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Volume 7
Number 1
March 1989
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Archimedes and Z88

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*Hidden features of
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Z88 PRINTING

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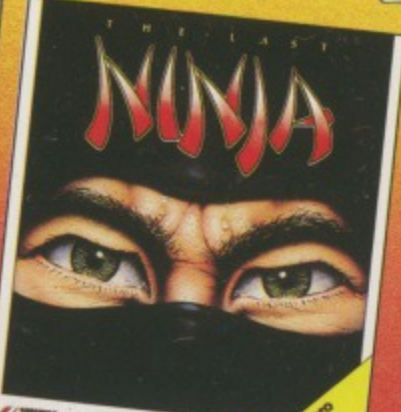
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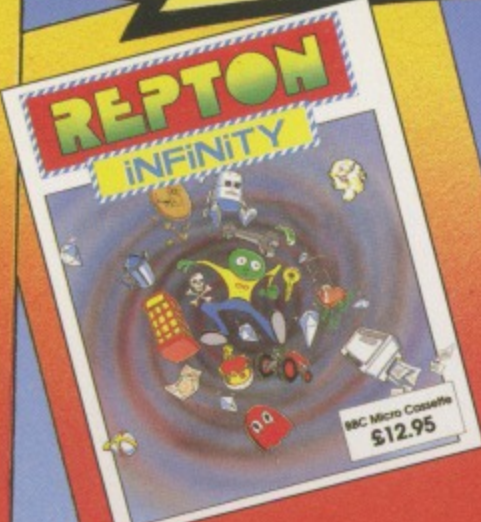
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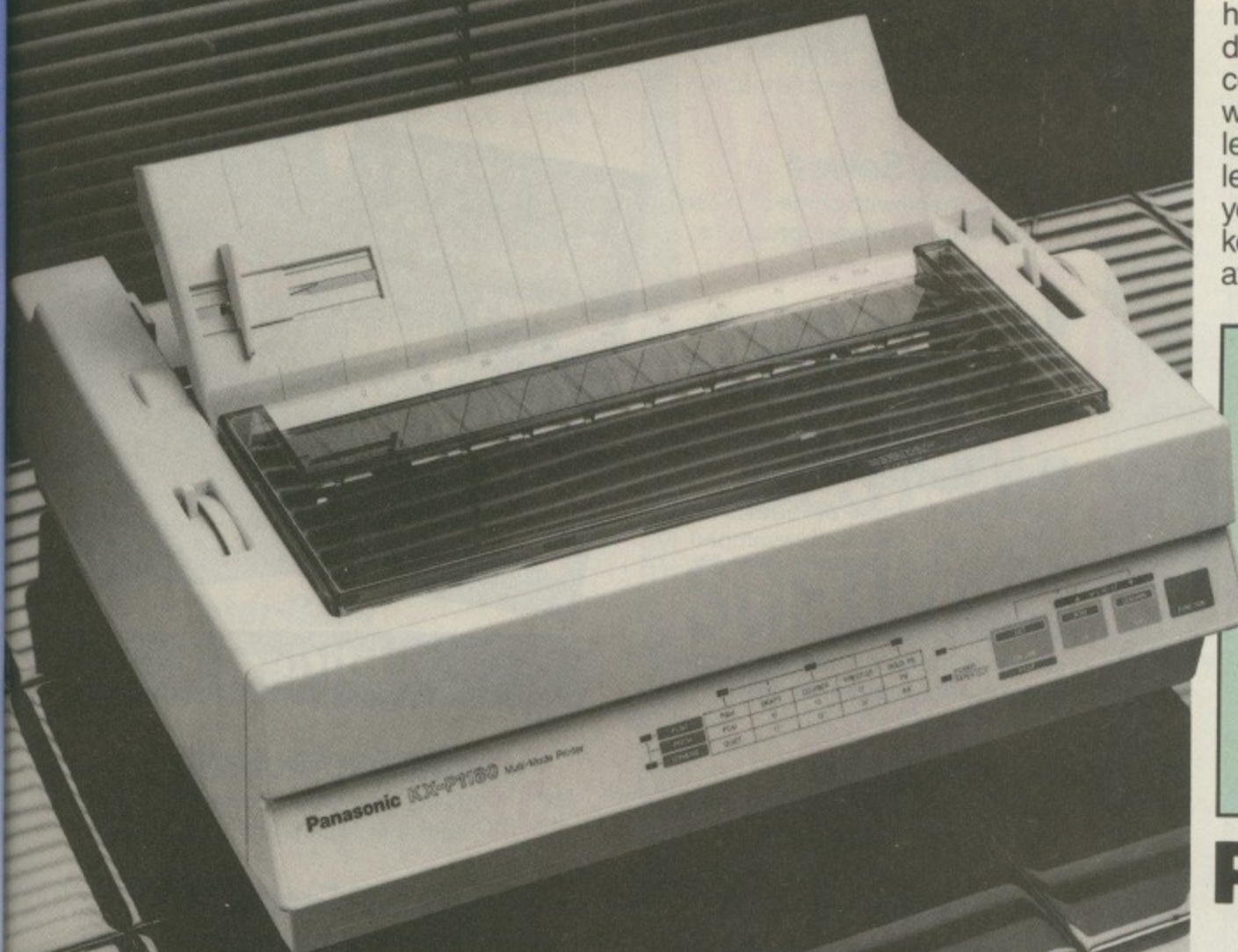
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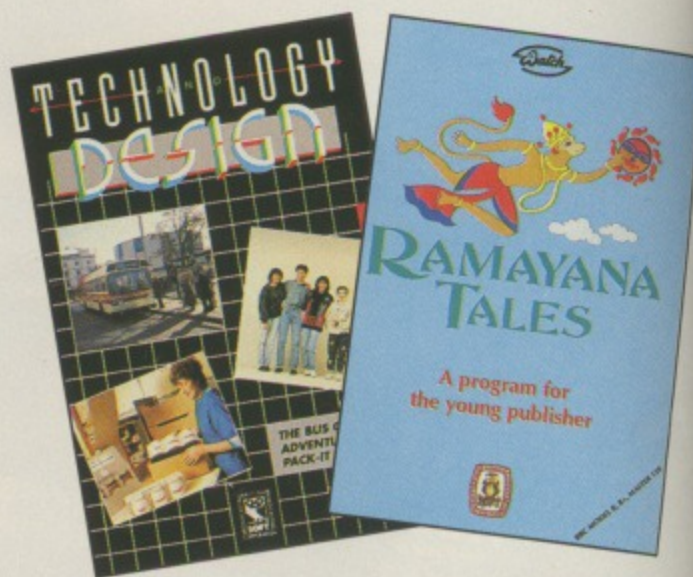
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Want to find out how fast a car is going or the speed of a snail? Our handy utility for either the BBC Micro or Z88 can help you. Whether you're making a scientific study or lobbying your MP about traffic problems, you can give your facts micro-accuracy. Just turn to Page 21.

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MICRO USER CLASSIFIEDS

The best bargains in the world of the BBC Micro come from fellow readers of *The Micro User*. Turn to **Page 136** to find just what you're looking for — from cheap modems to complete computer systems.



For full details of how to use the Checksums, see the article on Page 48 of the February 1989 issue of *The Micro User*.



The Type-it-in symbol indicates that the feature contains at least one full length listing for you to key in on your micro.

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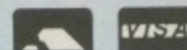
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NEWS *beat*

Euro market printers safe, says distributor

A WARNING from a major manufacturer that "grey imports" of two of its most popular printers may be unsafe has been dismissed as scaremongering both by a leading distributor involved and a technical expert.

The models in question are the Star LC-10 and LC-10C, both extensively used with BBC Micros in schools and colleges.

Star Micronics UK recently warned its dealers to be on the look out for printers designed for the European market, but brought into the UK instead.

Although almost identical, these machines differ in being fitted with 220 volt power supply with a 10 per cent plus or minus variant instead of the UK 240 volt.

"Safety is the main concern that worries me", said Roger Bayley of Star. "These grey imported printers will run hot, and there is the faintest chance of one of them catching fire in the event of a power surge. This would do untold damage to our reputation".

While stressing that the



Malcolm Jamieson . . . "They're not dangerous"

practice of unofficial import and sale of Star printers is not illegal, Bayley has suggested that anyone with a grey import should return it.

However Bayley's comments were dismissed as sour grapes by a leading unofficial

distributor. "What is really behind this is that we are able to sell these machines at much lower prices than Star's official dealers", said Malcolm Jamieson, the managing director of Crown Computer Products of Burscough, Lancashire.

"Our company imports the NX1000, the European badged version of the LC10. And we have sold these extensively, not only to the man in the street but also to schools and colleges through our newly-formed education division.

"We are quite confident that the machines run perfectly well on UK voltage and in no way could be considered dangerous.

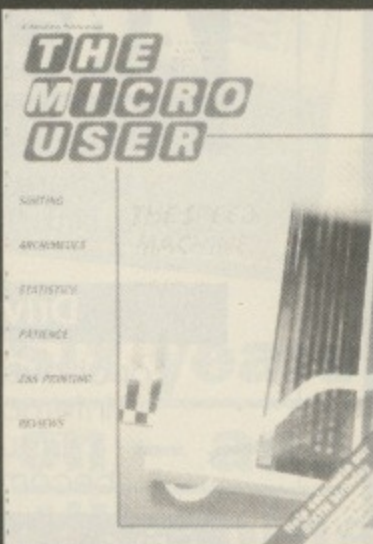
"All our units carry a full English manual and instructions together with a full 12 month return to base warranty. Naturally the consumer should beware of anything less than this being offered as it may suggest they are converted machines".

The Crown boss also hit out at the term grey imports. "This is a phrase that has been coined to cast doubts on what are really legitimate direct importers", he said.

Consulted on the safety aspect of the direct imports, Mike Cook, technical editor of *The Micro User* and senior lecturer in physics at Manchester Polytechnic, came down heavily on the side of Crown.

"I'd eat my hat if there was any cause for concern because a printer had a 220 volt power supply as opposed to 240 volt", he said. "It simply doesn't make a scrap of difference - to safety or anything else".

W.H. Smith goes for



FROM Glasgow to Gloucester and Bournemouth to Blackpool, *The Micro User* is featuring in a national promotion at 140 branches of W.H.Smith.

It has been selected from 20 leading computer magazines to underline the quality and depth of the retail giant's stock of titles.

For three weeks up to March 6 the cover of this issue is on show in special window displays at the cream of the group's High Street stores - its "three window" branches.

"We chose *The Micro User* because it is one of our top selling magazines and we felt it was the best title to promote our range of computer publications to the public", said retail news buyer for W.H.Smith, Nigel Perris. "We are delighted to feature it in our windows".

Technomatic expands

COMPUTER systems and peripherals supplier, Technomatic

Limited, has moved to new larger premises in Church Lane, Kingsbury, London NW9. The move to Kingsbury from Dollis Hill is due to the company's continued expansion. Said Director Jay Mehta: "We simply outgrew our previous location."

The new building, Techno House comprises 10,000 sq ft with ample car parking available. Besides better warehousing and office facilities, Technomatic now has a large computer demonstration area for customers. "We are extremely pleased with the new offices and I am confident that we will be able to offer an even better service to our customers".

Take a Risc

SYSTEM DeltaPlus from Minerva Software (0392 437756) will now operate with the Acorn Risc OS. It has been upgraded and is supplied with a re-written manual. Price £79.95.

The Risc OS upgrade itself contains a utility which will make existing Minerva business software run correctly.

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NEWS *beat*

A real fun day for Theresa



THERESA Elliot has cancelled plans to buy a home computer for her daughters after a New Year stroke of luck.

The housewife from Honour Oak Park, London, was presented with an Archimedes after scooping first prize in a Great Monument Grand Draw organised by the Muscular Dystrophy Group and supported by Acorn Computers.

Research into muscular dystrophy will be funded by money from the draw which was held as part of a Great Monument Fun Day. A total of £20,000 was raised by

the event which started at the Houses of Parliament and took in 14 monuments and well known buildings in London ending at The Burgers of Calais on the Embankment. Over 1,600 children from 21 schools took part.

Theresa was presented with her prize in front of The Monument in London before a reception at Bill Bentley's Monument Restaurant.

With Theresa in our picture is Vikki Lawrence (left), from the Muscular Dystrophy Group, and Jane McAteer representing Acorn.

New vocational software

VEHICLE repairs, horticulture, catering and hairdressing are some of the jobs covered in a new set of vocational software packages for the BBC Micro from Computer Training Services (021-233 3465).

Computers? No Problem! is the name of the series designed for first time users to build confidence both in personal and computer skills.

Material is presented in an easy-to-understand format using cartoons and humour to illustrate points. Software pack £113.82 (including postage and packing). Back-up manuals £28.45.



"THE independent magazine that helps you make the most of your micro". That was the claim for *The Micro User* when it was launched in March 1983 and it still holds good six years on.

Turning back the pages in this sixth birthday edition, our first issue broke the news that sales of the BBC Micro had reached 11,000. Acorn was looking forward to going into Europe and planned an aggressive drive into the education market in America.

Later that year, *The Micro User* told readers of Acorn's new micro, the Electron, due out in June. It was hoped to sell 50,000 by Christmas.

August, 1983 brought news of the first Micro User Show in Manchester. It attracted 12,500 visitors and there were plans to take it round the country.

Our first birthday issue hit a high note with the BBC Micro taking the US market by storm. More than \$50 million worth of business had been done there in the previous six months.

In 1984, we reported a critical shortage of chips facing manufacturers of BBC Micro add-ons who were being forced to pay double the normal price.

Acorn won the Queen's Award for Technological Achievement and the Queen saw inside a BBC Micro when she opened Cambridge Information Technology Centre.

Sir Clive Sinclair claimed

Six years on – and still going strong

that his QL would topple the BBC Micro from its top spot in education, and Acorn was poised to sell into Russia.

The second birthday issue dropped the first hints of a new enhanced model of the BBC Micro, and in a special birthday competition we offered a gold plated model.

Olivetti acquired 49.3 per cent of Acorn as part of an £18m rescue package and after losing £6 million at its previous attempt, Acorn was poised for a second trading assault on the USA.

In July, 1985, *The Micro User* broke the news of secret talks on an upgrade kit to convert the BBC Micro into B Plus.

The following month, this model went on the market priced at £499.

Mid 1985, electronic graffiti was a problem for micro users logging on to bulletin boards and in September Acorn unveiled its 32 bit workstation – the Acorn Cambridge – rapidly followed by a 128k version of the BBC B Plus.

By March 1986, sales of the Master series had exceeded

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Inequalities, eg $10x + 7 > 2(x - 3)$

Linear Equations, eg $5x + 4 = 0$

● Finds the Value of Formulae by the Method of Substitution, eg Find $5x^3 - (4x + 5)$ When $x = -3$

● Changing the Subject of Equations, ● Common Factors,

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For example, a standard problem might be to differentiate $\sin(\cos(6ax+1))$, or, harder, to integrate $\arctan(x)$.

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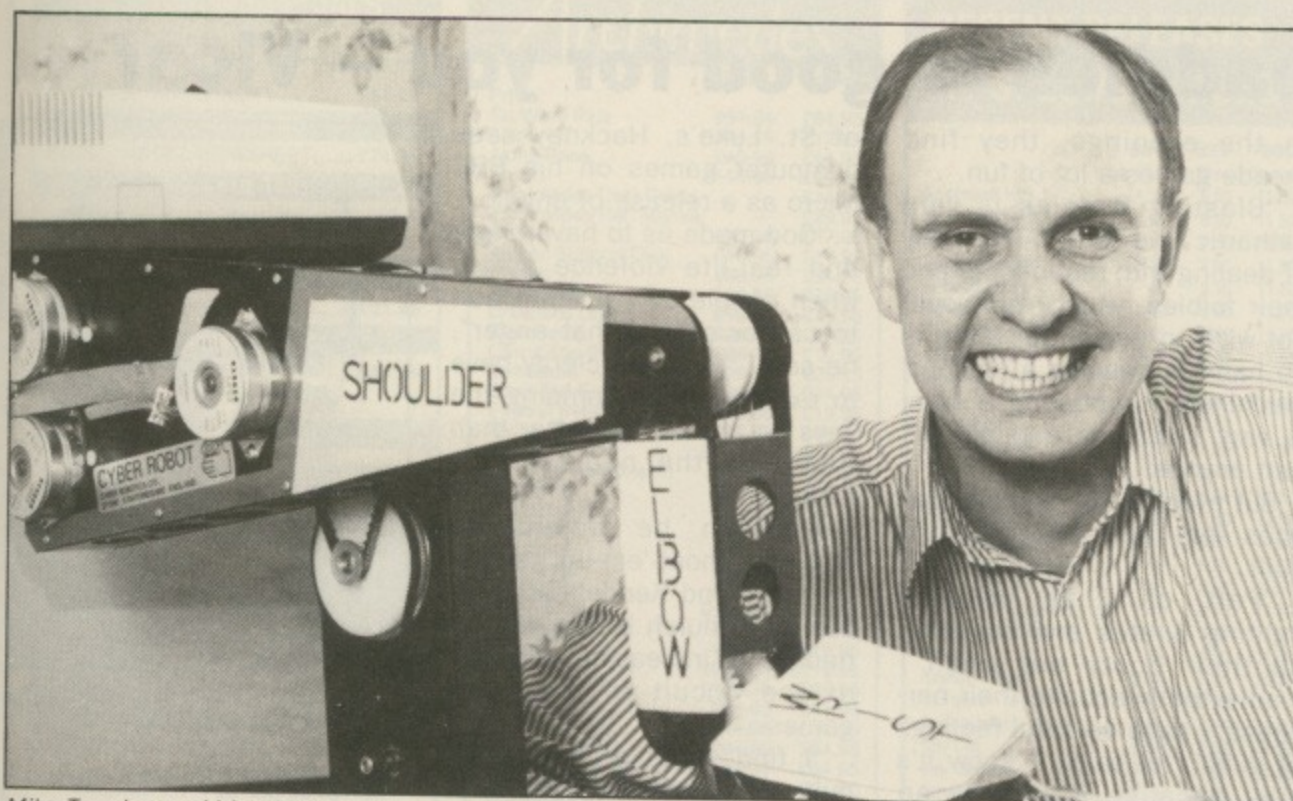
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NEWS *beat*



Mike Topping and his winning entry

POLIO victim Mike Topping's success in *The Micro User* 1988 Innovation Awards has brought him £30,000, a full time job and the chance to achieve a life's ambition.

Mike's winning entry was a robotic feeding arm which works with the help of a BBC B or Master. As a result of the competition, it will now become a workable reality and could be used by 11,000 disabled adults throughout the country plus children in special schools and the elderly in hospital.

Success follows Innovation Award

GEC Control Systems of Kidsgrove has given Mike £15,000 worth of technological assistance by producing a prototype "black box" which will enable his device to be used by the severely disabled — even those without limbs.

After the Innovation Awards

success, National Westminster Bank and the New Moorgate Charitable Trust in London have each donated £5,000.

When Kevin Perryman, editor of Munich-based magazine *Spotlight*, saw the robotic arm at the Electron & BBC Micro User Show he was so impressed that he made a collection in his office and sent Mike £500 plus the promise of a feature in his publication.

JCB Diggers of Uttoxeter has given £1,000 and a further £500 has come in from Brownie packs, churches and other organisations in Mike's home town of Newcastle, Staffordshire.

Success in the awards has brought personal rewards for 40 year-old Mike. "Since I graduated from Keele University last May, I had been doing unpaid work for CASE, Computer Applications for Special Education", he said.

"I won the competition on Sunday and went to see the Vice Chancellor on Monday. He was really very pleased with the result and offered me a paid job as a research fellow. The competition did that for me".

compatibility for the BBC Micro with its Co-Pro Adaptor and rumours on a new 32 bit machine grew.

The rumours bore fruit in **August 1987** when the Archimedes was unveiled. Hailed as the world's fastest micro, its target was six figure sales in the first year.

But November brought a setback in Acorn's finances with a loss of £1.38 million.

The Micro User's fifth birthday issue included news of a coup for Acorn to install 40 Masters and 128 BBC Micros in Japan's Ministry of Foreign Affairs.

New boss Harvey Coleman was formulating his plans to take the company forward into the 1990s.

Cut price Arc plan denied

ACORN has discounted rumours that a new low cost Archimedes is in the pipeline.

Michael Page, the company's communications manager, told *The Micro User* that the 310 is the most popular entry level machine with many first time users already opting for its extra facilities in preference to the 305.

Because of this Acorn feels there would not be the market for the rumoured 205 series.

Speaking at the British Education and Training Technology Show at the Barbican Centre, Mr Page said there was no precedent to show that a low budget machine would sell and denied suggestions that a £399 Archimedes could be on the market by the summer.

Fresh fonts

TWO new font discs are now available for Fontstyle from Database Publications. Capersoft of 36 Deburgh Road, Wimbledon, London SW19 1DU has brought out discs for text and display fonts and has also developed Fontstyle for the Archimedes.

The font discs sell at £4.95 for one or £7.95 the pair.

ABC upgrade

DABS Press (061-766 8423) has released version two of ABC, its Archimedes Based Compiler. The upgrade now provides greater compatibility with BBC Basic V.

Price: £99.95. Free upgrade for registered users.

The Arc only

REAL Time Solids Modeller from Silicon Vision (01-422 2274) reviewed in the January issue of *The Micro User* is only available for the Archimedes at a price of £89.95.

For BBC Micros, it has the name of Realtime Graphics Language and sells for £49.95.

From Page 9

target by 30 per cent but there were stories of bogus BBC B Plus machines being sold in a nationwide swindle.

Headmasters in 90 schools were warned about copying protected software programs on classroom micros in May 1986 and by August that year there were the first rumours of a new super-powered 32 bit machine from Acorn.

After two years of financial problems, Acorn was reported back in the black with a £298,000 operating profit for the first six months of that financial year.

A technical breakthrough by Watford Electronics opened up IBM PC

NEWS *beat*

Blasting baddies is good for you – Vicar

VIOLENCE, warfare and theft are alien to the godly man but increasing numbers of the clergy are using shoot-'em-up adventure games to unwind after long days preaching the gospel.

Even pop star Cliff Richard resorts to combat games that are the opposite of his on-stage peace message.

A keen exponent of this preachers paradox is the Reverend Bob Redrup, vicar of the parish of St Kea near Truro.

He uses his BBC Micro to trade his way across the galaxy with Elite, blasting aliens and stealing their plunder.

"I think a lot of clergy need a hobby to get rid of their accumulated frustrations", he said. "Many of them are into using micros for their parish work but

in the evenings, they find arcade games a lot of fun.

"Blasting baddies is very cathartic", he said. "After a day of dealing with real people and their foibles, which you would not wish to denigrate, there is no harm in bashing a piece of machinery. Clobbering a pixel is very satisfying and doesn't hurt anyone".

But even on the screen, Bob does feel the odd twinge of guilt.

"Part of Elite involves fighting pirates and scooping up their booty but when I inadvertently acquire their narcotics, I have dreadful feelings of guilt", he said. "I know it's silly because it is only an arcade game, but the natural revulsion is still there".

The Reverend Brian Snelling

of St. Luke's, Hackney sees computer games on his BBC Micro as a release of anger.

"God made us to have anger and real-life violence erupts when people do not know how to use or control that anger", he said. "Even the clergy have to express this. Thumping the keys on a micro is better than thumping the nearest parishioner".

Although he admits to enjoying shoot-'em-up games, the Reverend Kendall Down of the Free Church in Rhyl is worried about increasing evidence of the occult in computer games.

"I find some of the ethics quite wrong in adventures that have occult overtones", he said. "I can disassociate reality from the screen with a lot of



The Rev Bob Redrup... "clobbering a pixel is very satisfying"

adventure games, but I certainly think that those leaning towards the occult are dangerous".

Disc wins top award

CRUCIAL issues threatening rural areas are featured on the BBC Countryside disc which has been awarded top prize in the education category at the British Interactive Video Association's annual dinner.

Although this is an educational disc, it is designed to extend beyond schools.

At the launch of the disc, Junior Environment Minister Virginia Bottomley said: "I hope this information will be used by large numbers of people in the town and country to gain an understanding of the crucial issues facing the future of our countryside".

The disc was sponsored by British Gas, the Countryside Commission, the Department of the Environment, the Ernest Cook Trust, the Economic and Social Research Council and National Farmers Union.

It was produced by the BBC Interactive Television Unit and is published by BBC Enterprises, Education and Training.

Price £339.

Business welcomes Euro Show

A STRONG contingent of companies actively involved in the BBC Micro and Archimedes markets is heading for the first European Computer Trade Show.

Flying the flag for Acorn products at London's Business Design Centre from April 16 to 18 will be Watford Electronics, Superior Software, Mandarin Software, Domark and Audio-genics.

With three months to go, the unique event is already an assured success. An update reveals:

- More than 50 exhibitors confirmed – including big names from the USA, Germany, Spain, Sweden and Switzerland.

- All the mezzanine floor stands at London's Business Design Centre now sold.

- 50,000 ticket registration forms on their way to leading industry names throughout Europe and the USA.

- Star-studded speaker line-up for show seminars involving key industry figures from the USA,

UK, France, Sweden, Greece, Switzerland, Italy and Holland.

- Major American trade presence expected. US personalities to include Larry Foster, the man who controls the purse strings of the world's largest retailer, Egghead Software, and Glen Ochsenreiter, director of Waldenbrooks, the 500-strong store group.

- US Software Publishers Association to attend to seek out European opportunities for its 2,000 members.

- International network of 12 agents in place and promoting the show.

"The computer industry has reacted in the most positive way possible to this event – by voting with its feet", said Michael Meakin, head of organiser Database Exhibitions (0625 879970).



Rumours nailed

MICHAEL Page of Acorn has discounted reports that the new Risc OS due on the Archimedes at the beginning of April is not multi-tasking.

He stressed that it has collaborative multi-tasking so long as programs used are designed for it.

It has also been reported that PipeDream will not work on Risc OS. The claim has been refuted by Colton Software (0954 211472).

Its technical director, Mark Colton, told *The Micro User*: "We have thoroughly tested PipeDream under Risc OS and it runs without any problems".

Perfect plus

USERS of desktop publishing package Pixel Perfect now have the opportunity to upgrade from BBC B and Master ranges. AVP (0291 625439) has made the software available on the Archimedes.

Features include flexible page making, wysiwig – what you see is what you get – print out and full use of sprites.

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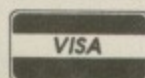
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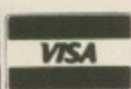
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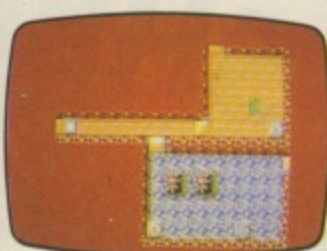
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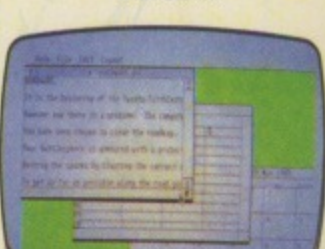
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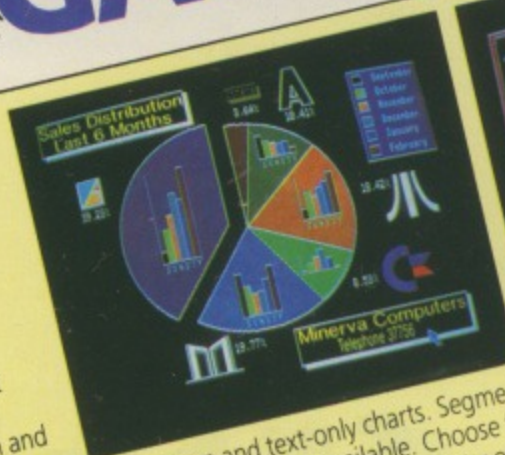
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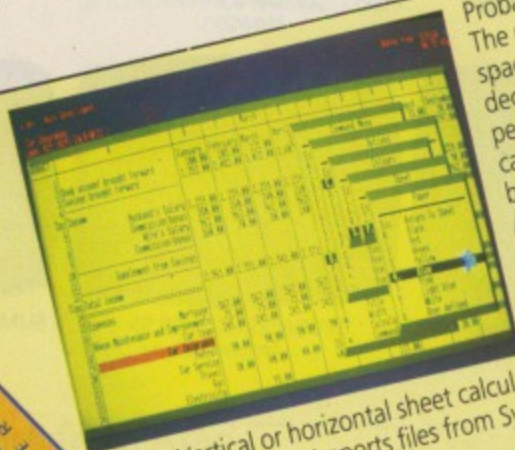
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First type both programs into your BBC Micro and use the checksums to ensure they are entered correctly. If you are using a Z88 make the changes shown in Panels I and II before transferring the routines over.

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When you have taken enough readings for your sample, press Escape to save the data to a file – called speeds. The GraphIt program is chained

Turn to Page 23 ►

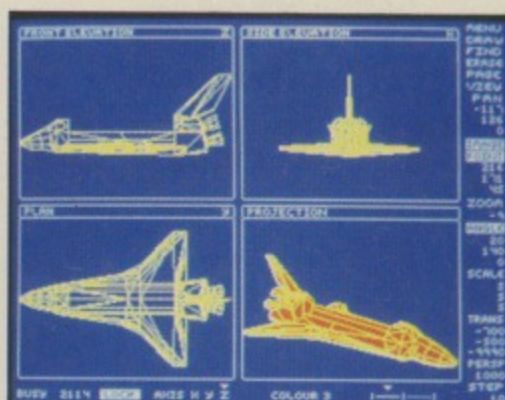
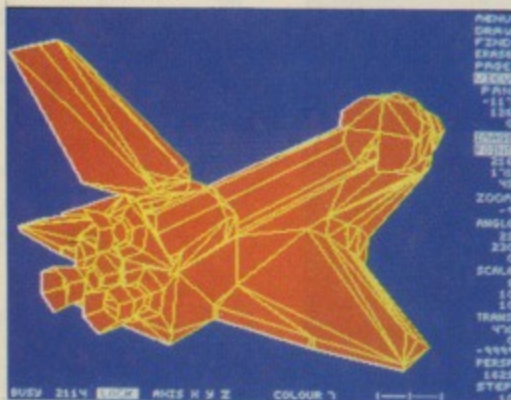
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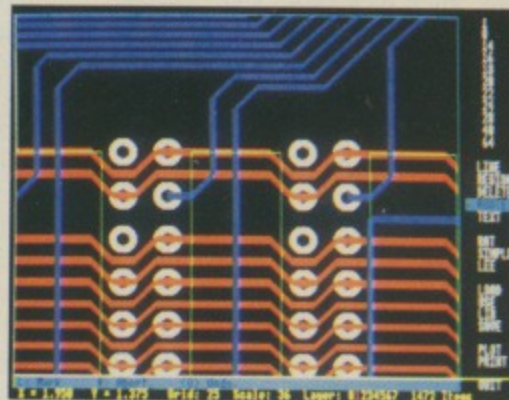
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Speeder changes for Z88

Alter the following lines for the Z88 version:

```
40 *NAME SPEEDER
330 AS=CHRS(1)
345 CLS
350 PROChead(" CAR SPEED TIMER : ")
):REM 5 SPACES
400 VDU12,1,55,35,49,52,32,90,40,129
405 VDU1,55,35,50,33,33,49,39,131,12
425 PRINT AS;"212"
426 PROChead("CAR SPEED TIMER")
435 PRINT AS;"211";AS;"S"
480 VDU1,70:PRINTMS:VDU1,70
510 PRINT TAB(0,0)AS;"R ";HS+" ";AS;"R"
540 VDU1,50,73,56,1,127,1,67,1,83
and delete line 450.
```

GraphIt changes for Z88

Alter the following lines for the Z88 version:

```
260 IF A(IX)>=8-row% PRINT;DS; ELSE FOR
J%=1TO2:VDU32-63*(row%=7):NEXT
290 PRINT"A B C D E F G H I J K L M N O
P Q R S T";
300 PRINTTAB(56,0)HS"CAR SPEEDS DISTRIBUTION";HOS
340 PRINTTAB(34+12*(IX),J%+1)CHRS(59+5*I
%+J%)"=";25*I%+5*J%-30"-25*(IX-1)+5*J%-
1" mph"
500 CLS
510 NX=20
520 *NAME DISPLAY
530 DS=CHRS255
540 VDU1,138,61,65,159,159,159,159,159,1
59,159,159
542 VDU1,138,61,66,190,190,190,190,190,1
90,190,190
544 DS=CHRS1+CHRS130+CHRS63+CHRS65+CHRS1
+CHRS130+CHRS63+CHRS66
546 HS=CHRS1+"R "HOS=" "+CHRS1+"R"
and delete lines 210 and 310.
```

◀ From Page 21

automatically and this will plot the results in a simple bar chart. Depending on the number of observations taken and their spread, the graph is automatically scaled to accommodate all the data.

There are a couple of very important points to bear in mind when using the programs:

- Always make sure that you are viewing the traffic from a safe place, preferably well away from the road. Choose a spot that is both safe for you and for the motorists.

- If the results are to be reliable, you should make sure that you are not visible to the motorists. Any driver who sees someone by the

SPEEDER MAIN PROCEDURES

err	Detects Escape and saves Speeds file — or ends program and reports error
instns	Opens data file and gives instructions
screen	Sets up input screen with on-screen instructions
measure	Detects key presses and calculates speeds
form	calculates speed in different units m/s, km/h and mph
reset	Resets machine and clears screen on exit

GRAPHIT MAIN PROCEDURES

init	Sets up defined characters for display of bar chart
read	Reads data from speeds file and sorts into 5 mph classes
scale	Scales Y axis if number of readings in class exceeds 8
display	Plots histogram

side of the road with a micro or black box is likely to slow down.

The programs were originally written for use on the Z88 and the true portability of the machine comes into its own in a use such as this. However if you have a mains supply within sight of a road they work equally well on a BBC Micro, and the core versions listed are for that.

```
10 REM Speeder
20 REM by G.J. Monney
30 REM (c) The Micro User
40 MODE7
50 ON ERROR PROCerr
60 PROCinstns
70 PROCscreen
80 REPEAT
90 PROCmeasure
100 UNTILFALSE
110 END
120 DEFPROCmeasure
130 A=GET:TIME=0
140 PROCflash(TIMING ...)
150 A=GET:tim=TIME
160 tim=tim/100:s=dist/tim
170 speed=FNform(s,1):speedk=FNform(s,
3.6):speedm=FNform(s,2.237)
180 IF speedm>99 THENVDU11:PRINT Read
ing ignored:GOTO210
190 PRINT"ch%,speedm
200 VDU11:PRINT"Speed: ";speed;" m/s :
";speedk;" km/h : ";speedm;" mph"
210 ENDPROC
220 DEFNform(X,C)
230 =(INT(X*C*10+.5))/10
240 DEFPROCerr
250 ON ERROR OFF
260 CLOSE#0
270 PROCreset
280 IF ERR<>17 REPORT:PRINT at line
;ERL:END
```

```
290 PRINT"Data saved as the file "s
peeds":D=INKEY(200)
300 CHAINGraphIt
310 ENDPROC
320 DEFPROCinstns
330 "X%=820105
340 ch%=OPENOUT("speeds")
350 PROChead("CAR SPEED TIMER")
360 VDU28,0,23,39,2
370 PRINT This program measures car s
peeds.
380 PRINT Please enter the distance i
n metres over which the car speeds are t
o be measured: ;
390 INPUT"dist
400 CLS
410 ENDPROC
420 DEFPROCscreen
```

```
430 PRINT Press any key to start
/stop ESC to end
440 PROChead(RESULTS)
450 VDU28,0,23,39,8
460 ENDPROC
470 DEFPROCflash(MS)
480 PRINTCHRS88MSCHRS889
490 ENDPROC
500 DEFPROChead(HS)
510 FORI=0TO1:PRINTCHRS881;CHRS89D;CHR
S883;CHRS88D;;PRINTTAB(19-LENHSDIV2);HS:
NEXT
520 ENDPROC
530 DEFPROCreset
540 VDU28,0,23,39,2
550 CLS
560 ENDPROC
```

10 = 00	140 = 621D A	270 = EDFA F	320 = 55C4 2	370 = 8860 9	470 = 61B1 A
20 = 00	150 = B62A 9	280 = 84CA 7	330 = 9213 6	380 = CF9F 3	480 = 3621 4
30 = 00	160 = B152 9	290 = E68C 9	340 = 5735 D	390 = 8CF1 6	490 = ED0F D
40 = 8AFC C	170 = 11B0 7	300 = 323D 2	350 = A18D C	400 = 7A16 1	500 = F2D8 C
50 = 2D1B 5	180 = 7FBF 7	310 = ED0F 3	360 = A331 5	410 = ED0F B	510 = 23FA 1
60 = 3545 6	190 = A2BE A			420 = F5B9 D	520 = ED0F 4
70 = 9538 F	200 = F989 8			430 = 5061 5	530 = 469E 4
80 = BFBA 5	210 = ED0F 1			440 = E028 1	540 = A331 F
90 = 8CC6 9	220 = 24D2 5			450 = 27B 5	550 = 7A16 0
100 = E014 F	230 = 172C B			460 = ED0F E	560 = ED0F F
110 = FD2E A	240 = 24C8 0				
120 = 6160 1	250 = F4C9 B				
130 = 5E0D 5	260 = 9EE3 4				



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FEATURE

◀ From Page 23

```

10 REM Graph It
20 REM by G.J. Monney
30 REM (c) The Micro User
40 PROCinit
50 DIMA(N%)
60 PROCread
70 PROCscale
80 PROCdisplay
90 END
100 DEFPROCread
110 FORI%=0TON%:A(I%)=0:NEXT
120 ch%=OPENIN('speeds')
130 REPEAT
140 INPUT=ch%,s
150 x=1+s DIV5
160 A(x)=A(x)+1
170 UNTILEOF=ch%
180 CLOSE=ch%
190 ENDPROC
200 DEFPROCdisplay

```

```

210 PRINT
220 FORrow%=1TO7
230 PRINT;INT((8-row%)/scale+.5);
240 PRINTTAB(3);
250 FORI%=1TON%
260 IF A(I%)>=8-row% PRINT;D$; ELSE PR
INT;
270 NEXT:PRINT:NEXT
280 PRINTTAB(4);
290 PRINT"ABCDEFGHIJKLMNQRST"
300 PRINTTAB(5,12)H$CAR SPEEDS DISTRI
BUTION;HOS
310 PRINTTAB(5,13)H$ figures in m.
p.h.;HOS
320 FORI%=1TO4
330 FORJ%=1TO5
340 PRINTTAB(10*(I%-1)+J%+1,14+J%)CHR$(59+5
*I%+J%);25*I%+5*J%-30-25*(I%-1)+5*J
%-1

```

```

350 NEXT:NEXT
360 ENDPROC
370 DEFPROCscale
380 max%=0
390 FORI%=1TON%
400 IFA(I%)>max% THEN max%=A(I%)
410 NEXT
420 scale=1
430 IF max%<9 THENENDPROC
440 scale=8/max%
450 FORI%=1TON%
460 A(I%)=INT(A(I%)*scale+.5)
470 NEXT
480 ENDPROC
490 DEFPROCinit
500 N%=810:CLS
510 N%=20
520 REM DEFINE CHARACTER
530 D$=CHR$255
540 H$=CHR$131+CHR$157+CHR$129:HOS=CHR
$32+CHR$131+CHR$156
550 ENDPROC

```

✓ Get it right!

10 = 00	80 = 2F83 2	150 = 8206 1	220 = FC5E 7	290 = 2F1E A	360 = ED0F 7	430 = 176A 9	500 = 4ACF D
20 = 00	90 = FD2E 9	160 = FAFE D	230 = BA96 A	300 = CE11 8	370 = 5EDD 0	440 = 7E27 5	510 = 879B B
30 = 00	100 = 5A9D E	170 = 57FD 0	240 = 5C28 5	310 = E74B 5	380 = 4DCC D	450 = 42F6 D	520 = 0B
40 = DEBB B	110 = 47F4 0	180 = 773 9	250 = 42F6 D	320 = CFF9 3	390 = 42F6 4	460 = C617 4	530 = FD13 E
50 = 6757 1	120 = FD4F 0	190 = ED0F C	260 = 5EA4 2	330 = 1138 1	400 = 881A 2	470 = 2C83 0	540 = DC42 A
60 = B06A 7	130 = BFBA 1	200 = C225 6	270 = 4C8B E	340 = 9100 B	410 = 2C83 9	480 = ED0F 6	550 = ED0F F
70 = F5B9 5	140 = 3BF0 5	210 = 7475 0	280 = 2B7 6	350 = 24BD E	420 = 4D56 F	490 = 344C 4	

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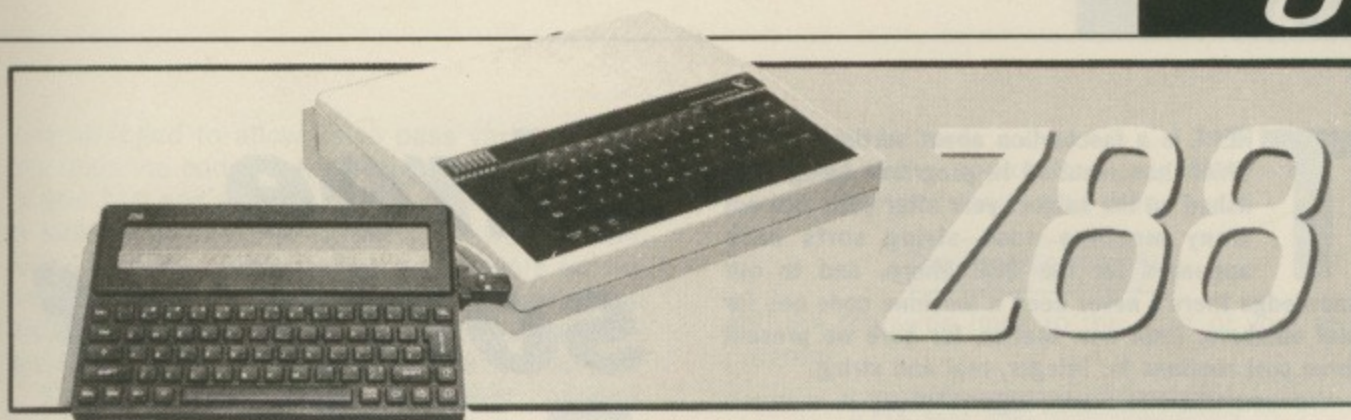
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Accent on the output

In the April 1988 issue of *The Micro User* we explained how to use a printer with your Z88. There was a handy little printer server program that allowed a Z88 to output data to a printer via a BBC Micro. Now let's look at how to use the Z88's PipeDream printer driver from within Basic programs. Why might this be useful? The main reason is all to do with the Z88's portability.

Putting effect codes like underline directly into a program means that it can only be used with one particular type of printer. On a fixed BBC Micro system this is unlikely to be a problem, but a Z88 may be used with more than one printer — say a dot matrix at home and a daisywheel in the office.

By sending all the output through the PipeDream printer driver, changing printer is just a matter of loading a new definition file.

Using the driver is not difficult. First the printer has to be opened in the program in the same way as a file — using the device name :PRT.0 instead of the usual filename, for example:

```
X=OPENOUT":PRT.0"
```

Then use PRINT#X or BPUT#X to send output to the printer. It is worth mentioning that PRINT# on the Z88 is different to the corresponding instruction on the BBC Micro. Each string is sent to the

```
10 REM Using the Z88 Printer Driver
20 REM by John Allen
30 REM (C) The Micro User
40 :
50 REM Open the Printer for output
60 X=OPENOUT":PRT.0"
70 :
80 REM Activate the Printer Driver
90 BPUT#X,5:BPUT#X,ASC"C"
100 :
110 text$="This is some text"
120 :
130 REM underlining and italics
140 PRINT#X,text$+" "+FNP("U")+text$+"
+FNP("I")+text$
150 PRINT#X,text$+" "+FNP("I")+text$+F
NP("I")+text$
160 :
170 CLOSE#X
180 END
190 DEF FNP(AS)=CHR$(5)+AS
```

file or device followed by a Return, rather than in the BBC Micro's internal form.

This means each line sent has to be a single string and in practice this is achieved by converting everything to strings — use STR\$ for numbers — and using + instead of the normal , separator. When you've finished with the printer the channel should be closed like a file:

```
CLOSE#X
```

The printer driver is activated by a series of commands to the VDU drivers. These are always the number 5 followed by an Ascii code. First you must ensure that the driver is active using:

```
BPUT#X,5:BPUT#X,ASC"C"
```

In this case BPUT# is used to send the two bytes because PRINT# would also send a Return. PipeDream printer effects are now possible. Fortunately the codes required are identical to the letter needed after the QP in PipeDream for the same effect. It's easier to define a function to send these codes via PRINT#:

```
DEF FNP(AS)=CHR$(5)+AS
```

Then if, for example, you want to underline, just add FNP("U") to the string at the appropriate place. Remember that an effect will be turned off at the end of a line if that's how it is set in the driver.

As you can see from the example listing there's not much to it at all.

Printer driver commands

	BPUT# form	PRINT# form
Printer driver on	5,ASC"["	CHR\$(5)+"["
Printer driver off	5,ASC"]"	CHR\$(5)+"]"
Underline	5,ASC"U"	CHR\$(5)+"U"
Bold	5,ASC"B"	CHR\$(5)+"B"
Extended sequence	5,ASC"X"	CHR\$(5)+"X"
Italics	5,ASC"I"	CHR\$(5)+"I"
Subscript	5,ASC"L"	CHR\$(5)+"L"
Superscript	5,ASC"R"	CHR\$(5)+"R"
Alternate font	5,ASC"A"	CHR\$(5)+"A"
User defined	5,ASC"E"	CHR\$(5)+"E"

The Z88 has good output facilities. Here John Allen shows you how to use them to best effect

Z88 Software

In this issue there are two other programs for your Z88:

- *Speeder* on Page 21 lets you measure the speed of passing cars.
- *Patience* is a version of the classic card game and is on Page 53.

Both programs are listed for the BBC Micro and necessary changes for the Z88 are given.

Shell sort algorithm is much more efficient than the old bubble sort . . . and acceptably fast

THERE is a fascination about sorting systems which has resulted in programs being published on the subject year after year. But not many machine code string sorts have appeared for the BBC Micro, and to our knowledge there's never been a machine code one for real numbers. Until now that is, for here we present three sort routines for integer, real and string.

We use the shell sort algorithm as it is much more efficient than the old bubble sort and even for larger data lists it is acceptably fast. Because it's not recursive it is straightforward to convert to machine code — no stack is needed to keep track of the loop nesting.

Consequently on the BBC Micro it is relatively easy to make the code relocatable, so that any program can use it without reassembly. Furthermore the Basic version by Phil Bender published in Program Library (October 1988) uses division by 2 instead of the more common logarithmic split of the table to be sorted. This is very much easier to code, so we'll use this sorting algorithm for our present programs.

Next month we'll be looking at a general purpose version plus a program that will sort whole data blocks — immensely useful for databases.

Listing I is the shell sort algorithm for Basic integer arrays. Listing II is designed to be merged with the first to convert it to a string sort. Listing III — also designed to be merged with Listing I — produces a real number sort. All the routines take a similar time — around two seconds for 500 items — and each can be designated as ascending or descending sorts. The string sort can also be set to treat small letters the same as capitals.

So type in each listing in turn, checking them with Get it Right! and saving them to disc as Integer, StringV and RealV. To create the string version follow this sequence:

```
LOAD"StringV"
*SP00L StrAsc
LIST
*SP00L
LOAD"Integer"
*EXEC StrAsc
SAVE"String"
```

Follow the same procedure using RealV to produce the floating point sort routine. Remember, the errors generated as you *EXEC a spooled file into your micro are harmless and do not affect the program in memory.

When you type in the main program, make sure you number the lines as they are printed — in multiples of 20. This is to leave room for the extra

&600	2	Number of parameters passed
&601	21) Address of first parameter
&602	2F) is &2F21
&603	4	First parameter type (integer)
&604	25) Address of second parameter
&605	2F) is &2F25
&606	4	Second parameter type (integer)

An example of two integer variables being passed

Three sorts of Basic

Discover how to put things in order with Peter Vasey

ones entered when converting to string or real sorts and for next month's general purpose routines.

The integer sort

The Basic section of the program sets up and tests the routine. Points to note are the setting of the direction flag and the method of calling the machine code. The variable *dirn* is simply a flag which the machine code needs to determine whether to sort the items into ascending or descending order — zero or non-zero respectively. In a stand alone program you will need either to declare *dirn*=&80 or use ?&80 directly.

The actual initiation of the sort is straightforward. BBC Basic's CALL command is very clever

```
20 REM MACHINE CODE SHELL SORT
40 REM INTEGER ARRAYS
60 REM By Peter Vasey
80 REM (C) The Micro User 1989
100 :
120 MODE7:PROCassem
140 DIMAX(1000)
160 REPEAT
180 INPUT"How many numbers to be sort
ed? "N%
200 PRINT"(A)scending or (D)escending
order? ";
220 REPEATAX=GETAND223:UNTILAX=ASC"A"O
RA=ASC"D"
240 VDUAX:?dirn=0:IFAX=ASC"D" ?dirn=1
260 PRINT"Setting up ..."
280 FORIX=1TONX:AX(IX)=RND(10000)-5000
: NEXT
300 PRINT"Sorting ..."
320 TIME=0:CALLSORT,NX,AX(1):TX=TIME
340 REM FORIX=1TONX:PRINTAX(IX):NEXT
360 PRINT"Time for sort = ";TX/100" se
cs."
380 PRINT"Checking ... ";
400 FORAX=1TONX-1:IF?dirn=0:IFAX(AX)>A
X(AX+1) PROCERROR
420 IF?dirn=1:IFAX(AX)<AX(AX+1) PROCER
ROR
440 NEXT:PRINT"OK"
460 UNTILFALSE
480 END
500 DEFPROCERROR
520 VDU7:PRINT"ERROR AT ";AX:END
540 :
560 DEFPROCassem
580 params=&600:varptr=&604
600 count=&70:gap=&72:items=&74
620 g=&76:j=&78:k=&7A
640 jptr=&7C:gptr=&7E
```


erly arranged to allow us to pass variables into our machine code routines. See your User Guide pages 214 and 446 for further details. It sets up a table of pointers at &600 which we can read from our code. Table I gives an example for two integer variables being passed. The parameter types we are concerned with are integer, real and string represented by codes &04, &05 and &81.

Since numerical arrays are stored consecutively all we need to do is specify the number of items to sort and the first item in the array to be sorted. So:

```
CALL Sort,N%,A%(1)
```

will tell the routine to sort N% items of A%() starting at element 1. You can therefore sort just a section of the array but be very careful not to spill over the end — no check is made on the size and if you exceed the limits you'll corrupt other variables and the array itself.

Be very careful if you try to sort a multi-dimensional array because the way it's stored means that you can only sort certain elements. For an array set up as A%(2,300) you can only sort the second elements. It is as well to do a test run before attempting to program for these more ambitious sorts.

You will see a number of rather odd looking link labels in the code. These are to allow us to load the code anywhere in user ram and run it as it stands — the code is relocatable. All the zero page addresses used are safe. So all we need to do to use the code from any Basic program is to

proceed as follows:

- First RUN the appropriate program module — integer, string or real — and then:

```
*SAVE CODE 900+200
```

Add the following lines to the start of your own program:

```
DIM Sort 350
DIMXX-1:Y%=XXDIV256
SX%="LOAD CODE "+STR$~Sort
CALL&FFF7
```

You can then use the code as before, for

Turn to Page 28 ►

SORTING INTEGER ARRAYS

Integer variables are straightforward. Each variable is stored in four bytes, with the most significant last. Since the value is represented directly, the numbers can be immediately compared. The elements of a single dimension array follow each other directly, so to find the next element we increase the counter by four. Sorting individual elements is then a matter of comparing and if necessary swapping the four bytes pointed to by the array pointers set up in lines 1320 and 1340.

```
660 dirn=&80:swapflag=&81
680 :
700 FORN%=0TO2STEP2
720 PX=&900
740 [OPTN%
760 .SORT
780 LDAparams:CMPI#2:BNEbad
800 LDAparams+3:CMPI#4:BNEbad
820 LDAparams+6:CMPI#4:BEQgood
840 .bad BRK
860 ]
880 SPX=CHR$255+"Bad CALL"+CHR$7
900 PX=PX+10
920 [OPTN%
940 BRK
960 .nosort RTS
980 .good LDAparams+1:STA&70:LDAparams
+2:STA&71
1000 LDY#0:STYgap+1:LDA(&70),Y:STAitems
1020 INY:STYgap:LDA(&70),Y:STAitems+1
1040 BMI bad:BNErepeat1:LDXitems:BEQnosort:DEX:BEQnosort
1060 .repeat1
1080 CLC:LDAgap:ADCGap:STAGap
1100 LDAgap+1:ADCGap+1:STAGap+1
1120 LDAgap:CMPIitems:BNEtequ:CLC
1140 .ntequ LDAgap+1:SBCitems+1:BCCrepeat1
1160 LDAgap:SBC#1:STAGap:BCSrepeat2:DECGap+1
1180 .repeat2
1200 LSRgap+1:RORGap
1220 LDX#0:STXk:STXk+1
1240 SEC:LDAitems:SBCgap:STACount:LDAitems+1:SBCgap+1:STACount+1
1260 .for LDAk:STAJ:LDAk+1:ASLj:ROLA:ASLj:ROLA:STAJ+1
1280 .repeat3 LDAgap:STAG:LDAgap+1:ASLj:ROLA:ASLj:ROLA:STAG+1
```

```
1300 CLC:LDAgap:ADCG:STAG:LDAgap+1:ADCG+1:STAG+1
1320 CLC:LDAvarptr:ADCG:STAJptr:LDAvarptr+1:ADCG+1:STAJptr+1
1340 CLC:LDAvarptr:ADCG:STAGptr:LDAvarptr+1:ADCG+1:STAGptr+1
1360 LDY#0
1380 .forlink BNEfor
1400 .repeat2link BNErepeat2
1420 BEQcompare
1440 .comeback LDAswapflag:BEQnext:LDY#3
1460 .loop2 LDA(jptr),Y:PHA:LDA(gptr),Y:STA(jptr),Y
1480 PLA:STA(gptr),Y:DEY:BPLloop2
1500 SEC:LDAj:SBC#4:STAJ:LDAj+1:SBC#0:STAJ+1
1520 BPLrepeat3
1540 .next INCK:BNEon:INCK+1
1560 .on LDAk:CMPIcount:BNEforlink
1580 LDAk+1:CMPIcount+1:BNEforlink
1600 LDAgap+1:BNErepeat2link
1620 LDXgap:DEX:BNErepeat2link
1640 RTS
1660 :
1680 .compare STYswapflag:LDXdirn:BEQasc:LDX#1
1700 .ptloop LDAjptr,X:PHA:LDAgptr,X:STAJptr,X
1720 PLA:STAGptr,X:DEX:BPLptloop
1740 .asc LDX#4:SEC
1760 .loop LDA(gptr),Y:SBC(jptr),Y
1780 INY:DEX:BNEloop:BVCnoov:EOR#&80
1800 .noov EOR#0:BPLcomeback
1820 INCswapflag:BNEcomeback
1840 ]
1860 NEXT
1880 ENDPROC
```

✓ Get it right!

20 = 00	660 = AAF9 C	1300 = 3AC A
40 = 00	680 = 9719 D	1320 = A514 1
60 = 00	700 = 2395 D	1340 = 6E2 5
80 = 00	720 = C92F 4	1360 = 9B97 B
100 = 9719 9	740 = 6A96 9	1380 = A912 2
120 = D07F 5	760 = 6ACB 5	1400 = 272B 8
140 = A1D7 A	780 = F89C 1	1420 = 7D01 A
160 = BFBA C	800 = D95 4	1440 = EA62 F
180 = D6C5 6	820 = 6881 D	1460 = 9162 8
200 = 8090 C	840 = 6913 5	1480 = 3BCD C
220 = DC4F A	860 = 8B58 8	1500 = 434D 3
240 = 1794 5	880 = 5039 E	1520 = 29AC C
260 = B40E B	900 = 5503 C	1540 = B45D E
280 = D6B5 D	920 = 6A96 1	1560 = CEF8 8
300 = A4CE 1	940 = E2BF 7	1580 = 7747 8
320 = 9FEF A	960 = 5F49 F	1600 = B5FA 7
340 = 0A	980 = 7376 E	1620 = AC80 6
360 = 88B5 4	1000 = 4600 2	1640 = 9843 9
380 = DAB1 7	1020 = 48C0 1	1660 = 9719 0
400 = C20D 3	1040 = E36 B	1680 = 31D9 6
420 = 16E9 6	1060 = AB47 B	1700 = 7290 1
440 = F0CC 9	1080 = F121 E	1720 = A10 C
460 = E014 A	1100 = 1B07 9	1740 = BC63 0
480 = FD2E F	1120 = 67F9 E	1760 = A026 3
500 = 4C1F F	1140 = EB29 6	1780 = E29E 6
520 = BA15 0	1160 = AD44 2	1800 = 5D78 F
540 = 9719 9	1180 = 9B24 F	1820 = 1142 B
560 = 1330 6	1200 = 2591 B	1840 = 8B58 9
580 = 356B 7	1220 = 2F49 F	1860 = 2C83 E
600 = B8FC 3	1240 = 1279 A	1880 = ED0F 0
620 = 3C60 3	1260 = 71E9 4	
640 = 8574 9	1280 = BEA8 1	

◀ From Page 27

example:

```
?&80=0:?&88=1
CALL Sort,N%,AS(1)
```

So there you have it. The only restriction is on the maximum number of items the routine can deal with, which is limited by the two byte signed counters *g* and *j* to 32,767 bytes of data, which allows us up to 8,190 integers or strings and 6,553 reals. This is academic for the standard BBC B, but could be exceeded by the Master using shadow screen.

● Next month we'll look at a general purpose routine which can perform the three types of sort from one block of code. There'll also be a version that can rearrange a table of pointers to items within a data block rather than moving the items themselves – this is the only satisfactory way to deal with sorting a database file. See you then.

SORTING STRING ARRAYS

These would pose a massive problem if the array pointers referred directly to each element, since the elements can be of different lengths. Consequently each time an element was swapped it would be necessary to reallocate memory space and tidy up the store. This would not only slow the sort down considerably, but create a real programming headache.

Fortunately none of this is necessary. BBC Basic keeps track of the location of each string in a separate table of four byte pointers. It is addresses in this table which are swapped – not the strings themselves. This method can be used to sort large blocks of data quickly – we do not move the data in memory, only the contents of the pointer table, which can itself be an array. We will see how this can be used in database sorting next month.

The comparison of strings is considered in three ways. Each letter is compared, ending at the first

mismatch, with a swap flagged if necessary. Ascending numerical order has the lowest number at the top of the list, so with strings we obtain alphabetical order. This is the usual way to sort names, so it suits our purpose.

If both strings are still equal when the end of one of them is reached, the longer string is swapped down the table. A third consideration is important when sorting lists of names. Lower case letters have a higher Ascii value than equivalent capitals, and this can cause problems unless all entries follow the same format – *Jim* will appear before *JOHN*. So there is an option to treat lower case letters the same as capitals by setting the "caps" flag at &88 to a non-zero value.

Null strings are moved to the bottom of the table in an ascending sort. This means that in a descending sort they come to the top. One way to avoid this if you are sorting a table with a lot of null strings in it is to do an ascending sort first. Next search for the first null string and only do the descending sort on the non-null section of the array.

SORTING REAL ARRAYS

Real numbers are more correctly known as floating point variables. Each occupies five bytes, with the first – the exponent – defining the position of the decimal point, or more accurately the binary point, and the remaining four – the mantissa – is the number itself.

Unlike integers, the most significant byte comes first. The numbers are shifted left so that the most significant bit of the mantissa is always one except when the whole value is zero, when the most significant bit is zero. This normalising process is carried out on all real numbers by Basic as it stores them.

A further refinement is that Basic uses the most significant bit for the sign, changing it to zero for positive numbers. When manipulating the numbers for arithmetic operations Basic unpacks the one it is working on into extra bytes in a work area of memory and then re-stores the most significant bit to one. It is all this extra manipulation which makes real

```
40 REM STRING ARRAYS
140 DIMAS(1000)
180 INPUT "How many strings to be sort
ed? "N%
245 PRINT "Treat lower case as upper?
(Y/N) ";:REPEATX=GETAND223:UNTILX=ASC
"Y"ORAX=ASC"N"
255 VDUAX:=?caps=0:IFAX=ASC"Y" ?caps=1
280 FORIX=1TONX:AS="":LX=RND(20)
290 FORJX=1TOLX:AS=AS+CHR$(RND(52)+64)
: NEXT:AS(IX)=AS:NEXT
320 TIME=0:CALLSORT,N%,AS(1):TX=TIME
340 REM FORIX=1TONX:P.AS(IX):N.
370 IF?caps=1 GOTO460
400 FORAX=1TONX-1:IF?dirn=0:IFAS(AX)>A
S(AX+1) PROCERROR
420 IF?dirn=1:IFAS(AX)<AS(AX+1) PROCER
ROR
665 jlen=&82:glen=&83
670 jaddress=&84:gaddress=&86
675 caps=&88:temp=&89
820 LDparams+6:CMP#&81:BEQgood
```

```
1670 .link CLC:BCCcomeback
1740 .asc LDY#3:LDA(gpctr),Y:STAglen:LDA
(jptr),Y:STAjlen
1760 BNEotnull:ORAglen:BEQlink:BNEswap
it
1780 .notnull LDAglen:BEQlink:LDY#1
1800 .addrloop LDA(jptr),Y:STAjaddress,
Y
1820 LDA(gpctr),Y:STAgaddress,Y:DEY:BPLa
ddrloop:INY
1840 .sloop LDA(gaddress),Y:LDXcaps:BEQ
nochange1
1860 CMP#97:BCCnochange1:CMP#123:BCSnoc
hange1:AND#223
1880 .nochange1 STAtemp:LDA(jaddress),Y
:LDXcaps:BEQnochange2
1900 CMP#97:BCCnochange2:CMP#123:BCSnoc
hange2:AND#223
1920 .nochange2 CMPtemp:BCCLink:BNEswap
it
1940 INY:CPYjlen:BEQlink:CPYglen:BNEslo
op
```

```
1960 .swapit INCswapflag:BNElink
1980 ]
2000 NEXT
2020 ENDPROC
```

✓ Get it right!

40 = 00	420 = B87E B	1840 = 3520 E
140 = 19B6 6	665 = 87BB 4	1860 = C53F 7
180 = 7652 D	670 = 1098 3	1880 = C139 1
245 = 70F6 4	675 = D490 4	1900 = 7001 2
255 = D6E4 0	820 = 178C 8	1920 = 2B5F A
280 = C8F9 5	1670 = 60A D	1940 = 9DB7 A
290 = B72C 0	1740 = 8401 B	1960 = FD19 9
320 = 74CC 1	1760 = E926 6	1980 = 8B58 4
340 = 001	1780 = 77A9 0	2000 = 2C83 1
370 = DD57 1	1800 = 3AAC 1	2020 = ED0F 7
400 = 6C9A E		

number arithmetic so much slower than integer arithmetic.

To compare the numbers therefore, we proceed like this:

- Compare the signs and if different, swap as appropriate.
- If the signs are the same compare the exponents and swap as appropriate.
- If the exponents are the same, we compare the mantissae without the msb restored. We don't need the msb — it's like comparing 700088 with 700099 — the 7 doesn't affect

the outcome.

If we did reset the msb we would then have to perform a separate test for zero. Since the numbers are unsigned, we need only compare each byte in turn, working from most to least significant, and flag a swap as required. When flagging the swap we must take into consideration whether the numbers are positive or negative — a large negative number must be sorted above a small negative number in an ascending sort. This is catered for in lines 2000 to 2040.

```

40 REM REAL ARRAYS
140 DIMA(1000)
280 FOR I%=2TON%STEP2:A(I%)=(RND(10000)
-5000)/RND(100):NEXT
290 FOR I%=1TON%STEP2:A(I%)=RND:NEXT:A(
RND(I%))=0
320 TIME=0:CALLSORT,N%,A(1):TX=TIME
340 REM F.IX=1TON%:P.A(I%):N.
400 FORAX=1TON%-1:IF?dirn=0:IFA(AX)>A(
AX+1) PROCERROR
420 IF?dirn=1:IFA(AX)<A(AX+1) PROCERRO
R
670 gexp=&8A:jsign=&8B:gmanthi=&8C
820 LDAparams+6:CMP#5:BEQgood
1270 CLC:LDAK:ADCj:STAJ:LDAK+1:ADCj+1:S
TAj+1
1290 CLC:LDAgap:ADCg:STAG:LDAgap+1:ADCg
+1:STAG+1
1440 .comeback LDAswapflag:BEQnext:LDY#
4

```

```

1500 SEC:LDAj:SBC#5:STAJ:LDAj+1:SBC#0:S
TAj+1
1740 .asc INV
1760 LDA(jptr),Y:AND#&80:STAJsign
1780 LDA(gptr),Y:AND#&80:DEY
1800 CMPjsign:BEQcompexp:BCSswap
1820 .link CLC:BCCcomeback
1840 .compexp
1860 LDA(jptr),Y:CMP(gptr),Y:BEQcompman
t:BNEot
1880 .swap INCswapflag:BNElink
1900 .compmant INY:LDA(gptr),Y:AND#&7F:
STAgmanthi
1920 LDA(jptr),Y:AND#&7F:CMPgmanthi:BNE
not
1940 LDX#3
1960 .rloop2 INY:LDA(jptr),Y:CMP(gptr),
Y:BNEot
1980 DEX:BNErloop2:BEQlink
2000 .not BCSjsig0

```

```

2020 .Jsig80 BITjsign:BMIsap:BPLlink
2040 .Jsig0 BITjsign:BPLswap:BMlink
2060 ]
2080 NEXT
2100 ENDPROC

```

Get it right!

40 = 00	1290 = 1315 D	1900 = C1A6 B
140 = A1E E	1440 = 9A85 4	1920 = 8789 9
280 = CF61 6	1500 = EF2C C	1940 = 9CC4 D
290 = 2BA9 5	1740 = C31D B	1960 = A620 5
320 = C3FF F	1760 = 523D E	1980 = 930B E
340 = 0F	1780 = E051 A	2000 = 57EC C
400 = 5CEE C	1800 = 7403 5	2020 = F218 6
420 = 7604 5	1820 = 60A D	2040 = E019 1
670 = FA99 2	1840 = E1D5 7	2060 = 8B58 3
820 = 83A2 1	1860 = AD34 F	2080 = 2C83 E
1270 = 8E14 B	1880 = 6505 A	2100 = ED0F E



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SOFTWARE SCENE

Question of Sport ... and you may confer

Price: £12.95 (tape), £14.95 (5.25in disc), £19.95 (3.5in disc)
Supplier: Superior Software, Regent House, Skinner Lane, Leeds LS7 1AX.
Tel: 0532 459453

WHEN you run this program, brought to you courtesy of Elite systems, you are greeted by the lifelike sketches of David, Bill and Ian and take the part of one of the latter two. Next you choose your specialist subject or opt for minor sports and choose two team members from a board of graphic interpretations of digitised faces.

As in the original TV game, there are six rounds: Picture Board, Mystery Personality, Home or Away, What Happened Next, Quickfire and then back to the Picture Board to round off.

I expected the Picture Board to be similar to the television, but instead when you select one square it flips over to reveal an icon representing a sport.

After this a stream of text, moving through a speech bubble over Mr. Coleman's head, asks you a multiple-choice question related to the icon. Get it wrong or run out of time and it is passed over to the opposition. If they also get it wrong you still aren't told the correct answer. Fair enough, as you might get asked this again, but very irritating if you were sure you were right.

The Mystery Personality section is the same in name only. You are given three statements about a person. Three points are for getting it on the first try, two on the second and so on. If you answer incorrectly it's passed to the other team



regardless of whether you have more clues to go.

The third round tests everyone's specialist knowledge in Home or Away and the fourth gives you a description of the circumstances and you must reveal what happened next.

The penultimate round is the Quickfire with nine questions to answer in the time limit. The first person to select an answer stops the clock and, as in all the sections, you get two points for a correct answer. One is awarded if you correctly answer a question which is passed over to you from the other team.

Finally it is back to the Picture Board to finish the

remaining squares.

If you like testing your own knowledge and enjoy all sorts of sport you will like this one. Possibly one for all the family.

Jo Giles

Sound	3
Graphics	8
Playability	9
Value for money	8
Overall	8

Archimedes Repton 3 ... Oh no, not again

Price: £9.95 (tape) £11.95 (disc)
Supplier: Superior Software, Regent House, Skinner Lane, Leeds LS7 1AX.
Tel: 0532 459453

SO you bought your Archimedes and heaved a sigh of relief, thinking you'll never need to play Repton again. But what's this? Your little green friend has moved up market too, and here he is in all his glory.

So what's new in the Archimedes version? To be honest, not much. On the disc you get all the original Repton 3, Life of Repton, Repton through Time and Around the World in 40 screens. This makes a grand total of 144 screens on which the passwords and edit codes are different to the original version.

The game runs about 25 per cent faster and the action is much smoother, but the apparent screen resolution is identical, as are the colours. In fact the horizontal resolution is twice as good – pixel size halved – but the screens are

exact copies, so that's irrelevant.

You get four new tunes instead of one, all of which are quite competently produced using the built-in sounds, but the third seems to tail off at the end as if it wasn't finished – which is a shame because it's my favourite.

The screen editor is a slight improvement on the original, with better mouse handling and pop-up menus. But there are still no useful features like mirror and flip in the character designer, which means you have to design the full set of Repton figures individually – even when they are exact mirrors of others.

The full 16 colours are available and definable, but some are limited for system use. The increased screen resolution makes detailed design much easier as you can see from the new Reptina shown in the picture.

You still can't paint on to the map screen and have to click the mouse for every position. In addition the handling of teleports is very tricky. On my first map design I lost the first three accidentally and couldn't get them back. However the screen designer no longer discourages use as it did before.



This is a reasonable package but nothing to get enthusiastic about. Superior intended it to be a conversion from the original and that is what it is. But the time would surely have been better spent producing something new.

Petra Galloway

Sound	9
Graphics	7
Playability	9
Value for money	8
Overall	8

SOFTWARE SCENE

The Last Ninja ... cut above the average

Price: £9.95 (tape) £11.95 (disc)

Supplier: Superior Software, Regent House, Skinner Lane, Leeds LS7 1AX.
Tel: 0532 459453

THE Last Ninja is a story of jealousy, power, and revenge – of good versus evil and one man's struggle against overwhelming odds. Oh yes, I almost forgot, it is easily the best martial arts-cum-adventure game on the market.

For many years the evil Shogun had envied the closely guarded skills and secrets of the Ninja. Executing a dastardly plot he slaughtered the Ninja community on its once-a-decade visit to the sacred island of Lin Fen.

Unbeknown to the Shogun a solitary Ninja – Armakuni – had been left behind to guard the shrine, feed the cat and perform other such tasks. Now he has sworn to avenge the deaths of his comrades and re-build the Ninja empire.

You play Armakuni as he begins his assault on the island of Lin Fen. There are six separate locations on the island and you must kill every guard and collect all available objects on each level before advancing to the next.

Control is achieved using the keyboard only – this may sound restrictive for a martial arts game, but it works well in practice. In addition to the direction keys there are also three separate jump buttons – each providing increasing distance. As if to demonstrate his supreme athleticism, Armakuni insists upon performing a forward somersault when prompted to jump.

Level one is set in the wilderness, a barren wasteland of



rocks, bushes and a thoughtfully provided path for you to walk on, but it is patrolled by the Shogun's warriors. Inexperienced in the way of the Ninja, they do not yet possess your skills, but they are still capable of giving you a good thumping if you become careless.

Initially unarmed, you must pummel your opponents using only fists and feet. Things become a little easier as you round the first corner and find an abandoned sword – the first of five weapons available on level one. By pressing the spacebar you can quickly switch between any of the weapons currently in your possession. The instructions advise you to use the same weapon as your opponent, but I found the sword to be effective against most adversaries.

Unlike many games, you are not restricted to travelling in one direction, but are free to wander where you wish within the confines of the location. Another very welcome feature is the way that the guards stay dead once you have dealt with

them – there is nothing worse than returning to a location and having to fight the same guard that you killed five minutes earlier.

Once you have mastered the human opponents, why not try your hand with the flaming dragon that guards the exit to level two?

The Last Ninja is quite a departure from programmer Peter Scott's traditional style – the prolific author of countless cute platform games has really come up with the goods this time. Ninja is fast, furious and totally addictive.

Jon Revis

Sound	8
Graphics	8
Playability	9
Value for money	9
Overall	9

Startrader ... capitalists in space

Price: £17.95 (mail order only)

Supplier: Gem Electronics, 17 Tandragee Road, Portadown, Craigavon BT62 3DQ.

IT is easy to believe that there is only one universe as you hold that 3.5in disc in your hand. However, beings in another dimension would be inclined to argue the point. And when you boot the disc you are informed that a universe is being created for you and suddenly you find yourself in a totally capitalist society.

Everything costs credits, which you can only gain by smart interplanetary trading, and you must seek the elusive nine segment de-activation code for an Armageddon Device set by the evil Kargans. Not only is this timed to destroy the universe at stardate 999.9, but these creatures are not beyond a little ambushing as you wander round. The storyline comes with the disc and some poorly laid out instructions.

Almost all the game control is via the mouse through an attractive set of full screen menus. The icons are colourful and reasonably obvious. For docking your ship Gem has sensibly used left and right buttons for attitude control rather than the mouse proper – after Lander/Zarch this is greatly appreciated. Yet for some reason, keys are used in combat when the mouse would have been more obvious.

Impending battles set off a warning system as you are told to set your weapons system. Not expecting my micro to talk, this rather threw me the first time, so that I had only enough time to desperately see off my attackers with zero energy phasers and no shields.

though this is not exactly fair as it is much larger, with more



than 100 galaxies to hyperdrive through, each with about five visitable planets, and it makes no pretence to 3D graphics.

There is little actual flying, as your course is plotted between planets, leaving you with the docking which, if you don't do it properly, results in damage to your hull. You can also manoeuvre in battles, though this is a little sluggish. You are flying a large cargo vessel whereas your opponents are various classes of fighters, so perhaps this is logical. Should you survive you can always upgrade your engines.

If you should decide to transport to the planet's surface you may be disappointed – indeed I would have happily sacrificed a few star systems for the benefit of better planetary graphics.

Overall, Startrader is a well thought out strategy game

though the combat section could have been tighter. I was impressed that the disc was not copy protected and that you are encouraged to make yourself a back-up. Incidentally, it might be paranoia on my part, but after ending badly several times, I found the closing message distinctly smug.

Terry Blunt

Sound	8
Graphics	7
Playability	7
Presentation	5
Value for money	9
Overall	7

Pac-mania ... out for the chomp

Price: £19.95

Supplier: Grandslam Entertainments, 12-18 Paul Street,
London EC2A 4JS
Tel: 01-247 6484

WHEN Pac-mania landed in my lap I thought *Oh no, not another Pac-man!*. Well it isn't, and I'm a converted Pac-maniac.

With all the versions of the original game around – including Snapper, Munchy man and our very own Hac-man – I'm sure you're all familiar with the little chomper, power pills and the ghosts.

In this new game you not only get a 3D view – which doesn't cover the whole screen – but four different worlds to chomp your way through.

When you boot the disc you get a fairly dull set of instructions and from there you go to screen selection, which has pictorial representations of Block Town, Pac-man's Park, Sandbox Land and Jungly Steps – theoretically graded in order of difficulty.

The default controls are Z,X,O,K and spacebar for jump. You can define your own keys but although unusual I found the default ones quite comfortable and convenient. All extra options such as pause, sound and so on are controlled by Shifted keys, so you won't press them accidentally.

Selecting Block Town takes you to an intermediate screen which has Pac-man being chased across the screen by the ghosts, now named Inky, Pinky, Blinky, Clyde, Sue and Funky. Then you get to the game proper.

You start to munch your way round the maze, composed of Lego and Duplo blocks and accompanied by a jolly tune using excellent sounds, chomping at the little yellow spots while the ghosts wander round randomly matching your speed. Scattered to the four corners of the maze are the power pills which, when chomped, change all the ghosts blue and reduce their speed for about 15 seconds.

In this time you can chomp them – the points you get double for each subsequent ghost chomped, up to a maximum of about 7000. The ghosts' eyes then wander around the maze rapidly until they reach their base, at which point they re-constitute.

Occasionally a piece of fruit or a sweet appears at a point on the maze and will give you a score if you chomp it – but it only lasts for a while. If you're very lucky a small green sphere appears. When munched this gives you double speed for a while and can really help in cleaning up the maze and getting high scores. Also short duration turn-blue pills occasionally appear but they aren't very useful.

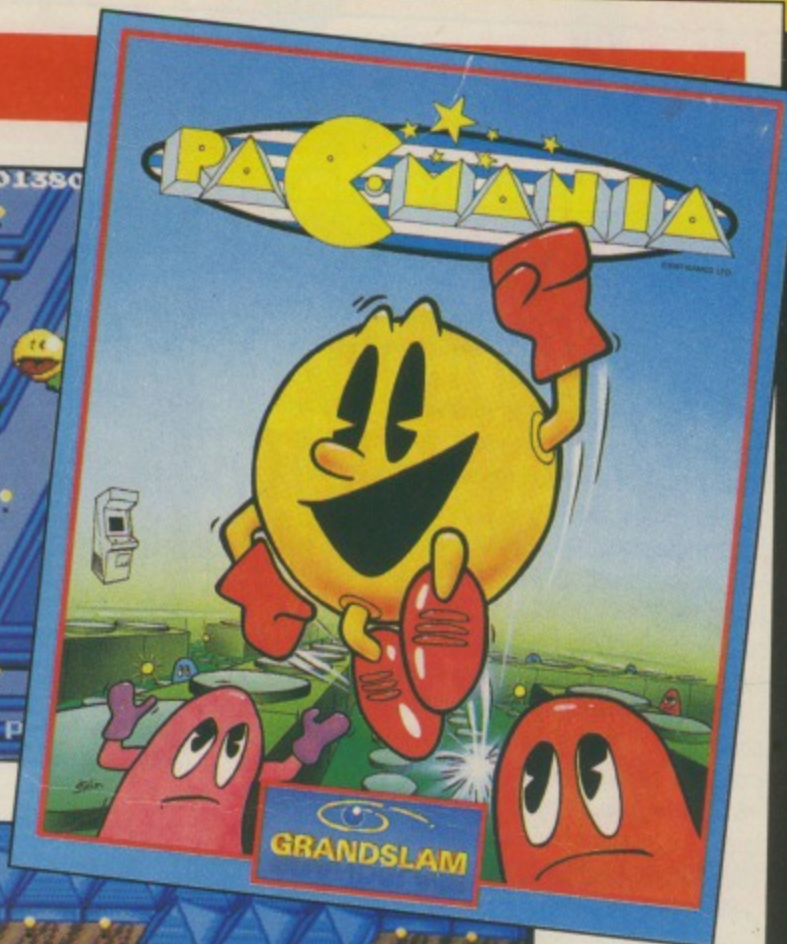
If you are being chased by a persistent ghost it is possible to reverse direction and jump over it. You can see its eyes look up as you go over it – but watch out. Don't jump just before a junction, as this is where ghosts change direction



Jumping over a ghost in
Pac-Man Park



Bouncing
ahead in
Sandbox
Land



and it'll stay on your tail.

Once Block Town has been cleared you move to Pac-man Park via a little theatrical interlude. The park looks like the classic original as seen from the side – including the route off screen from the right to the left, except the ghosts can use it, too. This screen has a different tune, excellently rendered, and is much more difficult to complete than Block Town.

Completing it the first time results in you having to do it again with different colours, but now the purple ghosts move faster than you and are virtually unshakeable. The only way is to get them on a straight with no junction near and do the reverse jump.

Sandbox Land is reached via an interlude screen which

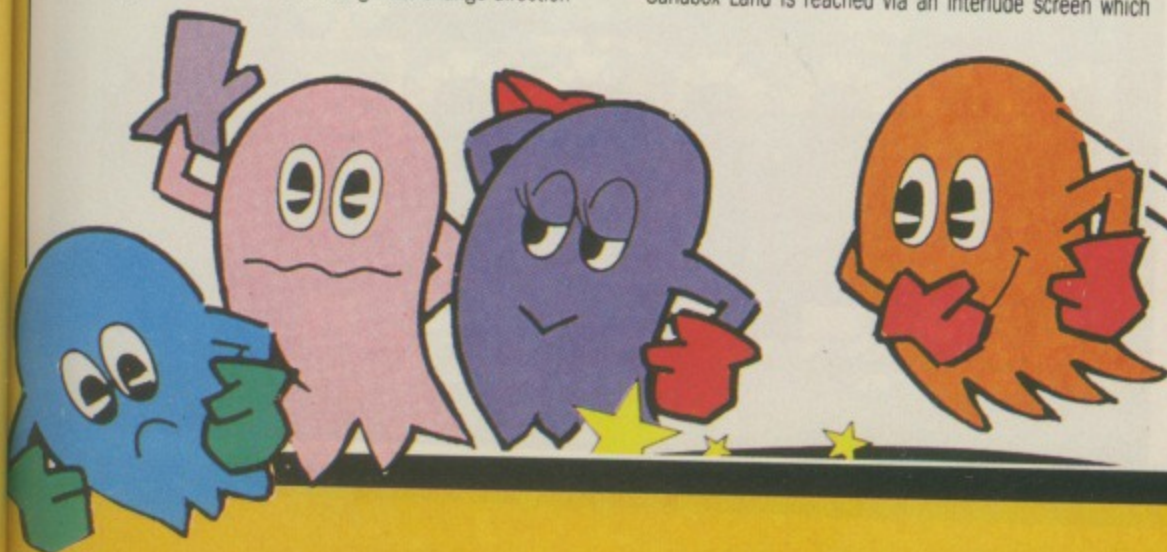
informs you that green ghosts can now jump too. This seems the easiest screen. Not only are there so many twists and turns that it's easy to foil pursuing ghosts, but if you get a go-faster pill you can wipe the floor with your opponents and get massive scores.

You do this screen twice – the purple ghosts go faster on the second one – then move to Jungly Steps after seeing a nightmare where Pac-man is chased by a giant ghost at least four times normal size. After getting over your fear of falling – Pac-man is moving along logs suspended above the jungle floor – you can zoom around this new screen fairly successfully on the first round. The impression of going up and down slopes is quite uncanny.

On the second round the ghosts are faster again, but it's still easier than Block Town. From here you go back to the start with the whole game running twice as fast, with jumping ghosts and superfast ones.

This game is an example of what really professional games companies can produce and it is superb. Buy it.

Lazarus



Sound	9
Graphics	9
Playability	9
Value for money	8
Overall	9

Repton Infinity ... new game – old face

Price: £14.95

Supplier: Superior Software, Regent House, Skinner Lane,
Leeds LS7 1AX.
Tel: 0532 459453

IT is unusual to find a games compilation that includes a game creator. Very handy – you don't have to be at the mercy of somebody else's warped imagination when you can be at the mercy of your own.

But before lashing out with the games creator you should play the four games provided. Each is similar in that the screen scrolls left, right, up and down, as the respective heroes make their way through a colourful maze of intricate puzzledom.

In the first, **Repton 3 – Take 2**, you amass as many points as possible by collecting crowns and diamonds and killing monsters. The usual eggs are scattered about ready to hatch into irksome green monsters. More difficult to shake off are large blue floating asterisks, or spirits, which have to be guided into cages where they metamorphose into diamonds – much more congenial.

Teleportation can speed things up a bit, but it is advisable not to use this facility too soon as you tend to find yourself in dead ends or spirit dens with no apparent way out.

Repton 4 is the second offering and here your mission is to amass banknotes and jewels and try to kill any ghouls that pass your way by strategic dropping of rocks. Magiblocks when pushed together to form a threesome turn into diamonds, which earn you more points. One of the more delightful features was the way objects can be duplicated by using the photocopiers you encounter.

The third game – **Robbo** – is graphically a little more stylish and the gameplay is distinctly more demanding – Repton's spatial puzzles supplemented by a number of tasks like illuminating a light bulb, putting a can into a fridge or mowing a section of grass.

The final game is **Trakker** which presents a bizarre scenario with you taking the part of a JAFFA – Jagga Annihilation and Fruit Flinging Associates – driver. Indeed there is a great deal of squidding and squelching as you drive your bulldozer over any tomatoes which get in your way. Bananas, as you well know, are lethal weapons and can be used for crushing Jaggas. Approach from behind, otherwise the Jagga will transform itself into a green tubular spider.

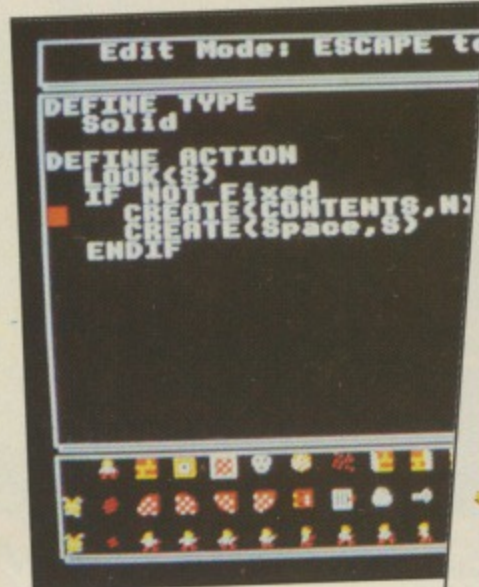
You are accompanied by Kevin – a bit of a dynamo when it comes to dynamite – and you will find the game can be quite explosive by placing him near sticks and then driving over a detonator.

The real joy of the package lies, not in the game itself, but in what the game creator enables you to do – apart from design the four other games on the disc. True, it confines you to Repton-type adventures, but there is a great deal of room for inventiveness.

The package takes out all the hard work that normally goes into the creation of a game and is a far cry from the editor usually supplied with the Repton games.

The creator is split into four distinct parts. Three are editors which enable you to work on the different elements of a particular game and the other links them to form a coherent game.

The first stage is the screen designer, and here you can create a landscape for your sprites to inhabit. Anyone who has used a graphics utility will find this extremely easy to handle. Various blocks of pattern and colour displayed at the bottom of the screen can be used to fill areas of the main

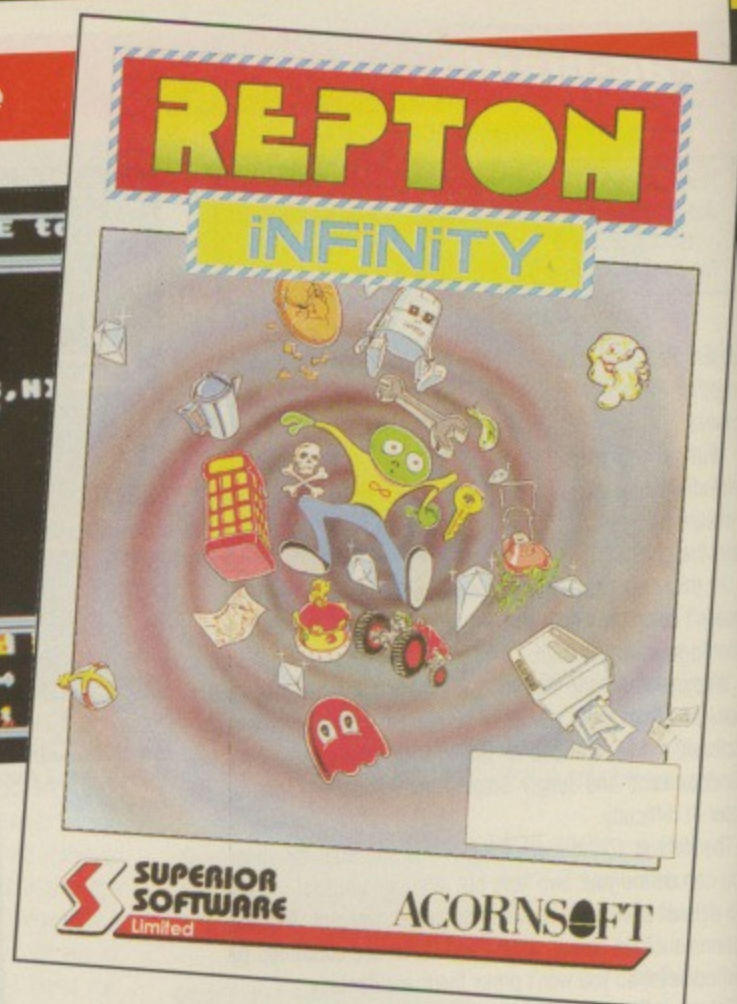


screen.

Similarly, you can go to the second of the programs and design your own sprites pixel by pixel. It's simply a matter of choosing an existing character and modifying it or creating something new.

The third program is perhaps the most difficult to use and a careful reading of the manual is necessary. The programming system which has been developed is called Reptol and is similar to Basic. However, the commands have been greatly simplified, so that only the essential ones are given and you do not need any prior knowledge of programming. Here you can bring your game to life, animate your sprites, randomise movement, create objects and produce sound effects.

Once all the hard work has been done, the final step is to link the files you have created using the File Linker facility. This is simply a matter of keying in the appropriate file



names so that your game is ready for its first showing.

Repton Infinity would be excellent value for games alone, but you can have much more fun by experimenting with the game creator. You won't be disappointed.

Tony Flanagan

Sound	9
Graphics	8
Playability	9
Value for money	10
Overall	9



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- Delete** - deletes any number of files
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Advanced File Manager 1.04 (C) PRES 1988.

Source: Advanced Disc FS: 10.9 Software: RFW.afm104

FILE	NAME	SIZE	DATE	TIME	ATTR	STATUS	CHANGED	CHANGES
1	AFM104	1024	1988	01	00	00	00	00
2	AFM104	1024	1988	01	00	00	00	00
3	AFM104	1024	1988	01	00	00	00	00
4	AFM104	1024	1988	01	00	00	00	00
5	AFM104	1024	1988	01	00	00	00	00
6	AFM104	1024	1988	01	00	00	00	00
7	AFM104	1024	1988	01	00	00	00	00
8	AFM104	1024	1988	01	00	00	00	00
9	AFM104	1024	1988	01	00	00	00	00
10	AFM104	1024	1988	01	00	00	00	00

Target: Advanced Disc FS: 1.1.9.RFWArchive

FILE	NAME	SIZE	DATE	TIME	ATTR	STATUS	CHANGED	CHANGES
1	AFM104	1024	1988	01	00	00	00	00
2	AFM104	1024	1988	01	00	00	00	00
3	AFM104	1024	1988	01	00	00	00	00
4	AFM104	1024	1988	01	00	00	00	00
5	AFM104	1024	1988	01	00	00	00	00
6	AFM104	1024	1988	01	00	00	00	00
7	AFM104	1024	1988	01	00	00	00	00
8	AFM104	1024	1988	01	00	00	00	00
9	AFM104	1024	1988	01	00	00	00	00
10	AFM104	1024	1988	01	00	00	00	00

CCChange: Off (Follow: Off) (Over: On) 65535 bytes free 10 marked

05 noted for copying to Advanced Disc FS: 1.1.9.RFWArchive

07 noted for copying to Advanced Disc FS: 1.1.9.RFWArchive

08 noted for copying to Advanced Disc FS: 1.1.9.RFWArchive

09 noted for copying to Advanced Disc FS: 1.1.9.RFWArchive

Screen picture shows AFM in Copy mode on Master Turbo

AFM follows the PRES 'Master Plan' of upwards compatibility - it runs on Electron, BBC B, B+, B+128, Master 128 and Compact, with Second/Co-processors and Acorn-compatible versions of DFS & ADFS.

AFM has four distinct modes:

MENU - allows browsing through the files and directories on a disc. Files are started from a menu of up to 7 options chosen for a selected ROM. Loaders are provided for Basic, The Basic Editor, View, ViewSheet, ViewStore, ViewSpell, Edit, Wordwise (+) and InterWord. This list can be expanded infinitely using an Acorn-approved OSWORD call... full details and example in the manual..

DELETE - allows files to be marked and then deleted with one keystroke.

RENAME - allows one or more files to be marked and then renamed using a wildcarded name, ie one which varies with each file renamed. Thus you could rename s1, s2 and s3 to be s1_old, s2_old, and s3_old in one operation... and that's only the beginning! As well as using the whole of the original name you can also pick out individual characters to form part of the new name.

COPY - the strongest feature of AFM. It is a two stage copy routine. With both source and target directories shown on screen the files to be copied are marked. Once all the files have been marked copying is started and the computer can be left to get on with it! Large files can be split across several disks, and recombined.

As much as possible of the computer's memory is used for copying files, including unused parts of shadow screen memory, sideways ram banks (inc. AP7), ram cartridges (inc. ABR (32K) and AQR (256K)), tube memory (up to 61K), B+ paged ram (12K) and unused parts of the Slogger Master Ramboard (Electron).

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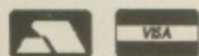
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Sigmasheet's the big one

*An investigation of the record-breaking
spreadsheet by Ian Whitmore*

Product: Sigmasheet
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Exeter, Devon EX4 6PH
Tel: 0392 37756

WITH Sigmasheet Minerva Software has created a great example of Archimedes software. This has to be one of the fastest and largest spreadsheets available for any micro. It is supplied on one protected disc with a manual 76 pages long. The instructions suggest making a copy which will be the working disc, but you have to keep the original handy as it must be inserted briefly when instructed every time you start up.

Hard disc installation is just as easy, but you still need the original every time to get going.

You are presented initially with a title program (Figure I) which, as well as letting you load Sigmasheet itself, provides an information system for updates to the software not shown in the manual and two import/export utilities. When you select Sigmasheet, the software checks for the original disc in drive 0 and providing it is there Sigmasheet runs presenting you with a blank spreadsheet which can extend from A1 to AM16383 – yes that's 16,759,809 cells (see Figure II).

In reality the usable size is limited by available memory, giving some 25,000 – 160x160 – cells on an A310 and 170,000 – 410x410 – on a A440. Above the sheet is an information and input area, displaying the contents of the currently selected cell, various cell parameters, an error line, cursor movement and recalculation modes, the number of bytes free and the time.

Input is particularly easy as Sigmasheet automatically recognises numeric data, labels and formulae on entry – defaulting to label if there is text which it cannot recognise as a formula. Entering a + as the first character forces a formula or value while " forces label entry.

Using < or > left/right justifies the cell while ↑ centres it, input is displayed on the input line until Return is pressed whereupon it is transferred to the cell. Although there were occasional problems with earlier versions, I found it impossible to enter data faster than the machine can deal with it.

There is one trap however – when entry forces the display to move across to the next screen there is a short pause while the screen is redrawn. During this time data input is completely suspended – any key presses ignored – and you

can get confused. Editing commands are the same as those used in the Wimp environment so Control+U deletes the whole input line and so on. Text extending over the boundary of a cell will be displayed in full as long as the cells it lies over are blank which makes labelling of columns much easier for tables. Commands are entered in a number of ways:

- Clicking the Menu button reveals the command menu – Figure III – from which individual commands are selected by using the pointer or single letter key presses.

- You can use Control plus a single letter.

- Or / and the same single letter on the input line gives direct access to the command in a similar manner to Inter-Sheet.

All the usual spreadsheet commands are supported such as load, save, insert, copy, delete, print, go to cell and column width. The display can be in 80 or 132 column modes – later versions will include a driver for multi-sync monitor modes. Also from this menu star commands and an on-screen calculator are accessible. The Alt key is used with a second key to alter column width, blank the current cell, force a recalculation or move the sheet one column width to right or left.

Although rows and columns are referred to by numbers and letters, you can label each one with a title of up to 60 characters. Reference to cells can then be either by number and letter in the usual way – J12 – or by a title, like Joseph Maths. Unfortunately Sigmasheet does not allow you to select cells for copying using the mouse or cursor, you have to refer to cells by number and letter and/or title.

However it will accept both colon and double full stop separators between cell references, so conforming with Inter-Sheet and Lotus 1-2-3 – the most popular PC spreadsheet. Column widths can be individually set and each cell indepen-



Figure I: The title screen

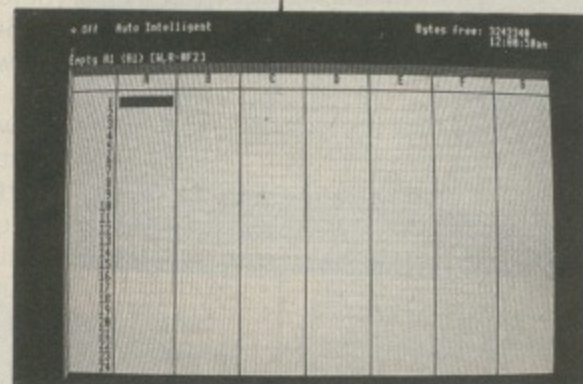


Figure II: A portion of the 16,759,809 cells

Turn to Page 38 ►

◀ From Page 37

dently formatted. What looks like a complex formula in square brackets following the cell reference is that cell's format. Numeric format may be general, exponential or fixed – a fixed number of decimal places – while the cell can be protected or writeable.

Negatives may be displayed with minus signs, in red, with brackets or by DR. Currency symbols, which are user definable, percentages, date and time formats are all available. Setting format from the command menu allows cells, columns, rows or the whole sheet to be set.

An option sub-menu selects various display parameters such as colours, column gap, user currency formats, printer options and cell or input line editing. At the top of the screen two further options – both selectable via the main menu – are the autocursor movement and recalculation modes. You can choose cursor movement in any direction or not at all after input into a cell.

Although Sigmasheet is very fast, when entering data to a large spreadsheet there is a significant delay while the whole sheet is recalculated after every input. Thus Minerva has allowed auto-recalculation to be switched off. If you then want to recalculate you must press Alt+R.

Most spreadsheets allow only column by column or row by row recalculation, but Sigmasheet also has an intelligent recalculation mode. This checks cell to cell references in formulae, working back to the original formula from the most distantly referred cell containing data. Thus it avoids the dreaded *Forward Reference* error. As this could give rise to circular calculations when the last cell refers back to the first, Sigmasheet checks for circular reference at the time formulae are input.

As each sheet is memory based, Sigmasheet demonstrates its speed during re-calculation – 200 times faster than Inter-Sheet and 1,600 times faster than Viewsheets, although in my tests it's not as fast as Pipedream. However it demonstrates great mathematical accuracy and is written to use the floating point emulator, or when it becomes available, the maths co-processor – Archimedes 400 series only.

Table 1 gives a list of operators and functions. Strangely missing are financial functions, which you might have expected to see on an advanced system such as this.

Printouts can be formatted automatically if that option is set. This allows Sigmasheet to print in condensed mode to put as much of a sheet on paper as possible. Only normal across the page printing is supported, but a large sheet is intelligently broken up when printed to allow you to do a manual cut and paste reassembly of the whole sheet. Once again some earlier versions did not always get this right.

From the printer menu you can redefine various

codes to match your own device. Three fonts and two user money formats can be selected, form feed and reset codes chosen. The user money format allows the printer to print the correct symbol for, say, Yen where you have used that currency in the onscreen sheet. Once selected these options can be saved as a printer driver for future reloading.

Type	Operation or function
Arithmetic	+ - * / ^ % MOD
Relational	< <= = > >= <>
Logical	OR AND NOT
Trigonometric	ACS ASN ATN COS DEG RAD SIN TAN
General	ABS ALG EXP INT LN LOG PI ROUND SGN SQR TRUNC
Data Manipulation	AVG CHOOSE COL COUNT IF LOOKUP MAX MIN ROW SUM SUMSQ
Time and date	DATE DAY HOUR MINUTE MONTH NOW SECOND TIME WEEKDAY YEAR
In addition some statistical functions which would allow you to build up more complex formulae are supported.	

Table 1: Operations and functions supported by Sigmasheet

The function keys are unused by Sigmasheet so you can use them at will, programming them in the usual way with *KEYn. This is particularly useful for some of the more complex commands. For instance you could use:

*KEY1 / F C #F2(R,W)

to reformat the current cell to #, fixed format with two decimal places, negatives indicated by brackets and highlighted in red, thousands indicated by commas and writeable.

You can select two options from the original screen to import or export data. Datalink – Figure IV – has been written to allow access to data held in Minerva's Deltaplus database system and enables quite complex data extraction. However it is difficult to understand the instructions for this in the manual, and there have obviously been some changes since that part was written.

Importing data from other spreadsheets is the province of the Utilities option. Sigmasheet can accept data from Lotus, Viewsheets and Inter-Sheet. In addition it will also attempt to import any Ascii file and comma separated files. I successfully input files in Ascii, comma separated and Inter-Sheet formats.

In general Sigmasheet is very good, although there are a number of niggles which could be improved particularly if you have moved from another spreadsheet and may miss facilities available previously. However you will be especially impressed by the size, speed and the intelligent recalculation.

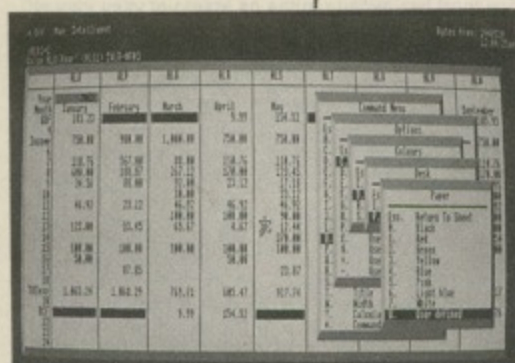


Figure III: The command menu

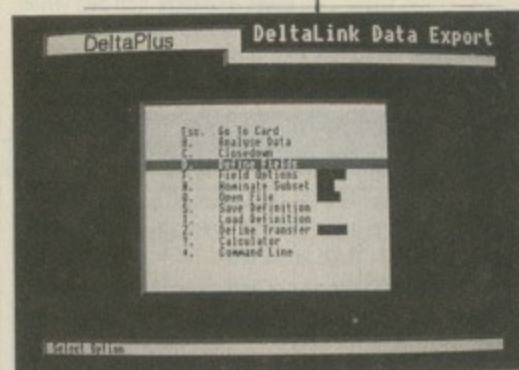


Figure IV: Importing database information

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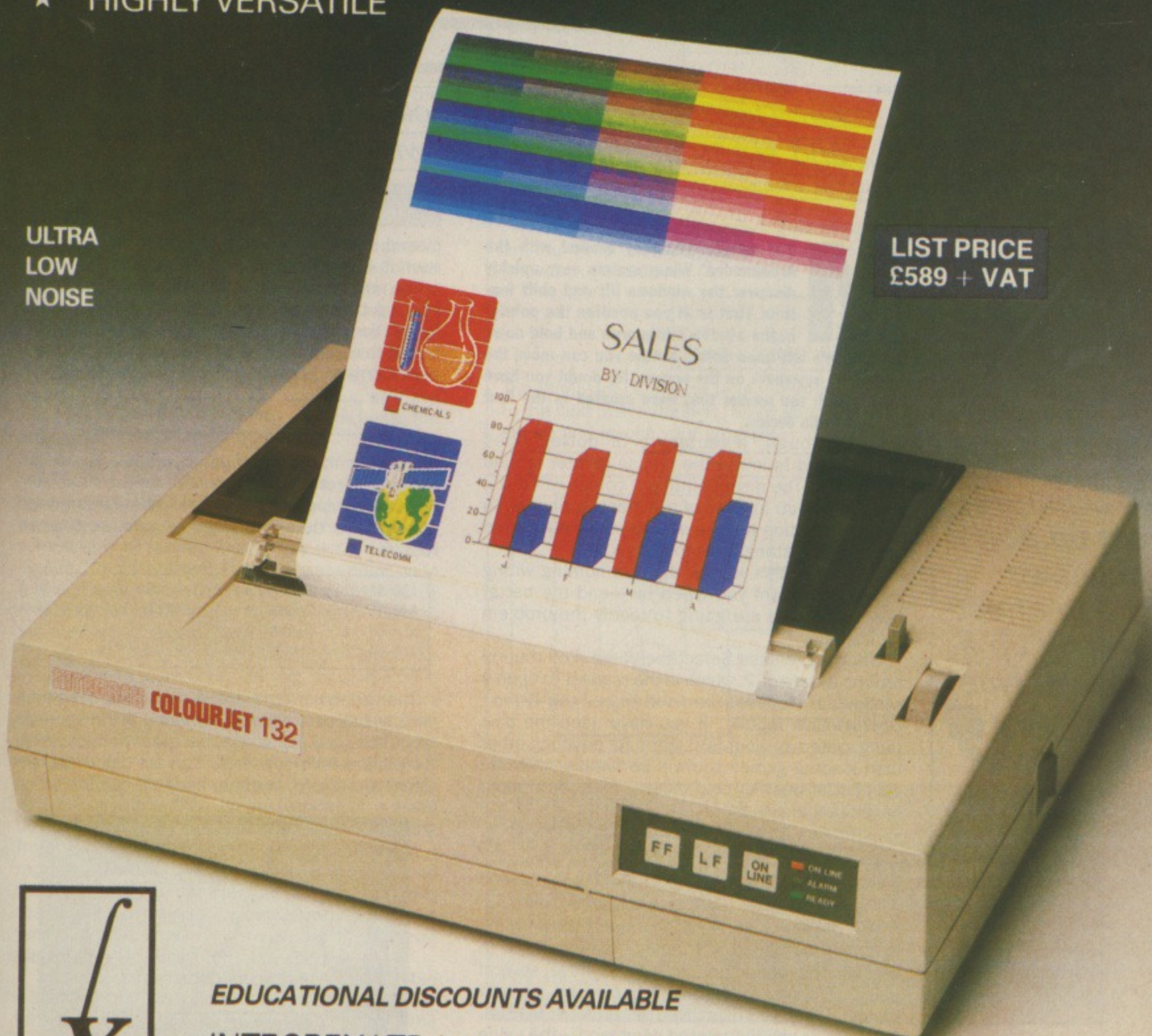
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Squaring up to windows

*Ken Down concludes his look at menus
and starts peering through windows*

MOST people who play around with the Archimedes' Wimp system very quickly discover the windows lift and shift feature. That is, if you position the pointer in the window's title area and hold down the mouse's left-hand Select button you can move the window to anywhere on the screen. No doubt you have tried it with the menus that were created in the first article of this series.

Sure enough, a rectangle of dotted lines appears and followed the mouse pointer around the screen. The disappointment comes when you release Select: Instead of the menu appearing in the new position it stays solidly where it was and the dotted rectangle disappears.

The good news is that there is nothing wrong with the program you typed in — and the better news is that we are going to rectify the problem right away.

When we release Select the Wimp-Poll routine returns a code of 2, which is the request to open a window. In response we need to call the *Wimp-OpenWindow* routine. If you have used the disc filing system on your BBC Micro for anything other than loading games you will be familiar with the concept of opening and closing files. You would have lines like these:

```
f%=OPENUP"Filename"  
INPUT#f%,data$  
CLOSE#f%
```

The OPENUP command returned a value which is called the handle — a unique number used to identify the open file. You could have several open at once, each distinguished by its own handle. When you used INPUT#, PRINT#, BGET#, BPUT# — or any file related command — the value of the variable that follows tells the filing system which particular file was to be read from or written to.

The Archimedes' windows must be opened and

closed in a similar way and while they are open each is identified by its own handle.

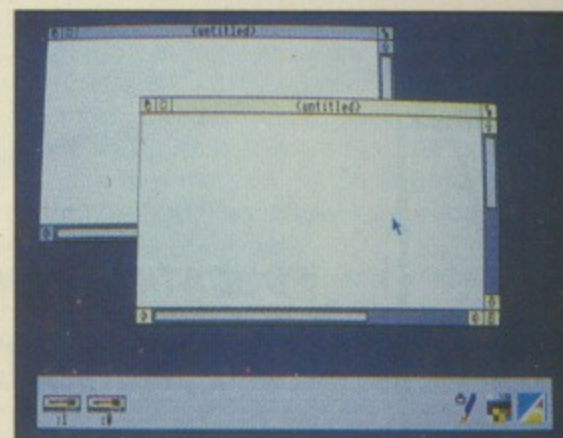
The poll routine that returns the code of 2 also sets up the memory block *poll%* to the correct format for opening a window, so it would be sufficient to respond to the call immediately with the statement:

```
SYS"Wimp_OpenWindow",0,poll%
```

However the call to open a window can result not only from lift and shift operations, but also from windows changing in size or being otherwise altered. We therefore need a general purpose routine:

```
400 DEFPROCopenwindow(handle%,mem%)  
410 IF mem%=block% !mem%=handle%:SYS"Wimp_Get  
WindowState",0,mem%  
420 SYS"Wimp_OpenWindow",0,mem%:ENDPROC
```

The variable *mem%* signals whether or not the window has been moved. If *mem%* is the same as *block%* it has not, so we ask the Wimp to set up the parameter block for us with the call to *Wimp-GetWindowState*. In either case we call the Wimp



Windows on screen

“When we set up a menu we are in effect setting up a special type of window”

routine *Wimp-OpenWindow* with register one containing the address of the parameter block.

We now need to tell the program to use this routine when the required code is returned by the polling routine. We have to insert a line in *PROCaction*.

```
240 WHEN2:PROCopenwindow(!poll%,poll%)
```

Seeing that we have a procedure to open windows, it is obvious that we will need one to close them. At the moment we don't have a use for it — but we will as soon as we start using real windows.

```
1100 DEFPROCclosewindow(handle%)
1110 !block%=handle%:SYS"Wimp_CloseWindow",0,
    block%
1130 ENDPROC
```

The procedure is extremely simple: All we do is set the first four bytes of an area of memory to the window handle, and then call the routine *Wimp-CloseWindow*.

Real windows

When we set up a menu we are in effect setting up a special type of window, one whose format the micro already knows about. As you are aware from using the *DeskTop* program, there are other types — for example the ones with scroll bars. When we want one of these we have to tell the Wimp about the desired format. We have to decide what colours we want, whether we have two scroll bars or not, and above all, how big the window is.

There are two aspects to a window's size. The most obvious is what we shall call the visible work area — VWA — which is what you actually see on the screen. You can enlarge it up to almost full screen size or reduce it to a tiny square in one corner. The VWA however is merely a window on to a larger area which can be scrolled into view by means of the scroll bars — we're going to call this the total work area, or TWA.

If you are trying to follow these articles in the *Programmer's Reference Manual* you will find it also uses the term visible work area for what is visible on the screen. However it calls the TWA the work area extent, a term which conjures up no picture at all. So we'll stick with VWA and TWA.

In case you are still confused, here's a concrete example. Imagine that you are working on a piece of paper — writing on it, drawing on it, erasing from it — and a fixed piece of cardboard with a rectangular hole covers it. When you have filled the area visible under the hole you have to move the paper sideways or up and down in order to reach a fresh area. Figure 1 shows the general idea.

The hole in the cardboard represents the visible work area and the paper is our total work area. Whatever the size of paper — A4, A5, A3 — the area visible through the hole in the cardboard remains the same.

So what we need is a function that will give all the necessary information to the Wimp Manager and will return a file handle:

Multitasking

Converting a Wimp-based program to operate in the multitasking environment is simplicity itself. First, two don'ts:

- Don't clear screen, change mode or alter the palette.
- Don't use the system sprite area — use your own.

To tell the Wimp that you are a new task you must modify the initialisation command to:

```
SYS "Wimp_Initialise",200,&4B534154,name$
```

The hexadecimal number is Ascii for the word *TASK* and *name\$* is what you want your program to be known as — 200 stands for the latest Wimp version number, 2.00.

In your Wimp-poll routine add a new action line:

```
WHEN 17,18: PROCmessage(q%)
```

Where *q%* is the address of the poll routine returned data block. Then include the new procedure:

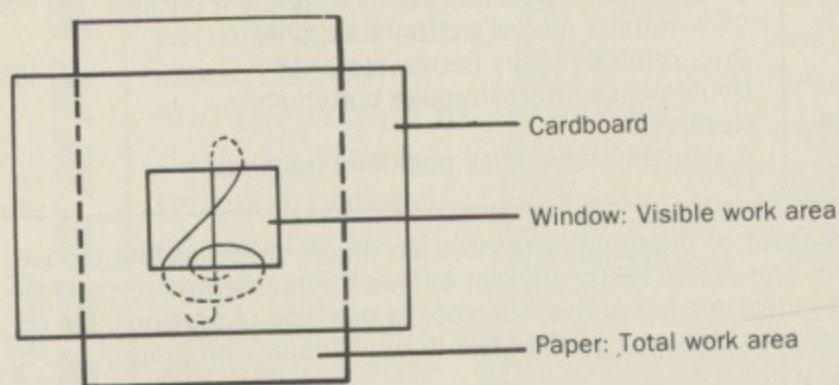
```
DEF PROCmessage(q%)
IF q%!16=0 THEN quit=TRUE
ENDPROC
```

This assumes that setting *quit* to true will cause your program to exit properly. The task manager will, under some circumstances, order a task — your program — to close down and this is needed to accept that order.

As it stands your program will grab all available ram so you need to tell the Wimp to only allocate a given amount. You do this with a *!Run* file which should look like this:

```
Wimpslot -min 64k -max
128k
RUN my_program
```

The *Wimpslot* command tells the Wimp how much space to allocate to the next task initialises. So by double clicking the *!Run* file you can set up and invoke your program.

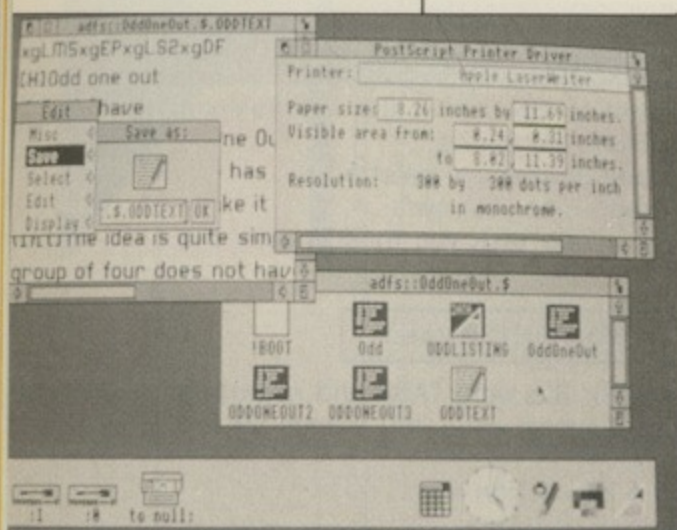


The window concept

```
500 DEFFNcreatewindow(title$,flag%,fgcol%,bgcol%,twatx%,twaty%,vwab
x%,vwaby%,vwatx%,vwaty%,nicons%)
510 LOCALhandle%
520 !block%=vwabx%:block%!4=vwaby%:block%!8=vwatx%:block%!12=vwaty%
530 block%!16=0:block%!20=twaty%:block%!24=-1:block%!28=flag%
540 block%!32=12:block%!33=14:block%!34=fgcol%:block%!35=bgcol%
550 block%!36=13:block%!37=14:block%!38=1:block%!39=0
560 block%!40=0:block%!44=0:block%!48=twatx%:block%!52=twaty%
570 block%!56=820:block%!60=83000:block%!64=0:block%!68=0
580 $(block%+72)=LEFT$(title$,11):block%!84=nicons%
590 SYS"Wimp_CreateWindow",0,block%TOhandle%:=handle%
```

Every window has a title bar which contains a string, here called *title\$*. Of course this can be null — "" — but that is up to you. The contents of

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the flag word are described below, as well as a short utility procedure to calculate it. Foreground and background colours – *fgcol%* and *bgcol%* – refer to the visible work area. For the sake of consistency and simplicity the border colours are kept the same.

The total work area top x and y coordinates are called *twatx%* and *twaty%* and in the same way *vwabx%* and

vwaby% refer to the visible work area bottom x and y coordinates – we assume the bottom left corner as being the graphics origin with coordinates of 0,0. The Programmer's Reference Manual seems to prefer a system where the graphics origin is at top left, so the y axis is measured in negative units.

The final variable is *nicons%*, which stands for number of icons. For most windows we will want to set this number to zero, but where we do include icons in the initial window definition we

0	Ignore mouse clicks
1	Notify the program when the pointer is over this icon
2	Clicks auto-repeat and notify the program
3	Clicks are de-bounced and notify the program
4	Click selects, release notifies program or deselects if the mouse has moved away from the icon in the meantime
5	Click selects, double-click notifies program
6	As 3 but can drag
7	As 4 but can drag
8	As 5 but can drag
9	Select when mouse is over icon, notify if clicked
10	Click returns mouse button state*256 Drag returns mouse button state*16 Double-click returns mouse button state
11-14	Reserved
15	A writeable icon, click positions the caret.

The concept of dragging is to have an object following the mouse pointer. The dotted rectangle that follows the pointer when you click Select in the title bar of the menu box is one type of drag box. We do not use any other type of drag box in the Accounts program.

Table 1: The button types

must follow it with information about the icons – 32 bytes each.

The first 16 bytes of a window's parameter block set out the coordinates of the initial VWA. Although you may subsequently stretch or shrink the window size, the first time it is opened it will appear on the screen in the size you have specified here.

The next eight bytes inform the Wimp Manager which part of the TWA is initially visible. Usually we want to have the top left part visible, so *block%!16* is set to zero and *block%!20* is set to the maximum y measurement – *twaty%*. Of course if you want the bottom right you should set *block%!16* to *twatx%* and *block%!20* to zero.

All windows currently on screen are repre-

sented by a list, and their position in this controls which ones obscure others. When you set up the window you can decide where in the list you want it to go. The value is held in *block%!24* and if this is -1 the new window is put in front of all others on the screen. If you want it to appear behind – underneath – another window *block!24* should contain the handle of the one that is to be on top.

The colours of the icon bar are controlled by *block%!32* and *block%!33* – foreground and background colours respectively. The scroll bars' fore and background colours are contained in *block%!36* and *block%!37*.

Writing windows

Some windows are writeable – you can type information from the keyboard on to them. By setting *block%!38* to a colour's value the Wimp Manager will alter the window's borders accordingly when Select is clicked in the window. Acorn must have some feature up its sleeve which has not yet been implemented. For this reason *block%!39* must always be zero.

The next 16 bytes tell the Wimp Manager how big the total work area is – measured in the normal graphics coordinates. Due to the fact that we assume the graphics origin is always at bottom left, the first eight bytes are set to zero. The second eight contain the coordinates for the top right corner.

The title bar is, in fact, an icon – one that contains text which is centred horizontally, has a border and a filled background. If you try out those four things with the utility procedure *PROCiconflag* you will find that the resulting code is &2D. This should be stored in *block%!56*.

The next four bytes are for the work area button type with exactly the same layout as the normal icon flags, except that nothing is set apart from the button type. You can calculate this by running the utility procedure *PROCiconflags* and answering No or zero to every question except that of button type.

A button, by the way, is an icon on the screen that you should click before the program proceeds further. If you type something into the notepad on DeskTop and then click Exit, a message appears telling you that there is unsaved data in the notepad and do you want to continue, Yes or No. The boxes containing the Yes and No are buttons and the program stops until you click one of them. The adjacent table shows the button types.

Utility procedures

As long as you are only going to use the system area sprites – ones loaded with the command **SLOAD* – *block%!64* should be set to zero. More future developments are catered for in *block%!68* so it should also be zero. The next 12 bytes are set aside for the title, which is made up of 11 characters plus Return.

The Wimp Manager call in line 590 gives you the handle of the window that has just been created. This is the value returned by the function and used by the program to keep track of which window does what. If you define a window where

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MU3

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the VWA is larger than the TWA you will get the error message *Bad work area extent*.

The final part of this month's article consists of three utility procedures. The first decodes an icon flag:

```
5700 DEFPROCdecodeicon(q%):RESTORE5770:PRINT
This icon:-
5710 FORi%=0TO10:READa$:IF(q%AND(1<<i%))=(1<<
i%)PRINTTAB(5)a$
5720 NEXT
5730 FORi%=12TO16STEP4:READa$:j%=q%AND(8F<<i%
):PRINTTAB(5)a$";j%>>>i%:NEXT
5740 FORi%=21TO22:READa$:IF(q%AND(1<<i%))=(1<<
i%)PRINTTAB(5)a$
5750 NEXT
5760 FORi%=24TO28STEP4:READa$:j%=q%AND(8F<<i%
):PRINTTAB(5)a$";j%>>>i%:NEXT:ENDPROC
5770 DATAcontains text,is a sprite,has a bord
er,has text centred horizontally
5780 DATAhas text centred vertically,has fill
ed background,text is anti-aliased
5790 DATAneeds program's help for re-drawing,
data is indirected,has right-justified text
5800 DATAmulti-select with <Adjust>,button ty
pe,ESG number,icon has been selected
5810 DATAicon is disabled,foreground colour,b
ackground colour,font number
```

Once it is entered into the micro simply type:

```
PROCdecodeicon(x%)
```

where x% is a number you want to analyse and

the procedure will tell you what the flag means for an icon.

The next two utilities create and decode the window flag. The utilities ignore bits 16,17 and 18 because these are set and unset by the Wimp Manager, not by your program.

```
5900 DEFPROCwindowflag:RESTORE5740:q%=0
5910 FORi%=0TO9:READa$:PRINT'a$"? Y/N";:g%=G
ET:IFg%=89q%+=1<<i%
5920 PRINT"q%:NEXT
5930 PRINTq%,"q%:ENDPROC
5940 DATA title bar,Is it moveable,Vertical
scroll bar,Horizontal scroll bar,Redrawn ent
irely by Wimp,Is it a pane,Allowed outside ma
in area,No 'quit' boxes,Scroll-request (auto-
repeat),Scroll request (debounced),Window is
open
6000 DEFPROCdecodewindow(q%):RESTORE5930:PRI
NT"This window:"
6010 FORi%=0TO9:READa$:IF(q%AND(1<<i%))=(1<<
i%)PRINTa$
6020 NEXT:ENDPROC
6030 DATAhas a title bar,is moveable,has a v
ertical scroll bar,a horizontal scroll bar,ca
n be redrawn entirely by Wimp,is a pane
6040 DATAis allowed outside main area,has no
'quit' boxes,returns scroll-request (auto-re
peat),returns scroll request (debounced)
```

● So now you can create windows – but they still won't appear on the screen. For that we need a bit more programming which we'll look at next month.

The bottom line...

This series on Wimps began in the January 1989 issue of *The Micro User*. Part one covered creating menus and the second article considered how to determine what selections have been made.

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All the examples are also on an accompanying disc which even includes a very useful routine to print out large spreadsheets sideways.

What's more, when you buy Mini Office II and the book together we'll knock £5 off the combined price!

Please turn to the order form on Page 135

A Dabhand Guide
 BRUCE SMITH
 ROBIN BURTON
Mini Office II
 BBC B B+ Master Series version



DABS PRESS

WORD PROCESSOR: Compose a letter, set the printout options using embedded commands or menus and use the mail merge facility to produce personalised circulars.

DATABASE: Build a versatile card index, do powerful multi-field sorting, use the flexible printout routine, perform all arithmetic functions and link with the word processor.

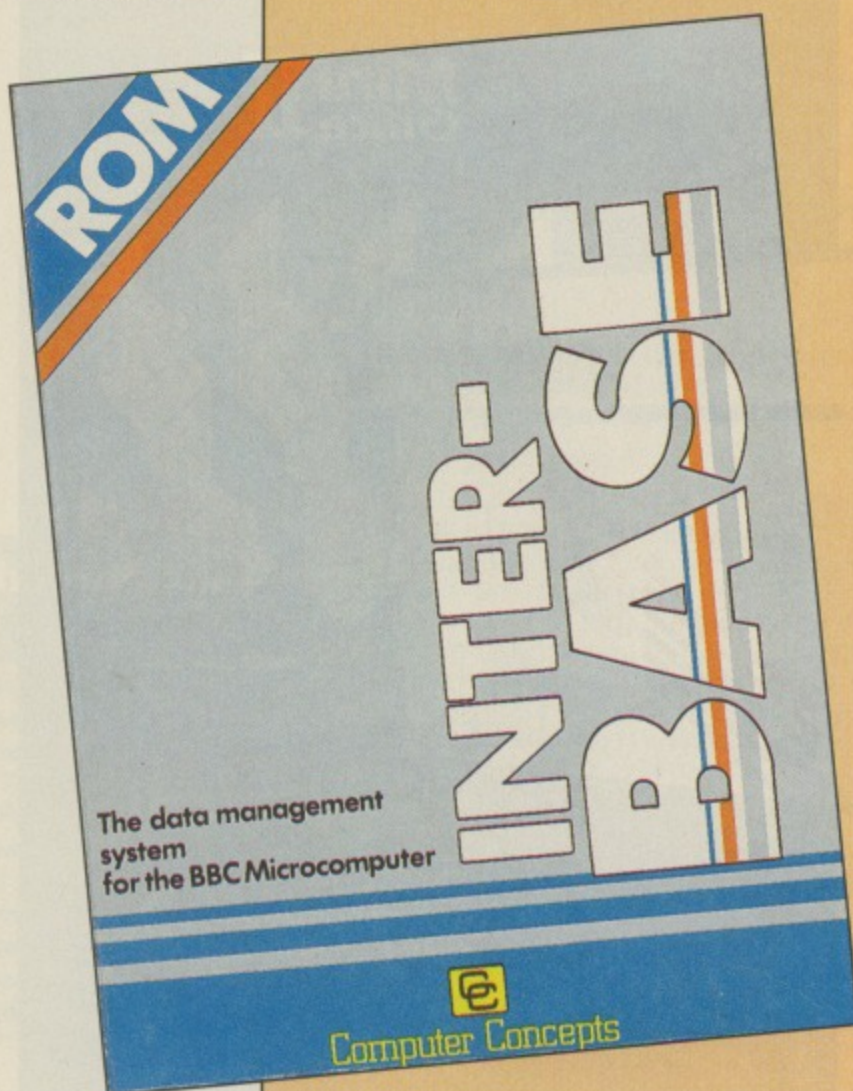
SPREADSHEET: Prepare budgets and tables, total columns and rows with ease, copy formulae absolutely or relatively, and recalculate automatically.

LABEL PRINTER: Design the layout of a label, select any label size and sheet format, read in files from the database module and print out in any quantity.

GRAPHICS: Produce pie charts, overlay line graphs and display bar charts side by side or stacked. Enter data directly or load data from the spreadsheet.

COMMUNICATIONS: Access services such as MicroLink, Telecom Gold and Prestel, send electronic mail, telex, fax and telemessages in a flash or order a wide range of goods.

B B+ M  



Straight data

*Inter-Base comes of age
and John Allen celebrates*

Product: Inter-Base

Price: £69

Supplier: Computer Concepts Ltd., Gaddesden
Place, Hemel Hempstead, Herts HP2 6EX.

Tel: 0442 63933

THE Inter series database for the BBC Micro is at last properly available. It crept out in the middle of 1987 but was never properly launched, persistent bugs and an impossibly difficult manual conspiring to keep it to the dedicated few. Now Computer Concepts has judged that it is really ready for release, with new coding and a much larger – and easier to understand manual.

Inter-Base is the final part of the company's Rom-Link products adding a database to the word processor Inter-Word, spreadsheet Inter-Sheet, graphics Inter-Chart and the related spelling checker Spell-Master. Being part of the series, it can exchange data with the other packages via special commands – but more of that later.

First off, what's in the box? Inter-Base is a rom with 64k of code which, like Inter-Word, is fitted on to a small circuit board with some clever electronics to make the BBC Micro think it's only the standard 16k, while all 64k of code is still available.

The whole thing is a bit taller than a 16k rom but fits most rom boards on the BBC B and some cartridges for the Master. Also in the box is a function keystrip, an examples disc and the new manual.

Databases can be difficult things to understand, and Inter-Base is no exception. Broadly speaking a database is a program which maintains a file of information, where each connected group of items of data – say someone's name, address and telephone number – is called a record and each individual item – the name for example – is a field within that record.

So a number of related fields form a record and the collection of records is a database – usually in the order that they were entered. Generally we want to examine them in a specific order – alphabetically for example – so index files are created and used to display the records in the desired order. As well as maintaining the file, a database system generally needs to have some way of extracting the information it contains and Inter-Base will do all of these things.

It is probably best at this stage to compare Inter-Base to Viewstore, the equivalent database for Acornsoft's View family. Viewstore is a 16k rom which in outline does much the same sort of

things. I base by produce of inform. While of acti ming la mise. B the who learn th be able makes erful.

When see is t create records and pri of the most select editor a progra

How instan Viewst native on dis having with th that th on to only datab allow effect On sensi

MAIL-MERGING WITH INTER-WORD

The manual does not show what seems to me to be the simplest way to link Inter-Base with Inter-Word, which is by using the former's commands embedded into the word processor document, obviating writing an actual program:

- Enter the Inter-Base card index and open the database with the appropriate index if you need one.
- Enter Inter-Word and load the document.
- At the first character position of the document use f1 to embed the colon command:

```
:READ REC f()
```

This reads the first record from the database file into the array *f*. This array is already declared by the card index for the purpose so it exists and the types match.

- Every time the Inter-Word document needs data from Inter-Base embed an EXPORT command at that point. For example if a name required in the document is in field 3 of the database you should embed:

```
:EXPORT f(3);
```

The semicolon stops a carriage return being sent, rather like in Basic's PRINT.

- In the final character position of the document embed:

```
:SKIP
```

which moves the database on to the next record.

- Set Inter-Word to print however many copies you require and print them.
- Go back to Inter-Base and close the database.

The Data Protection Act

Computerised databases containing personal information are covered by the Data Protection Act – this could include ones on a BBC Micro. If you keep such a database you'll need to register it with the Data Protection Registrar unless it satisfies at least one of the exemptions.

The most likely exemptions that will apply to users of BBC Micros are:

- Records kept for purely domestic or recreational purposes
- Membership records of unincorporated clubs – provided that none of the members has an objection.
- Data used purely for calculating wages, pensions or accounts.

If you are going to be setting up a database and are not certain whether it will be exempt it is advisable to take advice from the Data Protection Registrar. His address is:
Springfield House,
Water Lane,
Wilmslow,
Cheshire.
SK9 5AX
Tel: Wilmslow
(0625) 535777

things. Information is extracted from the database by a number of disc-based utilities – they produce reports, for example, or can provide a file of information for mail merging in View.

While Inter-Base is capable of a similar range of actions it also has its own built-in programming language so its actions are easy to customise. Better still, the language contains virtually the whole of BBC Basic so it is only necessary to learn the extra database handling commands to be able to use it. The programming language makes Inter-Base potentially much more powerful.

When you enter Inter-Base the first thing you see is the card index program. This allows you to create a database, view it, add and delete records and a few other things like create indexes and print reports. In short this program does most of the things that you're likely to want to do with most databases. It also has an option which selects the programming menu which has an editor and other useful facilities to help in writing programs.

However there are some negative points, for instance it can only show one record at a time – Viewstore has a spreadsheet display as an alternative. Also the Inter-Base label printer, supplied on disc, is quite different. In one way it is better, having a screen designer to give more flexibility with the layout of the fields on the label. Against that there are serious shortcomings. It only prints on to stationery with one column of labels, and it only uses data from the first nine fields of a database – the instructions say ten, but as it only allows entry of single digits, and zero has no effect, the tenth field is inaccessible.

On the positive side, Inter-Base deals more sensibly with altered records. If new data is

added in Viewstore and it makes the record larger than the space allocated to it in the file, you have to delete the record and create a new one at the end of the file. Inter-Base does all that automatically – there's no need to type it again.

It also allows any number of indexes for a file provided there is space in the directory. All Inter-Base indexes can be updated automatically to include new records as they are entered, and they can be conditional, so that only some records are included. I have found this extremely useful. For instance, say you keep membership records for a club which has an annual subscription, Inter-Base allows you to maintain 12 separate indexes for the subscriptions due each month. In Viewstore the conditional selection has to be done each time the data is required using the Select utility and a temporary index created from it.

Also included on the disc are utilities which will import existing databases from other systems. A test run on a ViewStore file of around 100 records, each with 10 fields, worked but was a little slow.

The language

In order to use Inter-Base effectively you really do need to come to terms with the programming language – some of the commands are needed to transfer data to other Inter products and using the language does allow that little bit of customisation.

Forgetting its database functions for a moment, the Inter-Base language is really very similar to Basic. It runs – according to benchmark

Turn to Page 48 ►

```
open,
REM ensuring that it exists and is
compatible.
REPEAT
```

```
  REPEAT
    REPEAT
      INPUT "Database filename"
    "File$
    IF File$<1>="*"
      REM issue star command
      OSCLI File$
    ENDIF
  UNTIL File$>"" AND File$<1>="*"
  REM see if file exists
  Handle=OPENIN File$
  IF Handle=0
    REM No file of that
    P."File does not exist"
  ENDIF
UNTIL Handle<>0
```

```
REM Open the database
USE DB File$
```

```
REM Test whether the data
```

DATABASE : ADDR

(C) Computer Concepts 1987

- 1) Close database
- 2) Disable Index (NAMES)
- 3) Set condition
- 4) Edit fields
- 5) Option menu
- 6) Print records
- 7) Build index
- 8) Create new database
- 9) Program menu
- 0) Extensions menu

ESC Edit current record

Enter choice _

The Inter-Base programming language . . .

. . . and main menu

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tests – about 10 per cent slower, even so it has advantages over the normal Basic on the BBC Micro:

- Programs have no line numbers and are created through the Inter-Base program editor.
- There are control structures similar to Archimedes Basic, like WHILE ... ENDWHILE loops, and CASE ... ENDCASE to allow several alternative actions.
- Arrays can have irregular dimensions, and different elements can be of different types, allowing strings to be mixed with integers, reals and dates in the same array and only the elements that are going to be used have to be defined.

The card index program and the program menu are written in the language, so there is already a mechanism to run programs from rom. Additionally Inter-Base contains a formatter to write programs into sideways ram, so it's possible to gain up to 16k of extra space for storing variables in main memory, which can be very useful.

Using Rom-Link

The whole idea of the Inter series is that it can interact in memory and allow data to be readily transferred. The usual way for other packages to extract data from Inter-Base is for the calling

package to run an Inter-Base program which contains the command EXPORT to send the data.

The examples disc contains a sample program to extract data for mail merging from Inter-Word. This seems to be unnecessarily complicated, since it can easily be done by embedding single commands in the Inter-Word document and having the relevant database open in the Inter-Base card index program. Used like this, mail merging is a doddle – far easier than with View and Viewstore – and as the data is on disc the number of letters that can be sent is not limited by memory. However the fact that there are two methods demonstrates the tremendous versatility of the system.

Conclusions

If you want a database with a fixed range of things neatly worked out for you, I wouldn't recommend this one – others are simpler. But if you are prepared to do the odd bit of programming yourself and want almost limitless flexibility you should seriously consider Inter-Base.

If you already use any of Computer Concept's Rom-Link products Inter-Base has obvious advantages with very good integration between them. The new manual is a lot better but you still need to sit down and experiment for quite a while before you get the hang of writing programs of any complexity.

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**Your technical questions
answered by MIKE COOK**

PROBLEM SOLVED

Random errors

HALF an hour after I switch on my old BBC B issue 3 – Basic I, Watford rom/ram board and two solderless ram boards – it fails to run most programs, but View will still work. When I check the micro with the Watford diagnostic disc I find that there is an error in the ram part – not always the same address but more or less random like &5FF3, &6400 or &7512.

The micro has run quite well for five years now and is not overheating. Have you any idea what the problem is and how I can solve it? – **D. Roovers, Almere, Holland.**

● On the face of it your micro appears to have a simple memory fault but the cause could be one of many things. The simplest explanation is that the ram chips themselves are at fault. However, if they are I would expect that you might also have random errors when using graphics in Modes 0, 1 and 2.

One way to test if it is the chips is to swap the first and second 16k memory blocks over. This can be done by swapping IC65 with 57, 61 with 53, 66 with 58, 62 with 54, 63 with 55, 67 with 59, 64 with 56 and 68 with 60. If the diagnostic reveals that the faulty memories are now below &400 the original high number in each part would be replaced.

However these apparent memory errors could be due to loading or timing problems. To see if this is the case remove all the extra boards from your micro and run the diagnostic program again. If the errors have disappeared a timing or loading problem would be confirmed. One way of curing this is to replace IC14 – a 74LS245 – with a 74ALS245. This will give the extra speed and drive needed by your system.

Bugged by buggies

I AM part way through making a computerised buggy for my Craft/Design/Technology GCSE. I need my BBC Micro to sense both the front and back bumpers plus hopefully about eight further switches using the last analogue input.

To do this, I was wondering if it is possible to make the switches using something similar to the conducting foam concept keyboard idea detailed in the November 1986 issue of *The Micro User* via two lower value resistors connected to the

analogue port.

Do you think that this would work and if so where can I acquire the foam and copper strip? – **David Nevard, Exeter.**

● Yes, it should be possible to sense different voltages through the analogue input port. Remember, however, you will be restricted to sensing the lowest switch in the chain. Copper strip and foam can be obtained from Musbury Consultants as Body Build Pack no 36 (£7.50). This went with the Body Build Article in November 1986.

Mousing about

I USE a BBC Micro a lot for my school work. I enjoy using CAD packages, and have the Nidd Valley Illustrator and AMX mouse. I want to use the mouse in my own programs, but don't have an AMX rom fitted and was wondering if there was a way to detect the mouse without it. – **Mark Gregory, Rugby, Warwickshire.**

● You can easily use a mouse by writing a background task in machine code. This was covered in the February 1985 Body Building article. Although this concerned itself with a track ball, the signals are the same from a mouse. However the AMX mouse uses a slightly different pin-out, which was given in the July 1986 issue. The change can easily be accommodated by slight alterations in the software patch.

Drive difficulties

I HAVE recently fitted a switchable double disc drive to my BBC Micro but I do not seem to be able to read or write to it. This means that my old discs will not operate at all and I receive an error message such as *Disc fault*.

Instructions describing the drives and setting up suggest soldering an 8-way Dip switch to the bottom right of the keyboard to allow me to select the operating speed of the DFS to match the drives. My last drive didn't need this. Could this be my problem, and if so do I need to fit this Dip switch? – **A. Leong, Eccles, Manchester.**

● The DIP switches on the corner of the keyboard are used to speed up disc access, and as drives

On the agenda...

- Making contact with a Compact
- Making boxes for holding discs
- Handling ram corruption and overloading
- Making a drive read a disc
- Devising detection switches for buggies
- Getting control of your mouse
- Spending too much time on the analogue port
- Waking up a sluggish micro
- Quieting a noisy disc drive

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I never recommend using the BBC Micro's own power supply for running disc drives simply because it can lead to problems

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will always work with the slower speed there is no need to tamper with that. Full details of these switches can be found in the Advanced User Guide.

You say that your old discs will not work with your new drive, but what about new discs? If you can format and use them but not your old ones, it is likely that the fault is head alignment either in your old drive or the new one. If the fault was in your old drive you could deliberately misalign your new drive to work with your old discs but this is a little dangerous as you run the risk of not being able to use other people's discs.

If, however, the drive will not work with new discs either, the fault is in your new drive or the cable. As it is a twin unit, make sure that the terminating resistor pack is only fitted to one drive.

Compact compatibility

IN your March 1988 issue I saw an article about building an Etch-a-sketch interface. Is it possible to link this hardware to my Master Compact? — **Elliot West, Loughton, Essex.**

● Unfortunately this is not possible — this interface relies on the analogue to digital converter available in other Acorn machines, but the Compact does not have one. The joystick port uses switched digital input.

Analogue errors

I ACCIDENTALLY broke the analogue port when I plugged a joystick into my micro. I carefully removed it but left in the ADC chip in IC73. Recently, however, for some reason this chip has caused a lot of games like Barbarian, Pipeline and Omega Orb to crash as they load, and other games like Spellbinder become impossible to complete. After removing the chip, all the games work, and I have finally completed Spellbinder. Have you any idea why this happened? — **J. Byrant, Dronfield Woodhouse, Sheffield.**

● You might have shorted some lines on the fire buttons, but as this does not go through the A/D chip it seems unlikely. What is more probable is that the A/D converter developed a fault quite independently of the physical damage to the socket. It sounds as though increased interrupts are being generated, causing the micro to slow down at crucial points. This could affect some protection routines and produce other random effects within games programs.

Removing the port simply because of a mechanical fault was a little extreme — replacing it would probably have been better.

A time to fail

I HAVE a BBC B with ATPL rom board and an Acorn 0.9 DFS with a Toshiba 40/80 disc drive which uses the micro's power supply. My problem is that when I first turn on the system, put in a disc and

try to catalogue it to run a game or do anything else, I am notified that there is a disc fault and the drive switches off.

This has been going on for a couple of years now. I can usually make the drive work properly by unplugging the connector which goes to the micro's power supply and putting it back on again in quick succession. Recently even this has failed to work and I have to leave the micro alone and wait for it to work naturally — it takes twice as long for 40 track mode. But sometimes it works as soon as I turn it on.

I have replaced the lead which supplies the power to the drive but this has had no effect. The problem also occurred on another 80 track drive. Please could you find the solution? — **S.R. Mansfield, Margate, Kent.**

● The solution is quite simple — I never recommend using the BBC Micro's own power supply for running disc drives simply because it can lead to problems like yours. The internal supply can't supply the switch on surges, so your solution is to get an external power supply. There is also a faint possibility that your problem could be a faulty auxiliary power socket.

Annoying noise

I HAVE a Master with a very noisy Watford twin 40/80 disc drive. My previous drive, also a Watford one, had an acceptable noise level. I have taken it back once and Watford assures me that it is quite all right. I admit that it appears to work, but I find the klonking and thumping very distracting. Is it a case of you get what you pay for? Can you advise on an alternative quiet disc drive or perhaps something can be done with this one? — **Majorie Costa, Ware, Herts.**

● What noise annoys an oyster? A noisy disc drive perhaps. I don't like my disc drive to be silent, preferring to know that it's working. Having said that, some drives are noisier than others but it is something that is never mentioned in the specifications.

Also a lot depends on the ambient noise level where you have your micro and the way your equipment is arranged. Is the drive sitting on something that could be acting as a sounding box and making matters worse? If that is the case a little re-arrangement might work wonders. If not make sure you hear the replacement before you part with more cash.

Boxing clever

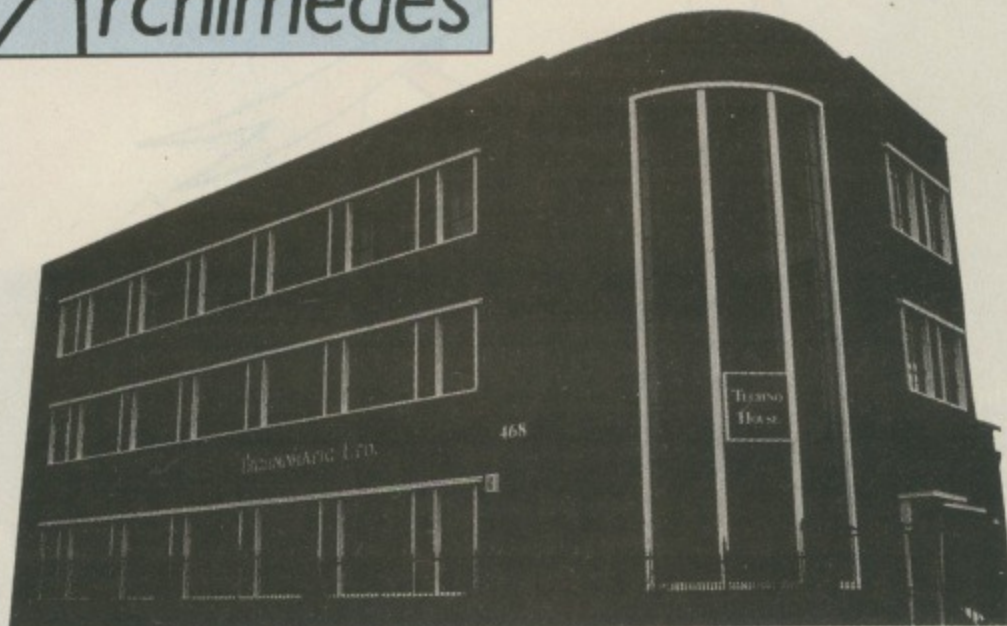
I AM working on a GCSE technology project and am considering making a disc organiser to facilitate finding of discs. I would like to know what limits it has to conform to, especially in respect of temperatures, materials regarding magnetism and so on. — **Lee Clarke, Wimborne, Dorset.**

● There are no recognised standards for boxes or disc wallets and there is little you can do in a box economically to protect discs from temperature and magnetic fields. A box made of mu-metal would protect the contents from stray magnetic fields, but it would be quite expensive, heavy and fragile.

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Orthogonal Patience

Gyles Harvey
takes a
right-angled
view of the
popular
card game



THERE are many different versions of that old card game Patience, most representing the seven column sort. However here's a completely different one to allow you to while away a lazy hour. The cards are dealt on to screen in four rows of 13 and the idea is to sort them into numerical and suit order with the twos on the left and kings on the right

You do this by removing the aces and moving cards into the spaces left behind. But the only card that can be put into a space is one next in sequence and in the same suit as the one to the left of the gap. So you can't move a card on to the second of two consecutive gaps, or next to a king. And there lies the challenge!

Eventually you may reach a position where you can't move into any of the four gaps. Then you collect all the cards that don't follow correctly from a two in the leftmost position, shuffle and deal them. The measure of how well you solve the problem is how few – or many – times you need to do this.

The program is in three sections to allow it to be used on any BBC Micro or the Z88. On either machine, type in the base section – Listing I – followed by the appropriate section for your micro. Use Listing II for a Z88 and Listing III for the BBC Micro. Make sure you don't add any extra spaces for this one as memory is a bit tight.

The BBC Micro-specific part of the listing is much longer than the Z88 section as it contains code for expanding characters on to a two by two grid for the numbers and also large character definitions for the suits.

You press keys one to four to specify which space you want to fill and illegal moves are trapped. When a space is at the leftmost position you are asked the suit of which two you want there. When you get stuck pressing the spacebar will re-deal the cards that are not in position. Should you get really stumped Return is available as a last resort to re-start the game.

Move the
two of
diamonds to
position one



Listing I: The core program

```
10 REM Orthogonal Patience
20 REM By Gyles Harvey
30 REM (c) The Micro User
50 PROCcomputer
60 PROCinit
70 PROCscreen
80 PROCshuffle
90 PROCdeal
100 PROCkeys
110 IF KX=6:RUN
120 PROCmess(16,16,"YOU WIN")
130 KX=GET:RUN
140 DEFPROCinit
150 DIML(4,1)
160 DIMM10,p 52,0%52,s 52,B%4
170 FORAX=0T04:B%AX=0:NEXT
180 FORAX=0T052:p?AX=0:NEXT
190 s$="CDHS"

200 n$="A23456789TJQK"
210 d=-1:UX=0:VX=0
220 ENDPROC
230 DEFPROCshuffle:LOCALTX
240 FORCX=0T051:IFp?CX<>255p?CX=0:s?TX
= CX:TX=TX+1
250 NEXT
260 FORRX=0T03:FORDX=B%RX?RX?T012
270 REPEATX=RD(TX)-1:UNTILs?EX<>255
280 0%?(RX+13+DX)=s?EX:s?EX=255
290 NEXT:NEXT:ENDPROC
300 DEFPROCdeal:LOCALXX,YX
310 d=d+1:PROCscore
320 FORYX=0T03:FORXX=B%YX?YX?T012
330 PROCdraw(XX,YX+1):NEXT:NEXT
340 ENDPROC
```

Turn to Page 55 ▶

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Sixteen flexible exercise programs of games for up to four children are contained on twin cassettes or disk programmed for the home computer.

Each child's name is entered at the start and a complete record of results kept. All games can be set at two ability levels with any number of games for each exercise.

Right answers to a problem brings a Cheshire Cat grinning from the screen, a correct tick and a happy tune. Wrong answer and the program gives the unsuccessful child extra help.

Includes:-

- Counting: Keep count of Kicker Kangaroo's goal scoring
- Number Recognition: Sail the required number of boats into harbour. Put the right coloured shapes into sets.
- Sorting: An easy introduction to sums and to those + and = symbols-coloured beads give a visual aid.
- Addition: A fun hello to the important concept of sequences.
- Patterns: Spot the highest flower an exercise in visual perception.
- Tallest: and much, much more...

Adder Sums Age 7-8 yrs.

A sixteen flexible exercise program of games for up to four children are contained on twin cassette or disk programmed for your home computer.

Each child's name is entered at the start and a complete record of results kept. All **ADDER SUMS** games can be set at one of two ability levels with up to any number of tries per child in each.

Right answers bring a Cheshire Cat grinning from the screen, who quickly steps in to help the child in difficulty.

Cheshire Cat **ADDER SUMS** includes:-

- Multiplication: Calculate the cost of items shown in the grocer's shop window.
- Addition: Correctly total the shopping bill from the grocers
- Division: Share out the biscuits using the simple technique provided.
- Time: Learn to tell the time of day, days of the week and the months of the year.
- Tables: Make a start or improve on those important times tables.

Sum Takeaway (Maths Level 2) Age 6-7 yrs.

Nineteen flexible exercise programs of games for up to four children are contained on twin cassettes or disk programmed for your home computer.

Each child's name is entered at the start and a complete record of results kept. All games can be set at two ability levels with up to 100 games for each exercise.

Right answers bring a Cheshire Cat grinning from the screen, a correct tick and a happy tune. Wrong answer and the program gives the unsuccessful child extra help.

Cheshire Cat Sum-Takeaway includes:

- Addition: Full hello to sums.
- Subtraction: Starts with differences and introduces Take Away.
- Charts: Ways of recording information. A vital concept in the child's future.
- Tens & Units: Delightful visual hello to numbers over nine.
- Multiply: First step in those times tables and the 'X' sign.

Sum Measure Age 9-13 yrs.

Six programs with a choice of 6, 10 or 20 questions are contained on twin cassette or disk programmed for your home computer.

Two chances are given to achieve the correct answer, but don't worry extra help is provided for a child in difficulty.

At the end of each run the results are displayed thereby facilitating the monitoring of the child's progress

Cheshire Cat **SUM MEASURE** includes:-

- Length: Work out the length of a line in centimetres or millimetres.
- Area: Find the area of a rectangle using cm^2 .
- Volume: Give the volume of a cuboid in cm^3 .
- Temperature: Work out the temperature shown on the thermometer.
- Mass: Read the correct balance scale
- Capacity: Measure the amount of liquid in the cylinder.

Sum Times (Maths Level 4) Age 8-9 yrs.

Nineteen flexible exercise programs of games for up to four children are contained on twin cassettes or disk programmed for your home computer.

Each child's name is entered at the start and a complete record of results kept. All games can be set at two ability levels with up to 100 games for each exercise.

Right answers bring a Cheshire Cat grinning from the screen, a correct tick and a happy tune. Wrong answer and the program gives the unsuccessful child extra help.

Cheshire Cat Sum Times includes:

- Tally & Bar Charts: An easy introduction to graphs.
- Time: A moving clock for digital time.
- Tens & Units: Addition & Subtraction of numbers over nine.
- Symmetry: Lines of symmetry.
- Co-ordinates: Important for reading maps and graphs.
- Square Units: Invaluable for calculating areas etc.

and much, much more...

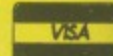
**EACH PACK CONTAINS TWO CASSETTES
PLUS PARENTS' GUIDE**

TOWERHILL COMPUTERS LTD

Unit 7, Acacia Close, Cherry Court Way Ind. Est.

Leighton Buzzard, Beds.

Telephone: Leighton Buzzard (0525) 385329/383074



◀ From Page 53

```

350 DEFPROCkeys
360 REPEAT REPEAT
370 KX=INSTR("1234 "+CHR$(13),GET$)
380 UNTILKX>0
390 PROCmess(20,20,""):PROCscore
400 IFKX<5:PROCswap(KX)
410 IFKX=5:PROCdeal
420 PROCscore
430 UNTILKX>5
440 ENDPROC
450 DEFPROCdeal
460 PROCchowcomplete
470 LOCAL FX,RX:FX=TRUE
480 FORRX=0TO3:IFBX?RX<>12:FX=FALSE
490 NEXT
500 IFFX?KX=7 ELSEPROCshuffle:PROCdeal
510 ENDPROC
520 DEFPROCswap(NX)
530 GX=L(NX,0):HX=L(NX,1):VX=VX+1
540 IFGX=0PROCwhichtwo:GOTO580
550 FX=0X?(GX-1+13*HX)
560 IFFXMOD13=12:PROCmess(3,3,"You can
not swap next to a King..."):ENDPROC
570 IFFXMOD13=0:PROCmess(2,3,"You can
not swap next to a Space..."):ENDPROC
580 LOCALXX,YX:FORXX=0TO12:FORYY=0TO3
590 IFOX?(XX+13*YY)=FX+1:IX=XX:JX=YY:X
Y=13:YX=4
600 NEXT:NEXT:UX=UX+1
610 CX=0X?(IX+13*JX):0X?(IX+13*JX)=0X?

```

```

(GX+13*HX):0X?(GX+13*HX)=CX
620 PROCdraw(GX,HX+1):PROCdraw(IX,JX+1)
630 ENDPROC
640 DEFPROCwhichtwo
650 PROCmess(5,0,"Which 2 ...? (C/D/H/
S) ... ")
660 REPEATNX=INSTR(ss,CHR$(GETAND&DF))
670 UNTILNX>0:FX=(NX-1)*13:ENDPROC
680 DEFPROCchowcomplete
690 FORRX=0TO3:BX?RX=0
700 NX=0X?(13*RX)
710 IFNXMOD13<>1THEN760

```

```

720 BX?RX=1:p?NX=255
730 FORDX=1TO11
740 IFOX?(13*RX+DX)=NX+DX:p?(NX+DX)=25
5:BX?RX=DX+1ELSEDX=13
750 NEXT
760 NEXT
770 PROCscore
780 ENDPROC

```

Listing II: Z88 Part

```

40 CLS
1000 DEFPROCscreen
1010 REM Z88 CURSOR OFF ...?
1020 PRINTTAB(50,0)"O R T H O G O N A L

```

✓ **Get it right!**

10 = 00	150 = BBD4 3	280 = 83C6 C
20 = 00	160 = 60D6 6	290 = BB05 F
30 = 00	170 = 10DE D	300 = 9F57 2
50 = F21F F	180 = 8322 F	310 = 4A9E D
60 = DEBB 7	190 = 4F42 D	320 = 7123 2
70 = 9538 5	200 = D44A 0	330 = 430 1
80 = D787 4	210 = BA18 0	340 = ED0F 0
90 = D5C C	220 = ED0F 0	350 = 5A41 7
100 = B0B6 6	230 = 60BA 8	360 = B1FE D
110 = AD84 8	240 = D1CC 1	370 = ECCD 4
120 = 8EAE 4	250 = 2C83 C	380 = 1350 B
130 = 553A F	260 = D916 E	390 = 2851 5
140 = 344C 7	270 = EEDD D	400 = 9833 5

410 = 5478 C	540 = F03C A	670 = C3A1 B
420 = CEC4 B	550 = 4085 B	680 = 3F5A 2
430 = 43F5 E	560 = A0A2 4	690 = DA54 4
440 = ED0F D	570 = 6047 3	700 = 57FA D
450 = AD24 8	580 = 2023 A	710 = 70FA 1
460 = 8D0A 4	590 = 9F18 D	720 = 8F6A 2
470 = C206 E	600 = 2B50 6	730 = E22E 7
480 = 7B0B C	610 = 157B D	740 = DE96 5
490 = 2C83 7	620 = 6E54 1	750 = 2C83 6
500 = 5A62 B	630 = ED0F 8	760 = 2C83 5
510 = ED0F B	640 = 3B84 2	770 = CEC4 1
520 = 4296 2	650 = 42E5 C	780 = ED0F B
530 = A1A 3	660 = 13C2 C	

The truth about TELEX

How much does it cost to go on Telex?

You could go the conventional way and buy a dedicated Telex machine. The cheapest will cost you £1,604 (the Whisper), the dearest £2,892 (the Cheetah). You will also need a separate telephone line, costing £101 to install, plus £404 a year rental. That's a total outlay over the first year of a minimum of £2,109. (All prices include VAT.)

Or you could do what more and more BBC Micro users are doing – use your BBC Micro to double as a Telex machine. And just use your ordinary telephone!

How do I turn my BBC Micro into a Telex machine?

All you need is a modem and appropriate communications software (see the advertisements in this issue), a telephone, and a subscription to MicroLink.

Telex is just one of a growing number of services available to micro users on MicroLink. You can also read the news as it happens, go teleshopping, create your own closed user group, send telemessages and electronic mail right round the world, download free programs directly into your micro ... and much more.

But why use Telex?

Because it's a standard means of instant communication between businesses. Today – there are 150,000 Telex machines in use in Britain – and more than 2 million worldwide. It's used to dramatically speed up business communications – it's just as quick as using the phone but far more efficient, because you have a hard copy of every "conversation" for your records.

But there's a big bonus you get when you use MicroLink for Telex that the conventional way doesn't offer.

With MicroLink you don't HAVE to be in your office to send or receive Telex messages. You can just as easily use your computer at home (or even a portable). So now you can check whether there are any Telex messages waiting for you – anywhere, anytime. How's that for your business efficiency?

How to join:
Phone 0625 878888

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```

1030 PRINTTAB(52,1)"P A T I E N C E"
1040 PRINTTAB(52,2)"By Gyles Harvey"
1050 PRINTTAB(52,4)"Space = re-deal"
1060 PRINTTAB(52,5)"Return = re-run"
1070 PRINTTAB(0,7)"deals :TAB(20,7)"cards :TAB(40,7)"turns :";
1080 ENDPROC
1090 DEFPROCdraw(P%,R%)
1100 EX=0%(P%+13*(R%-1))
1110 SX=EXDIV13+1
1120 EX=EXMOD13+1
1130 IFEX=1THEN1170
1140 PRINTTAB(P%*3+5,R%-1)MID$(n$,EX,1)
;
1150 PRINTMID$(s$,SX,1);
1160 ENDPROC
1170 PRINTTAB(P%*3+5,R%-1)*";SX;
1180 L(S%,0)=P%:L(S%,1)=R%-1
1190 ENDPROC
1200 DEFPROCscore
1210 PRINTTAB(8,7);d;TAB(28,7);
1220 FORLX=0TO3:PRINT;B%?LXSPC1;:NEXT
1230 PRINTTAB(48,7);U%;" ";V%;
1240 ENDPROC
1250 DEFPROCmess(before,after,string$)
1260 PRINTTAB(0,5)SPC(before)string$SPC(after);
1270 ENDPROC
1280 DEFPROCcomputer
1290 REM 288 GENERATOR INITIALISE ...?
1300 ENDPROC

```

Listing III: BBC Micro part

```

40 MODE1
1000 DEFPROCsuit(S%)
1010 ONS%GOTO1020,1070,1120,1170
1020 VDU23,128,0,1,7,15,15,55,123,125
1030 VDU23,129,0,0,192,224,224,216,188,
124
1040 VDU23,130,255,125,121,51,3,3,7,0
1050 VDU23,131,254,124,60,152,128,128,1
92,0
1060 ENDPROC
1070 VDU23,128,0,1,3,7,15,31,63,127
1080 VDU23,129,0,0,128,192,224,240,248,
252
1090 VDU23,130,63,31,15,7,3,1,0,0
1100 VDU23,131,248,240,224,192,128,0,0,
0
1110 ENDPROC
1120 VDU23,128,0,24,60,126,127,255,127,
127
1130 VDU23,129,0,48,120,252,252,254,252,
252
1140 VDU23,130,63,63,31,31,15,7,1,0
1150 VDU23,131,248,248,240,240,224,192,
0,0
1160 ENDPROC
1170 VDU23,128,0,1,3,7,15,31,63,63
1180 VDU23,129,0,0,128,192,224,240,248,
248
1190 VDU23,130,63,61,25,3,3,3,7,0
1200 VDU23,131,248,120,48,128,128,128,1
92,0
1210 ENDPROC
1220 DEFPROCchars
1230 VDU23,136,0,0,0,0,0,3,6,4
1240 VDU23,137,0,0,0,0,0,255,0,0
1250 VDU23,138,0,0,0,0,0,192,96,32
1260 VDU23,139,4,6,3,0,0,0,0,0
1270 VDU23,140,0,0,255,0,0,0,0,0
1280 VDU23,141,32,96,192,0,0,0,0,0
1290 VDU23,142,4,4,4,4,4,4,4,4
1300 VDU23,143,32,32,32,32,32,32,32,32
1310 VDU23,144,0,0,0,0,0,0,1,3

```

```

1320 VDU23,145,0,0,0,0,0,255,255
1330 VDU23,146,0,0,0,0,0,128,192
1340 VDU23,147,3,1,0,0,0,0,0,0
1350 VDU23,148,255,255,0,0,0,0,0,0
1360 VDU23,149,192,128,0,0,0,0,0,0
1370 VDU23,150,3,3,3,3,3,3,3,3
1380 VDU23,151,192,192,192,192,192,192,
192,192
1390 VDU23,159,255,255,255,255,255,255,
255,255
1400 ENDPROC
1410 DEFPROCscreen
1420 VDU23,8202;0;0;0;19,0,2;0;19,1,1;0
;19,2,0;0;19,3,7;0;
1430 MOVE0,1024:PRINTb$:MOVE0,1024:GCOL
0,3:PRINTi$:CHR$4
1440 VDU31,1,1:COLOUR131:COLOUR1:PROCEX
pand(79)
1450 VDU31,1,3:PROCEXpand(80)
1460 VDU31,4,1:PROCBboxes("RTHOGONAL")
1470 VDU31,4,3:PROCBboxes("ATIENCE")
1480 PRINTTAB(1,7)"Press Space to re-de
al, Return to run."
1490 COLOUR128:COLOUR2:PRINTTAB(24,1)"B
y Gyles Harvey"
1500 COLOUR3:PRINTTAB(20,3)"deals :TAB
(20,4)"cards :TAB(20,5)"turns :";
1510 PROCgrid
1520 ENDPROC
1530 DEFPROCboxes(t$)
1540 LOCALX%:FORX%=1TOLENT$
1550 VDUASCMI$(t$,X%)9:NEXT:ENDPROC
1560 DEFPROCcard(P%,R%,D%)
1570 GCOL0,D%
1580 VDU31,P%*3+1,R%*6+3
1590 MOVEP%*96,(30-R%*6)*32
1600 PRINTi$:CHR$4;
1610 ENDPROC
1620 DEFPROCgrid:LOCALX%,Y%
1630 FORX%=0TO12:FORY%=1TO4
1640 MOVEX%*96,(30-Y%*6)*32
1650 PRINTb$CHR$4;:NEXT:ENDPROC
1660 DEFPROCdraw(P%,R%)
1670 EX=0%(P%+13*(R%-1))
1680 SX=EXDIV13+1
1690 EX=EXMOD13+1
1700 IFEX=1THEN1770
1710 PROCcard(P%,R%,3)
1720 PROCsuit(S%)
1730 COLOUR131:IFS%=10RS%=4COLOUR2ELSEC
OLOUR1
1740 VDU31,P%*3+1,R%*6+3,128,129,8,8,10
,130,131,8,8,10
1750 PROCexpand(ASCMID$(n$,EX))
1760 ENDPROC
1770 PROCcard(P%,R%,0)
1780 COLOUR128:COLOUR3
1790 VDU31,P%*3+1,R%*6+4
1800 PROCexpand(48+S%)
1810 L(S%,0)=P%:L(S%,1)=R%-1
1820 ENDPROC
1830 DEFFNa(C%):LOCALTX
1840 IFCXAND128TX=TX+192
1850 IFCXAND64TX=TX+48
1860 IFCXAND32TX=TX+12
1870 IFCXAND16TX=TX+3
1880 =TX
1890 DEFFNb(C%):LOCALTX
1900 IFCXAND8TX=TX+192
1910 IFCXAND4TX=TX+48
1920 IFCXAND2TX=TX+12
1930 IFCXAND1TX=TX+3
1940 =TX
1950 DEFPROCexpand(!M%)
1960 LOCALAX%,LX%,XX%,Y%:AX=10
1970 XX=M%:Y%=M%DIV256:CALL&FFF1
1980 VDU23,132:FORLX=1TO4
1990 AX=FNa(M%?LX):VDUAAX%:NEXT

```

```

2000 VDU23,133:FORLX=1TO4
2010 AX=FNa(M%?LX):VDUAAX%:NEXT
2020 VDU23,134:FORLX=5TO8
2030 AX=FNa(M%?LX):VDUAAX%:NEXT
2040 VDU23,135:FORLX=5TO8
2050 AX=FNa(M%?LX):VDUAAX%:NEXT
2060 VDU132,133,8,8,10,134,135
2070 ENDPROC
2080 DEFPROCscore
2090 COLOUR3:COLOUR128:PRINTTAB(28,3);d
;TAB(28,4);
2100 FORLX=0TO3:PRINT;B%?LXSPC1;:NEXT
2110 PRINTTAB(28,5);U%;" ";V%;
2120 ENDPROC
2130 DEFPROCmess(before,after,string$)
2140 COLOUR128:COLOUR3:PRINTTAB(0,6)SPC
(before)string$SPC(after);
2150 ENDPROC
2160 DEFPROCcomputer
2170 PROCchars
2180 SX=RND(-TIME)
2190 b$=CHR$5+CHR$18+CHR$0+CHR$2+CHR$13
6+CHR$137+CHR$137+CHR$138+STRING$(4,STR
ING$(4,CHR$8)+CHR$10+CHR$142+" "+CHR$143
)+STRING$(4,CHR$8)+CHR$10+CHR$139+CHR$14
0+CHR$140+CHR$141
2200 i$=CHR$5+CHR$144+CHR$145+CHR$145+C
HR$146+STRING$(4,STRING$(4,CHR$8)+CHR$10
+CHR$150+CHR$159+CHR$159+CHR$151)+STRIN
G$(4,CHR$8)+CHR$10+CHR$147+CHR$148+CHR$14
8+CHR$149
2210 ENDPROC

```



40 = EA3A A	1400 = ED0F E	1810 = 1840 F
1000 = A703 B	1410 = F5B9 7	1820 = ED0F 9
1010 = 892D 6	1420 = 6869 3	1830 = F3DB 1
1020 = AC05 3	1430 = EC78 9	1840 = 1063 9
1030 = 71DC A	1440 = 82E8 A	1850 = F68A A
1040 = A99A 7	1450 = 3EF7 2	1860 = 30CD 5
1050 = 8B35 0	1460 = 665E 0	1870 = B0A5 F
1060 = ED0F E	1470 = 8DEB C	1880 = 3148 0
1070 = 52EB 2	1480 = 3F93 C	1890 = DE9F A
1080 = E765 2	1490 = D17A 2	1900 = 3591 7
1090 = 63F5 6	1500 = 9925 9	1910 = D2F7 0
1100 = 9AF5 6	1510 = 58D2 0	1920 = D6C0 B
1110 = ED0F F	1520 = ED0F F	1930 = 16F9 0
1120 = F399 C	1530 = D68 B	1940 = 3148 1
1130 = F63B 0	1540 = 303A 8	1950 = 899C A
1140 = 8C5 9	1550 = B10E 5	1960 = 26EB C
1150 = DD99 D	1560 = 1F92 1	1970 = 6339 E
1160 = ED0F 4	1570 = 9C08 C	1980 = CFE5 A
1170 = 3D45 C	1580 = 18D8 6	1990 = 65A8 8
1180 = 751E 1	1590 = F7CB B	2000 = 24C6 F
1190 = ED8 4	1600 = C180 1	2010 = 8DE5 B
1200 = 6222 0	1610 = ED0F E	2020 = 8821 C
1210 = ED0F 7	1620 = EC34 3	2030 = 65A8 F
1220 = 1613 6	1630 = 7D70 5	2040 = 6302 B
1230 = 58E4 9	1640 = D00B D	2050 = 8DE5 B
1240 = 496E 2	1650 = AB5B 0	2060 = 9DE9 C
1250 = 72D8 6	1660 = E2FC F	2070 = ED0F 2
1260 = DD8F 0	1670 = 3222 5	2080 = 65A0 E
1270 = C6FF 7	1680 = F7CE A	2090 = 3B44 D
1280 = F39D 6	1690 = 5464 3	2100 = DD93 B
1290 = 707C E	1700 = B7BC C	2110 = ECC7 A
1300 = B665 B	1710 = 84FD C	2120 = ED0F B
1310 = 9250 9	1720 = 2D80 B	2130 = CFA9 B
1320 = A881 2	1730 = A40 2	2140 = D306 5
1330 = 9BD9 2	1740 = 102C C	2150 = ED0F 8
1340 = 263 B	1750 = C4C 4	2160 = 789C A
1350 = 1478 E	1760 = ED0F 1	2170 = BD77 B
1360 = 185F F	1770 = D1AE 4	2180 = 5DE8 C
1370 = E7 A	1780 = 24B3 C	2190 = D268 C
1380 = F782 6	1790 = 683F 4	2200 = F285 0
1390 = 79E 9	1800 = 5730 0	2210 = ED0F 9

THE BBC Micro is an excellent machine for producing cheerful and quick graphics with plenty of colour. However, while it's easy to draw instructive diagrams, producing animation of any kind is laborious and complicated. You often see simple animations for shop or museum displays which employ transparencies, masks, a rotating disc and a backlight to produce the illusion of movement in the picture – producing striking effects very simply

Here is a program which can be used as an adjunct to any Mode 2 graphics package to allow a similar kind of animation that will indicate the flow of fluids or the propagation of radiation in eye-catching moving strips of colour. It uses a pre-drawn screen as a transparency, the masks are generated with the Flo program and the rotation is provided by sequencing the rarely used flashing colours – numbered 8 to 15. By using the VDU 19 command to alter the colour shown, the desired impression of movement can be produced.

The only complication is that the display must be handled by a short program or routine which keeps the colours rotating. It would be possible to write a background program to do this job by interrupts, but it is not necessary for most applications.

To use the system you must first create a Mode 2 picture which can be saved to disc as a block of memory from &3000 to &8000 – the normal procedure for saving graphics screens. When run, Flo loads it and you can place blocks and strips of colour on the picture, using size or angle and in a choice of two colours in solid stripes or dots. The animation can be tested at any time. Finally the enhanced picture is saved to disc for use with the Display program.

Type in the Flo listing and ensure it is correct by using Get it Right! When you run it you are first shown the keyboard controls, followed by a choice of message windows. You should choose one to conform with the type of graphics package initially used. For example if you use Nidd Valley's Grafik, select window number three.

The screen clears and you can now press L to load a prepared picture. You can place the cursor where you want the first block using the arrow keys and adjust its size with the game keys Z, X, * and ?. To rotate it use < and >. All functions may be speeded up by holding down Shift. The cursor will indicate size, colour and plot type at all times.

The colour may be selected using A or B. The solid or dotted plot is selected by C or D and pressing Tab irrevocably draws the block. Strange colour effects will appear momentarily, but they are soon sorted out by PROCcolsoff. Keep repeating the process until you are ready to test the animation by holding down M. Finally the screen may be saved by pressing S. Both filing

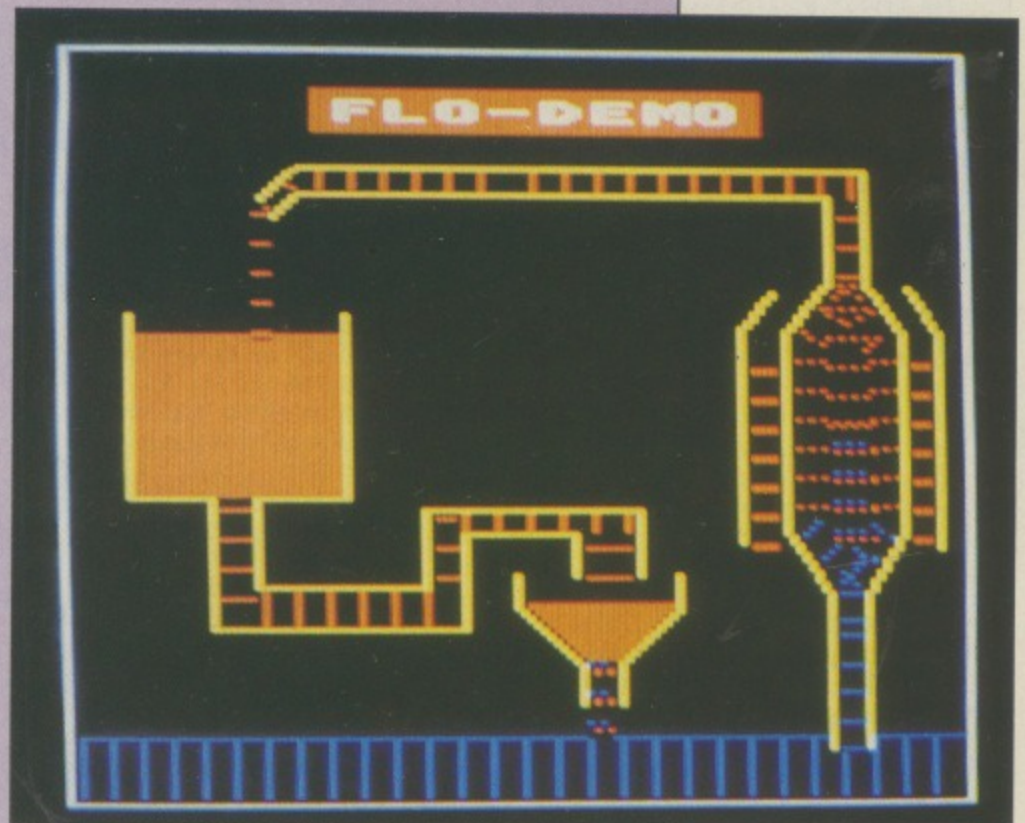
functions are aborted if Return is pressed with no filename given.

It may be necessary to return to the original graphics package to tidy up the picture and you can keep swapping between applications as many times as required. Listing II is the simple Display which gives a numerical choice of colours for the final display and any two from one to seven may be selected to replace the red and blue in the design program.

Flo should provide more interest and clarity for your displays by adding a dynamic element to a static picture. It can simulate chemical plants, convection systems, biological circulations, radar, electrical circuits and can enhance practically anything you can draw.

Let's get moving..

Make your images come alive with this clever George Speller utility



MAIN ROUTINES

keys	Accepts keyboard control
baseline	Draws a cursor
move	Selects position of block to be drawn
rotline	Controls dimensions and angle of block
lins	Draws the block
animate	Runs the animation

```

10 REM FLO
20 REM by George Speller
30 REM (c) The Micro User
40 :
50 ON ERROR MODE 7:PROCerror:END
60 :
70 MODE 7:PROCinstr
80 MODE 2:VDU 23;11,0;0;0;0;
90 PROCsetup:PROCinit

```

Turn to Page 58 ►

◀ From Page 57

```

100 REPEAT PROCkeys:PROCbaseline
110 REPEAT UNTIL NOTINKEY-129
120 PROCbaseline:UNTIL FALSE:END
130 :
140 DEFPROCinstr
150 VDU 28,8,20,32,5
160 PRINTTAB(7,0)"FLO"
170 PRINT"A/B....select colour"
180 PRINT"C/D....continous or dots"
190 PRINT"M.....check motion"
200 PRINT"L/S....load or save"
210 PRINT"Tab....draw a block"
220 PRINT"Arrows.move"
230 PRINT"Z/X....grow left/right"
240 PRINT"*/?...grow up/down"
250 PRINT"</>....rotate"
260 PRINT"Shift..extra speed"
270 PRINT"Press space"
280 REPEAT UNTIL GET=32:ENDPROC
290 :
300 DEFPROCinit:DIM b%256:FX4,1
310 addc%=0:start%=8:curcol%=1
320 x1%=0:x2%=0:y1%=0:y2%=0
330 X%=500:Y%=500:colA%=1:colB%=4
340 side%=100:base%=40
350 type%=5:FS="":GCOL3,1:ENDPROC
360 :
370 DEFPROCsetup:COLOUR 132
380 FOR NX=1 TO 4:READ a%,b%,c%,d%
390 VDU 28,a%,b%,c%,d%,12
400 PRINTTAB(6)"Window ";NX:;NEXT
410 DATA 0,30,0,1,0,0,19,0
420 DATA 19,31,19,1,0,31,19,31
430 VDU26:PRINTTAB(8,5)"FLO"
440 PRINTTAB(3,7)"Please choose TAB(3,
9)"display window TAB(8,12)"1-4";
450 REPEAT WX=GET-48:UNTIL WX>0ANDWX<5
460 COLOUR 128:CLS:RESTORE
470 FOR NX=1TOWX:READ a%,b%,c%,d%:NEXT
480 VDU 28,a%,b%,c%,d%:ENDPROC
490 :
500 DEFPROClns(X%,Y%,WX,H%,A,T%,S%,A%)
510 LOCALx%,y%,x1%,y1%:p=COSA:q=SINA
520 FOR OX=0 TO 3:GCOL 0,S%+AX+OX
530 FOR NX=OX*10 TO H% STEP 40
540 x%=p*NX:y%=q*NX:x1%=q*WX:y1%=p*WX
550 MOVEX%+x%,Y%-y%
560 PLOTTX%,X%+x1%+x%,Y%+y1%-y%
570 NEXT:NEXT:PROCcolsoff:ENDPROC
580 :
590 DEFPROCcolsoff
600 FORNX=8T015:VDU19,NX;0;0;:NEXT
610 VDU19,start%,colA%;0;
620 VDU19,start%+4,colB%;0;
630 ENDPROC
640 :
650 DEFPROCanimate:LOCAL L%,C%
660 REPEAT LX=C%:C%=(C%+1)MOD4
670 VDU19,start%+C%,colA%;0;0;
680 VDU19,start%+L%;0;0;:FX19
690 VDU19,start%+C%+4,colB%;0;
700 VDU19,start%+L%+4;0;0;:FX19
710 UNTIL NOTINKEY-102:FX21
720 PROCcolsoff:ENDPROC
730 :
740 DEFPROCmove
750 IF INKEY-1 s%=5 ELSE s%=1
760 X%=X%-4*s%:INKEY-122+4*s%:INKEY-26
770 Y%=Y%-4*s%:INKEY-58+4*s%:INKEY-42
780 ENDPROC
790 :
800 DEFPROCrotline
810 IF INKEY-1 s%=20 ELSE s%=1
820 ang=ang-INKEY-104*s%/60+INKEY-103*
s%/60
830 side%=ABS(side%-INKEY-67*s%+INKEY-
98*s%)

```

```

840 base%=ABS(base%-INKEY-73*s%+INKEY-
105*s%)
850 p=COS(ang):q=SIN(ang)
860 x1%=side%*p:y1%=side%*q
870 x2%=base%*q:y2%=base%*p
880 ENDPROC
890 :
900 DEFPROCbaseline:MOVEX%,Y%:FX19
910 GCOL3,7:PLOTtype%,X%+x1%,Y%-y1%
920 MOVEX%,Y%:GCOL3,curcol%
930 PLOT5,X%+x2%,Y%+y2%:GCOL3,7
940 PLOT69,X%+x2%,Y%+y2%:ENDPROC
950 :
960 DEFPROCload
970 REPEAT UNTIL INKEY-87=0:FX15
980 INPUT"Load filename",FS:CLS
990 IF FS>"":PROCos("LOAD "+FS)
1000 PROCcolsoff:ENDPROC
1010 :
1020 DEFPROCsave
1030 REPEAT UNTIL INKEY-82=0:FX15
1040 INPUT"Save filename",FS:CLS
1050 IF FS>"":PROCos("SAVE "+FS+" 3000
8000")
1060 ENDPROC
1070 :
1080 DEF PROCkeys
1090 PROCmove:PROCrotline:FX21
1100 IF INKEY-97 PROClns(X%,Y%,base%,si
de%,ang,type%,start%,addc%)
1110 IF INKEY-87 PROCload
1120 IF INKEY-82 PROCsave
1130 IF INKEY-102 PROCanimate
1140 IF INKEY-66 addc%=0:curcol%=1
1150 IF INKEY-101 addc%=4:curcol%=4
1160 IF INKEY-51 type%=21
1170 IF INKEY-83 type%=5
1180 ENDPROC
1190 :
1200 DEFPROCos($b%):LOCALX%,Y%:X%=b%
1210 Y%=X%DIV256:CALL&FFF7:ENDPROC
1220 :
1230 DEF PROCerror:FX4
1240 IF ERR=17 PRINT"Finished" ELSE REP
ORT:PRINT" at line ";ERL
1250 ENDPROC

```

DISPLAY LISTING

```

10 REM Display
20 REM by George Speller
30 REM (c) The Micro User
40 ON ERROR MODE7:PROCerror:END
50 MODE7:PROCsetup
60 MODE2:VDU23,1,0;0;0;0;
70 PROCcolsoff
80 PROCos("LOAD "+FS)
90 REPEAT TX=TIME+5
100 REPEAT UNTIL TIME>TX
110 PROCrotate:UNTIL FALSE
120 :
130 DEFPROCrotate:fx19
140 VDU19,SX+EX,A%;0;
150 VDU19,SX+LX,0;0;:fx19
160 VDU19,SX+4+EX,B%;0;
170 VDU19,SX+4+LX,0;0;:LX=EX
180 EX=(EX+1)MOD4:ENDPROC
190 :
200 DEFPROCsetup:DIM b%256
210 SX=8:LX=0:EX=0:FX4,1
220 PRINTTAB(0,10)"Display"
230 INPUT"Load filename":FS
240 IF FS="":FS="SCREEN"
250 PRINT"Colour A (1-7)":AX=FNn
260 PRINT"Colour B (1-7)":BX=FNn
270 ENDPROC
280 :
290 DEF FNn:REPEAT GX=GET-48
300 UNTIL GX>0 AND GX<8:PRINT;GX:=GX

```

Get it right!

10 = 00	430 = E568 A	850 = 8186 C
20 = 00	440 = 5192 F	860 = 7C3E 2
30 = 00	450 = 9EBC 7	870 = BC8F 2
40 = 9719 9	460 = 84D8 3	880 = ED0F 4
50 = C629 E	470 = 2888 6	890 = 9719 6
60 = 9719 F	480 = CD1B F	900 = C1B9 1
70 = 9398 5	490 = 9719 7	910 = 41AA F
80 = 3E9A 5	500 = 689C 7	920 = 669D E
90 = 5E26 B	510 = 2CD4 1	930 = E39A 6
100 = B31C 0	520 = 353A F	940 = 9381 1
110 = 1EDC D	530 = 5041 8	950 = 9719 6
120 = 486F 7	540 = 576B 4	960 = 24A1 1
130 = 9719 A	550 = 57D9 2	970 = 9FBE 3
140 = E0A0 9	560 = 3E3C 1	980 = 4F95 4
150 = 9079 8	570 = E50E 7	990 = AD06 B
160 = E5B9 2	580 = 9719 B	1000 = 22DD 2
170 = 5117 7	590 = 8FE6 C	1010 = 9719 E
180 = 960 E	600 = 948 2	1020 = 7A2C A
190 = 7B5E 0	610 = 87DE 3	1030 = E872 D
200 = 9CFE 5	620 = 3E11 A	1040 = E0E9 0
210 = B945 F	630 = ED0F F	1050 = 90F2 4
220 = 5CE1 E	640 = 9719 F	1060 = ED0F 6
230 = E7D 2	650 = 3FA5 6	1070 = 9719 5
240 = F6A4 8	660 = 198D 4	1080 = 2EDA D
250 = 3DD0 C	670 = 1078 1	1090 = E954 C
260 = A9BD 1	680 = 2F5 A	1100 = 92FF 7
270 = 2A00 8	690 = 478 A	1110 = FA8 2
280 = BF3A 3	700 = E579 D	1120 = 2882 9
290 = 9719 6	710 = AAB9 C	1130 = 7219 B
300 = 52FB 4	720 = 22DD D	1140 = 2F0F F
310 = 8C4A F	730 = 9719 3	1150 = F8A7 C
320 = 4F70 6	740 = D8D0 B	1160 = 5F97 0
330 = 31BB 1	750 = 7304 E	1170 = 7F9A E
340 = D46B 8	760 = 2DA8 5	1180 = ED0F 2
350 = 74D6 2	770 = D337 D	1190 = 9719 6
360 = 9719 1	780 = ED0F 6	1200 = 70F3 D
370 = 6268 0	790 = 9719 9	1210 = 3358 F
380 = FA51 F	800 = C2A8 A	1220 = 9719 D
390 = E114 0	810 = 4ADE 2	1230 = 294C E
400 = D4D7 D	820 = A65F 0	1240 = EE3E C
410 = 81D0 0	830 = 804D 6	1250 = ED0F 4
420 = 29A2 D	840 = CE3C E	

```

310 :
320 DEFPROCcolsoff:FORNX=8T015
330 VDU19,NX;0;0;:NEXT:ENDPROC
340 :
350 DEF PROCos($b%):LOCAL X%,Y%:X%=b%
360 Y%=X%DIV256:CALL&FFF7:ENDPROC
370 :
380 DEF PROCerror:FX4
390 IF ERR=17 PRINT "Finished":END
400 REPORT:PRINT" at line ";ERL:END

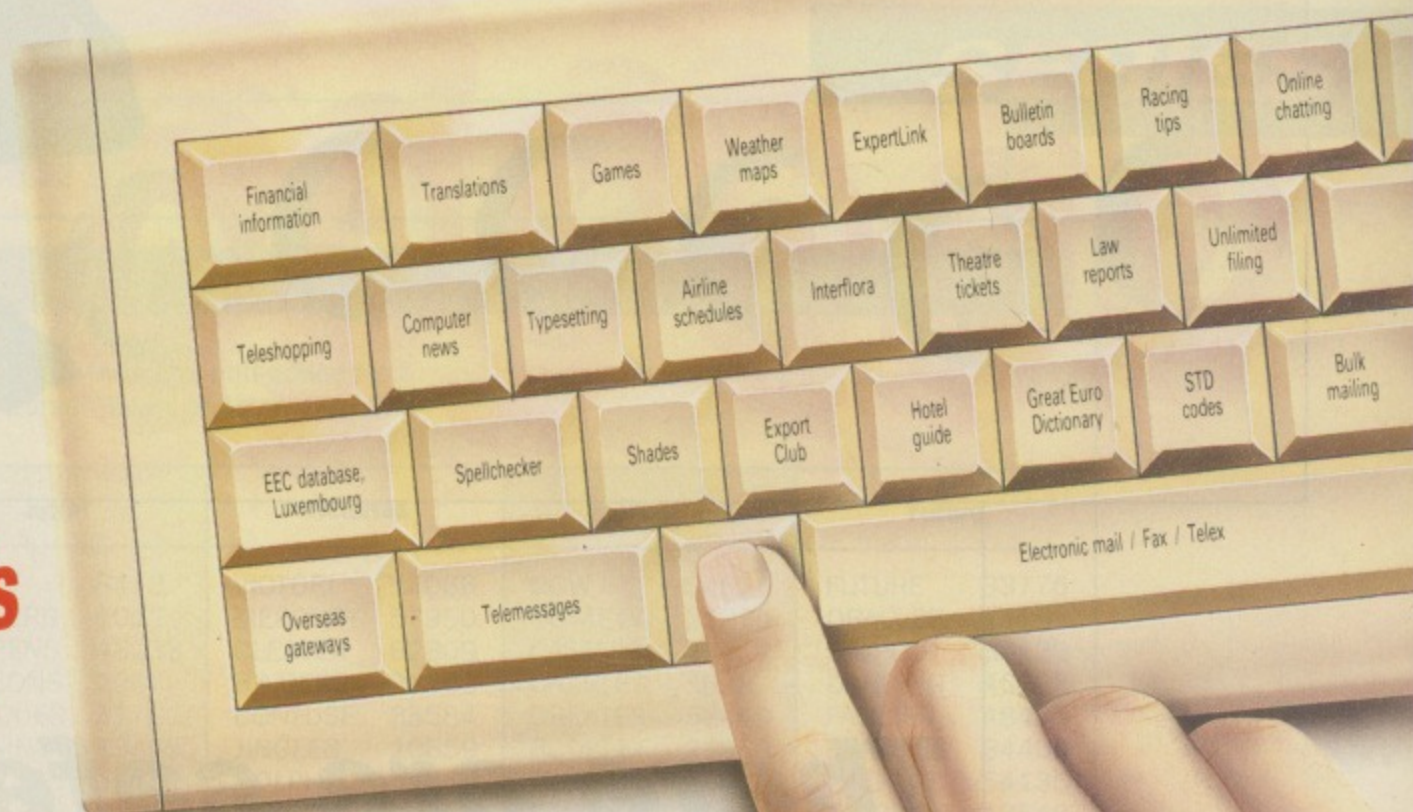
```

Get it right!

10 = 00	150 = 4DDF C	290 = DCFD A
20 = 00	160 = 9346 5	300 = B73 4
30 = 00	170 = 2684 5	310 = 9719 9
40 = B0C1 1	180 = 71B0 6	320 = 6E1D B
50 = E9E7 5	190 = 9719 B	330 = B746 7
60 = 8029 E	200 = FC9C 6	340 = 9719 8
70 = 6240 3	210 = 85CF F	350 = 4832 9
80 = 63E3 D	220 = 6A6B 3	360 = 3358 2
90 = D09F 7	230 = 7040 3	370 = 9719 4
100 = 64BD 8	240 = F50A 3	380 = 294C F
110 = 5873 6	250 = 9AFB F	390 = 66B9 E
120 = 9719 6	260 = 970C 1	400 = FA32 6
130 = 3F3 C	270 = ED0F 9	
140 = B08A 1	280 = 9719 A	

186 C
C3E 2
C8F 2
D0F 4
719 6
B9 1
TAA F
59D E
59A 6
8 1
19 6
A1 1
BE 3
95 4
06 B
DD 2
19 E
2C A
72 D
E9 0
F2 4
0F 6
19 5
DA D
54 C
FF 7
A8 2
82 9
19 B
0F F
A7 C
97 0
9A E
0F 2
10 6
3 D
68 F
19 D
C E
E C
F 4

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Back
By Fair Means or
Foul
Repton Thru Time
Barbarian II
Deathstar
Fireball
Saigon
Quest

HAPPY Birthday to me. This is the column's second birthday – as well as *The Micro User's* sixth – and we're still young, chomping and bursting with ideas. I'd like to say a few words of thanks to everyone who has contributed over the last two years, including software manufacturers, game authors, Walt the Modem, Alix the filing system and most of all to you, the readers and contributors: Thanks to you all. That said, on with the show.

Master Compact owners may remember a feature in the May 1988 column which explained

how to save and load your own tracks on Superior's **Grand Prix Construction Set**. The problem was that the game did not perform a *MOUNT command to force the ADFS to read the disc catalogue before attempting to read or write data. The result was that if you replaced the game disc with a data disc, the ADFS didn't know and complained with a *Disc changed* error causing the program to crash.

The solution was to create a separate directory on the game disc itself. I stressed at the time that this was an extreme case and is by no means a hard and fast rule. It was only possible in this case because the hidden protected data was on an area of the disc that could not normally be accessed by the ADFS so you couldn't accidentally corrupt it by saving data.

As I always emphasise, writing data to an original program disc is not a good solution, and I have since received a letter from Mark Penney of Hadfield, Cheshire, with a method of saving tracks on to a separate disc.

When prompted for a filename simply enter \$.filename. For example, to save a replica of the US Watkins Glen circuit just use \$.WATGLEN. Entering \$. before the required filename forces the ADFS to load, save or search using a path from the root directory – \$. So it must check the physical root directory on the disc rather than using the currently selected directory held in ram. This has the effect of issuing a *MOUNT for you and so the *Disc changed* error is cleared.

However, the ADFS now thinks it is accessing the data disc when, in fact, we want to continue loading game code from the program disc. No problem, simply put the game disc back into the drive and press R to the question *RACE OR ABORT*. Once again the ADFS recognises the disc has been changed and crashes the program, displaying a few hexadecimal numbers and the



Time passes

Here is the complete list of passwords and edit codes for **Repton Thru Time**, sent in by Daniel Hobbs of Aston School.

Prehistory		Egypt		Victorian		Now		Future	
PREHIST	12345	EGYPT	8473	VICTORI	54066	NOW	54524	FUTURE	33776
HEATERS	16494	FAVOURS	5012	MERCURY	57950	OCTAGON	21370	ORACLES	1119
HILLOCK	29652	HAPPENS	48238	CLEAVER	62809	CASTLES	48417	STAPLER	36126
PILFERS	28265	PERSONS	2247	BINDERS	31463	CHARLES	4698	DANCING	46223
MEDIATE	25655	CONQUER	31761	CONFUSE	35584	GREATER	58449	FANCIER	48475
COMPACT	9761	EVENING	19495	JINGLES	10659	BOOKLET	23963	BANANAS	34409
CARTOON	43981	MASTERS	52592	DOLPHIN	45367	FUNTIME	64332	EVEREST	54136
TUBULAR	35862	PIMPLES	51035	MINSTER	23180	SAVOURS	29294	KINGDOM	53546

familiar *Disc changed* message. Now enter:

*MOUNT
*LOAD SOUND
*RUN RCCODE

and the rest of the game will load with your selected or newly designed track in place.

Life after death

Repton aside, Superior is perhaps best known for its arcade adventures – Citadel, Palace of Magic and Exile spring immediately to mind. Another game in the same mould is **Quest** by newcomer Tony Oakden, released in the second quarter of last year.

Many modern games feature cheat modes, and Quest is no exception. However, most games don't advertise the fact. But Quest, on the other hand, details the cheat mode – a reincarnation facility – in the instructions but doesn't tell you how to activate it.

Help is at hand in the form of a cheat from D. Seymour from Cupar, Scotland: Press the keys R, E, I, N, C, A and T – the different letters that make up the word *reincarnate* – simultaneously. Now when you die you will be given the chance to reincarnate at your present position – but only four times.

Great balls of fire

A number of Archimedes owners will be familiar with **Fireball**, the Breakout/Arkanoid/Impact game. I have not seen it, but apparently the development cheats printed in the instructions are incorrect. This piece of information comes from Simon Heather, the author of the game, so he should know what he's talking about. Over to Simon...

To go to the next screen press Alt+. – full stop – on the numeric keypad. To jump to any wave press W+?+* on the keypad together then enter a number between 1 and 100. To alter the mouse

Turn to Page 62 ►

Bigger and better

Regular readers may remember that I have featured routines to run the enhanced Master version of Stryker's Run on Model B machines fitted with the Solidisk 128k and Fourmeg 256k sideways ram boards or the Watford Electronics rom/ram board. I have also featured a routine to allow the Master version of Craze Rider to run on the Solidisk Fourmeg board.

However, I have since received a letter from Chan Pheng Thaow of Hobart, Australia. He has installed a Peartree 128k sideways ram expansion board and a 65C02 processor in his BBC Micro, and would like to be able to run the enhanced Master version of Stryker's Run on his machine. Unfortunately I haven't seen the Peartree board; can anyone else help? If not Stryker's Run or Craze Rider, then how about the Master versions of Exile, Repton Infinity, By Fair Means or Foul, Jet Set Willy II or Elite?

Star spangled shoot-'em-up

Superior's **Deathstar** is a fairly old game now, but still a worthy blast for anyone intent on a quick bit of mayhem. It is a micro version of the Atari arcade machine game Sinistar and excellently reproduces that game's smooth 16-way screen scrolling. In fact, its author, Peter Johnson, wrote it as the official BBC Micro Sinistar but for some reason it was never released under that name.

The basic idea remains the same – you pilot your ship around the galaxy, mining crystals from the asteroids that float harmlessly around you. Once collected, the crystals act as Starbombs. However, two types of alien ship are out to stop you: The Workers also attempt to collect the crystals for assembly into the dreaded Deathstar. You can dispatch one of these with a single laser bolt and collect its crystal.

The other type, the Warrior, does not hesitate to shoot on sight. However, the real problems come when the Workers have finished building the Deathstar. It homes in on you relentlessly, causing obliteration on contact, and can only be destroyed with a full complement of Starbombs.

Fortunately, help is at hand – isn't it always – if you press Caps Lock+Control+Escape you will be promoted to the next level. You still have your current quota of Starbombs, but the Deathstar's progress is reset to zero, so that you have more time to collect the remaining crystals. Thanks to Reza Jugon of Wembley, Middlesex for this tip.

Tequila top

Tynesoft's *Saigon* is the first offering from Tequila, a name new to the BBC Micro games market. However, like the ones from many of the longer-established authors, *Saigon* features a built-in cheat mode which allows you to start on any one of the eight difficulty levels.

To activate it press Shift and a number key corresponding to the required start level – 1 to 8. While holding these two keys, press the spacebar. For example, to start on level five type Shift+5 then add the spacebar.

◀ From Page 61

sensitivity press < or >. The number opposite MS: on the screen will then change.

Thank you very much Simon.

Playing the game

J. Robbins of Acton Trussell, Staffs, has a very ungentlemanly tip for **By Fair Means Or Foul**. When you start, move back straight away to your own ropes – because the referee is less likely to see you perform any foul moves. When your opponent comes within range, kick him. If he manages to get closer, headbutt him repeatedly to push him back to kicking range and kick him again. By using these techniques repeatedly, you can usually achieve a knockout.

This tip is a bit below the belt but I'm sure it could easily be used as a kind of *level jump*. Simply cheat your way quickly to your desired starting level, then start playing fairly. Easy, really...

Striking back

Diluk Dias of Harrogate, North Yorks, has sent me a letter regarding a cheat mode in Domark's **The**

Empire Strikes Back. To obtain infinite shields press f6 and then press f0 on the little screen. The logos will turn green and the micro will display the message *The strength of the Force has been twisted to help a cheating coward*. So there.

Diluk discovered his cheat on the disc version of the game but any cheats that do not involve pokes normally apply equally to all versions. Diluk says that *The Empire Strikes Back* is far superior to *Star Wars* – I'd like to hear your opinion.

Stop Press!

Many readers will have either seen or heard of *Barbarian*, *Palace/Superior's* hack-and-slay sword fighting game. I have just received a letter from Peter Scott, author of a number of Audiogenic's most successful games, notably the arcade adventures *ThunderStruck* and *Omega Orb*.

Peter is now working with Dylan, author of *Barbarian I*, and has taken on the daunting task of converting the follow-up, **Barbarian II**, for the BBC Micro. Peter also sent me a disc containing a pre-release version of it. Though still at a fairly early stage of development it looks as if the finished result will knock its predecessor for six. More next month, when I've had time to give it a once-over...

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FAX

• P A C K •



With the ever increasing popularity of FAX machines this form of document communication is set to replace conventional postal deliveries with a fast, reliable, strike free, electronic mail service.

FAX PACK brings this world of facsimile document transfer to the Archimedes. By combining the facilities of a FAX machine with the power and flexibility of a computer, FAX PACK offers considerable benefits over conventional FAX systems.

FAX PACK basically allows any document, be it printed text or graphics, or an electronic document such as a word processor file, to be sent to FAX machines anywhere in the world, in seconds. This is done by scanning (digitising) the document and then sending it digitally over a normal phone line to the receiving FAX machine which re-constructs the image and then prints it.

THE HARDWARE

The basic FAX PACK consists of a modem podule that plugs into any Archimedes computer, and the software to drive it. A variety of options are available such as scanners and power switching boxes.

The podule has connections for a scanner and power switching box (see below) and a conventional telephone line. An adapter is provided allowing a conventional phone to be paralleled with FAX PACK so that only one telephone line is required for both FAX and conventional use. However if a lot of FAX mail is going to be sent/received then a separate dedicated line is advisable.



Scanner & Sheet Feeder

Unlike many normal FAX machines the hardware also provides both auto-answer and auto-dial facilities making it convenient and allowing completely automatic operation without human intervention.

THE SOFTWARE

As part of FAX PACK this not only provides all the basic mechanisms for communicating with FAX machines but also includes high level WIMP based facilities for viewing FAXes on screen within a window, where they can be pixel edited, scaled, cropped, printed, etc.

This WIMP based software is simplicity itself to use so FAX PACK can be used in the office by staff with little or no computer experience. Of course unlike any conventional FAX machine FAXes can be viewed on screen, or filed away on disc for future reference without ever getting onto paper.

The software also allows text, word processed files, even graphics, to be automatically converted to a suitable FAX format for sending to other FAX machines. The paperless office becomes closer to reality since it is now possible to write articles, documents or letters and then send these directly to remote machines without involving paper.

However facilities are also included for printing FAXes to a range of 9 and 24 pin dot matrix, inkjet and laser printers.

SUPER FAST MODEM

The FAX podule actually consists of a 9600 bps auto-answer, auto-dial modem, and so can be used for much more than just FAX transfer. The software can detect the type of remote machine, and if it finds a similarly equipped computer (rather than a FAX machine) at the other end it can then transfer ANY file fully error checked and glitch free. And by using some very advanced transmission protocols it can transmit data 4 times faster than most conventional modems on normal telephone lines.

THE SCANNER

In order to send printed material it is necessary to digitise the page. An optional hand-held, A4 width, 200 dpi scanner can connect to the FAX podule. Being hand-held it is not only supremely compact, but it can digitise complete A4 pages, or pages from books or other awkward shaped documents.



Of course images scanned in this fashion are not only useful for FAX purposes but also for inclusion in word processor or desk top publishing programs. FAX PACK software allows company logos and signatures to be scanned, cropped and then included as part of other FAXed material.

AUTOMATIC POWER SWITCH

This external power switching box can automatically switch the computer on in order to answer incoming FAXes. The FAX podule can then answer the phone, receive the FAX and file it to disc, and then switch the computer off again. The computer can therefore be switched off and left completely unattended for very long periods of time.

GUARANTEE

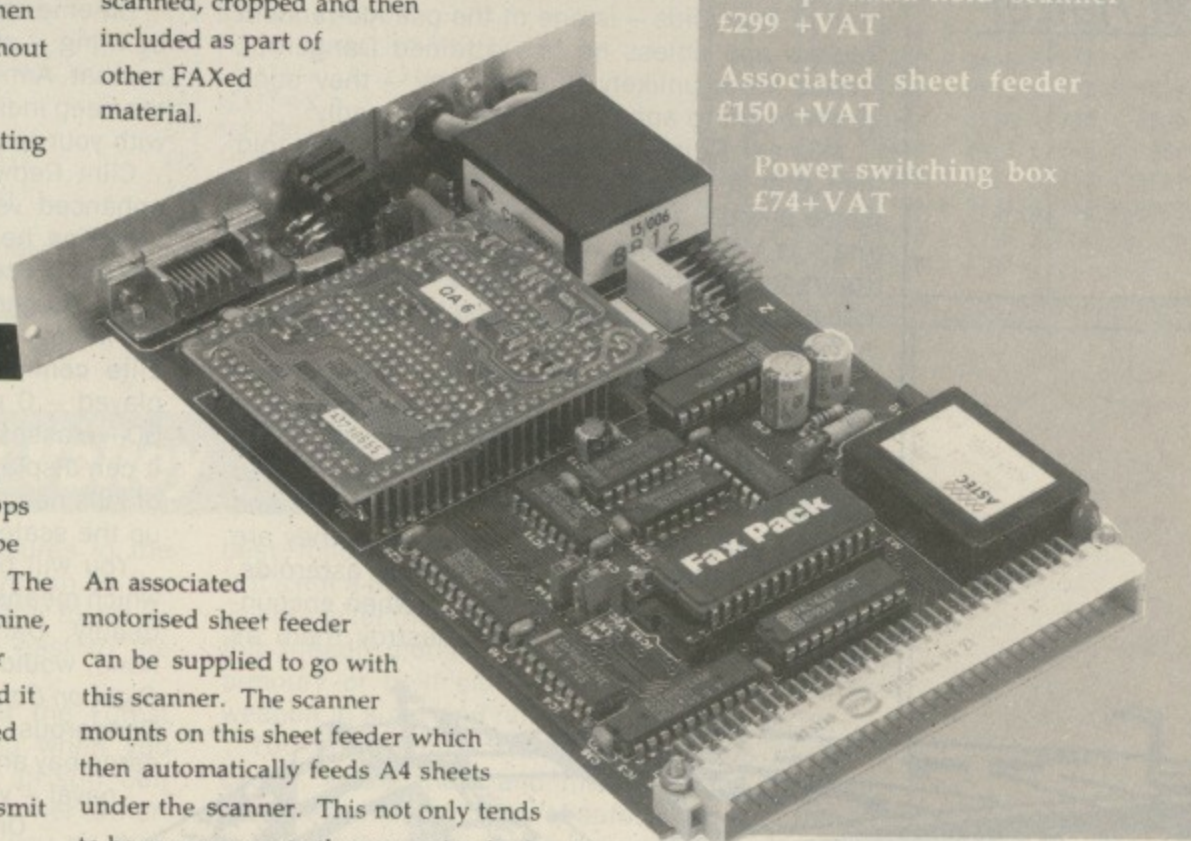
Not only do we provide a one year guarantee for the product, but also a 28 day money back no quibble guarantee. Owners can also receive free software updates as enhanced or new facilities are made available.

FAX PACK Podule and software
£499 +VAT

200 dpi hand-held scanner
£299 +VAT

Associated sheet feeder
£150 +VAT

Power switching box
£74+VAT



An associated motorised sheet feeder can be supplied to go with this scanner. The scanner mounts on this sheet feeder which then automatically feeds A4 sheets under the scanner. This not only tends to be more accurate than scanning by hand, but is also more convenient.



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B B+ M



*Hi-tech
adventure
with the
Mad Hatter*

Playing the Generation Game

ELITE continues to draw a tremendous postbag, so let's take a look at a few of the most interesting communications. I received a letter from Paul Mama, owner of the Master 128 version, who confirms the existence of Generation Ships. He encountered one while journeying through the galaxies after completing both missions. He saw it by chance since it didn't appear on the radar – and the rotter attacked it! He said that it had shields even more powerful than the Constrictor of mission one and took a long time to destroy.

You can see a picture of one when you load in a new Commander on the Master 128 version – something which gave John Devine some puzzlement.

J. Steadman wonders about the existence of asteroids on the disc version. They certainly are there and can be mined, but their arrival – like that of Thargoids – is one of the pseudo-random factors and unless he has attained Dangerous status he is unlikely to see many – they don't really begin to appear until you are Deadly.

Michael Quinlan mentions a friend who told him that a targeting computer is available on some planets once you are Elite. This is news to me – is Michael the victim of a leg-pull? He also refers to a shortage of asteroids, and asks if you can blow up a space station. The answer to that is simple: No.

Simon Parmenter, who has also encountered Generation Ships, has made some interesting observations. He agrees that combat in Turbo mode is extremely difficult and has encountered rock hermits – only available on Master 128 and second processor versions. As he says, they are almost indistinguishable from ordinary asteroids.

He offers a tip worth repeating: When encountering enemy ships you must destroy them as

quickly as possible to conserve your shields. If you don't do this you *must* destroy the more distant ones first while absorbing hits from the closer pirates to help minimise damage. Simon also asks if anyone has seen a space dredger.

Graeme Couves has been conducting trading experiments with platinum which, like all items not measured in tonnes, is carried in your cabin and not in the cargo hold. He sold 91kg at Cr 74 per kilo and should have received an extra Cr 6734 to add to his total – making him worth Cr 644819.5 in all. The actual total shown was Cr 638265.9 – a shortfall of Cr 6553.6 – or 2 to the 16th power over 10 – which suggests to him that a bit is not being carried forward and added into the credit total. My advice, therefore, is to stay out of platinum unless you fancy rewriting the code.

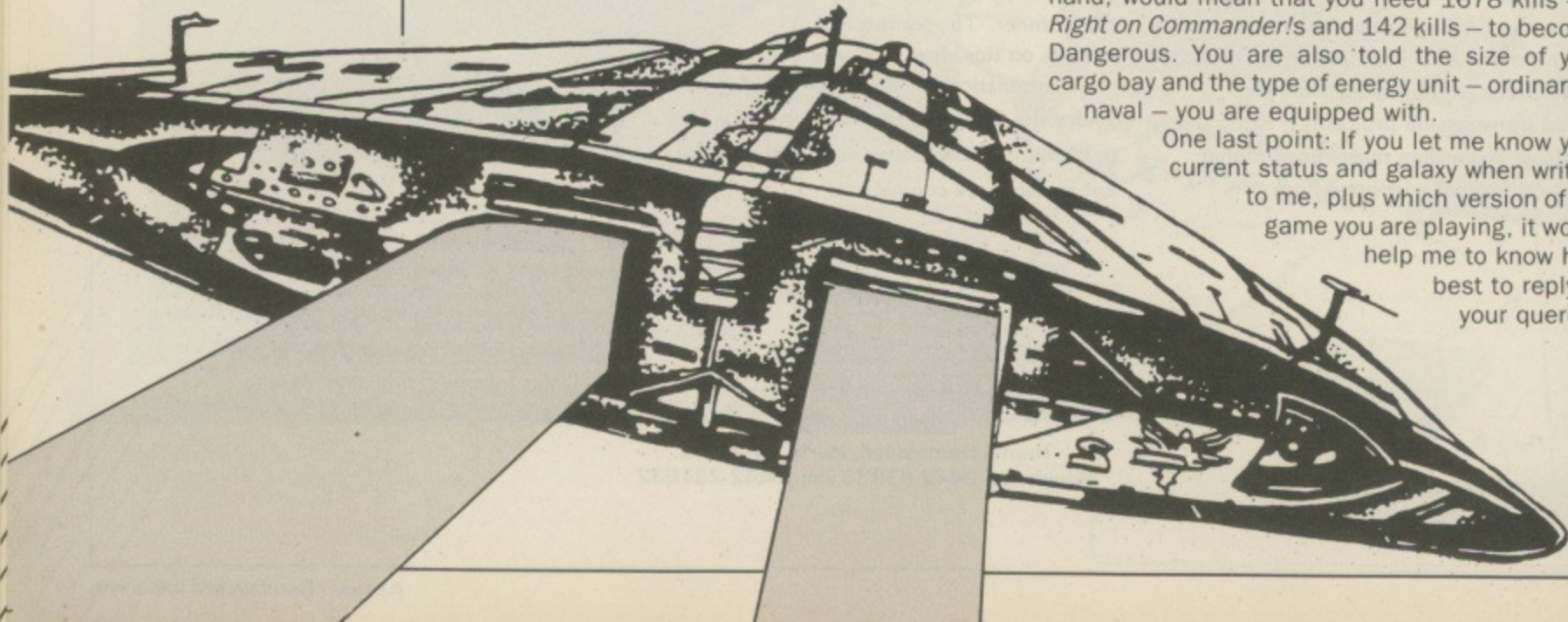
Graeme has a tip to save overheating your laser by firing – and missing – in the early stages of combat. Arm a missile, and the moment you hear the beep indicating that it has locked-on open fire with your lasers and you are bound to hit.

Clint Redwood asks if it is worth buying the enhanced version of Elite? The answer is yes, providing he has a B+, Master 128 or a 6502 second processor.

David Wayne has written a short program – see the listing – which offers a number of facilities on Elite command files. Your legal status is displayed – 0 means Clean, 1-49 is Offender and 50+ classes you as a Fugitive. More importantly, it can display your current rating and the number of kills needed to boost your rank to the next one up the scale.

You will be told something like: Deadly 0.50 which means 50 more kills are needed to become deadly. Dangerous 1678 6.142 on the other hand, would mean that you need 1678 kills – 6 *Right on Commander!* and 142 kills – to become Dangerous. You are also told the size of your cargo bay and the type of energy unit – ordinary or naval – you are equipped with.

One last point: If you let me know your current status and galaxy when writing to me, plus which version of the game you are playing, it would help me to know how best to reply to your queries.




```

10 REM Elite Commander Display
20 REM by David Waine
30 REM (c) The Micro User
40 MODE7:DIM kl(13),rt$(13),b%&400
50 DATA 0,Harmless,8,Mostly harmless
60 DATA 810,Poor,&20,Average
70 DATA 840,Above average,&80,Compete
nt
80 DATA 8200,Dangerous,&A00,Deadly
90 DATA 81900,Elite,&3200,Elite (x2)
100 DATA 84800,Elite (x3),&6400,Elite
(x4)
110 DATA 87000,Elite (x5)
120 FOR A=1 TO 13:READ kl(A),rt$(A):NEXT
130 ON ERROR PROCerr
140 FOR AX=0 TO 1:VDU 31,0,AX,129,157,13
1,141,31,12,AX:PRINT"COMMANDER DISPLAY":
NEXT
150 VDU 28,0,24,39,2:REPEAT REPEAT CLS
160 PRINTTAB(0,2)CHRS129"Enter filena
me:"+CHRS131;
170 INPUTfs:UNTIL LENfs<8 AND fs>"
180 PRINTTAB(0,3)CHRS129"Which drive:"
CHRS131;
190 REPEAT dr%=INSTR("0123",GET$)-1
200 UNTIL dr%>=0:PRINT;dr%
210 fs=":"+STR$dr%+"E."+fs
220 OX=OPENINfs:IF OX>0 CLOSE#OX
230 IF OX=0 PRINTCHRS133"File "+fs" n
ot found...":IFGET
240 UNTIL OX>0
250 PROCoscli("LOAD "+fs+"STR$b%")
260 B%=b%&48:REM RoCs
270 C%=b%&47:REM Remainder of kills
280 AX=B%*256+C%:REM Total kills
290 D%=b%&34:REM Legal points
300 EX=b%&16-2:REM Cargo bay size
310 FX=b%&28:REM Energy unit type
320 CLS:PROCdisplay:PROCratings
330 PROCkills_needed:PROCrocs_needed
340 PROCrerun:RUN

```

```

350 DEF PROCdisplay
360 PRINTTAB(0,1)CHRS129"Commander:"CH
RS131fs
370 PRINTTAB(0,2)CHRS129"Legal Status:"
CHRS131FNlegal" (;D%)"
380 PRINTTAB(0,3)CHRS129"Energy Unit:"
CHRS131FNenit
390 PRINTTAB(0,4)CHRS129"Cargo Bay Siz
e:"CHRS131;EX" tonnes"
400 PRINTTAB(0,5)CHRS129"Rating:"CHRS1
31FNrating
410 PRINTTAB(0,6)CHRS129"Right on Comm
anders:"CHRS131;B%";C%
420 PRINTTAB(0,7)CHRS129"Total Kills:"
CHRS131;AX
430 ENDPROC
440 DEF PROCratings:FOR A=1 TO 13
450 PRINTTAB(0,A+8)CHRS129rt$(A)
460 NEXT:ENDPROC
470 DEF PROCkills_needed:FOR A=1 TO 13
480 PRINTTAB(21,A+8);FNkill(kl(A))
490 NEXT:ENDPROC
500 DEF PROCrocs_needed:FOR A=1 TO 13
510 PRINTTAB(28,A+8);FNroc(kl(A));F
Nroc1(kl(A))
520 NEXT:ENDPROC
530 DEF PROCrerun
540 PRINTTAB(10,23)CHRS131"Rerun (Y/N)
?";
550 REPEAT AX=INSTR("YyNn",GET$)
560 UNTIL AX=IF AX>2 CALL!-4
570 ENDPROC
580 DEF FNrating:FOR A=2 TO 13
590 IF AX<=kl(A) rS=rt$(A-1):A=13
600 NEXT:=rS
610 DEF FNlegal:IF D%=0 ="Clean"
620 IF D%>0 IF D%<50 ="Offender"
630 ="Fugitive"
640 DEF FNroc(N%):XX=N%-AX
650 IF XX<0 =0 ELSE =XXDIV256
660 DEF FNkill(N%):XX=N%-AX

```

```

670 IF XX<0 =0 ELSE =XX
680 DEF FNroc1(N%):XX=N%-AX
690 IF XX<0 =0 ELSE =XXMOD256
700 DEF PROCerr:VDU26,12
710 REPORT:PRINT" at ";ERL:END
720 DEF PROCoscli($$700):LOCAL XX,Y%
730 Y%=7:CALL&FFF7:ENDPROC
740 DEF FNenit:IF F%=0 ="Not Present"
750 IF F%=1 ="Normal"
760 IF F%=2 ="Naval" ELSE ="Cheat"

```

Get it right!

10 = 00	270 = CD13 0	530 = 64B5 C
20 = 00	280 = AAEF 3	540 = 6B9F D
30 = 00	290 = 12A B	550 = AEE6 1
40 = 166F F	300 = 2E9A 2	560 = 330F 6
50 = 8793 6	310 = 4A6F 2	570 = ED0F 7
60 = 49B9 3	320 = C803 4	580 = 5DAE 9
70 = 3E34 B	330 = 149B 3	590 = E33A D
80 = 1418 A	340 = 8987 A	600 = D31D E
90 = 6A9A 4	350 = 2FC 2	610 = 6AD7 3
100 = 2CA2 2	360 = D950 9	620 = 16F D
110 = E77D 9	370 = BBA2 7	630 = D775 7
120 = 4187 0	380 = 5E73 0	640 = D28F C
130 = 2D1B D	390 = C028 B	650 = 69D5 0
140 = 95EC 1	400 = B31 B	660 = FD68 6
150 = BAA3 1	410 = D712 3	670 = D6F8 9
160 = A132 F	420 = 76CF 6	680 = 6B15 9
170 = B0D1 7	430 = ED0F C	690 = 84BD C
180 = 436F F	440 = 2402 5	700 = E1FD 5
190 = AE58 A	450 = B4A0 5	710 = 532 0
200 = A43E 7	460 = E531 6	720 = 1C6E 7
210 = F8DF 2	470 = 6E6D 4	730 = 50E0 E
220 = 9F78 C	480 = CACE 6	740 = 17B7 9
230 = 193D D	490 = E531 E	750 = DCAF 9
240 = 10C6 8	500 = 9E3F B	760 = E1C5 E
250 = D3B0 8	510 = C129 2	
260 = B268 0	520 = E531 7	

Twin Kingdom Valley

After you have deposited your treasures in the cabin — see last month's issue — return to the gold door either via the grating in the forest or Watersmeet, pass through and go east to the bronze door.

As long as you have the amulet the Forest King's daughter will recognise you when you unlock and open it. Leaving her prison cell thankfully, she tells you to go and see her father, the King, to gain a reward. Before you do this, however, drop the amulet and enter the Desert King's castle and fill up the lamp with oil from the workshop. Then go back along the passage to the armoury, killing the large guard along the way.

Now visit the Forest King and collect your reward — the silver key. Use it to unlock the secret door in the bones room and retrieve the diamond which you should take and leave in the cabin along with the brass key.

Retrace your steps to the armoury in the Desert King's castle, making sure that you shut the door behind you. It's time to select weapons and you'll find the axe — which you should already have — is

best, followed by the broadsword and mace.

It's not a bad idea to take something along with you ready for the giant but, whatever you do, keep this friendly monster from gaining access to the armoury or he'll clutter himself up with every weapon in sight and nullify his use as a porter.

You should now attack the inmates of the castle, killing them and the King, and remove their weapons to a place of safety. The best thing is to lock them inside the armoury. Now you can liberate the giant safely.

Return along the cellar passages and down to the damp hall near where you released the Princess. Open the remaining locked bronze door and enter the dungeon.

On finding the ill giant, take him through the house to Watersmeet — he'll swim here and become the healthy giant. He is of supreme utility in carrying heavy objects, so give him a minor weapon and take him back to the Desert King's castle ready for some pillaging — which we'll deal with next month.

Turn to Page 68 ►

◀ From Page 67

Problem Corner

F. R. Harvey has struck a problem in the reissued version of *Elite*. He writes: I find that there is no way in which I can reach the planet Birera because this and its sister planets Ordiesat, Riblara, Ersodi and Lelebi are all outside the seven light year range of any other possible jump off point. Thus I cannot complete the mission.

Suggestions and comments are welcomed.

James Hardwood has problems with two adventures that are unknown to me: In *Time Machine* he can't get out of the moors and in *Gideons Gamble* he just says he can't get very far. Can any reader help – either specifically, or with full solutions?

Hatter's Helpline

Once more Barbara Gibb comes to the rescue of a reader – Gollum, this time – who was stuck in *Valley of the Kings* and *Castle Blackstar*. In the first pyramid, the last few moves from the evil-smelling chamber are TAKE DIAMOND – size of a duck's egg – S, W, S, S and W to a dead end. There's an egg-shaped hole here, so INSERT DIAMOND in order to be dropped into a chamber below, TAKE LAMP and PRAY to be teleported back to the oasis.

When you've collected the items you think you'll need for the second pyramid, simply go S and S from the oasis to inside pyramid. Incidentally, writes Barbara, leave the flask behind before entering the first pyramid or you won't be able to collect all the treasures – but *do* DRINK before entering.

In *Castle Blackstar* – an adventure she rated very highly – the broomstick is used to transport you at the end of the adventure to heaven and the goddess. Don't overload it: You only need the orb and the broomstick. EXAMINE PLAQUE on the broomstick and the magic word needed to operate it is hidden in the answer. You can now fly up, and you should continue until you can TOUCH STARS. Then you can progress until you meet the goddess.

The vase is not accessible from the woodland side of the grating. A tunnel from one of the cells in the cell block leads to the grating which can be opened using the winch – a useful additional entrance and exit. The orb is, naturally, in the orb room – located at the end of a maze which can be

found by going DOWN from the warm room between the laboratory and the dragon room.

Graeme Couves asks about a wargame he encountered on a VAX 11/780 called *Empire* and wonders if a BBC Micro version exists. I don't know of any, but if Graeme has access to an Archimedes equipped with PC emulator I'd strongly recommend *Star Fleet 1* which I reviewed recently. Graeme is having a spot of bother in the fish room in *Kingdom of Hamil*. He, quite rightly, switches off the torch to discover the word SWAMP, but the roof falls in if he types it. That's because he *should* be typing OPEN.

Menno Nijland, from The Netherlands, is stuck in the goblins' dungeon in *The Hobbit* – as most of us have been at some time or another. He should wait for Gandalf or Thorin, then ask him to break open the trapdoor – discovered by digging – to get the key which is essential to the endgame. Next he should say CARRY ME, ask him to open the window and go through it. After that, Menno *must* find the ring before proceeding further.

L and back

Continuing from last month, when you reach the boiler room you are faced with two choices, writes Bill Hensman. Down takes you to a passage moving E, and E from there brings you to a door with four locks and also key blanks and files. If you enter GET FILE or GET BLANK you will be asked if you want to cut a key. The response Y produces a picture of four keyholes and a key-blank plus instructions for cutting it.

The key you need is the mathematical intersection of the four shapes and it is best to draw it out on paper first. When you have cut it successfully you can UNLOCK DOOR and pass through. You can also reach this point from another direction, as we'll see later.

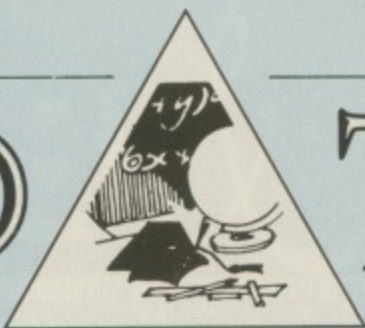
Back at the bottom of the stairs, you can now follow the main route in the game: Go up to the boiler room, up again to the top of the stairs and E to a room with a swimming pool. Then go E again to an orange lobby with a locked door – Bill says he's never found a key for it. East from the orange room takes you to the music room where you type PLAY PIANO and get the response OK. You have to play part of *Three Blind Mice* on the qwerty keys. The sequence is EWQEWQTREE then press Return.

The tune will now be completely replayed and you'll be given a bottle and a phial – but don't take them just yet. Leave the key here also, for use later. From here E takes you to the solarium and E again to a room with an elliptical billiard table. Although you can have fun here there's nothing to be gained by lingering too long.

● To be continued...



U·P·D·T·E



Education grants scheme storm

EDUCATIONAL software manufacturers have attacked a government grants scheme, claiming it could put them out of business. But the outburst has brought criticism of their industry from a government spokesman.

The manufacturers have called for more contact with Whitehall so they can plan ahead to be in a competitive position in Europe and they warn that if government help is not given it could spell the end of the British educational software industry.

Mike Matson of 4Mation Educational Resources (082 581 2679) and Bill Bonham of Sherston Software (0666 840 086) enlisted the help of shadow secretary of state for trade and industry Bryan Gould in their "Save our Educational Software Industry" campaign. They also involved Labour education spokesman Jack Straw.

Their action followed the government's offer of £1m in grants to help schools and local authorities buy educational software. The Department of trade and industry grants covered one third of the cost of buying software over an initial three month period ending in January, but were restricted to 16 and 32 bit machines.

Taking up the campaign, Bryan Gould asked trade and industry secretary Lord Young to increase the scope of the scheme to cover 8 bit machines and also to extend the time scale.

Replying for Lord Young, DTI Minister Eric Forth said the timescale of the scheme had been extended to February, but requests to include 8 bit software had been denied.

"Many argue that the British educational software industry is fragmented, inefficient and unprofitable, perhaps partly because it has been shielded from competition by several years of government subsidy", said Mr. Forth. "Indeed, some would argue that the industry has been too slow to bring our new 16 and 32 bit software to run on the excellent modern micros now marketed by British companies like Acorn". He said that if the current grants encouraged schools to buy for-



Shadow secretary of state for trade and industry Bryan Gould has taken up the software writers' campaign

eign software it would be an indictment of the British industry.

Mike Matson said: "What upsets us considerably is that if this scheme had been hugely successful it could have killed off the educational software industry in this country. If local authorities had spent all their money on 16 and 32 bit software over the three months, educational software producers who are still doing 8 bit would have had no income for that period. We are very small companies and that three months would have finished us off completely.

"There are only a few of us in educational software and we have not gone into 16 and 32 bit because we feel the market is not there at the moment, particularly in primary schools. The time limits imposed on the grants were just not sufficient to allow new software to be produced.

"We need to know what the government is going to do - whether it is going to push for the Master and Archimedes or retain support for 8 bit and we need to know 12 months in advance. We are mostly on the scale of cottage industries and cannot commit months of development work to

Turn to Page 70 ►

“If this scheme had been hugely successful it could have killed off the educational software industry in this country”

MUSE conference

MUSE (Micro Users in Education), the national body for coordinating information technology in schools, will hold its annual conference at Nottingham University from July 24 to 26.

Featuring strongly at the conference will be the national curriculum and its effects on information technology. MUSE delegates have already contributed to a government sponsored conference on IT in the new curriculum. It is also hoped to have a number of sessions arranged by MUSE's

sister organisation BLUG, the British Logo Users' Group.

"Deeds not words" will be the theme of the conference with a practical, lively and down to earth approach and plenty of machines in evidence.

At its meetings, MUSE promotes the exchange of information and ideas and also runs courses on all aspects of hardware and software for learning. It can be contacted on 0533 433839.

◀ From Page 69

one machine if the market is not going to be there in the end".

His words were echoed by Bryan Gould, who told Lord Young that without a long term government response, worked out with the industry, to convert British software for the new generation of school micros and to develop it for export markets, Britain is in danger of losing an important knowledge-based industry almost entirely composed of small businesses.

He said there is also the threat of overseas software, particularly from Holland where the government is pumping 26 million guilders into a project to produce 54 educational courseware packages. "These will be marketed in Britain with catalogues already available and could well swamp the market here in the run up to 1992", said Mr. Gould.

Latest figures available from the DTI showed the scheme had prompted local authorities to buy £780,000 worth of software with a further £80,000 in the pipeline for independent schools and teacher training colleges. This accounted for £286,000 of the £1 million available.

Hampshire goes for Archimedes

HAMPSHIRE Local Education Authority has approved the purchase of more than 1,000 Archimedes to equip its 114 secondary schools and sixth form colleges.

Cheaper connection

HUMAN-Computer Interface Ltd (0223 314934) has announced bulk purchase deals for its BBC Connectivity products. Schools or other educa-

tional buyers can now get discounts if they buy 10 or more items.

Under the new deal, View Mac Version 2 for document conversion between BBC Micro and Macintosh drops from a single copy price of £67.85 to £54.28 for bulk order. Screen Mac for graphics conversion between BBC Micro and Macintosh drops from £56.35 to £45.08. There are similar cuts for the company's SC1 and SC2 serial transfer cables.

Children go for Fun School 2

TEACHERS have applauded Fun School 2 from Database Educational Software (0625 878888), now available on the BBC range of micros.

"Fantastic", was the opinion of Shelley Gibson, a primary teacher in Tameside whose opinions are shared by other educationalists.

"It is very refreshing to actually find software which is designed for the age range on the label", she said. "The reception and nursery classes are often the most difficult to find appropriate material for but this is ideal. It is hard to keep the children off it. They are so keen that time with Fun School is often used as a classroom reward".

The Fun School 2 package is available in three versions for children under six, six to eight and over eight. For the under sixes there is a suite of eight programs designed by educationalists to combine fun with a wide range of early skills.

The six to eight programs are designed to allow various levels of difficulty covering word and number work, coordination and logical thinking.

In the over eights section, Fun School 2 combines the challenge of a larger adventure game with the convenience of a series of short puzzles. Seven of the games are self-contained and the eighth can only be solved using keywords obtained by successfully completing the seven others.

It is very refreshing to find software which is designed for the age range on the label



Souvenirs: One of the Fun School 2 programs designed for over eights

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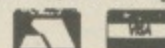
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Feb 3 to 9

Alginon **Alg-ug** **Ex1**
Ex2 **Ex3** **Ex4**

A set of useful routines to incorporate in your own Basic programs, all concerned with producing graphical representations of data. Highly structured and easy to follow, they may be tailored to your own specification.

Bisness

A lively and addictive simulation of the world of the small business. Take the reins of your very own company — in debt to the

Teachers' notes

Notes to accompany the schools broadcasts *Scene*, *Tutor Group Starter* and *Taking Sides*.

Escape

Can you collect all the blueprints and avoid the monsters? Play this great arcade adventure from the November 1988 issue of *The Micro User*.

Notes for schools

Notes for the current schools programmes *Scene* and *Modern plays: The Crucible*.

Sta/Src

Get useful information about your Basic programs memory usage with this useful utility from the November 1988 issue of *The Micro User*.

ways ram light pen drivers and supplies programs to act as drivers for the pen to allow easy modification of your own programs.

Clock

Confused by Rubik's Clock? Learn how to solve it in under a minute using this program from the November 1988 issue of *The Micro User*.

Feb 10 to Feb 16

Data **Words** **Leader**
Produce word search puzzles

Feb 17 to Feb 23

Catdisc **CDInfo**
Obtaining details on the contents of any disc is a useful facility for a wide range of programs. CatDisc

Teachers' notes

Notes to accompany the schools broadcast *Scene*.

Feb 24 to Mar 2

Wordbox **Intro** **Sample**
WBdata

Can you work out the hidden message in the wordbox before your opponent does? Buy vowels or hazard guesses, but don't be wrong because it's at your own expense. Creation of your own words is possible with WBdata, so you can have an inexhaustible quantity of data for playing the game.

Image Dat/inf

This extremely useful facility adds another three commands to your operating system. It solves the problem of recalling the latest version of a file by date stamping it when saved, so each version then contains its own unique identity. Since the package uses the internal clock, it will only run on a Master series machine.

T/Ttx00 **Scroll** **Subtitl**

The first in a new series of modules to investigate the Acorn teletext adaptor. It begins by looking at ways of extending the facilities provided by the ATS. Enlargement and scrolling of teletext pages, or obtaining subtitles are looked at this week.

Teachers' notes

Notes to accompany the schools broadcast *Scene*.

Scroll

A short display routine that draws big Mode 7 graphics and scrolls them across the screen following a mathematical path. Taken from the January 1989 issue of *The Micro User*.



Guide

B **B+** **M**

Software is currently transmitted for a period of one week. Files are available from Friday afternoons to the following Thursday evening, with the exception of the Issues teachers' notes which, due to their topical nature, are available from the Wednesday morning to the following Tuesday evening during the week of transmission. The details are provisional only.

bank with an ultimatum to pay, wheel and deal, hire or fire as you battle for survival.

automatically. Just give the micro your selection of words to be included, and wait as the completed puzzle is produced.

can be appended to your own Basic programs and returns in a string array, the name of every file held on the disc in the specified drive. Suitable for both DFS and ADFS.

VidiEditor

The ultimate Mode 7 teletext screen design system. This is the software used by CeeFax to create its entire magazine and has recently been updated to incorporate many new features. Communications protocols are also offered for those with Acorn Prestel adapters and access to the Prestel computer on an information provider level.

Emads **Docu** **Demo1**
Demo2 **Demo3** **Demo4**

If you've ever attempted creating sound envelopes on the BBC Micro, you will appreciate just how difficult it can be. This program is designed to make the task easier by providing a menu of options for updating and listening to different envelopes as you adjust their individual parameters.

Text **Printer** **Code**
Init **Proc**

This package goes a long way in solving some of the memory problems associated with assembling very large machine code programs. Using a clever technique of data entry, source code held on disc can be assembled into machine code in ram, and since there is no need for both source and machine code to be in memory at the same time, much larger programs may be assembled.

T/Pen03 SPinter

A further chance to expand your knowledge of light pens on the BBC Micro. This week's package explores the problems of using a light pen with a second processor. Examples of this, plus how to achieve scrolling using interrupts, are included.

/Pen04 Graphic

One of the most useful features of a light pen is surely graphical input. This week's module examines the method for doing this and provides a program to read the graphics coordinates to allow drawing.

T/Pen05 **WStext** **SWgraph**
Artist

The last in the series exploring the uses and functioning of light pens. This week it looks at side-

Learning has never been such fun!

A computer is an ideal teaching tool for young children – if you have the right software.

Fun School 2 is available for three age groups: Under-6s, 6-8 years and Over-8s. Each pack consists of eight colourful and exciting programs carefully designed by a team of educationalists.

The computer itself monitors the child's progress. The skill level – initially set by parents – is automatically adjusted to suit the child's ability.

Now children can enjoy using their parents' computer while they learn at their own pace.

You can give your children an unfair advantage with Fun School 2 – it's the ideal way to introduce youngsters to the joys of using computers.

Detailed instructions are supplied with each pack giving educational help to parents and teachers, together with full instructions for each program.

A colourful button badge with each package!



Fun School 2 for 6 to 8 year olds contains:

- **Number train:** Calculations made enjoyable
- **Shopping:** Which shops for which products?
- **Maths Maze:** Fun improving arithmetical skills
- **Treasure Hunt:** Introduction to coordinates
- **Bounce:** Get to grips with angles
- **Packing:** Discover tessellating shapes
- **Caterpillar:** Word building challenge
- **Number jump:** Have fun practising tables

fun school

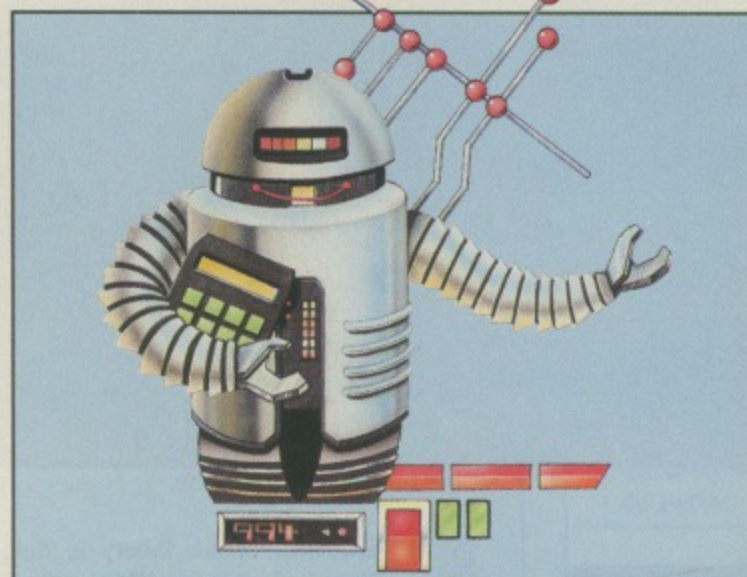
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2

Fun School 2 for Under-6s contains:

- **Shape Snap:** Colourful shape recognition
- **Find the Mole:** Experiment with number sizes
- **Teddy Count:** Ideal introduction to numbers
- **Write a Letter:** Creative fun at the keyboard
- **Colour Train:** Play at spotting colours
- **Pick a Letter:** Word building made easy
- **Spell a Word:** Enjoy naming the pictures
- **Teddy Bears Picnic:** Move around a maze



Fun School 2 for Over-8s contains:

- **Build a Bridge:** Shape-fitting challenge
- **Passage of Guardians:** Enjoy anagrams
- **Unicorn:** First steps in problem solving
- **Logic Doors:** Mapping made easy
- **Souvenirs:** An introduction to travel
- **Code Boxes:** Discover binary arithmetic
- **Mystery machine:** Have fun breaking codes
- **Escape:** A final check on progress

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SEND TO: Database Educational Software, FREEPOST, Europa House, Adlington Park, Adlington, Macclesfield SK10 4NP.

Mastering music

Ian Waugh takes a look at software that tries to make music theory more interesting

Points for

- Excellent value for money
- Lots of options
- Easy to use

Product: *Theory of Music*
 Price: 80 track or 40 track doubled sided £12.80, 2 x 40 track £13.80
 Product: *Play What I Play*
 Price: 80 or 40 track £8.90
 Product: *Can You Read Music?*
 Price: £7.90 (*Can You Read Music?* and *Play What I Play* on one disc, £12.80)
 3.5" disc £1 extra.
 Supplier: Ted Kirk, 33 Humber Crescent, Sutton Leach, St. Helens, Merseyside WA9 4HD.
 Tel: 0744 818761

The letters for each sound are shown below.
 Each one has also been given a number.

1 2 3 4 5 6 7 8
 G A B C D E F# G
 PRESS RED KEY 8 TO HEAR SOUND

Experimenting with sounds

Against

- Doesn't tell you the answers
- Implementation could be improved

The bottom line...

Definitely worth considering if you want a program to help you learn music

LEARNING music theory is dull, dull, dull – there's just no getting away from it – but some enterprising companies and individuals have produced programs which aim to make the process more interesting. One of the simplest is *Can You Read Music?*, which asks questions about notes in three areas. You must name one shown on the staff, position a named one on the staff and say how many of a particular duration make up another note length.

You use the cursor keys to select an answer from a multiple-choice selection but, oddly, you must press the spacebar to register your choice – why not Return? You are given more than one crack at each answer or you can pass – but both these options lose you marks and after 20 questions your score appears.

It's a simple program which lets you choose the level, quite fun and suitable for reinforcing note names, positions and durations.

Play What I Play is aimed at secondary and upper junior school students. It tests relative pitch,

melodic memory and the ability to relate notes heard to the notes displayed on screen – a sort of sophisticated Simon program. The notes can be shown on a piano keyboard or a diatonic glockenspiel which shows only the notes in the related key. Like *Can You Read Music* this, too, has several options and uses a similar method of scoring.

The author calls it a game but some of the questions will have you scratching your head – or pulling your ears. It could certainly help you improve your aural ability.

The Theory of Music is specifically for students studying for the Associated Board's exams from Grades 2 to 5. It is written in a similar style to the other programs with many options at all levels. It is menu driven but sometimes the colour of the highlight bar almost obscures the menu option – cyan on yellow for example.

You are not given the correct answer at any time although hints sometimes appear. After entering an answer you press r – instead of the spacebar – and then you must press x for the next question.

Seven topics are covered including key signatures, scales, intervals, bar lines, time signatures, rests, musical terms and the arrangement of chords on two staves. All sections tie up with parts of the Associated Board's Rudiments and Theory of Music. A set of Teacher's Notes is included and this contains further information on the program but isn't essential reading.

The program doesn't include every type of question you'll come across in the exam – the manual details the omissions – but if you score well you'll have an excellent chance of doing well in the examination room.

Product: *Reading Music*
 Price: 4 x 40 track discs £25 or £7 per disc
 Product: *Musical Dictation*
 Price: 3 x 80 track discs £19 or £7 per disc
 Supplier: Musicality Software, 15 Cheddington Road, Edmonton, London N18 1LT.
 Tel: 01-803 9449

MUSICALITY Software has two sets of rather massive programs. *Reading Music* contains a total of 18 routines and *Musical Dictation* contains 24.

Reading Music teaches music theory from the most basic aspects such as rhythm and pitch right up to key signatures, tonic triads, musical terms and signs. It doesn't carry any grade markings, although the poorly-photocopied instruction sheets list the contents. The course is divided into parts, programs, sections and chapters, but

this tends to confuse rather than help you find your way around it.

After completing a section you are sent back to the chapter menu rather than the part menu which would seem to be the more logical option. This prompts for a program number when it really means a section number. Some programs are not even in chronological order, for example, program eight contains questions about programs nine and ten. Programs seven and eight are reversed on this menu option, too. It's really not as confusing as it may sound, but it really needs to be sorted out.

In the early exercises, when learning note names, the software insists on playing the notes. This is unnecessary from a practical point of view and as most sequences are fairly bland, also rather unmusical.

Notes are positioned using the U and D keys for up and down and confirmed by pressing the spacebar — why not use the cursor keys and Return? If you answer incorrectly you may be given a hint or referred to the relevant program and section number for revision — nice.

Input isn't standardised. Note names, for example, only require a single keypress, some numeric input must be followed by Return and some text entries are checked letter by letter so there's no opportunity for correcting a mistyped answer.

The answers to some questions requiring text input are shown in jumbled — anagram — form which is pretty inane. Can you work out what *Fine* means if you're given *het nde*? Some questions contain beamed notes on a staff but where the beams run over the staff lines they are difficult to see.

You can't escape from a program once you're in it and you can't skip questions. You are not scored during the exercises, only on the two tests in part 7 — programs 17 and 18. The exercises and tests ask the same questions each time through — surely unforgivable on a micro with a RND function.

Musical Dictation is a set of aural training programs. It starts off with simple high/low exercises then long and short note durations are introduced

along with variations in pitch and rhythm. In many exercises you must enter a sequence of note durations which are played by the micro. Once a duration has been entered you can't erase it, and if your answer is wrong everything is wiped out and you are prompted to try again.

Some exercises play a sequence of notes twice, but you can't repeat it if you're still a little unsure. In fact, you can't quit some exercises; neither do they show you the correct answer — you just have to plug away till you get it right.

The more advanced tests are similar but in different keys which would make little difference to anyone unless they had perfect pitch — in which case they'd sail through an aural exam — but you aren't given a reference note to start with, which makes some questions particularly difficult.

I'm afraid I couldn't really get excited about

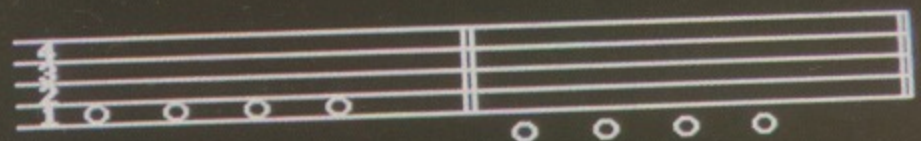
Points for

- Fairly thorough content

Against

- Implementation needs to be improved
- Cost seems a little expensive

Move the notes into Space 1



U for UP
D for DOWN
<SPACE>
when note
is
in place

Learning about note positioning

these programs. Although they cover a lot of ground and the content is reasonably thorough, the implementation is poor. They miss many opportunities afforded by the micro to add interest and variety to what is, after all, one of the less-exciting aspects of music.

The bottom line...

Good try but could do better

The clothes show

Marshall Anderson learns how to put on the style

Product: Fashion — the T-Shaped Garment
Price: £20.00
Supplier: Coventry CBL, Casselden House, Greyfriars Lane, Coventry CV1 2GY.
Tel: 0203 831756

THIS package from the Coventry CBL unit is aimed at the secondary/college market. It takes a student through the various processes involved in making a T-shaped garment, the sort of task a fourth or fifth year GCSE candidate might undertake.

The menu presented divides this task into three

units, Design, measurement and construction. If followed consecutively these will take you through the process introducing new ideas and skills as you go along. The design section introduces the T-shaped garment, one of the simplest shapes you might want to make — looked at from a creative standpoint.

You explore different neck lines and see the effect of shortening or lengthening sleeves, along with some explanation of the way they are shaped and made. There is also the opportunity

Turn to Page 76 ►

Points for

- Good use of graphics
- Step by step approach

Against

- Very difficult to resource
- Tutorials ineffective

The bottom line...

Useful on the creative side but do the teaching yourself

Points for

- Colourful and lavish images
- Extremely straightforward to use

◀ From Page 75

to look at the additional design ideas of using pockets, applique, inserts, trimming and slits.

There follows a step-by-step look at exactly how measurements are taken for clothing. This section divides into male and female to demonstrate the different measurements that have to be taken. Once this is complete the measurements are transferred to a pattern and instructions given on how allowances are added at this stage for seams, hems and so on. To complete the pattern another tutorial section takes you through the method used for shaping the neck and its facings.

After the pattern has been created and labelled the fabric must be chosen. This section considers and demonstrates nap, pile, and pattern and the way they will affect layout and construction. This section also gives the opportunity to look at the way colours work together.

Having bought the wherewithal to complete this garment the program moves on to help with its construction. You find out all about something called *straight of grain* and how this is going to affect our layout on the cloth. Armed with this information, along with that on nap, pattern and pile, the micro invites you to wield the scissors.

Now that you have in front of you a pile of material in assorted shapes and sizes, assuming you can remember which is pattern and which waste, the program coaxes you further into the terrors of actually fitting the whole thing together into some sort of recognisable form by constructing plain seams, neatening and tapering them. Then neck facings are attached along with any little extras like pockets, inserts or, presumably, designer labels.

This package is designed for the complete beginner and in that respect at least it seems to be fairly well on target. Some of it seems a little

shaky, technical terms are often explained but sometimes not. There are several lines of text on what exactly a hem is but the term *ease* is blithely dropped in with no further reference. Input handling is poor – there are few second chances.

Almost all the manual skills are illustrated, usually quite well, and when the program examines anything to do with the creative side of things it does a good job. The section on choosing fabric and joining patterns is very good indeed as several right and wrong examples are shown on the screen.

The problem here is not so much the quality of the package, for something so extensive it is good of its type, but its effectiveness in the classroom. With the exception of the design and creative side of the package, the rest can be done much better by other means – through books, work sheets and personal contact.

The package demands that students have ready access to the micro at many stages of the designing and making process and this will cause resourcing problems for many schools and colleges. That is not to say that it won't find its way into many design departments and be exploited very well but the teaching part of the program seems of limited use, despite the wealth of worksheets provided with it.

In general, micros are not capable of being good teachers – they don't have the capacity to respond to the many needs of the individual unless the thing to be learned is small and tightly defined. This package, for instance, does not respond usefully if you tell it that your chest measures 2500 cm. Perhaps that part of things is best left to the tutor while the micro concentrates on what it is good at, allowing students to try designs out on the screen first, to play with pattern and colour in a creative way. When this package deals with these things it is at its best, and it's a shame those parts were not more extensive.

Myths and legends

Hindu tales revealed to desktop publisher Phil Tayler

Product: *Ramayana Tales*
Price: £15.95
Supplier: BBC Soft, PO Box 234, London SE1 3TH.
Tel: 01-576 2548

THE cover describes this package as *A program for Young Publishers*, and goes on to suggest a suitable age range of seven to nine. Yet this is not the type of DTP package so popular in schools today, but it would be eagerly received by children throughout the junior age range. One reason for the age range is explained by the fact that this software has been designed to support the Watch BBC television series. This includes a module on festivals on a truly multi-cultural basis.

The Ramayana is an ancient Indian poem sacred to Hindus, and a reasonable knowledge of this piece is essential. There's a wealth of characters and wisely the software only concen-

trates on a few of the main ones in the epic. Even if you are totally unfamiliar with Asian mythology you will find plenty of ideas and information.

The publishing side is easy to use and very well thought out. There are 68 pictures through which you can browse. Some are complete featuring the heroes such as Sita and Rama, whereas others are of a single tree. All pictures are detailed and the Mode 2 colours are used very well. After browsing you can then use them – or the printouts supplied – to build your own story using the Edit option.

This is simplicity itself, as any picture can be brought on to screen and moved around the invisible 20x14 character grid. Should you change your mind, any shape can be highlighted, moved or deleted. The picture colours are fixed, but the captions are left to you to place and write

Turn to Page 79 ►

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The land of Shades

by someone who has been there and survived

I TOLD you last month how to kill and run away when others come after you with the axe, the rusty longsword or even the mild unassuming rat which hath teeth the like of which I have never seen.

The best way to practice if you are a worthless beginner is by bashing the mobiles like the deer. But sooner or later another player will attack you, and if he is any good he may do rather more than just type K BABY LS and wait to see what happens.

So learn your spells. You cannot use all of these at once but when you have acquired enough points new spells become available. But you must know what some of them are in case big tough bullies like Spitzen use them against you!

Most useful is STEAL which you can use to deprive your opponent of his only weapon.

Then there's STRIP and FUMBLE: The first makes you drop any weapons you are carrying, and the second makes you drop everything. Useful in fights where your opponent has more than one weapon.

When it comes to the best weapons like the rusty longsword or the rat, you can only carry one at a time unless you steal another. So if a player has both, and you make him drop them, he can only pick up one, leaving the other for you.

You need to know how well you are doing in a fight, in order to flee in time. Spitzen's remaining stamina can be revealed with QS SPI, and as you will see your own going down, you can tell who is winning. Spitzen of course, so run away and hide!

To find out what weapons Spitzen has use I SPI. But remember players may be carrying invisibly, so you may have to guess or wait until attacked.

A very nasty spell is CRIPPLE which only lets you move one step at a time by typing HOBBLE. Fighters who use this are the scum of Shades but there is no law against being scum, so be careful.

If you are not much good at fighting your best bet is to QUIT straightaway and log back on to whinge and moan and let everybody know what you think.

Above all, if you want to learn how to fight, do not use your favourite character, create a special one to practise with. Later you can take out your 'main' character reasonably confident of handling the killers.

Next month I will talk about the safe places in Shades like the pub, the church and the bridal suite, and what you can do in them (Oooo-errr.!).

May the goddess be with you!

Whirlwind

PS Congratulations to Stunner the really gorgeous Witch, the first TG player to reach immortality! Also to Stingray who made it in record time - at the second attempt He He!

And hi to the MicroLink gang - Arfabrain, Skeeve, Zimmerman, Mnementh and Zakym. And a special hello to Dodo from Iceland!

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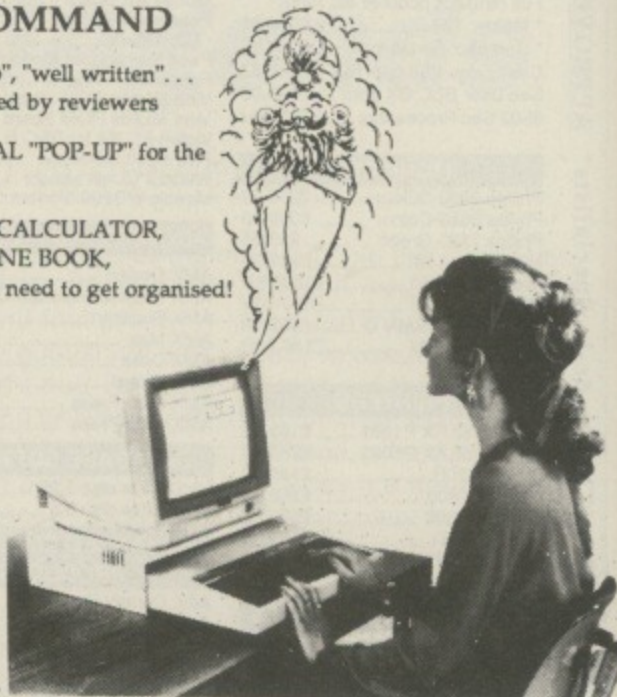
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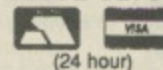
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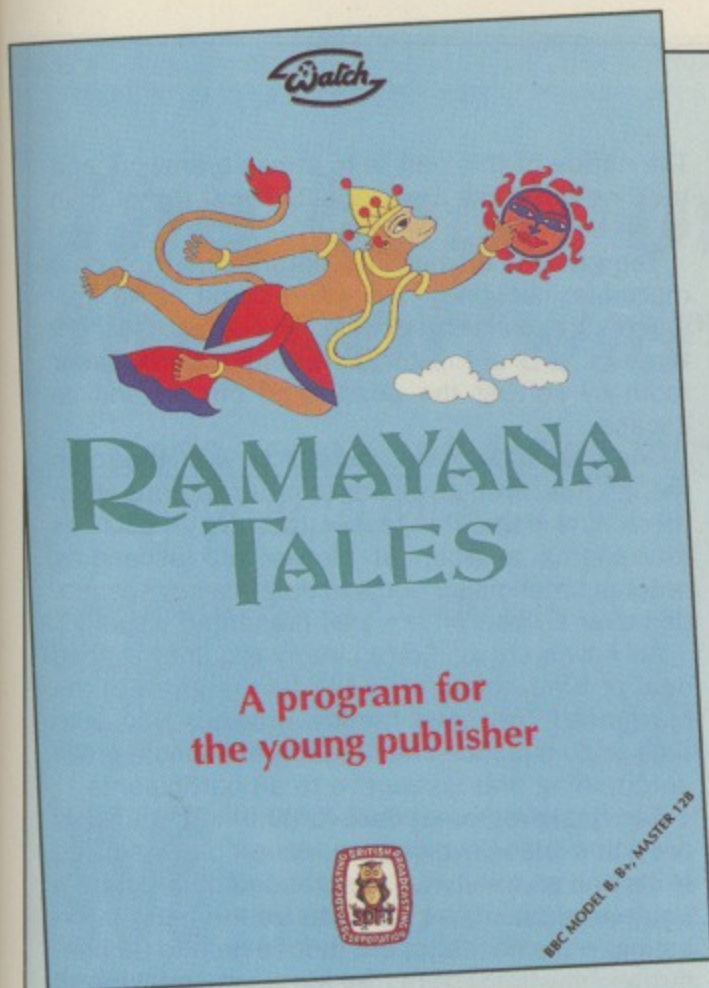


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◀ From Page 76

from a combination of seven solid and two flashing colours. If you are feeling adventurous you could try some simple animation.

A third option lets you display your version of the Ramayana or any other story using the central characters of Ravana, Sita, Jatayu and Rama. This is done by using the strange key combination of < and >. You can also expand on the stories by pressing J which allows you to jump to any other page. In this way the 40 available pages could well be greatly expanded.

Hidden is a fourth option for teachers where you can set parameters such as the maximum number of pictures on any one page. You can also decide if you want the class to have the option of clearing a page. If you choose to allow this the



The Monkey god on his travels

program automatically saves an emergency version – a very nice touch.

How rigorous is the program in use? Sadly the Break key is not disabled – possibly fatal for an interactive package. However you are advised not to work from the original discs but from back-ups.

All in all Ramayana Tales is well error-trapped and encourages experimentation and imagination. One use we found was to create magazines by printing out the screens. Unfortunately, though, the dump utility supplied produces only a positive or negative image. The lavish colours are lost and a nice addition would have been a colour print routine.

At the moment only those schools with a colour dump resident rom will be able to make the very best of this program's potential. For schools using the Watch programmes on Festivals, and in schools with children of Hindu origin, I believe it offers a unique and very adaptable package.

Against

- Rather limited in application

The bottom line...

Very good as far as it goes



On the buses

An adventure in packing examined by Tony Flanagan

Product: Technology and Design (Part 2)
Price: £24.95
Supplier: BBC Soft, PO Box 234, London SE1 3TH.
Tel: 01-576 2548

THIS package contains three very different programs designed to test and develop a variety of skills from the simple keying in of data to quite advanced problem solving. The package would suit the upper school range, especially GCSE students taking design and technology courses, though each program could be used as stimulus material in other subjects too – including those more advanced and vocational in nature, such as retail and management.

In the first of the programs, *The Bus Game*, you

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Points for

- Plenty of material
- Well-packaged and presented
- Well-written and easy to follow manuals for each program

◀ From Page 79

take on the role of manager of a town's bus system. Up to four individuals or groups can play in each of the three game options. In the first, each company starts with £100,000 with no established routes. In the second, one company starts with a developed network of routes and £50,000, while the rest start as in the first option. The third option gives one £500,000, the rest with £100,000 and all must build their routes.

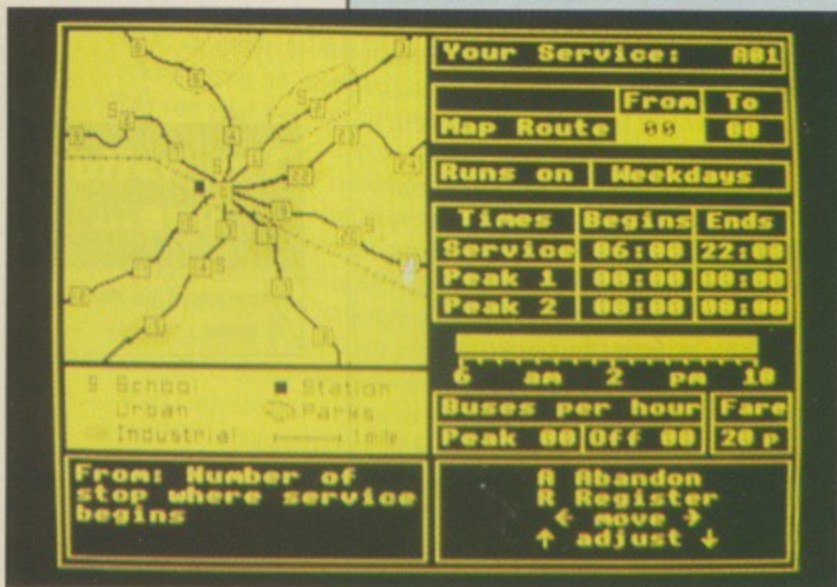
Companies must take it in turn to make a variety of decisions. You are given full responsibility for buying and selling buses, hiring and firing drivers, altering routes, increasing and decreasing fares, wages and so on. At the end of each month you are given an account of how much was spent and your profit and loss situation.

The main screen shows a map of the town and the available routes with each stop numbered. This could have been a little clearer but works relatively well once you have got used to it. The gameplay, which is menu driven, is quick and logical, though I would advise teachers to familiarise themselves fully with the manual.

Success depends on exercising a range of decision making skills whether financial, managerial or social. There is a good deal of data to interpret in numeric and graphic forms. The essential point is that decision making is cyclical

Against

- Time consuming



Controlling your fleet



Packing it in

rather than linear, and that taking several factors into account simultaneously is very important.

Adventure of Sorts, the next offering, combines the problem solving of an adventure game with the gathering and interpretation of a range of data. Initially you must gather a range of physical statistics relating to the members of a group of up to 40. Such numerical data is mostly conventional – height, weight and so on. But some is bizarre – ring finger size and foot length. All is important, though.

Once all the information for the 13 fields has been gathered it is keyed into a data sorter. As you would expect, this sorts the data according to a variety of criteria. At this point a team of six students must be selected to provide a good variety of physical differences. A wide range will be needed to solve the physical and technological problems. A default is supplied with the program.

The nature of this part is to stress teamwork and tackling problems as a collective unit rather than as an individual.

The game is a typical adventure centering on a maze-like network – the weird home of Mr Procrustes the mad ergonomist. The object is to get three of your group to this strange man's tower room by solving the puzzles he poses, and so escape.

The display is of an abstract view of the room though this often gives way to other screens when there is a particular teaser to solve – such as rearranging a group of blocks into ascending order or balancing a plank to obtain a key suspended over a river. All are well-presented visually.

An **Adventure of Sorts** clearly requires a good deal of time, though the solution is given in the playguide. The save facility provides you with time to do it justice and the program should prove entertaining and instructive to all participants.

The final program is **Pack-It**. Similar to the other two, this also involves you in problem solving skills and an ability to interpret and manipulate a range of data. This I found to be the least interesting in the package, but it does help to demonstrate how important design is to packaging products economically and with the minimum of wastage.

The program enables you to design your own cartons and pack them in cases and then on pallets. Initially, you need to decide what type of

The bottom line...

For teachers who are following a specific syllabus, this might be too time consuming

materials you want to package, whether powder or solid – as this will influence the type of cardboard box you decide on. You must also choose the size of case and pallet and attempt to pack all the contents as economically as possible.

The screen is split into two halves – one showing the various data, the other the three dimensional drawings of whatever is specified – whether carton, case or pallet. Any wastage is automatically calculated and displayed in the data panel.

Though well presented, the program lacks the competitive element present in the other two though teachers could introduce this themselves – careful reading of the manual is necessary.

All in all, **Technology and Design Part 2** offers excellent value for money with three good programs in the same package.

The book of the software

A good read? Jon Revis looks at a guide to Mini Office II

Product: Mini Office II – A Dabhand Guide

Price: £9.95

Supplier: Dabs Press, 5 Victoria Lane, Whitefield, Manchester M25 6AL

Tel: 061-766 8423

MINI Office II, the award winning suite of business programs, has been available for several years, so why bother to release a third party user guide for it now? For many BBC Micro owners – including many who are not *au fait* with the finer points of the jargon – it is still the first serious package they buy and it is at these users that the book is aimed.

The 256 pages go to great lengths to try to explain all features of each and every Mini Office II module – a task that is already performed very competently by the manual supplied with the software. The book's greatest strength, however, is the well organised approach to the task in hand – this I cannot fault.

Some time is spent at the start discussing file management. An explanation of directories and sub-directories is followed by advice on choosing meaningful filenames. Finally file management is tackled at office level and you are recommended to keep documents, databases, and spreadsheets on separate, well labelled discs, with up to date backups being a main priority. All of this is sound practice that most of us are already aware of but seldom follow.

Word processing is the first utility to be given the Dabhand treatment. Beginning with the first few tentative sentences typed into the editor, you are coaxed through block manipulation, loading, saving and, finally, the potentially confusing subject of mail merging. When explaining the importance and use of embedded commands to control the layout of the printed output the authors wander off into the realms of Basic programming. Only after six pages did they get around to using the CC command and embed the required codes in the text.

A demonstration disc to enhance the book is available and included on it are several word processing files. These include a short passage for use in block manipulation experiments and a standard letter and database for use with the mail merging facility.

Chapter 14 is packed with some juicy tips on function key definitions. Instead of plodding through several levels of menus to get from the editor screen to the file save menu you can store all of the necessary key presses in a single function key – this is mentioned in the Mini Office II manual but not demonstrated. The Dabhand guide provides a complete list of useful key defini-



tions plus instructions on how to *EXEC them from a file at a future date.

The database section is opened using the same approach as the previous one – the importance of planning when constructing a database is emphasised. When considering template design everyone remembers to include fields for things like name and address, but what about a couple of extra single character ones to indicate whether or not a club member is on the committee or has paid this year's subscriptions? It is only when you are experienced in database design that you build in these essential yet not immediately obvious fields, and the book tries to pass on that experience quickly.

In the original Mini Office II manual the operation of the database utility is explained in nine pages. The Dabhand guide has expanded upon this somewhat with chapters weighing in at a hefty 46 pages.

While the Mini Office II word processor appears to have changed little over the years the same cannot be said about the database – versions for the B+ and Master have much improved search facilities, all of which are explored fully in the guide. The closing pages of the database section discuss memory usage and how this can be maximised through efficient database design and

Turn to Page 82 ►

◀ From Page 81

a few tricks with the BBC Micro itself.

Assuming the role of carpet fitters, you are launched into spreadsheets and it came as no surprise that careful planning was also the foundation of good spreadsheet design. Not only must you decide how to cram it into the BBC Micro's meagre memory, but you must also construct it so that the finished output will fit on your printer.

As an example you're led through the planning of the carpet laying spreadsheet. Every step is discussed in detail, from breaking down the manual job into its constituent tasks, using the word processor to create and print a dummy sheet, right up to spreadsheet creation and data entry. The ever-useful demonstration disc even contains a neat routine that will print a wide spreadsheet sideways with a dot-matrix printer.

Once you have entered and calculated all of this wonderful data what else can you do with it? You can use the graphics program to convert it in to a pictorial form, and this is covered in Chapter 29 where the advantages and limitations of the graphical representation of data are first discussed. Heavy stuff. Eventually the conclusion is that graphics are all right really and the technicalities of drawing pretty pictures are then explained.

Mini Office II Communications software is

treated to a relatively brief, but nonetheless informative, Dabhand approach. Background information about computer communications is followed by use of the Mini Office II software and finally an annotated printout of a MicroLink session.

Unfortunately the book does contain several omissions and factual errors that could prove confusing to an inexperienced reader.

On page 12 you are informed that users of rom and disc based Mini Office II packages can access the individual modules by the use of star commands. I duly inserted the disc and typed the appropriate commands only to be greeted with a *bad command* message – it would appear that not all disc versions can be run in this way.

Moving on to page 13 I spied the possible solution to my dilemma: Appendix A, it claims, contains a list of the differences between the many versions of Mini Office that have evolved through the years. That's wrong – Appendix A actually contains a list of Epson printer codes which looks as if it has been lifted from another book rather than tailored to Mini Office II users.

Bruce Smith and Robin Burton have produced a friendly and informative book that goes to great lengths to try and instill the necessary degree of organisation and forward planning into the new user. Unfortunately it is marred by these irritating inaccuracies.

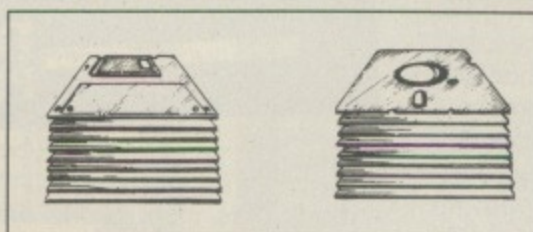
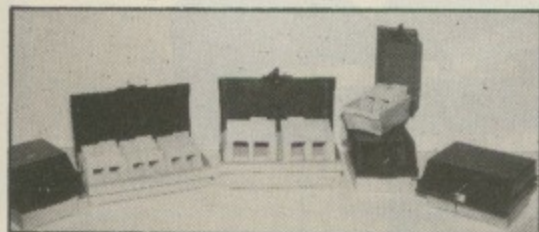
Points for

- Chatty yet informative approach
- Brimming with useful tips
- Accompanying disc of demonstration files

Against

- Several potentially confusing inaccuracies and omissions

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Saving grace

Make your Forth block handling much faster with Martin Goose's utility

FORTH provides standard calls for loading and saving to disc and tape, but if you have additional sideways memory it's very simple to create the words to implement a Forth ram disc. Loading and saving to ram is much faster than similar disc accesses, the only problem being the fact that you lose any data when the machine is switched off. And provided you save it to disc at the end of the session or have battery back-up even this needn't be a problem.

These listings give you a complete ram disc so you can speed up your Forth operations. Just type in each block — separated by the titling comments — and make sure you save them to disc or tape before switching off.

The core of the ram disc is osword 66 which transfers data to and from sideways ram. This call was first implemented on the B+ and also exists on the Master series. However, several of the better third party ram boards for the BBC B do implement it correctly. Reading and writing

blocks of data is accomplished by creating an equivalent of the disc word DR/W and tape word TR/W which are already provided.

To produce this new word several others need to be defined first:

● **OSWORD** This is defined in assembler and takes a parameter block address and call number as stack parameters when it executes.

● **** An extra word for adding comments to a block — it ignores all the text following on the current line. The existing word **[** also terminates at the end of the line but has to scan all the following symbols in case there is a terminating symbol **]**.

● **OSBYTE** Also defined in assembler, this word takes the X and Y registers and call number as parameters. Because there are so many types of osbyte call — requiring three, two, one or no return values — it is not convenient to place them on the stack as it would lead to much DROPPing

Turn to Page 84 ►

(Cold Start definitions 1 of 7)
: \ (--) (ignores text to line end)

>IN @ 64 / 1+ 64*
>IN ! ; IMMEDIATE

(Cold Start definitions 2 of 7)
HEX

CODE OSBYTE (X, Y, call number --)
XSAVE STX, \ save stack pointer
2 ,X LDA, TAY, \ Y to Y register
0 ,X LDA, PHA, \ call number
4 ,X LDA, TAX, \ X to X register
PLA, \ get call number
FFF4 JSR, \ do FX call
CS IF, 1 # LDA, ELSE, 0 # LDA, THEN,
PAD 2+ STA, \ carry at PAD 2+
PAD STX, \ X at PAD
PAD 1+ STY, \ Y at PAD 1+
XSAVE LDX, \ restore stack
INX, INX,
POPTWO JMP, \ drop 3 & return
END-CODE DECIMAL

(Cold Start definitions 3 of 7)
HEX

CODE OSWORD (block address,
(call number --)
2 ,X LDA, TAY, \ msb to Y register
0 ,X LDA, PHA, \ call number
4 ,X LDA, TAX, \ lsb to X register
PLA, \ get call number
FFF1 JSR, \ do osword call
XSAVE LDX, \ restore stack

POPTWO JMP, \ drop two & return
END-CODE DECIMAL

(RAMdisc 1 of 5)

CREATE PARAMBLK
0 C, \ Read/Write flag
0 , 0, \ buffer address
1024 , \ size of block
0 C, \ Ram id fo R/W
0 , \ address for R/W

(RAMdisc 2 of 5)

: RR/W (buffer addr, block number
(R/W flag)
IF 0 ELSE 128 THEN
PARAMBLK C! \ set R/W flag
64 MOD 16 /MOD \ reduce to MOD64
4 + PARAMBLK 7 + C! \ set rom id
1024 * -32768 \ and
PARAMBLK 1+ ! \ romm address
PARAMBLK 66 OSWORD ;

:RAM ASSIGN R/W TO-DO RR/W ;

:DISC ASSIGN R/W TO-DO DR/W ;

(RAMdisc 3 of 5)

EXVEC: SOURCE EXVEC: DEST

: MOVE-BLOCKS (first, count --)

OVER + SWAP
DO
SOURCE I BLOCK DROP
UPDATE DEST SAVE-BUFFERS
LOOP ;

(RAMdisc 4 of 5)

: DISC>RAM
ASSIGN SOURCE TO-DO DISC
ASSIGN DEST TO-DO RAM
MOVE-BLOCKS ;
: RAM>DISC
ASSIGN SOURCE TO-DO RAM
ASSIGN DEST TO-DO DISC
MOVE-BLOCKS ;

(RAMdisc 4 of 5)

CREATE EMPTY] ." \ EmptyRAMdisc "[
: ?INIT 12 >VDU
." Blank the ram disc (Y/N) ? "
KEY DUP EMIT 89 =
IF
RAM
CR ."Blanking "
64 0 DO I 4 .R
I BUFFER 1024 BLANKS
EMPTY 2+ COUNT
I BLOCK SWAP CMOVE
UPDATE FLUSH
LOOP
DISK
THEN CR ;
?INIT FORGET EMPTY

◀ From Page 83

of items off the stack.

The method used is to return the values to PAD, which means nothing is on the stack so nothing needs to be DROPPed and the calling word can extract the data it needs from PAD.

Getting data from PAD to the stack is quite simple:

To get	Use
X register	PAD C@
Y register	PAD 1+ C@
Carry flag	PAD 2+ C@
XY 16 bit value	PAD @

Forth uses the vectored word R/W to move data between its block buffers and mass storage devices. The term vectored is used to show that the word can have a different definition depending on which mass storage device is being used: For disc it is vectored through DR/W and for tape through TR/W.

All that's needed to change its method of operation is to use the phrase:

ASSIGN R/W TO-DO DR/W

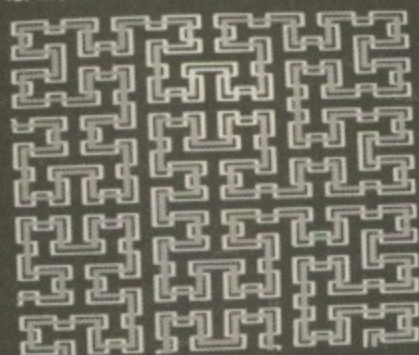
RR/W calculates the sideways ram location for a given block, sets up the data in the parameter block - PARAMBLK - and then calls osword 66. Two words have been defined to switch media - RAM and DISK - and two more copy data blocks between media: RAM>DISK and DISK>RAM.

If you accidentally crash your system with valuable data blocks in the sideways ram you will find that they will still be intact even after a Control+Break. As with all Forth, the general principle is to omit all error checking in the word definitions - checking can be incorporated during program development and eventually removed to obtain improved execution speed.

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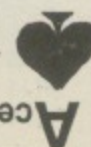
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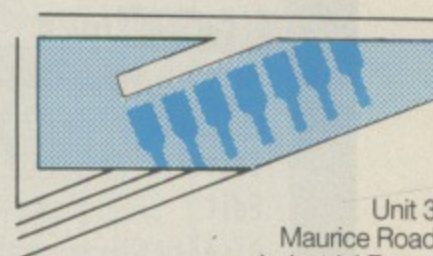
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A tour around your Risc OS

*Steve Turnbull continues his look at the
new Archimedes operating system*

WE looked last month at plugging in your new Risc OS and how it looks when you switch on. Let's continue by taking an overview of the DeskTop along with some new system concepts which make it easier to use. It is generally agreed that the most user-friendly operating systems use Windows – it was Apple which first researched, developed and marketed Wimp systems in the ill-starred Lisa and later with the more successful Macintosh. Since then many companies have emulated this innovation – and Acorn has improved on it with the Archimedes Wimp Manager.

Although the original Arthur operating system had a window-based desktop it failed to implement many of the key features expected. Foremost among those missing was the ability to drag file icons from one window representing the contents of a disc to another and have the actual file copied over.

In addition, a favourite Macintosh facility was the ability to click a document icon, say a text file, and have the operating system find the correct application program – word processor in this case – on the disc, run that with the originally

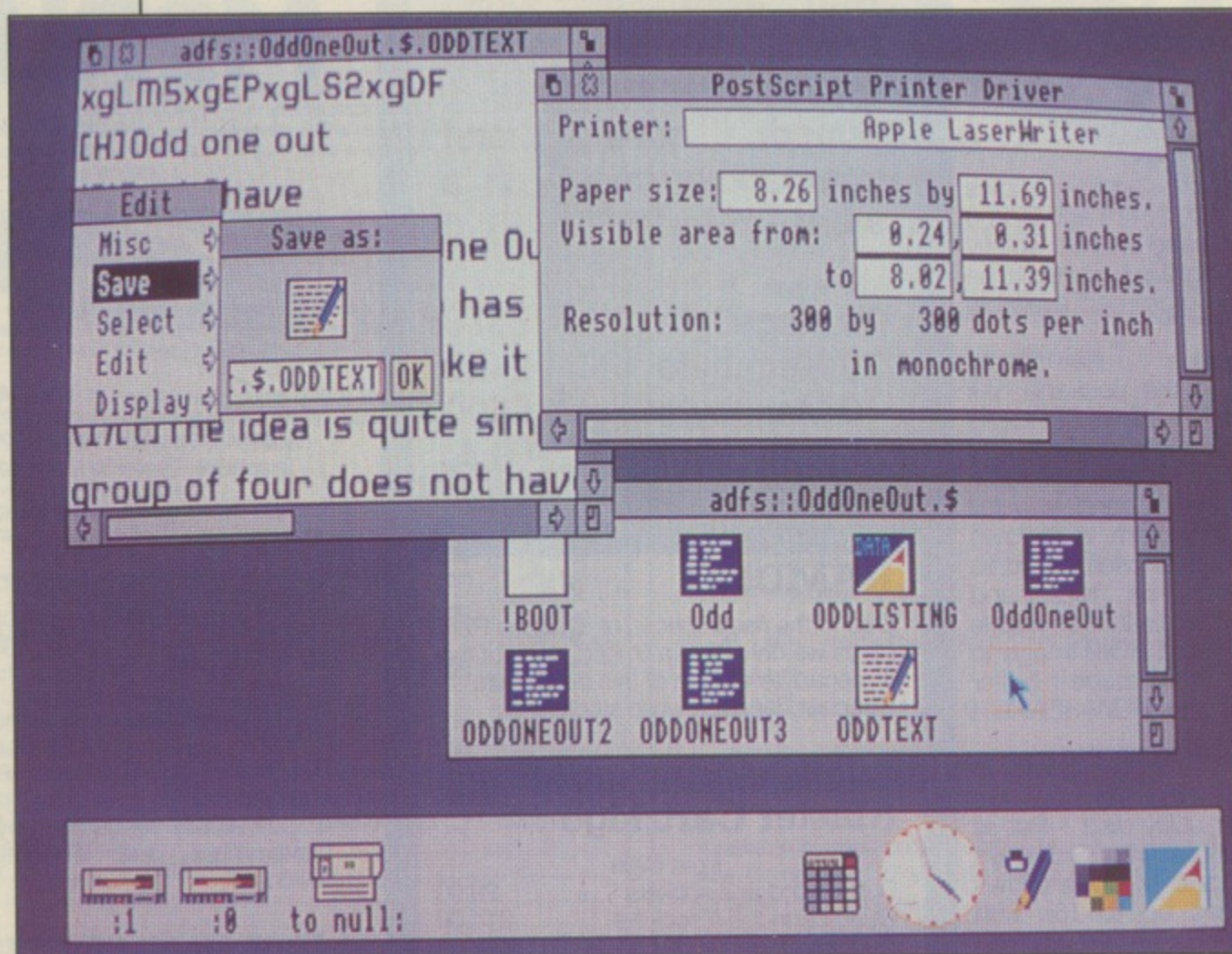
clicked document loaded.

Finally there is the ability to recognise discs by name, so if a file is supposed to be saved on to a specific one – say called TextFiles – the filing system will check the drives and if the disc isn't present it will request that you insert it. When you finally do the file is saved.

Well, under the new Risc OS the Archimedes will do all these things and more. If you drag a file icon to a directory window the file is copied, but if you do the same with Shift held down the file is moved. Using Adjust, you can select more than one file at a time and move or copy the lot.

As mentioned last month, double-clicking an application program runs it, even if it's actually a directory. But you can open it up to view the contents by double-clicking with Shift held down. By doing this you get access to the various sprite files and can personalise the icons.

Another Macintosh feature implemented on the new operating system is the choice of file representation: Large icons with filename below, small icons next to the filename or *Full info* with small icon, name, access levels, file size, file type and



*Saving a
file by
dragging
the icon*

date of creation. The files themselves can be listed alphabetically, by file type, size or creation date. However this is not a complete system because the directory window format is not stored in the directory itself and resets to large icons when the machine is switched off.

The task icon – the Archimedes symbol at the bottom right of the display – gives access to a wide range of facilities: You can invoke the task display, exit the DeskTop completely, start up new tasks or issue star commands. The last two are virtually identical except that a new task starts in its own Wimp-created window and star commands take the whole screen.

The task display produces a list of all the tasks currently running, together with their memory allocations, and it allows you to dynamically alter such things as screen and RMA size, system ram allocation and extent of ram disc. Creating a ram disc automatically places its icon on the bar and it remains in place until you press Control+Break or reduce its size to zero.

An annoying feature – one of the very few grumbles – is that the screen size resets to the minimum required for the current DeskTop screen mode – usually 80k for Mode 12. You must manually adjust the screen size using the task window every time you run a program that needs more unless it automatically grabs what it needs.

Next in from the task icon is the Palette icon and, as before, this allows you to redefine the current colour set but clicking Menu on it brings up a further set of options: Invert swaps the components of the first eight colours which are shaded from white to black and there's the default option which resets them to their original settings. Save simply allows you to put a palette file of the current settings to a storage medium.

Finally you can change screen mode: The DeskTop will run in any – including custom designed ones – as will any properly written multitasking utility, such as those provided. This amazing trick is performed by the Wimp which automatically chooses colours to approximate the originals. In modes with few colours the Wimp simulates more by pattern shading.

One of the less important, but very impressive, features of the new software is window movement. Under every other Wimp system on any

TIMESHARE BASIC

Most of the short programs available on the two utility discs are written in Basic, which means that you can have as many running in the machine at one time as there is memory available.

It's strange that with a machine with so much more ram space than the original BBC Micro, it is once more important to keep the overall size of programs down. After all, you can only have about eight to ten alarm clocks running at one time on a 310 because each one takes 64k.

However what you can't do is work on more than one program at a time using the Basic Editor – although you can use the !Edit program instead it doesn't have all the useful Basic-oriented facilities of the purpose-designed editor.

MULTITASKING

The operating system technique which allows more than one program to run at any given moment is called multitasking and the Archimedes demonstrates one of the best methods in this field.

There are two main ways of achieving multitasking:

- **Time slicing** requires the operating system to interrupt – using hardware – the current program, saving any necessary information and passing control on to the next program for a given period of time allocated by the operating system. Refinements of this involve allocating more time to programs which are particularly busy or have a high priority level and taking time away from others. This method is used on the Acorn Unix machine.

- Multitasking on the Archimedes utilises **Cooperative scheduling** via the Wimp. Programs which conform to the Wimp standard continually check to see if something has happened in their windows, if it has they act upon it and check the Wimp again. In the original Arthur window system that was it and only one program could use windows at any time.

Now, however, the Wimp is in overall control and whenever an executing program checks to see what's happening control is passed to the next program. The result is that whatever application you happen to be working on is the one that gets the most Wimp events, and hence it gets the most processor time associated with it. But it doesn't stop there, because every program is continually checking to see whether the Wimp has any new event for it so each one does get a slice of time. This means programs like the alarm clock can continually update their screen display and show the current time.

The only programs that don't multitask are those that don't use the Wimp – like the ADFS, so formatting stops the machine until it's finished. However that's not to say that you can't write a little Wimp-compatible Basic program to do formatting and have that running while you do something else.

other machine if you want to move a window around the screen you click on the title bar and hold the mouse key down. A rectangle of dotted lines the size of the window appears and you move this. When you release the button the window is moved to the new position and comes to the front of all the other windows on screen. The same principle applies to window scrolling and re-sizing.

Under Risc OS the whole window moves continuously – no dotted line. It's hard to describe – the effect is quite stunning – but you can go back to rectangles if you wish. In addition, if you drag with Adjust rather than Select, the window does not come to the front but stays wherever it is in the stack. So you can move one around in the background sliding it in and out of any others on the screen – not only is it fun it can be quite useful when you are working with several windows and programs at once.

However the concept of dragging icons is not just restricted to moving files around on disc. Acorn is encouraging all software houses to conform to the standard where, if you are doing a save, an icon appears in a small window and you drag it to the place you want the document to be saved – for example, a directory window.

But the place that you save the file could also be another application. The best way to explain this is to illustrate it. Let's say you have typed in some text in the !Edit program and want to transfer it to !Draw. Since the Archimedes is multitas-

Turn to Page 88 ►

NAMING DISCS

To take full advantage of the Risc OS disc handling capability you should give all your discs meaningful names, rather than leaving them named by the date of creation. To do this just load the disc and click Menu on the drive icon, then select the Name disc option and type it in.

We thoroughly recommend naming the two applications discs as RiscDisc1 and RiscDisc2 so that when you get prompted to insert either you'll know exactly which one to grab.

◀ From Page 87

king, you can have both these programs running at once, so select save from !Edit and drag the icon into the !Draw window and release it. And the text is copied across — no special commands needed, at least not as far as you, the user, are concerned.

Of the three main programs supplied with the Risc OS, !Edit doesn't have a print option, so does that make it a waste of time? Not at all: Just load up the printer driver you want, then select save and drag the icon into the driver window and away it goes.

The underlying concept is one of messages. The new Wimp Manager has commands which

allow programs to send and receive messages to each other. This is clearly illustrated by the !Help utility which, when loaded, continuously requests data from whatever application the mouse pointer is indicating and prints in its own window the help information sent back.

This means that properly written programs don't need to provide their own help windows, they just have a section to reply to help requests so if you want help you load up the utility, otherwise don't bother.

Isolation of function is the product of the multitasking concept.

Because you can have more than one program running at a time you can build short individual utilities which interact with one another to provide a customised system. The facilities provided allow you to load just the software you need and no more.

The icon bar at the bottom of the screen is now a much more dynamic thing. As multitasking programs are loaded and initialised they have the option of placing an icon on the right-hand side of the bar to indicate their presence and provide an entry point. Filing systems appear on the left, and if the bar gets too crowded it actually extends off the screen and scrolls as needed. All program tasks on the right provide a Quit option to remove them from the machine completely.

● Next month we'll take a more detailed look at the software provided on disc and in particular !Edit, !Paint and !Draw.

Availability

The Risc OS from Acorn will not be available until April, and this series of articles has been written using a preview version. Also the disc software has not been finalised.

The new operating system, complete with four roms, two manuals and two discs packed with software, will be available for just under £30.

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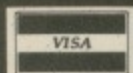
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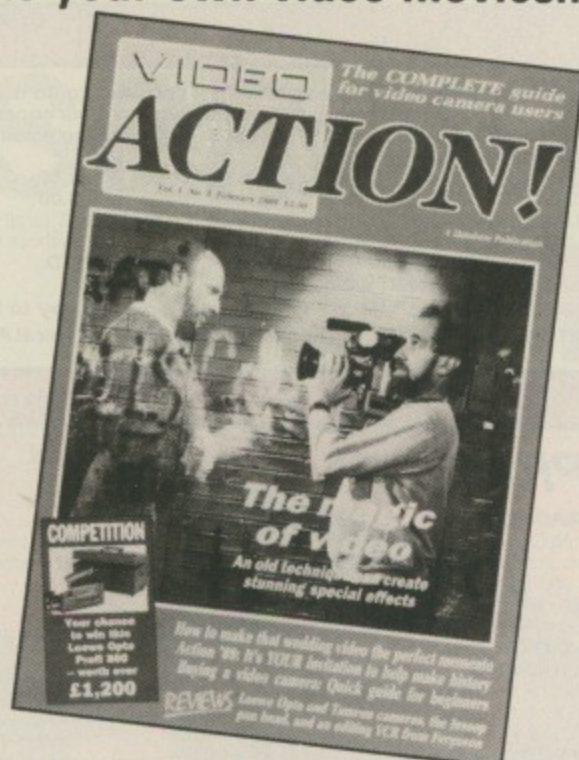
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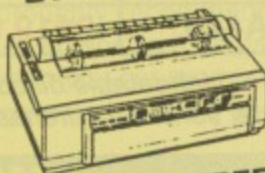
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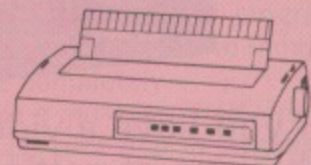
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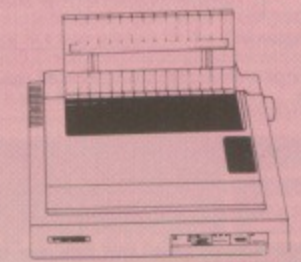
CITIZEN Daisywheel	
Premiere 35	
35cps 15" daisywheel. Diablo compatible	399.00

PRINTERS

CITIZEN 120D	117.00
Dat Matrix Printer. 120cps NLO. 2 year warranty. You have to see the quality at this price.	
CITIZEN LSP 100P	138.00
120/25cps 80 column Centronics IBM Parallel	
CITIZEN MSP 15E	
160/40cps 136 column Centronics IBM Parallel	240.00
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80 column. 24 pin. Dual interface.	
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Colour Ribbon	20.00
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NEW	
CITIZEN 180E	169.00
175cps Draft Elite	
30 NLO. 4k Buffer.	
2 year warranty.	



CITIZEN 120D



CITIZEN HQP40

PRINTERS



1
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&
A&B COMPUTING**



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the experience

Archimedes *micro*

Winter Sale

System	Basic	Mono	Colour
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310	£672	£720	£845
310M	£725	£774	£895
440	£1999	£2055	£2189

(Securicor carr. £10 on Archimedes)

ACCESSORIES

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● Archimedes IEEE Interface Adaptor	£269
● Dual RS232 Podule	£195
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● Archimedes Reference Manual	£29
● Artm Assembly Lang. Prog. Manual	£12

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SPREADSHEETS

Intersheet ROM	£35	Viewsheets	£49
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Inter-Word Disc	£27	Inter-Sheet Disc	£27
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ANSI 'C'; ISO-PASCAL; FORTRAN 77;	£94 each
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BASIC Compiler	£89
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Nominal Ledger*	£53	Reporter	£20
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* Requires System Delta

Archimedes to BBC SERIAL LINK

Using this simple data link, it is possible to solve all your BBC to Archimedes data transfer problems. The kit is supplied with a disk, and the necessary cable to connect the two computers. Using this package it is possible to transfer any data from the BBC to Archimedes at up to 19200 baud.

Only £15

Archimedes 5¼"/3½" Disc drive Interface

With this interface it is possible to connect almost any 5¼"/3½" disc drive with its own power supply to the Archimedes. NO SOLDERING is involved. Supplied complete with necessary lead.

Only £21

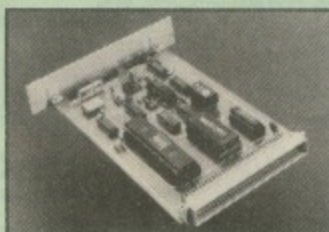
Note: This is not simply a lead. Attempting to connect an external disc drive by direct connection may result in damage to your Micro.

New

Watford's 20Meg Archimedes Hard Disc

Watford Electronics' 20Meg hard disc fits internally into the Winchester slot provided. It is fully compatible with Acorn's hard disc upgrade, (the only difference is our low price). The price includes the Hard Disc Drive, Controller Podule & fitting instructions. P.S. This upgrade requires a backplane and a fan.

Type Arch-HD20	£379
Backplane for 2 Podules	£25
Backplane for 4 Podules	£38
Slimline Quiet Extractor Fan	£9



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further information.

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MASTER 128K Micro incl. Acorn's:
View, Viewsheets, ADFS, BASIC Editor
& TERMINAL plus £35 worth of FREE
OFFER (see below) **£345**

FREE . . . £35 worth of Software

Gemini's OFFICE MATE & OFFICE MASTER
packages on Disc consisting
of: Database, Spreadsheet, Beebplot
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With every BBC Master purchased from
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Co-processor Board (incl. Mouse
and GEM package) plus the above
£35 worth of SPECIAL OFFER **£475**

Securicor Carriage on Micros £7

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Econet Module for the Master	£40
Twin ROM Cartridge for Master	£8
Quad ROM Cartridge for Master	£12
Universal Processor Adaptor	£75
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Master Reference Manual II	(No VAT) £14
Master Advance Ref. Manual	(No VAT) £18
64K Upgrade Kit for B+	£32
Acorn 1770 DFS Kit complete	£49
ECONET Upgrade Kit for BBC	£42
ALL ECONET UPGRADES Available	
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Filestore E40s	£799
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System 1A	System 1 + TV Modulator	£329
System 2	System 1 + Green Hires Monitor	£359
System 3	System 1 + Medium Res Colour Monitor	£469
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Delta 3B Single Joystick	£10
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ATTACHE CARRYING CASE

For the BBC Micro. Attractively finished in
antique brown leatherette. Lockable.

Only £10 (£2 carr.)

Continued

CO-PRO Adaptor



With this Watford's Co-pro Adaptor unit, you can now attach any BBC Master's coprocessors to your original BBC B.

Use the super fast Turbo Board with your BBC B, it is much faster than the 6502 2nd processor superseding it.

With the 512K add-on your standard BBC machine achieves IBM PC compatibility at a realistic price running GEM, Lotus 123 and many other programs. Included with the 512k package is a high precision mouse and the Digital Research GEM suite of software; GEM Desktop, GEM Write GEM Paint. This requires both the 1770 DFS and the ADFS to be fitted to your computer.

To use other co-processors you require a BBC B with DNFS 1.20 or higher, or BBC B+ fitted with 1770 DFS 2.20 or greater. Co-processors work exactly like a second processor.

Master owners may use Co-Pro Adaptor to add a second Co-processor externally. Watford, brings power to your BBC at only:

£35 (carr £5)

**Watford Electronics are
Appointed & Authorised**

DEALERS / REPAIR CENTRE

**for Acorn Computers Ltd
Cambridge Computers Ltd
Microvitec Monitors
Panasonic Printers**

Versatile BEEB SPEECH SYNTHESISER Unit



The Watford Speech Synthesiser is a very flexible speech synthesis unit based upon the powerful phonemes system. This system stores the building blocks of speech (called phonemes) and allows you to combine them quickly and easily to form virtually any word imaginable.

Supplied with an advanced ROM, you are provided with a 500 word dictionary to get you started. These can easily be added to by following the notes given in the comprehensive manual.

SPECIAL PRICE £32 (carr £2)

65C102 2nd PROCESSOR

This amazing package consists of the Acorn 65C102 'Turbo' Board, the Watford Co-Pro Adaptor and Acorn 1.2 DNFS ROM. The 'Turbo' board, running at 4MHz with 64k of additional RAM will increase the speed by between 50 and 200% depending on the application running, and allow a BASIC program of up to 44k in any screen mode. Simply by plugging in the Co-Pro and the DNFS ROM with its special Tube host code and you massively increase the power of any Model B. This is a complete package, with its own power supply, ready to interface with your BBC Micro.

£159

**By Popular demand we are now
supplying refurbished and fully
guaranteed BBC Micro Model B with
Disc Filing System**

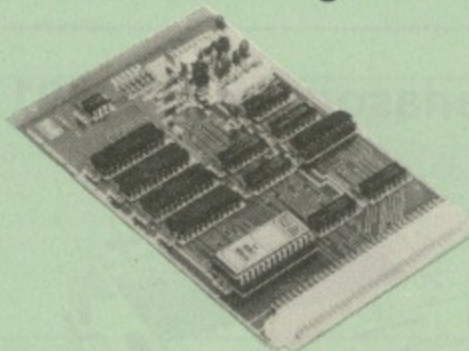
(Please telephone for price & availability)

The 80186 Co-Processor

This package consists of the Master 512 board, Watford Co-Pro Adaptor, 1770 Disc Upgrade and Acorn ADFS. This is a complete package, with its own power supply, ready to interface with your BBC Micro. The Master 512 board using the 80186 16 bit Processor at 10MHz and running Digital Research DOS Plus, gives a high degree of IBM compatibility at an extremely reasonable price. Included in the 512k package is a mouse and the amazing Digital Research GEM suite of software; GEM Paint, GEM draw and GEM desktop giving a complete Mouse Icons environment (All other GEM packages will work on the 512k). Famous packages that will work with the 512k board include Wordstar, Dbase II, Lotus 123 and many others. The only requirement to upgrade any BBC Model B to this system is you must have twin 80 track disc drives.

New low price £219

Archimedes Real-Time Digitiser



Watfords' Archimedes Video Digitiser is the most sophisticated digitiser ever designed for a micro. It provides a fast and flexible means of capturing images from a video camera or recorder for display and manipulation on the Archimedes range of Micros. Off-air television signals may also be digitised via a video recorder or TV tuner.

Once captured, Video images can be stretched, squashed, rotated, stored on disk, printed, or used by applications software.

Applications include desktop publishing, graphics, animation, image analysis and recognition, medical imaging, automatic inspection and measurement, databases, interactive video, remote transmission of pictures via a modem, movement detection ... or anything else you can think of!

SPECIFICATION

SOFTWARE

All the driver software for the digitiser is contained in a ROM on the podule. Facilities provided include:

- Grabbing of images to the screen or dumping to memory.
- Continuous grabbing and display for previewing or camera alignment.
- 'Hot key' grabbing - pressing a (configurable) key combination grabs and displays an image on the screen while another program (e.g. paint software such as Artisan) is running.
- Scaling (zoom/shrink) any section of an image to any size in X and Y directions, with optional X/Y flip, window clip and logical (AND/OR/XOR) plotting.
- Rotation and scaling to any angle and size, rotating about any point, with optional window clip, and logical (AND/OR/XOR) plotting.
- Very versatile matrix printer screendump facility for Epson FX, LQ and EX compatible printers - pictures can be printed to ANY size (including multiple sheets) at any orientation, using any available printer density and one of six internal sets of dot patterns, or with user definable patterns (pattern editor supplied). The screen-dump can also be used for general purpose graphics screen printing.
- Pixel value lookup tables: pixel values can be passed through a user defined lookup table to allow contrast enhancement, thresholding pseudo-colouring etc.
- Smoothing and noise spot removal to enhance image quality.
- Creation of sprites from all or part of a digitised image.
- Saving and loading of digitised images in compressed format.
- Combination of pictures by adding, averaging, subtracting, multiplication etc.
- Much faster versions of the Arthur 'ScreenLoad and 'ScreenSave commands.

Software facilities are accessed via operating system star (*) commands and SWI calls. High resolution screen modes using MultiSync type monitors are supported.

UTILITY DISK

A disk is included, containing sample pictures, examples and utility programs including the following:

- Colour image grabbing using colour filters with monochrome or colour cameras, including colour balance adjustment and scaling facilities.
- Pattern editor for 2 colour display modes and printer screen-dumps.
- 512 line interlaced display for non MultiSync monitors.
- Thresholding to create two colour images.
- Capture and replay of animated sequences.
- Several example programs illustrating the use of digitiser software.

RESOLUTION

Images are digitised to 512 (h) x 256 (v) pixels, and then scaled to fit the Archimedes' screen. It is possible to digitise to 512 x 512 pixels if the picture is stationary for about 0.1 second. 512 x 512 images can either be displayed on a MultiSync monitor, or on a normal monitor using interlacing.

Pictures are digitised to 64 levels of grey (6 bits). Note, however, that it is only possible to display all 64 levels on a monochrome monitor, or a colour monitor which has a composite (CVBS) input. For this reason, the Philips CM8533 monitor is recommended instead of the standard Archimedes monitor. It is also possible to connect both a colour and a monochrome monitor at the same time.

Any 2, 16 or 256 colour graphics mode can be used to display digitised pictures. In two colour modes, grey levels are represented using dot patterns, which may be redefined if required (a pattern editor is supplied).

Cont.

SPEED

Video fields are captured in real time (1/50th sec.), and then transferred to Archimedes' memory or the screen. The grab/display rate is dependant on the screen mode and picture size, up to 25 fields per second for quarter screen images, or 12.5 per second for fullscreen (Mode 9).

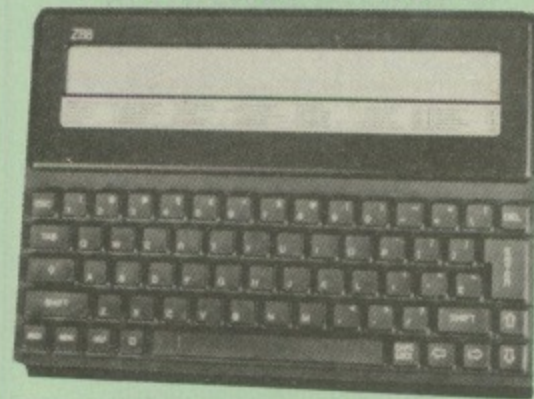
HARDWARE

The digitiser is a single width podule, with a BNC socket on the rear panel for the video input, which may optionally be terminated via a link. There is 128K of on-board memory to store the digitised image, and a 32K ROM on the podule contains all the driver software.

Automatic video level control and black level clamping circuitry is used to ensure that the optimum contrast is obtained from a variety of video sources. A filter is included to avoid patterning effects when using colour sources.

Price £249

Z88 Sinclair's Portable Micro



The worlds first, truly portable Micro. It is A4 size, only an inch thick and weighs under 2lbs. Ideal for use when travelling or as a personal organiser.

Only: £239

FREE

With every Z88 purchased from us this month, we are giving away absolutely FREE, a Z88 to BBC Interface Link, 4 rechargeable batteries and a compact Mains Battery Charger worth £38.

ACCESSORIES

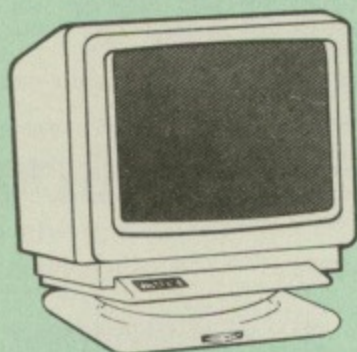
Mains Adaptor	£8.65
32K RAM Pack or 32K EPROM Pack	£17.35
128K RAM Pack or 128K EPROM Pack	£43.40
512K RAM Pack	£169
Z88 Spellmaster for Pipedream	£51
Z88 to BBC Link	£21.70
Z88 to PC Link II	£30
Z88 to Macintosh Link	£49
Z88 EPROM ERASER	£34.75
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Parallel Printer Cable	£24.00
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MONITORS

&

SWIVEL BASES



All Monitors are supplied complete with BBC connecting leads FREE.

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- 1431AP RGB + PAL and AUDIO £199
- 1451AP RGB + PAL and AUDIO £255
- 2030 CS 20" Med Res £380
- 2040 CS 20" Hi Res £675
- Dust Cover for Microvitecs £5.50
- Touchtec 501 Touch Screen £239

TAXAN 12"

- TAXAN Super Vision 2 Type 620 Hi-res RGB Colour, Green/Colour Switch £265
- TAXAN Super Vision 3 - Type 625 Super Hi-res RGB Colour, Green/Colour Switch £315

14" MULTISCAN COLOUR

- TAXAN Multisync 770 Plus £449
- EIZO Flexscan 80605 - For technical info, read the review in Micro User, Jan. '89 £459
- NEC JC-1402P - Multisync II £456

NEW

Aries 1458 14" Multisync

Aries 1458 is a state of the art, stylishly finished, flat screen, Enhanced Multiscan Colour Monitor. An auto-switching device changes modes without having to adjust the monitor (it also works in monochrome). Its wide frequency range (15-45KHz) and multi-colour display allows increased options and flexibility. 0.31mm dot pitch. Input Signal: TTL/Analogue, H-Sync 15-45KHz; V-Sync 47-100Hz; Bandwidth 35MHz; Resolution 800 x 600 Hi-resolution Multi colour Display; Display Colours CGA-16, Mono-Green (3 levels), EGA 64, Analogue - limited only by the video display adaptor; Built-in tilt and swivel base.

(FRO IBM PCs & Compatibles ONLY)

Launch offer £349

PHILLIPS

- BM7502 12" Hi-res Green Monitor £65
- CM8833 14" Med. Res Colour Monitor £219

STAR BUY

- PHILLIPS 14" Medium Res, dark glass, attractively finished Colour Monitor - supplied complete with RGB, SKART and Audio/Phono Inputs. A push-button switch toggles between Hi-Res monochrome green text mode and full colour display. (Please state the type of Connecting Lead you require).

ONLY £199

Dust Cover for Phillips Monitors £6

SPARE LEADS

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- Skart Monitor Lead £5
- RGB lead for TAXAN Monitors £3
- Archimedes Colour Monitor Lead £7.50

By simply placing your monitor on one of our front adjustable professional swivel bases (see drawing on the left), you can easily adjust the monitor viewing angle.

for 12" Monitors £8 (carr. £2.50)

for 14" Monitors £12 (carr. £2.50)

Anti-Glare VDU Screen

These extremely effective, easy to install, 12" & 14" VDU screens eliminate harmful glare, improves contrast on colour monitors. Increases productivity in offices. A must for all wordprocessor users.

£12

TAXAN KP-815 PRINTER

80 column, Bi-directional, 160 CPS, (NLQ 24cps); Friction & tractor feed + paper roll holder as standard; Epson FX compatible.

Offer Price £155

Taxan KP915 132 Column Printer
£275 (carr £7)

- RS232 Interface £49
- RS232 Interface with 2K Buffer £69
- RS232 Interface with 16K Buffer £89

Panasonic KX-P1081



Attractively finished in BBC beige. Bi-directional, logic seeking. Has IBM and Epson RX compatible command calls. Speed: 120CPS draft mode, 24 CPS NLQ mode. Character width range from 5 cpi to 17 cpi. Up to 40 downloadable characters. Functions include, Proportional spacing, Justification, centering and left & right ranging.

(Price includes, FREE a 4ft Printer Lead, and a Dump Out 3, Screen Dump ROM worth £35 with every printer purchased from us).

WINTER SALE OFFER only: £139

Optional RS232 Interface: £39

PANASONIC PRINTERS

- KX-P1124 24pin 80col. 192/63 CPS £349
- KX-P1180 9pin 80col. 192/38 CPS £169
- KX-P1540 24pin 80col. 240/80 CPS £449
- KX-P1592 9pin 136col. 216/45 CPS £295
- KX-P1595 9pin 136col. 288/61 CPS £409
- Panasonic KX-P4450 LASER PRINTER Latest technology at Watford's special offer price £1,540
- Spare Toner £29 ● A4 Feeder £55

PRINTER LEADS

- BBC Centronics 4' long £5
- BBC Centronics 6' extra long £7
- Compact's Special Centronics Lead £7
- Archimedes Printer Lead 1 meter £6
- IBM Parallel Lead 1 meter £6
- Double Ended 36 way Centronic Lead 4' £7
- Double Ended 36 way Centronics Lead 6' £9
- MSX Centronics Parallel Lead 4' £12
- RS232 Leads (Various) P.O.A.

RS-232 GENDER CHANGERS

- Male to Female £4.95
- Male to Male £4.95
- Female to Female £4.95

INTEGREX COLOUR JET PRINTER

- Colour Jet 132 Printer £515
- Paper Roll £6
- Screen Dump Software £10
- Colour Cartridge £14
- Black Cartridge £8
- 100 A4 OHP transparencies £55
- 8K Serial Interface Optional £123

NEW - Intergrex COLOURCEL NPQ Ink Jet Colour Printer £2,695

NEC P2200 PINWRITER

24 pin; 80 column; 168CPS - 56CPS LQ; Epson LQ compatible, 7K Buffer; 7 resident FONTS, Friction & Tractor feed, front load single sheet feed, etc.

Price: £269

- Pinwriter Serial Interface (optional) £55
- P2200 Cut Sheet Feeder £65
- Additional Font Cartridge £25
- NEC P2200 Pinwriter Ribbon £6

NEC PINWRITER P6/P7 Plus

The Ultimate 24pin matrix Printer for Business.

- P6 Plus 80 columns £439
- P7 Plus 136 columns £575
- Colour Option £74
- Serial Interface £73
- Cut Sheet Feeder £125

- Star LC10 £175
- Star LC24-10 £279
- LC10 Colour £215
- NB24-10 £399

Brother HR20 DaisyWheel Printer £339

EPSON PRINTERS

- EX800 £405
- EX1000 £564
- FX850 £315
- FX1000 £425
- FX1050 £439
- LQ500 £275
- GQ3500 Laser £1150
- LQ850 £430
- LQ1050 £570
- LQ2550 £925
- LQ2500+ £839
- LX800 £175
- SQ2500 £975

PLOTTERS

- Hitachi 672 Colour Plotter £475
- Plotmate Plotter A4S £379
- Plotmate Plotter A3M £549

CUT SHEET FEEDERS for

EX800 £149; EX1000/LQ2550 £210; FX800 £149; FX1000 £179; LQ/LX800 £139; LQ500 £75; LQ850 £135; LQ1050 £175.

TRACTOR FEED for

EX800/1000 £85; LQ800 £44; LQ850 £69; LQ1050 £85; LQ2500 £195

ACCESSORIES

- EX800/1000 Colour Option £55
- EX800/1000 Colour Ribbon £18
- LQ2500 Colour Option £65

(Securicor Carriage on Printers £7)

EPSON PRINTER INTERFACES

All these interfaces fit inside the printer.

- RS232 £32
- IEEE 488 £40
- RS232 + 2K Buffer £52
- RS232 + 8K Buffer £79

Universal Printer Sharers/Changers

Connect upto 5 Micros to 1 printer or 5 Printers to 1 Micro with our combined, Sharer/Changer. These Units are made to a very high standard. For extreme reliability, they all have Printed Circuit Boards mounted inside the case, (not a Spagetti Junction of wires). Internal connection is made via high quality ribbon cables. (Ideal for School environments.)

- | Connects | Serial | Centronics |
|----------|--------|------------|
| 2 to 1 | £20 | £22 |
| 3 to 1 | £27 | £30 |
| 5 to 1 | £36 | £39 |

(Cables extra at £5 each. Please specify type required when ordering)

Listing Paper (Perforated)

● 1,000 Sheets 9½" x 11" Fanfold Paper	£7
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● 1000 Sheets 9½" x 11" NCR 2 Part Fanfold	£19
● 1,000 Sheets 15" x 11" Fanfold Paper	£9
● 1000 Sheets true A4 Fanfold Paper	£11
● 2000 Sheets true A4 Fanfold Paper	£19
● Teleprinter Roli (Econo paper)	£4

(All our Fanfold paper is Micro perforated leaving a smooth clean edge when the tractor feed strips are detached).

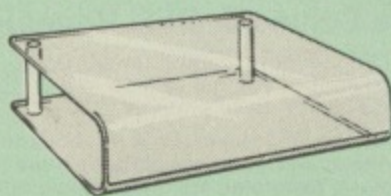
Carriage 1K Sheets £2.50. 2K Sheets £3.00

PRINTER LABELS

(On continuous fanfold backing sheet)

1,000 90 x 36mm (Single Row)	£5.00
1,000 90 x 36mm (Twin Row)	£4.90
1,000 90 x 49mm (Twin Row)	£7.50
1,000 102 x 36mm (Twin Row)	£6.25
Carriage on 1,000 Labels £1.00	

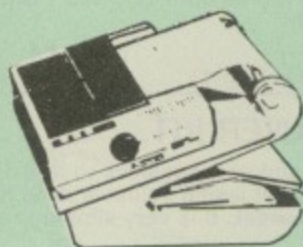
Perspex Printer Stand



Give your Computer System a touch of Class with our elegant, smoke finished Perspex Printer stand. The printer sits on top and the fanfold paper rests neatly underneath, thus occupying the same space as the printer footprint.

Only: £16 (carr. £3)

Professional Printer Stand



This new professional printer stand takes hardly more space than your printer. Due to the positioning of the paper feed and re-fold compartments i.e. one above the other, the desk space required for your printer functions is effectively halved. Additional facilities include: Easy access to paper from both sides, used with both top and bottom feed paper and with its dial controlled paper feed system with adjustable deflector plates it ensures smooth paper flow and automatic refolding.

tions is effectively halved. Additional facilities include: Easy access to paper from both sides, used with both top and bottom feed paper and with its dial controlled paper feed system with adjustable deflector plates it ensures smooth paper flow and automatic refolding.

80 Column version £23 (carr. £3)

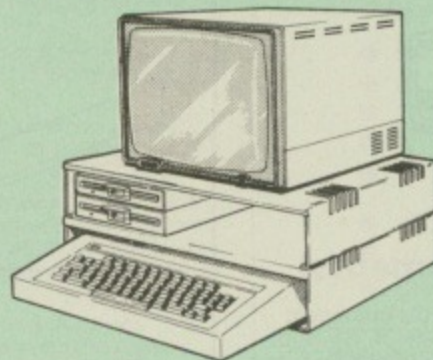
132 Column version £26 (carr. £3)

PRINTER RIBBONS & VARIOUS DUST COVERS

Type	Ribbons	Dust Covers
BBC Micro	-	£3.50
BBC Master	-	£4.00
Archimedes Micro pair	-	£9.00
IBM PCs pair	-	£6.00
Brother HR15/20	£3.00	£5.00
DMP2000	£3.75	£4.75
EX/LQ800	£4.50	£4.50
EX/LQ1000	£7.50	£5.00
RX/FX80/85/800/MX80	£3.90	£4.95
RX/FX100/1000	£5.75	-
Kaga/Taxan KP810/815	£4.90	£4.00
LC10 (Black)	£4.25	£5.00
LQ500/800	£3.75	£5.00
LQ1050/LQ2500	£8.50	£5.50
LX80/86/800	£3.80	£4.50
M1009/GLP	£3.80	£3.75
Panasonic KX1080/81	£4.00	£4.75
SQ2500	£23.00	£5.50
Star NL10	£3.75	£4.50
Olivetti Ink Jet	-	-
Cartridges (set of 4)	£9	-

Our attractive Dust Covers are manufactured from translucent PVC. The seams are stitched and edges are taped to prevent splitting due to continuous use.

PLINTHS FOR BBC MICRO, MASTER & PRINTERS



Protect your computer from the heat of your VDU. Our micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and VDU, whilst the double height version provides enough room for our stacked disc drive and other peripherals like, Eprom programmer, music unit or simply discs & stationary. The computer slides neatly in the lower section allowing easy access to remove the lid.

The single printer stand is equally sturdy but instead of cooling slots it has elegant cutouts on the sides. This allows easy access to paper from all sides. Colour: BBC Beige.

Single BBC Plinth	£12 (carr. £2)
Double BBC Plinth	£20 (carr. £3)
Printer Plinth	£12 (carr. £2)
Single Master Plinth	£13 (carr. £2)
Double Master Plinth	£24 (carr. £3)

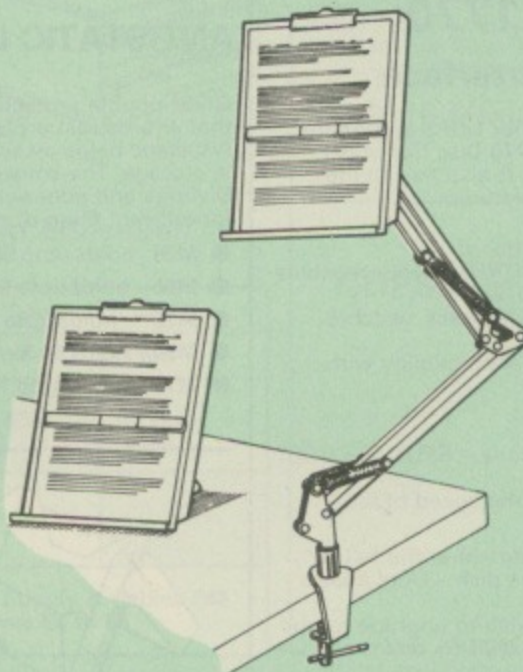
REPLICA 3

This new improved REPLICA 3 from Clares is a very powerful disc based TAPE to DISC Utility. It now transfers even more programs than ever before. Replica 3 will not work with all programs but then neither will anything else. 30,000 Replicas have been sold to date. It has to be good.

£15 (40 or 80 track)

Acorn's Speech Synthesiser package, complete
Special Offer £18

Copy Holder



Whether you want to type in your latest program or the draft of a new trilogy, Watford's manuscript holders are superb for holding your paper at the ideal height and angle to allow you to read and type in ease and comfort.

Available in 2 full A4 versions, desk resting and shelf clamping. Paper is held firmly by means of a plastic retaining ruler and a clip grip. (for resting books or magazines, the desk top version is recommended).

Desk Top £10 (carr. £3)

Angle poise £14 (carr. £3)

MEGABUFFER 256



The Smallest 256K Printer Buffer Unit in the world 38mm x 130mm x 134mm.

This new Megabuffer 256 from Watford is a full featured 256K Printer Buffer. It allows the computer to print 256,000 character in a short time thus freeing the computer very quickly. In short it makes light work of printing large documents, screen dumps, etc. It is extremely simple to connect. The features are:

- Improves efficiency by making more efficient use of computer and printer.
- Compatible with any computer and printer that uses Centronics Parallel connections including all BBCs, IBM PCs, etc.
- Total compatibility with all software.
- Cheaper phone bills when using your Modems.
- Ideal for those doing large graphics screen dumps that are slow to print.
- Multi-Copy facility allows you to print several copies via Megabuffer without going through your computer.
- Data Dump facility is included.
- Built in test unit for both the buffer & your printer.

In conclusion it can safely be said that MEGABUFFER 256 is the ultimate printer Buffer for both the amateur and professional user.

Only £149 (carr £5)

OKIMATE COLOUR PRINTER

The first ribbon transfer printer in its price range which offers fully versatile colour or black printing. A 24 element print head produces more than 100 shades with exceptional clarity. Ideal for use with Quest Paint or AMX Super Art.

Only: £119

BBC Screen Dump	£10
Colour Ribbon	£6
Black Ribbon	£6

THE EPSON RX-FX-KAGA PRINTER COMMANDS REVEALED

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities - he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.

Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out. Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON RX-FX-KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English, how to use and make the most of your KP810, PW1080A or any other Epson FX80 compatible Printers like Panasonic KX-P1080/1, etc., with the BBC Micro, both from BASIC and Wordwise.

It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

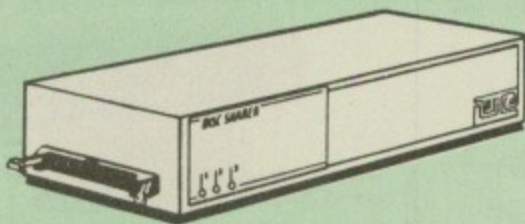
£5.95 (No VAT)



CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 50234 or 33383

Continued

DISC DRIVE SHARER



(Ideal for educational establishments)

At last, a low cost alternative to the Econet system. Watford's Intelligent Disc Drive Sharer allows you to connect 3 BBC micros (model B, B+ and Master series) to a single or double disc drive. Running under any DFS or DDFS, this intelligent unit will automatically queue the computers. Each computer has a status light dedicated to it. If it is green you will get immediate access to the disk, and red means that you are next in line. The unit plugs directly into the disc drive socket on each computer and is powered by the mains. (N.B. Not for use with ADFS.)

Launch Price: £65

Price includes 3 Cables

NOW WITH EXTRA FEATURES AT NO EXTRA COST – Watford's latest DFS 1.44

- Incorporates Acorn's Official Tube Host Code so that those with 2nd processors no longer need to waste a ROM socket on the DNFS.
- Option to DOUBLE the speed of BPUT and BGET.

WATFORD's & ACORN's DFSs

Watford's popular and widely acclaimed DFS has now been available for six years and has gained a large following amongst serious and educational users of the BBC Micro. Owners of Acorn or any other standard DFS can upgrade to our "Ultimate" DFS merely by replacing their DFS ROM. See below for this upgrade. (P.S. Watford's highly sophisticated DFS is fully compatible with Acorn standard DFS). (while Acorn's 1770 DFS is fully compatible with Watford's Mk II DDFS)

- DFS Manual (Comprehensive) (no VAT) £6.95
(P.S. Our DFS manual is the only comprehensive Manual available for the BBC micro and covers both Acorn & Watford DFSs).
- Watford's sophisticated DFS ROM only £16
- We will exchange your existing DFS ROM for Watford's Ultimate DFS ROM for only £12
- DNFS ROM only £17 ● ADFS ROM only £25

(The Single Density DFS system is now old technology. Like Acorn, Watford too have decided to replace it with their more up-to-date 1770 DDFS interface. We have informed most of the software houses of this decision in order that they can ensure compatibility with our highly sophisticated and fully Acorn compatible DDFS).

NEW

Watford's MkII 1770 Double Density DFS Interface

Many of our customers have wanted to use our superior DDFS and Acorn ADFS together. Now our Mk II DDFS Board with its 1770 Disc Controller, has been adapted to allow the use of Acorn ADFS as well. It also has all the commands of the Acorn's 1770 DFS, plus the added features:

Added features include:

- Acorn ADFS compatible – Use ADFS on our DDFS board.
- Tube host Code – No longer any need to have the DNFS in your machine to use Co-Processors, even the CoPro and Master 512.
- Auto 40-80 Track sensing – no need to fuss with 40/80 track switches (even works with protected disks).
- An extremely powerful 8271 emulation – ensuring compatibility with almost all software.
- New low profile – small footprint board.
- Fits with all third party ROM boards.
- Option to double the speed of file handling operations – BPUT and BGET.
- Operates in both single and double density modes.
- OSGBPB has been recoded, increasing still further the speed of file handling.

Please note that not all DDFS's are capable of providing either the full 80% storage increase or of allowing a file the full size of the disk – Ours allows both of these!

If you already have a DDFS (any manufacturer), and wish to upgrade to our MkII version, then simply return your existing ROM and DDFS board and we will supply the new DDFS for only £30.00.

- Special introductory offer £39.00
- DDFS Manual (No VAT) £6.95
- We will exchange your existing DFS Kit for our sophisticated DDFS for only £25.00

Please note, as the MkII DDFS is a hardware and software upgrade, it is not possible for existing Watford DDFS users to simply exchange their ROM for the new version.

DUST COVERS (For our Disc Drives)

Single CLS (without PSU) £3.20 Twin CLD (without PSU) £3.85
Single CS (with PSU) £3.95 Twin CD (with PSU) £3.90

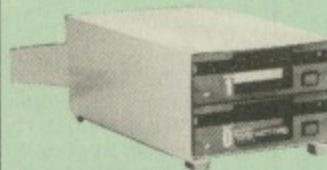
Special 40/80 Disc Drive/DDFS Mk II Offer

- The popular 40/80 track 400K single Disc Drive, Double Sided, cased with Cables. Plugs directly to your Micro.
- Watford's extremely popular DDFS Disc Interface (allows 720K storage). Will run in both, Single & Double Density modes.
- A comprehensive User Friendly Manual.



A Bargain at Only £123 (£7 carr)
(Offer valid while stocks last)

3 1/2" DISC DRIVE OFFER



These top quality 3 1/2" Double sided, 80 track, 1 Megabyte (unformatted each Disc Drives), are attractively finished in BBC beige. They are supplied complete with all cables and a Utilities Disc. They run directly from the BBC B/Master's own PSU.

- CLS35 400K Unit £69
- CLD35 800K Unit £126

Mysteries of Disc Drives & DFS Revealed

Are you tired of faulty cassettes, and lengthy loading times? Do you want to upgrade your BBC micro to take discs but you get tied up in the plethora of jargon surrounding the choice and use of these systems.

Then The Mysteries of Disc Drives and DFS Revealed is the book for you. It explains in detail the different types of systems available, how they are installed and how to use them. Many examples are given including pre-written programs to call various functions of the DFS available only through Operating System calls. Different types of disc, 40/80 tracks etc. are all explained. This book is ideal for the beginner confused by the plethora of choice available in the marketplace.

£5.95 (Book No VAT)

DISC ALBUMS

Attractively finished in black leather look vinyl. Stores upto 20 Discs. Each disc can be seen through the clear view pocket.

£4

FLOPPY HEAD CLEANER KIT

The heads in floppy drives are precision made and very sensitive to dirt. The use of a cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. It is very simple to use. Available in 3 1/2" & 5 1/4", please specify.

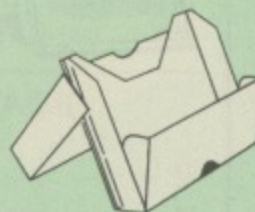
£4

ANTISTATIC LOCKABLE DISC STORAGE UNITS

Gives double protection – Strong plastic case that affords real protection to your discs. Antistatic helps avoid data corruption whilst in storage. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.

- M35 – holds upto 50 5 1/4" discs £4.95
- M85 – holds upto 95 5 1/4" discs £6.95
- M25* – holds upto 25 3 1/2" Discs £4.95
- M50 – holds 50 3 1/2" Discs £6.50
- M10 – holds upto 10 Data Cartridges £15

* Not lockable



PLASTIC LIBRARY CASES

Holds up to 10 5 1/4" Discs. Only £2.00

DISC PLONKER RACK

When using ones micro, there is a tendency to have more than one Disc on the desk. This exposes them to the hazards of fingerprints, scratches, dust, coffee and an untidy desk.

Why not protect your valuable data from all these hazards with the help of our extremely handy and low cost DISC PLONKER RACK. It holds up to eight 5 1/4" Discs.

Protection at Only: £2



Quality Disc Drives from Watford

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below.

The first capacity given in the first column indicates capacity in single density mode. That within the brackets is the capacity in double density mode. All disc drive type numbers start with the prefix "C".

The tinting on some of the boxes is used to indicate which Drives are 40 track (non-tinted) and which are 80 track (tinted). All our 80 track drives are already fitted with a 40-80 select switch.

All our Disc Drives are Double Sided and will operate in both Single and Double Density modes. Extensive experience of the usage of disc drives suggests that the JAPANESE drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro.

Various UK "manufacturers" of disc drives for the BBC micro (more accurately, "packages" label other manufacturers drives with their own name). We buy the high quality NEC and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public.

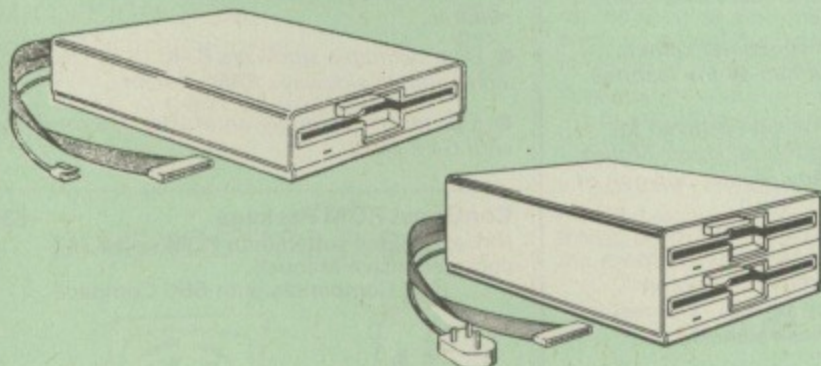
If you look around the popular BBC micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.

Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate (extensive tests within our workshops have confirmed this). All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. Ideal for Schools & Colleges. We are now able to supply all single disc drives with Power Supply, in either single or dual case. (Dual case has a twin data cable and a power supply capable of driving two disc drives) allows easy expansion to a dual drive unit, at a later date. Prices stated in the pricing boxes below are for single drives in standard single cases. Single drives in a dual case cost an extra £10. (At Watford we anticipate your needs of tomorrow, not just today!)

When using a BBC Micro, most people find themselves short of desk space. The Watford's BBC Micro plinths form an ideal way of recovering some of this precious space: your BBC, Disc Drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. With the Watford Double plinth, your Disc Drive is mounted vertically at one side, leaving a very valuable area directly in front of you for such useful items as spare discs, pen, paper, reference manuals, etc. Follow the trend with Watford plinth. (Turn to the 5th page of our advert for the Plinths).

P.S. All our 5¼" Disc Drives with PSU are compatible with the Compact Micro. All you require is the special Compact Disc Drive Cables designed by us.

Our Disc Drives conform to BS415



"Test Bureau Approved for Use in Education"

Capacity	Drives without P.S.U.		Drives with P.S.U.	
	Single	Twin	Single	Twin
400K (720K)	CLS400S £79	CLD 400 £168	CS 400S £89	CD400 £188
800K (1.44M)		CLD 800S £159		CD 800S £179
● TWIN Disc Drive Case, complete with Power Supply & Cables £43 Securicor carriage on Disc Drives £5 to £6				

Prefix C = Cased Drive
L = Less PSU
S = Single
D = Double

Suffix S = 40-80 Switchable

e.g. CLS400S = Cased Disc Drive, Less power supply unit, single 5¼" 400K, (720K in double density); Double sided; 40/80 track switchable.

Cable to connect 5¼" Disc Drives to BBC Compact
Single £9 Twin £12

Special Cable to connect both 3½" and 5¼" Disc
Drives simultaneously to the BBC Compact £13

3M - DISKETTES

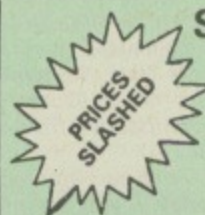
3M - SCOTCH Diskettes with Lifetime warranty from Watford Electronics your 3M Appointed Distributor.

● 10 × 5¼" S/S D/D 40 Track Diskettes (744)	£6.00
● 10 × 5¼" D/S D/D 40 Track Diskettes (745)	£7.00
● 10 × 5¼" S/S D/D 80 Track Diskettes (746)	£11.50
● 10 × 5¼" D/S D/D 80 Track Diskettes (747)	£11.00
● 10 × 5¼" 1.6M D/S D/D High Density Discs for IBM XT and AT	£16
● 10 × 3½" S/S D/D 40/80 track Discs	£10.00
● 10 × 3½" D/S D/D 40/80 track Discs	£11.75
● 10 × 3½" High Density Diskettes	£25

TOP QUALITY 3½" & 5¼" DISKETTES

To complement our range of Quality Discs and Disc Drives, WE are now supplying SPECIAL OFFER packs of 10 Lifetime guaranteed discs. Each disc has a reinforced hub ring. Supplied complete with selfstick labels and a Plastic Library Disc Box.

● 10 × M3 3½" D/S D/D 80 Track Discs	£11
● 10 × M9 3½" Double Side High Density	£25
● 10 × M4 5¼" S/S D/D 40 Track Discs	£5
● 10 × M5 5¼" D/S D/D 40 Track Discs	£7
● 10 × M7 5¼" D/S D/D 80 Track Discs	£9
● 10 × M8 5¼" D/S H/D Hi-Density Discs	£14
● 3" Double Sided Discs	£2.50 each

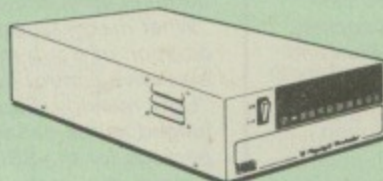


Special BULK OFFER on 5¼" DISCS

(Supplied packed in Anti-Static Lockable Storage Units)
(Lifetime warranty on Discs)

BULK PACK DISCS in lots of 100

Type	S-S 40T	D-S 40T	D-S 80T
● Without Sleeves	£35	£39	£45
● With Sleeves	£38	£42	£48



WATFORD's WINCHESTER DRIVES

Undoubtedly the best value for money Winchester Hard disc available anywhere for the BBC Micro.

This 30 Megabyte hard disc is completely compatible with the Acorn ADFS - that's why we have bundled it with each Winchester drive, along with a Utilities Disc.

Finished in rugged metal and fetching BBC beige, the Winchester has an internal fan, so quiet you won't even hear it! A switched mode power supply and a neon-lit on/off switch are there along with a light on the hard disc to tell you when it is working - just compare the price with our competitors' 20 or 28 Mbyte discs!

Compatible with the Master, and the BBC B (with 17 X disc interface).

● 10 Megabyte £350; ● 30 Megabyte £405
(Securicor Carriage £9)

CDP800S

CDPM800S



Twin 800K Double sided 40-80 track switchable disc drives mounted in an attractively finished Beige colour plinth for the BBC Micro. Supplied complete with integral power supply, cables and Utilities disc. The mains switch with neon On/Off light indicator, and the two 40/80 track switches are mounted on the front panel for ease of use.

CDP 800S for BBC Micro £182

CDPM 800S for Master £185

DP35-800 for BBC/Master £169

(For DP35-800S spec. see Page 13 of our advert)

(Securicor Carr. £7)

(The above drive units are 2 Megabytes unformatted)

Continued



QUEST MOUSE MkII

The ultimate in Mouse technology, the Watford Electronics Quest Mouse must be the most powerful Mouse package yet produced for the BBC Micro. Featuring state of the art 32K ROM software the Quest Mouse package is filled with features essential to the budding artist. The Quest Mouse is a high precision, low profile and large footprint mouse. It has three large comfortable buttons and its RUBBER COATED STEEL BALL is smooth and easy to use on virtually any work surface. This also eliminates any directional bias that one encounters on the most well-known mouse for the BBC. The Quest Mouse is FULLY HARDWARE COMPATIBLE with the AMX MOUSE so that it will work with any of the AMX range of software.

The two parts of the Quest package are available separately so that existing Mouse owners can upgrade to the Watford's sophisticated Quest Paint software or replace their existing worn out mice for a minimum cost.

QUEST PAINT

The Quest Mouse software is supplied on a PALPROM unit to allow the sophisticated 32K program to be used from a single ROM socket. It is compatible with the BBC B, BBC B Plus and BBC Master Series machines.

The software is used to draw high resolution Mode 1 pictures in full colour. All menu selection and control of the drawing process is performed with the mouse so that you will hardly ever touch the keyboard.

SOFTWARE FEATURES

The software is far too powerful for us to describe it fully in such a small space. Below is a list of the various features. Please write to us for a fully descriptive leaflet.

Disk interface not required. Utilities disk has facility to create and print big screens. Colours applied can be solid, either pattern of user defined pattern. Drawing can use brush or airbrush. Brush shapes can be defined and stored. Airbrush sprays colour/pattern randomly with four jet sizes and even or center spread. Colour cycles. Colour protection to stop particular colours from being overwritten by selected drawing actions. All standard drawing facilities like: rubber, straight pencil lines, triangles, circles, ellipses, rectangles, parallelograms, polygons, etc are provided. All shapes can be solid or just a boundary line. Once a shape has been set up it can be repeated anywhere on the screen. Global colour replace in a rectangle. Powerful fill facility for areas and vertical/horizontal lines. Full cut and paste of rectangular areas with rotation and size with screens from Watford Beeb Video digitiser. Load and Save screens with colour pallet information, save brush and pattern definitions etc.

Take The Guesswork Out of Selecting a Mouse Package

With reviews like this how can you go wrong.

Popular Computing Weekly, 9-11 June '87

"What you actually get for your money is a well built, three button mouse (far superior to the AMX mouse)."

"Overall the combination of a quality mouse and decent art package gives Watford Electronics a real chance of supplanting AMX as mouse supremos."

FREE

With every QUEST MOUSE package purchased from us this month, we are giving away absolutely FREE our QUEST FONT DISC software pack.

A&B Computing June '87

"... Watford Electronics, a company famed for excellent hardware add ons and versatile software packages. Called Quest mouse, "this is a very special mouse driven drawing package..."

"... you will have one of the most comfortable and professionally built mice I have used in a long time. The buttons are responsive, the mouse movement is smooth and without directional bias - a pleasure to use."

"What we have here is probably the best art package there is for the BBC Micro..."

"Quest Paint is a major leap forward in BBC programming..."

"Quest Paint is an original piece of programming, it is friendly and well endowed with many useful facilities. I would comfortably say it is easier to draw good pictures with Quest Paint than it is with more expensive 'Professional' art packages for the Atari ST and the Commodore Amiga. A recommended buy if you are looking for the best in BBC micro based art packages"

Acorn User, September '87

"The mouse (Quest) performs well in the face of competition from AMX, Wigmore and the rest..."

"... this package represents excellent value for money. If you are interested in art then this program is for you to buy"

"All in all, Quest Paint is a very professional package. It contains virtually every feature the budding artist could require"

"What makes Quest Paint so versatile is the addition of a sub-menu which allows you extensive control over each function"

"Until recently, Superart from AMS had been judged as the definitive mode 1 graphics package for the BBC micro. But now it has a serious rival in the form of Quest Paint, from Watford"

"As a measure of what is contained within Quest Paint, I would say it had all the features of Superart plus..."

"In most art packages, provision is given for drawing triangles and rectangles. Quest Mouse goes 14 better, allowing any regular polygon of up to 16 sides"

"One facility, not found on any other Art package to my knowledge, is the ability to access a digitiser from within the program". The reviewer concludes by saying, "The result is an extremely comprehensive and professional art package"

John Kilby, Head of Computer Science, Bishop Wulstan High School, Rugby, writes:

"Quest has been an excellent piece of equipment. The problem that seems to occur everyday is that at lunchtime the pupils rush to the computer room to make sure that they are first in the queue for the 'Quest' mouse"

Beeblet User Group, New Zealand Oct '87:

"One of its nicer features is that the top menu is done in Mode 0, the drawing itself is in Mode 1. Thus on screen together are two different Modes. A neat way around an old problem"

Quest Mouse II & Quest Paint	£58
Quest Mouse II, Quest Paint, AMX	
Stop Press & Pagefont	£89
Quest Mouse II only	£26
Quest Paint Software only	£34
Quest Font Disc	£15
Quest Mouse Mat	£3
Part Exchange your unreliable AMX Mouse for a Quest Mouse for only	£22
GXR ROM for the BBC Micro	£22

(P.S. Quest Paint is not compatible with BBC Compact)

N.B.

1. Quest Paint supplied complete with Software in a 32K ROM, Comprehensive User Guide and a Utility Disc.

2. Quest Font Disc has 22 text FONTS for use within Quest Mouse.

ConQuest

Watford's Quest package is an extremely powerful and flexible drawing package, with very wide and unusual features. However, since its launch various suggestions for even more advanced & powerful facilities have been received from the Quest users. ConQuest allows you these more advanced facilities, like, distortion of a cutout to any shape and a full font designer. If you also have a GXR ROM in your machine or you are using a BBC Master then ConQuest will take advantage of this to give ellipses at any angle, sectors and arcs, etc. Quest combined with ConQuest and Acornsoft GXR ROM make up THE MOST POWERFUL drawing packages available for the BBC range. Quest Paint is able to take advantage of almost any additions to your machine, such as Shadow or Sideways RAM. ConQuest takes this principal even further, by utilising the otherwise normally incompatible Sideways RAM facility by holding pictures in them.

Some of the features are:

- Pick filenames off the screen for loading and saving.
- Rotate a cutout to any angle and Distort it to any four sided shape.
- Has Built in Font editor.
- Default brushes and patterns on startup.
- 16 x 16 font available on start up.
- Ability to reset patterns, fonts and brushes to default at any time.
- ROM based enhanced Epson and compatible printer dump.
- ROM based enhanced extended picture routine.
- Ability to create and abort extended pictures.
- Improved disk access speed for extended pictures.
- User definable sideways RAM driver for incompatible sideways RAM systems.
- Ellipses at any angle on Master 128 (or B with GXR ROM).

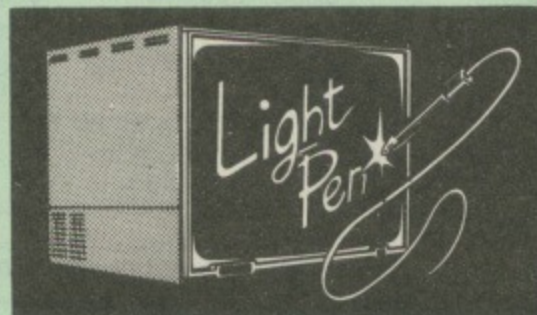
ConQuest ROM Package

£30

(Price includes software in ROM and a comprehensive Manual).

(Not Compatible with BBC Compact)

MARK II LIGHT PEN



Our Mark II Light Pen is the very latest in light pen technology. It is totally insensitive to local lighting conditions and works with many different monitors. The pen only responds to the High Frequency light produced by your monitor/TV. An LED indicates when valid video data is being produced. A conveniently located switch is also fitted.

Price Only £21

(Price includes FREE software Disc and Operating Manual)

RB2 Marconi TRACKER BALL

RB2 (AMX/Quest compatible)
RB2 including Quest Paint

£45
£75

FLEET STREET EDITOR

Software pack for BBC Micro	£33
Software pack for the Master	£39
Software Pack for Compact	£40
Admin Xtra Disc Utility	£13
Walt Disney Disc Utility	£13
Fonts N Graphics Disc Utility	£13

THE NEW Mk III AMX MOUSE

ONLY: £59 Inc. Super Art package
(carr £3)
(Please specify for BBC, Master or Compact)

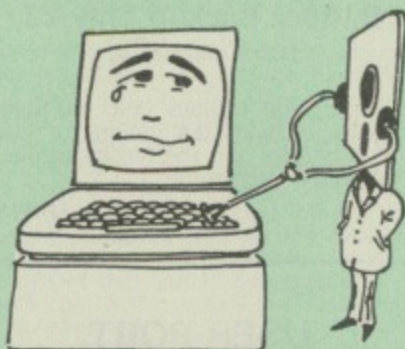
FREE our popular Colour Art software pack worth £15 with every AMX Mouse package purchased from us.

MOUSE MAT	£3
AMX MOUSE ONLY	£29
AMX UTILITY Package	£11
AMX SUPERART Package	£34
AMX STOP PRESS - A Desktop publishing software. Works with Keyboard, Joystick or a mouse	£32

PAGE-FONTS - Over 20 Fonts for use with AMX Pagemaker £12

AMX DESIGN (ROM)	£55
AMX XAM Educational	£15
AMX EXTRA EXTRA	£16
AMX MAX A gem of desktop (ROM)	£15

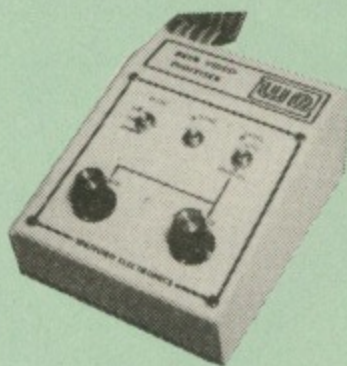
DIAGNOSTICS DISC



The BBC Micro is a very complex machine and thus diagnosing a fault can be very difficult. At Watford Electronics, we realise how difficult it can be when faced with a problem, finding yourself a long way from your nearest dealer, or even just uncertain about your Beeb's health, but not wanting to waste time and money taking it to be looked at. The solution to these problems is here now, in the form of the Watford's Diagnostics Disc. This excellent utility is specially designed to test out the following areas of your Beeb: RAMs, ROMs, ULAs, Sound, Keyboard, Disc, RS423, ADC, User Port, Printer Port, Cassette, Joysticks, Speech, Disc Drives, 6502 and Z80 2nd Processors. This utility is an invaluable aid for all those who take the reliability of their system seriously. A comprehensive manual provides full operating details and a list of possible causes and remedies for any faults that you may find along the way. The package also enables a permanent equipment and service record to be maintained.

Only £20.00

BEEB VIDEO DIGITISER



"Test Bureau Approved for
Use in Education"

Using any source of composite video (colour or monochrome) and the Watford Beeb Video Digitiser, you can convert an image from your camera into a graphics screen on the BBC Micro.

This uses the full graphics capacity of the BBC micro in modes 0, 1 or 2. The video source may be a camera, video recorder or television, and is connected via the video output socket.

Images produced can be compressed, stored to disc, printed on an Epson compatible printer, directly used to generate graphics, analysed for scientific and educational use or converted to other formats e.g. Slow Scan TV or receiving a picture from a remote camera using a modem.

The output from the digitiser exactly matches the graphics capability in each mode, with up to 8 levels of grey in mode 2. The unit connects into the User Port and automatically scans a complete picture in 1.6 seconds.

Both the black and white levels can be adjusted manually for the optimum picture, or switched to automatic for unattended use. The image produced can be reversed if necessary.

Full controlling software is supplied on a normal sideways ROM and this is easily accessed via additional * commands. The package is designed to allow easy input of complex screens and give full access of the data to the user. Once on the screen, the image can be used as a normal graphics screen, allowing any of the usual graphics commands in BASIC or other ROMs to work on it.

A special print dump routine is included with the driver programs. This is specially designed to produce a fast, correctly proportioned picture, with reduced "contouring", resulting in an accurate reproduction of the original image.

Detailed examples of driving this unit from BASIC or other languages are all provided in the extensive manual supplied.

£109 (Carr. £5)

(Price includes) Digitiser Unit, Software in ROM & a Comprehensive Manual
(BBC B+ and Master compatible, except Master with Econet)

Magazine Maker

(As seen on TV)

A combination of the Pagemaker and Watford's Beeb Video Digitiser.

Using any video that provides a composite signal and the digitiser, images from a camera or TV can be converted into a graphics screen on the BBC Micro.

They can then be used within Stop Press to illustrate magazines or newsletters - in fact anything that needs to be created on A4 size paper.

With Stop Press's many features, a variety of pictures can be composed - the only limit being the imagination.

Pictures can be doctored using Stop Press's graphics option to produce any number of effects.

Text can be formatted around the digitised photo on screen using the facilities available, which include 16 typefaces, character and pattern definer, text formatting and the ability to load in wordwise and viewfiles plus much more.

Once created the picture can be printed out. The Magazine Maker is suitable for any use that requires illustrated documents.

Complete Package **£135.00** (carr. £3)



Watford Electronics bring professional quality Desktop Publishing to the Beeb. The Wapping Editor is a totally self contained mouse-driven desktop publishing package designed to run on the BBC B, B+ and Master computers. The massive 64K Rom contains ALL the software you need to do your own publishing. It 'Brings the Freedom of Press' to your fingertip. The software has a word processor, a graphics package, a page layout section and a font designer. Although very sophisticated, Wapping Editor is simplicity itself to use. Anyone already familiar with Quest Paint will immediately feel at home.

GRAPHICS PACKAGE

Imagine Quest Paint re-written to take advantage of the high resolution of Mode 0, well this is it. The Wapping Editor could well be worth buying for this facility alone. This must surely be the graphics.

WORD PROCESSOR

This section is a fully functional word processor specially tailored to suit the Desktop Publishing environment. Gone are all the unnecessary and cumbersome text formatting commands - these are dealt with in the 'Page-Layout' section. The features of this word processor include wordwrap, wordcount, insert/overwrite, move block, copy block, delete block, search and replace, browse, etc, many of these features being mouse controlled. Text input can of course be taken from existing word processor files like Wordwise, View, etc, but it is not necessary to have a separate word processor in order to use this package.

PAGE-LAYOUT SECTION

Page Layout becomes easy using these mouse-driven routines. The user simply 'pulls' a rectangle onto the page and states which text document or graphic is required to fill the space - it's as simple as that! Text can be automatically printed in a pre-set number of columns, left justified and/or right justified, or centered. Several different typefaces can be held in memory at one time. Graphics may be stretched, squashed or cropped to fit any size rectangle. Graphics input can be from the software provided in the package or, using the 'mode convert', from any graphics mode screen.

THE FONT EDITOR

This is an enhanced version of the font editor contained in the Con-Quest ROM and allows the editing of ALL 95 characters. As well as being able to design your own typefaces, fonts from other DTP packages or from Quest Paint may be loaded into the editor and converted for use with the Wapping Editor. This sophisticated editor has numerous functions including slide, flip, invert and rotate individual characters or the whole font. Individual characters can be mirrored or copied and a mask feature allows you to superimpose two characters. Lines and columns can be inserted or deleted allowing the character to be stretched or squashed. This font editor will also allow 'font' and 'brush' files to be designed for use with Quest Paint. This package is the latest in the line of integrated professional quality mouse-driven software from Watford Electronics, the company that adds power to Beeb.

Wapping Editor Launch Offer: **£69**
Wapping Editor with
Quest Mouse **£89**

Continued



ARIES CORNER

B-32 Shadow RAM Card

Like the BBC B+, the B32 provides 20k of shadow screen RAM and 12k of sideways RAM. Unlike the B+, the B32 has simple software commands which allow the user to reconfigure the RAM as 16k of shadow RAM and 16k of sideways RAM, or all 32k as sideways RAM.

With the B32, the programmer gets up to 28k of RAM available for Basic, Logo, Comal, Forth, Lisp and BCPL programs in any screen mode. The business user gets extra memory for View, ViewSheet, Wordwise Plus, Interword and many other applications. For advanced applications, the scientific user gets access to a massive 47k of data storage using the Acorn approved *FX call.

Sideways RAM enables you to load sideways ROM images from disc, allowing you to have a large library of sideways ROMs (subject to the copyright holder's permission) stored on disc. The B32's sideways RAM can also be used to extend any operating system buffer (such as the printer buffer) or to load tape programs into a disc system.

The B32 simply plugs into the 6502 processor socket on your BBC micro – no flying leads to connect and no soldering. Provision of the on-board ROM socket means that the Aries-B32 control ROM does not use up one of your existing ROM sockets.

● Recommended by Computer Concepts for use with their Inter series of ROMs.

Price: **£80** (carr. £2)

Aries B-12 Sideways ROM Board

This board is extremely well made, simple to install, reliable when fully loaded and compatible with the Aries-B20 and the Aries-B32.

The B12 provides a total of twelve sideways ROM sockets (the four in the original machine are replaced by the twelve on the board), all fully accessible by the MOS sideways ROM system. In addition, there are two sockets for sideways RAM, giving up to 16k of RAM using 6264 static RAM chips.

The B12 system consists of two parts: a large detachable "mother board" which carries the extension ROM sockets and a small "base board" on a short ribbon cable, which plugs into the existing sideways ROM sockets. This two-board design eliminates the reliability problems previously associated with some other ribbon-cable based systems.

If you do not have a B32 or B20, a small adaptor module (the Aries-B12C) is available at a nominal cost.

Price: Aries B-12 **£40**
Aries B-12C **£5**



CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 50234 or 33383

ARIES B-488 IEEE-488 INTERFACE UNIT

The Aries-B488 is an interface unit to enable the BBC micro to control and monitor IEEE-488 bus systems. The IEEE-488 bus (also known as the 'GPIB' or 'HP-IB') is the standard method of interconnecting programmable laboratory instruments and control equipment. Using the B488, up to 15 devices may be connected in a single high-speed data network.

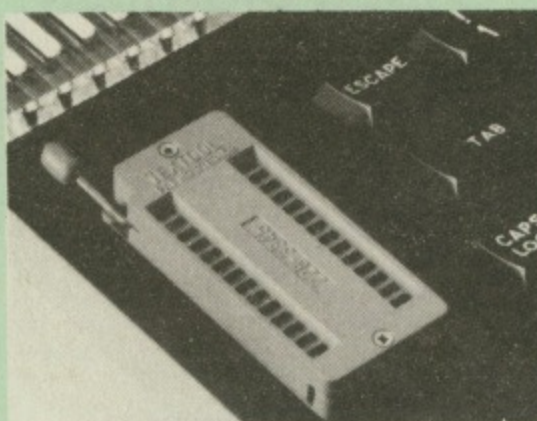
£238 (Carr £3)

EXTERNAL ROM BOARD for BBC MASTER

This external Beige finished, free standing cased unit with its own Power Supply allows you to plug-in upto 12 ROMs and 16K Sideways RAM.

Only **£78**

SIDEWAYS ZIF SOCKET



Allows you to change your ROMs quickly and efficiently, without opening the lid. The ZERO INSERTION FORCE (ZIF) socket is located into the ROM Cartridge's position.

● Very simple to install. NO SOLDERING required. The ZIF (Zero Insertion Force) eliminates the possibility of damage to your ROM pins when inserting & extracting.

● The low profile of the socket allows unrestricted access to the Keyboard.

● All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.

● This versatile hardware solves the problem of running out of socket space. Simply lift the ROM from the ZIF & insert a different one (No pulling or pushing of Cartridges. It is a must for all professionals and Hobbyists alike.)

● BBC, B+ and Master compatible.

ONLY £18 (carr £3)

Low Profile CARTRIDGE SYSTEM

Complete System consists of: Low profile ROM Cartridge, Socket housing, Cable assembly, 5 labels and a library storage rack for the BBC B.

● Complete System **£11**
● Spare Cartridges **£2.50**
● Spare Rack **£1.50**

ROM Cartridges for the BBC Master
Twin **£8**; Quad **£12**

16K DISC RAM

Complete with such features as read and write protection, these new modules from Watford Electronics are ideal for the hobbyist, software developer and ROM collector.

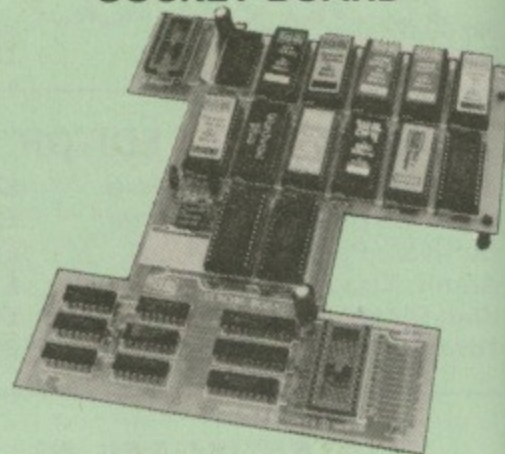
Key points to note about this new addition to the Watford range of products are:

- Write protection (useful in a variety of circumstances).
- Compact construction.
- Supplied complete with Battery Backup.
- No overheating or overloading problems.
- Free utilities disc supplied.
- Can be used as a 16K PRINTER BUFFER.
- Ideal for professional software development.
- Supplied with utilities software disc.

Only **£35** (carr £2)

P.S. 16K Disc Ram Board is not designed to work in conjunction with a Sideways ROM Board.

SOLDERLESS SIDEWAYS ROM SOCKET BOARD



In the May 1986 Micro User's independent review, the writer concludes, "The board has been well laid out. Its position is much better than others – not over the HOT RAM chips and further away from the disc controller area". "I give the solderless ROM board the thumbs up and wish it success".

This brand new board from Watford Electronics is designed specifically for those wishing to add a ROM board to their own BBC without the need to perform any soldering.

This new board expands the total possible number of ROMs in a BBC from 4 to 16.

Unlike our competitors inferior boards, the ONLY upgrade required for fitting battery backup to the Watford Solderless ROM board (all Watford ROM boards, actually) is the fitting of the battery itself. (No other expensive components are required.)

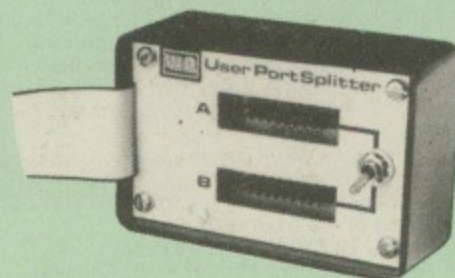
- The key features of this new, no fuss, easy to install quality product from BBC leaders Watford Electronics are as follows:
- Increase your BBCs capacity for ROMs from 4 to 16.
- No soldering required.
- Very low power consumption.
- Minimal space required.
- Compatible with Torch, DDFS, RAM Card, 2nd Processor, etc.
- Socket 14 takes two 6264 RAM chips.
- Read protect to make RAM "Vanish" allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: Only **£32**
Battery backup fitted **£36**
Battery Backup only **£3**
(carriage £2)

● Sideways RAM Utilities Disc for Solderless ROM Board. Includes the options to load and save ROM Images and the facility to use Sideways RAM as Printer Buffer.

Only: **£8**

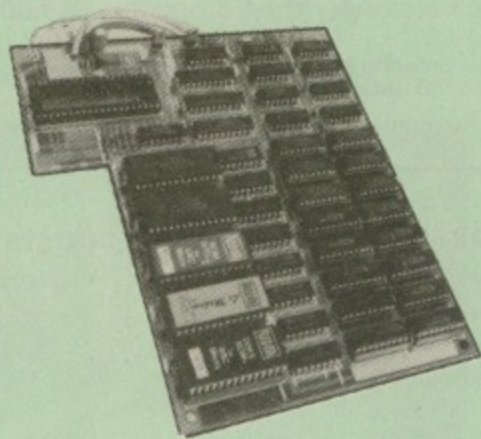
USER PORT SPLITTER UNIT



Gone are the days when you had to plug and unplug devices from the User Port. This extremely useful little device allows two units to be connected to the User Port simultaneously, and select between them simply by toggling a switch. This device is particularly useful for those people using Quest Mouse and the Watford Video Digitiser or any similar combination.

Excellent Value at **£22** (carr £2)

ROM/RAM CARD



Watford Electronics announced the first ever commercial ROM board for the BBC micro, the Watford Electronics 13 ROM Socket Board 3 years ago. Following the success of this board, we have designed what probably represents the ultimate in expansion boards, the new Watford Electronics ROM/RAM board. This highly versatile and sophisticated board represents the latest in "2nd generation" sideways ROM technology for the BBC micro, designed to satisfy the serious BBC user.

- NO SOLDERING required to fit the board.
- NO overheating problems.
- No User Port corruption (avoids problems with the mouse, modems, Eeprom Programmers, etc.)
- Fully buffered for peace of mind.
- Firm mounting in BBC micro.
- Compatible with all BBC micros (not BBC+ or Master).
- Total number of ROMs increased from 4 to 8.
- Up to 8 banks of sideways RAM (dynamic).
- Option for 16k of Battery backed CMOS RAM (CMOS RAM needs one ROM socket).
- Software Write protect for ALL RAM.
- Read protect for CMOS RAM (ALLEVIATES crashes during ROM development).
- Separate RAM write register (&FF30 to &FF3F).
- Automatic write to currently selected RAM socket for convenience.
- Accepts any ROM.
- FREE utilities disc packed with software.
- Compatible with our DDFS board, 32k RAM Card, Delta Card, sideways ZIF, etc.
- Large printer buffer.
- UNIQUE Fully implemented RAM FILING SYSTEM (similar to the popular Watford DFS).
- ROM to RAM load and save facilities.

The SFS (Silicon Filing System) can utilise up to the full 128k of RAM (with the SFS in any paged RAM) as a SILICON DISC. This behaves as a disc drive, with all the normal Watford DFS features (including OSWORD &7F for ROM-SPILL, etc.) to provide an environment that looks like a disc but loads and saves MUCH faster.

The ROM-RAM Board plugs into the 6502 CPU socket. This leaves free all the existing ROM sockets, which can still be used normally.

Any ROM that can be plugged into the BBC micro's own ROM sockets may be used in the ROM-RAM Board.

The ROM-RAM Board is supplied with all ordered options fitted as standard. Upgrade kits (with full instructions) are available for all of the options, for later.

Please write in for further details.

INTRODUCTORY PRICES:

- ROM/RAM card with 32k dynamic RAM£48
- ROM/RAM card with 64k dynamic RAM£65
- ROM/RAM card with a massive 128k dynamic RAM£109
(carriage on ROM-RAM Card £3)

OPTIONAL EXTRAS:

- 16k plug-in Static RAM kit.....£17
- 16k Dynamic RAM for Upgrade.....£17.50
- Battery backup.....£3
- Read and Write protect switches.....£2 each
- Complete ROM-RAM board
All options installed£115

P.S.

Is your existing ROM Board overflowing with ROMs? Do you need more Sideways RAM? Is your Board unreliable? Then upgrade to Watford ROM/RAM Board and pay £5 less

Le Modem



The MODEM from Watford

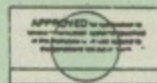
The features that make Le MODEM such good value are:

- Auto Dials, Auto answers, and is completely controlled by your micro. There are no external controls!
- Allows you to access PRESTEL, B.T. GOLD, THE SOURCE, MICROLINK, MICRONET, MICROWEB, THE TIMES NETWORK, MICRO LIVE (BBC TV database), CITY BB and more.
- Supplied with a comprehensive telecomms package in a 16K sideways ROM which includes a FULL PRESTEL terminal allowing TELE-SOFTWARE to be downloaded.
- A comprehensive 80 column terminal. This includes XMODEM error checked transfer protocol, to allow error free data transfer anywhere in the world!
- FULLY controlled by simple *COMMANDS allowing you to control it from your own BASIC programs. To get you started we supply a FREE disc of bundled software!
- Connects to the 1MHz bus. A *AUDIO ON-OFF command allows you to actually hear the telephone line through your BBC micro loudspeaker.
- Completely self contained with internal mains power supply. (Even a free mains plug is fitted!) A *TEST facility gives ON SCREEN indication that Le MODEM is working correctly.
- FREE Registration to MicroLink.

SALE OFFER £62 (carr £5)

(Price includes, Le Modem, Software ROM, Cables & Comprehensive Manual)
(Write in for further details)

APOLLO



The NEW Modem from Watford

Following numerous requests from you, our discerning customers for an APPROVED, Low Cost & High Performance modem with Auto Dial & Auto Answer facilities as standard) we bring you the versatile APOLLO Modem. Just compare the features and look at the price (which incidentally includes the cost of the Software, manual and BBC connecting cable). We are sure you will agree that Watford Electronics in their traditional way are giving you a super 'value for money' deal.

Just look at these features:

- V21 for Bulletin boards, Microlink, Telecom Gold, etc.
- V23 for Prestel, Home Banking, and other Viewdata services.
- Reverse V23 allows User run Viewdata service.
- 1200-1200 half duplex for communications.
- XMODEM, HEX and ASCII file transmission.
- Auto Dial of given 'phone number.
- Auto Answer for User's Bulletin Board.
- 80 column terminal with split screen facility.
- Prestel text screen dump.
- Fully BABT approved.
- FREE Registration to MicroLink.
- £6.50 off annual Membership to Micronet, Prestel and Telecom Gold.

Sale Offer: £64 (Carr £5)

Price includes, the Modem, Comm Software Cables & Operating Manual).
(Write in for full specification).

NEW

Aries 1200 MODEM

APPROVED for connection to telecommunication systems specified in the instructions for use subject to the conditions set out in them

If you thought £150 didn't buy much of a modem you haven't heard about the aries 1200

Up till now buying a modem was a compromise between price and performance, but the new Aries 1200 offers performance and features not found on modems costing two or three times as much. Look at the features offered by the Aries 1200, features which you wouldn't expect from a modem at this price – and some which you would be lucky to find on a modem at any price.

- Operates in V21 (300/300), V23 (1200/75 and 75/1200) and proprietary V23 1200 mode.
- Connect it to any type of computer or terminal via the 25 way serial D connector or the BBC standard 5 pin Domino socket.
- A built in phone socket means your phone plugs straight through.
- A reset switch so the hardware makes it easy to restart – even when your software doesn't.
- Industry standard Hayes (C) compatibility means that this is one of the easiest modems to use. It can automatically work out the speed your computer is working at, and even the speed and protocol of the modem at the other end.
- Auto Call mode can dial using tone or pulse (the modem works that out too), and when it connects it will automatically determine the speed of the answering modem.
- Auto answer mode means the modem can be left unattended to answer calls from other modems, and of course it automatically works out the speed and protocol of the calling modem.
- The built in speaker and front panel LED's mean that you always know what the modem is doing.

... Features at any price.

- Proprietary V23 mode mean that two Aries 1200's can communicate at 1200/1200 and in this situation you can take advantage of the built in data compaction which reduces the volume of text you send by 30%.
- Built in scrambler means that data transferred between two Aries modems is automatically encrypted. The encryption code can be user defined for a totally private email system.
- User defined control commands means that the Aries can even be used from a dumb terminal or with non standard software.
- Front panel light include indicators for Power, Auto Answer Mode, Transmit, Receive, On line, Terminal ready and Carrier Detect. There's even an indicator to show the quality of the phone line.
- Internal watch-dog monitors the modems activity and in the event of a power failure or computer crash it automatically resets the modem. The Aries modem can never hold open your phone line or lock up your computer.
- Built in printer port allows the Aries to direct incoming data directly to a printer, text can be tagged so that it is selectively sent either to the printer or the computer.
- All modem setting are stored in solid state non volatile memory – no battery to go flat and hang crash the system.

Launch Offer Only: £149

Hayes Compatible BBC Comms Software ROM & Manual £25

WATFORD CUT PRICES NOT PERFORMANCE

Continued

COMPUTER CONCEPT'S ROMS

ACCELERATOR	£30
CARETAKER Basic Utility	£23
DISC DOCTOR	£28
Graphics ROM	£29
TERMI	£25
COMMUNICATOR	£49
Printmaster	£24

Wordwise

£26

Wordwise plus

£40

We are giving away absolutely **FREE**, the superb Word-Aid ROM worth £24, with every WORDWISE PLUS package bought from us.

Word-Aid

The most comprehensive utilities ROM for Wordwise-Plus

Extend the power of your Wordwise Plus word processor with this most advanced ROM from Watford. By utilising the powerful Wordwise Plus programming language, WordAid provides a whole host of extra features, all accessed via a special new menu option. This ROM has been personally approved by Mr Charles Moir, the author of WORDWISE PLUS.

- Alphabetical sorting of names and addresses.
- Text transfer options.
- Chapter marker.
- Epson printer codes function key option.
- Search and display in preview mode.
- Embedded command removal.
- Print Multiple copies of a document.
- Multiple file options for print and preview.
- Address finder.
- Label printer.
- Mail-merger.
- Number/delete/renumber.
- Clear text-segment area.
- BBC B, B+ and Master compatible.

Only £24

(N.B. Word Aid requires a Disc Interface in your Micro)

HI-WORDWISE-PLUS DISC: £5

SPELL MASTER £42

Inter SHEET ONLY £37

INTER-CHART

ONLY: £25

Inter-WORD

£36

MEGA-3 ROM

Interword, Intersheet & Interchart - 3 in one ROM

£76

INTERBASE £49

All Prices Exclusive of VAT

VIEW

VIEW WORDPROCESSOR 2.1 £35

VIEW 3.0 ROM £48

VIEW PROFESSIONAL £59

HI-VIEW (for 6502 2nd Processor) £36

VIEWSHEET (Acornsoft) £36

VIEWSTORE £36

VIEWSPELL with 80 track disc £29

VIEWPLOT Disc £20
(Please specify for Master 128 or Compact)

VIEW-INDEX £12

OVERVIEW Packs 1 & 2 £69

Watford's own Sophisticated VIEW PRINTER DRIVERS

Epson FX80 & Kaga KP (Disc) £8
Juki & Brother HR15 (Disc) £8
Silver Reed Printers (Disc) £8

BBC SOFTWARE'S Popular Educational Software

- Maths with a Story 1 (Disc). 4 primary level maths programs £11.25
- Maths with a Story 2 (Disc) 4 further maths programs £11.25
- Picture Craft (Disc) 6 - 14 age group. Pack consists of flexible geometrical design & colouring programs £17
- WAVES: Science Topics (Disc) CSC O Level Physics program. £14.95
- RELATIONSHIP: Science (Disc) O Level Biology program. £20.00
- BONDING: Science (Disc) O Level Chemistry program. £20.00
- ELECTROMAGNETIC SPECTRUM (8 Discs) O Level program. £20.00
- ELECTRONICS IN ACTION (Disc) O Level program £19.95
- NEWTON & THE SPACE SHUTTLE (Disc) O Level program. £20
- ECOLOGY (Disc) O Level program. £20
- POLYMERS (Disc) O Level program. £20
- Classification & Periodic Table O Level. The suite is supplied with its own database of chemical elements which can be classified according to your own rule. £20
- FOOD & POPULATION (Disc) O Level program. £20
- MICROTECHNOLOGY (Cassette) O Level program. £11.25
- A VOUS LA FRANCE (2 Cassettes) A French language home study aid. £21.70
- DEUTSCH DIREKT! (Disc & Audio Cassette) £19.95
- Modem Master (Disc) £11.25
- ADVANCED TELETXT SYSTEM £8.65
- PERIOD TABLE SOFTWARE £20
- Astronomy - Primary (Disc) £12
- Computers at Work - Primary £17.35
- Introducing Geography - Primary £17
- Introducing Geography 11-17yrs £17.50
- Electric Fields 6-14 years £11.25
- BlackQueen Contract Bridge £13
- Espana Viva - 3 Discs £19.95
- A Vous La France Disc £21.50

MINI OFFICE II

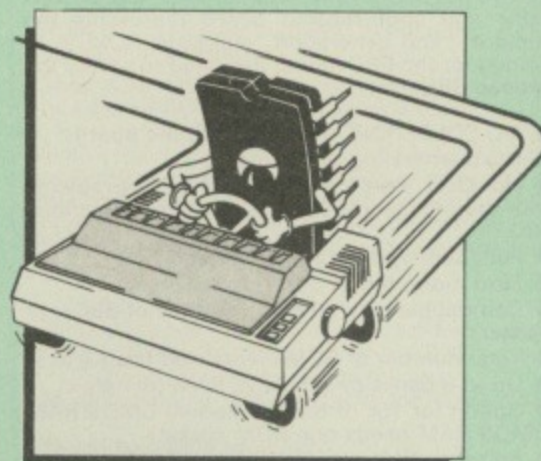
DISC Version for BBC B & B+	£14.00
DISC Version for BBC Master	£16.50
Disc Version for the Compact	£18.00

(When ordering please specify for which Micro & 40 or 80 track Disc).

Advanced Computer Products

Advanced Disc Toolkit	£30
Advanced Disc Investigator	£25
Advanced 1770 DFS BBC	£29
Advanced 1770 DFS Master	£30

VIEW PRINTER DRIVER ROM



View is a powerful word processor, but until now has seriously lacked in terms of printer support. With the launch of our Printer Driver ROM, which includes an extremely powerful and easy to use Printer Driver Generator, View users can find themselves in the realms of advanced word processing only at a small outlay.

The VPD extends View's printer command with a series of mnemonic commands. All standard highlight sequences are also supported. A large range of printers are supported by drivers contained within the ROM (the drivers can be downloaded and customised). Printers supported include: Epson's MX, RX, FX, LX, JX80 range, Hi80, KP810/910, PW1080, JP101, HR15, M1009, GLP, Panasonic KX-P1081/2, JUKI 6100, etc.

Other printers are readily supported by defining a Printer Driver using the built in Printer Driver Generator. The features mentioned below are available to both the built in Printer Drivers and user defined drivers (assuming the printer supports the features).

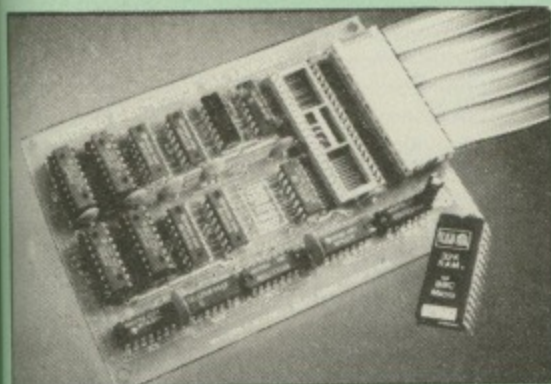
NLQ control, Underline, Bold, Proportional Spacing, Microspacing, Italic, Superscript, Subscript, Condensed, Enlarged, Double Strike, Set lines per inch numerically (e.g. LPI 6), Set characters per inch numerically (e.g. CPI 5), Select printer font, Select printer ribbon colour, Translation sequences, Emulation of BBC Character Set, Simple numeric expressions for certain operations, Full printer setup, Send control codes, Print prompt on screen, Redefinable Pad character, Pause for key press, Prompt to change daisywheel, and Execute * command when printing.

Other features include a very powerful on screen preview, with bold, italic, underline, super/subscript, enlarged highlights, and a special printer driver to allow memory based text to be previewed by View 1.4. Of course, View 1.4, 2.1 and 3.0 are all supported, as is Shadow RAM and 6502 Second Processors. The BBC B series and Master series of micros are supported. A comprehensive manual is supplied. All in all, a very professional product for the discerning user who wants power at their finger tips. (Write in for a detailed leaflet).

Price: Only £33

32K

SHADOW RAM- Printer Buffer Expansion Board



A MUST FOR WORD PROCESSING

Watford Electronics now brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. Don't throw away your BBC B for a BBC B Plus or BBC Master. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16K or even 20K, but a massive 32K of extra RAM!!!

● IMPROVE your WORD PROCESSING system, whether disc or cassette based. Don't wait for a slow printer – type in text while printing. TWO JOBS DONE SIMULTANEOUSLY and £100+ saved on a printer buffer.

● "VIEW" Wordprocessor users can now type in letters in 80 columns and have up to 28,000 bytes free – 5 times as much as normal.

● In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24K of text in memory. This product is recommended as an ideal complement by Computer Concepts.

● Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20K of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28K of program space.

● Use the FULL 32K or the bottom 12K of the expansion RAM as a PRINTER buffer for PARALLEL or SERIAL printers, sound channels, RS423 etc. Print large text files while running long graphics programs, and have all your buffer options available as well (*FX15,21,138,145,ADVAL etc). Please note only a 12K printer buffer can be used with Wordwise or Wordwise-Plus, due to the way they are written.

● Unique facility to turn ROMs off and on again. Unlike all other ROM managers, this feature does not use 'unofficial' memory. Two bytes of normally user-inaccessible memory on the RAM card are used to ensure ROMs are disabled WHERE OTHER ROMS FAIL.

● Recommended by Computer Concepts for use with their Inter series of ROMs.

Only £59 (carr £2)

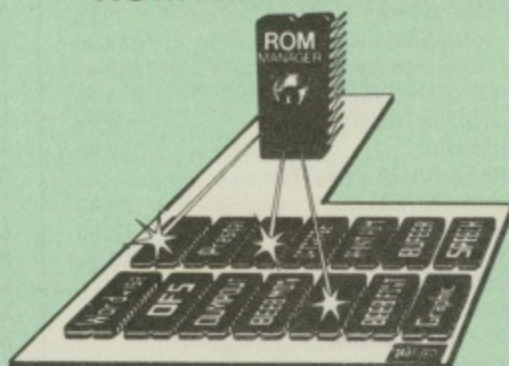
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INCREDIBLE WORDPROCESSING DEAL

Watford's 32K SHADOW RAM CARD and Computer Concept's INTERWORD Wordprocessor package.

at Only **£89** (carr £2)

ROM MANAGER

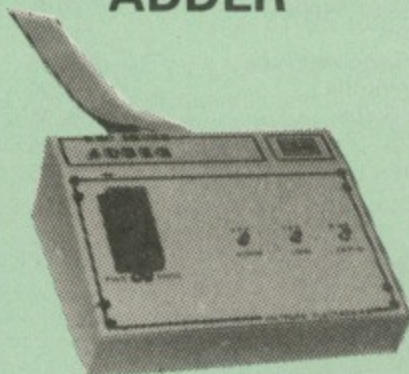


Take control of your Sideways ROMs with ROM Manager. This powerful utility ROM gives you power over your sideways ROMs. Disable whole ROMs, send commands directly to named ROMs and many other powerful facilities.

"Provides comprehensive management of all your installed ROMs". (BEEBUG November '84.)

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ADDER



The only low cost EPROM Programmer for the BBC Micro that will program both the standard 21V and the new 12V5, 27128 EPROMs.

Adder is the ultimate EPROM programmer for the BBC Micro. It will program many different EPROMs up to the very latest 27256 32K devices.

The Adder unit connects to the User Port and draws its power from there too. The EPROM is mounted in a top quality ZIF socket. There are no switches or controls as Adder is entirely software controlled.

The Adder software provides sophisticated facilities for programming EPROMs from a RAM image produced by loading disc files. The software is menu driven and designed for ease of use.

Features:

- Two ultra fast programming algorithms or standard slow algorithm.
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- The RAM image to be programmed can be built up in many ways. Sections of image can be loaded separately. Part programming. Read EPROM. Edit data in memory.
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All this for only **£21** (Disc)

OFFICE MATE



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- BEEBCALC SPREADSHEET
- BEEBLOT GRAPHICS

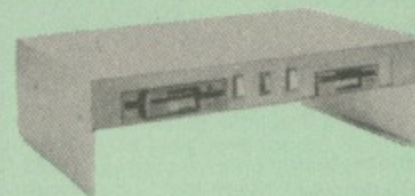
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SPREADSHEET – Offers many calculation and editing features.

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Disc Drives DP35-800S



A Double disc drive – with a difference! Times are changing fast for the floppy disk, and whilst the current standard for the BBC B and Master Series is the 5.25 inch disk, the standard for the future will most certainly be the smaller; faster and more reliable 3.5 inch disks – now a standard feature of both the Master Compact and the Archimedes Series.

To support the present disc drive users, and cope with the future, we have designed our own plinth-mounted disk system – called the DP35 800S, it contains both the 5.25 inch and the 3.5 inch drive formats as well as offer a firm and rigid support for a monitor on top. With the BBC Micro underneath, the plinth makes a surprisingly small footprint on the desk – leaving you more space to work with.

The 5.25" disc drive is 40/80 track switchable. For ease of access, the switches are front mounted. DP35-800S has its own power supply, independent of the BBC Micro.

Watford's new plinth enables users to read, write and format disks both in DFS and ADFS format – currently the accepted standard for the Master Compact and the Archimedes, it also enables the user to read disks written for the Archimedes. Ideal for both BBC & Master.

Launch Offer: **£165** (carr. £7)

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At last Acorn's long awaited Advance Reference Manual for the BBC Master Series of Microcomputers has now been published. Watford Electronics' own authors have edited and added missing sections to the original script and produced a very high quality publication.

It features information about:

- Memory Organisation
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- Disc Filing Systems
- ANFS
- Terminal Emulator & Editor
- View internal format
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- Comprehensive appendix on 65C12 instruction set

At the rear of the manual there are pull out circuit diagrams for the Master 128K. A worth-while addition to any Master owner's library.

All this for just £17 (NO VAT)

THE COMPLETE BBC COMPUTER USER HANDBOOK

"Why has no-one written a book like this before? It's long overdue".

If you own a BBC-B, BBC B+, Electron, Master 128, Master Compact or Archimedes then this book is for you. It shows you how to get the most from your computer, and how to make the computer work for you. Although some sections are machine specific, most of the information, programs, hints and good solid experience are for the whole range of BBC machines. The general style and level means that both beginner and expert will feel satisfied with the quality and quantity of the material.

GENERAL - Uses and abuses of computers.

HARDWARE - How to design your own work station. Hardware additions (disc drives, ROMs, printers, 2nd processors, etc). DIY alterations.

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Aerosol Dust Spray

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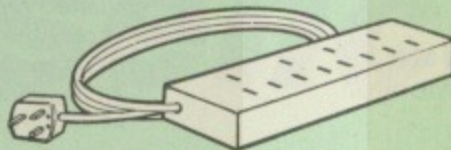
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Protection for only **£7.50**

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4 way top quality mains trailing sockets. Supplied wired up with mains plug ready for use. Can be screwed to floor or wall if required. Very useful for tidying up all the mains leads from your peripherals.

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Replacement FLEXIBLE 17 way Keyboard Connector £3

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Increase the speed of your Disc Drives by soldering this switch to your BBC B or B+ Keyboard.

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Convert two single Disc Drives into one Dual Drive with this simple external unit (Suitable for Disc Drives with PSU. For Disc Drives without PSU, you will also require Watford Power Duck, see below).

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(All ready made and tested)

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Supply from BBC power supply to standard Disc Drive connector.

Single **£3.00** Dual **£3.75**

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BBC to Disc Drives Ribbon Cable
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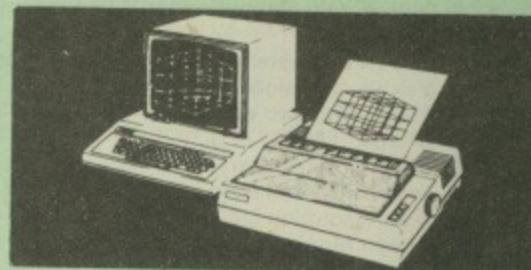
	Plugs	Sockets
RGB (6 PIN DIN)	30p	45p
RS423 (5 pin Domino)	40p	50p
Cassette (7 pin DIN)	25p	65p
ECONET (5 pin DIN)	20p	30p
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Speed is of the essence

Mike Cook continues his *Body Build* Experimenter's Board series

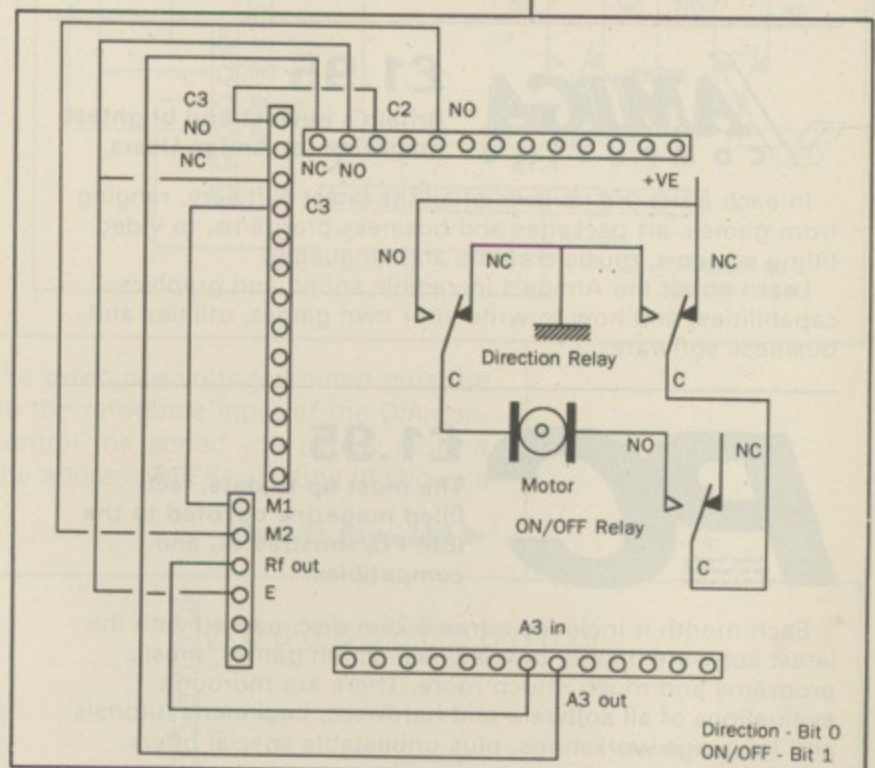
THE BEEB BODY BUILDING COURSE

WE looked last month at how to turn the motor on and off under micro control and how it could be made to stop more quickly when turned off using flywheel braking. I left you with the problem of writing a program to count the number of revolutions made by the motor after it was turned off and display the result.

This is best done on the LED bar display but, as the first four bits reflect the relay state, we have to use the upper four bits. Remember that the cardboard on the motor cuts the opto slot switch twice per revolution, so we will have to divide any count we get by two. The major problem facing the program is not to get stuck waiting for a transition that will never come when the motor stops.

My solutions to the problem are shown in Listing I – Basic – and Listing II – Forth. Both assume the motor is controlled by bit zero and the panel below explains how they work.

Figure 1:
Simple
direction
control



BASIC keeps the variable *TIME* constantly incrementing 100 times a second so we can use this to make sure the program does not get stuck. Line 40 sets the B side of the VIA to be inputs, line 50 is the time limit and 60 initialises the count. Then the motor is turned on at line 70 and allowed to run up to speed – lines 90 and 100.

The motor is turned off in line 110 and line 140 holds until the opto slot beam is broken or we run out of time. Lines 150 and 160 increment the count and display it and line 180 holds until the beam is unbroken or again we run out of time. Then line 190 tests to see if long enough has elapsed for the motor to stop. Finally line 200 prints out the result. Note that, as we are counting in steps of 16 and there are two beam breaks per revolution, we divide the resulting count by 32.

The **FORTH** listing takes a single page, and unlike other offerings it is entirely self contained and uses variables for the first time. Although it is possible to make Forth use the equivalent of *TIME* it is simpler to use a variable that the program itself increments. Line 1 defines a dummy word and puts the system into the hexadecimal mode. Line 2 creates a variable called *TIME* and a constant called *LIMIT*. When you compile this you will get a

warning that the word *LIMIT* is not unique. However it is not important, so you don't need to worry.

The word H.L on lines 3 and 4 increments the time counter, looks at the opto slot and exits when it is low or we have reached the limit on our time. Similarly the word L.H waits for the beam to be unbroken or the time out. Line 7 defines words to turn the motor on and off with line 8 containing a simple delay.

Line 9 combines these last three words to turn the motor on, let it run up to speed and then turn it off – in other words pulse the motor – hence the name M.PULSE. Line 10 starts the definition of our final word that ties it all together: We reset the variable *TIME* and pulse the motor then put the count on the stack and wait for the first break.

When it occurs we increment the count – remember we are in hexadecimal, so adding 10 is a decimal 16 – and display it on the LED bar. Then we wait for the other transition and repeat this if we have not run out of time, and finally we print the result. Remember that as Forth works with integers, the number will be truncated to a whole number of revolutions, unlike the Basic version that could show a half revolution.

Turn to Page 109 ►

The **Body Build** Experimenter's Board was first described in the August 1988 issue of the *Micro User*. It enables you to learn about interfacing in a relatively painless way and contains many components which can be interlinked to enable a wide variety of experiments to be carried out.

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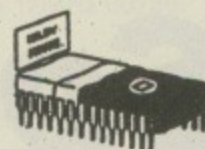
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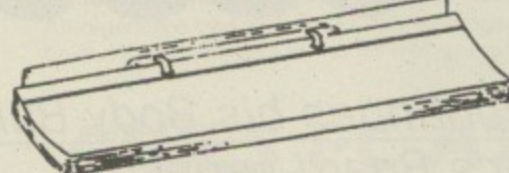
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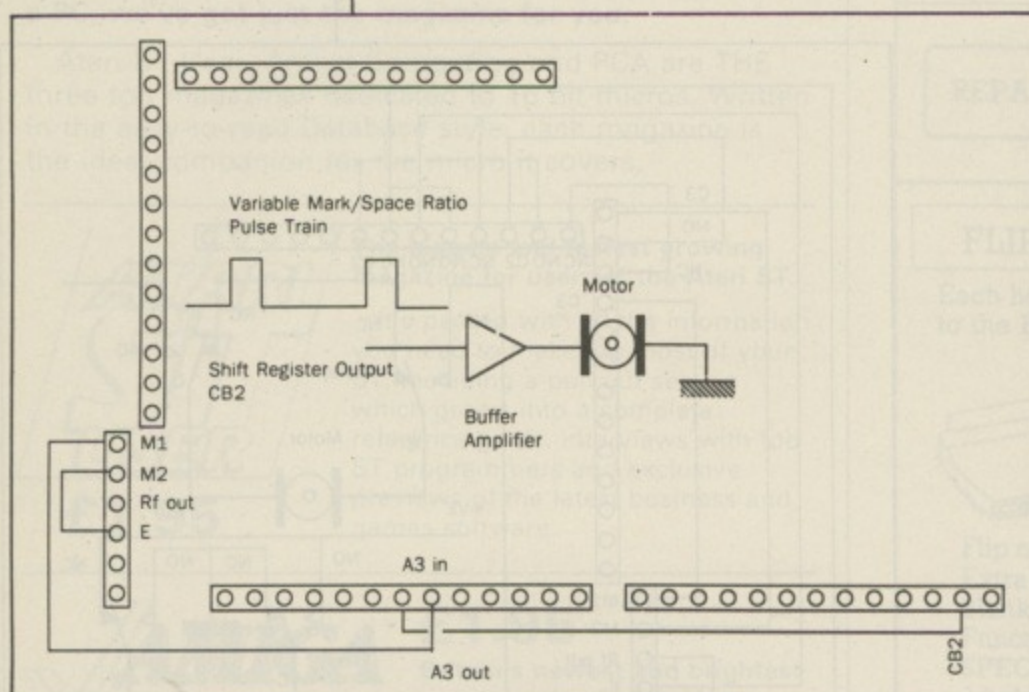


Figure IV: Pulsed speed control

◀ From Page 109

simple Basic program to allow you to send different numbers to the port.

By pressing the keys you will alter the number sent and when you run the program you will notice that the range of control is very small, which is partly due to the output impedance of the buffer amplifier and partly due to the technique itself. You will find that, once started, you can make the motor run much slower than the initial starting speed. This is part of the trouble with this technique of motor speed control, as the voltage drops, so does the speed, and the torque is soon too low to rotate the spindle.

The solution is to use a pulsed technique, applying the full voltage to the motor for short periods. The ratio between the on and off time will control the motor speed, but as the full voltage is being applied it is developing maximum torque while it is on, so the average torque is much higher.

We looked at the shift register in the December 1988 article. What we need to do is to use this in the re-circulating mode to generate a pulse train. The number fed into the shift register will determine the on/off time, and the pulse train is output on control line 2 on the B side – CB2. The wiring for this is shown in Figure IV the beauty of this technique is that once it is running the

```

10 REM BODY BUILDING EXPERIMENT BOARD
20 MODE7
30 PRINT "MOTOR TEST 2"
40 PRINT "Press > to go faster"
50 PRINT "Press < to go slower"
60 PRINT "Press space bar to stop"
70 REPEAT
80 AS=GET$
90 IF AS="." THEN V%=V%+1
100 IF AS="," THEN V%=V%-1
110 IF AS=" " THEN V%=0
120 IF V%>255 THEN V%=255
130 IF V%<0 THEN V%=0
140 ?&FE61=V%
150 PRINTTAB(0,8)"Current value ";V%;S
160 UNTIL FALSE
    
```

Listing III: Sending numbers to port A

hardware takes over and there is no need for software control.

Listing IV shows a simple Basic demonstration program that will not only allow you to send different pulse trains to the motor but also draws a graphic representation of them. You can see that with this technique you have a much greater range of control than with the variable voltage technique and you can run the motor much slower.

However, the motor used here is a very low power one and won't develop much torque anyway – it's easily stopped with your fingers. Nevertheless the same technique can be applied to DC motors of any size. About 20 years ago I used this technique for controlling some fork lift truck motors.

To preserve the motor's life don't let it stand stationary for long with current going through it as this *stall* current is higher than the normal running current, and could damage the contacts if left on too long.

● Next month we will explore some more aspects of the Experimenter's Board's flexibility.

```

10 REM BODY BUILDING EXPERIMENT BOARD
20 MODE4
30 P%=&1F
40 ?&FE6B=4*4 :REM SHIFT REG MODE
50 ?&FE68=&FF :REM SET T2
60 ?&FE69=&FF
70 AS="."
80 GOTO 100
90 AS=GET$
100 CLS
110 PRINTTAB(0,3);"MOTOR TEST 3"
120 PRINT "Pulse width control"
130 PRINT "Press > to go faster"
140 PRINT "Press < to go slower"
150 IF AS="." THEN P%=P%+2+1
160 IF AS="," THEN P%=P% DIV 2
170 IF P%>255 THEN P%=255
180 ?&FE6A=P%
190 PRINTTAB(0,8)"Current value ";P%;
200 MOVE 0,100
210 W%=&100
220 M%=&80
230 FOR A%=1 TO 8
240 IF (M% AND P%)<>0 AND (W% AND P%)<
0 THEN PLOT 1,0,160
250 PLOT 1,160,0
260 M%=M% DIV 2
270 W%=W% DIV 2
280 NEXT
290 GOTO 90
    
```

Listing IV: Sending and graphing pulse trains

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All you have to do is complete and return the survey form on the next page. Your name will be included automatically in the draw from which our four winners will be selected.



BBC Micro
prize!

The most prolific producer of games for the BBC Micro has possibly 10 or more games scheduled for the coming year, including its next release **Barbarian II** and at least one other **Play it Again Sam** compilation in the pipeline.



BBC
Micro prize!

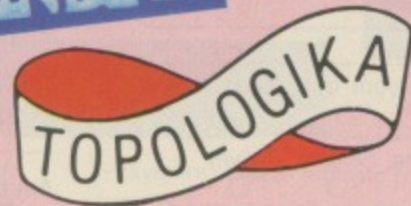
Both these companies have some superb games planned – **Orbital** has just been released by Impact, while **Superman** and **Circus Games** from Tynesoft look stunning. Many more are on the drawing board.



BBC Micro
prize!



Three companies with very different ranges of software. Topologika is famous for its excellent adventure games with **Avon** as its next release. CDS has great plans for the next 12 months. Greatly respected for its sports releases it has just released **Football Director**. In its Blue Ribbon range you will experience the very best in budget titles – the ageless **Steve Davis Snooker** is a good example.



Archimedes
prize!

For Archimedes owners there are some very exciting plans involving companies not usually seen in the BBC Micro market – plus old favourites Grand Slam, Rainbird, US Gold, Minerva, Dabs Press and Topologika. Together they offer an overview of the different types of games which can be played on the Archimedes.

Pacmania is Grand Slam's latest release and is beautifully addictive. Rainbird has brought you **Corruption** by Magnetic Scrolls and is about to introduce you to the world of **Fish**. US Gold's first release for the Archimedes – **Joan of Arc** – is imminent and for golf fans **World Class Leaderboard** is an absolute must.

The most productive games company for the Archimedes has been Minerva which is continuing its support for the machine with **Thundermonk**.

Dabs Press has brought games to the Archimedes screen almost since the machine's inception and its latest – **Arcendium** – successfully converts some popular board games.

Topologika's adventures work on the PC emulator but it too will be making the transition to true Archimedes games. (Don't forget to tick Archimedes in the 'Your Micro' section.)

WHAT TO DO

When you return your completed survey ensure that you fill in your name and address, as well as which type of micro you own. Then ensure that your form is with us by March 31, 1989. All entries will then automatically be put into the Prize Draw.

You don't have to fill in an answer if you don't want to. You may photocopy this page to protect your magazine.

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How old are you? ☐ Under 11 ☐ 11 - 15 ☐ 16 - 18 ☐ 19 - 22 ☐ 23 - 30 ☐ 31 - 39 ☐ 40 - 50 ☐ Over 51

Sex? M/F Occupation? _____

Please tick the square which matches your level of interest in the following areas of computers or computing (0 least - 5 most)

	0	1	2	3	4	5
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Arcade games	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Adventures	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Programming	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hardware	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Desktop publishing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Future tech	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Learning about:						
Programming	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hardware	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

How do you rate your knowledge of the following subjects? (0 none - 5 excellent):

	0	1	2	3	4	5
Basic programming	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6502 Machine code	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ARM code	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hardware	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

YOUR MICRO

What micro(s) do you own or use?

☐ BBC Model A or B ☐ BBC Master ☐ Archimedes
☐ BBC Compact ☐ Electron ☐ Z88

How long have you had a BBC Micro?

☐ Under 1 year ☐ 1-2 years ☐ 2-3 years ☐ 3+ years

Which other computer do you have (if any)?

Which other computer are you thinking of buying (if any)?

What other hardware do you have?

☐ Monitor ☐ Colour ☐ Monochrome
Make _____
☐ Disc drive ☐ 40 ☐ 80 ☐ Single ☐ Double
Make _____
☐ Printer ☐ Daisywheel ☐ Dotmatrix ☐ Laser
Make _____
☐ Modem Make _____
☐ Sideways ram Make _____
☐ Teletext Make _____

Please list any others: _____

What do you use your BBC Micro for (fill in your own ideas in the spaces at the end of the list)?

	Only	Mostly	Some	Seldom	Never
Arcade games	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Adventure games	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Programming	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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What type of hardware would you like next for your micro?

Please indicate which of the following types of software you have:
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What type of software are you most likely to buy next for your micro? _____

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Communications	0	1	2	3	4	5	6	7	8	9
Problems solved	0	1	2	3	4	5	6	7	8	9
Mad Hatter	0	1	2	3	4	5	6	7	8	9
Hac Man	0	1	2	3	4	5	6	7	8	9
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Business	0	1	2	3	4	5	6	7	8	9
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Games programs	0	1	2	3	4	5	6	7	8	9
Utilities programs	0	1	2	3	4	5	6	7	8	9
Archimedes	0	1	2	3	4	5	6	7	8	9
Z88	0	1	2	3	4	5	6	7	8	9
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Indicate any articles or series you would like to see in future editions of *The Micro User*. _____

Any other comments you would like to make about *The Micro User*. _____

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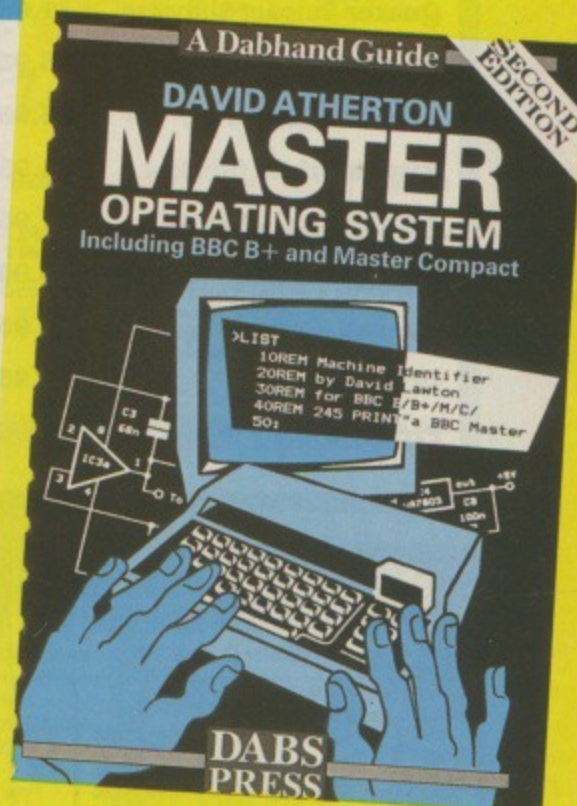
This book details all you need to know about the internal organisation of the BBC Master. With many of the detailed explanations accompanied by comprehensive, fully documented listings, coming to grips with even the most complicated of operating system functions is made as easy as possible.

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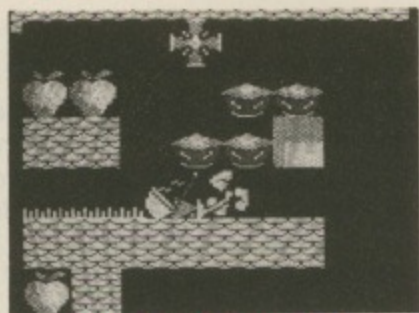
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B B+ m d A

NOW you can get the best of the hordes of floating rocks – before they get the best of you in this stunning version of the classic game using solid graphics. Just type in the listing and ensure it is correct with Get it Right! and save it. When it's run it generates a pure machine code program called 3D-ROID which is automatically saved. To play the game type:

*3D-ROID

*Blast the
belt to
smithereens
with Douglas
Pirie's help*

Only three controls are required – rotate left, rotate right, and fire. By default these keys are Q, P, and the spacebar but they may be redefined by pressing K.

The game starts after you press P and select a difficulty level. You have a pilot's eye view of the asteroids spinning smoothly towards your ship in the upper half of the screen, and a radar display in the lower half.

half way down the Mode 1 screen. This colour switching allows the use of four colours in the lower half of the screen, while using a colour swapping technique in the upper half produces flicker-free animation of the asteroids.

The screen has been shrunk to a width of 256 pixels, so the program incorporates its own specialised drawing routine which provides full hidden line removal for all shapes on screen.

The only illegal activities the program performs are direct access to the screen, video ULA, and both VIAs, and intercepting the interrupt vector. It also changes the values of some of the video processor registers, but this is done through the standard VDU23 operating system call. Despite all these tricks it still works correctly on all the 6502 BBC Micros.

Unfortunately, due to its length the code has to be presented as data statements rather than assembly language and a short routine is used to

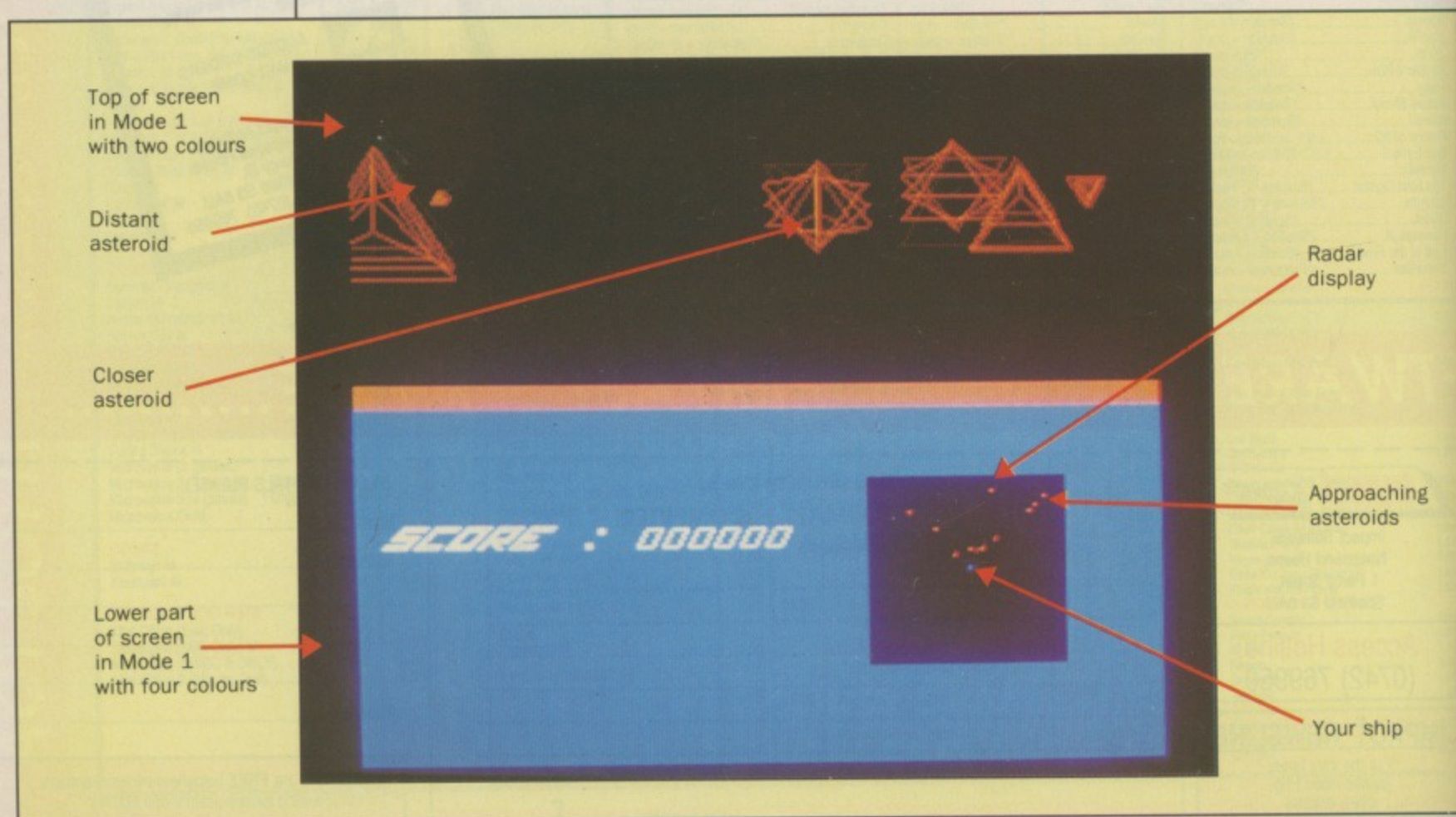
3D Asteroids

is roughly in the centre of the upper screen and then blast it. The further away it is, the higher the score you get. But keep an eye on the radar for rocks approaching out of sight from the side.

The sound is fairly rudimentary since the program disables all normal interrupts in order to boost the speed as much as possible. It replaces the normal routines with two of its own – one for simple sound effects and one to switch colours

convert these into code. However the compression method ensures that you don't have to type in too much. The checksums were generated with the new program printed in the February 1989 issue of *The Micro User* which works correctly with complex data statements. If you use the old program or the one on the monthly disc the checksums will not match.

So away you go for some carefree blasting.




```

10 REM 3-D Asteroids
20 REM by Douglas Pirie
30 REM (c) The Micro User
40 MODE7: SX=84000:HIMEM=5X
50 PRINT CHR$134"Generating code"CHR
$134"This should take about a minute"CH
R$134;
60 AX=SX:REPEAT READ LS
70 IF LS<>"END." PROCbytes(LS)
80 UNTIL LS="END."
90 DIM XX80:YX=XDIV256
100 $X="SAVE CODE "+STR$SX+" "+STR$
AX+ 1900 1900:CALL&FFF7
110 PRINT CHR$129"RUN CODE"CHR$131"t
o play the game...":END
120 DEF PROCbytes(LS)
130 VDU46:IF POS=0 VDU134
140 FOR PX=1 TO LENLS STEP 4
150 p$=MID$(LS,PX,4)
160 ?AX=FNV(ASCIDS(p$,1))+FNV(ASCIDS
(p$,2))*64
170 AX?1=FNV(ASCIDS(p$,2))DIV4+FNV(AS
CIDS(p$,3))*16
180 AX?2=FNV(ASCIDS(p$,3))DIV16+FNV(A
SCIDS(p$,4))*4
190 AX=AX+3:NEXT:ENDPROC
200 :
210 DEF FNV(CX)=CX-63
220 :
230 DATA [Q_?LAB?LU_?LEb?Lyc~HCO?siZ
240 DATA ]VM?_A?fEQw?Cagg@cIq_0~"aMOi
250 DATA KAAI~JY?hQ?Gs~NGu?QiOUwah]Zf
260 DATA KeiwDuGGim@GkiPBIG?F?_pHSo_f
270 DATA Stf[m@ARdXE\?AGy?q~dmGGPj@g
280 DATA ki?fStf[m@aSh\EYS@AGy?q~dqGG
290 DATA Pj@Gki?fEdeId@AG?AG?AGy?q~
300 DATA duGGPj@gf~NGki@GOHVXrLFGJ@aX
310 DATA nHFGmTu\_kUXxLFJ\_ce\_?DGsiEG
320 DATA opUWx@aJ\_wq~\_?~h\qJ@~PHBds
330 DATA rBQc?Ad?Ar?lqE~ci?DYWfUGa
340 DATA DIWi@Sw\_h?~f?TG\_hAwfFHiD\_sFH
350 DATA IjKcxBQcdcy?DyGG]UAGhdQhMALi
360 DATA KPSE\_oiEKWGRTEZdLE\wUXv@AR
370 DATA DXCT\_kUXx@aJ\_wAGm?q~\_OhEDmGG
380 DATA ki@BEAqSdpUXbPFGmTu\_GTQfCT
390 DATA \_kUXx@aJ\_wAGm?q~\_OhEDqGGki@B
400 DATA EAqSdpUXbPFGmTu\_WSQTCGjTU]
410 DATA \_wAGm@aJ\_NGSiP?LAafYcYDaA?G
420 DATA s~NRfd@G]iPhkBN~H?GWhIPf[dyC
430 DATA \_0~"ErDsxBEYDqBYDuBfQ@I?erBs
440 DATA AW]NpqRq~Bn@\_w~"KXjEduBQdqBQ
450 DATA cIDWH@GMhB@QihcQITWxhYofadI?
460 DATA DMEGEPAYws]QgeZAZ?@CH@Gix}se
470 DATA HJA(H?az~bKsrBaz~Bqx~BUSrORL
480 DATA ?ar\_Lwd?k]TPSRQx?rVnEbKChdL
490 DATA TICSXZzb@fdPXhsq?hRd[MTOfcR
500 DATA KLRVdmjU~YdOLpaJnSkqPRitYvLw
510 DATA brdxepBieIbIB@ARdXE\iKSWoLFG
520 DATA KLeIQTE\thfZiKDYhXE\osYiOSX
530 DATA kTEldhaXogQ0\_OsZvxeIB@QTohAT
540 DATA fHeIR@VWbTeIBiEXhQPrLUWoTeI
550 DATA eDbIeHbIeLbIeTbIeXbIefbIedbi
560 DATA B@aSh\YshA]lab?LQ?LEb?LU\_?
570 DATA h}VbMx~bm~bLx~bLx~h?sgR}VY?
580 DATA Lye~hEWfEdiADECUHY@Gm~"iF?az
590 DATA "Ji?oiE~?QbCuX\_rsAP\_Cs[te[
600 DATA ndEXr@AGAdFGC@ASHVYd@AG[u.A
610 DATA "jKsTVi?OnOpFAI@DbGsBoCG\GiA
620 DATA daWv?W@cQ?LfD]Wv@W@ch?iCdYwv
630 DATA AW@kKgGEht\_iJfs]rCG\?yX\_VE[
640 DATA UcYBDqTmrVPe?W@aErDstjGEht\_i
650 DATA OZ]hGeh~TSyfx~"dDYWe?W@eWcEi
660 DATA DyRiTcE?D]BGkiPBIGo\_BieZfHVW
670 DATA sTFZfPVYnxu[?AGXiUlfGVX\_OUX
680 DATA fPeJLg\_AEAASKTUWrTEGdxEdHFG
690 DATA xiUq@aZfUX\_gBG~BI~\_?~"Hv?{
700 DATA kcKGOU~q?AZ{H~FsK\_GKE?az~rSt
710 DATA K{fBkAOaOif?az rSt[?az~fHN
720 DATA \r?j?{fCIGPyBQOVNGkip~"iv~

```



```

730 DATA ~toAJko~hEO?BAI?[_]~oiE~?AG
740 DATA _{~hBeC\_H~GcAcM@\_w~"dMGEh@BG
750 DATA m~NGki@GL?q~hiOf[dJ?U?az~bKp
760 DATA [@\i\_oiE\_wAGm@aJ\_CngAcJ?UgcQ
770 DATA IhCEh@BGm~"m?WPIN\_PYo?az~bKq
780 DATA OOMGf~nxBUY\_Hf?KUAEGki@BICwS
790 DATA dpUXbPFGCdeXeduWtpElx@ARdXVX
800 DATA k@AIP?QJ\_ORI\_NG\_NMhFRQC?ji
810 DATA DEepf@E?g?G~"Y?aAOiOAAI~JI?
820 DATA Iecf\_w~"gBmIOV~bOLOi?tWSBGi
830 DATA \_AOiGSw\_h]@Gm~na\_w~"xMff\_w~"
840 DATA GZ{OVNy\_JHsbBI?xMoF\_w~"GBKE
850 DATA OVNg?OGNaIOi\_TWNh}~c{KszZ]N
860 DATA IBlihASf{cYyDugBgC[_]Vc{GC
870 DATA zZ]NevbqOJNWUCod?C?O???????
880 DATA V?~?Y@????????@K~"????????od
890 DATA ?s????????@K~"N{~"in~"Fo{
900 DATA er{f~"v~"AO?B{r~"RWBZGBxN~"x
910 DATA NbHK~"iNeKc~"ei{fo{v~"rN?A??
920 DATA ?A?~Ko?????o?BoEfGaOCpG}~C~@
930 DATA [_?C~?M?NC~?@AoOB\_FAO?EC~?{
940 DATA ?c\_CcwFAO?A?F~?C?O?AoBo@G?@N
950 DATA CEG{?{f?C~?C~?C?NcEGC@CaoBoB
960 DATA PGANG?@wV?oA?oA????????PEPCP?
970 DATA ?Eg\_BQWfEAqfwdy~"Lyc~"Lye~"hAOB
980 DATA jx~"i~"vGY~"vWY~"fySLQ~?h}PbDGOi
990 DATA hVg?h}Pfbci\_Lyc~"hAYbm~"i?Sga
1000 DATA W@Ujlx~"Jmx~"I~"B\luc~"lwc~"hg?s
1010 DATA ETI~"tWZ]bHQ~"OmH?Qb?wNaO[h
1020 DATA IANJh}~bBxNhHeZE~"l@DiGRi}@G
1030 DATA n}PnY?QIBg\_AH?IGn}PmY?aQI@qj
1040 DATA ~KqCeGYgUI~"tWO}vIO}fA{LAC~
1050 DATA ijmyijmyij]AGSGO}BezBGObLxNe
1060 DATA G@yBpIOb?wNaO~"iOsGY~"fyHlee~
1070 DATA gfYh{Bcie~"ipuYdFYfXVcLeEp@
1080 DATA uZmtEZjhUYw\ftPv[qDFWnxV~"kl
1090 DATA eJxfsPuSBPHRKOnNkZExMqLLSzl
1100 DATA rESLJXZTv}Dmhdz[yuvmf}z~"Gy~
1110 DATA iEKGLA\_BIBpihAO{ciBduBg?iB
1120 DATA iIJGhKcxJL?gTGSiA\_BDYCKCci?
1130 DATA oJOi~"VwR\_gxHdmSc{Ky\_BGscBK?
1140 DATA OnLxiSYNHZ@sRJI?~qOm[DQf?W@y
1150 DATA GAfi\_bEsoBegVcy~"TQ\_qOkngJcI?
1160 DATA \mSHIBf}LYh?dyVjTIOf~"U?AK?@
1170 DATA DW?AK?fD[GAIqksrmi{rh}TihIXK
1180 DATA QIhbwwgBa\_bbAwXP]yHtFxHtk}zQ
1190 DATA "qyQSm]OjRXOMi@JYwGJZYcPZAfP
1200 DATA E@fmdTemoVUXORL[qPinkpuntQDT
1210 DATA teJJapQmkoAq]Jf~"Gzn~"c@?fcPE?
1220 DATA [QE??OH?OE?@A??OEf??X[A??
1230 DATA cpH?OE?@A?X[aduWpDVcPEXihe[
1240 DATA qHf\U@?@Go?D[GAlmWbNAXcQP@??
1250 DATA ??AG~?Q]cieWnxchKeY]~"0~"B?C
1260 DATA C?I?o~"hJAAI~"BM?00?g@?l?~"Nf
1270 DATA @IiDENGCCcy@DMWnx?QfEtZcgSGV
1280 DATA dEGCBoSKasJ]g\_SfatZ]g\_Sfbdy~
1290 DATA DUEGEPqhlShKfESnOaQfatZcgSW
1300 DATA huOfEd@aPcSY\_oB@YWSER\afIgTUR
1310 DATA \eFIKI]GgErXkTh]g\_UxLtx]g\_Uf
1320 DATA b?UfaTY\_ovO?i~"RxaTgWhAOxbTW
1330 DATA huOfEd@aPcSYRGtIRGtJcgSgWiEHl
1340 DATA DMui~"VWX\_WCHgEPXktHcg\_UXLtx
1350 DATA gsZcg?p?KtkGdMG{BoCsacy\_hDwn
1360 DATA xEACEcs~"Wcu?wu\cg?XMD}SnwfA[
1370 DATA Hcs~"Wcu?oJ\_pNTgrtYutf@J@t]Ud
1380 DATA eTGS\_gxHIAHIDySnPaQfENTyQDADG
1390 DATA Y]QhJTxXK@LGI_EHID}SnOaQfMTZX
1400 DATA TZEkCSjXT]UfO@aefsJ]gSgRiefI
1410 DATA D]ShJTGS\_gxHiefIOgO?i~"RxJThX
1420 DATA K@LgdmSdepCsaw\cgsZ]g?pDtYEM
1430 DATA i?x?}fFIi?fFI\afIO}f~"xEARDKQL
1440 DATA efbIOM\_vx?QfEMtJ]g\_RmMth]g?z?
1450 DATA ]fFI?EMiSgROM\_vPaQnOaAMdzSf
1460 DATA OaAkBw\cg\_PnPaQP[da]oN?Mo[Ph
1470 DATA EtT]gcA~"o?AsA?x~"ciGIjKKeosc
1480 DATA fsZcggCM\DHih?C{BQ~"cosMbsZ]
1490 DATA ggSVx?fQI?@~"u\_sFHKlRgl]wzh[Vb

```

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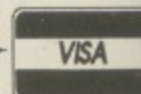
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1500 DATA F}Uh?AIGEBWhB@nMhAOE{ciMdubg
1510 DATA ??I?pqBKE?I_pqBKdW]NgR}00v]i
1520 DATA xYb_0~"IUC_OCfADIGCKCY?DAWi
1530 DATA ?SWahEOEIAUnMfAaAqTdsy?As{?
1540 DATA A?~}hAOBfW~iOsWG}fIOLEa~hATb
1550 DATA fWNRiPaaIfYmJTQQ~FA@~QOI?TGN
1560 DATA heUfIsZcgcC_IhSQ~bPY?fSIWjcQ
1570 DATA dtRfI_UIF_PX{SGNOI_xisZ]gcC_
1580 DATA IhCQhonAdpRf{?h?evRiGSWQgdq?
1590 DATA Dud{EWSQEvDsyVYQXmSH_AOC{CHN
1600 DATA dqrdCSYNTU?WhAOEJTGRDuSpb@B@
1610 DATA oJoi~VGXETECrSiWWSuQdmShbTER
1620 DATA DqShcTURDuShd@~AEGeHbXAXKEDH
1630 DATA @~qGdSYWocAsscy?DATi?SwRdyVf
1640 DATA M@aefSyQISHXhAOEINTy~DyCGY]Qh
1650 DATA JhOdfpsvcSi~ITHXd}fQTJER~RQq
1660 DATA @~?EdyfqDmcQWSuQTYUH~hSfJhCE
1670 DATA dISdfpsvcSi~TYUH~TxXh}VfPaQi
1680 DATA ~vHcg?qGdSy~\aFIIdVfxARXNQh
1690 DATA }@BBhAWfxQi?hJg?nAh}VfxQi
1700 DATA ~vHJg?qGdSy~\AHIdyVfPaARXNQh
1710 DATA }TgWd}VfbdyQDUEGEPqhJfPYITwQ
1720 DATA OI~xKTyQWSJRDyVhKdM?D}FW~?QO
1730 DATA L?AG~?AG~?AGhAOE{CUWfIEIHREc
1740 DATA EcMXeRGsufkAOYoiW]fOZ~fQTYf
1750 DATA Ig_AIS_SwbPXEUgfdQWFXUwEhAOX
1760 DATA GUGaWfyF~w~hMAGm~"iP?az~Bi?
1770 DATA xYG?IhcQIEPYGAaz~fj?c?BWCeA
1780 DATA ~w~"GAPx_dI?DyRiySwNaY?g?dI?
1790 DATA PyBq?BKsxfy~PyBq?BCsxZ}NIBly
1800 DATA hAOEChIeBSh?d{BOQOI?SGOh}~f
1810 DATA AtZ]gc{?OGPqiBbBiEIHn?CFc{~
1820 DATA o?BRL_QnPaQq?~jHiaFIIDYsnxÉAC
1830 DATA KcI?wSmPDYS?S~}Jsg?xCOfoh
1840 DATA E@R@IAHio~ygmEORJ~XggQXQDI
1850 DATA GvJcgcHTg~[nPaQeSfAqeJCRiWQh
1860 DATA ATwOeNcAwSeODIDCBocMfoiSwiYm

1870 DATA UfAaGaGKPCltG?biO~]mWfQuTfAc
1880 DATA hBZxcQSnSfQeMfAgiSX?d{BOQOy
1890 DATA N?L}DESmwE{QEmdZ]gSwRxEHIGTGS
1900 DATA xAHIIWASH}VfUfAGY]Qi?SgPgda~
1910 DATA Ig_AeWcAeWcAeWSf{SiPwceBDubh
1920 DATA @pjNfSjigSWPaAOK{~PXJTHf?GS
1930 DATA Acc_oZoi~VXFoOoi?SXFgbMqcVCK
1940 DATA ~BnveECnLdag?CJNTqAKCcI?oJoi
1950 DATA ~VXJgbMqcVCKjB~y_ONIEJCKJWMP
1960 DATA dQSQE?~?KieHdAGK[cy~DQSiCSWP
1970 DATA aUOnvaQd[sZngSHJIBp{~ONIEBWh
1980 DATA FdAAO~OixByFKLuHhMg~_VfAOW?
1990 DATA WdIOduBg?OGNaAQInOqPOJoiVWQ
2000 DATA pqRHHDHNGBiIevbqOJ~hFdCaD]CW
2010 DATA dATfHdi?DmSf~TyRO{~x~di?wSmR
2020 DATA DySi?S}RD}Si?SgQhAOEPTyROZOh
2030 DATA MTKSOab@OXQSDETpN@j@EgCsqBNI
2040 DATA ObOhMTKSzO?koZSSe@ThMfRxoTgr

Checksums: You must use the new checksum generator — from the February 1989 issue — to check the listing.

2050 DATA d}SxPtwRdmCEDhsfJTYQDADsuUyV
2060 DATA o~oi?~RxJTWq~@QfWkb_AoiX@aI
2070 DATA gcyU_gAIXMKIoZ?Gn}~qOnMWG@Aj
2080 DATA Y[~@{~NY_w}~"oiE?~?~?~?~?~?~?~?~?
2090 DATA LM~?LN~?onngQVNW~?AG~?AG~?AG
2100 DATA ~?aODDDG~?AJ~"puZn@VB~?AG~?AG
2110 DATA ~?AG~?ARCfDG~?AEnLVB~?AG~?AG
2120 DATA ~?AG~?ARCdDG~?qJgTe{diT}k.TB
2130 DATA ~?AG~?AG~?AG~?ARCfDG~?qGEW~@
2140 DATA Mw_AIg_BMW~@Eo?BG?N?~?F?C~N?
2150 DATA ?O{~"ZM}oFn{oFn{pJ~"qNnirR~"i
2160 DATA sVnitZ~"iu~"N}vb~"wfn}xj~"JynN~
2170 DATA zr~"vn~"iz~"~?SyPIhcQDacg?cy?
2180 DATA DmdGuiAKE?AkjocBhW{UtuPt~?BA
2190 DATA OVPL{SIFo}oi@SgTiaIEHh?GYiAR

2200 DATA wCqi~VgTiaPYA_ia_ghItuQtn?BA
2210 DATA OVPLKSLJo}oi@SwTiaIEHh?GgiAR
2220 DATA adQi~VwTiaPYA_ia_ideTpWdi?
2230 DATA DqTfIdE?DiDixad?DuThZ@~"KTbI
2240 DATA EeShCEPYySwNdYDKACI?D}ThV@b?
2250 DATA hAOE_TiUoJoiOSgPIaPXETgPdYCi
2260 DATA xq@~?Xz@~?OFpm~?Ou~?~?sHci?Dmdh
2270 DATA HpCciWYQ_WjIoY?GomARTgahYTjT
2280 DATA WcFF?cHF?cZF?SvVXu@~?ceSmk?Oq
2290 DATA ?@~@EHBKKS_Sm~?~?KG_UQ~?aYi~"BL@
2300 DATA gEYi?ChNiaYQ@gYlWfPX[TVGoUou
2310 DATA W@~?cOUIVwCNU?SGVdYSQO_YlUfP]
2320 DATA [?Oe{?Om~?O~"dXF?oChh?a}j?JA
2330 DATA deCg?C@NPqRhY@NAdQTm?LEoJSh
2340 DATA RTlFOBPI?Ab@t}~?sG?nKt}Pq~BNJ
2350 DATA didGqJqhY@~"daDRshqhXfPX[TVG
2360 DATA oQOp~hBdiTQ@~?asiSIVws}VDQdR
2370 DATA tgAygr}PoN?RMCaWEYcitq@Mxr@?
2380 DATA DadhE@efEHYlk_R}k?OEXxiP_TZF
2390 DATA HF?CSc{~"o?PT{Ca_OjO}LSDJh?Ks
2400 DATA A_@Ww?E{fTyTosaxSTITHBCC}W]T
2410 DATA EzTh]dq@H~?{JWKNdQrQ}BLOEvBW
2420 DATA dqBMhf~f{SYNHfOeI?epSTITHBKK
2430 DATA PW[TeZTh]dq@oBfx{~?EevBWhAOE
2440 DATA ZfEYK@hIdqBEhd~f{SYNHdOeI?Uh
2450 DATA U@PGWSuSolSfRXQOqYOhHdACoj}h
2460 DATA GTWdqdBmhbOeI?ZvEvBWWSuSopPé
2470 DATA RXSQoYOhHdAAof{hFTWdqdBHEfOe
2480 DATA {?HnevBWCUti~BL@CQTi?SwVh?Wf
2490 DATA _TIPwceMD}BeD@Utm?NDHBCCOcKo
2500 DATA ooOh~DhNwAPXVfIRQAR}kqi?TWN
2510 DATA tqPÉRfPY?aSi{?cAW}NDRLksGT
2520 DATA H@WfTDC_WcEOH}Fqh_nQITUNDuBY
2530 DATA h[Of]TENDqBcAW}Nd}SfHEUIB?n@
2540 DATA gYSQGAi~XgPhirf~SySH@ghC@RG
2550 DATA oF@hSDINOY?hTDINO}éx~gKsnRYT
2560 DATA PzBKEOITPzBkAchNWwIP_X}NIBi}
2570 DATA PzBKEOITPzBkAchNWwIP_@A?XXXX
2580 DATA "END."



10 = 00	350 = 3F86 E	1230 = FE96 7	1570 = 8328 E	1910 = 744A F	2250 = 66B3 7
20 = 00	360 = 8286 B	1240 = 9646 B	1580 = 78A0 C	1920 = C7B 7	2260 = 6230 D
30 = 00	370 = 748C 0	1250 = 895F A	1590 = E78E 1	1930 = F619 0	2270 = 535D B
40 = 22D8 8	380 = 4ABC 6	1260 = C6D5 2	1600 = C556 9	1940 = 1595 5	2280 = 58F2 7
50 = B0F6 C	390 = E710 3	1270 = 644C C	1610 = C5C2 3	1950 = 3789 D	2290 = F370 A
60 = 148E 0	400 = C7B5 5	1280 = 85F1 2	1620 = 1508 3	1960 = D64A 9	2300 = 5246 8
70 = 5C52 D	410 = 5C93 7	1290 = C43 F	1630 = AD3D 1	1970 = EA74 8	2310 = 5B16 9
80 = ADEB E	420 = 4A8B 1	1300 = 9C4E 8	1640 = 8B6B 9	1980 = 3F63 D	2320 = 7021 3
90 = B09A D	430 = C811 E	1310 = 4962 B	1650 = 999B 3	1990 = 7DC4 5	2330 = D6C8 2
100 = 4811 B	440 = 614E C	1320 = C1C6 C	1660 = ECE1 C	2000 = 115E 3	2340 = B51B E
110 = BC0D 5	450 = 7BC0 9	1330 = 9B6F F	1670 = 616D 2	2010 = 8A22 A	2350 = 88C0 A
120 = C278 2	460 = 576D 5	1340 = 4929 8	1680 = 9A9D 1	2020 = 9144 B	2360 = 4E44 1
130 = 1332 0	470 = 9221 B	1350 = 3C9 4	1690 = 8718 3	2030 = 683A 0	2370 = 236B F
140 = A721 5	480 = 9604 0	1360 = D28F 9	1700 = 966C 8	2040 = 685B 0	2380 = 4C14 5
150 = 365D 2	490 = CAE2 B	1370 = 7874 8	1710 = C5E4 F	2050 = 5C57 7	2390 = 4648 E
160 = 56ED A	500 = 4A09 2	1380 = 199F E	1720 = 2EF 4	2060 = BD92 0	2400 = 24C6 6
170 = 25A5 A	510 = 3E97 F	1390 = 305E 4	1730 = FC81 8	2070 = B0 3	2410 = 7039 C
180 = F931 C	520 = 5005 1	1400 = 8BA2 8	1740 = D06B 1	2080 = 62D6 8	2420 = 1F0 4
190 = DE67 1	530 = EF83 3	1410 = E746 E	1750 = BBA2 4	2090 = D15E A	2430 = CAF 4
200 = 9719 2	540 = 202C D	1420 = B4D4 F	1760 = 182F 4	2100 = 2B96 8	2440 = 5075 0
210 = 769F 3	550 = 1E95 2	1430 = 5638 A	1770 = 5BE4 8	2110 = A777 6	2450 = 32D C
220 = 9719 C	560 = 7A71 5	1440 = FBD E	1780 = D0BD E	2120 = 437C 4	2460 = FFC F
230 = ABB6 D	570 = D5CC E	1450 = A2FD 7	1790 = AB9B 4	2130 = AF6D C	2470 = F92D 9
240 = 8694 9	580 = 1D33 0	1460 = 9034 2	1800 = C0FD 3	2140 = E875 0	2480 = CEDC B
250 = C1E2 8	590 = FB61 5	1470 = 1A10 5	1810 = 333D 2	2150 = 4883 5	2490 = B045 3
260 = DD91 5	600 = FE37 0	1480 = 4F1D B	1820 = 256D 0	2160 = A279 C	2500 = 18C7 F
270 = 3494 3	610 = 87DD F	1490 = BF5 8	1830 = 41DE F	2170 = 880F B	2510 = 585B F
280 = D026 C	620 = B1EF 0	1500 = 5376 9	1840 = 409F 1	2180 = 190 7	2520 = 9FFD E
290 = 8F04 E	630 = 78CF 8	1510 = B594 1	1850 = FCD1 8	2190 = 5D35 1	2530 = 1C5C A
300 = B359 C	640 = DB58 F	1520 = 9D5E 7	1860 = 887C 1	2200 = 575E 4	2540 = 77A3 8
310 = 91F2 B	650 = E93 1	1530 = D8FB D	1870 = 7431 4	2210 = 7D49 A	2550 = 2E32 0
320 = 2394 E	660 = 68F9 7	1540 = AC08 0	1880 = C6CA 0	2220 = F216 8	2560 = 8161 3
330 = 9036 6	670 = E25D 3	1550 = 8722 E	1890 = 26EE 1	2230 = B7D3 9	2570 = 8FFB A
340 = ACBF F	680 = 3865 9	1560 = BA1E B	1900 = 37B2 2	2240 = 314A 9	2580 = E9B1 1

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● BBC B, B+ or Master all half list price and very little used. Watford Electronics Questpaint £16, Questfont disc £6, AMX stop press £16, additional clip art £8. Tel: Thirsk (0845) 22779.

● Torch Z80 twin disc pack/processor, BBC B 1.2 OS, Watford DFS, Perfect Writer/ Calc/ Filer/ Games, £410. Tel: E.Grinstead (0342) 325915.

● BBC B, Watford DFS, 40/80 drive, BBC datacor-der, Selkosh GP 2504 printer including leads, manuals. Database, VU-File, VU-Calc, other software. £375 ono. Tel: 021 550 2190 after 6pm.

● BBC B issue 7 40/80T DS/Drive 1770 DDFS Genie Junior, 64K swr, joysticks, books, magazines, disc

box, lots of software, D + tape utilities, £300 ono. Tel: 061 370 7316 after 6pm.

● Complete system comprising: BBC Master 128, Microvitec Cub monitor, Cumana twin 40/80T DS/DD drives, Citizen 120-D NLQ printer, roms, magazines, books, software, desk, all excellent condition for £875 or offers. Tel: (0432) 56700 after 6pm.

● Master 128 £250, 40T disc drive £50. Tel: Pete 0245 321285.

● Master 128K Watford dual double sided disk drive, Quest house, Philips 8833 colour monitor, manuals, hardly used, £500 ono. Tel: (01) 572 0957.

● Acorn Z80, software, manuals £100. 80186 Co-processor and Co-pro adaptor (runs Wordstar, Lotus 123 etc) with manuals and software £110. No Offers. Tel: 098683 403.

● BBC B, Acorn DFS, software, manuals £200. AMS 3" disc drive with 9 discs £40. Solidisk 2 meg 128 board £35. Master PC-style case £30, Termulator £10. Tel: 0993 843901.

● BBC B Solidisk 40/80T DFS + ADFS. Wordwise+, metal case, separate keyboard £250, B/W TV £60. Tel: 01 445 5203.

● Archimedes 310M colour as new £945 ono. Spellmaster £37. Tel: Bedford (0234) 267067.

● BBC B, DFS, Pace disc drive. Light-pen with software. Loads of games. Bargain at £300. Tel: 0625 871154.

● Teletext, Adaptor, rom, 2 manuals, BBC+ Master, new condition only £60. Tel: 0202 532216. Also other BBC hardware, software sale.

● Propunter £20 or swap AMS mouse. Tel: 0224 742866 after 7pm.

● BBC B Dual 40/80T d/drives, monitor, rom board with W.P., S/sheet, D/base and utility roms, manual books, software. Tel: Guildford (0483) 33702.

● BBC B Issue 7, Microvitec colour monitor, cassette recorder, various books and manuals and all leads included. All for £250 o.n.o. Tel: Cheltenham (0242) 571238.

● BBC B, DFS, 40T drive, manuals, software. Tel: 01 441 1019.

● Master 512, dual drives, green monitor, printer, manuals. Lots of original software £950 o.n.o. Excellent condition. Tel: 0202 888441.

● BBC B with dual d/s d/d switchable drives, mono

monitor, Z80 second processor. Quest mouse + paint. Amx Stop Press, Wordwise2 + Wordaid. Plinth termite control interface, rom/ram board + discs and games £475 o.n.o. Tel: 01 806 7120.

● BBC B Issue 7, twin 40/80T switchable. C/W Plinth, 32k SWR, ATPL Board - Full. RGB col/mon, (new) Viglen Consul, teletext adaptor, Amx mouse, draw/pad, joystick, boxes of discs, numerous roms, 100's of games £750 o.n.o. Tel: 02814 3669 or 01 900 7594.

● Master 128 dual ds drive, Quest mouse and paint. Joysticks, manuals, disc software £650. Cassette Recorder, lead, tape software £50. Micro User sound sampler boxed software £40. Tel: 0562 69575 after 6pm.

● BBC B, Issue 7 in PC case, DFS, drive & dualling cable. Microvitec colour monitor, datacor-der, speech synth. Replay, Mini Office II, analogue joysticks, Amx mouse. Superart, discs, tapes, box, books, software galore, best offer around £455. Tel: Brighton 0273 670609 after 6pm.

● BBC B Plus with manual and Sidewise Plus Expansion board. Excellent condition £225. Tel: 0264 710314.

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Statistically significant software

Mike Mahon compares five statistical packages for the BBC Micro

You may need a stats pack for a number of reasons

In the early days of the BBC Micro there was very little software dedicated to data handling and data analysis, despite the micro's speed and graphics, which lend themselves readily to heavy number crunching and data presentation. This is surprising since the BBC Micro and its later incarnations are employed widely in schools and universities, research laboratories and industry where data handling, data analysis and data presentation are used regularly.

Indeed, within these institutions homespun statistics packages were rife and now a number have emerged giving us today a choice from more than 25 regularly advertised statistical software packages.

From them we have chosen software at various levels of sophistication – from the simple to use,

and simple to adapt, to the powerful packages which may interact with spreadsheets or databases. Here I will try to present the flavour of each, its strengths and weaknesses, rather than a complete account of every statistical descriptor or test offered by the software.

You may need a stats pack for a number of reasons. For example, if you have lots of data you may wish to present it in a more readable format such as a graph or histogram. You may also want to know the average value, highest, lowest and perhaps some descriptors of the shape of the distribution graph.

If you have more than one group of data – usually small samples from large populations – you may want to know if they are likely to be different from each other or whether any difference is due to chance sampling.

Where separate values have been collected from the same individuals, for example height and weight, you may ask if there is any relationship between them such that you can accurately predict one from the other. A good statistical package should therefore have a fair number of the facilities shown in the adjacent panel.

So let's see what some of the current crop can offer, bearing in mind the wide range of prices and needs of different users.

WHAT MAKES A GOOD STATISTICAL PACKAGE

- **Data handling:** Simple and fast data entry, single item or grouped data input, good labelling, options for alterations, additions and deletions plus data group combination and separation, mathematical data transformation and sorting. Save, load, print, porting to and from other packages.
- **Descriptive statistics:** Data group central tendency: Mode, median and means. Data spread: Range, percentiles, variance, standard deviation, coefficient of variation, standard error and so on. Data distribution: Binomial, Gaussian, logarithmic, skewness, kurtosis and so forth.
- **Comparative statistical tests:** For one, two or more data groups following normal or other distributions.
- **Association or Predictive statistics:** Linear and other correlations between two or more data groups, regression relationships between groups.
- **Graphical presentation:** Of raw, sorted or grouped data, descriptive statistics and regressions. Trend and moving average plots.

Product: Statpack
Price: £13.74
Supplier: Micro-Aid
Address: Kildonan Courtyard, Barrhill, S. Ayrshire KA26 0PS.
Tel: 0465 82288

THIS is the earliest offering of a statistical package for the BBC Micro and has been around on other machines since 1978. Written entirely in BBC Basic, Statpack provides an easily transportable and readily adaptable piece of software. The disc autoboots and is menu driven – indeed, it is so straightforward to use there is no manual.

It provides routines for data entry in user-specified rows and columns – up to about 1,000

values on a BBC B. Options include Chi square tests, linear correlation, regression and descriptive statistics – sum, SD, CV, range, median. It is particularly impressive in providing a variety of means – arithmetic, geometric, harmonic, progressive – not available on some of the more expensive packages.

Graphics are limited to text-based horizontal bar charts, though all results are printable. An excellent menu option is one which allows you to add your own data analysis routine. In my opinion this ought to be available on all statistics programs.

In summary, although unsophisticated by modern standards, Statpak still represents good value for money. It probably best fills the requirements of secondary school pupils carrying out survey data analysis. For the Basic programmer it also provides a good starting point for writing specific statistical routines. Statpak is compatible with all versions of the BBC Micro and Master, 6502 second processors and shadow ram.

Product: Statpak

Price: £17.25 (5.25in disc), £19.55 (3.5in disc)

Supplier: Chalksoft

Address: PO Box 49, Spalding, Lincs. PE11 1NZ

Tel: 0775 69518

IN addition to providing statistical utilities, Statpak may be described as an interactive teaching and learning aid for mid-secondary school level and upwards. It has been specifically designed with a number of GCSE and A level subjects in mind.

The software autoboots and is menu driven, offering six options. Unfortunately data entry is limited – only positive values in one group of up to 56 data items or two groups of maximum 20 items each are allowed. Data may be saved, loaded, or printed and there is a limited facility to amend grouped data.

Descriptive statistics include range, quartiles, median, mode, arithmetic and geometric means, variance, standard deviation, standard error, coefficient of variation and skewness. Although only one comparative test – Chi square – is available, the association statistics are fairly comprehensive for a package in this price range and include Pearson's, Spearman's and Kendall's correlation coefficients, plus standard and inverse linear regression equations.

Statpak is particularly strong on graphical representation of data and results, and various outputs are possible – frequency histogram, cumulative histogram, graphs, scattergram with regression lines – all of which may be dumped to an Epson-compatible printer. Unfortunately Statpak has a most annoying feature – the opening animated sequence looks and sounds like a game and provides a major distraction and delay to the numerical tasks in hand.

The 12 page manual is adequate and gives example printouts and basic statistical formulae. Statpak is compatible with the BBC B, B+ and Master, but not shadow ram boards. It certainly represents good value for money and although limited in range is excellent in implementation.

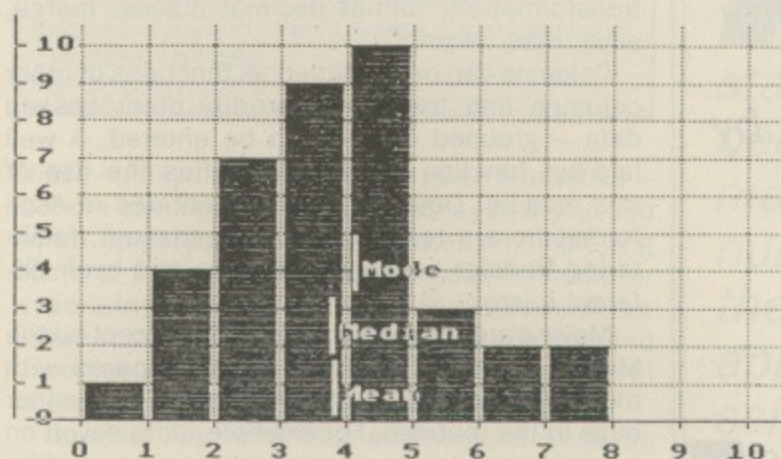
BASIC STATISTICS FOR AGE

COLUMN 1

NUMBER	SUM	SUM OF SQRs.
20	1318	89358
MEAN	VARIANCE	STANDARD DEV.
65.90000001	131.6736842	11.47491543
PROB.ERROR	STD DEV MEAN	COEFF VAR.
7.73983046	2.565869095	0.1741261826
LOWEST	HIGHEST	RANGE
36	84	48
GEOM. MEAN	HARMON. MEAN	MEDIAN
64.76363227	63.39154255	70.5

Statpak: Descriptive stats

FREQUENCY HISTOGRAM



Statpak: Frequency histogram

Product: Unistat-II (disc)

Price: £143.75

Supplier: University Software

Address: PO Box 383, Highgate, London N6 5UP

Tel: 01-883 7155

UNISTAT-II is an integrated suite of menu-driven data handling, statistical and plotting programs and provides a considerable upgrade to the already highly acclaimed original version. The package is very easy to use even for the complete statistical beginner and the 100 page manual is fairly comprehensive.

Menu option zero allows alteration of default parameters such as screen mode, colour, data disc drive number, printer type and width, and data column format.

The powerful and comprehensive data processor – option two – is truly remarkable. It allows for data entry of up to 3,000 items in a spreadsheet fashion, with options for labelling, data alteration, insertion or deletion by item column or row, data sorting, copying, or data

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UNISTAT-II (C) 1986 Unisoft Ltd

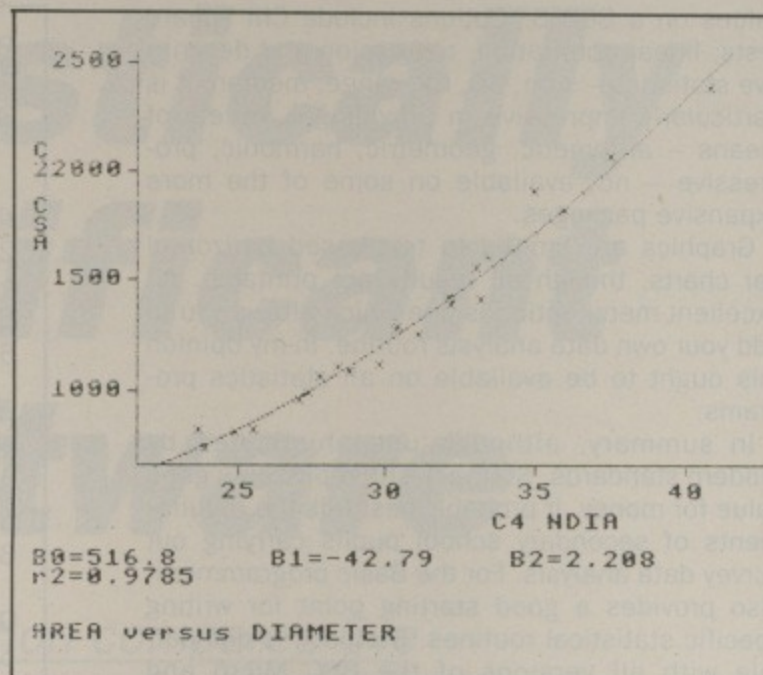
Descriptive Statistics

C(1) AGE Total freq = 21
 Min: 18.000 Max: 93.000 Range: 75.000
 Sum: 1252.0 Sum of squares: 8.30E4
 Mean: 59.619 Variance: 398.14
 s.e. mean: 4.4617 Std. dev: 19.953
 Median: 61.000 Mean deviation: 16.721

Unbiased est of variance: 418.05
 and the std dev: 20.446
 Coefficient of variation: 0.3347

3rd moment about mean: -935.88
 4th moment about mean: 3.389E5
 Skewness: -0.118 Kurtosis: 2.138
 Unbiased est of 3rd moment: -1086.1
 Pearsons 2nd coeff of skewness: -0.208

Unistats-II: Descriptive stats



Unistats-II: Polynomial regression

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transformation, format decimal places, merge, save, load, or print.

Columns can be identified as functions of other columns and therefore partially preprocessed data — grouped data — can be entered. A well laid-out function keystrip simplifies the use of this module. Data may also be entered in Ascii format from a text editor or spreadsheet, facilitating transfer between packages and even different micros.

Moving around the spreadsheet — except on the Master Turbo — is a little slow compared with rom-based software, and there are a few minor bugs in the routines. For example, data saved on a machine using the second processor was often corrupted on reloading to a machine without one. There also seems to be some problems in loss of the last data item when transferring from Inter-Sheet files.

Other menu options are also outstanding in their range of facilities. Each begins by requesting the data columns of interest and can cope with missing values. It's a pity you can't save time by selecting multiple columns requiring similar processing. The output of descriptive statistics is good but not exhaustive — where is the mode, geometric mean, or 90th percentile? Like all output from Unistat-II, results may be printed with a single key press and the same menu option also provides frequency distributions in text or plotted form as scattergrams, histograms or time series plots.

Option three gives the comparative statistical tests, correlations and data distributions. Most produce exact p-values obviating the need to check against books of statistical tables. Data can be checked against 14 different mathematical distributions — five of which I have never even heard of before. Parametric tests include paired and unpaired t with equal or unequal variances, and the variance ratio (F) test.

Nine non-parametric tests are available including versions of Chi square, Kolmogorov-Smirnov, Mann-Whitney, Wilcoxon, Walsh, and

Wald-Wolfowitz. Non-parametric analysis of variance — ANOVA — for comparing a number of columns include Kruskal-Wallis, Friedman, Page's L trend, Cochran's Q, Jonckheere's trend, Somer's delta, Goodman-Kruskal's gamma and Kendall's tau.

Parametric ANOVA is available from a separate menu option and is extensive providing nine versions up to three way with two repeated measures. Correlations include Pearson's, Spearman's, Kendall's, point biserial and tetrachoric. Multivariate regression — which looks at the associations of a number of data columns simultaneously — is impressive and could account for missing values and produce a correlation matrix.

Finally, although all other parts of the program can print the screen output, option six provides high resolution plots including up to six overlaid time series, scattergrams — unfortunately with only one regression line — graphical plots of functions and, most impressive of all, curve fitting and equations to polynomial functions. One item missing from this section, however, is a user-defined axes scaling routine.

Although Unistats-II can run on the BBC B, B+ or Master, and utilise shadow ram or the 6502 second processor, its protected disc format does not allow for transfer to ADFS or hard disc, and you can't add new statistical routines. Overall, Unistats-II is an excellent statistical package and I hesitate to be overcritical; perhaps this is owing to familiarity brought about by its ease of use.

Product: Instat

Price: £85 (eprom and disc)

Supplier: University of Reading

Address: Statistical Services Centre, Department of Applied Statistics, University of Reading, Whiteknights, Reading RG6 2AN

Tel: 0734 861239

INSTAT — Interactive STATistics package — consists of a 16k eprom which may be fitted into any rom socket of the BBC B, B+ or Master and a double-sided 80 track disc holding the dictionary

It's a pity you can't save time by selecting multiple columns requiring similar processing

of commands, Help messages and example data files. You are recommended to produce working copies for each application – spare labels are provided.

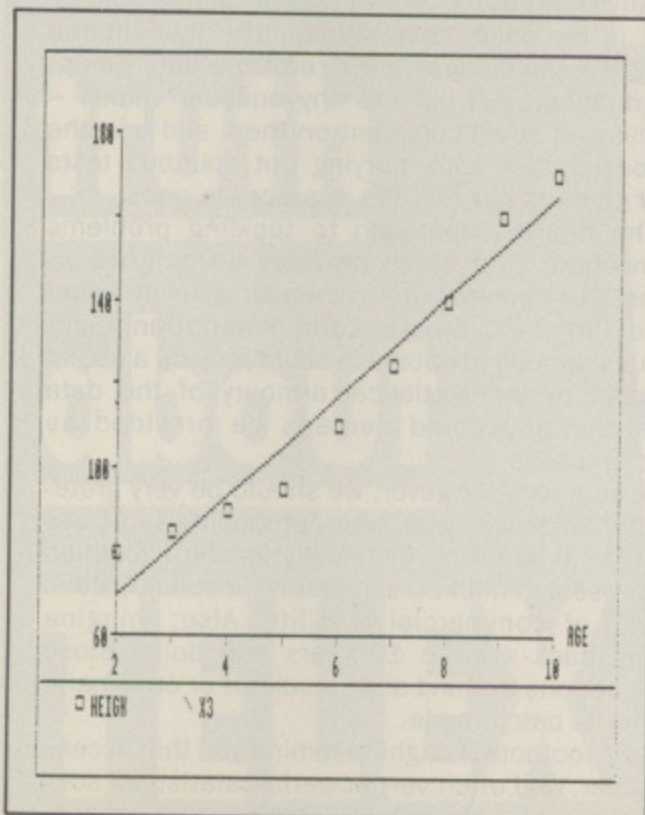
Documentation is thorough, and comes in the form of three lengthy manuals – a 150 page Introductory Guide, Reference Guide – 96 pages – and Supplementary Guide – 69 pages. A Programmers Guide and an Educational Guide are also available according to the supportive Instat Newsletter.

Instat, although similar in scope to Unistats, is implemented in an entirely different manner using around 90 three character commands. Data entry requires setting up of a worksheet and the use of READ and ENTER commands. Although memory held worksheets are limited, disc based ones allow large data files to be utilised – up to 40,000 items on a double sided DFS disc. Data may also be fed in from elsewhere using Ascii files. Data manipulation is extensive and can include labelling, sorting, selection of subsets, introduction of function columns, addition of constants, column locking and data display. You may also generate random numbers from 10 different probability distributions.

Descriptive statistics – using commands such as DES, STA and CAL – give the mean, range, percentiles and standard deviation, and may be used to calculate the coefficient of variation, confidence intervals, standard error, skewness, kurtosis and so on. Data may also be checked against a number of probability distributions such as binomial, Poisson, t, F, normal, gamma or Chi.

Tests include goodness of fit, Chi square, Kolmogorov-Smirnov, Mann Whitney and ANOVA. Correlation values – Pearson's – and correlation matrices may be estimated as well as regression values and plots including multiple, weighted or polynomial regression. Analysis may be carried out on columns or rows and can deal with missing values.

Graphical display is by way of histograms,



Instat: Linear regression

scattergrams, boxplots, needle plots, stem and leaf diagrams and time series graphs. I liked especially the possibility of producing linear regressions with confidence interval curves. PLOT and HISTogram produce high resolution displays, requiring shadow ram memory extension on the BBC B and these may be dumped to a printer via an inbuilt Epson or NEC utility. Sequences of commands may be stored as macro's avoiding the need to retype for each data set.

Although more difficult to operate than the menu-based Unistats, Instat is more flexible and does provide an online Help facility and diagnostic error messages. Recent enhancements provided with the Programmers Guide – £23, manual and disc – include facilities to interact with database files and to add user defined commands to the dictionary.

Instat works on all BBC Micro configurations including shadow ram and second processors (6502, 32016, Z80), DFS and ADFS.

Product: First

Price: £150 (disc)

Supplier: Serious Statistical Software

Address: Lynwood, Benty Heath Lane, Willaston, S Wirral L64 1SD

Tel: 051-327 4268

FIRST – Fully Interactive Regression Statistics – is more specialised than the packages discussed so far. In particular it concentrates on employing some of the newer and more robust methods for assessing and predicting the association between groups of data, critical data analysis and experimental design. First is therefore unique in micro stats packages – if you need it, buy it.

However, as more non-statisticians such as biologists, health workers and social scientists become more numerate in their approach to scientific data analysis, greater numbers are likely to realise their need for such a package. Nevertheless, First also provides the more traditional statistical analyses such as mean, standard deviation, range, skewness, kurtosis, percentiles, Chi square, t test, up to three-way ANOVA, Mann Whitney, Kruskal-Wallis, and Friedman.

It can handle missing values, transform data, generate random data and locate outliers as well as plot, print, save and load. Upwards of 1500 items may be entered depending on the memory specifications of the micro used. As stated earlier, First's forte is regression analysis and it incorporates multivariate regression with ANOVA and residuals, linear and non-linear curve fitting, weighted and robust regression, cluster analysis, contour plots, diagnostics, time series and autocorrelation.

First is a massive program utilising disc overlays and its format is more in line with Instat than Unistats. Although it is interactive and includes a Help page listing nearly 40 two-character commands, First is not particularly easy to use and I only managed to unleash portions of its phenomenal power. The documentation – more than 80 loose leaf pages – is good, referenced

As non-statisticians become more numerate in their approach to scientific data analysis, greater numbers are likely to realise their need for such a package

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and indexed. Furthermore, free technical advice and support is offered for two years by the author G. R. Edwards.

Although First can operate on a BBC B, B+ or Master, it seems that separate versions are required to make use of shadow ram or second processors – a major disadvantage to portability. Its heavy disc protection also means it cannot be ported to ADFS and hard disc, again you need a separate version. First is also available for the Archimedes.

I tried version 2.76 – BBC Micro – although the program is continuously being revised and the author has recently added a few new routines.

In summary, First is currently most likely to be used by statisticians and find a place in university and industrial applications – for whom approval copies are available on request – although later versions, perhaps with a more user friendly interface, are likely to have wider applications.

The bottom line

There is something here to suit everyone's needs. If you can afford it, Unistat-II is a good buy.

Summing up

The two cheaper packages – Statpack, Statspak – performed well, particularly with respect to statistical descriptors or graphical representation and provide adequate data handling and analysis for the majority of people at good value. They were, however, limited in their range of inferential or predictive statistics, especially those requiring lookup tables, and would not be ade-

quate for an industrial or university research group, for example.

The more expensive packages obviously offered a more complete combination of these functions. However, I was a little disappointed that less care had been put into some of these than the cheaper versions and there were a number of notable statistical omissions. Unistat-II and Instat were on a par for both price and facilities, the former offering an excellent idiot-proof comprehensive menu-driven package and the latter a more flexible and even more powerful, but more difficult to learn, user-designable macro format.

For powerful regression analysis First obviously goes the whole hog and although excellent has a limited usage for the beginner or casual user.

Overall, my vote goes to Unistat-II for its ease of use and range of facilities although an enhanced and more crashproof version III with inverse regression, confidence limit plots, confidence ellipses, frequency histograms, data distribution checking and user added routines would not go amiss.

However, if you wish to build your own routines, Instat would be better. Ideally a combination of the top of the range statistical programs with a user friendly input and graphical package would suit almost everyone.

I must also add that in a number of these products the software protection restricted program usage and certainly adaptability on different configurations of the BBC Micro – indeed, so much so that there would have been a sixth package in the review, but its disc protection excluded me from using its main statistical routines.

One small gripe is that none of the software attempts to tackle the old problem of *Garbage in, Garbage out*. With the ubiquity of micros, many owners without any formal training in statistical theory – and sometimes without any common sense – can enter data into a micro, press a few keys and produce impressive-looking statistical results to endless decimal places, which may be totally worthless – or even worse, dangerous.

It is my belief that with a little thought the program could check the size of the data group, its distribution type and any unusual values – outliers. It could comment on them and trap the innocent user from carrying out spurious tests and perhaps suggest the appropriate ones.

The nearest approach to tackling problems came from First which provided warning messages. Furthermore, the increased use of linear modelling and Monte Carlo simulation techniques applied to data sets could provide a useful adjunct to the statistical armoury of the data analyser and could perhaps be provided as add-on packs.

In summary, however, we should be very grateful for what we have since producing top-class statistical software, especially for the education and research market, can hardly be considered in terms of commercial viability. Also, imagine going back a mere 10 years and doing those calculations by hand and calculator or on a mainframe in batch mode.

As a footnote, I ought to remind you that access to other, and often very powerful, statistical software can also be gained via MicroLink, or university computer centres for registered users.

PACKAGE	STATPACK	STATSPAK	UNISTAT-2	INSTAT	FIRST
Data handling					
entry	••	•	••••	••	••
amend	•	•	•••	••	•
transform			•••	••	•
sort			•••	••	•
Descriptive stats					
central tendency	•••	•••	•••	••	•••
ranking	•	•••	••	••	•
distributions		•	••••	••	•
Comparative stats					
parametric			••••	••	•••
non-parametric	•	•	••••	••	••
Predictive stats					
correlation	•	••	••••	•	••••
regression	•	••	•••	•••	••••
Graphics					
distribution	•	•••	•	•••	•
association		••	•••	•••	•
Ease of use	•••	•••	••••	•	•
Adaptability	••••	••		••	
Value for money	•••	•••	•••	•••	••
• limited •• moderate ••• good •••• excellent					

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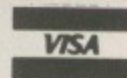
"*Pixel Perfect* is every bit as good as those DTP packages which run under the PC Emulator – and much, much faster!"

"The verdict? If you need to produce quality presentation material with no fuss – then buy this package. It represents good value for money." *Micronet*

All BBC versions £39.50 (5.25 disk) £41.70 (3.5 disk) Archimedes £79.50 plus VAT (no charge for p & p)



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*THE following key definition provides a convenient method of intermittently saving text files from View and can be set up using a !BOOT file which must also include *FX228,1:*

*KEY 11 "!! !! !! !! {sa t
emp!Ms ^-^-^-!M!;!U!;!U!
!U!;!U"

To save the file at any point while you're typing text all you have to do is hold down the Shift and Control keys, briefly press Copy, then release all three. You can then carry on typing if you wish – even while the save is taking place.

It works by inserting four

Order of the boot to auto-save with View

Highlight 1 characters into the text. An Escape to command mode occurs and the file is saved under the name temp. Then a command to search for and delete the four Highlight 1 characters is issued.

The saved file will have the latest set of extra Highlight 1 characters, but as these cancel each other out this is immaterial – they can be

reduced to two if you're not using extended highlights.

A further benefit of using a highlight code is that there is no unintended word-wrap if they're used at the end of a line.

If you don't have View A3.0 you may find it necessary to use one of the red function keys instead of Copy. — **Lawrence R. Edwards, Hornchurch, Essex.**

Teletext on the Z88

It is possible to have the full 64-character Teletext graphics set even on an unexpanded Z88.

Executing the following short section of code defines an array T\$ in such a way that the statement PRINTT\$(n) — where n is between 0 and 63 — will print the required character. The graphics are numbered in the standard order, as in Mode 7 on the BBC Micro.

```

100 DIM T$(63)
110 FOR N%=0 TO 31
120 VDU 1,138,61,N%
130 FOR LX=0 TO14 STEP 2
140 R%=LX DIV 5*2 : VDU
-56* ((N% AND 2^R%)<>0)-7*
((N% AND 2^(R%+1))<>0)
150 NEXT
160 T$(N%)=CHR$63+CHR$N%
170 T$((63-N%)=CHR$82 +T$
(N%)+CHR$1+CHR$82
180 NEXT

```

Officially you can only have

16 user-defined characters on the unexpanded Z88, but in fact there is room for 32 – although the top 16 may be lost when you leave Basic.

As 64 are needed here this program exploits the fact that the top 32 teletext graphics are just inverted versions of the others.

Lines 120-150 define the Z88 UDCs 0-31 to hold the appropriate shapes and lines 160-170 set up the array so that T\$(0) to T\$(31) contain the VDU codes to print them and T\$(32) to T\$(63) contain the codes to print the same shapes in inverse video in reverse order.

You can use this method on an expanded machine to have the full teletext character set plus another 32 graphics characters of your choice — T.D. Lascelles, Portsmouth.

release any vectors claimed although it can retain its workspace if the call is non-fatal.

When the operating system finishes tidying the RMA it calls the initialisation code of the module, which should then reclaim any vectors that were released.

Neil's Strip Control doesn't do this. Instead the initialisation code checks to see if it has been already called to set up the system variables and vectors and, if it has, terminates without doing anything, so the vectors are not grabbed the second time.

The result is a module which thinks it has claimed a place in the printer vector's queue when it hasn't. The error occurs when you give a second RMTidy because the module tries to release a vector which it doesn't have.

This fault is very simple to cure and only requires moving four lines of code – the vector claiming part of the initialisation routine.

These lines should be placed before the three which check if the initialisation code has already been called. You therefore need to move lines 320 to 350 to in between lines 280 and 290.

With these changes, I have found that the program behaves correctly for all module commands and is now compatible with other software that tidies the module area. — **George Taylor, Cambusland, Glasgow.**

Stripper revamped

In your August 1988 edition you published a relocatable module program for the Archimedes by Neil Strong which stopped control characters being sent to the printer.

It works fine apart from one serious problem – it cannot handle the *RMTidy* command.

On issuing this nothing appears to go wrong but the module no longer stops control characters. This failure can be clarified by issuing a second RMTidy which produces a Bad vector release error message.

When an RMTidy is executed the module is temporarily disabled by the operating system calling its finalisation code. This should

Win a tenner

● Want to write to The Micro User? The address is: Letters, The Micro User, Europa House, Adlington Park, Adlington, Macclesfield SK10 4NP.

Writers of the most interesting letters receive a £10 prize.

Thriving Down Under

I AM the secretary of the Auckland BBC User Group, ABUG. We have been established for some years now and would like it to be known that we are a thriving club using Compacts, BBC Bs, Masters and Archimedes. There is a user base of about 40,000 machines in New Zealand.

Thank you for your excellent magazine, which all of our members eagerly await each month. — Theo Olifiers, ABUG, P.O. Box 9322, New Market, Auckland, New Zealand.

£10 Prize letter

Multiple prints

I HAVE a reliable old BBC B which I regularly use to write newsletters for clubs and societies using View.

Can you tell me how to print multiple copies – say 30 – of any file so I can greatly speed up the printing process? Currently I do them one at a time

Turn to Page 130 ►

◀ From Page 129

by re-entering instructions. — M.J. Stickland, Pontypool, Gwent.

● Assuming you always print complete pages, the simplest method is to set up a function key:

```
*K.O. PRINTM
```

Then repeatedly press this for the number of copies you want — the keyboard buffer will save up to 31 key presses.

Alternatively, you could change your word processor. Mini Office II and Inter-Word offer multiple copies as standard, and on Wordwise-Plus you can write a segment program to give you the feature.

The price on your head

I HAVE a two year old Juki 5500 printer which cost me about £200. Recently I have had problems with the print head so I decided to replace it, but when I phoned a Juki agent I was quoted £198 for a replacement.

The company said the high cost is due to shipping charges, but a new printer only costs about £280. If some other make of print head will not adapt I will buy a new printer — but it will definitely not be a Juki. — J. Parsons, Peterlee, Co. Durham.

● Unfortunately, this is a problem that exists with several makes of printer and not just Juki.

When you buy a new head — or any other component — the benefit of the competition between suppliers holding the price down is not as great as on the complete unit. However it is still worth shopping around for the best price.

Dump Out difficulties

AFTER the interesting articles in your August 1988 issue I bought DumpOut 3, but it leaves gaps between the lines

Problems en masse

LIKE most of your readers I have been impressed by the convenience and flexibility of my Z88. I no longer have to hog a TV set or sit in another room while I write letters like this.

I also have a few eprom cards for storage of essential information, but they are too expensive to use for longer term bulk storage — a need which would normally be met by disc or tape. Unfortunately, I

do not always have easy access to a BBC Micro to which I could transfer data and programs. Does Cambridge Computer or a third party plan to produce a disc drive?

And what is the edge connector for concealed beneath the cover below Enter on the right hand side of the Z88?

It really is a shame to see such a brilliantly designed micro without cheap bulk

storage. It could easily be a world-beater.

But who would really want to fork out £20 every time you need another 32k of permanent storage? — G.R. Williams, Cheltenham, Gloucestershire.

● The slot at the back is not for extension and to our knowledge Cambridge Computer does not intend to provide any other mass storage.

when I print graphics with my Brother M1009 printer.

I've tried toggling the line feed DIP switch manually, as well as using *FX6,0 and *FX6,10 commands, but to no avail. What is the remedy please? — D.A. Patterson, Chorley, Lancs.

● The slight gap indicates that the line spacing has not been defined correctly — although Dump Out 3 will issue the correct codes any incompatible printer won't accept the command. It may be necessary for you to send a line spacing command before starting the dump.

Easy Dos it

I'VE had the Dos-plus boot disc for my Master 512 modified by Programmable Systems Design to provide the numeric keypad facility which enables the BBC B to access the IBM keys necessary for certain software applications.

When I tried out the modified disc I encountered some difficulty in making a back-up copy and rang PSD for advice. My call was taken by Ken Fullbrook who rang me back later that evening to discuss the situation.

Although it was quickly established that the fault was not caused by his modification, he spent over half an hour on the phone estab-

lishing exactly what was wrong. To meet this kind of courtesy and consideration following such a modest financial outlay is worthy of mention and commendation. — Rex Conway Crapp, Carmarthen, Dyfed.

With a View to some £s

I HAVE recently bought a Master with the View word processor. Unfortunately the pound sign comes out as an apostrophe. Any advice would be appreciated. — Tom Pythian, Brandleholme, Bury.

● You can use the routine from Letters in our January 1989 issue, entitled *Minimalists strike*. Prepare the routine and save it on disc, enter View and type *RUN KODE. Now issue:

```
*CODE 96 35
```

When code 96 is printed it is converted to Ascii value 35 which should print as £.

Listing files

I RECENTLY bought a printer and immediately typed in File Lister from the November 1987 issue of The Micro User. It works very well except for one small point: It apparently does not cater for coloured REMs and I can't work out how to make it do this.

I use them in most of my programs, so any assistance would be much appreciated. — R. Hunt, Uxbridge, Middx.

● The program changes are quite simple:

```
745 rem%=FALSE
815 IF byte%<>13 IF rem
% line$=line$+'<'+STR$b
yte%+'>':ENDPROC
855 IF byte%&F4 rem%=T
RUE
```

This will ensure all colour codes in REMs are printed as their number values.

ALL programs printed in this magazine are exact reproduction of listings taken from running programs which have been thoroughly tested.

However, on the rare occasions when mistakes occur corrections are published as a matter of urgency. Should you encounter error messages when you type in a program, they will almost certainly be the result of your own typing mistakes.

Unfortunately we can no longer answer personal programming queries concerning these mistakes. Of course letters about suggested errors will be investigated without delay, but any replies found necessary will only appear in the letters pages.

Recursive Arm power

WRITING recursive procedures in machine code has always been problematic. But with the Arm chip you can produce quite startlingly simple and elegant code. As an example here's the classic factorial calculator:

```
REM > Factorials
sp=13:link=14:DIM M%40
FOR IX=0 TO 2 STEP 2:P%=M%
[OPTIX
MOV r1,#1
.fact
STMFD (sp)!,{r0,link}
CMP r0,#1
SUBGT r0,r0,#1
BLGT fact
LDMFD (sp)!,{r0,link}
MUL r1,r0,r1
STR r1,ans
MOV pc,link
.ans EQU 0:]:NEXT
REPEAT
INPUT"Factorial",A%
CALLM%:PRINT!ans
UNTIL FALSE
```

It will not calculate very large factorials because the MUL command will only operate up to 32 bits of accuracy, and results greater than this will be meaningless.

The routine also shows how much can be achieved with so little — it's only nine instructions long. — **Dr. Anton L. Mans, Fraserburg, South Africa.**

New ribbons for old, again

If you examine a used printer ribbon you find that only one small strip along its length has been used.

The ink is usually soluble in methylated spirits or even WD40. If you remove the cover and soak the old ribbon in the solvent you can rejuvenate it quite remarkably. — **Mr. A.N.R. Campbell, Bristol.**

Crashing asterisks

I have a query about machine code — I am a rank novice at the moment but I'm trying to learn. I have written a short

program that will print an asterisk every time A is pressed — but each time I try to run it it crashes.

```
10 P%=&1900
20 FOR IX=0 TO 2 STEP 2
30 [OPT IX
40 .loop
50 JSR &FFEE
60 CMP #65
70 BEQ print
80 JMP loop
90 .print
100 LDA #42
110 JSR &FFEE
120 JSR loop
130 ]:NEXT
140 CALL &1900
```

Can you help? — **Alex Hunsley, Fenham, Newcastle upon Tyne.**

● The reason your program hangs up is both the most obscure problem we usually come across yet the easiest to solve.

Quite simply, the program is probably sitting at &1900 in memory and you are asking Basic to put the machine code in the same place. The first pass will run correctly, but the second will fail, so you must set aside an area of memory for assembly. Do this by inserting or replacing the following lines in your code:

```
5 DIM M% 256
10 P%=M%
20 FOR IX=0 TO 2 STEP 2
140 CALL M%
```

However, the first three lines highlight the second problem. Because code is assembled in two passes you must reset P% at the start of the second loop, so lines 10

and 20 should be the other way round:

```
10 FOR IX=0 TO 2 STEP 2
20 P%=M%
```

Finally, at line 120 you use a JSR loop to restart the loop. This will seem to work, but each command puts another two bytes on the stack, which is only 256 bytes long. When the stack is full it wraps around to the start again and will begin to delete important data regarding the return to Basic.

There's no return in this program anyway, but in other situations it could be serious. Just change the JSR to JMP.

That handles the errors, but the routine can itself be made shorter and simpler by changing these lines:

```
60 CMP #65
70 BNE loop
```

and deleting lines 80 and 90.

Welcome art bonus

ALTHOUGH Quest Paint is an excellent package it does not have any really good fonts on the supplied disc. If you have a Master you'll find that the Welcome disc has three files called Thin, 7by8 and Italic.

Before entering Quest Paint type one of the following:

```
*Thin
*7by8
*Italic
```

This will load the font which

will then be used by the package as font 1 — the system one. For best results you should use them with Lock size on. — **Andrew Thacker, Croydon, Surrey.**

Enigmatic errors

I HAVE typed in the Enigma variations listing from the July 1988 issue of The Micro User and checked my typing against the checksums — they indicate that I have made no errors.

But when I run the program and try to load a piece of code to decode from disc, I get the error BAD DIM at line 780.

However, if I type the code in direct the program seems to work OK — the problems start when I try to use pre-typed code from disc.

I am assuming that the file to be loaded can be created by using Wordwise and saving with the name message. — **B.J. Mahony, Marden, Hereford.**

● Unfortunately it's that assumption that's causing the problem: The pre-typed file needs to be in a special format. You can use the following program to create the correct file from the Ascii — spooled — one from any word processor:

```
10 Z%=OPENIN"code"
20 L%=EXT=Z%
30 Q%=OPENOUT"code2"
40 PRINT#Q%,L%
50 FOR IX=1 TO L%
60 BPUT#Q%,BGET#Z%
70 NEXT:CLOSE#Q%
80 CLOSE#Z%
```

DFS doesn't play the game

I HAVE a BBC B fitted with a Solidisk 40/80 drive and 2.2J DFS plus Wordwise, WordAid and WordAid Plus.

I bought three Superior Software games — Elixir, Pipeline and Play It Again Sam 2 — but none of them will run. I've tried them on another BBC B with Acorn DFS and a Cumana drive and they work perfectly.

Could the Wordwise or the

WordAid chips be affecting the games or is there an incompatibility problem? — **Mr. G. Bright, Chelmsford, Essex.**

● Although the WordAid chips could be a problem — it certainly isn't Wordwise — the most likely culprit is the Solidisk DFS. Unfortunately this software is very non-standard and upsets a lot of

games' protection.

If you want to play games you will have to change your DFS — it probably won't be necessary to exchange your disc drive as these are merely labelled by the retailer or supplier.

The Watford DFSs are all satisfactory — they don't interfere with games — and provide many facilities beyond the Acorn DFS.

Write your own arcade smashes using the

ARCADE GAME Creator

Arcade Game Creator is a suite of programs for the BBC Micro or Electron. Taken from the pages of *Electron User*, it lets you into the secrets of writing fast-action arcade games, and provides you with a number of utilities to make design and programming easier.

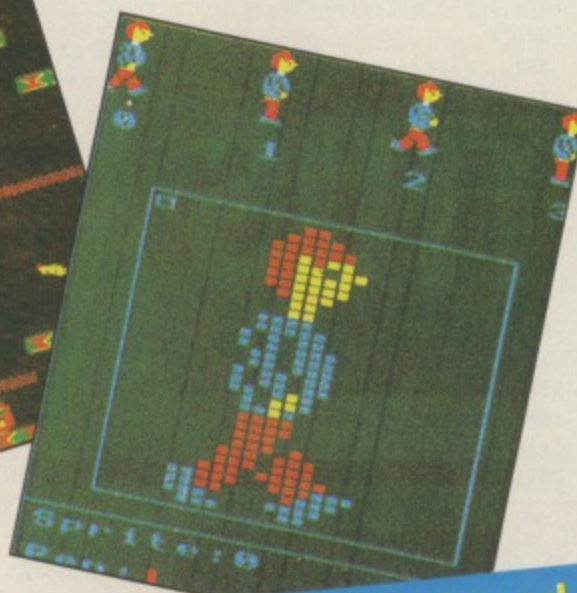
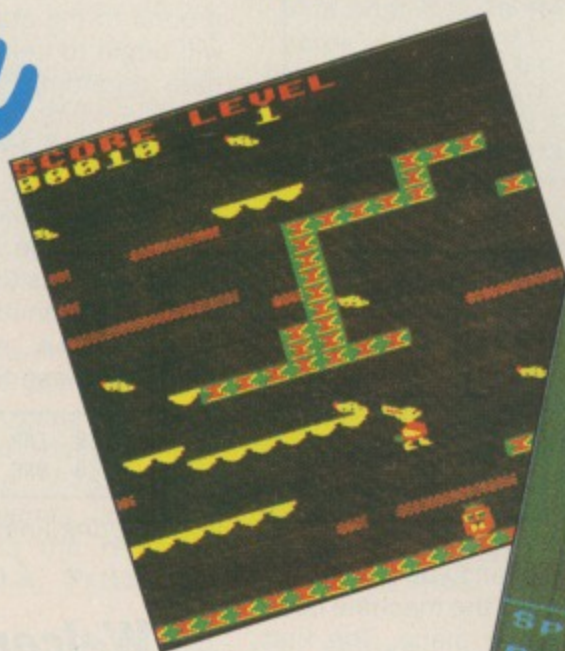
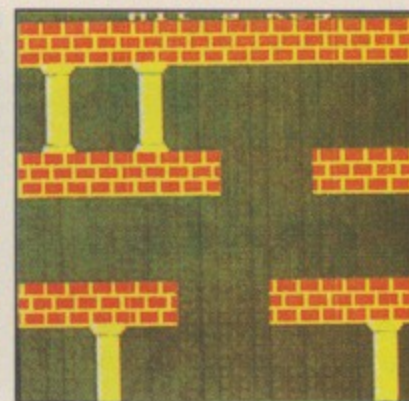
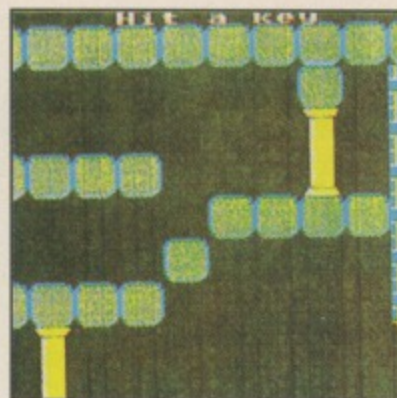
Among the programs are:

- A Mode 5 sprite editor for designing your own multi-coloured characters.
- A selection of fast print routines that will move sprites both in front or behind other objects on the screen.
- Map generators that will squeeze a Mode 5 screen into 8 bytes!
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... and much, much more.

To help you make the most of the Arcade Game Creator, you will also get a comprehensive manual based on the original series.

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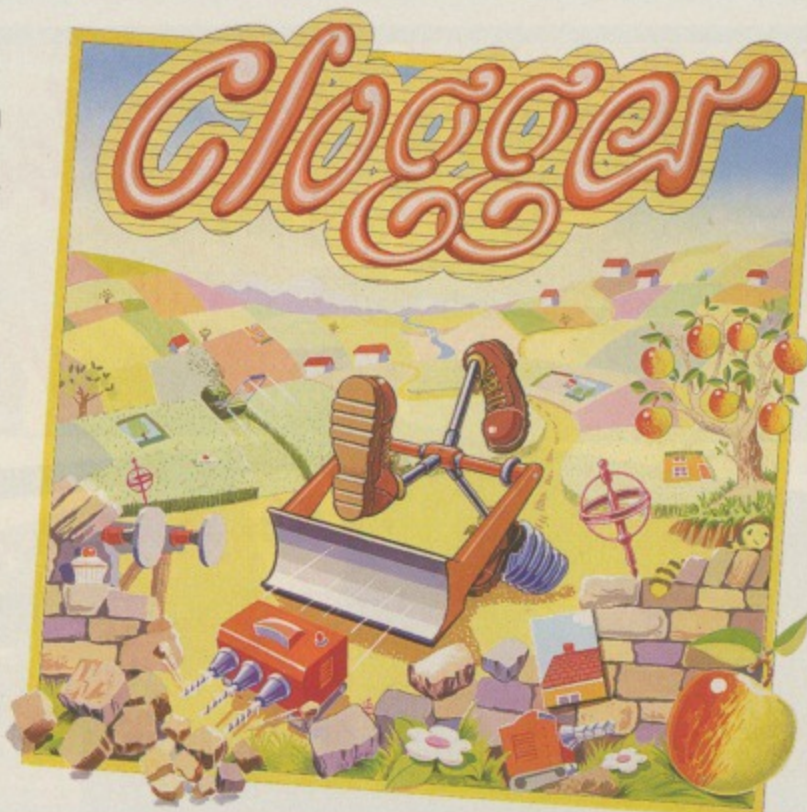
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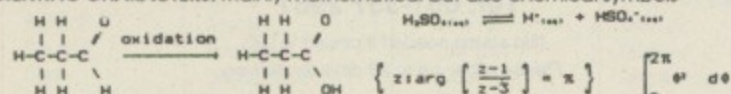
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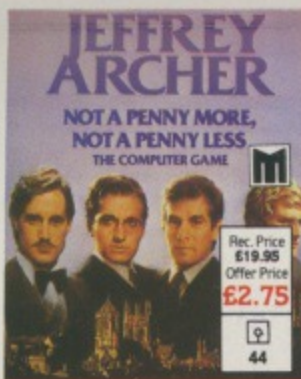
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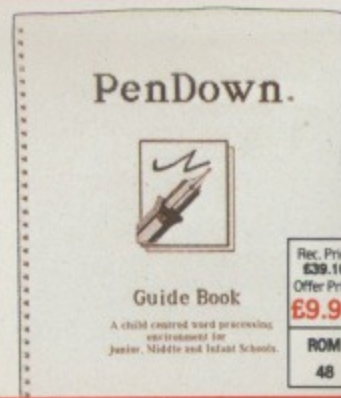
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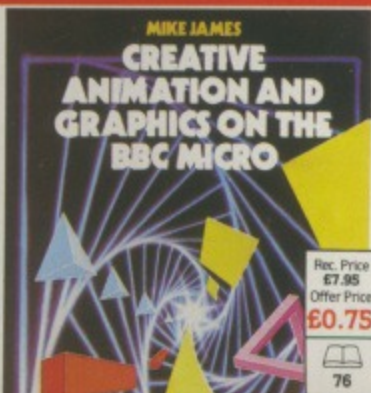
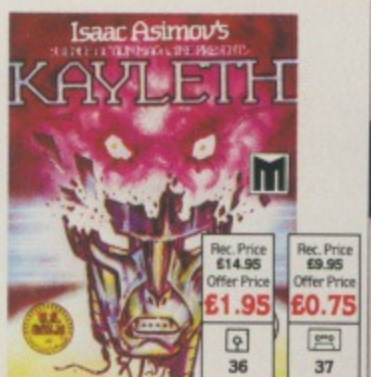
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A Database Publication

THE MICRO USER

March 1989



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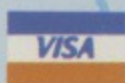
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