POPULAR Computing WEEKLY

35p 21-27 July 1983 Vol 2 No 29

## This Week

**Micro-Professor review**

John Scriven puts the MPF II through its paces and looks at the accompanying disc drives and printer. See page 14.

**Spectrum calculator**

Ian Logan looks at the advantages of using the calculator in the last of his present series on the Spectrum. See page 20.

**BBC assembler**

Jeremy Ruston presents an introduction to the intricacies of assembly language programming on page 27.

**New releases**

Latest software games including *Escape from Perilous* for Atari and *Skier 64* for Commodore 64. See page 45.

★STAR GAME★

Beltman on 16K Spectrum. See page 10.

## News Desk

# Microdrive arriving soon

First deliveries of ZX Microdrives should take place in early September — with orders being taken in August.

With the launch date of the Sinclair ZX Microdrive and ZX Interface 1, (previously called the ZX Expansion Module) fast approaching, more details are now beginning to emerge.

The ZX Interface 1 takes the form of a wedge-shaped box, the same size as the Spectrum, which sits underneath the computer tilting the keyboard up at an angle of about 20°. The box plugs into the expansion port and screws into the Spectrum ensuring a secure connection.

The design of the interface unit will make it difficult to use with Spectrums that are either inside a full-size keyboard case or connected to Micronet 800 using the Prism direct connect Prestel modem.




The ZX Interface 1 gives the Spectrum an RS232 communication port, a simple networking facility and the means to connect up to the long-awaited ZX Microdrive mass-storage devices — all controlled by an 8K Rom.

Continued on page 5

# The tax man cometh

THE Inland Revenue has set up a special team to investigate the microcomputer industry.

The IR is apparently worried about the large number of new companies that have sprung up in the last couple of years that are failing to fulfil their tax obligations.

In particular, as both hardware and software prices start to tumble, there is concern that the 'bubble' will burst and that no tax will be collected from the firms which go bankrupt or disappear.

Based in Bristol, the Special Office is currently screening and cross-indexing information from computer magazines published in the last 18 months.

Intelligence is being collated, not only from advertisements but also from interviews with individuals in an industry noted for its extravagant sales and motor-car purchase

Continued on page 5


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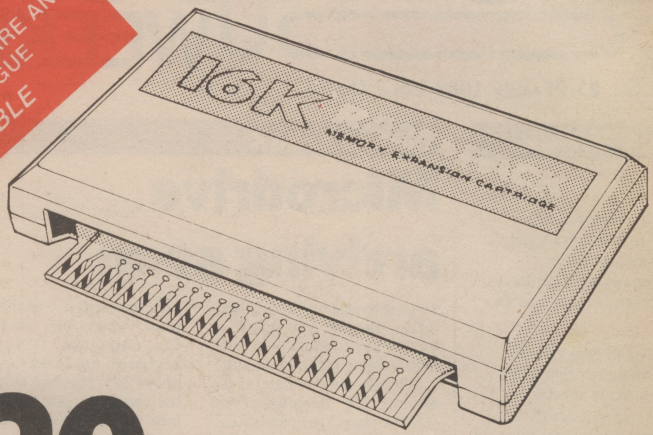
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Continued on page 40

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21-27 July 1983 Vol 2 No 29

SUNSHINE

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**Software Editor**
Graham Taylor [01-839 2504]

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**Managing Editor**
Duncan Scot

**Publishing Director**
Jenny Ireland

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**How to submit articles**
Articles which are submitted for publication should not be more than 3,000 words long. The articles, and any accompanying programs, should be original. It is breaking the law of copyright to copy programs out of other magazines and submit them here — so please do not be tempted.

All submissions should be typed and a double space should be left between each line. Please leave wide margins.

Programs should, whenever possible, be computer printed.

We cannot guarantee to return every submitted article or program, so please keep a copy. If you want to have your program returned you must include a stamped, addressed envelope.

**Accuracy**
*Popular Computing Weekly* cannot accept any responsibility for any errors in programs we publish, although we will always try our best to make sure programs work.

## This Week

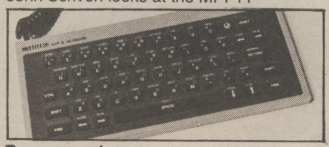
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## Editorial

Sir Clive Sinclair's £2m research institute — Metalab — is an intriguing idea (*PCW*, 2-8 June). Gather the brightest young minds in the country under one roof, pay them large salaries, give them unrivalled resources, and take the resulting products through to the market-place.

The idea is not new, of course. American companies have been pursuing similar policies for years. In Britain, however, the tendency has been to underpay researchers, limit their resources and give the end-product to someone else to market. The realms of academia and business have, on the whole, been kept completely separate.

The catch-phrase "British brains, American gains" has a kernel of truth, though it rather denigrates the innovative efforts of our American cousins.

Metalab is designed to give researchers the freedom to pursue their own lines of investigation and the incentive to make the end-result into a commercial success. It should provide the same sort of interface between science and business as the science parks, but without their attendant problems.

Whether or not Metalab will be a success remains to be seen. Certainly, Sir Clive is the man with the Midas touch at the moment. The idea deserves to succeed, if only because it is an investment in the future.

## Next Thursday

**Move the snake around the maze, eating the pounds and diamonds to grow bigger, but avoid the deadly dollars! Money Snake, next week's game for the unexpanded Vic20 by Ian Craighill.**

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# WINDOW ON ANOTHER WORLD



## NEW RELEASES FOR DRAGON 32

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Salamander Software

## Microdrive

Continued from page 1

led by an 8K Rom.

The Microdrives themselves are, as predicted, high-speed tape drives. Each unit measures 8 × 9 × 5cm and is roughly the same in appearance as the prototype shown at the time of the Spectrum's launch, 15 months ago — the only main difference being a slot to take the tape 'cartridges'. Each tape cartridge measures 30mm × 43mm × 5mm and has a nominal memory storage capacity of 100K. The tape inside the cartridge — a high-quality video-type of width 1.5mm — is in a continuous loop 5.3 metres in length, rotating at about 1.3 metres per second.

Access time to the tape is around 3.5 seconds and the information transfer rate to the computer is 16K per second. Often it will take longer to find a program than to load it.

Up to eight Microdrives can be connected — each one connecting into the last. Each one uses up about 600 bytes of user Ram in the Spectrum and this may mean that some commercial cassette software will not Run with the Microdrive connected.

A demonstration tape cartridge is to be supplied with the Microdrive.

Prices have yet to be announced, but the ZX Interface 1 is expected to cost around £30 with the ZX Microdrive at £40. Tape cartridges for the drive are expected at under £3 each.

● One reason that the ZX Interface 1 provides a simple networking facility is that Spectrums may be used for terminals in a networking system, driven by the next generation of Sinclair computers.

## Taxman cometh

Continued from page 1

claims.

Tony Slater of the Bristol Special Office said: "I am interested in finding out as much as I can about the home computer business — hardware and software — from the top to the bottom.

"It is too early to say what the results of the survey are — but I wouldn't say anything to you anyway."

The investigation seems to be developing in the same way as the extremely successful "Entertainers Unit" set up in Watford three years ago to combat tax evasion in the pop music industry.

Alan Lamb, tax manager for London chartered accountants Crossley and Davis, who act for one major home computer client, commented: "Anyone who sits back and hopes that the tax man will go away is wasting valuable time. Computer software comes into a tricky area of taxation concerning 'intellectual property'. One idiosyncrasy means that a best-selling piece of software is worthless at the point of its creation. At that time there are possibilities for ensuring that the potentially valuable property achieves maximum profitability with the minimum of tax liabilities."

# 25 commands for Spectrum

FIFTH is a software package adding 25 new Basic commands to the Sinclair Spectrum.

According to Clement Chambers of Computer Rentals who will release the title in about six weeks, *Fifth* is designed specifically for writing games on the Spectrum: "You will no longer have to resort to machine code to write an arcade-type game. *Fifth* will make writing a *Space Invader* game, for example, like falling off a log.

*Fifth* is basically a sprite handling system. Characters can be defined in shape and colour and then moved — retaining their shape and colour attributes.

Each of the 25 keywords is entered into the Spectrum following a *Rem* statement. In this way none of the existing Sinclair Basic commands are affected.

*Object* is the command to define a shape within a single character square. *Vector* sets its direction of travel in one of 16 options. *Speed* sets its speed — with up to 155 variations. *Move* followed by an *x–y* co-ordinate moves a given object to any point on the screen.

Other commands are *Get, Put, Replace* (changes an object's colour), *Large* (magnifies an object in width or height), *Limit* (sets boundaries of an object's motion), *Attr* (detects a collision between any two given objects) and *Interact* (a conditional command giving new instructions following a collision).

Multi-statement lines are possible making more than one object move with the same command.

*Fifth* is expected to cost around £10 and each tape will be accompanied by a 48K demonstration tape and a 25-page manual.

More details from Computer Rentals Ltd, 140 Whitechapel Road, London E1.

# New low-cost dotmatrix printer for the home

MANNESMANN Tally, better known for its printers for business systems, has now announced a new low-cost dotmatrix printer for the home user.

The MT80 is an 80-characters per second, 9 × 7 bi-directional, dot-matrix machine, capable of using either friction feed or tractor feed stationary up to 10ins in width.

In normal use, it prints 80 columns (10 characters per inch), but double width and compressed text (16.7 characters per inch) are also possible. Double printing gives bold letters. A unique feature is that the MT80's print-head produces square rather than the more usual round dots, increasing legibility.

The unit is available now, complete with parallel Centronics interface, price around £328. An alternative version adds a serial RS232 interface and 2K printer buffer for around another £58.



Further information from Mannesmann Tally, Molly Millars Lane, Wokingham, Berks.

● Epson, Mannesmann Tally's main rival, also has a new printer — the RX80F/T. A development of the existing RX80, the new model offers both friction and tractor feed. The RX80F/T will cost £343.

## QS goes transatlantic



*Rod Cousins.*

*QUICKSILVA has become one of the first UK software houses to open up an American office.*

*The new company, Quicksilva Inc, will be based in San Antonio, Texas.*

*Rod Cousins, managing director of the UK company, said, "The new company will address the vast potential market for our software in the US and Canada, and will also handle increasing demand from Latin America." Quicksilva Inc will be responsible both for manufacture and distribution of software – particularly the Timex Sinclair 2000.*

*Carl Ziegler, until now general manager of Saab-Fairchild SNC, has been selected as president of Quicksilva Inc.*

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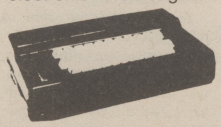
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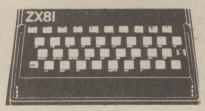
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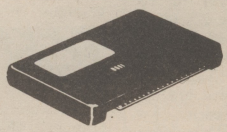
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## Copy-cat 1

Regarding the correspondence on copying, surely the whole point of this argument is that if a cassette has been produced in such a way that you cannot *Load* it and then recopy to another cassette, then the supplier of that tape obviously did not want you to copy it! The case is simple. Copyright belongs to the author or publisher. Copyright means that the contents of a program *belongs* to one person — it is not public property.

"Copying cassettes" are obviously designed to copy tapes that one would normally be unable to copy. They are therefore illegal. No one would buy a copying program to copy another tape that they could copy without it, would they? Suppliers of these tapes cannot be so naive as to believe they are acting in ignorance of what their produce is being used for. I have yet to buy software that contained only one copy of a program on it. You are usually supplied with back-up.

As far as I can see, people buy copying programs to make *more than one* copy. Mr Bobker's argument about software houses copying their own material is obvious rubbish. They hold the copyright on that material and as such are able to do with it exactly as they like.

Personally, I am disappointed that your publication accepts these advertisements. They can be nothing other than an invitation to break the law.

*David Penny*
*4 Victoria Terrace*
*Llansantffraid*
*Powys SY22 6AB*

## Chip in action

Have you ever wondered what a silicon chip in action must look like if we could see its electronic activites? This machine-code/Basic hybrid program may give some insight for Spectrum owners. It works on any Spectrum.

```
10 CLEAR 2999: INK 7: PAPER 0: BRIGHT 1: BORDER 0: CLS
20 FOR x=30000 TO 30020: READ y: POKE x,y: NEXT x
30 DATA 33, 255, 63, 17, 0, 64, 1, 0, 24, 26, 174, 18, 35, 19, 11, 120, 177, 32, 246, 24, 235
40 CIRCLE 128, 88, 87: RANDOMIZE FOR 30000
```

Sit back and watch. Interesting, isn't it?

*Iain Stewart*
*17 Torry Drive*
*Alva*
*Scotland FK12 5NQ*

## Copy-cat 2

We are suppliers of the Spectrum *Kopykat* program copies and would welcome the opportunity of replying to Andrew Ratter's letter in your issue of June 16.

We would like to make it clear that it is *not* illegal to copy programs. It is probably illegal to copy programs and then sell or give away such copies. There has not so far been a test case in the courts to clarify this point. It is reasonable to assume that when finally settled it will be decided that computer software is an intellectual property that may be copyright in the same way that a book, film or piece of music may be.

It is definitely legal to make back-up copies of any programs you own. With business software the supplier often advises the user to do just this. This is analogous to photocopying part of a library book for your own use or videotaping a film off the tv. These practices are quite legal, but it is illegal to distribute copies whether for sale or for fee.

It is not true to say that programs like the Spectrum *Kopykat* are used only to copy commercial software. Our program for instance Runs continuously and enables every program or data-file on a tape to be copied without the difficulties of *Loading* and *Saving* each program individually. This means that you can run through a whole tape of your own programs and produce a copy of the complete tape for a friend very easily.

To call for the banning of such programs is ridiculous and rather like calling for the banning of photocopiers and videotape recorders. In fact, those tape recorders with two cassette drives that enable tape-to-tape copying are responsible for far more copies of programs than all copier programs put together, not to mention the copying of music tapes. Should these be banned?

Finally, we would note that other suppliers of these programs are remarkably coy about the size of program that may be copied. Our program enables full size of programs (over 41.5K) to be copied, which is certainly not true of some other programs on the market.

We, of course, give full permission to all purchasers of the Spectrum *Kopykat* to make back-up copies of it for their own use.

*J E Barker*
*Medsoft*
*61 Ardeen Road*
*Doncaster*
*South Yorkshire DN2 5ER*

## Copy-cat 3

The controversy about Copy-cat programs has been thoroughly debated in public, thanks to the generous amount of space allowed in your magazine.

However, I do feel that most of your correspondents are missing the point in suggesting the main use of these programs is illegal copying. Those who wish to be so unethical need not even buy a Copy-cat cassette, for duplicates can easily be made by tape-to-tape and I cannot really understand why David Webb (Letters, July 7-13) should have had problems.

In my opinion, most computer addicts (it really is an addiction) want to break into unstoppable programs for two reasons: (a) a genuine desire to learn from the experts, and (b) capability to modify the original program to suit their own special needs.

Is it a sin to seek knowledge and thus improve one's own programming techniques, or to alter one's own property — we did buy the original cassettes after all — to put on it our own stamp of individuality?

If I buy a radio and can find a way of getting into the case, I am entitled to study the wiring circuit, make modifications, add components and even remove some to use in other electronic hook-ups for my own use. All this would be perfectly legal, until I attempted to sell the ideas or components as my own invention.

Stealing another's brains for personal gain is of course unlawful and totally wrong.

*Jack Bettridge*
*3 Ingleby Way*
*Wallington*
*Surrey*

**A moot point. Copy-cat programs have numerous supporters and detractors, both convinced that the other side is wrong.**

**The legal position is, as with most cases dealing with computers, unclear.**

## Copy-cat 4

I am writing to give my wholehearted support to Mr Webb (Letters, 7-13 July). His suggestion about the replacement of damaged cassettes was a very sensible one, and well worth taking up — I hope that software houses take heed.

The adverse effects of home taping are something that I have often attempted to explain (with little success) to my associates and friends who have a "software swapping circle" and tape and exchange programs. One person I know has spent £20-£30, yet has £200 worth of software.

I believe that this is a growing problem, not helped by the availability of Copy-cat programs. However, the damage has already been done. These programs have already been sold in large quantities (and been copied in even greater quantities) and will be used.

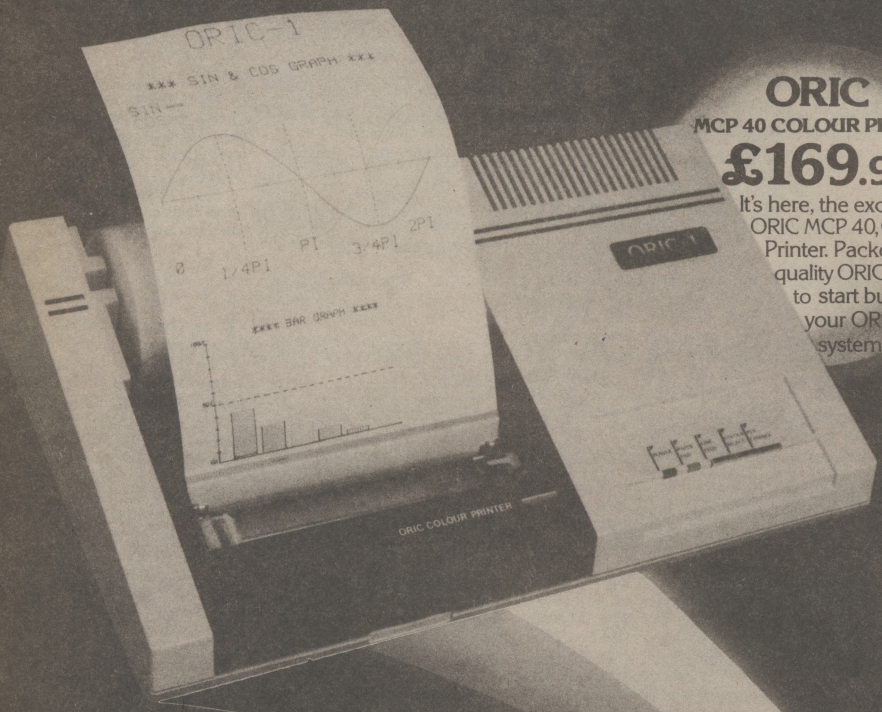
The only lasting solution that I can see is the use of Eproms which will eradicate home taping, and tough legislation to stop any professional copiers. I realise that this will increase the cost of software, but surely if software is all saved on Eprom the cost of manufacturing cartridges will drop considerably.

*P Butcher*
*Highlands*
*Lyme Road*
*Crewkerne*
*Somerset TA18 8HF*

**Unfortunately, although Eproms are harder to copy than tapes, they are not copy-proof.**

**Legislation is needed to combat professional pirates, but for home-copiers it is more a matter of education.**

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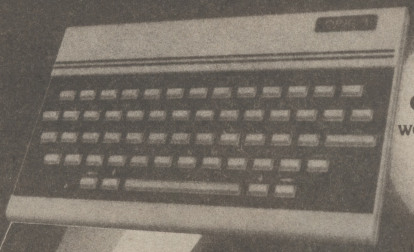
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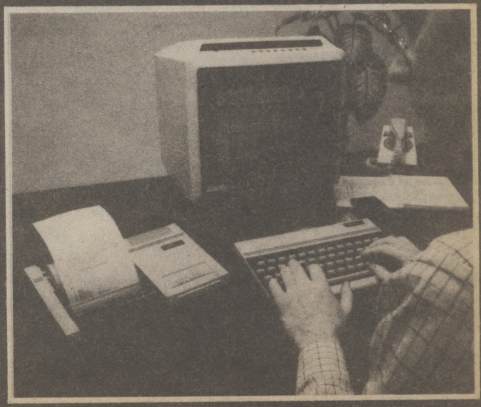
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# Beltman

**A game for 16K or 48K Spectrum by T Wiley**

As an electrician in the Clyde Syntax widget factory, it is your job to check the fuses at the top of each workshop. To reach the fuses, however, you must climb up the moving conveyor belts and through the holes in them, using the cursor keys 5 to 8.

Normally, the belts will slide along underneath you, but if a hole passes by you will fall down to the next level. Spread around the room are boxes you can stand on to prevent this happening. Once you reach the top, you must jump up to one of the numbered fuses — they are worth from 10 to 300 bonus points from left to right.

When you have checked one room's fuses, you must check the next room, where the belts are not only tattier (more holes) but move faster. If you take too long climbing the belts, the fuses will blow (at time — 0), and the game will end.

There are three sections of machine code to enter — type in the following:

```
1 REM (75 'x's)
2 REM (30 'x's)
3 INPUT A,B : FOR N-A TO B : INPUT (N);" ";X :
  POKE N,X: PRINT N,X : NEXT N
```

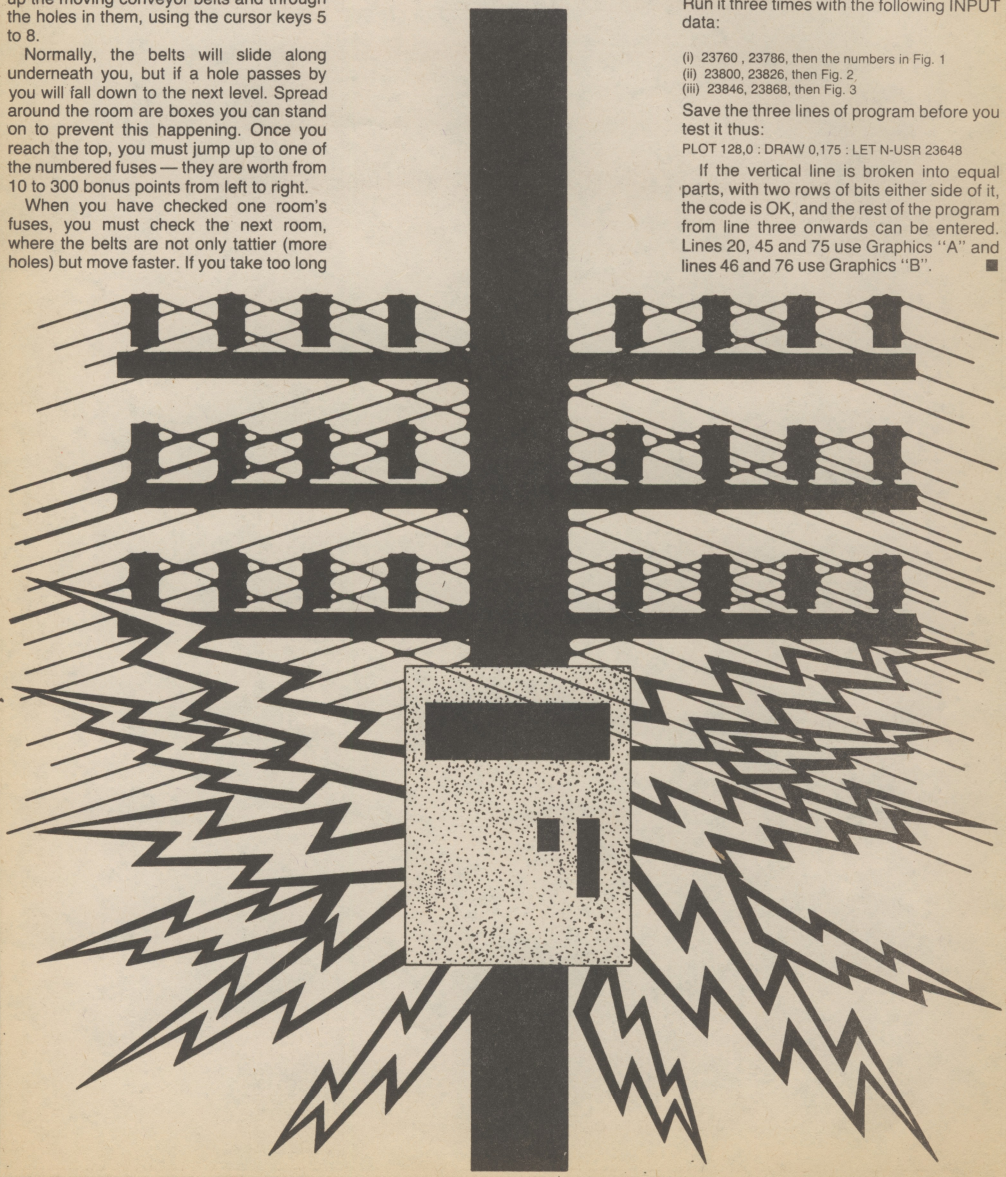
Run it three times with the following INPUT data:

(i) 23760 , 23786, then the numbers in Fig. 1
(ii) 23800, 23826, then Fig. 2
(iii) 23846, 23868, then Fig. 3

Save the three lines of program before you test it thus:

```
PLOT 128,0 : DRAW 0,175 : LET N-USR 23648
```

If the vertical line is broken into equal parts, with two rows of bits either side of it, the code is OK, and the rest of the program from line three onwards can be entered. Lines 20, 45 and 75 use Graphics "A" and lines 46 and 76 use Graphics "B". ■



```
   1 REM #VAL \E2VAL \ RESTORE M
OVE #??? GO SUB VAL :VALxxxxxxx
x#VAL \E2VAL \ RESTORE MOVE +???
 GO SUB LN :VAL \<>xxxxxxxxxxxxx
   2 REM >?G PRINT STEP DRAW \ L
ET ANDG PRINT STEP CLOSE #\ LET
ANDRETURN PI>=? FOR ?xx
   3 REM left 23760 right 23800
   4 GO SUB 600: LET sc=0
   5 PAPER 5: BORDER 5: INK 0: C
LS
   6 GO SUB 1000
   7 FOR a=0 TO 31: PRINT AT 0,a
;(a-INT (a/10)*10);" ": NEXT a
  10 LET r=21: LET c=1
  11 DATA 0,16,80,60,18,16,40,32
  12 DATA 0,16,18,60,80,16,40,8
  13 DATA 0,16,80,60,18,16,40,32
  18 LET q=0
  20 PRINT AT 21,1;"*"
  25 FOR t=1000 TO 0 STEP -2
  29 PRINT #0;AT 1,0;"Score=";sc
;"   ";TAB 13;"Time=";t;"
  30 LET m=(INKEY$="8")-(INKEY$=
"5")
  40 IF c+m>30 OR c+m<1 THEN GO
TO 60
  43 IF m=0 THEN GO TO 60
  44 LET q=NOT q
  45 PRINT AT r,c; OVER 1;"*"
  46 PRINT AT r,c+m; OVER 1;"*"
  50 LET c=c+m
  60 LET m=(INKEY$="6")-(INKEY$=
"7")
  70 IF r+m>21 OR r+m<0 THEN GO
TO 100
  72 IF POINT (c*8+2,175-r*8) AN
D m=-1 THEN GO TO 100
  73 IF m=0 THEN GO TO 100
  74 LET q=NOT q
  75 PRINT AT r,c; OVER 1;"*"
  76 PRINT AT r+m,c; OVER 1;"*"
  77 LET sc=sc-10*(m)
  80 LET r=r+m
  90 IF r=0 THEN LET sc=sc+10*c:
GO TO 2000
 100 FOR g=0 TO 30-sc/80: NEXT g
 101 IF INKEY$<>"" THEN BEEP .01
,21-r
 300 LET l=USR 23846
 302 POKE 23675,w+q*8
 303 IF SCREEN$ (r+1,c)=" " THEN
 LET m=1: GO TO 74
 305 NEXT t
 306 GO TO 3000
 600 FOR k=USR "a" TO USR "d"-1:
 READ a: POKE k,a: NEXT k
 630 LET w=PEEK 23675
 660 RETURN
1000 REM initialise
1002 OVER 0
1005 LET l=1
1007 PRINT #0;AT 0,0; INK 5;"---
----------------------------"
1010 FOR c=7 TO 159 STEP 8
1011 LET l=NOT l: IF l THEN GO T
O 1020
1015 PLOT 0,c: DRAW 0,8,PI
1016 PLOT 255,c: DRAW 0,8,-PI
1020 PLOT 0,c: DRAW 255,0
1021 FOR d=1 TO 2+sc/500
1023 PRINT AT 21-INT (c/8),RND*2
9+1;" ": NEXT d
1027 NEXT c
1029 OVER 1: PAPER 8
1030 FOR k=1 TO 21 STEP 2: PRINT
 AT k,0; PAPER 6;"
                  ": NEXT k
1050 FOR k=0 TO 10: PRINT AT RND
*20+1,RND*29+1;"#": NEXT k
1070 RETURN
2000 FLASH 1: PAPER 4: CLS
2020 PRINT AT 10,8;"BONUS ";c*10
;" POINTS"
2050 FOR c=1 TO 20: BEEP .01,21:
 BEEP .01,26: BEEP .03,.31: NEXT
 c: FLASH 0: GO TO 5
3000 PAPER 0: INK 7: BORDER 0: C
LS
3010 OVER 0: PRINT AT 15,0;"oop!
 the lights have gone out."
3020 PRINT AT 17,0;"Never mind-
you got ";sc;" points."
3030 INPUT "Try again? ";y$: IF
y$="y" OR y$="Y" THEN RUN
5000 FOR c=0 TO 7777: LET l=l+(I
NKEY$<>""): PRINT AT 0,0;l: NEXT
 c
```

**Fig 1**

```
23760  42
23761  176
23762  92
23763  69
23764  14
23765  0
23766  205
23767  170
23768  34
23769  126
23770  50
23771  176
23772  92
23773  229
23774  209
23775  35
23776  1
23777  31
23778  0
23779  237
23780  176
23781  58
23782  176
23783  92
23784  18
23785  0
23786  201
```

**Fig 2**

```
23800  42
23801  176
23802  92
23803  69
23804  14
23805  255
23806  205
23807  170
23808  34
23809  126
23810  50
23811  176
23812  92
23813  229
23814  209
23815  43
23816  1
23817  31
23818  0
23819  237
23820  184
23821  58
23822  176
23823  92
23824  18
23825  0
23826  201
```

**Fig 3**

```
23846  62
23847  7
23848  71
23849  245
23850  205
23851  252
23852  92
23853  241
23854  198
23855  8
23856  71
23857  245
23858  205
23859  212
23860  92
23861  241
23862  198
23863  8
23864  254
23865  167
23866  200
23867  24
23868  235
```

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**PSSST for 16 or 48K SPECTRUM**

Little vermin, leave my plant alone. Oy! My plant's dying. No! No! Nasty bugs sucking the life from my Thyrogodian. Maggie Chrisanthodil, making her shrink, wilt and die. I'll soon put a stop to their little game, quick Spray-O-This'll sort 'em out, therel take that and that. Ha! Ha! Mustn't die, Mustn't die. . . its got to flower, it must do. It said on the packet, "Takes between two and five minutes to grow" it can't be much longer, wont be long now. Why! you little, little . . . Quickly, get the super slug spray, and then the leech laser, Quick, Quick. They breed so fast, can't hold them back for long, Hurry! . . . Hurry! . . . Arrggg! . . .

**PSSST** . . . The ULTIMATE Challenge. 100% machine code, incredible graphics, and that totally new addictive concept and all those features you come to expect the ULTIMATE GAME people.

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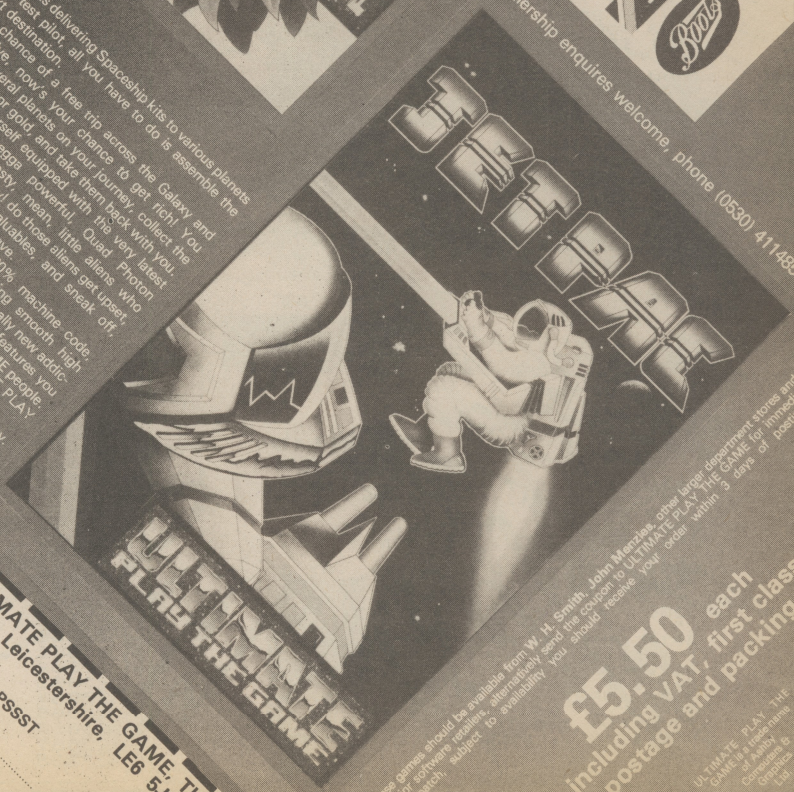
Upon landing, you will find yourself equipped with the very latest Hydrovac Laser Phasers, to blast any nasty, powerful, Quad Photon might object to your visit. And my! do those aliens get upset. when you collect all of their valuables, and sneak off without so much as a by-your-leave.

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Address .....

.....

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# On the screen...

***David Kelly** talks to Lawson Brown about the BBC's plans to broadcast software*

Viewdata systems like Prestel, which use telephone lines to communicate information, are nothing new. Neither are teletext systems like Ceefax and Oracle, which are broadcast information services run, respectively, by the BBC and ITV.

Using similar methods to transmit software programs is a more recent innovation.

Micronet 800, launched in March this year, became the first consumer software database to operate over the telephone network — using part of the Prestel facility.

Now the BBC is to launch the world's first broadcast telesoftware service. The scheme will run under the Ceefax umbrella and a former teacher — Lawson Brown — has been selected to co-ordinate the project. He explains: "BBC telesoftware will be allocated five Ceefax pages on which we will broadcast computer software each with around 30 sub-pages."

Between September 1980 and July 1982 the BBC carried out trials in conjunction with ITV, Brighton Polytechnic and chip manufacturer Mullard, to develop a workable system. The results of that research persuaded the BBC to press forward and launch a full service, planned to coincide with the start of the 1983/84 school year.

In order to understand how telesoftware will work, it is necessary to know a bit more about Ceefax itself. The UK's PAL colour television system operates on 625 lines — but not all the lines are used for the picture. If you switch on your television and squash down the picture using the height control you will be able to see four rows of white dots at the top of the picture. This is the information — broadcast as a 'bit-string' — which is decoded to give the Ceefax pages. To read the pages you need a decoder. Normally this means a special television with a built-in decoder.

Pages are transmitted in an endless loop — if you want a particular page you have to wait until it comes round. At the moment Ceefax has about a 15 second cycle (access) time. Each page can support sub-pages — up to 99 — and only one sub-page is read on each cycle. Subsequent sub-pages are read on subsequent cycles, again in a loop returning to the first sub-page after the last.

In September, to link up with the start of the BBC's telesoftware broadcasts, there will be an alternative way of decoding Ceefax pages — using an ordinary tv together with a BBC microcomputer and a special teletext adapter unit developed by Acorn.

Says Lawson Brown: "Because the information is coded for transmission in digital form, it makes sense for a computer to be used in conjunction with it. So, originally, when the BBC machine was first conceived as part of the BBC's Computer Literacy Project, it was always envisaged as being capable of receiving broadcast software."

Advantages of the Acorn system over a conventional teletext tv are that it is much faster, it can save pages as they appear on screen to disc, capture further pages while you are reading another, capture sub-pages as they go round, allowing you to step through them at will. It is also possible to write control software to enable the individual user to extract particular types or sets of information from the Ceefax pages.

But the main application of the teletext adapter will be telesoftware. Software down-loaded from the BBC's telesoftware pages goes straight into the computer to be run or listed.

To load a program, first the telesoft mode must be selected (the adapter has two modes — teletext and telesoft). Then it is necessary to type in the tv channel, teletext page number and then *Exec* "Name of program".

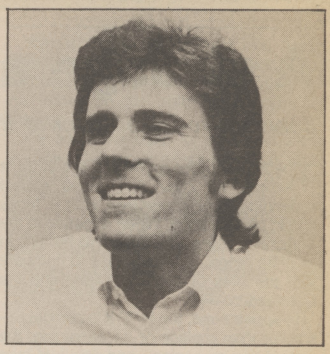
The system takes about 15 seconds per K of program. Every page incorporates what is called a cyclic redundancy check. As the program is loading the computer calculates a value based on the Ascii codes of all the characters on the page being loaded. At the end of the page the computer compares this value with one given on the end of the page — if the two numbers are different the computer signals a loading error and automatically reloads the page.

Now that the system works, what is the BBC going to do with it? "Well, to start with," says Lawson, "we will only be broadcasting software for the BBC computer — simply because it is the only one at the moment with a teletext adapter. If they are brought out for other machines then in theory we can transmit for them — the software at our end should work with any machine."

This software is what Lawson calls the 'Sausage Machine' — a software program developed by the BBC to encode programs into a form suitable for broadcasting. "It takes an ordinary file — in tokenised Basic — and turns it into an Ascii file which is what Ceefax demands. Then it splits it up into Ceefax pages."

The sausage machine also gives each Ceefax page a couple of identifying lines telling the receiving computer how many pages the program takes up, which page the computer is reading, what machine it is for, redefinitions of active control codes and a run-inhibit control. If this last instruction is missed off, then the program will auto-run on loading.

"There is no security in the system at present," says Lawson, "because the whole idea is that telesoftware should be provided as a public service."



The software Lawson will select will broadly be aimed at two areas — education and programs for the domestic user. Educational material will probably dominate, but Lawson is keen to emphasise that he means 'education' in its broadest sense. Many of the initial educational programs will be provided by either the MEP or by the Brighton Polytechnic project. Lawson is also currently negotiating with other suppliers — including the Advisory Unit for Computer Based Education in Hatfield.

"We are wide open to good quality software written by members of the public at the moment," he says, "but if anyone does send anything it must be in machine-readable form together with full documentation and we are insisting that the programs must be of the highest standard because users can list them out and will use them to learn from. Any program must, for example, be in good structured programming style." Unfortunately the BBC will only pay a nominal £5 fee. "We will also have reviews of commercial software packages in cut-down sampler versions. You will even be able to interact with some of the review versions. I think that will form an important part of what we do because people are getting fed up shelling out quite large sums of money to buy software they have never seen."

The initial software program schedule is now sorted out — and it will be published in the telesoftware index. That can be found on Ceefax page 700 with more details of the programs and forthcoming attractions on page 701. Programs will be changed every two weeks and repeated once after three months.

At the moment there are only two programs in the system but, come September, there should be a lot more. And by then, hopefully, Acorn's manufacture of the teletext adapters will be in full swing. Already, Acorn has received over 3,000 orders, without placing a single advertisement.

Delivery of the first adapters is now planned for late August but, because of the order back-log that has built-up, it seems unlikely that anyone ordering their £225 adapter now could hope to take delivery of it before late September. ■

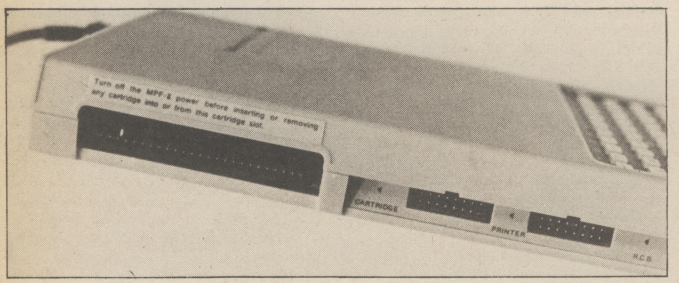
# A strange animal !

***John Scriven** takes a look at the Multitech MPF II*

The Micro-Professor MPF II is a strange animal. At £269 one would expect something fairly impressive, both in looks and in performance. When released in the States two years ago, there was nothing in its price range, but now it has to compete with the likes of the BBC Micro and the Commodore 64.

In appearance, the MPF II is compact — smaller than a piece of A4 paper (eg, the size of this magazine), and only just over an inch in thickness. There are 49 tiny calculator keys recessed on the top, and a full range of interfaces.

At the back are sockets for standard PAL TV, a "monitor" (although it's a standard TV socket), and miniature jack-sockets to connect a cassette recorder. Also to be found here is the low-voltage input (a separate power supply generates the rather unusual 5v and 9v necessary). On the side can be found the "real keyboard"/joystick socket, the printerface and the I/O port for disc-drives and cartridges.




You are also supplied with a two-way adaptor for the video output so the computer can be permanently connected to the TV. The usual white foam packaging also contains a diagnostic cassette and four manuals — one to install the machine correctly, a diagnostic booklet to complement the cassette, and two information books. One is a teaching manual and the other explains in some detail the more advanced features of the MPF II.

As an example of modern technological design, it is compact and neat, and its internal construction is well laid-out, containing a sizeable speaker and two circuit-boards. The second of these is a colour card that piggy-backs the width of the case. The machine certainly has a feel of being well-made, but the calculator keys mean that anyone would plump immediately for the extension keyboard. This is full-size, containing a normal space-bar and two SHIFT keys as well as CONTROL, RESET and FIRE buttons.

The first criticism must be levelled at the keyboard. Instead of producing a traditional typewriter form, Multitech have gone for a rubber-pad model, presumably for cheapness. Unfortunately, the result is rather like upgrading a ZX81 with a Spectrum keyboard. Most people would rather pay £45 for the feel of real keys under their fingers than £30 to wade in a sea of floppy rubber.

As it is, touch typing is out of the question, and the space-bar fails to operate unless it is struck at either side. Another problem is that the *Fire* buttons are at the lower corners, in exactly the position that SHIFT usually occupies.

The machine itself has an impressive specification — 64K Ram (although it's really only 35K — 40K for most applications), and the ubiquitous 6502 as central processor. The character set is only upper-case, which is another reason why word-processing would be complicated, and as seems usual for machines full of Eastern promise, it omits the pound sign.

The Basic is practically identical to Applesoft, so much so that Applesoft programs can be loaded in from tape. This may lead you to suppose that you could equip yourself with an Apple for half the price — the problem is that nobody I know with an Apple still uses cassettes, and most software houses stopped producing tapes at least four years ago, when Apple released their disc-drives.

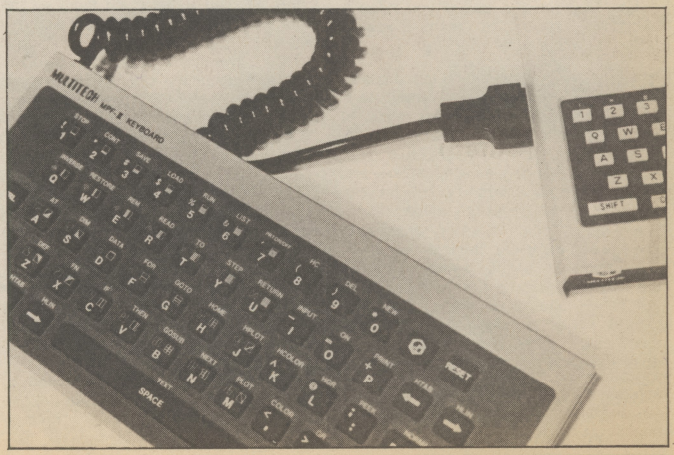
The importers have assured me that when Multitech drives arrive in this country they will be fully compatible with Apple format. As the drive units never appeared I wasn't able to test this out.

For those of you used to more recent Basics, Applesoft is a bit long in the tooth and makes no concessions to the structured programming lobby — no *Else, Repeat, While, Case* or *Procs* to be found. There are eight colours available, as opposed to 16 on the Apple II: black, green, purple, white, green, orange and blue. (Yes, I know there are only six different ones, but that's what the manual tells you!).

You also have the choice of two graphics modes. These are capable of reasonable graphics, and the commands *Plot, Hplot, Hlin* and *Vlin* provide easy ways of screen manipulation. If you want filled boxes or circles, etc, then you will have to resort to basic trig. to plot them.

The drawing commands themselves are pretty good. Typing *Gr* will bring you into the low resolution graphics mode with an area of 40 by 40 pixels. *Hgr* produces the high-resolution mode — an area of 280 by 160 pixels. These two modes leave a space of four lines at the bottom of the screen for text. If *Hgr2* is selected, the screen is extended to 280 by 192 pixels with no room for text.

As with the Apple, it is possible to define a wide range of graphics in shape tables and move them around the screen, rotating and changing the size with ease — this can result in good graphics, but the slowness of the Basic lets it down. Potential






games writers will have to take their 6502 primers to bed with them!

As an extra, there are on-board graphics symbols, rather more like the PET shapes than those found on Sinclair machines. Another similarity to Spectrums and ZX81s is the option to have single-key entry if you so desire. This is achieved by holding down SHIFT and CONTROL while depressing a letter key. The key-words are written above the keys on the large keyboard, and available on a plastic overlay on the standard machine.

The manuals are very comprehensive and full of sample programs. Unfortunately, they are translated from Chinese and the inevitable few mistakes have crept in. There is no index in the Basic tutorial manual, which is frustrating, and the explanations of graphics commands are not as clear as they could be.

Access to the sound commands seems to be by trial and error. It is as unfriendly as the Vic20, relying as it does on *Pokes* for success. While the results approach the standard of the Oric, they are nowhere near as easy to produce, and assistance in the manual is sadly lacking.

On the whole, I would suggest that anyone buying an MPF II would do well to get their hands on an Apple manual. The differences in Basic commands are minimal and the American authors have produced a clear and concise guide that contains most of what you would need. They are also amusing in a dry way.

The MPF II books are full of cartoons that don't help to explain points in the text and the only real humour is in the misprints!

The printer, supplied as an extra, uses heat sensitive paper and makes use of the excellent screen dump command to produce graphs, etc, from the display, as well as normal *Lprinting* and *Listing*. The characters are 5 × 7 pixels on a matrix of 7 × 10, and are standard size on 4 1/2 inch paper.

The full ASCII character set is available as well as lower case and graphics. Bit image printing is possible, as used in hi-res screen dumps, and the printing speed is variable from 150 to 180 line-scans a minute.

The 68-page manual gives details on how to connect up the printer to other computers with a Centronics interface. The cable to the MPF II, however, has a 16 socket connector that is specific to that machine, so using the printer with other computers is not as straightforward as it could be.

It cannot produce the print quality of daisy-wheel printers or an Epson, but it is ten times better than a Sinclair and at least as good as the dot-matrix printers around £250.

Six cassettes are available — *Gobbler*, a Pacman look-alike, and some rather boring "educational" cassettes. The joystick cannot be used if the extension keyboard is plugged in, and is not very sensitive (it only has four rather than eight switches inside). The games tapes were equivalent to Commodore or Dragon versions, but there was nothing that rivalled the Apple high-resolution games that should be possible on this computer.

This is where the problem lies. Apple games should be compatible (according to Multitech), but you would be poorly off if you relied on the software available at present.

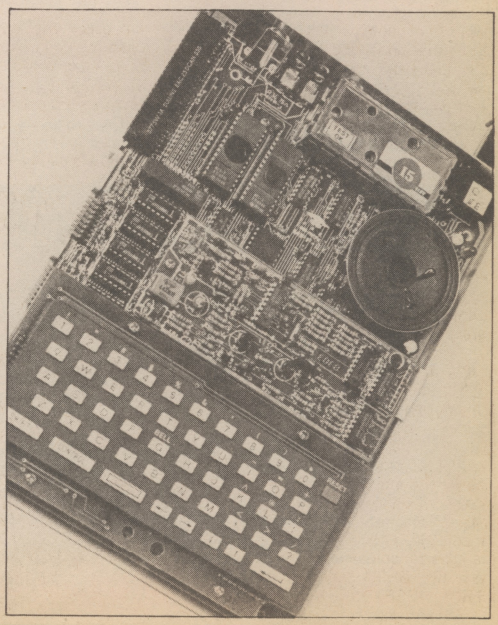
For someone used to an Apple, there are few problems, but they would certainly miss the real keyboard and discs. Another problem is knowing who the MPF II is aimed at. The advertising would imply that this is a machine upon which to learn Basic, and yet it is based on the Apple, a machine which very few people would choose as a home computer.

If the likely customers are small businesses, then they would be disappointed in the lack of useful software. A lot seems to depend on the compatibility of the disc system, if and when it appears.

The facilities offered by the printer certainly improved my over-all impressions of the MPF system, but it is still difficult to recommend it to potential purchasers. For a machine that appears so well made, it is a pity that it falls between so many stools — it is graphically inferior to the BBC and Commodore 64 machines, although it offers more than Spectrums, etc.

If it had appeared two or three years ago, it would have been a good investment. Now it shows its age by using a five year old version of Basic. Ultimately, it is let down by its tacky keyboard and a price that is about £100 more than it should be.

Thanks are due to Jay-Dee Computers of Port Talbot for their help in supplying the review machine. ■



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# Strong language!

***Bryan Skinner** presents a program that is designed to help you learn French*

This article describes a program to aid the learning and spelling of words. It is designed to be used to learn French vocabulary, but could easily be amended for use with a different language. It could also be used for young children learning English.

The program is written for the Dragon 32 micro, but is easily adaptable for most other machines. The major differences will be in the screen handling, random number generation and string manipulation.

The user is initially presented with the first character of a word. He may then either guess at the word, see the next letter or give up. If the user guesses the word correctly, a point is gained and the user given credit according to how many letters have been added; the most credit being earned for the least additions.

If the user quits, the word is displayed before the next go. And, if all the letters have been added without the user guessing the word, it is again displayed.

The words are presented at random, without any words being repeated. At the end of the program, the user is shown how many words he guessed correctly.

The words themselves are held in Data statements at the end of the program. Should you alter these, check if you need to alter the variable *Nw* at the beginning of the program. Also check *Ng*, since if you try to have more goes than words, the subroutine which prevents reselection of words will never be resolved. Of course, you could insert a routine to allow the user to select the number of goes given the above constraints.

Perhaps the least comprehensible part of the coding lies in the calculation of the percentage score. This I will leave to you to unravel.

Figure 1 shows the variables and their meanings:

**Fig 1**
PG — potential guesses
TL — total length of all words
GI — "guessed in"

Remember that you cannot make a guess without seeing at least the first character!

The program is fully documented and should therefore be easy to understand. Lines 1120-1160 show how to manipulate *Data* statements easily: *Restore* the data pointer to the first data item (line 130); calculate which data item you want; call a subroutine to move the data pointer to the item you require (remembering that you should therefore move it *N−1* times! — see line 1130); then *Read* the item.

Notice that this operation should not be done with a *For . . . Next* loop. The reason for this is that in most implementations of Basic such loops are always performed at least once, since checking the loop counter is done at the end of the loop. In practice, this means that using a *For . . . Next* loop to move the data pointer will prevent us ever accessing the first data item!

This technique is useful if you have so much data that there is not room to hold it in an array. In this example, the program could be simplified by the use of an array by the following amendments:

35 DIM WD$ (NW): REM ARRAY FOR WORDS
36 FOR W = 1 TO NW: READ WD$(W):NEXT
Delete line 120
Delete lines 1120-1170
Amend line 200 to: 200 AW$ = WD$(R)

**Analysis of program**

| Lines | |
|---|---|
| 10-110 | Initialisation of main variables |
| 120-210 | Select a word at random (no repeats) |
| 220-240 | Set variables |
| 250-260 | Set letter pointer to first character of word |
| 270-310 | Display the first *L* characters of word and print prompt |
| 320 | Clear prompt from screen |
| 330-350 | Action according to user's choice: |
| 330 | Next letter — update letter pointer, if last letter display it. Update *GI* and terminate go |
| 340 | Quit — display word, update *GI* & terminate go |
| 350 | Guess — do guess subroutine, then terminate go |
| 360 | Update letter pointer, if not end of word set next letter |
| 370-400 | End of go — display word, print continue prompt, update goes and do next if necessary |
| 410-480 | End of program — display number of correct guesses, calculate % based on number of characters displayed before successful guesses, print result & end |
| 500-580 | Guesses — define letters of the rest of the word, set input & compare, print appropriate message, update *GI* (guessed in) and *CG* (correct guesses) if correct |
| 600-620 | Space to continue subroutine |
| 1000-1030 | Space to continue subroutine |
| 1040-1110 | Get a random number, test if used before, if so get another |
| 1120-1170 | Move the data pointer to the random number chosen, to point to the next word |
| 2000-2020 | *DATA* statements ■ |

```
10 REM ********** DEFINE VARIABLES **********
20 NG=10
30 NW = 10:REM NUMBER OF WORDS
40 DIM RN(NG):REM ARRAY FOR RANDOM NUMBERS
50 CH$ = "GNQ":REM STRING TO SELECT CHOICE (SEE LINE     )
60 CG = 0:REM CORRECT GUESSES
70 GI = 0:REM VARIABLE FOR "GUESSED IN"
80 TL = 0:REM TOTAL LENGTH OF WORDS VARIABLE
90 REM ********** VARIABLES DEFINED **********
100 G = 1:REM 1ST GO
110 REM ########## START OF A GO ##########
120 RESTORE:REM RESET DATA POINTER
130 CLS
140 PRINT@ L(2),"GO NUMBER";G
150 GOSUB 1040:REM GET RANDOM NUMBER &
160 REM              TEST FOR REPEATS &
170 REM               MOVE DATA POINTER TO WORD NUMBER R
180 RN(G) = R:REM PUT THE RANDOM NUMBER INTO THE ARRAY
190 REM
200 READ AW$:REM GET A WORD
210 LS = LEN(AW$):REM LENGTH OF WORD
220 TL = TL + LS:REM UPDATE TOTAL LENGTH OF WORDS
230 REM
240 REM ******** NOW DISPLAY CHARACTER BY CHARACTER *****
250 L = 1:REM L=CHARACTERS OF WORD
```

**Continued on page 19**

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```
260 PRINT@ L(4),MID$(AW$,1,L):REM PRINT L CHARACTERS OF WORD
270 PRINT@ L(15),"G=GUESS/N=NEXT/Q=GIVE UP"
280 UC$ = INKEY$:IF UC$ = "" THEN 280
290 UC = INSTR(1,CH$,UC$)
300 IF UC = 0 THEN GOTO 280
310 PRINT@ L(15),STRING$(32,32);
320 IF UC = 2 THEN L=L+1:IF L = LS THEN GI=GI+LS-1:GOTO 360:
    REM NEXT LETTER,IF END OF WORD,PRINT IT
330 IF UC = 3 THEN GI = GI+LS-1:GOSUB 590:GOTO 370:REM QUIT-
    DISPLAY WORD & DO NEXT GO
340 IF UC = 1 THEN GOSUB 480:GOTO 370:REM GUESS SUBROUTINE,
    THEN NEXT GO
350 IF L <= LS THEN GOTO 260:GET NEXT LETTER, IF ANY
360 GOSUB 590:REM DISPLAY WORD
370 GOSUB 1000:REM SPACE TO CONTINUE
380 G = G + 1:REM UPDATE NUMBER OF GOES
390 IF G <= NG THEN GOTO 110:REM NEXT GO
400 REM %%%%%%%%%%%%%% ALL GOES DONE %%%%%%%%%%%%%%%%%%%%%%%%
410 CLS
420 PRINT@ L(5),"YOU GOT";CG;" OUT OF";NG
430 PG = TL - NG:SC = 100 * (1 - (GI / PG) )
440 PRINT@ L(7),"PERCENTAGE SCORE=";SC;"%"
450 PRINT@ L(9),"END OF PROGRAM"
460 END
470 REM %%%%%%%%%%%%%%%%%%%% END OF PROGRAM %%%%%%%%%%%%%%%%
480 REM ~~~~~~~~~~ SUBROUTINE FOR GUESSES ~~~~~~~~~~~~~~~~~~
490 RO$ = RIGHT$(AW$,LS-L):REM REST OF WORD
500 PRINT@ L(7),"ENTER YOUR GUESS ";
510 INPUT GU$:REM GUESS
520 IF GU$ = RO$ THEN GOTO 550
530 GI=GI+LS-1
540 PRINT@ L(10),"WRONG":GOSUB 590:RETURN
550 PRINT@ L(10),"CORRECT":CG=CG+1
560 GI=GI+L-1
570 RETURN
580 REM ~~~~~~~~~~~~~~~~~~~~ END OF GUESSES ~~~~~~~~~~~~~~~~~~~~
590 PRINT@ L(11),"THE WORD WAS ";AW$
600 RETURN
1000 PRINT@L(16),"PRESS SPACE TO CONTINUE";
1010 C$ = INKEY$:IF C$ <> CHR$(32) THEN GOTO 1010
1020 PRINT@ L(16),STRING$(31,32);
1030 RETURN
1040 REM GET A RANDOM NUMBER,TEST FOR REPEATS,MOVE DATA POINTER
1050 R = RND(10)
1060 EF = 0
1070 FOR CN = 1 TO G-1
1080 IF R = RN(CN) THEN EF = 1:REM ALREADY USED R
1090 NEXT
1100 IF EF = 1 THEN GOTO 1050
1110 REM ********** TEST COMPLETED **********
1120 REM ++++++++++ MOVE DATA POINTER ++++++++++++++
1130 RW = 1
1140 IF RW = R THEN RETURN
1150 READ AW$
1160 RW = RW +1:GOTO 1140
1170 REM ++++++++++++ POINTER MOVED +++++++++++++++++
1180 RETURN
1190  REM $$$$$$$$$$$$$$$$$$ DATA BLOCK $$$$$$$$$
2000 DATA MAISON,CHAMBRE,BLEU,ROUGE
2010 DATA PERE,MERE,GRENOUILLE,CHAT,CHIEN,SOEUR
```

# Calculated actions

***Ian Logan** explains how to use the calculator in the last of his current series*

A microcomputer operating system has many parts. That part which contains all of the routines for handling arithmetic and manipulating strings can be called the calculator.

In the Spectrum, there are a relatively small number of rules to be followed when using the calculator. Hence, it is easy for a machine code programmer to include 'calls to the calculator' in his, or her, own programs.

The calculator is called into use by a particular Z80 restart instruction — *Rst 0028h* — followed by defined bytes that indicate which routines are to be used. All the routines in the calculator have their own unique defined bytes, which makes for a very compact internal calculator language.

Now for the rules:

(i) *Look after the calculator stack correctly*

The main work area is the calculator stack. In this area the user can store 5-byte numbers or 5-byte string descriptors. The system variable *Stkbot* always points to the base address of this area, while the system variable *Stkend* always points to the first free location above the current stack. If this stack is empty, then these two system variables will hold the same address; otherwise *Stkend* will always point higher in memory than *Stkbot*.

The calculator stack is used in the standard "last-in, first-out" manner. It is undesirable, though not normally fatal, to either take a value off the stack when it is empty, or to leave unused values on the stack when moving on to the next part of a program. Remember that the calculator stack is totally separate from the Z80 machine stack and that 5-byte values are never scored on the machine stack in normal operation.

(ii) *Make use of the calculator's memory area*

There is a second work area used by the calculator and that is the memory area. It has 30 locations that form a sub-area within the system variables area. In these locations it is possible to hold six 5-byte values in an ordered manner. These 5-byte slots can conveniently be labelled *'mem-0, mem-1, mem-2, mem-3, mem-4 and mem-5'*.

The system variable *Mem* normally points to the base address of the memory area and hence forms a vector to the current memory area. Indeed, the machine

Table of Calculator Routines (adapted from The Complete Spectrum ROM Disassembly).

| DEFB | LABEL | DEFB | LABEL | DEFB | LABEL | DEFB | LABEL |
|---|---|---|---|---|---|---|---|
| 00 | jump-true | 15 | str-less | 2A | abs | 86 | series-06 |
| 01 | exchange | 16 | strs-eql | 2B | peek | 88 | series-08 |
| 02 | delete | 17 | strs-add | 2C | in | 8C | series-0C |
| 03 | subtract | 18 | val$ | 2D | usr-no | A0 | stk-zero |
| 04 | multiply | 19 | usr-$ | 2E | str$ | A1 | stk-one |
| 05 | division | 1A | read-in | 2F | chr$ | A2 | stk-half |
| 06 | to-power | 1B | negate | 30 | not | A3 | stk-pi/2 |
| 07 | or | 1C | code | 31 | duplicate | A4 | stk-ten |
| 08 | no-&-no | 1D | val | 32 | n-mod-m | C0 | st-mem-0 |
| 09 | no-l-eql | 1E | len | 33 | jump | C1 | st-mem-1 |
| 0A | no-gr-eq | 1F | sin | 34 | stk-data | C2 | st-mem-2 |
| 0B | nos-neql | 20 | cos | 35 | dec-jr-nz | C3 | st-mem-3 |
| 0C | no-grtr | 21 | tan | 36 | less-0 | C4 | st-mem-4 |
| 0D | no-less | 22 | asn | 37 | greater-0 | C5 | st-mem-5 |
| 0E | nos-eql | 23 | acs | 38 | end-calc | E0 | get-mem-0 |
| 0F | addition | 24 | atn | 39 | get-argt | E1 | get-mem-1 |
| 10 | str-&-no | 25 | ln | 3A | truncate | E2 | get-mem-2 |
| 11 | str-l-eql | 26 | exp | 3B | fp-calc-2 | E3 | get-mem-3 |
| 12 | str-gr-eq | 27 | int | 3C | e-to-fp | E4 | get-mem-4 |
| 13 | strs-neql | 28 | sqr | 3D | re-stack | E5 | get-mem-5 |
| 14 | str-grtr | 29 | sgn | | | | |

All 'defined bytes' are given in hex.

code programmer is quite at liberty to move the memory area by altering the address in *Mem* if so wished.

The calculator contains routines for handling the values in individual slots, which can be very useful when a value is to be held aside for a moment.

(iii) *If in doubt, save H' and L'*

In the normal operation of the Spectrum, the alternative *Hl* register pair contains the return address required after a *Usr* machine code routine has been executed. Although these registers are not normally disturbed, it is good practice to store and later restore these particular registers if there should be any doubt.

(iv) *Transferring values to the calculator stack*

There is a series of ways of putting values on the calculator stack and each has its own advantages and disadvantages.

- *Integers in the range 0 – 255*
  These are best transferred by entering the value into the *A* register and calling the subroutine *STACK-A (2D28h).*
- *Integers in the range 0 – 65535*
  Enter the value into the BC register pair — high byte in *B*, low byte in *C*; and call *STACK-BC (2d2Bh).*
- *Strings*
  A string descriptor comprises five bytes. A two byte length, a two byte starting address and a fifth unused byte. Note that the string of characters can never itself be put on the calculator stack.
  A string descriptor can be transferred by entering the length into the *BC* register pair, the start into the *DE* register and calling *STK-Store (2AB6h).*
- *Transferring a number as a string*
  It is possible to transfer a number by putting the 5-bytes of the floating-point number into the appropriate registers and calling *STK-STORE (2AB6h).* The *A* register has to hold the exponent and the *E, D, C* and *B* registers the four bytes of the mantissa.

The action of transferring a value to the calculator stack adds one to the number of items on that stack. Values can be transferred to a memory area slot directly, the correct base address being derived from the system variable *Mem.*

(v) *Taking values off the calculator stack*

Again, there are a series of ways of taking numbers or strings off the calculator stack:

- *Numbers whose integer value is 0 – 255*
  A call to the routine *FP-TO-A (2DD5h)* will compress the topmost value on the stack into the *A* register. The carry flag is returned reset if the value fits successfully.
- *Numbers whose integer value is 0 – 65535*
  A call to the routine *FP-TO-BC (2DA2h)* compresses a value into the *BC* register pair. Again the carry flag shows overflow.
  In both cases the zero flag is set for positive numbers and reset for negative numbers. Note that string descriptors do not tend to compress to sensible numbers!
- *Fetching string descriptors*
  A call to *STK-FETCH (2BF1h)* takes a 5-byte value off the stack. It puts the first byte into the *A* register (normally a zero) and the other bytes into the *E* and *D* registers (normally the starting address) and the *C* and *B* registers (normally the length of the string).
- *Printing a value as a decimal number*
  This action also takes a value off the stack. A call to *PRINT-FP (2DE3h)* leads to the topmost value being taken as a number and it is printed at the current print position.

### Calculator's routines

The full list of the 82 routines is given in the accompanying table. The most important routines are as follows:

```
  1 REM -- a CUBE routine --
 10 INPUT "Enter your value ";a
 20 PRINT a;" cubed = ";
 30 LET VAR5=1+PEEK 23627+256*P
EEK 23628
 40 LET MEM5=25+PEEK 23656+256*
PEEK 23657
 50 FOR n=0 TO 4
 60 POKE MEM5+n,PEEK (VAR5+n)
 70 NEXT n
100 POKE 32000,239: REM CALC
110 POKE 32001,229: REM get
120 POKE 32002,49: REM dup
130 POKE 32003,49: REM dup
140 POKE 32004,4: REM mult
150 POKE 32005,4: REM mult
160 POKE 32006,56: REM end
170 POKE 32007,195: REM jp
180 POKE 32008,227: REM print
190 POKE 32009,45: REM fp
200 RANDOMIZE USR 32000
210 PRINT
220 GO TO 10
```

(i) *Stacking constants*

The calculator has a table of five constants, all of which are very useful. They are: *stk-zero (AO), stk-one (A1), stk-half (A2), stk-pi/2 (A3)* and *stk-ten (A4).* In each case, the required constant is added to the calculator stack as a 5-byte number.

(ii) *Arithmetic operators*

The main arithmetic operations are: addition *(OF),* subtraction *(03),* multiplication *(04)* and division *(05).* In each case, the two topmost numbers on the calculator stack are replaced by a single result.

(iii) *The numeric functions*

There are a large number of routines for handling functions, eg, tan *(21),* 1n *(25),* sqr *(28),* etc. In all cases, the topmost value is modified by the function — the stack remains unchanged in size.

(iv) *Manipulating the stack*

There are four special routines that are very useful:

- exchange (01) — the two topmost values are switched over.
- delete (02) — the topmost value is lost.
- duplicate (31) — the topmost value is repeated.
- restack (3D) — the topmost value is converted to the long form if it is a short integer.

(v) *Transferring values to the memory area*

The six defined bytes *C0 — C5* are all *'st-mem-x'* instructions. This action merely copies the value to the required memory area slot. The stack is left unaffected.

(vi) *Fetching values from the memory area*

The six defined bytes *E0 — E5* are all *'get-mem-x'* instructions. The instructions in this group transfer values to the calculator stack and the stack thereby increases in size.

(vii) *Exiting from the calculator*

The *end-calc* (*38*) routine has to be called as the last routine whenever the calculator is used. This routine has no action other than to return the user to normal Z80 machine code.

(viii) *Stacking 5-byte numbers*

The routine *stk-data* (*34*) is of special interest, as it allows the user to stack numbers from within a series of defined bytes. Although a compressed form can be used, it is probably easiest if the '34' is followed by the five bytes of the number with the exponent byte increased by *70h.*

### Using the calculator

The accompanying Basic program illustrates how the Spectrum's calculator can be used. The task of the program is to do no more than print the value obtained by 'cubing' the *Input* value. Of course in this instance the use of *'Print a*a*a'* would be easier, but less instructive.

The parts of the program are:

Lines

| | |
|---|---|
| 1 | the title. |
| 10 | the INPUT value for 'a' is requested. |
| 30-70 | the 5-byte value of 'a' is moved to the 'slot', mem-5. (The INPUT value is present in the variables area and needs to be passed to the calculator; and this is a suitable manner for the present example.) |
| 100-190 | a machine code routine of ten bytes. The base of the area has been selected as 32000. (Just a suitable round number.) |

The assembly list is:

```
RST 0028,FP-CALC ;invoke the calculator
DEFB E5,get-mem-5 ;take the value 'a'.
                  ;stack holds 'a'.
DEFB 31,duplicate ;stack holds 'a','a'.
DEFB 31,duplicate ;stack holds 'a','a','a'.
DEFB 04,multiply  ;stack holds 'a','a*a'.
DEFB 04,multiply  ;stack holds 'a*a*a'.
DEFB 38,end-calc  ;exit from the calculator
                  ;leaving 'a*a*a' on the stack.
JP 2DE3,PRINT-FP  ;exit from the machine code
                  ;routine via PRINT-FP so as
                  ;to print 'a*a*a'.
```

| | |
|---|---|
| 200 | execute the USR routine. |
| 210 | supply a 'line-feed'. |
| 220 | around once again. |

Note: Line 20 does use the 'memory area' hence it is placed before the moving of the 'a' value.

This example of how to use the calculator is just a starter and is not meant to do any more than introduce the subject. For more information, refer to *Understanding Your Spectrum* or *The Complete Spectrum Rom Disassembly* published by Melbourne House. ■

# Save and load . . .

***Brian Cadge** explains how to catalogue your tapes to screen or printer*

This article deals with the Dragon's cassette operating system and how it can be used to *Save* and *Load* programs from machine language. This will be useful for anyone writing programs like word processors which need to access the cassette recorder.

The cassette interface operates at about 1,500 baud (180 characters per second) and uses blocks of 256 bytes for *Loading* and *Saving*. The cassette buffer usually starts at address 474 in the system Ram but may easily be changed.

This program is designed to end hours of searching tapes with thousands of *Skipf* commands — it will catalogue the programs on your cassettes to either the screen or printer (if attached).

To enter the program either key in the assembly language listing directly (if you have an assembler), or enter and Run the Basic loader program. This program will check for errors in the *Data* statements — avoiding a machine crash.

To use the program type:

? USR0(0) to get a screen output, or
? USR0(1) to get a printer output.

Any other number in the bracket will yield a syntax error message.

Place the cassette in the recorder, as if to *Load* the program, and press play. As programs are encountered, their file names will be displayed, together with filetype (Basic, data, or machine code). For machine code programs, the start and entry address of the program is also printed. Finally, the block number is seen ticking over in hexadecimal — one block is 256 bytes of data.

The Rom routines are all given labels in lines 30-100 of the assembly language listing — look at the listing for actual entry addresses.

Location 126 contains the address of the start of the cassette buffer, which is set to 474 as normal in line 260. *@search* starts the cassette motor and looks for a header (128 bytes of hex 55). Control then goes to *@getblock*, which *Loads* a block of data into the buffer.

Location 124 contains the block type — 1 is data, 0 is namefile, 255 is end of file. If this location contains a namefile, then the filename and filetype are printed to channel *@chan*. If machine code is involved the start and entry addresses are also printed. The rest of the blocks are skipped, displaying the block number until an end of file is found. The program then loops and starts searching for the next program:

@PRINT will print the character in register A to the channel in location 111.
@NUMPRT will print the number in the D register to channel in location 111.
@MOTOROFF will turn off the relay (Routine 48591 — not used here — will turn it on).

To *Save* data to tape, the best method is to access the *Csavem* command in the Rom. Follow this procedure:

Ld X, Return address to your program
PSHS X
Ld X, Start of data to be stored.
St Xn487
PSHS X
Ld X, End of data
PSHS X
Ld X, Entry address (use 46004 if not actual machine code)
ST X 485
PSHS X
JMP 39195

The Rom routine will then *Save* the data and return control to the first address pushed onto the stack. Similar routines can be accessed for *Loading*, but *@search* and *@getblock* should be sufficient. ■

```
10 CLEAR 200,32499
20 FOR I=1 TO 233:READA$:Z=VAL("&H"+A$):CS=CS+Z:POKE I+32499,Z:NEXT
30 DATA BD,8B,27,C1,1,23,5,C6,2,7E,83,44,7C,0,68,7F,1,41,5D,27,5,86,FE,B7,1,41,B
D,BA,77,8E,1,DA,9F,7E,BD,BD,E7,BD,B9,3E,26,FB,B6,0,7C,26,F6,BD,BD,DC,B6,1,41,B7,
0,6F,8E,1,DA,A6
40 DATA 80,BD,B5,4A,8C,1,E2,25,F6,86,20,BD,B5,4A,B6,1,E2,8D,75,81,2,26,16,86,20,
BD,B5,4A,FC,1,E7,BD,95,7A,86,20,BD,B5,4A,FC,1,E5,BD,95,7A,86,20,BD,B5,4A,B6,FF,2
1,8A,8,B7,FF,21,7F,1
50 DATA 40,BD,7F,92,BD,B9,3E,B6,0,7C,81,FF,27,5,7C,1,40,20,EE,B6,1,41,B7,0,6F,7C
,0,89,7C,0,89,86,D,BD,B5,4A,20,84,B6,1,40,5F,84,F0,44,44,44,44,8D,9,5C,B6,1,40,8
4,F,8D,1,39,81
60 DATA A,24,4,8B,70,20,2,8B,37,9E,88,30,85,A7,84,39,34,2,C6,5,3D,C3,7F,CE,1F,1,
C6,5,A6,80,BD,B5,4A,5A,26,F8,35,82,42,41,53,49,43,44,41,54,41,20,4D,43,4F,44,45
70 IF CS<>25363 THEN PRINT"DATA ERROR":STOP
80 DEF USR0=32500
```

```
                7EF4                    20      PRT
                7EF4                    30 @START EQU *
                B54A                    40 @PRINT EQU 46410
                957A                    50 @NUMPRT EQU 38266
                BDE7                    60 @SEARCH EQU 48615
                B93E                    70 @GETBLOCK EQU 47422
                BDDC                    80 @MOTOROFF EQU 48604
                0140                    90 @BLKS EQU 320
                0141                   100 @CHAN EQU 321
7EF4 BD8B27             200      JSR 35623
7EF7 C101               210      CMPB #1
7EF9 2305               210      BLS @OK
7EFB C602               220      LDB #2
7EFD 7E8344             220      JMP 33604
7F00 7C0068             230 @OK INC 104
7F03 7F0141             230      CLR @CHAN
7F06 5D                 230      TSTB
7F07 2705               230      BEQ @SCR
7F09 86FE               240      LDA #254
7F0B B70141             240      STA @CHAN
7F0E BDBA77             250 @SCR JSR 47735
7F11 8E01DA             260      LDX #474
7F14 9F7E               260      STX >126
7F16 BDBDE7             270 @BEGIN JSR @SEARCH
7F19 BDB93E             280 @ERROR JSR @GETBLOCK
```

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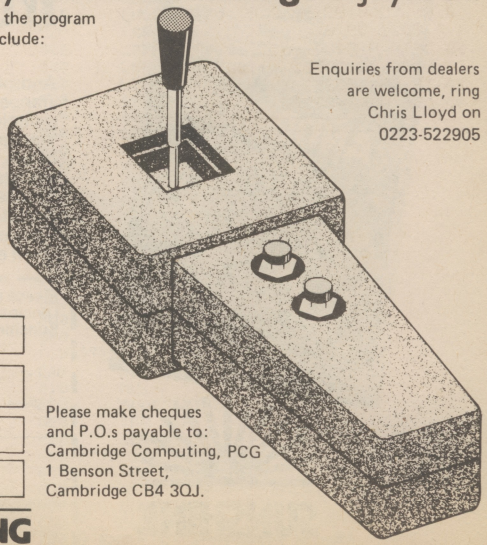


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```
7F1C 26FB          290      BNE @ERROR
7F1E B6007C        300      LDA 124
7F21 26F6          300      BNE @ERROR
7F23 BDBDDC        310      JSR @MOTOROFF
7F26 B60141        320      LDA @CHAN
7F29 B7006F        320      STA 111
7F2C 8E01DA        330      LDX #474
7F2F A680          340 @NAM LDA ,X+
7F31 BDB54A        340      JSR @PRINT
7F34 8C01E2        340      CMPX #474+8
7F37 25F6          340      BLO @NAM
7F39 8620          350      LDA #32
7F3B BDB54A        350      JSR @PRINT
7F3E B601E2        360      LDA 474+8
7F41 8D75          360      BSR @TYPE
7F43 8102          370      CMPA #2
7F45 2616          370      BNE @CONT
7F47 8620          380      LDA #32
7F49 BDB54A        380      JSR @PRINT
7F4C FC01E7        380      LDD 474+13
7F4F BD957A        380      JSR @NUMPRT
7F52 8620          390      LDA #32
7F54 BDB54A        390      JSR @PRINT
7F57 FC01E5        400      LDD 474+11
7F5A BD957A        400      JSR @NUMPRT
7F5D 8620          410 @CONT LDA #32
7F5F BDB54A        410      JSR @PRINT
7F62 B6FF21        420      LDA 65313
7F65 8A08          420      ORA #8
7F67 B7FF21        420      STA 65313
7F6A 7F0140        430      CLR @BLKS
7F6D BD7F92        440 @LOOP JSR @HEX
7F70 BDB93E        450      JSR @GETBLOCK
7F73 B6007C        460      LDA 124
7F76 81FF          470      CMPA #255
7F78 2705          470      BEQ @FIN
7F7A 7C0140        480      INC @BLKS
7F7D 20EE          480      BRA @LOOP
7F7F B60141        490 @FIN LDA @CHAN
7F82 B7006F        490      STA 111
7F85 7C0089        490      INC 137
7F88 7C0089        490      INC 137
7F8B 860D          500      LDA #13
7F8D BDB54A        500      JSR @PRINT
7F90 2084          500      BRA @BEGIN
7F92 B60140        510 @HEX LDA @BLKS
7F95 5F            510      CLRB
7F96 84F0          520      ANDA #240
7F98 44            520      LSRA
7F99 44            520      LSRA
7F9A 44            520      LSRA
7F9B 44            520      LSRA
7F9C 8D09          530      BSR @CHROUT
7F9E 5C            530      INCB
7F9F B60140        540      LDA @BLKS
7FA2 840F          540      ANDA #15
7FA4 8D01          540      BSR @CHROUT
7FA6 39            550      RTS
7FA7 810A          560 @CHROUT CMPA #10
7FA9 2404          560      BHS @ALPHA
7FAB 8B70          570      ADDA #112
7FAD 2002          570      BRA @PUT
7FAF 8B37          580 @ALPHA ADDA #55
7FB1 9E88          590 @PUT LDX >136
7FB3 3085          600      LEAX B,X
7FB5 A784          600      STA ,X
7FB7 39            600      RTS
7FB8 3402          610 @TYPE PSHS A
7FBA C605          610      LDB #5
7FBC 3D            610      MUL
7FBD C37FCE        620      ADDD #@TEXT
7FC0 1F01          630      TFR D,X
7FC2 C605          630      LDB #5
7FC4 A680          640 @TYP LDA ,X+
7FC6 BDB54A        640      JSR @PRINT
7FC9 5A            650      DECB
7FCA 26F8          650      BNE @TYP
7FCC 3582          650      PULS A,PC
7FCE 4241534943444154  700 @TEXT FCC "BASICDATA MCODE"
7FDD                  1000      END @START
```

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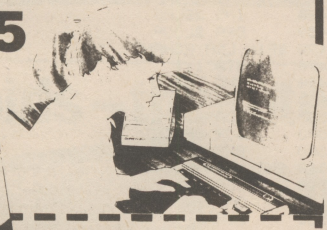
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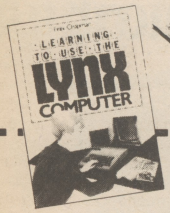
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# Assembled—part one

***Jeremy Ruston** provides a simple introduction to the intricacies of assembly language*

Many BBC micro programmers restrict themselves to programming in BBC Basic. This is not a bad idea, since there are advantages to programming in Basic — programming can generally be done quite quickly, easily and with less chance of things not working when you try to run the program. Just as importantly, Basic is an easy language to debug.

Once programmers begin to realise the disadvantages of Basic — slow speed and huge listings — they often start using a compiler in order to gain extra speed. However, the time often comes when the programmer wishes to learn assembly language. This is usually because code generated by a compiler is never as efficient as 'real' assembly language.

Before progressing further, it's a good move to examine exactly what assembly language is. A computer is based around a particular microprocessor. In the case of the BBC micro it is a 6502, but many computers are based on other (usually more exotic) processors, such as the 8088, 8086 or the Z80.

Each of these microprocessors responds to its own particular set of machine level instructions, which make it carry out certain very basic things. These operations usually consist of "fetch a number from a particular memory location", "add these two numbers together" or "store a number in this memory location".

All these operations are identified by a special number — the operation code, or op-code — which depends on the microprocessor in use. To program a computer in these numbers, you simply fill up memory with the relevant numbers and set the computer up to execute them. This is a very tedious way of programming, because the numbers themselves bear no relation to the operation being performed. This makes them difficult to remember, especially in the case of the 8086, where there are billions of different numbers.

Rather than expecting programmers to remember these endless sequences of numbers, manufacturers have developed various mnemonics to represent these numbers. For example, a common operation in assembly language programming is to load a given number into a variable (in assembly language there are only three variables available). In machine code, this is represented as *&A9 &XX*, where *&XX* is the number to be loaded. On the other hand, the same instruction in 6502 assembly language is *LDA £XX*. In the case of the 6502 the mnemonics are a little odd, but they are very easy to remember, because there are so few of them.

Before we can start to learn about 6502 assembly language programming, we'll have to learn more about the 6502 itself. Internally, the 6502 consists of several registers. These registers are similar to the variables that you use in Basic, except that they are more limited in range. Most 6502 registers are 8 bits wide, which means that they can only hold a number between 0 and 255.

The registers provided are the accumulator, which is often referred to as the *A* register, the two index registers, which are usually referred to as *X* and *Y*, the program counter register which is called *PC*, the stack pointer which is called *SP* and the status register which we shall call *P*, although there is no defined standard for this register.

The accumulator is the most important register of the system. It is used for all arithmetic and logical operations. It is 8 bits wide. The index registers are used to access memory, but they are often used for passing parameters to subroutines. The index registers cannot be used for arithmetic of logical instructions. Both index registers are 8 bits wide.

The program counter is probably the oddest register. It is 16 bits wide, but it cannot be accessed directly by the programmer. It is used to keep track of which instruction is being executed.

The stack pointer serves exactly the same purpose as those used in Basic programs in the rest of this book. The odd thing about this one is that it is only 8 bits. Because it is used to access memory, we might expect it to be a full 16 bits wide. The stack pointer is always assumed to be between addresses *&100* and *&1FF*, so the top 8 bits are not needed.

The status register contains 6 bits, which reflect various things about the current state of the microprocessor. For example, one of the bits is always a 1 (or "set"), if the last instruction dealt with a number that was zero — it is only unset if the number was not zero. These flags are used for things like testing to see if one number is greater than another.

Because there are so few of these registers, it is also possible to treat all the memory locations in page zero (the bottom 256 bytes of memory) as 256 extra registers. They aren't quite as good as real registers, since they are slower to access. In addition, in the case of the BBC micro, many of these registers in page zero are used up by Basic and the operating system. In fact, the only locations in page zero that are free for us to use are *&50* to *&8F*. In theory, that should read *&70* to *&8F*, but most machines do not use locations *&50* to *&6F*.

Most of the 6502 instructions access memory in some way. The way in which they access memory varies according to exactly what the instruction does. There are 11 basic addressing modes (or ways to access memory).

The most obvious addressing mode is immediate addressing. In this mode, the data for an instruction follows immediately on from the machine code identifying the instruction. In other words, this mode means we are loading the accumulator with a number, rather than the number found at an indicated address. It is similar to the Basic statement *Let A = 23*. To indicate that this addressing mode is in use, the number is preceded with a £ sign (pronounced 'hash'). Eg, *Lda £8* would place the number 8 in the accumulator.

On the other hand, if you miss out the hash sign, you get direct memory addressing. This means "load the accumulator with the contents of the given memory location". Using the above example, *Lda 8* would mean "load the accumulator with the contents of location 8". In Basic, a similar statement would be *"Let A = ?8"*.

Direct addressing comes in two forms — 8 bit addressing and 16 bit addressing. The idea is that you can access any location using the 16 bit addressing mode (for example, *Lda &3200*). If the address you wish to access is in the first 256 bytes of memory, you can omit the most significant byte from the address. This makes instructions which access the first 256 bytes of memory faster than the others.

The BBC micro assembler automatically decides which of the two kinds of direct addressing should be used, which means that you rarely have to think about the two kinds of instructions. However, it is sensible to ensure that any data that you may wish to access in memory repeatedly during a program is placed in page zero.

The next addressing mode is sometimes call "implied" or "inherent". In this addressing mode, no data is required by the instruction. This means that the instruction is written without any memory address indicated in the assembly language. It doesn't need any data, because instructions using this mode always imply their own data. Examples of this kind of mode are *Clc*, which clears the carry flag, *Tax* which transfers the contents of register *A* to register *X*, and the similar *Tay*.

Accumulator addressing is similar to implied addressing, except that the data is always assumed to be the accumulator. The trouble is that these instructions can often use other addressing modes, so it becomes necessary to include an indication of the addressing mode required. The normal way of doing this is to include the letter "*A*" after the mnemonic. For example, the instruction *Asl &3200* means "multiply the contents of location &3200 by two", whilst *Asl A* means "multiply the contents of the accumulator by two". ■

*To be continued next week.*

This is an extract from *The BBC Micro Compendium*, available from 1 August, from Interface Publications, 44-46 Earls Court Road, London W8.

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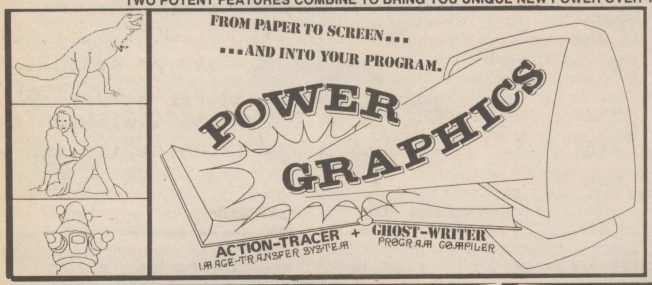
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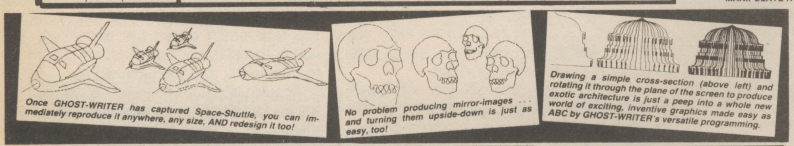
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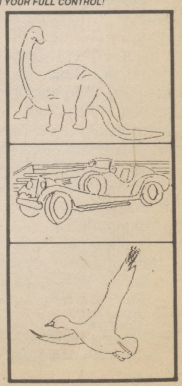
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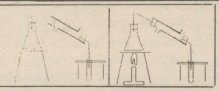
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## Race

### on Spectrum

The object of this game, written for the ZX Spectrum, is to steer your 'car' around the race track, avoiding the sides and trying to reach the finishing post, shown as a capital 'F'. This is quite hard to do — I have only managed it a couple of times. If you think it is too hard, you can easily change the track by altering lines 60-120.

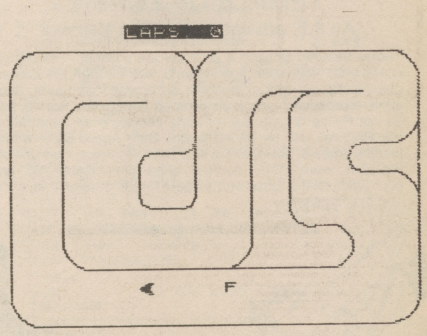
The graphics characters in line 15 are in 'alphabetical order', ie, the first one is a graphic 'A', the second a graphic 'B', etc. Make sure that the graphics string G$ in line 9010 is typed in in the order shown.

**Program notes**

| | |
|---|---|
| 3-50 | Initialisation |
| 60-120 | Draw track |
| 140-250 | Main loop |
| 300-320 | Crash routine |
| 9000-9270 | Graphics setup |

Use key 'M' to steer to the right, and key 'N' to steer to the left.

```
  1 REM ***** RACE *****
  2 REM                    © C.Cox
  3 GO SUB 9000
  4 LET lvs=3: LET lps=0
  5 LET sgn1=1: LET sgn2=1
  6 CLS : LET pos=1
 10 DIM c$(8,5)
 12 LET x=18: LET y=15: LET xx=
x: LET yy=y
 15 LET c$(1)="◀p0m1": LET c$(2
)="▼m1m1": LET c$(3)="▲m1p0": LE
T c$(4)="◆m1p1": LET c$(5)="▶p0p
1": LET c$(6)="◆p1p1": LET c$(7)
="▼p1p0": LET c$(8)="▲p1m1"
 50 BORDER 1: INK 2
 60 PLOT 32,160: DRAW -16,-16,P
I/2: DRAW 0,-120: DRAW 16,-16,PI
/2: DRAW 200,0: DRAW 16,16,PI/2:
 DRAW 0,120: DRAW -16,16,PI/2: D
RAW -200,0
 70 PLOT 60,36: DRAW -16,16,-PI
/2: DRAW 0,62: DRAW 16,16,-PI/2:
 DRAW 32,0
 80 PLOT 104,160: DRAW 16,-16,-
PI/2: DRAW 16,16,-PI/2: PLOT 120
,144: DRAW 0,-64: DRAW -8,-8,-PI
/2
 90 DRAW -16,0: DRAW -8,8,-PI/2
: DRAW 0,15: DRAW 8,8,-PI/2: DRA
W 16,0: DRAW 8,8,PI/2
 100 PLOT 61,36: DRAW 75,0: DRAW
 16,16,PI/2: DRAW 0,64: DRAW 16,
20,-PI/2
 110 DRAW 48,0: PLOT 190,138: DR
AW -16,-16,PI/2: DRAW 0,-52: DRA
W 16,-8,PI/2
 120 DRAW 8,0: DRAW 0,-24,-PI: D
RAW -64,0: PLOT 248,124: DRAW -1
6,-16,-PI/2: DRAW -16,0: DRAW 0,
-16,PI: DRAW 16,0: DRAW 16,-16,-
PI/2
 140 PAPER 7: INK 0: FLASH 0
 142 PRINT AT 0,10; BRIGHT 1; IN
VERSE 1;"LAPS: ";lps
 144 PRINT AT x,y-3;"  "
 145 LET st=pos: IF pos=1 THEN P
RINT AT x,y+2;"F"
 147 IF pos=5 THEN PRINT AT x,y-
2;"F"
 150 PRINT AT xx,yy;" ";AT x,y;c
$(pos,1)
 160 IF c$(pos,2)="m" THEN LET s
gn1=-1
 170 IF c$(pos,4)="m" THEN LET s
gn2=-1
 175 LET xx=x: LET yy=y
 180 LET x=x+(sgn1*(VAL c$(pos,3
))): LET y=y+(sgn2*(VAL c$(pos,5
)))
 190 IF ATTR (x,y)=58 THEN GO TO
 300
 195 LET sgn1=1: LET sgn2=1
 200 IF INKEY$="m" THEN LET pos=
pos+1: IF pos>8 THEN LET pos=1
 210 IF INKEY$="n" THEN LET pos=
pos-1: IF pos<1 THEN LET pos=8
 220 IF pos=st AND SCREEN$ (x,y)
="F" THEN BEEP .1,10: BEEP 1.5,1
0: BEEP .1,15: BEEP 1.5,15: LET
lps=lps+1: GO TO 142
 250 GO TO 150
 300 REM xplosion
 305 LET lvs=lvs-1
 310 PRINT AT xx,yy; FLASH 1; BR
IGHT 1; OVER 1; INK 2; PAPER 6;"
#";AT xx,yy;"-";AT xx,yy;"!"
 311: FOR i=1 TO 10: BEEP .1,-10
: BEEP .03,-30: NEXT i
 312 PRINT AT xx,yy;" ": INK 0
 320 LET x=18: LET y=15: IF RND<
=.7 THEN LET pos=1
 325 IF lvs<1 THEN PRINT AT 10,6
; FLASH 1; PAPER 3; INK 6;"G A M
E  O V E R ": GO TO 350
 330 IF pos<>1 THEN LET pos=5
 335 LET lps=0: GO TO 142
 350 FOR i=-5 TO -15 STEP -1: BE
EP .3,i: NEXT i
 360 FLASH 1: BRIGHT 1: CLS : PR
INT AT 10,7;"ANOTHER GO ?"
 370 IF INKEY$="y" THEN FLASH 0:
 BRIGHT 0: CLS : GO TO 4
 380 IF INKEY$="n" THEN STOP
 390 GO TO 370
9000 RESTORE 9200
9010 LET g$="cgaedfbh"
9020 FOR c=1 TO LEN g$
9030 FOR i=0 TO 7: READ gr: POKE
 USR g$(c)+i,gr: NEXT i: NEXT c
9100 RETURN
9200 DATA 16,56,56,124,124,254,1
98,130
9210 DATA 130,198,254,124,124,56
,56,16
9220 DATA 0,7,30,124,252,124,30,
7
9230 DATA 0,224,120,62,63,62,120
,224
9240 DATA 3,7,15,31,63,127,7,3
9250 DATA 3,7,127,63,31,15,7,3
9260 DATA 0,255,255,126,60,28,12
,4
9270 DATA 0,4,12,28,60,126,255,2
55
```




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## Square

### on Commodore 64

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**Variables**

X(25) Used for colour flag

AA Centre of particular square
CC Ascii number of square code
GG Ascii number of square code
XY Ascii number of square code

**Program notes**

| | |
|---|---|
| 0 | Colour setting |
| 800-890 | Instructions |
| 3 | Initialise array |
| 5 | Colour square (black) |
| 400-430 | Draw random square |
| 510-530 | Draw random square |
| 10-251 | Change colour of square |
| 500-530 | Change colour of squares |
| 600-602 | Are all squares yellow? |
| 605-650 | Translate letter of square to Ascii |

(Lines 10 to 250 are easily entered if overtyping is used).

```
  POKE53280,7:POKE53281,7
  JSUB800
 DIMX(25):FORI=1TO25:X(I)=0:NEXT
 4 PRINT"■":GOSUB5:GOTO7
 5 FORJ=0TO600STEP40:FORK=55507TO55522:POKEJ+K,0:
   NEXT:NEXT:RETURN
 7 GOSUB400:GOTO600
 10 AA=1277:CC=1:GOSUB500:AA=1280:CC=2:GOSUB500:
    AA=1397:CC=6:GOSUB500
 11 GOTO600
 20 AA=1280:CC=2:GOSUB500:AA=1277:CC=1:GOSUB500:
    AA=1283:CC=3:GOSUB500
 21 AA=1400:CC=7:GOSUB500:GOTO600
 30 AA=1283:CC=3:GOSUB500:AA=1280:CC=2:GOSUB500:
    AA=1286:CC=4:GOSUB500
 31 AA=1403:CC=8:GOSUB500:GOTO600
 40 AA=1286:CC=4:GOSUB500:AA=1283:CC=3:GOSUB500:
    AA=1289:CC=5:GOSUB500
 41 AA=1406:CC=9:GOSUB500:GOTO600
 50 AA=1289:CC=5:GOSUB500:AA=1286:CC=4:GOSUB500:
    AA=1409:CC=10:GOSUB500
 51 GOTO600
 60 AA=1397:CC=6:GOSUB500:AA=1277:CC=1:GOSUB500:
    AA=1400:CC=7:GOSUB500
 61 AA=1517:CC=11:GOSUB500:GOTO600
 70 AA=1400:CC=7:GOSUB500:AA=1280:CC=2:GOSUB500:
    AA=1397:CC=6:GOSUB500
 71 AA=1403:CC=8:GOSUB500:AA=1520:CC=12:GOSUB500
    :GOTO600
 80 AA=1403:CC=8:GOSUB500:AA=1283:CC=3:GOSUB500:
    AA=1400:CC=7:GOSUB500
 81 AA=1406:CC=9:GOSUB500:AA=1523:CC=13:GOSUB500:
    GOTO600
 90 AA=1406:CC=9:GOSUB500:AA=1286:CC=4:GOSUB500:
    AA=1403:CC=8:GOSUB500
 91 AA=1409:CC=10:GOSUB500:AA=1526:CC=14:GOSUB500:
    GOTO600
100 AA=1409:CC=10:GOSUB500:AA=1289:CC=5:GOSUB500:
    AA=1406:CC=9:GOSUB500
101 AA=1529:CC=15:GOSUB500:GOTO600
110 AA=1517:CC=11:GOSUB500:AA=1397:CC=6:GOSUB500:
    AA=1520:CC=12:GOSUB500
111 AA=1637:CC=16:GOSUB500:GOTO600
120 AA=1520:CC=12:GOSUB500:AA=1400:CC=7:GOSUB500:
    AA=1517:CC=11:GOSUB500
121 AA=1523:CC=13:GOSUB500:AA=1640:CC=17:GOSUB500
    :GOTO600
130 AA=1523:CC=13:GOSUB500:AA=1403:CC=8:GOSUB500:
    AA=1520:CC=12:GOSUB500
131 AA=1526:CC=14:GOSUB500:AA=1643:CC=18:GOSUB500:
    GOTO600
140 AA=1526:CC=14:GOSUB500:AA=1406:CC=9:GOSUB500:
    AA=1523:CC=13:GOSUB500
141 AA=1529:CC=15:GOSUB500:AA=1646:CC=19:GOSUB500:
    GOTO600
150 AA=1529:CC=15:GOSUB500:AA=1409:CC=10:GOSUB500:
    AA=1526:CC=14:GOSUB500
151 AA=1649:CC=20:GOSUB500:GOTO600
160 AA=1637:CC=16:GOSUB500:AA=1517:CC=11:GOSUB500:
    AA=1640:CC=17:GOSUB500
161 AA=1757:CC=21:GOSUB500:GOTO600
170 AA=1640:CC=17:GOSUB500:AA=1520:CC=12:GOSUB500:
    AA=1637:CC=16:GOSUB500
171 AA=1643:CC=18:GOSUB500:AA=1760:CC=22:GOSUB500:
    GOTO600
180 AA=1643:CC=18:GOSUB500:AA=1523:CC=13:GOSUB500:
    AA=1640:CC=17:GOSUB500
181 AA=1646:CC=19:GOSUB500:AA=1763:CC=23:GOSUB500:
    GOTO600
190 AA=1646:CC=19:GOSUB500:AA=1526:CC=14:GOSUB500:
    AA=1643:CC=18:GOSUB500
191 AA=1649:CC=20:GOSUB500:AA=1766:CC=24:GOSUB500:
    GOTO600
200 AA=1649:CC=20:GOSUB500:AA=1529:CC=15:GOSUB500:
    AA=1646:CC=19:GOSUB500
201 AA=1769:CC=25:GOSUB500:GOTO600
210 AA=1757:CC=21:GOSUB500:AA=1637:CC=16:GOSUB500:
    AA=1760:CC=22:GOSUB500
211 GOTO600
220 AA=1760:CC=22:GOSUB500:AA=1640:CC=17:GOSUB500:
    AA=1757:CC=21:GOSUB500
221 AA=1763:CC=23:GOSUB500:GOTO600
230 AA=1763:CC=23:GOSUB500:AA=1643:CC=18:GOSUB500:
    AA=1760:CC=22:GOSUB500
231 AA=1766:CC=24:GOSUB500:GOTO600
240 AA=1766:CC=24:GOSUB500:AA=1646:CC=19:GOSUB500:
    AA=1763:CC=23:GOSUB500
241 AA=1769:CC=25:GOSUB500:GOTO600
250 AA=1769:CC=25:GOSUB500:AA=1649:CC=20:GOSUB500:
    AA=1766:CC=24:GOSUB500
251 GOTO600
400 GG=1:FORBB=0TO480STEP120:FOREE=1277TO1289STEP3
    :AA=EE+BB
405 IFRND(1)>0.5THENF=32:GOTO410
406 F=102:X(GG)=1
410 POKEAA,GG:GOSUB510
430 GG=GG+1:NEXT:NEXT:RETURN
500 IFX(CC)=1THENF=32:X(CC)=0:GOTO510
505 IFX(CC)=0THENF=102:X(CC)=1
510 POKEAA-39,F:POKEAA-40,F:POKEAA-41,F:POKEAA-I,
    F:POKEAA+1,F
520 POKEAA+39,F:POKEAA+40,F:POKEAA+41,F
530 RETURN
600 FORJJ=0TO480STEP120:FORII=1237TO1249STEP3
601 IFPEEK(II+JJ)<>32THEN605
602 NEXT:NEXT
603 GOTO700
605 PRINT"■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■PRESS
    DESIRED SQUARE      ■■■■■■";
606 INPUTXX$
607 IFASC(XX$)>47ANDASC(XX$)<58THEN1000
610 XX=ASC(XX$)-64:IFXX>18THEN630
620 ONXXGOTO10,20,30,40,50,60,70,80,90,100,110,
    120,130,140,150,160,170,180
630 XX=XX-18
640 IFXX>7THEN1000
650 ONXXGOTO190,200,210,220,230,240,250
700 PRINT"■■■■■■YOU HAVE WON!! ANOTHER(Y/N)";
    :INPUTAN$
710 IF AN$<>"Y"THENPRINT"■":END
720 RUN
800 PRINT"■■■■■■■■■■■■■■■■■■S Q U A R E■■":
    PRINT:PRINT
805 PRINT"■■■■■■YOU WILL BE PRESENTED WITH A 5
    BY 5  SQUARE. THE OBJECT";
810 PRINT" IS TO CHANGE THE     COLOUR OF ALL
    SECTIONS FROM BLACK ";
815 PRINT"TO    YELLOW":PRINT
820 PRINT"   DEPRESSING A PARTICULAR KEY WILL
    CHANGE THE COLOUR ";
830 PRINT" OF THAT AND ALL      ORTHOGONALLY
    ADJACENT SECTIONS"
840 PRINT:PRINT"■■■PRESS ANY INTEGER TO FINISH"
860 PRINT"■■■■■■■■■■■■■■■■PRESS 'SPACE' TO START■"
870 GETA$:IFA$=""THEN870
880 IFA$=" "THENRETURN
890 GOTO870
1000 PRINT"       DO YOU WISH TO FINISH(Y/N)";
     :INPUTWW$
1010 IFWW$="Y"THENPRINT"■":END
1015 PRINT"■                    ":GOTO605
```

**Square**
*by N F Leigh*

# Pac-man

## on Spectrum

This is an implementation of Pac-man on the Spectrum. The object, as ever, is to go around the maze devouring the dots and avoiding the ghost.

There are four power pills (in each of the corners) which give you about 15 seconds to try to eat the ghost four times.

Each time you do this, your score will be incremented by an ever-increasing amount. When all 350 dots have been eaten, the screen will clear and the chase will recommence.

### Program notes

Lines

5 *Defined* Functions for score per ghost and random number for ghost movement

10-90 *Data* for udgs and udgs set up

100-260 *Data* for the maze; the graphics are user defined s's

270-320 Set up for a machine code noise for eating of ghost (*Ramtop* set to 64999, but can be lowered for 16K Spectrum)

340 Initialisation of screen; "do you want instructions?" prompt

370 *Defined* Function for colour of Pac-man depending on his power

390 Variable initialisation

400-470 Screen set up

(480-640 Main loop):

490-530 Check key being pressed and print Pac-man in appropriate colour

560-570 Check that the Pac-man does not go off the side of the maze

590-600 Check what the Pac-man has "landed" upon

605-610 Check if the side tunnel is being used

615 Check to see if the screen has been cleared, and if so do the appropriate things and put on a fresh maze

650-740 Move ghost and see if it has caught the Pac-man

750-770 If so, Let lives be decreased by one

780-800 End of one game and start of another

810-840 Ghost munching and m/c sound playing subroutine

850-950 Instructions

960-1020 Play a little tune

8800-8945 Spectral stripes (see a recent *Popular Computing Weekly*)

### The Variables

*FN* q() 1 or 2, *FN* g() score for a particular ghost, a = *Usr* "a" *Fn* a() colour of Pac-man, x$ = "(name of highest scorer so far)", level = no. screens munched, po = power of Pac-man, sc = current score, live = no. lives left, counter = no. dots munched on any screen, ghostx = vertical pos. of ghost, ghosty = horizontal pos. of ghost, a$ = current direction of Pac-man, high = the best score so far, y = horizontal pos of Pac-man, x = vertical pos of Pac-man, xx = x,yy = y, ghostyy = ghosty, ghostxx = ghostx, f$ = what is under the Pac-man, gm = no. ghost munched since the last power pill meal.

**PROGRAM OF THE WEEK**

```
  1)INVERSE 0
  2 LET peek=PEEK 23733: IF pee
k<130 THEN LET clear=32400
  3 IF peek=255 THEN LET clear=
65000
  5 DEF FN q()=INT (RND*2): DEF
 FN g()=(16 AND gm=3)+(8 AND gm=
2)+(4 AND gm=1)+(2 AND gm=0)
  10 DATA 60,126,255,248,248,255
,126,60
  20 DATA 60,126,255,31,31,255,1
26,60
  30 DATA 60,126,255,255,231,231
,102,36
  40 DATA 36,102,231,255,255,255
,126,60
  50 DATA 60,60,36,126,255,255,1
70,85
  60 LET a=PEEK 23675+256*PEEK 2
3676
  70 FOR f=a TO a+39
  80 READ b: POKE f,b
  90 NEXT f
 100 DATA "SSSSSSSSSSSSSSSSSSSS
SSSSSSSSS"
 110 DATA "S.................
.....S"
 120 DATA "S...S..S.S..S.S..S.S.
.S.S...S"
 130 DATA "S...SSSS.SSSS.S..S.SS
SS.SSSS...S"
 140 DATA "S.................
.....S"
 150 DATA "S...SSS.S.S.S..S.S.
S.S.SSS...S"
 155 DATA "S.................
.....S"
 160 DATA "S.SSS.SSS.S.S.S..S.S.
S.SSS.SSS.S"
 170 DATA "S.S...S.....S.S..S.S.
....S...S.S"
 180 DATA "S.........SS....S..S..
.SS.........S"
 190 DATA "S.S.................
.....S.S"
 200 DATA "S.SSS..SSSS...S..S...
SSSS..SSS.S"
 210 DATA "S.........S.....S..S..
...S.....S"
 220 DATA "S.........S.....S..S..
.....S...S"
 230 DATA "S...S.S.....S..S.....
....S.S...S"
 240 DATA "S.SSS.SSSS..SSS..SSS.
.SSSS.SSS.S"
 250 DATA "S.................
.....S"
 260 DATA "SSSSSSSSSSSSSSSSSSSS
SSSSSSSSS"
 270 CLEAR clear-1
 280 RESTORE 320
 290 FOR z=clear TO clear+29
 300 READ y: POKE z,y
 310 NEXT z
 320 DATA 6,5,197,33,15,0,17,40,
0,229,205,181,3,225,17,16,0,167,
237,90,125,254,255,32,237,193,16
,230,201,0
 330 LET clear=(65000 AND PEEK 2
3733=255)+(32400 AND PEEK 23733<
130)
 340 POKE 23658,0: INK 6: PAPER
0: BORDER 0: CLS : GO SUB 8800:
PRINT TAB 7; INK 6;"SPECTRUM PAC
-MAN";TAB 6;"------------------"
;AT 7,6; BRIGHT 1; INVERSE 1;"Sa
m Knowles © 1983": GO SUB 960: P
RINT #0;"Do you want instruction
s (y/n) ?": PAUSE 0: IF INKEY$="
y" THEN GO SUB 850
 350 FOR f=0 TO 7: POKE USR "s"+
f,254: NEXT f
 360 POKE 23609,50: POKE 23693,5
6: POKE 23562,1
 370 DEF FN a()=(1 AND po>0)+(6
AND po=0)
 375 LET x$="Sam": LET high=5000
 380 PRINT AT 20,0;"Today's grea
test ";high;" by ";x$: PAUSE 100
: PRINT AT 20,0;"
                "
 390 LET level=0: LET po=0: LET
sc=0: LET liv=3: LET counter=0:
LET ghostx=15: LET ghosty=12: LE
T a$="A"
 400 PAPER 0: INK 5: BORDER 0: C
LS
 420 PRINT AT 0,0;"LIVES:";AT 0,
9;"SCORE:";AT 0,21;"HIGH:";
 430 PRINT AT 0,26;high
 440 PRINT AT 21,0;"Screens munc
hed:";level;: GO SUB 1030
 445 POKE 23658,8
 450 RESTORE 100
 460 FOR z=2 TO 19: READ z$: PRI
NT AT z,0;z$: NEXT z
 470 FLASH 1: PRINT AT 3,1;"*";A
T 18,1;"*";AT 3,30;"*";AT 18,30;
"*": FLASH 0: LET y=18: LET x=18
 480 PRINT AT 0,6;liv;AT 0,15;sc
;" "
 485 IF sc>high THEN PRINT AT 0,
26;sc;" "
 490 IF INKEY$="P" THEN LET a$="
A"
 500 IF INKEY$="O" THEN LET a$="
D"
 510 IF INKEY$="Z" THEN LET a$="
C"
 520 IF INKEY$="I" THEN LET a$="
B"
 530 PRINT AT y,x; INK FN a();a$
: LET xx=x: LET yy=y
 540 IF po<>0 THEN LET po=po-1
 550 PRINT AT ghosty,ghostx; OVE
R 1;"E"
 560 LET x=x+(a$="A" AND x<31)-(
a$="B" AND x>0)
 570 LET y=y+(a$="C" AND y<18)-(
a$="D" AND y>3)
 580 LET f$=SCREEN$ (y,x)
 590 IF CODE f$=0 OR ((CODE f$)1
27 AND CODE f$<144)) THEN GO TO
650
 600 IF f$="*" THEN LET po=po+50
: FOR f=0 TO 5: BEEP .005,45-f:
NEXT f: LET gm=0
 605 IF x=0 AND y=11 AND a$="B"
THEN PRINT AT y,x;" ": LET x=31
 606 IF x=31 AND y=11 AND a$="A"
THEN PRINT AT y,x;" ": LET x=0
 610 IF f$=":" THEN BEEP .00125,
40: LET sc=sc+10+(10*level): LET
 counter=counter+1
 615 IF counter=350 THEN LET cou
nter=0: LET level=level+1: RANDO
MIZE USR clear: RANDOMIZE USR cl
ear: CLS : GO TO 420
 620 GO SUB 660
 630 PRINT AT yy,xx;" "
 640 GO TO 480
 650 LET x=xx: LET y=yy: GO TO 6
00
 660 LET ghostyy=ghosty: LET gho
stxx=ghostx
```

```
  670 IF FN q()+(ghostx<x) THEN L
ET ghostx=ghostx+1
  680 IF FN q()+(ghostx>x) THEN L
ET ghostx=ghostx-1
  690 IF FN q()+(ghosty>y) THEN L
ET ghosty=ghosty-1
  700 IF FN q()+(ghosty<y) THEN L
ET ghosty=ghosty+1
  710 PRINT OVER 1;AT ghosty,gho
stxx;"E"
  730 IF ghostx=x AND ghosty=y TH
EN GO TO 750
  740 RETURN
  750 IF po<>0 THEN GO TO 810
  760 LET liv=liv-1: FOR f=10 TO
 0 STEP -1: BEEP .01,f-10: BEEP .
01,f: BEEP .01,f+10: NEXT f: LET
 y=16: LET x=17: LET ghosty=11:
LET ghostx=15: PAUSE 10: IF liv<
=0 THEN GO TO 780
  770 PRINT AT yy,xx;" ";AT ghost
y,ghostx; OVER 1;"E": GO TO 650
  780 PRINT AT 0,6;"0";AT 21,0; F
LASH 1;"GAME OVER"; FLASH 0;"
                              ";: FLASH 0:
FOR f=1 TO 150: NEXT f: CLS : IF
 sc>high THEN LET high=sc: INPUT
 '''"You have set a new high sco
re"'''( FLASH 1;(sc); FLASH 0);'
'''"What is your name ? "; LINE
x$
  790 PRINT ''' INK 4; PAPER 0;"T
oday's greatest ";high'''"
                          b
y "; BRIGHT 1; INVERSE 1;x$
  800 PRINT AT 21,0; INK 4;"Hit a
ny key to run "Pac-Man" ©": PAUS
E 0: CLS : GO TO 380
  810 LET sc=sc+100*FN g()
  815 LET gm=gm+1: IF gm=4 THEN L
ET gm=0: LET po=0
  820 LET ghostx=16: LET ghosty=1
0
  830 RANDOMIZE USR clear
  840 RETURN
  850 INK 6: PAPER 0: BORDER 6: C
LS
  860 PRINT TAB 11; INK 2;"Pac-Ma
n";TAB 10;"----------"
  870 PRINT '" In this version of
 the popular arcade game "Pac-Ma
n", your mustmanoeuvre your "Puc
ker" which is the "A" over all th
e dots. A   ghost, "E" wanders
around the    maze, & watch out f
or him when   you are green, & po
werless. To   gain power, go & ea
t one of the "; FLASH 1;"*"; FL
ASH 0;"" in the corners of the M
AZE."
  875 LET x$="Sam": LET high=5000
  880 PRINT '''"Use these keys for
 movement:"'''"O:-Up"'" Z:-Down"'
" I:-Left"'"    P:-Right"
  890 PRINT #0; FLASH 1;"Hit any
 key for next paragraph": PAUSE 0
  900 CLS
  910 PRINT TAB 9; INVERSE 1;"POI
NTS TABLE"
  920 PRINT '''"   "; INK 1;"E";
INK 6;"" ........+ 100 to score"
  930 PRINT '''"   ";" ........+ 10
  to score"'''"          (+10*scre
ens munched)"
  935 PRINT '''"   ""; FLASH 1;"*";
 FLASH 0;"" ........+ 50  to pow
er"
  940 PRINT '''"Today's greatest "
;high;" by"'''"   ";x$
  950 GO SUB 8800: PRINT #0;"Hit
any key to start !!!!": PAUSE 0
  960 RESTORE 1010
  970 FOR f=1 TO 25
  980 READ a,b: BEEP a,b
  990 IF INKEY$<>"" THEN RETURN
 1000 NEXT f
 1010 DATA .1,4,.1,4,.1,0,.1,-3,.
1,4,.1,0,.1,5,.1,5,.1,2,.1,-1,.1
,5,.1,2,.1,4,.1,4,.1,0,.1,-3,.11
,4,.12,0,.12,-5,.12,-5,.15,-3,.1
,-3,.15,-1,.15,-1,.3,0
 1020 RETURN
 1030 PRINT " ";
 1040 FOR f=1 TO level: PRINT INK
  FN a();"A";: NEXT f
 1050 RETURN
 8800 REM Spectral Stripes
 8805 LET p=0
 8810 INK 2
 8815 LET x=64: LET y=64
 8820 FOR f=191 TO 255
 8825 PLOT f,0: DRAW x,y
 8830 LET x=x-1: LET y=y-1
 8835 NEXT f
 8840 LET x=50: LET y=50
 8845 INVERSE 1
 8850 FOR f=205 TO 255
 8855 PLOT PAPER 6;f,0: DRAW PAPE
R 6;x,y
 8860 LET x=x-1: LET y=y-1
 8865 NEXT f: INVERSE 0
 8870 INK 4: LET x=38: LET y=38
 8875 FOR f=217 TO 255
 8880 PLOT f,0: DRAW x,y
 8885 LET x=x-1: LET y=y-1
 8890 NEXT f
 8895 INVERSE 1: LET x=26: LET y=
26
 8900 FOR f=229 TO 255
 8905 PLOT PAPER 1;f,0: DRAW PAPE
R 1;x,y
 8910 LET x=x-1: LET y=y-1
 8915 NEXT f: INVERSE 0
 8920 INK p: LET x=14: LET y=14
 8925 FOR f=241 TO 255
 8930 PLOT f,0: DRAW x,y
 8935 LET x=x-1: LET y=y-1
 8940 NEXT f
 8945 RETURN
```

Whenever A,B,C,D,E or S appear in quotes, they are to be taken as UDG's

**line 330 should be line 285**

Change line 350 to: 35
0 FOR f=1 TO 6: POKE USR "s"+f,1
26: NEXT f: POKE USR "s",0: POKE
 USR"s"+7,0

**Pac-man**
*by Sam Knowles*

# Pset

## on Dragon 32

These two programs show how the *Pset* command on the Dragon can be used in an interesting way. Fig. 1 draws a spiral pattern, it doesn't stop in the middle so just let it run. Fig. 2 draws a snowflake design. Each of these programs can be altered to produce impressive patterns. The *Poke* in line(s) 30 may not work on some Dragons and so should be left out.

**Fig. 1 — Program notes**

| | |
|---|---|
| 10-20 | Credits |
| 30 | Speeds up computer |
| 40 | Sets graphics mode, clears screen |
| 50-90 | Sets variables |
| 100-110 | Plots points |
| 120 | Slows computer down |
| 130 | Freezes picture |

**Fig. 2 — Program notes**

| | |
|---|---|
| 10-20 | Credits |
| 30 | Speeds up computer |
| 40 | Sets graphics mode, clears screen |
| 50-120 | Sets variables |
| 130-140 | Plots points |
| 150 | Enlarges D by 12 |
| 160 | Repeats plotting 5 times |
| 170 | Slows computer down |
| 180 | Freezes picture |

**Fig. 1**

```
10   REM **SPIRAL**
20   REM **D.DEWEN**
30   POKE 65495,0
40   PMODE 4,1:SCREEN 1,1:PCLS
50   Z = 50
60   FOR I = 1 TO 4000 STEP 3
70   Z = Z - 0.1
80   X = 128 + Z* SIN(I/32*3.142)
90   Y = 98 + Z*COS(I/32*3.142)
100  PSET(X,Y,1)
110  NEXT I
120  POKE 65494,0
130  GOTO 130
```

**Fig. 2**

```
10   REM **SNOWFLAKE**
20   REM **D. DEWEN**
30   POKE 65495,0
40   PMODE 4,1:SCREEN 1,1:PCLS
50   A = 0:B= 9.426
60   C = 360:D = 20
70   FOR P = 1 TO 5
80   E = (B - A)/C
90   FOR I = A TO B STEP E
100  X =*COS(I*10)
110  Y =X*SIN(I)
120  Z = X*COS(I)
130  PSET(128 + Y, 98 + Z,1)
140  NEXT I
150  D = D + 12
160  NEXT P
170  POKE 65494,0
180  GOTO 180
```

**Pset**
*by D Dewer*

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## Function Repeat

on Vic20

This program runs on the unexpanded Vic20. Auto-repeat is not standard on the Vic, though it can be programmed. The only keys which repeat are the cursor controls, the space bar and *Inst/Del* key. Sometimes it is desirable to have all keys repeat, other times it is preferable to have the usual set-up.

Here is a program which allows switching between these two modes by using the function keys, F1 and F7. F1 switches to all-keys repeat, F7 returns to normal.

The machine-code routine (once poked into memory by the Basic loader) sits in a free area of memory (673-718) and cannot be touched by other Basic programs. The routine revectors then interrupt routine to check every 1/60 of a second for F1 or F7, performs the appropriate *Poke*s, then returns to the correct interrupt vector.

Pressing *Run/Stop* together with *Restore* disables the program, SYS 673 enables it again. When typing in the program special care should be taken with the *Data* statements, and it should be *Saved* before *Running*.

```
10 X=673
20 READD
25 IFD=-1THEN50
30 POKEX,D
35 X=X+1
40 GOTO20
50 SYS673
60 NEW
70 DATA120,169,174,141,20,3,169,2,141,21,3,88,96,169,39,205
80 DATA197,0,240,10,169,63,205,197,0
90 DATA240,11,76,191,234,169,128,141,138,2,76,191,234,169
100 DATA0,141,138,2,76,191,234,-1

Ready:
```

**Function Repeat**
*by Tony Dickens*

## Code Load

on Ace

This is a machine code loading program for the Jupiter Ace computer. Although the speed of Forth abolishes the need for machine code in most parts of games programs, there are still some routines which require the extra pace.

```
( INPUT
 QUERY LINE
)


( D
 DECIMAL
)


( H
 16 BASE C!
)
DEFINER CODE
 CLS ." No. bytes to be
entered ? "
 INPUT CR CR
 ." Hexadecimal or decimal ?
(h/d) "
 INPUT CR 0
 DO
  INPUT C,
 LOOP
 DECIMAL 253 C, 233 C,
 CR CR
DOES>
 CALL
;
```

**Code Load**
*by Simon Cross*

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*London WC2 7HF*

Each month we will publish the name of the winner and the new *Cruising* high score. Are you good enough to accept the *Cruising* challenge?

The highest score sent in so far this month is 43552 from Carl Doran of Skidby Mill, N. Humberside. Entries for this month's competition close on July 31.

**Notes**

1) Each entry must consist of a ZX printout and your name and address.
2) Closing date for this month's *Cruising* challenge entries is July 31.
3) The highest score each month will receive £10.
4) High scores cannot be transferred from one month to another.
5) The judges' decision is final.
6) No employees of Sunshine Publications Ltd. or their families, will be eligible to enter.

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*Blind Alley*
*Hobhouse Court*
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The highest score sent in so far this month is 99855 from Shui Chung Li of Birmingham. Entries for this month's competition close on July 31.

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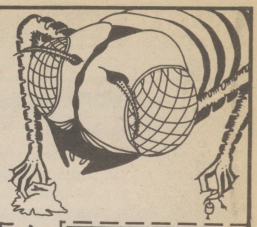
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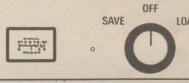
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# Tony Bridge's Adventure Corner



## Hobbit problems

This week we're going to look at *The Hobbit* — again. My letter file is turning into a *Hobbit Help* file — I must get 10 letters about this adventure to every one about other games.

First of all, a hall of fame. Here is a very short list of people who have completed the adventure recently. I'll be updating the list at intervals:

Steve Thomas
D. Millington
James Evans
Andrew Reid (sorry, Andrew, the prize went long ago!)
Jim Clavier
Kevin Maddocks
Pimperton, Lowry and Whittington

This last threesome, working on it together, finished the adventure in all of 7 days (nothing better to do, hey?) . . . but this was beaten by Matthew Taylor, who, at the tender age of seven, managed *The Hobbit* in six days! Kathy, his elder sister wrote to me about his achievement. And yea, Kathy, I think he probably is the youngest to have solved the game, as well as the fastest, of any age!

On now to problems. The one that seems to hold many people back is how to escape from the Goblin's Dungeon. I'm going to print the solution, but, as an added safeguard, I'll make a little code. Start at the second letter of the solution and read every other letter — you'll have to return to the first letter eventually, and repeat the process.

NSSAAYYTCOATRHROYRMIENTOHPEENN-SWAIYNGDOOWWETSHTE

That should keep you busy for a while. Type in the commands exactly as I have given them to you and it should work — although this program, as you are probably aware, is notorious for going off on its own, illogical, way at times!

Having got out of the Goblin's Dungeon, your trials are not over! But, have no fear, having escaped from the Dungeon, you are very close to the Ring, one of the main objects of the adventure, and one which you'll need to complete the game.

M Laurence, of Basildon, is unique, as far as I know from the letters that I receive, in depositing the treasure (he did it in a special way), and then going back for some more fun. This consists largely of Goblin-bashing — each Goblin bashed increases your score by 2.5 per cent.

And now, a miscellany of questions: "How do I get past the pale bulbous eyes?" These kill off a lot of Bilbos, and are almost always fatal. As there is, as far as I know, nothing on the other side of them, I wouldn't personally go anywhere near them!

"What are the pitfalls in Beorn's House?" Although these are mentioned in the book, I have never come across any, and no one else, as far as I can tell from your letters, has encountered any either.

The "place that is too full to enter" is a no-go area, I'm afraid, although it would be nice to think, wouldn't it, that Melbourne House plans to release a module to allow exploration of that area. That could be *The Hobbit Part Two*.

The golden key does not, as far as I know (and I am but a humble adventurer like the rest of you), actually do anything. Dave Bathe, however, had other ideas, and has sent me an advertisement that he noticed, from a philatelic brokers (they sell stamps for investment), for their golden key club. Well, I don't think *The Hobbit*'s golden key is anything to do with stamps!

Finally, just a few points that people have raised. No, there are not two cassettes. The double cassette that Melbourne House refer to in their advertisements for the game simply means that the program is recorded twice on the tape.

Many people wonder how they can complete the game without seeing all 30 pictures. As we've seen this week, the main objective can be achieved without completing the whole game. And in fact, many people seem to finish the game with a score of only 40 per cent or so! It is possible to increase your score even after getting rid of the gold.

Kathy Taylor also tells me of one or two interesting bugs they've found, apart from the usual ones. Try entering *En (Enter) Do*, or *Ex (Enter) Do*. You'll find that you've killed your lunch! I know that it is something you may often want to do in real life, but it is rather unusual in an adventure!

Finally if any BBC-er, TRSer, or any other machine-er has ploughed through all this, I'm sorry that you haven't yet got a version for your machine.

Speaking of the Beeb, next week, I'll be looking at a couple of BBC Adventures, and tips I've received for the solution of some of the problems contained in them. ■

This series of articles is designed for novice and experienced Adventurers alike. Each week Tony Bridge will be looking at different Adventures and advising you on some of the problems and pitfalls you can expect to encounter. So, if you have an Adventure you want reviewed, or if you are stuck in an Adventure and cannot progress any further, write to: Tony Bridge, Adventure Corner, *Popular Computing Weekly*, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.

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## SOFTWARE ATARI

*Cheryl Hays of St Matthews Road, Leigh-on-Sea, writes:*

**Q I have a friend who has just come back from America, and she says that she read in a computer magazine over there, that Atari software can be used on a Vic20. Unfortunately, she lost the magazine on the way back, so cannot show it to me. I have a Vic20, with Super Expander, and I would like to know if it really is possible to use Atari software, and if so can I get the necessary peripheral over here?**

A I have heard this in connection with a company based in Canada called 'Electronics 2001'. I can see that it might be possible, but I doubt whether Atari would approve. In all honesty I know very little more. I would presume that if the device does catch on in America, then it will make its way over here. But I wonder just how big the market would be, as most of the Atari games now have reasonable Vic look-a-likes, which people will have already bought. However, it is an interesting thought, and if it does find its way over here, and can be used on the Commodore 64, then I feel there might well be a worthwhile market.

## ERROR ROUTINE

*Terry Simmons of Heol-y-Fedwen, Ta-Teg, Mid Glamorgan, writes:*

**Q If I set a loop counter (j) so that I can *Input* information into variable array n(k,j), how do I write an error routine that does not allow the user to input a k or a j?**

**I have managed to write a routine that will stop me entering numbers that I do not want, but k and j are driving me crazy!**

A You do not tell me which computer you are using, nor give me any further details of the program. I presume that you are using something along the lines of

```
FOR j = 1 TO 10
INPUT n(k, j)
NEXT j
```

You say that you already have a routine in that will check the value *Input* to see if it is a number you do not want. So you must have an extra line in that reads the *Input* value, before it is assigned to the array. If it is not assigned then you will have to decrement *J*, before *Next J* is called.

If you want to check for j or k then, this check for the numbers you do not want, is the place to do it. However, in most Basics that I can think of 'n' as an array name only can apply to numeric arrays. Could it be that this is the source of your problem, you are trying to enter letters in a solely numeric array? To get over this you will need to use a string array 'n$', with other changes accordingly. When you then read the *Input* to see whether it is a number you want, you just add an extra statement to check whether j or k have been called.

```
INPUT Z$
IF Z$ = "J" or Z$ = "K" THEN . . .
```

the precise syntax will depend on the Basic you are using.

## SIMPLE MATHS

*Colin Turev, of Highgate, Birmingham, writes:*

**Q I have an Atari 400 and am struggling a bit because there does not seem to be much published for the computer. I am writing a program for my younger brother, to help him with some simple maths, but I am having trouble with the word *Input*.**

**I want to put some sums into the computer, and then have him try and enter the correct answer. But when I put the sum in with *Input* the computer either thinks that the number in the sum is the answer, or else does not understand whether it is addition or subtraction. I am sure there must be a simple answer to this!**

A *Input* is a command that seems to fool people in various dialects of Basic. In your case what I think you need is *Input* for *both* the numbers used in the sum, and for the operator, and the result. This program will form the base of what I think you are looking for.

```
 10 INPUT A
 20 INPUT B
 30 PRINT "OPERATION ADD(1) SUBTRACT (2)
 40 INPUT C
 50 IF C=1 THEN GOTO 100
 60 IF C=2 THEN GOTO 200
 70 IF C<1 OR C> 2 THEN GOTO 30
100 LET D = A + B
110 INPUT E
120 IF E = D THEN . . . (right answer routine)
130 IF NOT E = D THEN . . . (wrong answer routine)
```

A and B are the numbers in the sum, which on the Atari will be displayed on the screen; on other computers you might need to add a *Print* statement for each. C is the choice of operation, and it would be no problem to add other options for multiplication and division.

There is then a separate subroutine for each type of operation, these are identified in lines 50 and 60. Line 70 is an error trap, to check for wrong *Input* at line 40.

Line 100 is the addition subroutine, and the operation is defined as addition by line 100. The D becomes the computers copy of the correct answer, and E is your brother's answer. Lines 120 and 130 check your answer E against the computer's answer D, and act upon the comparison. The *Then* statement at the end of the line allows you a lot of freedom as what to do next. You might want to keep it simple initially by ending with *Then Print "Correct"* at line 120 and "wrong" at line 130. However, you can develop these to keep a track of right answers, have another go, or print a special display on the screen.

Line 200 would be LET D = A − B which sets the value of D. The next three lines 210 to 230 would be the same as their counterparts 110 to 130. At the moment it would be easier to enter them twice, so you can follow through what is happening. However, if you want to increase the number of operations available, you will realise that it would be far more efficient to put these repeating lines into a *Gosub Return* routine.

## LEARNING PASCAL

*Donald McIntrye, of Giffnock, Glasgow, writes:*

**Q I have a 48K Spectrum, and have mastered Basic quite well. Now I would like to get into another language, I have tried Pascal and this is the next language I would like to learn. I am sure that I have seen details of Pascal for the Spectrum somewhere. Typically, I cannot find out where, maybe it was just my imagination. Do you know who makes it, and how much does it cost?**

A No, it was not your imagination, although it is quite new, at least as far as actually being able to buy a tape of it. It is produced by Hisoft, and costs £25, that is for an almost complete implementation of the language. If you want to do it the hard way (but cheaper), then Jeremy Ruston's *Learn PASCAL on your Basic Micro* has Spectrum, BBC, and Microsoft compilers in the back. They supply a good subset of the language, and if you do not mind entering such a long program then it will be cheaper, plus you get a good book on the subject.

The book is published by Interface, and should be available from John Menzies or W H Smiths. Hisoft are at 60 Hallam Moor, Liden, Swindon, Wiltshire SN3 6LS.

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**ZX81** plus Hander 16K Ram pack, keyboard, plus magazines and manual, £45. Tel: 900-0188 daytime.

**ZX81,** 16K plus consul, fully boxed with manual, leads, £70 software, magazines, £70 ono. Tel: Upwey 3950.

**ZX81,** 16K, plus 4K graphic Rom and keyboard by DK'Tronics, £200 software. £125. Tel: Ipswich 79925.

**ZX81,** 16K Ram pack, manual, leads and box. Lots of software, excellent condition, £65. Tel: Sheffield 690638 evenings.

**ZX81** plus Kempston keyboard, £50, Memotek 16K Ram pack, £15. Zont sound unit plus Spectrum expansion board, £23. Sell whole lot for £90. Tel: 01-660 6007.

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**ZX81,** 16K plus DK'Tronics keyboard and printer plus £75 software, plus 4K Graphics Rom, £35. Books, magazines and learning cab. Boxed, leads, £100 ono. Tel: 0590 72191.

## Ataris for sale

**ATARI 800,** 32K, plus Basic cartridge plus manuals, £250 ono. Tel: Nottingham 252277.

**ATARI 400,** 16K + recorder + software and books, worth £560, accept £275 ono. H. Taylor, 15 Melrose Crescent, Grimsby.

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**SWAP ATARI VCS,** 15 cartridges, joysticks plus paddles. Still in box, worth £500. Swap for BBC Model B. Tel: Cardiff 565058.

**ATARI VCS** plus two cartridges, complete with paddles plus joysticks. As new. Offers. Tel: 0432 74362.

**ATARI 400.** 16K Ram plus Basic plus recorder plus joysticks plus Le-Stick plus seven cartridges/cassettes. £260. Tel: Kings Lynn 841008 after 6 pm.

**ATARI 400,** 16K Basic cartridge plus manuals, various cartridges, Atari 410 program recorder, £200. Tel: 01-435 7336.

**ATARI 400,** 48K, recorder, books, £150 of software, as new, £220 ono. Tel: Hinckley (0455) 614830.

## Dragons for sale

**DRAGON 32.** As new plus cassette recorder, leads, books, software, magazines. Worth £350, accept £250 ono. Tel: 0535 273338 after 6 pm.

**SWAP OR SELL DRAGON 32,** plus joysticks, four tapes for £180 or swap for BBC B. Reasonable condition. Tel: 0929 425811 after 8 pm, not Fridays or weekends.

**DRAGON 32** plus joystick plus Z80 software, £170. Tel: 0942 712530.

**DRAGON,** with dust cover, £135. Tel: Bridgwater 56292.

## Tandys for sale

**TANDY TRS 80 MODEL 3,** upgraded 32K, one built-in VDU, books, tapes, games, etc. Ideal home or small business. £450. Tel: 01-363 7866.

**TANDY TRS 80,** model 1, level 2, plus assorted games packs, £135 ono. Tel: Northampton 28617 (daytime) or 845666 (evenings).

**TANDY TRS 80,** colour, 16K extended basic, Edfasm plus assemble adventure cassette plus leads, manuals, etc. £190. Tel: Sheffield 386229.

**TANDY TRS 80,** level 2, 16K, including VDU, cassette recorder, VTR 80, software games, Re-no program listing, dust covers, books and sound box, £190. Tel: 01-521 0672.

**TRS 80,** level 2, 16K monitor, recorder, manuals, software, books, magazines plus printer and cables, £475 ono. Tel: 0903 65287.

## Commodores for sale

**SWAP SUPER EXPANDER** for Machine Code monitors plus adventure cartridge to swap. Tel: (0887) 270920 (after 6 pm).

**VIC20** + 16K + 3K hi-res super expander + joystick, cassette deck and nearly 100 games, 18 months old, guarantee, offers to: 01-948 0507 (anytime).

**SWAP VIC20,** 16K memory, cassette unit, software, joystick, 6 months old, for Dragon 32 and cassette recorder, or Spectrum 48K. Tel: Cardiff 595784.

**VIC20** + super expander, programmers aid, cassette unit, software, £200 ono. Tel: 0935 823752.

**VIC20,** C2N, 16K, joystick, books, 8 cartridges, many cassettes and programs, superb, cost £500, must sell, £185 ono. Tel: 0702 201637.

**VIC20 C2N,** joystick, 16K, super expander, programmers aid, motherboard, £450 software, sell for £175. Tel: 0342 513450 after 6 pm weekdays.

**VIC20 CASSETTE UNIT,** with £150

software, still under guarantee. Want only £65. Tel: 01-574 4122.

**VIC20** plus one cartridge power pack. Tel: 061-8814133. £80 ono.

**VIC20** plus software, sell for £110 or swap for 48K Spectrum. Tel: 03265 62345.

**VIC20,** CZN, 16K, S/E, £30, magazines plus books, 4 tapes, software, £200. Tel: 0935 823537.

**VIC20** plus cassette unit and joystick plus programmers manual, £115. Tel: Colchester 869194 after 7 pm.

**VIC20** plus super expander C2N cassette unit. Lots of software, worth £240, will accept £150. Tel: Epsom 29810 after 5 pm weekdays.

**VIC20** plus tape deck. Swap for Spectrum. Tel: Basildon 558509.

**VIC20** plus cassette and joystick. many cassettes, magazines, three books. Dust cover. £150. Machine code monitor, £23. Two adventures, £16 each. Three cartridges £13 each. Everything £210. Vic 15/15 printer plus paper £175. Tel: 0440 703357 after 7 pm.

## Acorns for sale

**ACORN ATOM,** 15K Ram, with games pack, including 5 volt regulated power supply for expansion and all manuals, £75 ono. Tel: 061-790 8151 after 6 pm.

**BBC MODEL B** 1.2 operating system, wordwise fitted RGB colour monitor. Lots of software, books, etc., £450. Tel: Hemel Hempstead 48141 (evenings).

**BBC MODEL B,** 1.2 operating system. As new, never used, £350, no offerd. Tel: 01-641 1304.

## For sale

**DRAGON 32,** four months old, £50. Software, joysticks, cost £250. Sell for £150 ono.

**SHARP MZ-80K,** 48K with Quantum Hi-res graphics, reset button, dust cover. Extensive software including several Basics, Pascal, Fortran, Assembler, Chess, Pac-man, Defender, Scramble, etc. One year old, £600+. As new. £350. Tel: Wilmslow 526663.

**SPECTRUM 16K.** As new. Manuals, dustcover. Software value £40. Bargain £80.

**ZX81,** 16K, 4K. Grapics Rom, Eprom toolkit, mono TV, £30, books £100. Tel: Chesterfield 475790.

**SELL NEW LYNX 48K.** Still boxed, not used, full guarantee, £180 including postage. R. Hebert, Kongens Gade 713, 5000, Odensee, Denmark. Tel: 9179672.

**VIC20 + CZN CASSETTE** plus 16K plus stack cartridge. (Hi-res/tool kit/3K/slot) plus dust covers, software, magazines, £155. Tel: St. Ives (Cambridgeshire 0480 63985).

**ATARI 16K 800,** plus 410 program recorder and joysticks. Software: Assembler, Defender, Centipede, etc. Books, operational service manual, De-re, compute, etc. Six months old, £450. Tel: Padgate 825593.

**COMMODORE 64 PROGRAMS.** Unwanted gifts, Krazy Kong and Gridrunner £7 each including postage. Tel: Strwart, Grimsby 78206.

**MEMOTEK** hi-res graphics pack, working, £5. Tel: 01-450 2395.

**TEXAS I 99/4a,** tape, begin Basic, additional cartridge, chess cartridge, 5 months, £150 ono. Mr Workman, 54 Hatton Road, Blacon, near Chester.

**COMMODORE,** CXX Cibie with £120 channels, as new, + 2 aerials, magmount, complete with all accessories, bargain at £80. Tel: 061-881 4496.

**TEAC.** BBC disc drives with cables, double-sided, 80 track, 400K, switchable to 40 track internally, brand new, unused, £300 each. Tel: 0553 62888 after 6 pm.

**SHARP MZ80K,** 48K, six languages, 100 program library. Apollo WP. £350. Tel: Tewkesbury 297579.

**INTELLIVISION** plus five cartridges for £110. Tel: 01-698 9604.

**FULLER MASTER UNIT** for Spectrum, contains speech and sound operations with joystick plus demonstration tape, ZX Aspect Assembler, £30. Tel: 051-734 1448.

**JUPITER ACE,** complete with manuals and leads. As new, £45. Tel: 0284 67277.

**COLOUR GENIE,** 16K with black and white 14in TV cassette player. Less than 6 months old, £190. Tel: 0793 78037.

**EPSON FX80,** new, unused, £300 ono. Tel: (0553) 62888 after 6 pm.

## Wanted

**WANTED.** BBC mode A, any condition. Redhill (0737) 69337.

**WANTED.** ZX printer for Z5 or will swap for software cassettes. Tel: 01-574 4122.

**WANTED.** Dragon 32 or Spectrum 48K to swap for Vic20 + 16K + cassette unit and joystick and software. Tel: 0222 595784.

**WANTED.** Commodore 3040 or 4040 disc unit. Tel: 01-992 8249.

**WANTED.** Tandy colour or Dragon owners to swap ideas and information. Tel: 0922 691618, Mark Davis.

**WANTED.** Vic64. Tel: 0203 503038.

**WANTED.** Colour monitor, suitable for BBC Model B. Tel: Coventry 0203 504485 after 5.30 pm.

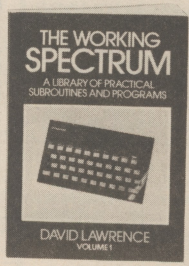
**WANTED.** BBC Model B. Tel: 01-986 0666.

**WANTED.** Sinclair printer. Tel: Chipping Norton 0608 2373.

**MATEL INTELLEVISION** plus five cartridges. Perfect condition. £150. Tel: Kings Lynn 62234.

**LYNX 48K** plus cassette recorder, still under guarantee. Very good condition. £485 ono. Tel: Southampton 862577.

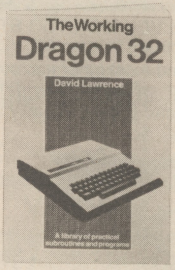

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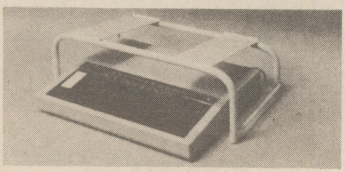


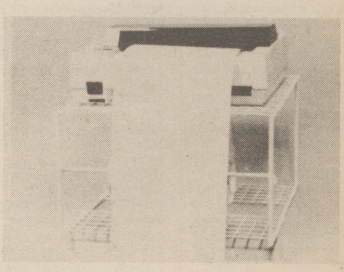
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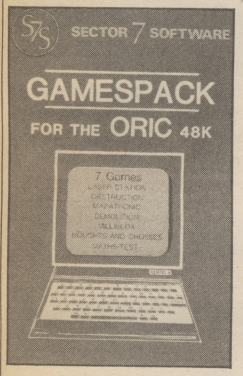
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## PACKAGED




The games pack is an unusual beast — usually loathed by computer journalists and ridiculed by reviewers, it is still the staple diet of many a new software house.

*Games Pack* from Sector 7 Software contains seven games for the 48K Oric. *Demolition* is *Blitz* — where you have to destroy tall buildings before your plane crashes.

Other games include *Noughts and Crosses* and a *3-Dimensional Maze* — all the tried and tested games in fact. Doubtless the package will prove popular with those who have just bought their machines because of the recent price drop and are wondering what to do now.

**Program** *Games Pack*
**Price** *£7*
**Micro** *Oric 48K*
**Supplier** *Sector 7 Software*
*4 Blagdon Barton Farm*
*Collaton St Mary*
*Paignton*
*S Devon TQ4 7PU*

## DATA TONE

*Music Master* is a program for the Lynx that enables you to write music on your computer.

A musical stave is displayed on the screen and you select your note by pressing a key. Duration of note is selected in a similar way.

After you have constructed your melody, you can play it back at a variety of speeds and change a note or notes to improve it.

Your tune, expressed in terms of Data, can be listed and adapted for use in your own programs.

**Program** *Music Master*
**Price** *£4.95*
**Micro** *Lynx*
**Supplier** *Albasoft*
*180 Terreglas Avenue*
*Glasgow G41 4RR*

## FORTH

There are now a number of versions of Forth available for the Spectrum — Mike Hampson's one man operation has produced three of them.

The most sophisticated of his packages is *Spectrum Forth with Floating Point* for the 48K machine. This features all the usual Forth functions with a new command *Bleep*, for sophisticated sound effects, and trigometrical functions in radians and degrees.

**Program** *Spectrum Forth with Floating Point*
**Price** *£14.95*
**Micro** *Spectrum 48K*
**Supplier** *Mike Hampson*
*7 Hereford Drive*
*Clitheroe*
*Lancs BB7 1JP*

## FILED AWAY

Despite claims to the contrary, it is actually true that a home micro is ideally suited for use as a filing system. You really can put all your club records on file and search through them in a couple of seconds — your computer is actually useful!

The problem is, of course, that few people can ever understand the instruction manuals that come with these file packages. Consequently, most people who run clubs, etc, can be seen running off to buy a notepad and pen after a few days.

Having said all that, it's nice to find a file package that comes with a 56-page manual that seems quite easy to understand.

*Pro-file*, from Micro-De-Bug, gives all the usual features of edit, delete, find, etc, and enables you to design your own file layout.

**Program** *Pro-file*
**Price** *£9.95*
**Micro** *Dragon 32*
**Supplier** *Micro-De-Bug Consultancy*
*60 Sir John's Road*
*Selly Park*
*Birmingham B29 7ER*

## FOLLOW-UP

Phipps Associates' *Magic Mountain* is its follow up to the well received *Knight's Quest* adventure. Like that program, *Magic Mountain* is a graphic adventure for the 48K Spectrum.

Somewhere within the mountain is hidden the ancient scroll of wisdom — your task is to find it without falling prey to the various traps and dangers set by the ancient sorcerers to protect it.

By way of a perk, the adventurer may also come across treasures on his travels, as well as less pleasant surprises like poisonous spiders and lizards.

The game uses *The Hobbit* technique of splitting the screen to give a graphic window illustrating the scene. A hints feature is included, but it will not give up its information easily — you will have to be really stuck.

**Program** *Magic Mountain*
**Price** *£4.95*
**Micro** *Spectrum 48K*
**Supplier** *Phipps Associates*
*99 East Street*
*Epsom*
*Surrey KT17 1EA*

## VAPORISED




Quest Microsoftware has its follow-up to *Black Hole* available.

In *Violent Universe* you are again confronted with infinite space, but this time your only weapons are gas clouds which vaporise the aliens and spaceships attacking you.

You pass from level to level by scoring 1,000 points within 40 seconds — the game will work with most of the major joysticks and interfaces on the Spectrum.

**Program** *Violent Universe*
**Price** *£5.50*
**Micro** *Spectrum 16/48K*
**Supplier** *Quest*
*119 The Promenade*
*Cheltenham*
*Glos*

## 8 GAMES

Michael Orwin Software will be familiar to all ZX81 owners and his *Cassette 5* sounds like good value for money.

The cassette contains eight games for the ZX81, most of which are in machine code. Games included are *Planetoids*, *Space Rescue*, *Breakout*, *Draughts*, etc.

**Program** *Cassette 5*
**Price** *£6.80*
**Micro** *ZX81 16K*
**Supplier** *Orwin Software*
*26 Brownlow Road*
*London NW10 9QL*

## LOGICAL

Challenge Games aims to tap an interesting side aspect of adventure games, ie, detective programs where you must use your powers of deduction to find a criminal.

Although analagous to conventional adventure games, "logic" games tend to be stricter and more cerebral and are completely different on each play.

*The Mansion Murders* introduces you to the Montague family. An ambitious relative of theirs has been found dead and everybody is suspected of murder. From the clues given, you must find the guilty party within a certain time limit.

The arrangement of suspects, weapons, motives, etc, is randomly set, so that over 20,000 combinations are possible.

**Program** *The Mansion Murders*
**Price** *£6.95*
**Micro** *BBC B*
**Supplier** *Challenge Games*
*64 Ferndale Road*
*Leytonstone*
*London E11*

## JACKPOT




Things to do with your Spectrum other than kill aliens number eight: win the pools.

Well, not exactly win the pools, but at least not lose. Much. *Spectadraw 2* is a pools prediction program which uses a database of over 7,500 matches to predict those teams most likely to draw.

Each week you tell the computer what matches are to be played and it will make its predictions based on past form.

The author is not claiming that a vast win is likely on this system, but he does suggest that a series of small wins is possible — in any event I suspect that you will have more fun if you are not overly earnest about it.

**Program** *Spectadraw 2*
**Price** *£12.95*
**Micro** *Spectrum 48K*
**Supplier** *Spectadraw*
*1 Cowleaze*
*Chinnor*
*Oxford OX9 4TD*

## STAR TREK

The classic computer game *Startrek* is now available on the Jupiter Ace. The program, which requires 19K, has all the usual trek features of shields, scans, phasors, torpedos, etc. The task, as ever, to rid the galaxy of the Klingon menace.

Should you complete your mission successfully, you will be awarded a percentage rating depending on your performance.

This is one of a number of programs issued recently for the Ace — good to see the software back up improving tremendously for this machine.

**Program** *Startrek*
**Price** *£5*
**Micro** *Ace 19K*
**Supplier** *Ravensoft*
*67 Barker Road*
*Linthorpe*
*Middlesbrough*
*Cleveland TS5 5EW*




## SLALOM!

When the Commodore 64 price cut comes, there will be a lot of people with newly acquired machines looking for software.

Adamsoft is the UK software distributor for Abacus USA — an American company with a number of products for the 64.

Available now is a game called *Skier 64*. This gives you a choice of three courses to negotiate, *Slalom*, *Giant Slalom* and *Alps*. In all three you must use your skill to pass between a number of flags.

Should you complete the course you are told that, "refreshments and other forms of recreation are left up to your ingenuity".

**Program** *Skier 64*
**Price** *£6.50*
**Micro** *Commodore 64*
**Supplier** *Adamsoft*
*18 Norwich Avenue*
*Rochdale*
*Lancs OL11 5JZ*

## UNPLEASANT




The English Software company has just released an animated graphic adventure for the Atari 32K.

*Escape from Perilous* requires you to find a wand, a sword, a pentacle and a cup.

The game requires a joystick and is actually more like an arcade game than the conventional adventure. As you travel around a maze, looking for the objects, you must also avoid various traps and the two monsters Phobos and Deimos, both of whom can do unpleasant things to you.

**Program** *Escape from Perilous*
**Price** *£14.95*
**Micro** *Atari 400/800 32K*
**Supplier** *English Software*
*50 Newton Street*
*Piccadilly*
*Manchester M1 2EA*

## DICEY!

Writing programs that only work with add-ons to the basic computer is a dicey business, since you are restricting the number of people to whom you can sell.

Nevertheless, S&G Software has done just that with its *Speak and Spell* for the Spectrum. This program works with a number of the "speech unit" add-ons which enable the computer to speak, in a metallic kind of way.

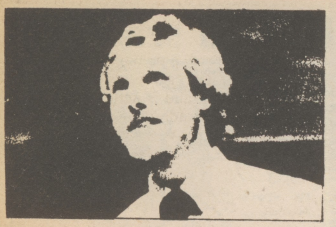
The problem with most speech units is that although, using phenomes, it can be made to say almost anything — the system is so intricate it can be weeks before you can get it to say anything recognisable.

*Speak and Spell* aims to simplify this process by enabling you to enter words as a string which it will then translate. The markers are not claiming it is 100 per cent accurate, only that the process is greatly simplified.

**Program** *Speak & Spell*
**Price** *£5.95*
**Micro** *Spectrum (+speech)*
**Supplier** *S&G Software*
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New Releases is designed to let people know what software is coming on to the market. If you have a new game or utility which you are about to release send a copy and accompanying details to: New Releases, Popular Computing Weekly, 19 Whitcomb Street, London WC2 7HF.

## Ziggurat



# Media-ocre!

"Hi! I'm Brainy and I really rate computers . . . I can tell you why you should convince your dad to invest in a computer or I can end your loading problems."

*(Load Runner* magazine, 23 June 1983)

"When you consider television's awesome power to educate, aren't you thankful it doesn't?"

(A cartoon in *The New Yorker* magazine 1965)

The idea of the "child" is an invention of the seventeenth century. In Shakespeare's time there was no such thing. The idea of childhood emerged later and until it did the young person had been part of the world of the adult.

Today, many children are growing up in a strange environment. They live in two worlds — that of the child and that of the adult. On the one hand, there are children (program writers and such like) who have an earning potential greater than that of most adults. On the other hand, they are still children with the mental and emotional equipment of a young person.

There is certainly, therefore, a market for objects which pander to the child, and make gestures towards the adult in the child. *Load Runner,* the new computer comic, appears to be an offering in this direction — though I'm not sure quite how successful it is. But then I used to read *Wizard.*

If you ask older people what it is that worries them about using computers, they often answer that it is the fear of appearing a fool in front of children — who can always use micros so easily.

Computing is fun, and that young people can make a comfortable income from programming is not to be deprecated, but — as ever — where is our sense of proportion?

In the early 1960s there was a similar boom in youth, and a similar chance for those with a certain talent (or lack of talent) — some, like the Rolling Stones, are still with us. As now, there was the same adulation of the precocious young. Fashions change and boredom ensues.

The myths are all around us, particularly in the computing media. We are massaged by the media into believing that the opportunity for a certain few to leave school at 16 and be millionaires at 16½ is really open to all.

Talking to one young person, I commented that I enjoyed using the BBC computer because of the machine's power. His reply was that writing for the BBC computer was not "financially viable", which was why he wrote programs (and quite good ones at that) for the Spectrum.

Another young man I know (a 16-year-old youth) has just given up his A-level course, to work for a computer shop — he is still continuing to take A-level Computer Studies by day release. When he was explaining about his new career, he said that he guessed I would think him silly. I did.

I think he was silly on two main counts: one, he had effectively given up on education; and, two, the part of education that he had continued was Computer Studies — less useful in my view than Physics or even Latin!

Both these young men have been massaged by the media into believing a narrow-minded, almost authoritarian, scenario. As Geoffrey Sampson writes (in *Liberty and Language,* 1979): " . . . in an authoritarian society, in which the allocation of resources is planned to yield maximum production . . . original thought will eventually fade away as universities and related institutions are starved of money or required to shift the balance of their activities away from pure research and towards the teaching of (supposedly) useful established knowledge."

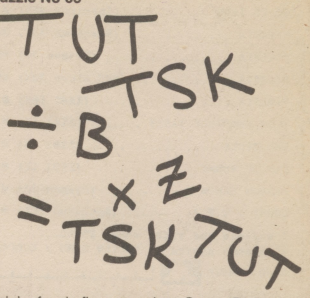
Computing should not be pretentious and I actually agree with the sentiment of the *New Yorker* cartoon. But fun is one thing and triviality is another. And the media seems only able to trivialise computing rather than having fun with computing. We get the media we deserve! Fun, fun, fun. ■

**Boris Allan**

## Puzzle

# Tsk, tsk, tut, tut!

**Puzzle No 65**




Think of a six-figure number. Go on. Divide it by seven to get the first answer. Multiply this first answer by six to get the second answer. Surprise! Both answers contain the same six numbers arranged differently. The first three numbers and the last three numbers of the first answer have to be transposed to form the second answer. What is the question? Find the original six-figure number.

**Solution to Puzzle No 60**

Between them the first two batsmen scored at least 300 runs. So we are looking for a total score greater than 300 that is a 'perfect' number — that is, the number is the sum of its divisors. The first four such numbers are 6, 28, 496 and 8128.

In the program, lines 10 to 60 test each number from 300 for this property. Then lines 70 to 90 find its divisors, print them and count them.

```
10 LET N = 301
20 LET T = 0
30 FOR I=INT(N/2) TO 1 STEP −1
40 IF N/I−(N/I)=0 THEN LET T=T + I
50 NEXT I
60 IF T=N THEN PRINT T
70 GOTO 100
80 LET N=N+1
90 GOTO 20
100 FOR I=INT(T/2) TO 1 STEP−1
110 IF T/I=INT(T/I) THEN PRINTI,
120 LET B=B+1
130 NEXT I
140 PRINT B, "BATTED"
```

The total score was 496 achieved by 9 players who scored: 248, 124, 62, 31, 16, 8, 4, 2 and 1.

**Winner of Puzzle No 60**

The winner is: A O Miller, Downs Road, Instead Rise, Gravesend, Kent, who receives £10.

## Top 10

**Vic20**

| | | | |
|---|---|---|---|
| 1 | (1) | Arcadia | (Imagine) |
| 2 | (5) | Cosmiads | (Bug-Byte) |
| 3 | (3) | Wacky Waiters | (Imagine) |
| 4 | (4) | Panic | (Bug-Byte) |
| 5 | (2) | Asteroids | (Bug-Byte) |
| 6 | (—) | Race | (Commodore) |
| 7 | (8) | Amok | (Audiogenic) |
| 8 | (—) | Blitz | (Commodore) |
| 9 | (9) | Alien Blitz | (Audiogenic) |
| 10 | (7) | Kaktus | (Audiogenic) |

(Figures compiled by Boots & Co, London)

**Spectrum**

| | | | |
|---|---|---|---|
| 1 | (1) | Penetrator | (Melbourne House)* |
| 2 | (3) | Jet Pac | (Ultimate) |
| 3 | (2) | Flight Simulation | (Psion)* |
| 4 | (5) | The Hobbit | (Melbourne House)* |
| 5 | (4) | Transylvanian Tower | (Richard Shepherd)* |
| 6 | (6) | 3D Tanxx | (DK 'Tronics)* |
| 7 | (8) | Horace Goes Skiing | (Psion/Melbourne House) |
| 8 | (7) | Ah Diddums | (Imagine) |
| 9 | (—) | Starship Enterprise | (Silversoft)* |
| 10 | (—) | Test Match | (Computer Rentals) |

*Requires 48K.
(Figures compiled by WH Smith & Son Ltd)

**Atari**

| | | | |
|---|---|---|---|
| 1 | (—) | Triad | (Adventure International)§ |
| 2 | (2) | Zaxxon | (Datasoft) |
| 3 | (1) | Miner 2049er | (Big Five)* |
| 4 | (—) | The Search | (CS) |
| 5 | (—) | Choplifter | (Broderbund)*§ |
| 6 | (9) | Mountain King | (CBS)† |
| 7 | (4) | Repton | (Sirius)¶ |
| 8 | (6) | Hellcat Ace | (Microprose)†† |
| 9 | (—) | The Pharoah's Curse | (Synapse)†¶ |
| 10 | (3) | Stone of Sisyphus | (Adventure International)§ |

*Cartridge. †32K cassette. ¶32K disc. §48K disc.
(Figures compiled by Micro Management, Ipswich 0473 59181)

**Dragon 32**

| | | | |
|---|---|---|---|
| 1 | (1) | The King | (Microdeal) |
| 2 | (3) | Space War | (Microdeal) |
| 3 | (2) | Talking Android Attack | (Microdeal) |
| 4 | (8) | Planet Invasion | (Microdeal) |
| 5 | (4) | Night Flight | (Salamander) |
| 6 | (7) | Katterpiller Attack | (Microdeal) |
| 7 | (9) | Dragon Trek | (Salamander) |
| 8 | (—) | Madness and the Minotaur | (Dragon Data) |
| 9 | (—) | Chess | (Dragon Data)* |
| 10 | (5) | Dragon Trek | (Wintersoft) |

*Cartridge
(Figures compiled by Boots & Co, London)

**BBC***

| | | | |
|---|---|---|---|
| 1 | (—) | Great Britain Limited | (Simon W Hessel) |
| 2 | (2) | Rocket Raid | (Acornsoft) |
| 3 | (1) | Killer Gorilla | (Program Power) |
| 4 | (—) | Snapper | (Acornsoft) |
| 5 | (—) | Monsters | (Acornsoft) |
| 6 | (—) | Wordwise | (Computer Concepts)† |
| 7 | (—) | Chess | (Program Power) |
| 8 | (—) | Creative Graphics | (Acornsoft) |
| 9 | (—) | Beeb Calc | (Computer Concepts)† |
| 10 | (—) | Castle of Riddles | (Acornsoft) |

*All Model B only. †Rom.
(figures compiled by Micro Management, Ipswich 0473 59181

**ZX81**

| | | | |
|---|---|---|---|
| 1 | (1) | Flight Simulation | (Psion) |
| 2 | (2) | Football Manager | (Addictive Games) |
| 3 | (3) | Fantasy Games | (Psion) |
| 4 | (9) | Space Raiders | (Psion) |
| 5 | (6) | Chess | (Psion) |
| 6 | (4) | 1K Games | (Artic)† |
| 7 | (5) | Defender | (Quicksilva) |
| 8 | (—) | 1K Chess | (Artic)† |
| 9 | (—) | Planet Of Death | (Artic) |
| 10 | (8) | QS Scramble | (Quicksilva) |

*All 16K except where shown
†Runs in 1K.
(Figures compiled by Boots & Co, London)

**Books**

| | | | |
|---|---|---|---|
| 1 | (2) | Vic Programmer's Reference Guide, *Commodore* | (Commodore) |
| 2 | (—) | Basic Programming on the BBC Micro, *Cryer* | (Prentice-Hall) |
| 3 | (1) | Structured Programming with BBC Basic, *Atherton* | (Horwood) |
| 4 | (4) | Commodore 64 Programmer's Reference Guide, *Commodore* | (Commodore) |
| 5 | (8) | Forth on the BBC Microcomputer, *De Grandis-Harrison* | (Acornsoft) |
| 6 | (10) | Assembly Language Programming for the BBC Micro, *Birnbaum* | (Macmillan) |
| 7 | (7) | Z80 Assembly Language Sub-routines, *Leventhal* | (Osbourne) |
| 8 | (—) | Enter the Dragon, *Carter* | (Melbourne House) |
| 9 | (—) | 6502 Machine Code for Beginners, *Stephenson* | (Newnes) |
| 10 | (—) | Spectrum Hardware Manual, *Dickens* | (Melbourne House) |

(Figures compiled by Watford Technical Books, Watford 0923 23324)
(Last week's position in brackets)

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| PIMANIA ..... (BBC Micro 32K) @£10 | |
| PIMANIA ..... (ZX81 16K) @ £5 | |
| BEST POSSIBLE TASTE ..... (ZX81 1K) @ £5 | |
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| CAN OF WORMS ..... (ZX81 1K) @ £3 | |
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# 'GO TO JAIL' legal sensation




# THE PIMAN DIARIES shock!

MONDAY....wake up, steal a hang-glider, get out of bed. Postman arrives with usual loony letters from Pimaniacs who think they have won my Golden Sundial, but nearest loony gets time, date and place wrong. Ho hum. Invade Poland. Go back to bed.

TUESDAY.... Wake up in waste disposal unit. Someone has been playing Pimania while I was asleep, and fed me a pork pie. I kick this player out of the game. Run out of T-shirts. Stay in bed. Post man bitten by red herring, as the dog is on holiday. Haven't sold a cassette all week. Consider eating herring as dog is on holiday.

WEDNESDAY....Disaster! Postman wakes me from dreams of playing sax in rock band by screaming "They've got you, you long nosed pixel!" I sign for a registered envelope. (This is a mistake.) Letter is from gentlemen claiming to represent makers of a well-known board game which shall remain nameless... (WADDINGTON'S MONOPOLY) Cripes! They're gonna get me for marketing "AUTOMONOPOLI" (only £6 including VAT, postage and packing, but this isn't an advert, honest.) I try to find valium, cuddly toy, anything that will stop me shaking. No luck. I phone Computer Trade Association. Ho hum.

THURSDAY....getting worried. Back page of Popular Computing Weakly featuring a cartoon character calling himself.. Uncle Groucho. Is AUTOMATA trying to retire me! I'm not finished yet boyos!! Go to the Cavern of Ivory for lunch. An idiot has left TV Dinner and a Can of Worms there. Eat Worms. Am advised by Solicitor to change name of my splendid "Automonopoli" I have to pay for such a piece of advice, already?

FRIDAY....Two large men with Italian accents and bulges in their jackets, arrive and put pressure on my nose. I am frog-marched to court where a lady accuses me of stealing her baby. Help. Luckily am dreaming again. Decide I cannot fight big business on my own so will change name of "Automonopoli" (up to 5 players, including Spectrum, large size moving board display etc.) Feel sick. Must be the worms.

SATURDAY....Can't sleep. What do I call my game? "NOT MONOPOLY"?nah, too silly, even for me. How about "YLOPONOM"? No. Maybe "WADDINGTONS ARE JOLLY NICE CHAPS SO PLEASE DON'T SUE THE EFFLUENT OUT OF ME." too grovelling? Images of me in a prison. Oh CRIKEY! I'll have to wear clothes with cursor symbols all over them. Don't take me away! I don't want to go to jail! THAT'S IT!!! I'll call it "GO TO JAIL". Celebrate this stroke of brilliance by doing Hokey-Kokey!!

SUNDAY.... Get ready to inform public, dealers, press etc, that "AUTOMONOPOLI" is to be withdrawn. "GO TO JAIL" on the other hand is only £6, your Spectrum has a cool, cunning personality, and it may well beat you. State of play at the touch of a button, up to 5 players etc. Dog comes back off holiday. Force feed it a well-known board game. Go to bed.

MEANWHILE, BACK AT AUTOMATA'S REGULAR KRUMMY KOMIC STRIP...

# we put some ting in computing

