telex: 8951921 ENCO G

● Circle No. 251

INSURE YOUR COMPUTER

Impact damage, Fire & Theft Insurance for your Computer, Equipment:

£1 to £1,500 cover ..... £8.00 p.a.
£10 (excess) x/s

£1,500 to £2,500 ..... £16.00 p.a.
£15 x/s.

For details:

KGJ Insurance Brokers,
6 Hagley Road, Stourbridge,
West Midlands, DY8 1QG
Tel (03843) 5333/2545

● Circle No. 252

KENT MICROCOMPUTERS LTD.

57, Union Street, Maidstone.
0622 52784

Ricoh RP 1600 Printer	£750
Paper Tiger 445 Printer	£275
Kode 43 Printer (teletype)	£595
9" Hitachi B/W V.D.U.	£70
Megastor 8" Drive DS/SD & Interface for Apple II	£1,150
Apple III with extra D/Drive Silent Type, Pascall Visicalc III & Business Basic	£2,450
Apple II Graphics Tablet	£200
Adler P2/64 Alphatronic	£1,800
Adler DRH80 Printer	£500

All prices excluding VAT and for collection from our premises.

● Circle No. 253

The POWER BANK

system compatible sine wave output

Plug your microcomputer, VDU and Printer into the POWER BANK and forget about a disabling break in the electricity supply. This unit will continue to run your system in the event of a mains failure . . WITH NO INTERRUPTIONS TO YOUR WORK!

Vital when running business. This unit will of course suppress MAINS SPIKES and SURGES. Batteries included (sealed for life)
120VA £320.00 and 250VA £450.00 (output) units available

Power Testing (Sales) Ltd
65a Shenfield Rd, Shenfield, Brentwood, Essex CM15 8HA
Tel Brentwood (0277) 233188 Telex 24224586

● Circle No. 254

RGB COLOUR MONITOR

ONLY £99.95 + CARR + VAT

We have on offer a limited quantity of 22" colour monitors with free isolating transformers.

The VMC 22 colour monitor features a 22" Mullard 110°C CRT and is designed to meet the high reliability and performance standards associated with the games and colour graphics industries.

For shipping purposes the CRT and scan coil assembly are separate from the chassis. The lugs of the CRT allow it to be mounted in a standard 22" colour TV cabinet or a unit of your own design. The unit is assembled by plugging the wires from the chassis to the tube, and soldering the input connector, power connector and isolating transformers.

A comprehensive instruction sheet, and manual with circuit board diagrams will be supplied with each unit.

RAM BARGAINS

	1 of	25-99	100.
4116–200ns.	.80	.75	.68
4116–250ns.	.75	.70	.55
2114–300ns.	.85	.80	.75
2114–L–200ns.	.95	.87	.83
4516–100ns. BBC Ram.	3.10	2.95	2.80
4164–200ns.	4.80	4.60	4.20
6116–150ns. C.MOS	4.20	3.95	3.50
2716–5V–450ns.	2.40	2.15	2.00
2716 TRIPLERAIL	6.00	–	–
2732–450ns.	3.95	3.75	3.25
2532–450ns.	3.95	3.75	3.25

Other IC'S available. Add 50p p&p + VAT @10%.

ATHANA FLOPPIES

Minis with free plastic library case and hub rings.

S/S S/D	£17.95 for 10
S/S D/D	£19.95 for 10
D/S D/D	£23.50 for 10
S/S 77 TRACK	£26.50 for 10
S/S 96 TRACK	£28.50 for 10
8" DISCS.	
S/S S/D	£15.50 for 10
S/S D/D	£24.50 for 10
D/S D/D	£25.50 for 10

All other discs available. Add 85p p&p + VAT@10%.

See us at the Northern Computer Fair, Belle Vue, Manchester — Stand 426.
Govt — Educational — + Official Orders Welcome.

OPUS SUPPLIES
10 Beckenham Grove
Shortlands, Kent.
01-464 5040 01-464 1598

ACCESS VISA

● Circle No. 255

SHOPWINDOW

Every computer needs a

CHATTERBOX!

"OK Spock, you win *this* time....

NEW!

SAVE £££s

ONLY £49

for

ZX81
SPECTRUM

NASCOM, VIC, PET, BBC, APPLE, TRS80, IBM, CRAY, ETC. (Please state)

At last! Genuine phonetic synthesis at a sensible price. Gives your computer an *unlimited* vocabulary (nothing more to buy!). Self contained speaker/amplifier, Sinclair connector etc, PLUS Expanslon socket for BIG EARS AND Monitor socket for Music Board. Full instructions, technical notes and programme examples supplied with this outstandlng educational unit.

OR COMPLETE D.I.Y KIT **£39**

DEALER ENQUIRIES WELCOME

As seen on BBC TV "Computer Programme"

BIG EARS

STOP! GO! LEFT! RIGHT!

SPEECH INPUT FOR ANY COMPUTER

Hugely successful Speech Recognition System. complete with microphone, software and full Instructions.
BUILT TESTED & GUARANTEED ONLY **£49**
PLEASE STATE COMPUTER: UK101, SPECTRUM, ATOM, NASCOM2, Vic 20, Micron, ZX80/81, PET, TRS80, MZ80K, APPLE II, BBC MICRO

NEW: FAST MACHINE CODE FOR ZX SPECTRUM £7.40

ZX81/SPECTRUM

MUSIC SYNTHESISER (STEREO)
+ 16 LINE CONTROL PORT

Play 3-part music, sound effects, drums etc. Full control of attack, decay and frequency. Input/Output lines provide control and monitor facility for Home Security, Robot Control, Model Railway etc. etc. Works with or without 16K RAM.

Add keyboard to make a live performance polyphonic synthesiser! Full instructions/software included.

AMAZING VALUE AT ONLY **£19.50** (KIT)
Extra 23 way connectors at £2.60 £25.50 (BUILT)

THE COMPOSER
Music Programme for above synthesiser.
Enter and play 3 part harmony.
Includes demonstration tunes. Recommended £7.40

COLOUR MODULATOR KIT £15
RGB in, PAL/UHF out (not for ZX) BUILT £20

SPECIAL OFFER I.C. £18
SPEECH OUTPUT CHIP SX-01
Phoneme Speech Processor DATA £0.60

Please add VAT at 15% to all prices. Barclay/Access orders accepted by telephone | All enquiries S.A.E. please

WILLIAM STUART SYSTEMS Ltd
Dower House, Billericay Road, Herongate, Brentwood, Essex CM13 3SD, England
Telephone: Brentwood (0277) 810244

● Circle No. 266

Mr. RETAILER (c)

POINT OF SALE SYSTEM

ACCESS COMPUTERS
2 Rose Yard, Maidstone, Kent
ME14 1HN
Telephone (0622) 58356

DISTRIBUTORS ENQUIRIES WELCOME

On Entry of Stock No. Receipt is printed, Stock updated, VAT updated and years bookeeping updated.
Complete system. Special introductory Price: Computer 64K + 700K + Printer +
MR. RETAILER(C) £2999 + vat
or MR. RETAILER(C) £975 + vat

● Circle No. 267

I.C. DESIGNS

I.C.D. SOLVE YOUR I/O PROBLEMS

A range of euro-size I/O boards
100 x 160mm
COMPATIBLE WITH ALL MICROS
Ideal in any control applications.
Connections to the Input/Output system are made from either an eprom socket within the computer or its bus expansion connecter.
48 Bit Parallel Input/Output
Dual Bi-directional Serial RS 232
16 channel 8 bit A/D converter
etc. prices from £76

64 EDWARD ST., MIDDLETON, MANCHESTER.

● Circle No. 268

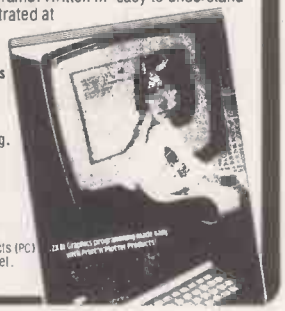
"ZX GRAPHICS PROGRAMMING MADE EASY"

Full Colour A4 Manual, 24 pages packed with ZX Graphics Programming techniques and ideas for games and 'serious' Programs. Written in 'easy to understand' language and illustrated at every stage.

Ideas Include:
Information Graphics
Sketch Pads.
Saving your 'Art'.
Making serious programs interesting.
Graphics Stringing.
ZX Printer Graphics

£1·50
(INCLUDING U.K. POSTAGE)

Print 'n' Plotter Products (PC)
19 Borough High Street.
London SE1 9SE.



● Circle No. 269

OSBORNE 1

● praxis daisywheel	£425
● NEC/Epson/OKI	£call
● Monitors + cable	£ 99
● OSBORNE	£call
● Games for Osborne from	£19

We specialise in Osborne & hold large stocks of above.
CALL FOR SUPERB PRICES

FRASER ASSOCIATES
Buckingham (02802) 6087

● Circle No. 270

MICROCOMPUTER INSURANCE

Comprehensive cover at a reasonable premium:

- All Risks Cover (incl. Transit) — up to £8,000 for £20
- Increased Cost of Working — to reinstate lost data
- Breakdown & Derangement — alternative to maintenance agreement

Write with details of equipment to:

Geoffrey Hoodless & Associates
Freepost (no stamp required)
Woking
Surrey GU21 3BR
Tel: Woking (04862) 61082 (24 hrs)

● Circle No. 271

LOW COST HIGH QUALITY SOFTWARE FOR 32K COMMODORE PET

PURCHASE & SALES CONTROL £80 + VAT
Including new datesort routine. Runs both purchase and sales ledgers to provide a chronological list of receipts and/or payments. VAT calculation from either the net or the gross amount (e.g. on petrol receipts) or VAT amount keyed in. Provides due for payment report at any time and purchase or sales analysis for any period with totals for net, VAT, gross and 99 analysis codes.

INVOICE PRINT ..... £80 + VAT
An add-on for PURCHASE & SALES CONTROL to print invoices laid out according to your own instructions, which you key in on the first run.

STOCK CONTROL ..... £60 + VAT
Stock lists with purchase and selling valuations, re-order list and list of goods needing re-ordering.

NOMINAL LEDGER ..... £60 + VAT
Trial balance, profit & loss, balance sheet and 20 other reports from 1000 nominal accounts.

ADDRESSES ..... £60 + VAT
Select addresses by categories from your mailing list and print labels in pairs. (Labels also available).

Don't be put off by the low prices! Write or phone for details:

Electronic Aids (Tewkesbury) Ltd., Mythe Crest, The Mythe, Tewkesbury, Glos. GL20 6EB.
Tel. (0386) 831020 or (0 84) 294003

● Circle No. 272

SUPERBRAIN QD £1400
10MB INTERTEC DISK £2100
BOTH TOGETHER £3250

Both only 6 months old
Both under maintenance 60 day warranty.
Will deliver.

BUSINESS LIKE SYSTEMS,
20a Grove St., Wilmslow
0625 530915

● Circle No. 273

SOUTHAMPTON

* SUPERBRAIN * COLUMBIA P.C. *
* SIRIUS * LSI M3 *
* PRINTERS - ALL POPULAR MODELS *

BEST PRICES AVAILABLE

PROFESSIONAL INSTALLATIONS FOR:-
* Small businesses * Accountants * Solicitors *
* Estate Agents * Word processing / mailing - applications * Newsagents *

APPLIED COMPUTERS

14/15 Hanover Buildings, Southampton SO1 1JX
Telephone: (0703) 36936 Telex: 477455

● Circle No. 274

BBC SOFTWARE

EDUCATIONAL — 1 (5-9 years) A/B £8.05
EDUCATIONAL — 2 (7-9 years) A/B £8.05
Hours of fun and learning for children. Animated graphics will make children enjoy maths, spelling, clock, memory games etc.
GAMES OF LOGIC AND CUNNING A/B £9.20
For children and adults alike.
SUPERLIFE B £9.20
Fast (machine code) version in a large universe.
UTILITIES A/B £8.05
An assortment of useful procedures:— date conversion, input and validation routines, graphic routines, sorts and many more.

*** SPECIAL OFFER ***
Any 3 cassettes for £20.70

Add 50p p/p per order.
Please state whether Model A or B and quote reference PC12.
Cheque/PO to GOLEM LTD, 77 Qualitas, Bracknell, Berks, RG12 4QG. Tel. 0344 50720.

● Circle No. 275

RAIR BLACK BOX CP/M used microcomputer. Rair maintenance transferable anywhere UK. Wordstar, Mailmerge, Datastar, Supersport, Spellstar, Calcstar, Diagnostics, BSTMS, BSTAM, CBASIC, MBASIC, Pascal MT+SP, COBAL, PL/1, MACRO80, dBASE2, integrated accounts package includes: stock control, invoicing, sales ledger, purchase ledger, nominal & management accounts, payroll. Choice of models: 3/20 64K Twin Floppy Disk with Hazeltine screen, total new list price over £8,500. Bargain £3,750. Plus VAT, or Model 3/30 128K 5 MEGABYTE 2 Hazeltine screen, total new list price over £11,500 bargain £5,750 plus VAT. Tel. London 01-989 0430 anytime.

ICL 1501 Intelligent terminal computer and large printer. Some software £12.00. BBC and Dragon software. Tel. 01-688 8365.

SORCERER 32K. Basic and development ROM Pacs. Video monitor. Two Micropolis disk drives. S100 box. MBASIC, CP/M and Micropolis basic. Documentation. £550. 01-552 6026 (Evenings).

S100 8080 CPU, £40 8" SSSD drives, £45 5V/100A switched PSU £40. T.E.I. S100 micro, twin minidrives, 80 x 24 screen, manual, £950. ASR33 (manuals) £75. Wanted: S100 boards. Chelmsford (0245) 360320.

ZX81, New, for sale, GUARANTEED, £43. Phone BARRY 458 5565.

FOOTBALL POOLS PREDICTOR for BBC micro, A or B. Uses unique mathematical and statistical forecasting methods. On cassette with full instructions, £4.99. MAYDAY SOFTWARE, 181 Portland Crescent, Stanmore HA7 1LR.

8032 SOFTWARE. Wordpro 4+ £185.00. Visicalc £75.00, Petaid £145.00. Quick Sale — Buying House. Simon, Redhill (0737) 60986.

KONG, MUNCHER and DODGEMS — m/c versions of popular arcade games for 16K TRS80/VG. On sale in America shortly but only available in this country from the author, Steve Morris, 44 Park Road, Hull, HU5 2TA. Only £5 each.

FOR SALE 2 No. 8050 Commodore Disk Drive Units (18 months old) good condition, recent service, £695 each. Aldershot (0252) 28015.

APPLE II +, 64K, Disc Drive, DOS 3.3, Pascal System, 12 inch Hitachi monitor, software. £1100 o.n.o. Phone 01-886 5789

MZ80A/K. Business, utility, games, education cassettes, super basic. S.a.e. 38 South Parade, Bramhall, Stockport.

WANTED someone with knowledge of ROBOTICS to help with development of a small computer controlled mechanism and later to assemble limited numbers of the electronics side of the mechanism. An interesting spare-time job. Write, Photo-Control Computers Ltd., 6 Kenton Rd., Harrow, Middx HA1 2BL.

OFFERS invited for surplus PERTEC 9.Track tape transporters, Model T7840/9/12.5 c/w Formatter, Interface and P.S.U. one unit cabinet mounted. One set of four items boxed. Telephone 06076-66539 Day, 0602-392802 Evenings.

ITT 2020, 48K, 2 drives, dot printer, TV monitor, 30 disks, paper. As new. Cost £2,400+ accept £1,000. Tel: 031-337 4248.

NEWBRAIN SOFTWARE Renumber £5.25. Telephone Directory £9.75. Text Editor £9.75. S.A.E. for details. J. M. Mason, 59a High Street, Astcote, Northants NN12 8NW.

Advertisement Index

DATALINK

MICROCOMPUTER SYSTEMS (U.K.) LIMITED

Microcomputer hardware and software for business, educational, industrial and scientific application.

APPLE

WE ARE THE BIGGEST SUPPLIER IN THE WEST COUNTRY

Why? — We're the longest established, the friendliest, the most experienced *AND* we give superlative service and advice.
This adds up to the best deal in Apples you'll find at the most sensible prices.
Give us a call for *all* Apple requirements.

OSBORNE 1

THE MOST EXCITING PRODUCT TO HIT THE MICRO MARKET FOR YEARS!

The fully portable 64K microcomputer, VDU, disks, mains/batteries together with a tremendous software package worth £800 alone!

— *ONLY £1250!* (Ex VAT)

AND LOOK AT OUR SPECIAL BONUS OFFER!
— A FREE 12" Green Monitor and A Box of Top Quality BASF DISKS in a Library Case — WORTH £200!

— ALL FREE WITH EACH OSBORNE!

BASF DISKETTES

Genuine German made First Quality — *FULLY GUARANTEED*

5¼" Single sided, single density, soft sectored £13.50 (Box of 10)
5¼" Single sided, double density, soft sectored £17.50 (Box of 10)
5¼" Double sided, double density, soft sectored £23.00 (Box of 10)

Postage & Packing 50p. Prices Ex. VAT
WE STOCK THE FULL BASF RANGE

STOP PRESS

OSBORNE 1 DOUBLE DENSITY VERSION

Now available £1375 (Ex. VAT)

New Extras Included in Price — UCSD P-System, Read other CP/M Disks including IBM PC & SIRIUS

DATALINKS EXISTING OFFER APPLIES

DATALINK

CRA

MICROCOMPUTER SYSTEMS (U.K.) LIMITED
10, Waring House, Redcliffe Hill,
Bristol BS1 6TB.
Tel: Bristol (0272) 213427

Authorised Dealer and Service Centre for
apple computer commodore COMPUTER

24hr answering service

To: **DATALINK MICROCOMPUTER SYSTEMS (U.K.) LIMITED**
Please send: ☐ Full Price List
☐ Quotations for (please attach details)
☐ Items listed (cheque enclosed)

Name .....
Address .....
.....
Tel No. .....

● Circle No. 230

MIOS- mightier performance for Apple

1·25 Mb (formatted) for only £899

New from Vlasak — the most powerful disk drive for Apple microcomputers at the most competitive unit cost to be produced this year. With years of international systems experience behind us, and on the strength of our long-standing relationship with Apple microcomputers, we have designed and manufactured a disk drive which leaves all others standing. The MIOS disk module — a five-inch trim disk drive for Apple II and /// which holds 1.25 million characters and matches the storage needs of most small to medium-sized businesses. For an incredible £899. This means that by paying only £100 more than for two Apple drives, you get a capacity five times larger.

That's a powerful reason for buying MIOS. Find out more by completing the coupon and posting to the address below.

Fully compatible with:

Apple II	**DOS 3.3**
Apple II	**Pascal 1.1**
Apple ///	**SOS 1.1**

OR

dual floppy

The most powerful disk drive for micros to emerge this year

Training facilities are now available for new dealers

Vlasak Computer Systems

Vlasak Computer Systems, Vlasak House, 8 Stuart Road, High Wycombe, Bucks HP13 6AG.
Tel: 0494-448633.

I would like: further information on MIOS ☐
a demonstration by my local dealer ☐
I would like to become a dealer ☐

Name _____

Company _____

Address _____

_____ Tel. No. _____

299P

● Circle No. 231

The 16-bit Micro

EuroMicro™ SYSTEM Z100

with 8-bit compatibility and colour graphics

All-In-One

EuroMicro's new desktop computer system runs CPM-86 and CPM-80/CPM-85 programs. Manufactured for EuroMicro by Heath-Zenith, the Z100 offers:

From **£1,895**

Microprocessors
8088 for 16-bit power
8085 for 8-bit compatibility
Memory
128 Kb expandable to 768 Kb
Storage
320 Kb to 10 Mb (floppy and Winchester disk)
Operating Systems
CP/M-85, CP/M-86, MSDOS
Multi-user
Up to 8/10 terminals
Graphics
High resolution 640 x 500 pixel
Colour
High definition 8 colour pixel
Communications
2 RS 232 ports, expandable to 10, and 1 parallel port. (IEEE 488 available soon)
Signetics 3661 chip ensures hardware compatible communications with most mainframes
Expansion
IEEE S100 BUS/5 Slots
Power supply
300W switched mode: ensures high stability and regulation
Application Software
Word processing, financial modelling, business management, integrated accounting — all from leading software houses, including PEACHTREE

Exceptional desktop computer power with a flexible and expandable system to meet the business needs of today and tomorrow!

Low Profile

EuroMicro's ANSWER TO HIGH PERFORMANCE AND FLEXIBILITY

EuroMicro™ SYSTEM M8/16

- 8088 8MHz for CPM-86/MPM-86
- 8085 5MHz for CPM-80/CPM-85
- 10 MHz Static Memory
- IEEE S100/20 slots
- MPM-86
- CPM-86
- CPM-80
- Disk options 5" or 8" floppy or winchester
- Options include:
  IEEE488 interface
  ADDA
  EPROM blowing/emulation
  Colour graphics

WE'VE been quietly busy developing a range of computers that will allow rapid development of software for CPM-86. The EuroMicro M8/16 will support up to 7 CPM-86 users in an MPM-86 environment.
AND
For those who have an investment in CPM-80 software, we've thoughtfully provided a second processor to run CPM-80 programs as well.
IN FACT you can run any combination of up to 7 CPM-80 and CPM-86 tasks simultaneously, each user having their own environment.

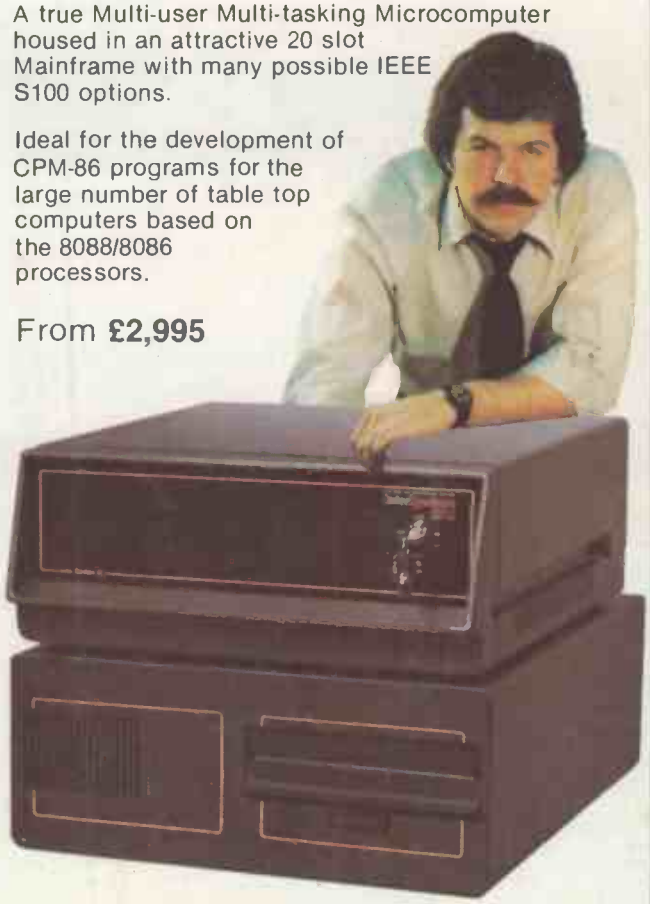
For details call **01-341 2447**

EuroMicro™

A true Multi-user Multi-tasking Microcomputer housed in an attractive 20 slot Mainframe with many possible IEEE S100 options.

Ideal for the development of CPM-86 programs for the large number of table top computers based on the 8088/8086 processors.

From **£2,995**



EuroMicro Limited
EuroMicro House, Coleridge Lane, London N8 8ED. England
Telephone: 01-341 2447

Prices shown are exclusive of VAT