

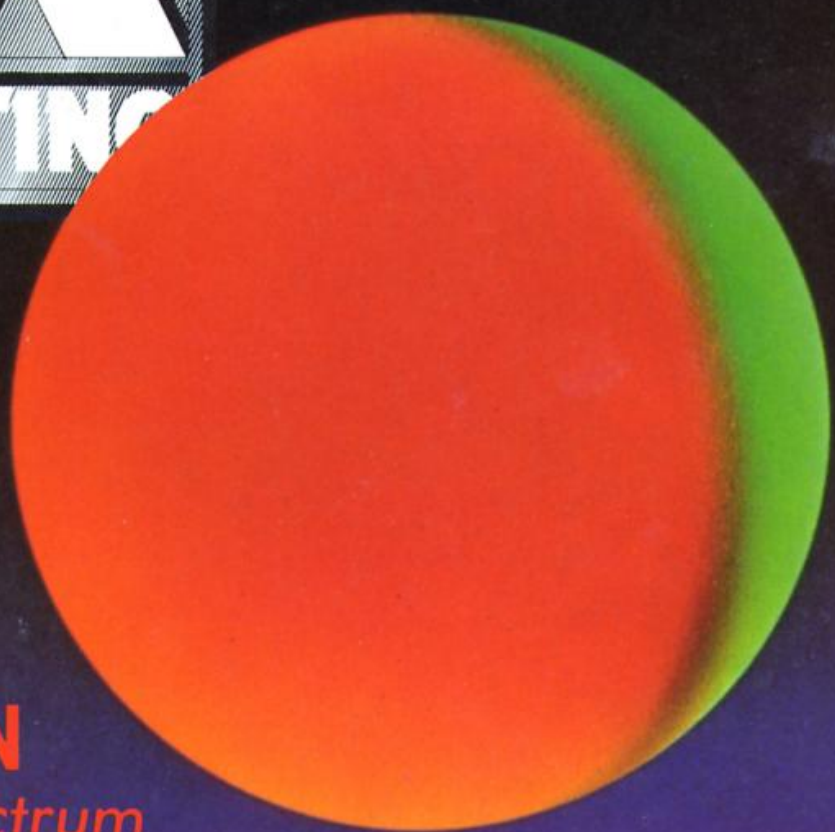
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NOVEMBER 1986

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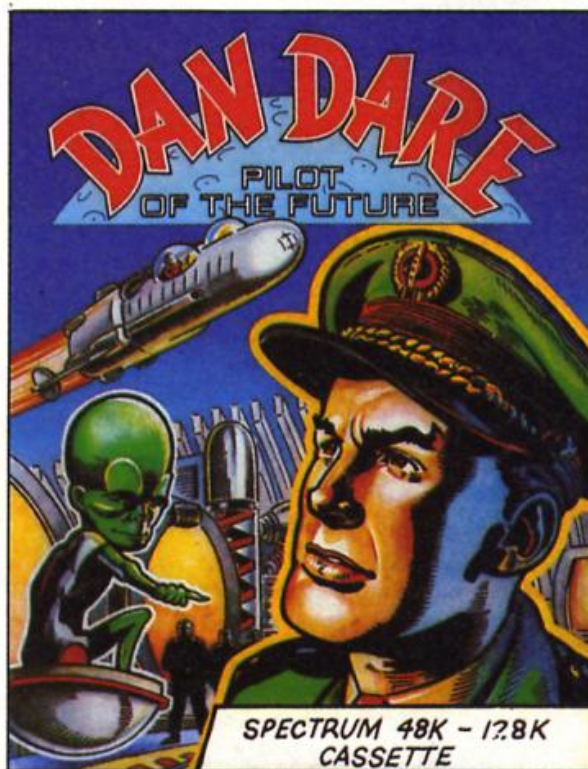
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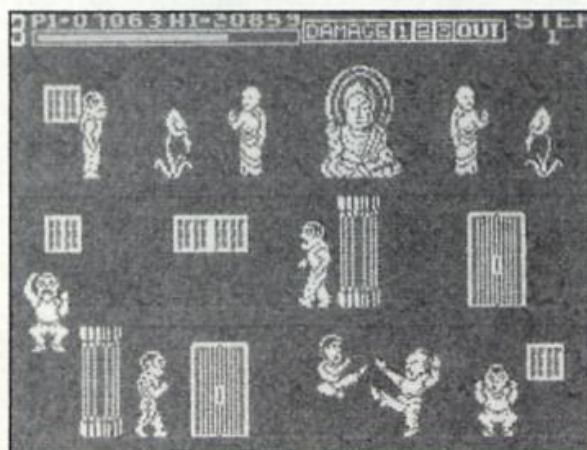
The Pilot of the Future in action (46)

NEWS

Fairlight II

Bo Jangeborg's follow up to Fairlight is now almost complete and due for an October release. Fairlight II carries straight on from where the action in Fairlight left off. But now, the game's hero, Isvar, has to leave Castle Fairlight and travel through a forest beset by the powers of Darkness. The Edge claim that this will be one of the first 'true' 128 games for the Spectrum and the 48K version will have to be loaded in two parts in order to fit into the smaller memory. Both versions will cost £9.95.

Also due from The Edge this month are Shao-Lin's Road, an arcade conversion of the sequel to Yie Ar Kung Fu, and The Artist II. The latter is an upgraded version of the rather nifty Artist, which was also programmed by Bo Jangeborg, and includes many new features such as pull down menus, icons, AMX and Kempston mouse control and lots more. As with Fairlight II, The Artist II will be available in 48K and 128K versions for £14.95 and £17.95.



Shao-Lin's Road

The French Connection

Vera Cruz is an interesting new game from French company Infogrames. The aforementioned Vera is, or rather was, a well known woman of 'ow-you-say, easy virtue. Until she was discovered dead in her apartment — which is where you come in.

Using a police computer system to gather information you must piece together clues to solve the murder and apprehend the villain. But first you have to track the game down in your local software shop and bribe the owner with £9.95 before you can get on the trail.



Codemasters

This little bunch of Darlings (Jim, David and Richard) are collectively known as Code Masters, which is the name they've given to their new budget software label. Jim Darling used to work for AI Products who have provided many of Mastertronic's titles in the past, and his two sons have programmed a few games, such as the well known The Last V8, Masters of Magic and others.

Code Masters intends to release games as good as most full priced titles, but at a competitive £1.99. Their first Spectrum titles include Vampire ('platform game with a difference'), Phantomas, a graphic adventure called Necris Dome, and Terra-Incognita, the follow up to Mastertronic's odd game Nonterraqueous. Let's hope that those four get Code Masters off to a good start.



Opus meet the Plus 2

Opus Supplies wish to announce that yes, the Discovery disc drive is compatible with the new Spectrum Plus Two. Risking potential egg-on-face of mega proportions, Opus' John Harris tried out the new Spectrum when it went on show for the first

time at the PCW show, and everything went fine. So Plus 2 owners looking for a disc system and not wanting to wait for the rumoured Amstrad system need look no further.

Discovery cost £99.95 plus VAT, and Opus can be contacted on 0737-65080.

Gratuitous violence

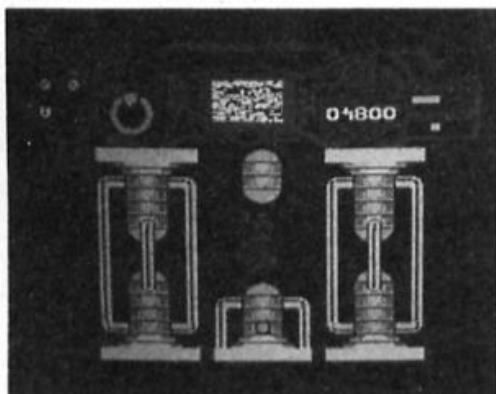
That's our only excuse for printing this picture of judo fiend Brian Jacks beating the daylights out of his poor old dad. That and the upcoming release of the judo simulation Uchi-Mata from Martech, on whose stand the two Jacks were demonstrating a few throws at last month's PCW show.

We would like to point out that ZX doesn't necessarily condone the mugging of one's father, though you have to admit that it's one way of getting him to go out and buy you a new Spectrum Plus 2.



At last, Antiriad

Despite a few last minute hitches, Palace Software's newbie, The Sacred Armour of Antiriad should be released this month. This epic of barbarians and nuclear holocaust has already been previewed in ZX, so we will only add that the release date is 23rd October, and the price £8.99.



Spectrum Games Top Ten

1 () Trivial Pursuit	Domark
2 () Dan Dare	Virgin
3 () Headcoach	Addictive
4 () Paperboy	Elite
5 () Dragons Lair	Software Projects
6 (2) Ghosts 'n Goblins	Elite
7 () Heartland	Odin
8 () Xarq	Electric Dreams
9 (4) Green Beret	Imagine
10 () Strike Force Harrier	Mirrorsoft

(Chart supplied by W.H. Smith)

All change at the top with some heavyweight releases this month. The question is can any game displace Trivial Pursuit before it comes into its own as the tailor made software stocking filler?

Strong contenders for the Christmas No 1 spot yet to be released include Gauntlet, (US Gold), Uridium (Hewson) and Trailblazer (Gremlin).

Now!

Virgin have just put together the third in their Now Games series. Now Games 3 is a compilation of five games, including a brand new Spectrum version of Sorcery which is available for the first time. The other titles on the tape are Nick Faldo Plays The Open, Codename Mat II, Everyone's A Wally, and the three part Bond Game, A View To A Kill. Now Games 3 should be in the shops as you read this, and costs £9.95.



Dan Malone; Antiriad's author, hard at work on the graphics using a barbarian machine.

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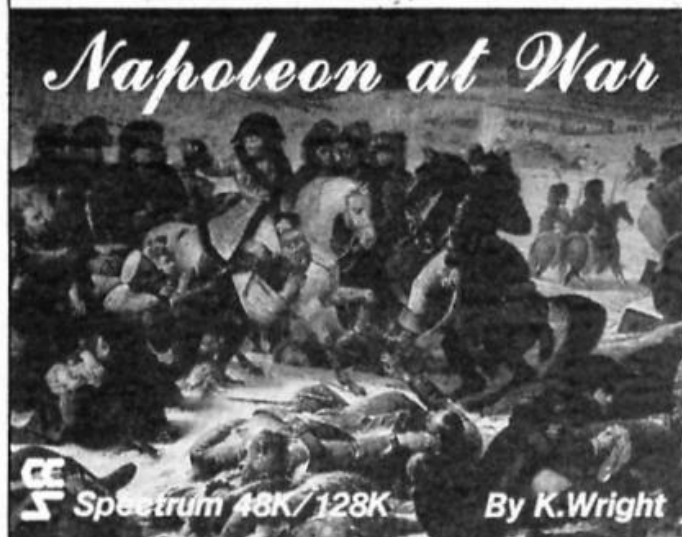
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Not tonight Josephine...

Is a new strategy game in which Napoleon Bonaparte attempts to — no, let's try that again.

Napoleon At War is the latest release from wargames specialists CCS. Based upon the Battle of Eylau the game puts you in control of French troops as they battle the opposing (computer controlled) Russian and Prussian forces. CCS say that the game offers a high level of artificial intelligence, both in the computer opponent and in suggesting alternative tactics for your own forces, so if you're into wargames this is your chance to meet your Bakerloo for £8.95.

Further strategic info from CCS on 01-858-0763.



Once bitten...

Twice Shy is the latest game from Mosiac, based on the Dick Francis horse racing thriller of the same name. In it, you'll play the part of teacher Jonathan Derry who finds some computer tapes that are wanted by shady underworld figures, and it's up to you to get the tapes back to their rightful owner.

The game is being written by The RamJam Corporation and is priced at £9.95. So if you fancy thrilling some race horses Twice Shy seems like a good bet.

Cruising

Microsphere, the software house that brought you Skool Daze, have been quiet of late but are about to surface again with a detective mystery game called Contact Sam Cruise. Sam Cruise is a private eye in the Bogart tradition with a permanently turned up collar. Microsphere are keeping shhmm about the plot thus far but here's a screenshot to get you into that 'film noir' mood.



Software Pirates

Ariolasoft offer you the chance to plan the crime of the century in their new game, They Stole A Million, in November. You are put in charge of a group of small-time villains and, with the help of some blueprints and your handpicked henchman, you can choose one of five 'targets' to rob and then you've got to find yourself a fence who can take the merchandise off your hands. If this sounds like your sort of thing, then beg, borrow or possibly steal £8.95 to get the goods from Ariolasoft.

Professional Retouch

Part of the listing in The Professional Touch (September) was printed out of sequence. The section of the listing C125 to C177 should be moved to the end of the listing.

Mantronix winners

The winner of our inlay design competition is 17 year old Ian Macaulay from Dudley, who sent in an impressive redesign of Probe Software's Mantronix cover. Ian's winning entry was

very professionally presented and he gets the chance to see the professionals at work with a visit to Probe as they work on the theatrework for a new release.

Mr D. Nichols from Holborn, E. Bennet from London SW11, Jay Sachania, Milton Keynes and David Rademaker from Gent, Belgium win runners up prizes of a copy of Mantronix.



Elite Classic Winners

Five winners carry off the first ten releases in the Elite Classics range. They are Tommy Tay, Oberusel, West Germany; Jeffrey Ford, Etwall, Tony Parrit, Cleveland; Richard Haggis, London N3 and Cleasie Ward, Spilsby.

Boggit Winners

Thirty ZX readers have booked their trip to the wacky land of enchantment, Muddle Earth by emerging the victors in our Boggit competition. They will each receive a copy of CRL's Monster Hit game and set off on this spoof adventure to discover the dreaded horrid squelchy things and other beings that Tolkien thought were too funny to include in the original.

The squad of winners are: H.H. Neilson, Galashiels; P. Gaw, Normanton; Brett Coles, Milton Keynes; Miss E. Dron, Sutton; Trevor Boyd, Belfast; Geoffrey Priced, Pulborough; J. Riddell, Herne Bay; Richard Grant, West Lothian; Lelf Kornstaedt, Colommières, France; Javier Packer Coryn, Court St Etienne, France; P.R. Ball, Brentwood; P.J. Nutter, Catterick; A.L. McLellan, Paisley; P.J.E. Williams, Fordingbridge; S. Burnett, Tottenham; Mrs P. Barclay, Plymouth; Gregory Teeger, London NW6; Colin MacKenzie, Fleet; D.J. Wagner, London W3; Sean Weekes, Sandiacre; Mark McEvilly, Birmingham; Phillip Hiscock, Shepton Mallet; John Jones, Lechlade; N.S. Collet, BFPO 34; N. Cashman, London E14; P. Harrison, Appleby; R. Record, Clacton; David Watson, Barnsley; Dirk Vanderreyken, Heverlee, Belgium; Skancmir Kais, Myslavokice, Poland.

Graphic Adventure Creator Winners

ZX readers plumbed the depths of their imaginations to summon up the opening scenes of a new adventure and the results showed some fine sparks of originality. Ten winners get the chance of developing their ideas into a finished product with Incentive's Graphic Adventure Creator. They are Pete Pointon, Walsal; Jorgen Jacobsen, Glostrup, Denmark; A.F. Motin, Leeds; J.S. Russel, Fareham; Barry Carter, London E.2; D.M. Shannon, Co Antrim; W.J. Stewarl, Nottingham; Emil Gruber, Graz, Austria; P. Newnham, Weston Super Mare; Roger Morton, Normanton.

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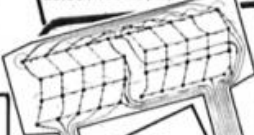
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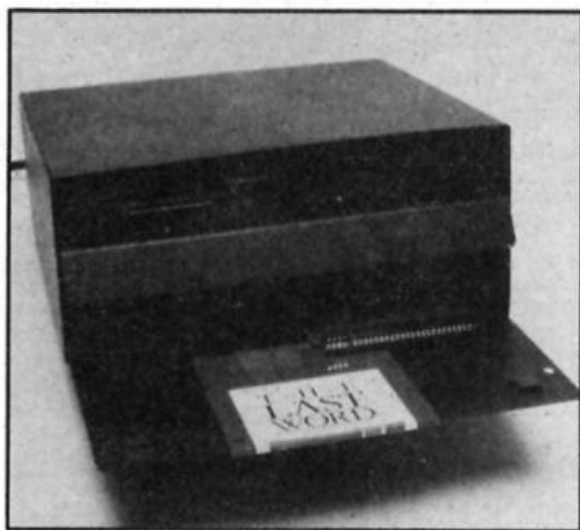
Saga Systems has put together a word processing package aimed at giving Spectrum owners a viable alternative to the temptations of the Amstrad PCW8256. Known as the Compliment it will be selling at

£299+, that's £100 less than the Amstrad word processor. But the Compliment is made up of hardware that can be used for many other uses — it's far more than just a word processor.

The Prize

The Compliment consists of:
LQ Printer — prints 150 characters per second and 25

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Mailmerge



Compliment Competition

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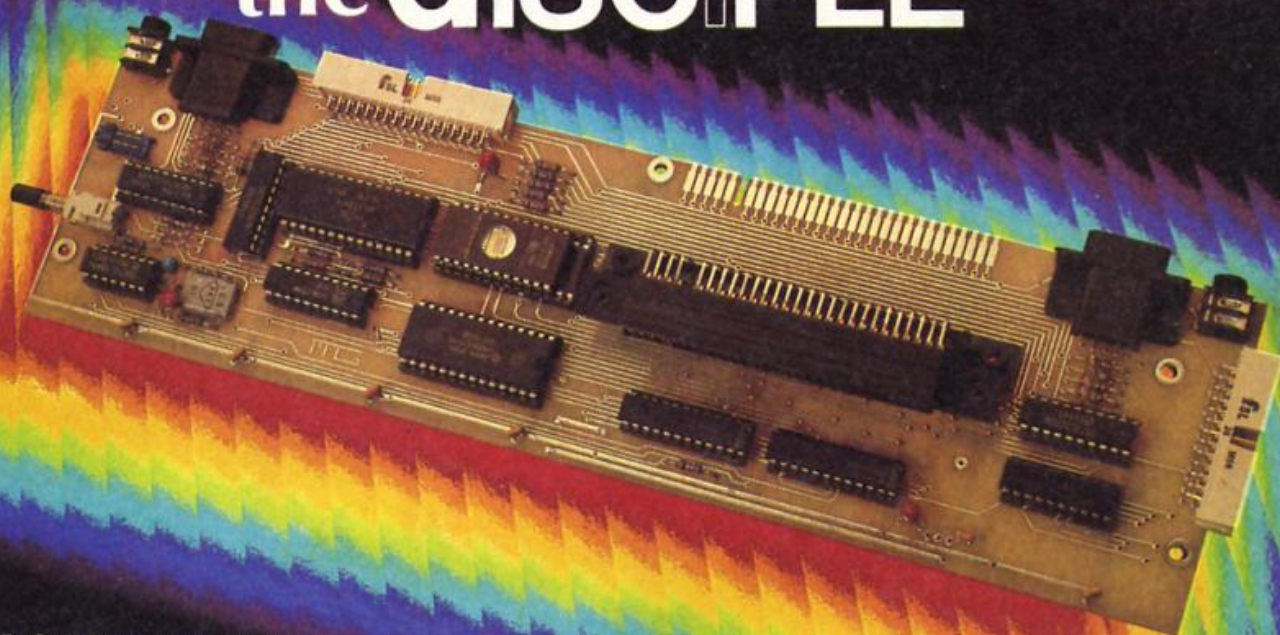
The competition

In conjunction with Saga, ZX is giving one of its readers the opportunity to win a Compliment system. All you have to do is give us in 50 words or less your reason for wanting to win the Saga Compliment.

The competition is open to all readers of ZX except employees of Argus Specialist publications, Alabaster Passmore and Saga Systems. The editor's decision is final and no correspondence can be entered into. The closing date is December 5th 1986.

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Alan Davis begins a three part series to create an original fantasy wargame.

Roland stood by the keep, watching the folk of Greenways gathering their crops from the nearby fields. It had been a fine summer — one of the best he could recall — and the Shirefolk were in good heart. There would be ample provision for Winter this year, and he was content. Suddenly the excited shouts and gestures of the villagers

drew his attention towards the forest of Greenways in the west, whence a solitary rider was approaching at great speed. "What news, friend?" he called, as the newcomer dismounted and tethered his beast. "Ill, my Lord," gasped the rider, gulping thankfully at a proffered draught of water. "I

the war of





the shires

come in all haste from the mountains of Darkness, where great armies are gathering in fearsome numbers!"

Roland shook his head. "Nay, friend — we surely have little to fear from the Shire of Darkness. The mountains are impassable. No army could penetrate them and survive."

"My Lord, the forces of

Darkness are mounted upon gurus — great beasts from the far west, capable of carrying many men over the most rugged terrain, at speed. Even water is no obstacle to them, for they are mighty swimmers. Believe me, my Lord, I have seen these things with my own eyes but three days ago, and even now Deepmeads and Northwood may have fallen!"

Roland needed no further persuasion.

"Then all the Shires are in the gravest peril! Freeman of Greenways, rally to my banner and prepare for war! We ride at once to warn Ranolf of Deepmeads. . . ." And as Roland spoke, from the west came the faint but ominous sound of thunder. . . .

the war of the shires

Don't worry — you haven't bought a role-playing fantasy magazine by mistake! This really is ZXC Monthly, and what you've just read is the introduction to a computer game. I'd better explain...

It all began with a bit of doodling, really. With pen and paper to hand one morning, I started sketching out a map of an imaginary world, with nothing very particular in mind — not knowing where it might lead. Gradually the map took shape, dividing itself interestingly into twelve Shires. Each Shire acquired a keep and a sprinkling of villages, and of course these in turn required inhabitants. So I started inventing some characters — thanes of the Shires: Roland of Greenways, Ranolf of Deepmeads, and so on.

Now, someone (C.S. Lewis, I think) once commented that imaginary worlds are all very well, but when you've created this interesting place and populated it with characters, something has to *happen* in it! It was at about this stage that I began to realise that there were possibilities here for a computer game of the "fantasy-epic-wargame" variety, which might provide some interesting programming examples (as well as an entertaining game) for my friends the readers of ZXC — not to mention myself! So I discarded the pen and paper, plugged in the old Spectrum — and the eventual result was "THE WAR OF THE SHIRES".

Building a world

Right at the start, a number of decisions had to be made about the format of the game. At first I did briefly consider using a simplified form of landscaped graphics, but rejected the idea on the grounds that the sheer volume of graphics data would make the program listings ridiculously long. However, there seemed to be no reason why the original "world map" itself couldn't be represented graphically — so I settled for that. The next question concerned the actual programming, which, ideally, should be sufficiently flexible for others to modify and add developments of their own. I could see from the start that some machine code programming would be necessary to prevent ponderous response times, but I was surprised to discover that in practise only two machine code routines were strictly necessary, and that BASIC was perfectly adequate for everything else.

Now this is good news, because of course it's very much easier to experiment with changes in a BASIC program than it is with machine code. The final requirements was merely that the game should be fun to play in its own right, regardless of any further developments you might like to make yourself in due course.

So if, as I am, you're attracted by the idea of creating imaginary worlds; or if you have a taste for the "Lords of Midnight" type of epic fantasy game which can be played over and again in different ways; or if you just fancy tackling the interesting programming challenges of a strategy game — why not join me for the next couple of months, and try writing your own...?

LISTING 1 Map printing routine: Assembler program.

HISOFT GEN53H2 ASSEMBLER
ZX SPECTRUM

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Pass 1 errors: 00

```

                20  +C-      10  +D+
                30  PRHAP
600000 400  ORG 60000
600000 400  LD  A,2
600002 600  CALL #1601
600005 700  CALL #006B
600008 800  LD  A,2
600010 900  CALL #1601
600013 1000 LD  HL,(VARS)
600016 1100 LD  DE,8
600019 1200 ADD HL,DE
600020 1300 PUSH HL
600021 1400 LD  DE,704
600024 1500 ADD HL,DE
600025 1600 EX  DE,HL
600026 1700 POP  HL
600027 1800 START LD  B,32
600029 1900 LOOP LD  A,16
600031 2000 RST 16
600032 2100 LD  A,(HL)
600033 2200 LD  (CHR),A
600036 2300 CALL COLOUR
600039 2400 RST 16
600040 2500 LD  A,(CHR)
600043 2600 RST 16
600044 2700 INC  HL
600045 2800 DJNZ LOOP
600047 2900 LD  A,E
600048 3000 CP  L
600049 3100 JP  HZ,START
600052 3200 LD  A,D
600053 3300 CP  H
600054 3400 JP  HZ,START
600057 3500 RET
600058 3600 COLOUR CP 144
600060 3700 JP  Z,BLUE
600063 3800 CP 145
600065 3900 JP  Z,GREEN
600068 4000 CP 146
600070 4100 JP  Z,CYAN
600073 4200 CP 147
600075 4300 JP  Z,GREEN
600078 4400 CP 148
600080 4500 JP  Z,RED
600083 4600 CP 149
600085 4700 JP  Z,MAGE
600088 4800 CP 150
600090 4900 JP  Z,GREEN
600093 5000 CP 151
600095 5100 JP  Z,GREEN
600098 5200 XOR  A
600099 5300 RET
601000 5400 BLUE LD  A,1
601002 5500 RET
601003 5600 RED LD  A,2
601005 5700 RET
601006 5800 MAGE LD  A,3
601008 5900 RET
601009 6000 GREEN LD  A,4
601011 6100 RET
601012 6200 CYAN LD  A,5
601014 6300 RET
601015 6400 CHR  DEFB 0
23627 6500 VARS EQU 23627

```

Pass 2 errors: 00

```

BLUE  EAC4  CHR  EAD3
COLOUR E99A  CYAN EAD0
GREEN  EACD  LOOP EAD7
MAGE   EACA  PRHAP 87F4
RED    EAC7  START EAD6
VARS   SC4B

```

Table used: 137 from 194

Maps and things

This month, as you might have guessed from the illustrations, is mostly about graphics and maps — specifically, the business of translating the original map of the Twelve Shires into something that can be readily programmed on the Spectrum. The Spectrum upper screen, as you know, consists of 22 rows of 32 character squares. Suppose we let each of these character squares represent one 'location' on the map of the world, then. This will give us 704 locations to play with — which should give ample scope for our "mini-epic", and will enable us to display the entire worldmap on screen at once.

But how should we store such a map in memory? One method would be to draw it out on-screen, and then store the entire screen as a code block above RAMTOP, calling it up as required during the game using a short LDIR-based machine code routine. Well, if the map were to remain unchanged during play, this would be fine — but in "The War of the Shires" I wanted certain features of the map to be altered by events. (Ships, for instance, won't always be in the same place, and keeps may be reduced to rubble in battle.) I finally decided to store the map in a BASIC character array, x\$(22,32), so that each character square on the screen could be directly related to a single element of the array, for ease of manipulation. Mountains, keeps, and so on, could then be represented by UDGs on screen, with the codes for the UDGs being held in the array.

So how do we actually get the map onto the screen, with each UDG appearing in its correct colour? Well, it *could* be done in BASIC — but it's a painfully slow process which would drive any player of the game to distraction (in play, the game involves a good deal of swapping between the map and the various text "pages" dealing with battles and the like.) This, then, *must* be a machine code job — and the assembler program in Listing 1 will do it for us. It's a very simple routine which assumes that the array x\$(22,32) is stored at the beginning of the BASIC variables area, and is simply prints the 704 characters contained in the array in the appropriate INK on white PAPER. I must emphasise that the routine won't work if the array x\$(22,32) isn't at the start of the variables area. This means that either the array must be dimensioned before any other

LISTING 2 BASIC program to generate machine code block and udg's.

```

1 REM *****
  Machine code and UDGs
  *****
10 CLEAR 59999: LET S=0
20 FOR I=60000 TO 60114
30 READ X: LET S=S+X: POKE I,X
40 NEXT I
50 FOR I=60200 TO 60366
60 READ X: LET S=S+X: POKE I,X
70 NEXT I
80 FOR I=65368 TO 65455
90 READ X: LET S=S+X: POKE I,X
100 NEXT I
110 IF S<46245 THEN PRINT AT 1
0,12;"ERROR!!!": STOP
120 PRINT AT 10,7;"SAVING MACHI
NE CODE"
130 SAVE "PRINT" CODE 60000,370
140 CLS: PRINT AT 10,11;"SAVIN
G UDGs"
150 SAVE "UDGS" CODE 65368,88
200 DATA 62,2,205,1,22,205,107,
13,62,2
201 DATA 205,1,22,42,75,92,17,8
,0,25
202 DATA 229,17,192,2,25,235,22
5,6,32,62
203 DATA 16,215,126,50,211,234,
205,154,234,215
204 DATA 58,211,234,215,35,16,2
38,123,189,194
205 DATA 123,234,122,188,194,12
3,234,201,254,144
206 DATA 202,196,234,254,145,20
2,205,234,254,146
207 DATA 202,208,234,254,147,20
2,205,234,254,148
208 DATA 202,199,234,254,149,20
2,202,234,254,150
209 DATA 202,205,234,254,151,20
2,205,234,175,201
210 DATA 62,1,201,62,2,201,62,3
,201,62
211 DATA 4,201,62,5,201
300 DATA 42,75,92,126,254,90,20
2,56,235,205
301 DATA 184,25,235,195,43,235,
35,126,50,203
302 DATA 235,35,35,34,205,235,2
05,127,235,254
303 DATA 1,202,181,235,205,146,
235,205,181,235
304 DATA 42,205,235,237,91,204,
235,22,0,25
305 DATA 34,205,235,58,204,235,
71,58,203,235
306 DATA 144,50,203,235,42,205,
235,126,254,32
307 DATA 194,66,235,35,34,205,2
35,58,203,235
308 DATA 61,50,203,235,195,104,
235,58,203,235
309 DATA 254,33,218,137,235,175
,201,58,203,235
310 DATA 50,204,235,62,1,201,42
,205,235,17
311 DATA 31,0,25,126,254,31,210
,165,235,19
312 DATA 123,50,204,235,201,35,
126,254,32,194
313 DATA 175,235,195,159,235,27
,43,43,195,153
314 DATA 235,62,2,205,1,22,237,
91,205,235
315 DATA 237,75,204,235,6,0,205
,60,32,62
316 DATA 13,215,201,24,24,119,1
78
400 DATA 16,24,60,52,118,114,24
2,105,0,0
401 DATA 0,56,116,242,56,0,0,10
2,153,0
402 DATA 0,102,153,0,0,48,108,5
0,110,124
403 DATA 36,0,0,0,24,60,126,52,
52,0
404 DATA 0,219,255,90,126,102,2
31,0,0,60
405 DATA 0,40,2,0,80,0,0,16,56,
16
406 DATA 56,124,16,0,22,28,60,1
24,254,16
407 DATA 215,126,0,0,0,0,0,0,0,
0
408 DATA 0,252,124,4,4,85,85,25
5

```

variables are assigned, or the variables area must first be CLEARED before loading the array from tape into a BASIC program.

Listing 2 will POKE in the necessary bytes for the map printing routine from BASIC — but it also contains two other important code blocks. The first of these "extras" is a machine code routine for printing text held in the BASIC variable Z\$, in such a way that words are not broken at the ends of lines. I haven't given the assembly language program for this, since it's very similar to a routine I gave in the May 1986 issue of ZX. The only important difference is that this routine

prints continuously downwards from the current PRINT position, whereas the previous routine produced a scrolling display. It's convenient to have both the map and text printing routines stored on tape as a single code block (saved as "PRINT" CODE 60000,370) — which is why I've given them together now even though we won't be using the text printing routine until next month. The call addresses, by the way, are USR 60000 and USR 60200 respectively.

UDGs

The last chunk of data in Listing 2 defines the UDGs required for the game.

The program will save these as separate code block ("UDGS" CODE 65368,88). You should note that the map printing routine will print the correct colours for the graphics characters only as I've defined them in figure 1.

Figure 1. Codes for the map's graphic characters.

CHR\$ CODE	SHAPE	COLOUR
144	Mountain	Blue
145	Downs	Green
146	Water	Cyan
147	Woodland	Green
148	Village	Red
149	Keep	Magenta
150	Meadows	Green
151	Pine forest	Green
152	Ship	Black
153	(Plain)	—
154	Army	Black

There's no reason at all why you shouldn't change the shapes themselves using your favourite UDG designer, if you wish. But you mustn't, at this stage, change their *meaning*, or their order if you're to avoid getting into a terrible mess later on! CHR\$ 144 (or GRAPHICS SHIFT/A, if you prefer) *must* be a mountain, and so on.

Now for the moment of truth. Somehow, we need to get the data for 704 locations into our map array — and if I were to present you with a list of 704 numbers to type in, you wouldn't be very pleased, would you? Can't say I'd blame you! Let's make ourselves a map editing program instead. Type in Listing 3, save it to tape with **SAVE "MAP EDITOR" LINE 1**, and then stop the tape in that position and put it to one side. Enter **CLEAR 59999** as a direct command, and load in the two code blocks you saved from Listing 2 thus: **LOAD "PRINT" CODE: LOAD "UDGS" CODE**. Now replace the editor tape and **SAVE "PRINT" CODE 60000,370: SAVE "UDGS" CODE 65368,88**. (They must be saved in this order). Rewind the tape, type **LOAD ""**, and wait for the menu to appear.

At the top of the screen you'll see the various UDG shapes presented for ease of reference

— except that the "Army" graphic will be missing since this doesn't form a permanent part of the map. Ignore options 1 and 2 for the present, and select option 3: "Edit map". You'll be greeted by a blank screen containing a white cursor square, with brief instructions displayed on the bottom two lines. Try moving the cursor

LISTING 3 The map editor BASIC program.

```

1 REM *****
  MAP EDITOR
  *****
5 DEF FN I(X)=(X=144)+(2 AND
X=148)+(3 AND X=149)+(4 AND X=1
45 OR X=147 OR X=150 OR X=151))+
(5 AND X=146)
10 BORDER 6: CLEAR 59999: LOAD
"PRINT" CODE: LOAD "UDGS" CODE:
DIM X$(22,32)
20 CLS: PRINT AT 10,11;"MAP E
DITOR":AT 13,10;"1: Load map":AT
15,10;"2: Save map":AT 17,10;"3:
Edit map"
25 PRINT AT 1,14;"UDGS":AT 3,8
;"A B C D E F G H I":AT 4,8:"FO
R I=144 TO 152: PRINT INK FN I(
I);CHR$ I":NEXT I
30 PRINT #1; BRIGHT 1;AT 0,9;"
SELECT OPTION: PAUSE 0: LET I$=
INKEY$: IF INKEY$="1" OR INKEY$=
"3" THEN GO TO 30
40 IF I$="1" THEN CLEAR: LOAD
"MAP" DATA X$(1): PRINT AT 10,4;
"Loading completed.": PAUSE 50:
GO TO 20
50 IF I$="2" THEN CLS: SAVE "
MAP" DATA X$(1): PRINT AT 10,4;"S
aving completed.": PAUSE 50: GO
TO 20
60 LET X=15: LET Y=10: RANDOMI
ZE USR 60000: GO SUB 1000
80 INK 8: PAPER 8: PRINT BRIGHT
1;AT Y,X; OVER 1;" ": PAUSE 0:
LET I$=INKEY$
90 IF I$="q" THEN GO TO 20
100 IF I$=CHR$ 13 THEN GO TO 20
110 IF I$=CHR$ 12 THEN PRINT AT
Y,X;" ": LET X=(Y+1,X+1)=" ": G
O TO 80
120 PRINT BRIGHT 0;AT Y,X; OVER
1;" ": LET X=X-(I$="5" AND X=0)
+(I$="6" AND X=31): LET Y=Y-(I$=
"7" AND Y=0)+(I$="6" AND Y=21):
GO TO 80
200 GO SUB 1010: PRINT BRIGHT 1
;AT Y,X; OVER 1;" "
210 PRINT AT Y,X; FLASH 1; OVER
1;" ": PAUSE 0: LET I$=INKEY$:
IF I$="a" OR I$="i" THEN GO TO 2
10
220 LET I$=CHR$ (47+CODE I$): P
RINT AT Y,X; INK FN I(CODE I$);
FLASH 0;I$: LET X=(Y+1,X+1)=I$:
GO SUB 1000: GO TO 60
1000 PRINT #1; BRIGHT 1;AT 0,0;
PAPER 6;"5,6,7,8= Move cursor ";
PAPER 7;"q= Quit "; "C5/0= De
lete "; PAPER 5;"ENTER= Add gra
phic": RETURN
1010 PRINT #1; BRIGHT 1;AT 0,0;"
Press the appropriate letter for
the graphic you wish to add here
": RETURN

```


the war of the shires

FIGURE 2
The on-screen map of the 12 shires.

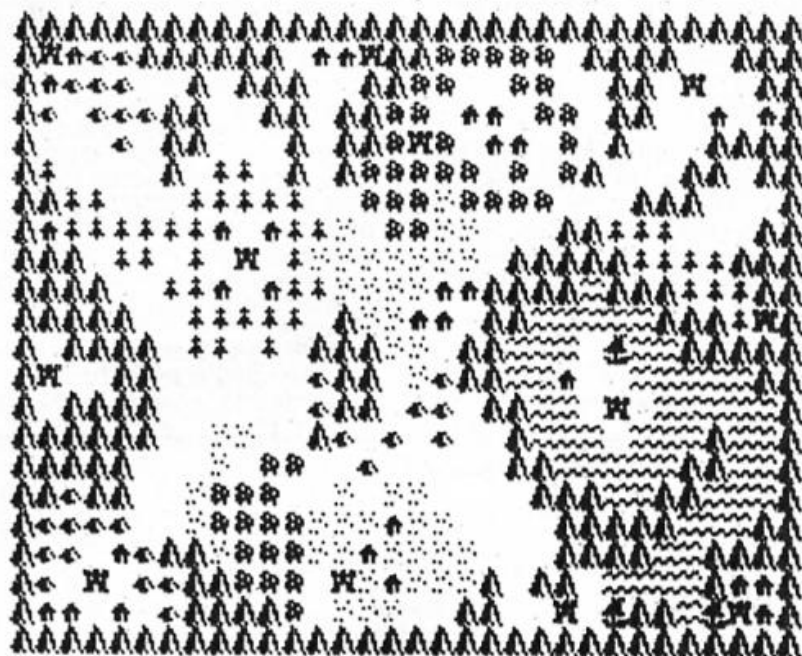


FIGURE 3
Guide to key presses for map editor.

```

AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AFEBBAAAAAAAAA EFAADDDDD AAAAA AAA
AEBBB A AAA AADD DD AA F AA
AB BBBAA AA AADD EE DD AA E EA
A B AA A AADF EE D A AAAA
AH A HH A AADDDDD D DA AA AA
AAHH HHHHH DDDGDDDD AAA A
AEHHHHHHE EHNG DGG AAHH AA
AAA HH H F HGGGGGGG AAAAAHHHHAA
AAAA HHE EHNGGGGEEAAAAACAAHHHAA
AAAA HHHHH AGGEE AACCCCAAAHFA
A AAAA HH H AAAGG AACCC ICCAAAAA
AF AA BAA GBACCE CCCCCAA
A AAAA BAA BB AACC F CCCCCA
AAAAAA GG AB B B AACC CCAACA
AAAAA G DD B AACCCCAACCA
AABAA GDDD G GG AAACCAACCA
ABBBB GDDDDGGGEGG AAAAACCAAA
ABB EBAAGDDDDGGEGGG AAAACCAAAA
AB F BBAADDD FGEGGGA AA CCCCHEEA
AEE E BAAAAA GGG AA F IAACIFEA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

```

square around using keys 5,6,7, and 8. OK?

Fine — now press ENTER, and the cursor will start flashing, ready for you to insert a graphic character. Press a letter key between "a" and "i" inclusive, and the corresponding graphic character will appear at the cursor position on the screen, in the correct colour. Finally, try passing CAPS SHIFT/O to delete it.

Going to war

Now that you're the proud possessor of a map editor, you're in a position to build up the map for "War of the Shires". Figure 2 shows you what the map should look like at the end (except that yours will be coloured, on screen), and Figure 3 shows you which keys you need to press at each cursor position, the blank spaces, by the way, require no action on your part; just leave them blank. At any stage you can return to the main menu by pressing "q", subsequently saving the map array to tape using option 2. At the start of another session you can load in a partly completed map using option 1, and then carry on where you left off. Go on, admit it — this is a lot more fun than typing in 704 numbers, isn't it!

To a certain extent you don't need to keep rigidly to Figures 2 and 3 — you can shift forests, hills, meadows and villages around as much as you like, really. However, do please check the positions of the keeps very carefully (look for the letter "F" in Figure 3). The keeps *must* be in precisely the locations shown in the Figures, and there must be 12 of them. Mountains will limit the movement of armies in the final game, and so you should make sure that every location at the edges of the map contains a mountain. You'd also be well advised to avoid making changes to the region surrounding the keep of Darkness on the western edge of the map (say within seven or eight locations from the keep) for reasons which will be obvious later on. Also, make sure that at least one ship is accessible from the mainland at the start, or your armies will be left high and dry! Within these limits, there's no reason why you shouldn't build up a small library of map arrays for use with the game.

Keep the machine code bytes, the UDGs, and your completed map array safely on tape — they're all vital. Till next month, when the action starts, happy map-making....

CROSSFIRE

The elusive 128 Keypad tracked down at last and a chance for you to nominate your choice in our quest to find The Greatest Unfinished Game of all time.

Keypad not required



In the June issue of ZX Computing there was a program I wrote for a machine code interrupt routine which put all of the new keys from the not yet available plug-in keypad for the Spectrum 128 in sensible positions on the Spectrum 128 keyboard.

An interrupt routine, however, is not

necessary at all! All of the keypad keys are already on the Standard Spectrum 128 keyboard, although in rather peculiar positions. The diagram accompanying this letter shows exactly where these new keys are. All of the symbols from the keypad are visible in the diagram, and by each symbol is a coloured square containing a letter or number (or in one case DELETE). The colours tell you which combination of shift key and extend mode is required with the letter or number in question. For

instance, the symbol (which means CURSOR DOWN TO END OF PROGRAM) is accompanied by the letter T in a green square, and the letter V in a black square. A glance at the key will tell you that a green square means EXTEND MODE FOLLOWED BY; therefore, pressing EXTEND MODE followed by T will move the cursor down to the end of the program. Similarly, since a black square means GRAPHIC MODE, it follows that pressing GRAPH followed by V (followed by GRAPH again to exit graphic mode) will have the same effect.

If you wish to make use of the new editing keys, but can't be bothered to load in and set up an interrupt routine program each time you switch the machine on, just cut the diagram out of the magazine (or re-do your own copy) and stick it somewhere near your Spectrum 128 so that you can refer to it whenever your Speccy is in use.

Of course, perfectionists who don't like the idea of having editing keys all over the place with strange combinations of shifts, would probably prefer to use the interrupt program, since that locates all of the new keys in sensible positions (on the cursor keys in conjunction with TRU VID and INV VID) so you don't need a table to remember everything.
Toni Baker.

Start to finish



When it comes to games software is it a case of many are played but few are finished? In the world of books there are "unread classics", tomes that sit proudly on the owners' shelves but are never looked at. Are there games which have totally bamboozled you and been left halfway through or adventures that have left you totally stumped and languish somewhere at the back of a cupboard?

Here at ZX we are announcing an

amnesty on games and adventure playing and readers are invited to point the finger at those games which have frustrated them most. Fill in the coupon below and from your responses we will be able to identify the most unfinished game and adventure of all time. Any additional comments on games playing are welcome and will form the basis of an article in a future ZX. Please send your nominations by December 5th 1986. Senders of the first 10 coupons drawn out of the hat will win a prize.

Great Unfinished Game Quest

My nominations for the Great Unfinished Game are

- 1.....
- 2.....

My nominations for the Great Unfinished Adventure are

- 1.....
- 2.....

What proportion of games and adventures that you buy do you play right the way through to the bitter end?

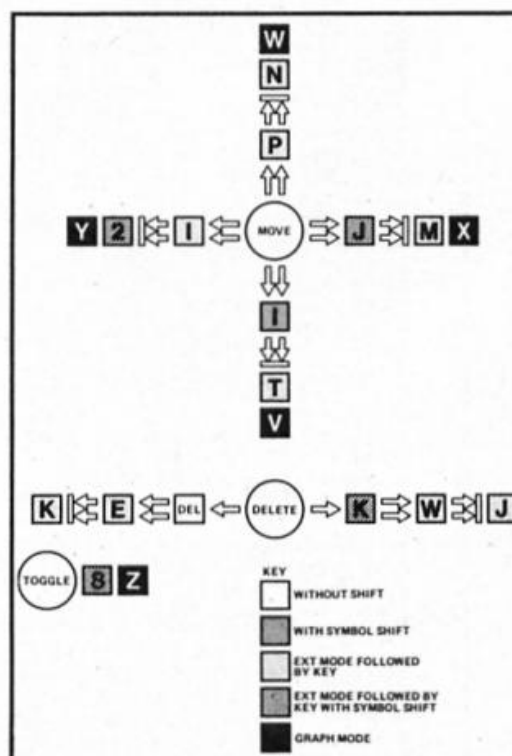
.....

Name.....

Address.....

.....

Send to Great Unfinished Game Quest, ZX Computing Monthly, 1 Golden Square, London W1R 3AB.



CROWIRES

Ray Elder tackles more readers' technical problems.

This month we really have a variety of obscure enquiries and due to their unusual nature, such as the operating commands of an ancient disk drive interface or the special commands of the American TS computer, we hope that perhaps YOU can help our desperate readers...

Dear Sir,

Q I have the following question to ask, I recently bought a Viscount disk drive interface for my Spectrum at a sale in a local computer shop.

But they didn't have a manual to go with it and they didn't know how or if it worked. I bought it anyway as it cost me only 10 guilders (about 2 pounds) but now I am trying to find out what commands to use with it.

It seems to work all right, it didn't wreck my Spectrum when I connected it and gave me a message on powering up. The message was "(c) 1983 by Marconics Ltd."

A friend of mine tried to find out what commands to use by reading the contents of the eprom of the interface but couldn't work it out.

So I hope you can supply me with the commands or an address of Marconics Ltd.

PS. I enjoy your magazine very much.
Yours faithfully
Daniel Muller, Haerlem, The Netherlands.

A I am afraid that the Viscount was just about the least popular of all the Spectrum Disk units, but at two quid you've got a bargain!

We have no address for Marconics they seem to have disappeared, but if any of our readers owned such a beast and would send us the operating details we would be only too pleased to forward them to you.

Dear Sir,

Q Last month I read an article about a brilliant program sold in America similar to the CARD DESIGNER for the Commodore 64, called "Greeting card designer" for the TS2068 BY ZEBRA systems, Woodhaven, New York, which I sent for and back came the program with a catalogue full of goodies or so I thought.

I was told the Timex 2068 computer was the same as the SPECTRUM 48K, however after the program loads I come up against two problems. The first is there are some different characters in the listing that my Spectrum doesn't understand (enclosed is an extract of the listing), the second problem is that the program doesn't allow for the use of my interface, only AERCO, TASMAN-B, TASMAN-C and A&J. Is there any way I can convert the program to work with my set-up. I have a SPECTRUM 48K+, "ZX LPRINT III" interface and a "EPSON LX-80" printer.

Your assistance in making this program work for me would be more than appreciated.

Yours sincerely
R.A. Williams, BFPO29.

A I am afraid that there are several differences which make the USA computer and the Spectrum incompatible. Timex were rather unhelpful in supplying a TS

machine for us to work with and so we really know very little about it.

BUT, we have many readers in the USA and perhaps one may help us. The Characters which cause the confusion are a curly bracket and a copyright sign which occur after a full colon.

You could try simply deleting them and hope that they are something unimportant such as sound commands, if you rerun your computer then you'll soon find out!

I would suggest that you try this and perhaps add a line 2185 LPRINT CHR\$(0);CHR\$(4);CHR\$(13)

This is the interface initialisation commands and in that line it should set it up ready for the programs use. A straightforward COPY command replacing one of the print routines could solve the problem.

Without my having the software to try out I'm afraid that you'll just have to experiment...

Dear Sir,

Q I wonder whether you can help me. I have a ZX Spectrum+ and an Alpha com 32 printer. All very satisfactory until recently I purchased, after reading an article in ZX Computing by John Wase, a Discovery I disk drive.

I immediately started having problems and found that these only occurred when the printer was plugged in. I was unable to load commercial tapes even from tape and could not convert Tasword II as advised at the end of the Tasword manual. The command LOAD""CODE would just of be accepted. Without the printer all worked as it should.

I wrote to Opus before I discovered about the printer and they just advised me to buy multiface 1. I have written again since but so far they have not been able to help.

I have also telephoned Dean electronics to ask if they knew of any reason of the apparent incompatibility. They have supplied me with a diagram of the pin connections to the plug but this is not a lot of help.

Thanking you in anticipation,
Yours faithfully,
R.J. Lawman, Cardiff.

A This has been a problem which arose after Alphacom had been supplying their printer for some time. It is simply not compatible with some peripherals and unfortunately the Discovery is one of them!

The only real advice I can give you is to buy a Centronics type full spec printer such as the GLP 2 or the Shinwa CP80.

I know it will set you back around £100-£200, but if you intend using your computer for serious text output then you will never regret it.

Dear Sir,

Q I own a ZX Spectrum 128K. When using it (programming or game playing) I get flickers of interference across my television screen.

The flickers last only an instant and come every seven seconds. They appear as silvery lines and in no continual place. As they are very distracting could you please tell me if this is normal and if not is it my computer or my television that is at fault.

Yours Sincerely,
Richard Finch, Southampton.

A Probably neither. This sounds like a case of interference from some other piece of electrical equipment. It could be that the computer is too close to your TV or that the PSU and the computer or the TV are interfering with each other.

Try moving each unit to different positions, but in the end I strongly suspect that another TV or a Cooker, Video, Fridge etc, is causing the problem. The only sure way is to turn everything off and just have your computer and TV on. Then again, a neighbour's unit might be the source of the problem.

Often one of the special suppressing plugs will cure or help alleviate the problem. It's a case of trial and error yet again!

A very helpful letter was received on the topic of the Opus and Printers from Mr. Turner of Hull, it reads:

Dear Sir,

A Reference Janet Watson's query in August edition of ZX Computing. I too have the Opus Discovery and Brother M1009 printer and also experienced problems using Tasword 2. After hours of work I finally contacted Tasman Software Ltd. They were most helpful.

The answer is Discovery will accept the microdrive version provided the following alterations are made to the basic program.

ADD LINES
6 CLOSE # 3
8 OPEN # 3,"B"
DELETE LINES 279 AND 281.

This is because the Discovery will not accept FORMAT "b";X Where X is the baud rate.

Printing may be stopped as normal by pressing and holding 'q' but if BREAK is used then you must restart by executing GO TO 6 or you will lose the text. You will also have to start to print from the beginning again.

Yours Faithfully,
T.W. Turner

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The

MUSIC

Machine

**Ray Elder enthuses
about the potential of
Ram's new
comprehensive musical
add-on.**

**The Music Machine
Ram Electronics
£49.95**

This smallish uninteresting looking black plastic box is perhaps the most powerful, versatile and exciting peripheral that I have had the pleasure to review for ages!

Described as 'The Complete Home Computer Music System' I consider this claim to be a modest appraisal of the unit, it could be used in professional applications as well. So what does it do?

At Home

The great majority of purchasers will go for its superb sampled drum sounds and built in sequencer allowing complex and carefully constructed

patterns to be created bar by bar and linked together to form a complete song.

A very versatile unit the quality and flexibility of which is equal to the £250+ Yamaha dedicated RX21 that I use. On the plus side is the fact that each bar can be set to individual tempos, not feasible with the RX. But there is a real time play mode where your fingers can attempt to mimic Buddy Rich. On the minus side is there is no "real time" pattern constructing and only two Toms, the RX has three. However the Music Machine has Cowbell and the RX hasn't.

But this does not matter!

If you want another Tom then you can have it, or remove the cowbell or any of the sounds and replace them with any other you fancy because the Music Machine is also a Sampler! This means that you can record digitally any sound you like via the cheap microphone supplied, tape or line out of an amplifier.

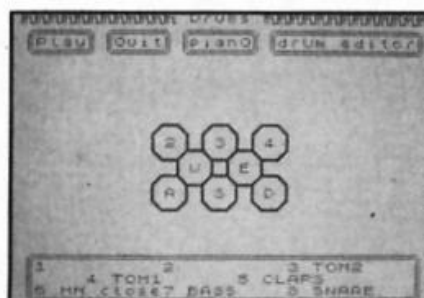
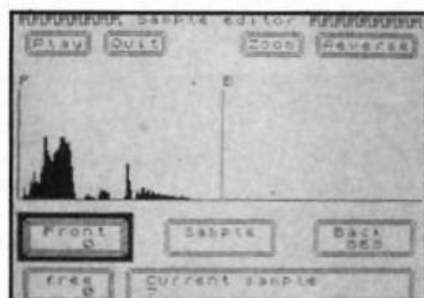
Once a sound is in memory then you can set the start and end parameters and play as much or as little of it as you wish, even looping it for continuous sustain. You can reverse it and play it backwards,

interesting, or go to the "piano" screen and play it back over a 12 note, one octave range rising from middle C.

Once you have exhausted the novelty of that then you can use the tune sequencer and play it over a much extended three octave range and in two parts. It is here that some of the limitations of an inexpensive unit may become audible, the sustain effect is played by a very fast staccato repeat and it can be heard as such, also the tone may become unpleasant in the extremes of the range. A £10,000+ Fairlight allows multi samples across the whole range to be taken so what can you ask of a unit such as this?

For technicrats the sampling rate is 19.444KHz and this gives approx 1.1 secs, it sounds short, but in fact it gives plenty of time to say "Samantha Fox" (should you so wish). A start and end of a sustain loop within the sample feature would have been useful, and the enlarged display of the waveform often resembles a burst from an airbrush and this is a pity.

The rear of the unit bristles with sockets and the three which most owners will use are the microphone IN, the Phono OUT to an amplifier or stereo and a





Headphone for personal listening. Only the output from either the tune sequencer or the drum sequencer can be sent to the headphone or phono socket at any one time.

Not just simply a fascinating toy as are most of the samplers I have seen, including some made by well respected companies in this field, but actually usable to create genuine musical compositions.

For anyone with musical interests this is an absolutely essential piece of equipment, I've heard 'Rap' records with less backing than this can produce, and the quality is good enough for studio use.

Midi

Should you be one of the growing number of serious home musicians who own a keyboard such as the Casio CZ101 or any of the other instruments fitted with MIDI (Musical Instrument Digital Interface) then you can greatly extend both units' use.

There are three MIDI sockets fitted, standard five pin DIN, for MIDI IN, OUT and THROUGH and via these you can either play your sampled sounds over the

full keyboard range, sync with external sequencers, play the Music Machine's sequencer out to the keyboard (at the same time as using the drums via the headphone or phono out) or any other combination you desire. This is possible from the software which operates in both the common Omni and Poly modes allowing full channel assignment and internal or external clock control.

Easy use

All this in one unit and program must make it complicated to run.

Not a bit! The manual is written to suit all abilities, step by step chatty approach throughout but with full technical detail for those with deeper understanding — something many of the dedicated "professional" units I've looked at do not usually give.

As for operating, the menu system has been carefully designed with many options being consistent whether you are in the Sampler, Piano, Midi, Echo or any of the many other operating screens. You soon

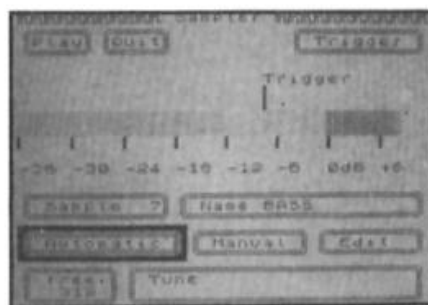
learn the essential commands and the others are nearly all self evident.

I am afraid this review is rather on the enthusiastic side, but then I have deliberately compared this unit with others of much higher price and it holds its own. A simple MIDI interface by itself can cost over £100, this has much, much more to offer.

RAM ask for ideas, there is no limit when you consider MIDI, for example how about; A real time multitrack sequencer with auto correct and variable quantize, or a multitrack step time sequencer, both with high resolution printout facilities, or a midi patchbay system (give me a unit and I'll write one of those!) or, or . . . the list is vast indeed.

Yes, you may say, but it'll cost the earth and be well out of my reach. I agree it is a little more than the average £15-£30 interface but at an astounding £49.95 it offers incredible value for money, the chance for anyone with an interest in music to get into the latest hi-tec musical development and I have no hesitation in giving it the highest accolade possible from a hard bitten, cynical reviewer.

I will buy one.



Joysticks

**Joystick connoisseur
Charlton Appleby takes
a critical look at
established Spectrum
joysticks and also
playtests Cheetah's
new 128+2 compatible
sticks.**

125+ Cheetah £8.95

The Cheetah 125+ joystick is a pistol-grip type of device with a thumb button on the top of the stick and a trigger for your forefinger. There is also the addition of two buttons on the ample, rounded, base. The moulding of the stick is very curvacious and fits the hand nicely, the base has four suction cups on it to secure the stick firmly to a smooth surface.

The cable is about a yard long with two plugs on the end. This split adaptor also features on the Mach 1+ and is of special interest to Sinclair owners, especially prospective purchasers of the ZX Spectrum 128+2. One of the plugs is a normal Atari-type D9 suitable for the majority of home computers, and the other one is a grey connector for the side of the new Sinclair machine. This second connector is re-wired in the manner that the new machine needs to get its signals, so you don't have to buy those awful SJSI things. My only worry is that, whilst this is a good idea, the way that the first connector has two wires coming out of it may weaken the link at the plug attachment point. As this is an area where a lot of joysticks break, and short of cutting the cable and replacing the plug, it is irreparable.

Also on the stick is the now almost obligatory, auto-fire switch. This is a switch to make the joystick function like a machine-gun, and to save wear and tear on the fire buttons (an



Mach 1+

area where a joystick is likely to fail first). A lot of modern games have auto-fire detectors that will cut out this facility or make it function to the detriment of the player, but a lot of games will be made more playable — in fact, some games are almost impossible to contend with without an auto-fire feature.

My main gripe with this stick is that it is not very responsive, the internal construction is that of collapsible domes, which usually give the best feedback, however in this case the stick is almost dead in my hand and games can be very tricky to play.

However, I would definitely recommend the 125+ for owners of the Spectrum 128+. It has all the features you would expect from an up to date joystick and although a bit lacking in the response department it's an efficient multi-purpose stick and at £8.95 it's a bargain.

Mach 1+ Cheetah £14.95

The Cheetah Mach 1+ is similar to the 125+ in that it has four fire buttons: two on the base and two on the stick, and in the same positions. However in this case the body of the stick is much bigger and angular and thus more difficult to use and a lot less comfortable than is expected for this kind of money.

Otherwise, the features of the other model are retained — two plugs, auto-fire, suction cups, etc. The internal construction of this stick however, is with micro-switches. These will last virtually forever under normal conditions.

The stick is awkward to hold and so is the base. Micro-switches are not very responsive at the best of times, and that point is proved again with the Mach 1+.

Apart from being very reliable it has little to recommend it over the 125+. If you want a joystick that will never let you down then you've found it with the Mach 1 but for enjoyable play opt for the 125+. The substantial price differential (£6) may also be a big influence on your choice.



Ever since 1976 when the first Atari VCS reared its ugly head in a few pioneering homes, the joystick has been a major bone of contention. Within a couple of years, third party companies were producing alternatives to the Atari standard stick. When the computer took over the Atari D9 standard became the *de facto* method of connecting a joystick or tracker ball to a computer. This standard persists to this day with even the mighty machines like the Amiga and Atari ST having the same little socket on their sides.

All Spectrum joystick interfaces have this D9 connector in them, some even have two. The one notable exception is the new 'Amstradified' Spectrum 128+2, which has had the wires all jumbled up in an attempt to make you buy Amstrad/Sinclair Joysticks. For the purposes of this article I will assume that anybody with one of these machines has either got an adaptor, or forgotten that they exist at all and has gotten himself a Kempston interface or something similar.

So what do you shove into that hole in the side of your machine? Having been playing games with joysticks for the last eight years or so I can safely say that I have some favourites. You may not agree with me, but then joysticks are like golf clubs, different sticks perform a different job, so select one that matches your needs.

Atari Standard

Atari
£6.95

The original, and some say the best. This awkward looking and ungainly stick is notorious for having started the whole ball game off. Internally it uses collapsible dome technology to make the connection, deforming a dome of thin metal until the electrical switch is made.

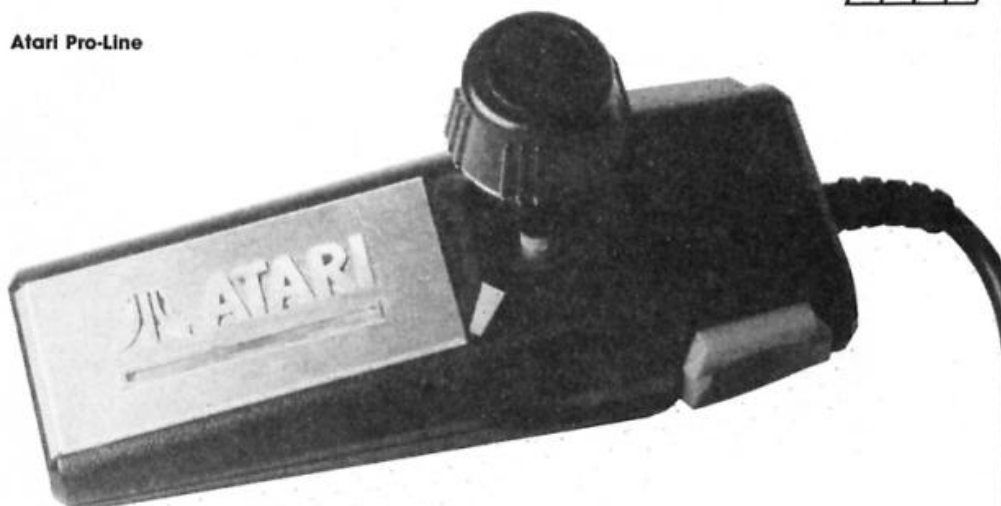
This system has the advantage of high tactile feedback, but the disadvantage of poor reliability and a short life time. These sticks seem to need a 'bedding in' period before they work to their best efficiency. The greatest advantage is that they're cheap, however their shape is very angular and the corners can dig into your palm and hurt a lot after a marathon all-night session.

Atari Pro-line

Atari
£9.95

The successor to the previous stick, this controller uses a contoured grip with two fire buttons for left/right handed operation, or fore-finger/thumb interchange. The short stick is

Atari Pro-Line



steel and unlikely to wear out, and is incredibly responsive.

The contacts are still collapsible domes, but this seems to combine with the short shaft to make this one of the most responsive joysticks that I have ever come across. This is my all-time favourite general purpose stick, capable of playing any game that there is, was, or could be!

Quickshot II Spectravideo £11.95

Probably the best known stick in the business. The Quickshot II has a contoured grip that fits the hand in a manner so perfect that it is a miracle of design. Two fire buttons are provided, one in a pistol trigger position and one on the top that fits your thumb. The base has four suction cups on it to grip the stick to a flat, smooth surface for one handed operation. Also on the base is a little switch for 'autofire' operation. This switch connects to a small circuit inside the joystick that creates a machine-gun effect when using the fire button. This is achieved by pulsing the fire button's output to the computer. This allows multiple firing in a game that allows such things, though a few of the more modern games can detect when an auto-fire switch is being used and will disable the fire button all together — with disastrous results.

Atari Standard



Internal construction is with collapsible domes, though with the large amount of leverage that such a stick affords, you may find that in some circumstances this stick will not have a long-life span — especially with younger players.

Fighter Pilot Tandy £8.95

This stick used to be marketed by Spectravideo under the name 'Quickshot' before the Quickshot II came out. Now re-badged, Tandy are selling it under their own brand name.

This stick has a fire button on the base, one on the top of the stick for your thumb, and a contoured grip — though not up to the standard of the Quickshot II. The base has suction cups on it to provide a firm footing for one handed operation, though there is no great problem using two hands as the base is also designed to be held.

Internal construction is once again by the collapsible dome method, with the usual limitations of not being too hard wearing, but with the advantages of good control and tactile feedback.

Trackball Atari £22

Not really a joystick, but can be used as one. The trackball was first introduced into the coin-op arcades on a game called Missile Command, and more recently on a game called Marble Madness.

The track ball consists of a 'billiard ball' mounted in a casing with detectors to report its movement to the computer and a couple of fire buttons. Instead of bending a stick in the required direction or roll the centre ball. This can give you an excellent control advantage in some games, but can be a liability in others. A track ball is at its best in Missile Command and Marble Madness type games, and can come into its

own in a lot of maze games.

A useful controller to have handy though definitely as a spare, rather than as your only control system.

Speed King Konix £12.99

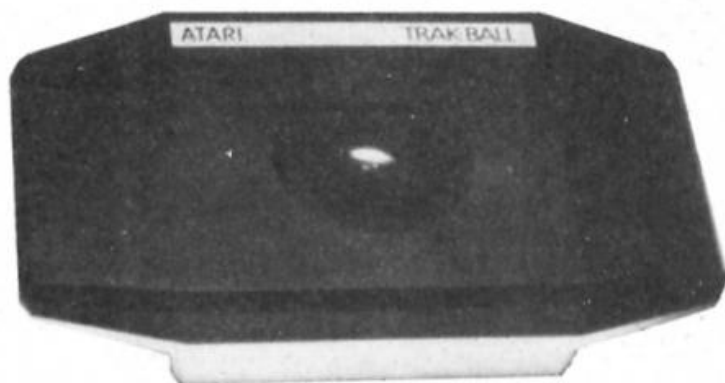
This is a fairly new 'stick' with a less than conventional configuration. An 'ergonomically' styled grip fits into your left hand like it was part of it, with the trigger resting neatly beneath the crook of your index finger. The top of the stick has a short, stiff stick protruding from it.

The switching is via micro-switches that will virtually last forever. However, their response time is a bit slow, and the tactile feedback is close to nothing. You hear your stick move before you can feel it or see it.

The grip is also a bit dicky at times. When you play for a long time in a difficult game, your hands can get a bit sweaty. With this stick you start to let it slip after a while and the whole situation gets out of control. If you are left handed — forget it!



Quickshot II



Trak-ball

Mazemaster Tandy £11.95

An interesting concept here, a joystick that can turn off its diagonal movement. Most joysticks allow for diagonal movement, but this stick lets you switch between eight-way and four-way operation. Why? For maze games of course. Ever had that time where you skid sideways into the spider? Well now this joystick will alleviate this to some degree.

The joystick is an awkward square shape, with a little stick protruding above it, this arrangement is fine for mazes, though I wouldn't want to play an action game with it.



Speed King

Construction is via micro-switch, and should last (effectively) forever, barring any adverse conditions.

Well, these are the sticks that I

like to use. You may prefer others, but these have stuck with me through thick and thin and I wouldn't give them up for the world.

HWARE

Sound Sampler

Cheetah follow up the success of their Spectrum with a new Sound Sampler.

SOUND SAMPLER
Cheetah Marketing
£44.95

The Cheetah sampling system consists of an interface, software cassette and microphone. The interface connects to the port at the back of the Spectrum (48K, Plus or 128) and has two control dials on the front, a mini jack sound input socket on the left hand side and a six foot lead fitted with a phono plug to take the output to an amplifier or stereo system. There is a

backup routine is supplied, there is a dire warning not to use the interface with anything other than another Cheetah Unit.

Tech specs

The specifications are impressive, replay over two octaves, superb processing allowing very fine selection of start and end points to be made, and sustain start and end points. These are chosen on a graphic waveform display. Samples can be reversed or combined, saved or loaded and reconfigured at will.

The frequency or bandwidth is 17.5KHz and this is as good as you'll get on some dedicated samplers for many times the money. Sample rate is 70000 times a second and maximum length is around one second. Which is long enough to say your name or a simple Nineteen!

The utility or effects program is great for playing around with, providing echo, reverb, fuzz, chop, bubble, and pitch effects, very noisy though and there's not enough control for serious usage.

Usability

The publicity claims "Home or Professional" use and I wouldn't disagree. All I would say is that the professional use may be rather limited, especially if it was intended for recording as the sound quality is good rather than excellent, and the background noise is rather too high for professional standards even under optimum conditions.

The input section is well designed, allowing a wide range of impedances from microphone, line or instrument sources and the output match proved compatible with both my power amp and my cassette line in.

Operating the sampler is a joy. Everything is menu driven and error tripping seems to be very comprehensive, even with my idiot act in full swing it informed me of where and why I had gone wrong each time.

I loved it, even at the level of simply playing around it was great. I took it into a local school and the pupils had a great time with the utility program and the Science teacher was devising ways of using it for the new GCSE exams!

Finally, I have spent quite some time using the sampler, and I am becoming more and more impressed with it. I would even cautiously suggest that a studio might be able to use it for some short and limited effects, provided enough noise reduction was available.



Sound sampling has become the "in" thing in the music field at the moment due to recent developments in technology and, since it is a computer based technique, it is not surprising that such a device should be developed for our home micros.

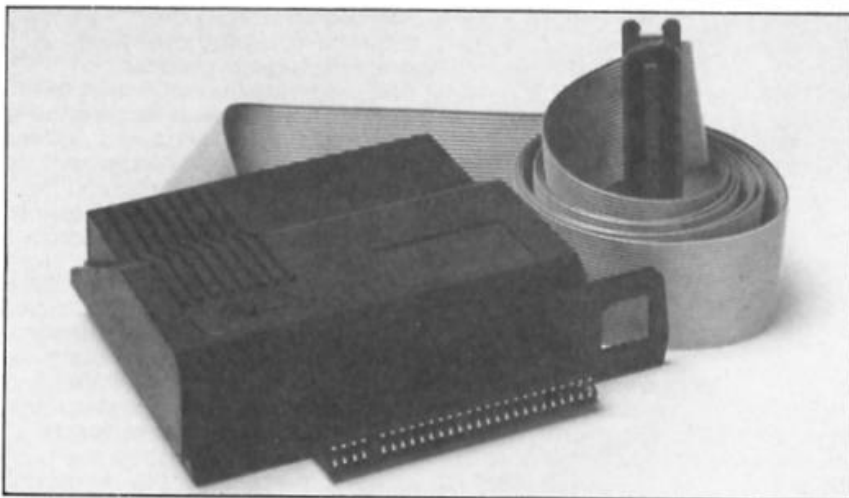
To put it rather simply, sound sampling involves making a digital recording of a voice, instrument, piece of music, or some other sound, processing it as required and replaying it in a choice of pitches.

problem in that the lead is not really long enough and the phono plug is only suitable for stereo or expensive mixing desks. The more usual plug is a standard jack, and it might have been better if the control knobs had been positioned on the top and a second socket had been fitted for output.

The microphone is a fairly basic one for use with a portable cassette recorder and is not really suitable for 'serious' use.

Although a Microdrive

RAMPRINT



Not only does RAM's new interface have everything but the kitchen sink crammed into it, the instructions are easy to understand too!

**Ramprint
RAM Electronics
£34.95**

Now let's be sensible about this; what are the reasons for buying a 'real' printer to use with your Spectrum. The main ones have to be to get decent listings, screen dumps and

The RAMWrite 32 column wordprocessor.

wordprocessing facilities. I got hooked on wordprocessing about a year ago when I discovered Tasword 2, and I would much prefer wordpro to using a typewriter if it weren't for my complete inability to cope with printers. The words always look fine on the TV screen, but I can never get them to come out of the printer at the other end.

The trouble is that you can't just plug a full size printer into the Spectrum and get it to work straight away (you could do this with Sinclair's new ZX Printer but that was very limited in both quality and options it offered). First of all you need an interface and the lead to connect the two machines, then there's the awful business of initialising the interface and shoving in all the control codes. Then, if you're using some sort of wordpro software, you'll probably have to

fiddle with that to get it to work with the particular interface that you're using. And if you get any of that wrong the whole setup goes mad and starts vomiting up reams of paper covered in a long-dead Greek dialect when all you wanted was your laundry list.

The whole business is a pain, and it's driven me back to my steam-driven typewriter many a time.

With that in mind it's strange that nobody has yet come up with the idea of producing an all-in-one printer interface with its own wordprocessing software so that the two are compatible and don't require hours of fiddling to get them working together. But that, at last, is what RAM Electronics have done with their new Centronics-type RAM Print interface and RAM Write software which is stored on a ROM chip within the interface itself, not to mention some of the other features included.

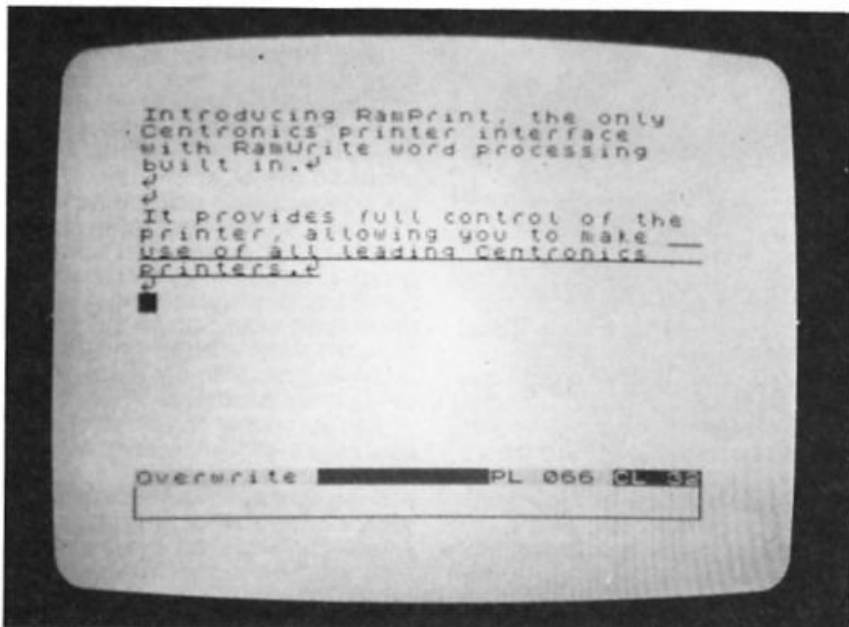
Kitchen sink syndrome

To start off with, the interface comes with its own Centronics cable built in, so there's no additional expense involved in buying one or working out what to do with it.

Then, surprisingly, RAM have made the interface emulate the old ZX Printer so that you can use the Spectrum's own LLIST, LPRINT, and COPY commands for listings and screen dumps. This is very sensible as it combines the simplicity of use of the ZX Printer with the high quality printing available from the whole range of Centronics printers.

RAM have also avoided a potential problem here as the Spectrum 128 isn't compatible with the ZX Printer when operating in 128 mode. However if you enter the command PRINT IN 251 on power-up then you can sidestep that particular problem. The commands for the 128 are slightly different, LPRINT "© copy" rather than simply COPY, but that's not too much of a problem.

Now we come to what is normally the tricky bit, the control codes. Thankfully though, RAM, have given you some help here also. Entering the command LPRINT "© set" calls up an options menu, a pull-down window which overlays, but doesn't wipe out, what is already on the screen. The options available here aren't exhaustive but they do at least



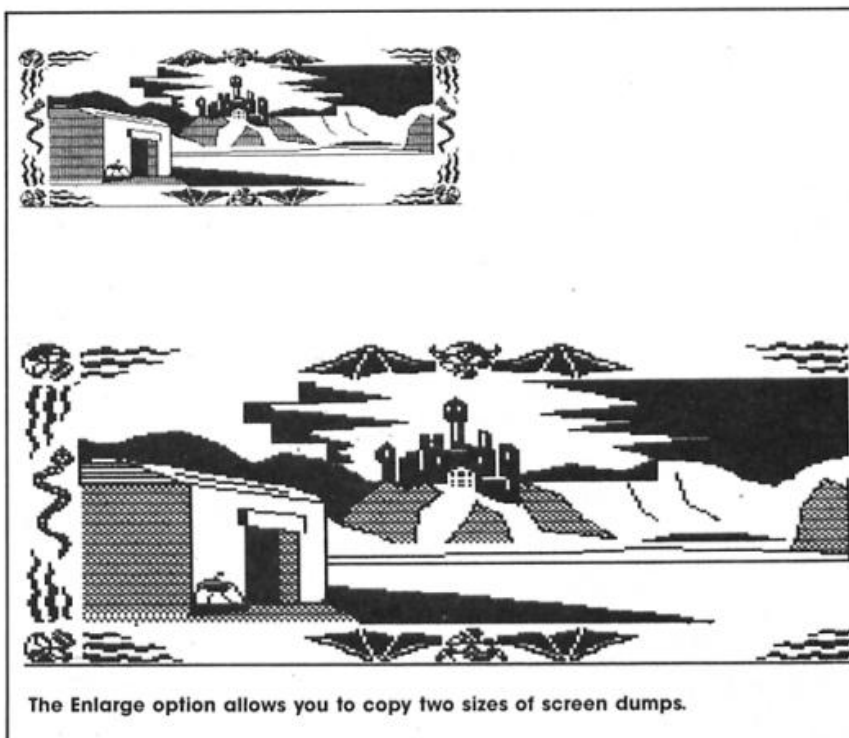
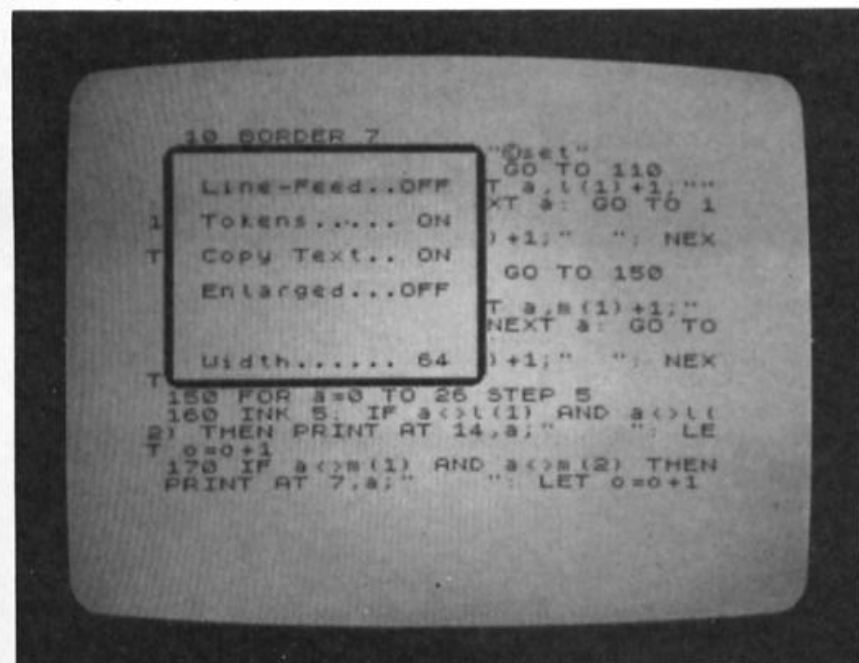
cover the most often used options; Line Feed, Tokens, Copy Text, Enlarge and Width. For each of these you can simply choose the On or Off state as required without any of the business of having to look up control codes and enter them as endless strings of CHR\$. The RAM Write software has its own set of control codes for different types of printing, but if you want to do fancy things with listings then you'll probably have to go back to looking up the codes in your printer manual. C'est la vie.

As a final touch the interface also includes a Kempston joystick interface — RAM are certainly making sure they've covered all their bases. The interface is well constructed in a robust black plastic. There are no exposed parts and there's even a small ring that goes around the power socket to make sure that everything fits nice and tidily.

RAM Writes

Of course, the most obvious attraction of this interface (for me anyway) is the inclusion of a wordprocessor program on ROM and the convenience of instant access and printer/interface compatibility. Entering the command LPRINT "© word" instantly calls up the RAM Write program and you are presented with a screen in which the upper 22 lines are blank (for text entry), while the lower two lines are for the status display and choice of option. When the cursor is on the bottom line you can choose whatever options you want simply by typing the appropriate letter (b= Back to Basic, c= Copy text, d= Display text and so on). The options available cover all the usual string search/replace, block copy/delete, and so on. These

RAMPrint's pull down options menu.



aren't as exhaustive as the options available in Tasword or The Writer, but they're adequate for most simple wordpro, apart from the omission of a wordcount (one day someone will produce a wordpro that has its own word count ...).

Entering 'e' puts you into Edit mode and reveals the only real disappointment in RAM Write. You can only enter text in the Spectrum's normal 32 characters per line, and while the printed output does have wordwrap, 64 character lines, justification on and off, you can't see these things on screen while you're editing the text. There is a display mode which allows you to see the text in 64 character lines, just as it will be when printed onto paper, but you can't edit the text in this display.

If you want to make any changes to the layout of your text you'll have to go back into edit mode and 32 character display.

This is a bit of a bore. In practice I found that I could just go ahead and slap the text onto the screen and it would come out of the printer looking okay, but I still wanted to get a look at the text as it would appear on paper and this meant a lot of switching to and from Display mode. If you're used to the 64 column display of Tasword or The Writer this can seem a bit of a step backwards and a lot depends on whether you find the convenience of the interface/software combination an adequate compensation for the relatively unsophisticated editing facilities.

On the other hand you could easily use Tasword with RAM Print, and this will give you the best of both worlds.

Despite the shortcomings of RAM Write, the convenience of having so much crammed into the interface and the ease of use that RAM Print offers make the whole thing a godsend for someone like myself who is totally baffled by the intricacies of printers and control codes and the like. At last I've gotten my hands on a word processing set-up that you can just plug in and use straight away. Don't forget that a decent Centronics interface would cost about £30 anyway, and for just £35 RAM Print offers a Centronics interface, plus cable, joystick interface, a passable wordprocessor and 'user friendliness' that it's difficult to put a price on. In other words I liked it a lot. RAM Print is the most useful bit of hardware to come my way for ages.

You may remember a few issues ago I suggested using a series of short subroutines, called in succession to produce an illustration. Now's the time to follow up that idea.

As 3-D pictures seem to be in vogue at the moment let's set about producing the graphics for a dungeon/passage-type adventure. We will need views into rooms, along passages, around corners, into dead-ends, through junctions etc. Although this may seem a little daunting it is in principle quite simple as all of these views can be made up of just a few, often repeated lines. Type in **Program 1**, keeping to the line numbers, and I'll show you what I mean. Now call a few lines with the command GOSUB (line number). In each case a few lines will appear on screen. Not very impressive you might think, but don't give up yet. These are only the picture elements. Add **Program 2** to the listing for Program 1 you have on board. Now set PAPER to 0 and INK to 7

PROGRAM 1

```
10 PLOT 16,175: DRAW 48,-48: P
LOT 0,0: DRAW 64,32: RETURN
11 PLOT 239,175: DRAW -48,-48:
PLOT 255,0: DRAW -64,32: RETURN
12 PLOT 15,175: DRAW 16,-16: D
RAW 0,-143: DRAW -31,-16: RETURN
13 PLOT 240,175: DRAW -16,-16:
DRAW 0,-143: DRAW 31,-16: RETUR
N
14 PLOT 32,127: DRAW 191,0: PL
OT 32,32: DRAW 191,0: RETURN
15 PLOT 223,127: DRAW -159,0:
DRAW 0,-95: DRAW 159,0: RETURN
16 PLOT 32,127: DRAW 159,0: DR
AW 0,-95: DRAW -159,0: RETURN
```

```
17 PLOT 223,127: DRAW -32,0: D
RAW 0,-95: DRAW 32,0: RETURN
18 PLOT 32,127: DRAW 32,0: DRA
W 0,-95: DRAW -32,0: RETURN
19 PLOT 65,126: DRAW -48,-46: P
LOT 190,126: DRAW -48,-46: PLOT
64,32: DRAW 46,23: PLOT 191,32:
DRAW -46,23: FOR n=16 TO 28 STEP
4: PLOT 95+n,96-n: PLOT 160-n,9
6-n: PLOT n+95,n/2+48: PLOT 160-
n,n/2+48: NEXT n: RETURN
20 PLOT 191,127: DRAW -127,0:
DRAW 0,-95: DRAW 127,0: DRAW 0,9
5: RETURN
21 PLOT 32,159: DRAW 191,0: PL
OT 32,16: DRAW 191,0: RETURN
```

— It'll look more "dungeony" in white on black background — then GOSUB to each of the new lines in turn, with a CLS between each call and you'll see how various combinations of those original picture elements can be joined to give a series of rooms, junctions, passages, turns etc.

So far so good, but our adventurer would be rather restricted in his movements. Let's add some doors, arches, openings, holes, ledges, and a crevasse! While we're at it we might as well supply some

You should get a view similar to that shown in **Fig. 1**. Note that the value of c determines the position of opening, arch or hole on the facing wall produced in lines 29-37. Also the value of i in lines 41-44 determines the INK colour of the handle of the torches. (The shimmering effect in the torches is caused by nothing more than the Spectrum's infamous "dot creep". There just had to be a use for it!) I'll leave you to experiment further — the function of each line is REMed in

RANDOM MEMORY

flaming torches to throw a glimmer of light on the proceedings. Add **Program 3**, noting that the capital letters are all udgs, and must be entered in the G mode. We'll also need to set these udgs so input the data from **Table A**, using
FOR f=USR "a" TO USR "p" + 7:
INPUT i: POKE f, i: NEXT f

Now you can add a lot more features to your basic rooms and passages. Try:

```
9999 LET i=2: LET c=10: GOSUB
36: GOSUB 37: GOSUB 3:
GOSUB 22: GOSUB 26: GOSUB
27: GOSUB 28: GOSUB 39:
GOSUB 41: GOSUB 42: GOSUB
44
```

the listing — and to discover impossible combinations. (Like trying to include a crevasse in a room!)

Instant Graphics

It may be that the perfectionists amongst ZXC readers are not happy with the way the picture is drawn before their very eyes. It may be that you would prefer the illustration to suddenly appear, complete, on screen. All that is needed for this effect is a combination of trickery and a short machine code routine. Use the following line to input these numbers: **33, 0, 88, 1, 192, 2, 22,**

PROGRAM 2

```
B 1 GO SUB 12: GO SUB 13: GO SU
B 2: RETURN: REM room
GO SUB 10: GO SUB 11: GO SU
B 10: RETURN: REM forward
GO SUB 10: GO SUB 11: GO SU
B 20: RETURN: REM dead end
GO SUB 10: GO SUB 15: GO SU
B 10: RETURN: REM right
GO SUB 11: GO SUB 12: GO SU
B 10: RETURN: REM left
GO SUB 12: GO SUB 13: GO SU
```

```
B 14: RETURN: REM right/left
7 GO SUB 10: GO SUB 13: GO SU
B 17: GO SUB 19: RETURN: REM fo
rward/right
8 GO SUB 11: GO SUB 12: GO SU
B 18: GO SUB 19: RETURN: REM fo
rward/left
9 GO SUB 12: GO SUB 13: GO SU
B 18: GO SUB 19: GO SUB 17: RETU
RN: REM forward/left/right
```



PROGRAM 3

```

22 PRINT AT 13,7:"O": PLOT 64,
96: DRAW -32,16: DRAW 0,-96: DR
U 32,16: DRAW 0,64: RETURN: REM
left door
23 PRINT AT 8,4:"AB": AT 9,4:"
AB": AT 18,4:"CD": AT 19,4:"CD":
FOR n=10 TO 17: PRINT AT n,4:
NEXT n: RETURN: REM left
opening
24 PRINT AT 8,4:"EFP": AT 9,4:"
EFP": RETURN: REM left arch
25 PRINT AT 13,24:"O": PLOT 19
1,32: DRAW 32,-16: DRAW 0,96: DR
AU -32,-16: DRAW 0,-64: RETURN:
REM right door
26 PRINT AT 8,26:"EF": AT 9,24:
"EF": AT 18,24:"GH": AT 19,26:
"GH": FOR n=10 TO 17: PRINT AT n
,24: NEXT n: RETURN: REM
right opening
27 PRINT AT 8,25:"OAB": AT 9,24:
"OAB": RETURN: REM right arch
28 PRINT AT 13,17:"O": PLOT 11
1,32: DRAW 0,-72: RETURN: REM
centre passage door
29 FOR n=9 TO 17: PRINT AT n,c
: NEXT n: RETURN: REM ce
ntre passage opening
30 PRINT AT 7,c:"OP": AT 8,c:"
OP": RETURN: REM centre pass
age high arch
31 PRINT AT 8,c:"EFAB": RETURN:
REM centre passage low arch (
centre)
32 PRINT AT 15,17:"O": PLOT 11
1,16: DRAW 33,0: DRAW 0,72: DRAW
-33,0: DRAW 0,-72: RETURN: REM

```

```

centre room door
33 FOR n=11 TO 19: PRINT AT n,
c: NEXT n: RETURN: REM c
entre room opening
34 PRINT AT 9,c:"OP": AT 10,c:
"OP": RETURN: REM centre room
high arch
35 PRINT AT 10,c:"EFAB": RETUR
N: REM centre room low arch
36 FOR n=7 TO 9: PRINT AT n,c:
NEXT n: RETURN: REM hole
37 PRINT AT 8,c:"OP": RETURN:
REM hole arch
38 FOR n=95 TO 97: PLOT 28,n:
DRAW 200,0: NEXT n: RETURN: REM
room ledge
39 FOR n=95 TO 97: PLOT 60,n:
DRAW 136,0: NEXT n: RETURN: REM
passage ledge
40 FOR f=18 TO 20: PRINT AT f,
8: NEXT f: PL
OT 63,32: DRAW OVER 1,-48,-24: D
RAW 224,0: DRAW OVER 1,-46,-23: R
ETURN: REM crevass
41 PRINT AT 8,17: BRIGHT 1: INK
6: "KL": AT 7,17: "MN": AT 8,17: INK
1: "KL": AT 9,17: "MN": RETURN: REM
near left torch
42 PRINT AT 8,29: INK 6: BRIGHT
1: "KL": AT 7,29: "MN": AT 8,29: I
NK 1: "KL": AT 9,29: "MN": RETURN:
REM near right torch
43 PRINT AT 11,10: BRIGHT 1: I
NK 6: "I": AT 12,10: INK 1: "J": RE
TURN: REM far left torch
44 PRINT AT 11,21: BRIGHT 1: I
NK 6: "I": AT 12,21: INK 1: "J": RE
TURN: REM far right torch

```

be drawn on. Generally rows 0 to 5, columns 8 to 23 are safe, or you could use the edit lines with PRINT 0: "message".

Using different combinations of doors, openings, arches etc. you can produce an enormous variety of illustrations. (There are 15 possible combinations of torches for a start, even if you don't alter the value of it!)

I'll follow up this idea of picture elements further in a later article when we'll look at "Lords of Midnight"-type scenes, but now to a completely different solution to the problem of big pics in few bytes.

Speedraw

If we had machine code routines to plot, draw, block in areas of paper and fill areas with ink we could build up a picture on screen very quickly from a string of data if this included information for choosing the right routine. Ladies and Gentlemen, the Great Wizard of Exon proudly presents "Speedraw", a graphics utility to produce high resolution illustrations drawn at high speed and at an average cost of only 250 bytes per screen. (Less if you reuse parts of one picture in another).

For the technically minded, this is how its done. The secret is in the sequence of numbers the routine encounters. Lets call this the Drawcode. The value 255 (and to some extent 0) is reserved for use by the driver. 0 on its own means return. The number of 255's at the beginning of each sequence determines which mode is selected. Exit from or jumping within a routine is controlled again by 255's being encountered. Figure 2 gives a flow chart for each mode.

Use
CLEAR 64890 : FOR f = 64891 TO 65367 : INPUT i : POKE f,i :

A packed column this month with Clyde Bish revealing the minimal memory route to 3-D adventure graphics plus a useful 'Speedraw' routine.

7, 114, 35, 11, 120, 177, 32, 249, 201

FOR f=USR "q" TO USR "u" + 7 : INPUT i : POKE f, i : NEXT f
 (If you want to use all the udgs you could move this code elsewhere). To call an illustration use a line such as **9999 CLS : INK 0 : GOSUB (each of the element subroutines) : RANDOMIZE USR "q" : INK 7**

This is how the trick works. INK is set to 0 — the same as PAPER — before calling the subroutines so they are drawn invisibly. Calling the machine code causes all the attribute file bytes to be altered to 7, i.e. white INK on black PAPER, so the picture appears more or less instantaneously. Finally INK is reset to 7 or you wouldn't see any subsequent printing! Note that the torch subroutines have to be called after the machine code or you'll get no colour. If you want of use, say, yellow INK on blue PAPER, POKE the attribute you require — in this case 6 + 1x8=14 — into address (start 7) as well as making the obvious changes to the INK number.

If you want your adventurer to have something to look at in the second it takes to produce the picture you could print a message after the CLS. The graphics won't affect it as long as you avoid areas which will

TABLE A

240	252	255	255	255	255	255	255
0	0	0	192	240	252	255	255
255	255	255	255	255	252	240	192
255	252	240	192	0	0	0	0
0	0	0	1	7	31	127	255
7	31	127	255	255	255	255	255
255	63	15	3	0	0	0	0
255	255	255	255	255	63	15	3
16	24	52	44	86	44	74	52
255	255	60	60	60	60	60	60
1	5	5	5	10	42	42	84
0	64	64	80	80	168	168	148
85	41	40	42	82	82	85	53
84	82	82	74	170	146	84	92
1	3	7	15	31	63	127	255
128	192	224	240	248	252	254	255

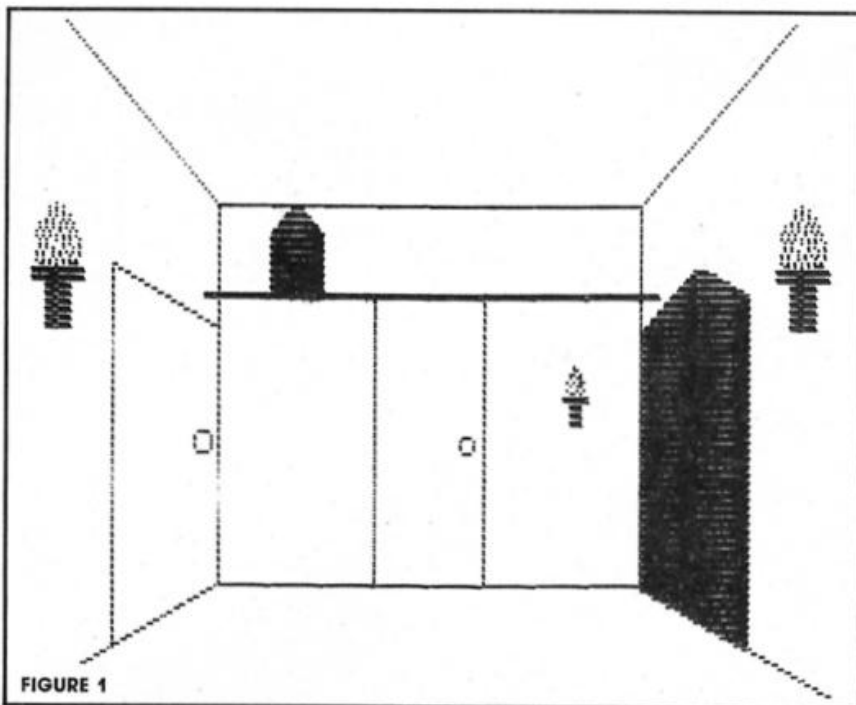


FIGURE 1

PRINT f,i : NEXT f to enter the data for the machine code from **Table B**, and save with **SAVE "speeddraw" CODE 64891, 477**.

Let's enter some example drawcodes to use each mode in turn.

Plot/Draw

This produces the outline drawing. Use the loader line **10 FOR f = 40000 TO 40021 : INPUT i : POKE f,i : NEXT f (RUN)** to enter the following sequence of numbers, pressing ENTER where there is a comma.

10, 10, 50, 10, 50, 60, 10, 60, 10, 10, 225, 100, 40, 160, 40, 130, 100, 100, 40, 255, 255, 0.

Now use **RANDOMIZE USR 64891** to display a box and triangle to screen. If you compare the data with the flowchart you will notice (a) that this mode is called when **NO 255** starts the sequence, (b) The first pair of numbers are the **PLOT** coordinates, subsequent pairs being **absolute DRAW** coordinates, i.e. you give the **actual** coordinates you want to draw to. No more messing about with positive/negative offsets; (c) a **255** starts a new **PLOT** position, (d) two **255**'s means return to the driver. Note that you cannot **PLOT/DRAW** to) or **255**. You don't need to anyway as the routine draws a border around the picture area. (This becomes very important in the **FILL** mode).

Fill

This mode "inks in" the pixels within an area bounded by lines. As you will need an area to fill after the **FOR/TO** numbers in the loader line to **40021** and **40030** and add the following data:

255, 255, 57, 11, 15, 58, 100, 42, 255, 0

RANDOMIZE USR 64891 to redraw the square and triangle and fill them with red and blue inks. Work out how it runs using the flowchart, remembering that the attribute values are ink + paper * 8.

One or two points to note when using fill. (a) the area to be filled must be **completely** enclosed. The smallest gap and **FILL** leaks out. There may be "invisible" gaps along a line. You can close these with an extra **PLOT-DRAW**, but often just moving the start position of the fill will solve the problem. (b) in order to be very fast the fill is only semi-intelligent, so you need to have the start position against a left or right boundary. You will also need to have more than one start point to fill shadowed areas (e.g. filling a ring), and the full may not spread to very narrow areas. Either complete these with **PLOT-DRAW** or don't have narrow areas! Finally it is just possible to crash the routine so save the drawcode before trying it out.

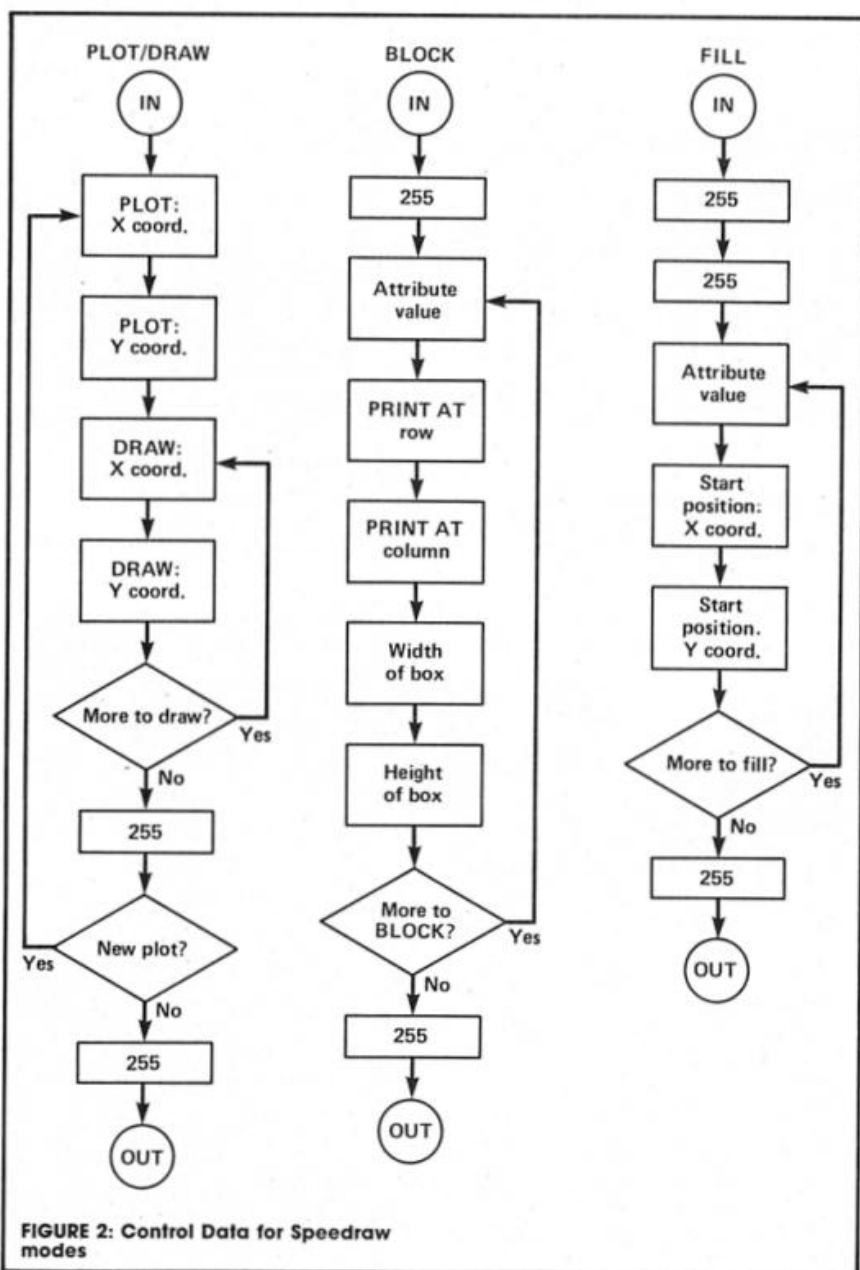


FIGURE 2: Control Data for Speeddraw modes

TABLE B

17	34	255	26	103	19	26	111	32	220	225	201	125	230	192	31
6	4	197	19	26	71	19	26	55	31	15	173	230	248	173	87
79	213	205	21	254	209	193	16	124	7	7	7	173	230	199	173
241	17	63	156	19	26	254	0	7	7	95	124	230	7	71	4
200	254	255	194	234	253	19	26	62	254	15	16	253	71	26	160
254	255	194	196	253	19	26	50	168	47	18	201	237	75	125	92
143	92	19	26	111	19	26	103	197	17	0	255	120	130	71	254
213	34	125	92	205	151	254	209	255	40	114	254	176	40	110	197
19	26	222	2	255	32	232	151	205	170	34	60	71	197	126	7
253	26	50	45	255	19	26	50	16	253	193	15	56	14	13	16
48	255	19	26	50	47	255	19	250	125	43	230	31	126	40	4
26	50	50	255	19	26	50	51	6	8	24	230	8	62	9	144
255	213	205	44	255	209	19	26	71	8	7	48	17	12	29	40
222	255	32	221	195	151	253	26	67	16	247	35	125	230	31	126
103	19	26	71	62	176	152	111	40	58	6	8	24	236	30	255
19	26	71	19	213	26	87	62	12	227	105	227	8	253	126	87
176	154	79	205	21	254	209	19	15	15	47	230	1	79	8	177
26	222	255	32	236	19	26	222	28	16	17	119	229	213	205	219
255	32	220	195	151	253	1	0	11	209	225	35	125	230	31	40
1	1	197	205	111	254	193	17	16	6	8	126	7	48	230	15
1	1	120	148	48	4	21	21	7	16	16	253	119	213	205	11
237	68	71	121	149	48	4	20	209	193	24	136	193	120	254	1
29	237	68	79	176	200	121	184	200	17	0	1	193	24	136	0
229	98	107	34	19	254	48	0	175	255	175	255	0	0	0	0
56	4	101	107	72	71	34	17	175	62	32	1	15	10	17	12
254	96	120	203	63	111	125	120	6	33	220	87	213	17	32	0
56	3	184	56	8	144	111	237	4	25	160	253	65	4	35	16
91	19	254	24	5	111	237	91	250	209	66	220	72	67	119	35
17	254	227	124	130	103	125	131	16	250	205	213	17	32	0	25
111	197	205	111	254	193	227	37	209	65	16	239	201			

(Of course, once you have it working correctly it won't crash when in use in a program).

Block

This effectively "papers in" a block of character squares. Alter the FOR/TO numbers to 40000 and 40007 and enter the following sequence, which produces a blue block, 10 by 5 with top left corner at row 15, column 1 255, 14, 15, 1, 10, 5, 255, 0

As before RANDOMIZE USR 64891 will display it. As it is the attribute number which is used this mode can be used to change the ink within an area without affecting the paper, and so alter just the outline colour.

If you want to see a large

picture drawn with Speeddraw use the loader line (with FOR/TO set to 40000 and 40250) to enter the data from Table C.

RANDOMIZE USR 64891 will quickly display a Hobbitish path in the Misty Mountains leading to the Golden Key that you don't need anyway (Oops — Sorry!). If you look carefully you'll see that the sky top left is BLOCKED, not FILLED. This is so you can FILL the moon. (Remember you can't have INK on INK).

When using Speeddraw in your own programs you'll need to set the data start register to the beginning of the drawcode you want it to read. Do this with the subroutine:

1 RANDOMIZE a: POKE 64917, PEEK 23670: POKE 64918, PEEK 23671: RANDOMIZE USR 64891:

RETURN having first set variable a to the data start address less 1 of the drawcode you wish to use.

You have probably worked out by now that to produce an accurate drawcode will take a lot of working out on pixel paper. This cannot be avoided, but I can offer you some help in the form of an Editor/Assembler which will find and help you correct the errors. The listing is too long to include here, but if you're interested in finding out more about it write to me care of ZX Computing enclosing an SAE.

Next time we'll return to the picture element idea and produce those promised "Lords of Midnight"-type landscapes at only 30 bytes each.

Til then, happy drawing!

TABLE C

68	159	115	159	115	158	56	158	255	175	71	154	22	255	183	39
56	159	67	159	71	174	255	56	163	17	255	83	174	80	160	255
159	38	92	44	47	55	44	76	143	174	128	128	255	193	174	160
43	74	34	76	33	88	30	127	112	255	220	174	200	88	255	254
24	144	23	152	22	150	19	164	168	247	152	232	94	255	309	167
15	165	10	164	7	159	1	255	33	166	29	162	27	156	29	149
124	174	112	152	109	144	112	139	33	145	39	144	36	150	35	150
120	132	127	127	159	111	199	87	36	162	39	167	36	166	255	1
215	77	231	63	247	39	254	24	174	4	170	17	142	31	123	40
255	110	152	106	148	104	143	107	115	47	112	1	112	255	47	174
135	112	128	144	104	157	93	176	47	111	255	48	114	48	130	50
72	182	56	184	39	184	31	176	130	50	120	49	120	49	130	255
15	168	1	255	84	157	57	48	255	255	9	0	0	6	8	255
255	103	141	74	34	75	33	103	255	255	8	1	119	48	1	1
141	255	119	119	96	29	255	140	49	48	174	14	28	156	50	169
103	126	25	255	167	79	146	23	1	255	0					

THE FUTURE IS HERE!

What better way to plan your adventures for 1987 than mark them on a stunning Level 9 year planner. Fifty ZX readers can rhyme their way to a prize.

"There once was man called Clive,
Who one morning brought the Spectrum alive,
He thought 'Oh well, I'll invent the QL,
And before lunch I'll create the C5."

■ This shining example of how to write a limerick (okay there may be a few poetic bugs in it) should give you some pointers towards creating your own rhyming masterpiece. To adorn your wall with a Level 9 year planner all you have to do is complete the limerick below. Remember the last line must rhyme with the first two and the third and fourth with each other. Getting the right rhythm is important and prizes will go to



One of four Godfrey Dowson illustrations that feature on the year planner

those who have thought up the most apt and humorous ending.

The wall chart is fully laminated and washable and comes with a fibretip pen to

pencil in your important engagements. Apart from being extremely useful the planner is decorated with four superb full colour illustrations by Godfrey Dowson.

Level 9 Yearplanner Competition

A spokesman for Level 9,
said adventures are truly divine,

Name: _____

Address: _____

Post to Level 9 Yearplanner Competition, ZX Computing Monthly,
No. 1 Golden Square, London W1R 3AB.

The limerick

Time to get into limerick mode.
The first two lines are...
A spokesman for Level 9,
said adventures are truly divine,

Now it's over to you to complete the last three lines. The competition is open to all ZX readers apart from employees of Argus Specialist Publications, Alabaster Passmore and Level 9. The closing date is December 5th 1986. Please remember to write your three lines on the back of your entry envelope.

Send your entry to Level 9 Yearplanner Competition, ZX Computing Monthly, No. 1 Golden Square, London W1R 3AB.

REVOLUTION

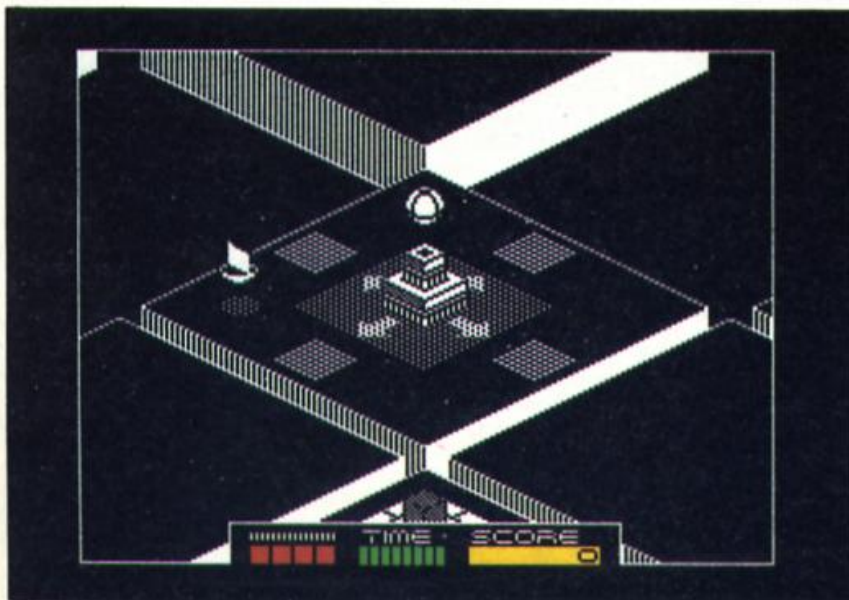
**Masterly graphics,
infuriating puzzles — all
you ever wanted from a
bouncing ball game.**

Revolution
Vortex/U.S. Gold
£9.99

Costa Panayi, author of many of Vortex Software's previous hits, has made a change in direction after his recent games *Alien Highway* and *Highway Encounter* and come up with another winner.

Revolution is one of those games which is quite simple to play (in principle anyway), but very difficult to master and absolutely infuriating when you get into the later levels of the game where you can see what you want to do but can't quite pull it off in time.

The game is played on a multi-tiered structure consisting of eight levels, and your task is to start on the bottom level and work your way to the very top. Each level is made up of an assortment of platforms, all on the same level but separated by gaps which have to be avoided. These platforms are arranged in a roughly square arrangement (which changes in each game) with the occasional empty position which you might find yourself plummeting into if you look before you leap (each of these levels is a bit like one of



those sliding square puzzles in which you can move the squares around to try and form a picture or sequence of numbers).

You control a ball which can be bounced around the platforms and in order to complete a level and progress to the next you have to solve four puzzles. Scattered around each level you will find four platforms which carry various brick-like structures and shaded pathways. On each of these platforms there are two grey blocks which turn white when you bounce into them and deactivate them. Each brick will remain deactivated for just a few seconds before reactivating and turning grey again, but if you can get both bricks deactivated at the same time then they will both vanish — problem solved



REVOLUTION

and you can move on to the next problem on that level.

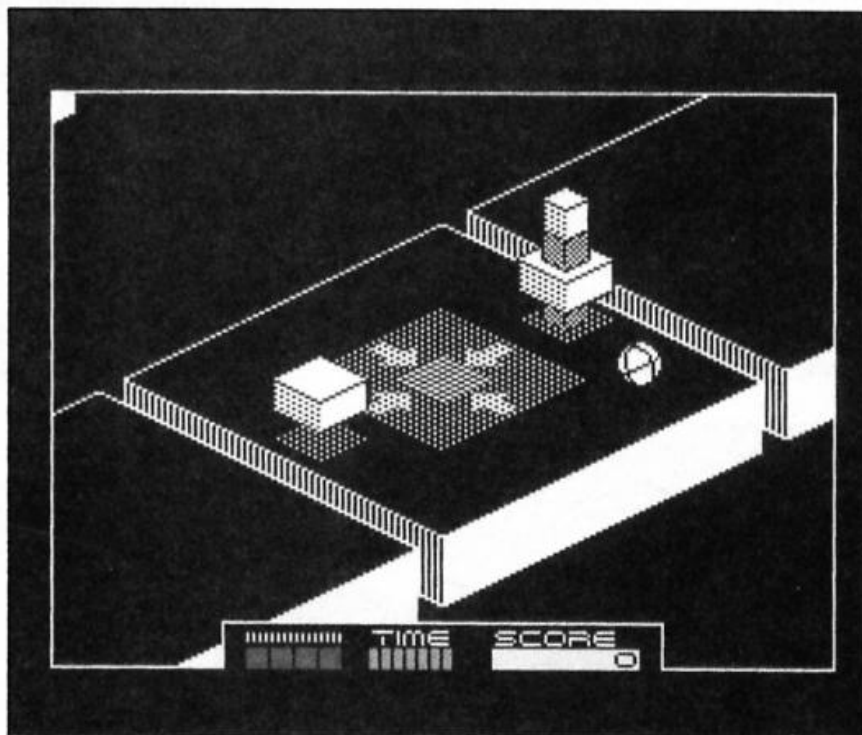
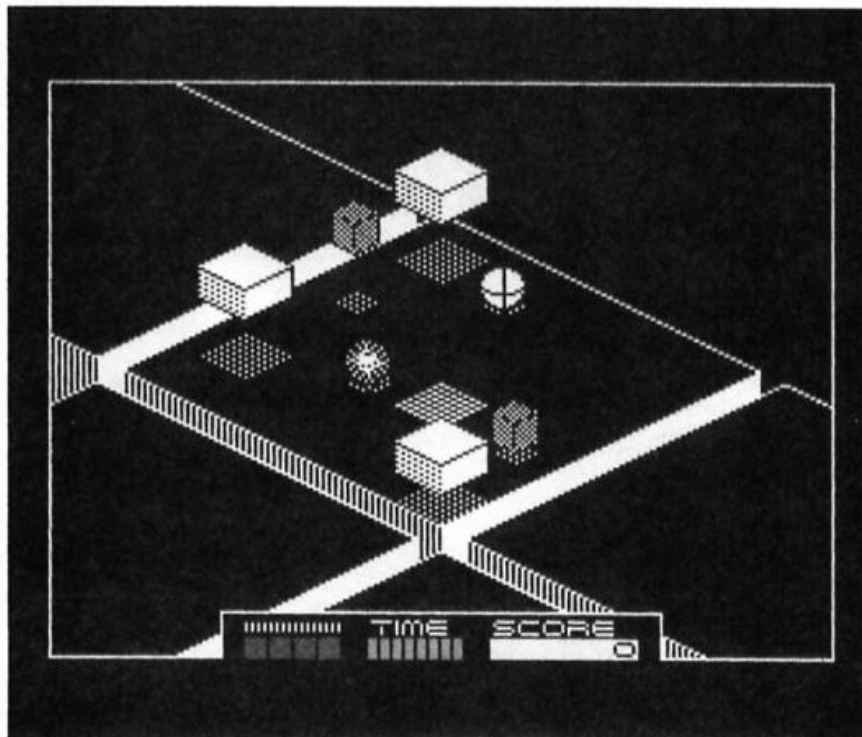
Unfortunately you've also got to contend with the shaded pathways on these platforms, and these can have different effects varying from just killing your bouncing or grabbing the ball and shooting it over the edge of the platform into oblivion.

At the start of each level you are shown your position within the overall structure, as well as a map of the particular level that you are on. This map highlights both your own starting position and the position of the puzzles on that level so you've got a few tips to start off with. When you see this map it's also a good idea to make a mental note of the empty positions, as I found that I often went bouncing from one screen to the next only to find myself bouncing into nowhere. You only get five lives (though there are additional ones for completing levels) so you can't afford to do that too often.

Controlling the ball is an art all in itself. It can move in any direction that a joystick handle can move in (a joystick is almost compulsory for this game I should think), and responds very smoothly to joystick control but judging the height and distance of your bouncing is a skill that will take a lot of refining, especially on some of the trickier puzzles where you've got to squeeze the ball through some quite tight spots.

There are four different heights of bounce, controlled by using the fire button, or you can kill the bounce altogether and just roll along the surface of the platforms. There is also a variety of flying objects which patrol each level and though few of these are deadly you can find yourself accidentally colliding with one and bouncing off in a totally unexpected direction.

The graphics are mostly in just two colours to avoid attribute clashes, but as with Vortex's Highway games the graphic style is quite distinctive, making good use of fine shading effects to create clear and detailed pictures. But where I found the Highway games to be a bit too fast and furious for my gin-addled reflexes, Revolution is the sort of game that each player can play at his or her own pace. If you want to go bouncing around the platforms



like a loony you're quite free to do so, but if you're content to take things a little bit slower and just roll slowly around while you try and figure out which way is up you can do that too.

At £9.99 Revolution is a bit pricey, but it's more likely to provide a long term challenge than most other arcade games around at the moment.



ZX talks to Salford based software house Vortex about the intricacies of Revolution.

Revolution, a complex 3-D brainteaser is a real test for puzzle solvers as the game layout subtly changes with each new game. Luke Andrews of Vortex explained the evolution of Revolution.

"Firstly it was essential to create the game in 3-D. It offers an attractive illusion and greater scope for complicated gameplay. The bouncing ball idea was really a progression from Highway Encounter but we wanted to do something completely different with it.

"The idea had been around in Costa's head for over a year until he got the confidence to create such a game. What happens is that Costa comes up with an overall graphic treatment and we discuss ideas and ways of creating improved gameplay.

On the level

"The levels idea came at a later stage. We knew the bouncing ball was going to be the main character but we wanted an alternative to a long drawn out game on one level and something different from the usual map. With the idea of the levels we solved both problems. This way you could identify where you are and the overall layout very simply."

One of the infuriating aspects of puzzle based games is laboriously working through the puzzles you've already solved to get back to the position you reached in your previous forays. In Revolution this problem doesn't arise.

"There are eight layouts in the stack and the chances of meeting those layouts in the same order twice are 1 in 10,000. There's also a checkerboard layout that you encounter in the later levels. The random element is built-in in two ways. Firstly the puzzles are mixed up in the various levels and secondly you may find one puzzle on an early level and again later but you will have less time to come up with the solution.

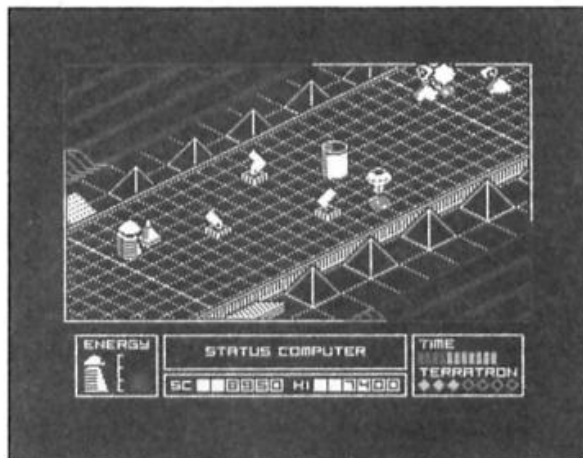
Complications

"Programming games like this presents immense difficulties and although most of them are ironed out in the early stages. One problem was that when the ball was perched on an object

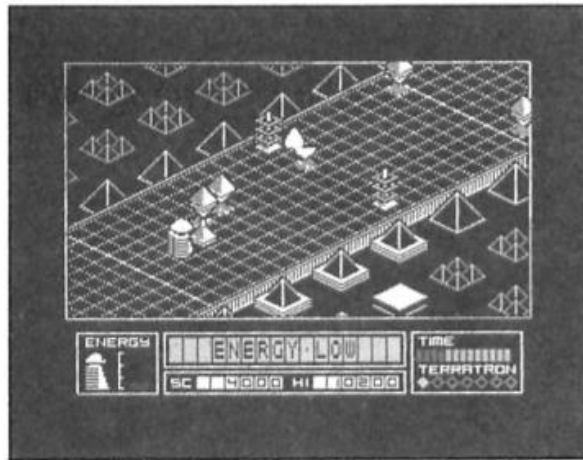


Vortex: Crete Panayi, Luke Andrews and Costa Panayi

it would just fall off rather than roll or pop up. It was solved, but getting the ball to look convincing and realistic was perhaps the hardest part.



Vortex's Alien Highway: Scheduled for budget re-release on U.S. Gold's Americana label



"The idea of touching the two blocks to solve the puzzle came about half way through the development. The three of us have been together for about four years now and when an idea comes up that we like we all get enthusiastic. If any of us hesitate then we ditch it. With the blocks we knew it was the vital ingredient we needed."

Revolutionaries

THE PROFESSIONAL TOUCH

THE PROFESSIONAL TOUCH



This month, Hewson's Steve Turner has some advice on how to Supercharge Your Spectrum.

■ In the past two years the standard of Spectrum programs has increased dramatically. To compete in today's market you have to push the Spectrum to its performance limits. This month I'll look at a few tricks of the trade that can be used to realise the full potential of the 48K machine.

Increasing user RAM

To use all of the RAM apart from the screen and attribute maps you must shut off the Spectrum ROM. Every 50th of a second a hardware timer causes an interrupt. This has the effect of giving control to the ROM keyboard scan routine. This interrupt needs to be switched off with a disable interrupt instruction. Of course no ROM routines can be used or the Spectrum ROM variable area may be corrupted (I have always avoided using ROM routines. It is usually much better to design your own routines that do exactly what is required).

You can also use more RAM than there is! This is achieved by using areas twice. Routines and data only used at the start of the program can be overlaid with other routines loading over them. In AVALON for example, the code for keyboard choice, displaying the pretty border and initialising everything is overwritten by the main game.

Both of these methods are best implemented in the final stages of testing. Once applied the game is in a 'live' state and can only be started once. It is also extremely difficult to get back to BASIC.

Reducing the size of your code

It is best to write code using as few bytes as possible from the outset of coding. This has to be balanced with clarity and execution speed requirements.

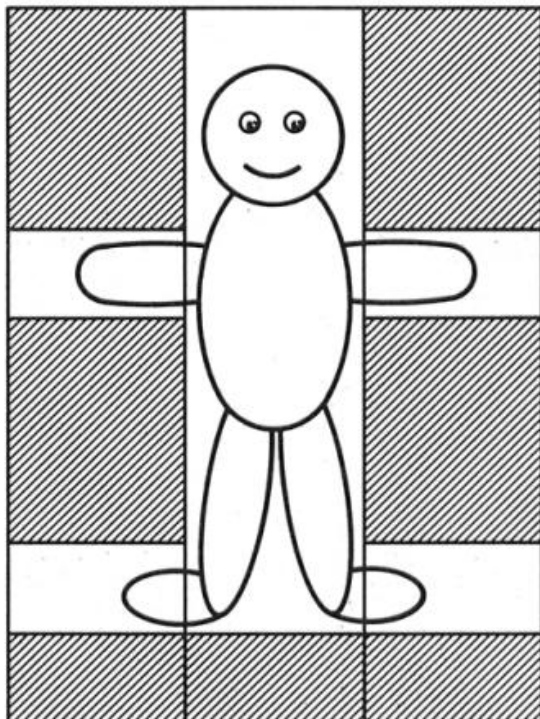
Here is a list of tips to reduce the size of your code.

1. Use **XOR A** instead of **LD A,0**
2. Use **AND A** instead of **CP A,0**
3. Structure your programs to avoid unnecessary repetition.
4. Make large macros into subroutines.
5. To increment counts etc make use of **INC (HL)**.
6. Use block moves and 'compares' when appropriate.
7. Use table-driven processing so that each routine performs a greater range of tasks. For



Irregular shaped graphics

Graphic is divided into byte size columns



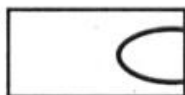
So that our graphics data will consist of the unshaded bits with some data to indicate their displacement within the graphic; the file format will be as follows:-

No. of pieces

Displacement x,y
size in bytes
(List of graphic
bytes)



Displacement x,y
size in bytes



Displacement x,y
size in bytes

etc.



instance, instead of coding a movement routine for each object in a game tabulate the movement characteristics, then write a general routine that accesses the table and produces a different result for each entry.

Reducing the size of data

When designing data tables bear two things in mind; how

often will the data be used and how tightly can it be packed?

Generally, packing data means a slower access time so often a compromise is necessary. Here are the techniques I use.

1. Use variable length data records where you can.
2. Use ROM or Machine code as table data as "free" data. Background wall objects in AVALON were chosen and placed using ROM as a data table, and I adjusted the data to

be in the required ranges. It is similar to using a random value except if you get the same value whenever you want it.

3. Design the data so that as much information as possible can be deduced from the record number. In AVALON room colours were a function of room number.

4. Do not include the record number in the record. The program either knows it or can deduce it from the record's position.

5. Look for common or repeated data and group these records, specifying the common ones.

6. Pack maps or suitable data and unpack them into a buffer for fast access.

Reducing RAM usage of graphics

Graphics data usually takes up a major part of the RAM in a state-of-the-art arcade game. The graphics, when used, may have to be accessed many times a second, so we must decide which graphics we can pack and which have to be in a format suitable for fast plotting.

One of the easiest ways of getting more graphics in the program is to use custom character sets as building blocks. Large graphics can then be constructed from the characters. A data record for each object specifies its dimensions and which characters it is made up of. If most of the characters are used many times the RAM savings are considerable.

An extension of this idea is to use a building block larger than a single character. This system could be used to program a game like Knightlore and its derivatives. Each 3D block could be one of the basic building graphics. By plotting them on top of one another, walls, towers and arches can be constructed.

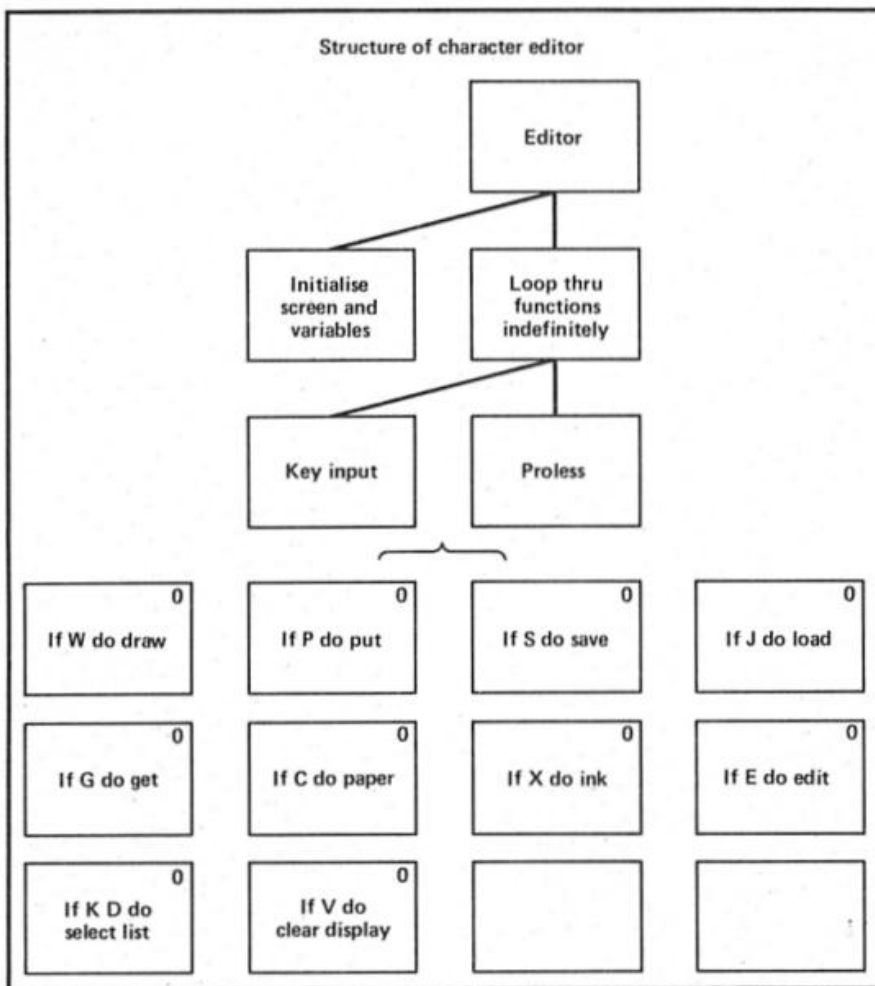
The choice of the shape and the size of building block depends on the style of the game. I have used variable size blocks which lead to a very flexible system. You can even build macro blocks out of small blocks using even less RAM, though there is a price to pay. The CPU has more work to do to decode the data and build the graphics. This is why Quazatron only scrolls slowly. The poor CPU is busy constructing the bit of the picture moving into view.

Another way to optimise space used by graphics is to design a graphics format that caters for odd shaped objects. This also saves the CPU time as it does not have to waste time plotting blanks.

Increasing execution speed

The place to concentrate on

Structure of character editor



speed optimisation is in the innermost loops of the program. One instruction saved here can be the equivalent of thousands of instructions saved elsewhere if you can identify the routines that are used the most. It is sometimes useful to get an idea of how long a routine is.

To do this code a **HALT** instruction and set the border to a different colour. Restore the border to its original colour after the timed routine has finished, then repeatedly call the routine. In most cases the routine will already be in some sort of loop and the program can be run as normal. The size of the coloured stripe on the upper border gives an indication of execution time. If the routine executes for more than a 50th of a second the whole border will flash the chosen colour.

Usually the place where speed is most required is in the graphics plotting routines. In my games the CPU spends about 90 per cent of its time driving the picture on the screen. The design of the graphics routines makes or breaks a Spectrum game, so I will delve into the theory of animation so that the problems can be identified.

Animation

Animation is moving pictures. It is achieved by replacing one picture with another in quick succession, the more frames per second the smoother the

part of a picture off screen. Background objects are drawn first, foreground objects last. Finally this new frame is copied to the screen.

The speed is affected by the size of the buffer or buffers that are built and copied. This is why so many games reduce the size of the moving screen area. The cleverest games manage to maintain a large moving area by just plotting the parts of the screen where changes occur.

The routines that clear, build and copy the buffers are worth optimising. This is where the craftiest techniques are employed. Let us examine the various methods applied to clearing a buffer to zeroes.

Using a **LDIR** instruction to copy the buffer to itself is a good method but not the fastest. It takes 21 cycles for each of the bytes to be cleared, plus setting up overheads. If interrupts are disabled the stack pointer can be used to **PUSH** two zeroes a time into the buffer. It only takes 11 cycles for each two bytes cleared plus 27 cycles as a loop control. If several **PUSH** instructions are coded in a list then the 27 cycle loop control does not have to execute for each two bytes cleared. The longer the list of **PUSH** instructions the faster the routine. Space considerations usually force a compromise.

animation. This is done by building up a new picture or

```

10 CLEAR 44999
20 BORDER 6: PAPER 6: INK 0: CLS
30 LET a$="" : LET c=0 : LET a=c : LET x=c : LET y=c : LET a=c : LET b=c : LET d=6
40 PRINT AT 0,4,"CHARACTER EDITOR" : CHAR LIST
50 GO SUB 100
60 PRINT AT 3,11,"W=DRAW" : AT 4,11,"G=GET P=PUT" : AT 5,11,"E=EDIT" : AT 6,11,"S=SA
VE" : AT 7,11,"J=LOAD" : AT 8,11,"K=LIST" : AT 9,11,"X=INK C=PAP" : AT 10,11,"V=CLEAR P
C"
70 PLOT 15,160: DRAW 65,0: DRAW 0,-65: DRAW -65,0: DRAW 0,65
80 PLOT 0,80: DRAW 183,0
90 PLOT 183,0: DRAW 0,175
95 GO SUB 9900
100 REM function loop
110 IF a$="W" OR a$="u" THEN GO SUB 400: GO TO 100
120 IF a$="P" OR a$="P" THEN GO SUB 4500: GO TO 100
130 IF a$="S" OR a$="S" THEN GO SUB 5000: GO TO 100
135 IF a$="J" OR a$="J" THEN GO SUB 6000: GO TO 100
140 IF a$="G" OR a$="G" THEN GO SUB 4000: GO TO 100
150 IF a$="C" OR a$="C" THEN GO SUB 8000: GO TO 100
160 IF a$="X" OR a$="X" THEN GO SUB 9000: GO TO 100
170 IF a$="E" OR a$="E" THEN GO SUB 300: GO TO 100
175 IF a$="K" OR a$="K" THEN GO SUB 500: GO TO 100
177 IF a$="V" OR a$="V" THEN GO SUB 3000: GO TO 100
180 GO SUB 300: GO TO 100
300 REM EDIT CHARACTER
305 LET I=X+(32*Y)+22594
306 LET J=120: IF PEEK I=0 THEN LET J=16
307 POKE I,J
310 GO SUB 9900
320 IF a$="0" OR a$=" " THEN PLOT OVER 1,96+X,159-Y: GO TO 370
336 LET J=0: IF PEEK I=120 THEN LET J=48
337 POKE I,J
338 IF CODE a$>50 THEN RETURN
340 LET dx=dx+a: IF dx>=0 AND dx<8 THEN LET x=dx
350 LET dy=dy+a: IF dy>=0 AND dy<8 THEN LET y=dy
360 GO TO 300
370 LET J=16: IF PEEK I=16 THEN LET J=120
375 IF INKEY$<>" " THEN GO TO 375
380 GO TO 307
400 REM DRAWING
405 LET I=A+(32*B)+22912
410 POKE I,128+PEEK I
420 GO SUB 9900
450 POKE I,E+(D*8)
460 IF CODE a$>50 THEN RETURN
470 IF a$="0" OR a$=" " THEN LET k=45000+((c+4)*8): FOR l=0 TO 7: POKE USR "u
+1,PEEK (k+1): NEXT l: PRINT AT 12+b,a: INK e: PAPER d: CHR0 164: GO TO 400
480 LET dx=dx+a: IF dx>=0 AND dx<22 THEN LET a=dx
490 LET dy=dy+b: IF dy>=0 AND dy<10 THEN LET b=dy
495 GO TO 400
500 REM select char
510 POKE 22583+(32*c),240
520 GO SUB 9900
530 POKE 22583+(32*c),120
540 IF CODE a$>50 THEN RETURN
545 POKE 22583+(32*c),48
550 LET dv=dy+c: IF dv>=0 AND dv<20 THEN LET c=dv

```



```

560 IF c=dy THEN GO TO 500
570 IF c=0 AND q<0 THEN LET c=19: LET q=q-20: GO SUB 1000: GO TO 500
580 IF c=19 AND q<1000 THEN LET c=0: LET q=q+20: GO SUB 1000: GO TO 500
590 GO TO 500
1000 LET k=45000+(q*8):
1010 FOR r=0 TO 19
1020 FOR l=0 TO 7: POKE USR "u"+l,PEEK (k+l): NEXT l: PRINT AT l+r,23;CHR# 164;"
      "q+r;"
1025 LET k=k+8: NEXT r
1027 POKE 22583+(32*c),120
1030 RETURN
3000 REM CLS BOTTOM AREA
3005 INPUT "CONFIRM CLS Y=YES "JA$
3010 IF A$="Y" OR A$="y" THEN FOR L=11 TO 21: PRINT AT L,0,"      ": NEXT L
3020 LET A$="u": RETURN
4000 REM get char from list
4010 LET K=((q+C)*8)+45000
4020 LET N=16460
4030 FOR L=1 TO 8
4035 LET O=PEEK K: LET K=K+1
4037 POKE N,O: LET N=N+256
4040 FOR M=1 TO 8
4045 LET P=0: LET O=INT (O/2): LET P=P-(O*2)
4050 LET J=0: IF P=0 THEN LET J=48
4055 POKE (22578-M)+(32*L),J
4060 NEXT M
4070 NEXT L
4075 LET A$="E"
4080 RETURN
4500 REM copy char to list
4510 LET K=((q+C)*8)+45000
4520 LET N=16460
4540 FOR L=0 TO 7: POKE k+l,PEEK (n+(256*L))
4550 POKE USR "u"+l,PEEK (k+l): NEXT L
4560 PRINT AT l+c,23;CHR# 164
4565 POKE 22583+(32*c),120
4570 LET A$="E": RETURN
5000 REM SAVE
5005 INPUT "NAME "JA$:" LAST NO "JO
5010 SAVE A$CODE 45000,0*8
5021 GO SUB 9900
5030 RETURN
6000 REM LOAD
6005 INPUT "NAME "JA$:" AT 0,0:"FIRST CHARACTER NO "JO
6007 LOAD A$CODE 45000+(O*8)
6010 GO SUB 1000
6020 LET A$="e": RETURN
8000 INPUT "PAPER="JD: IF D>7 THEN GO TO 8000
9010 LET A$="u": RETURN
9000 INPUT "INK="JE: IF E>7 THEN GO TO 9000
9010 LET A$="u": RETURN
9900 LET A$=INKEY$: IF A$="" THEN GO TO 9900
9907 LET dx=0: LET dy=0
9910 IF A$="5" THEN LET dx=-1
9920 IF A$="8" THEN LET dx=1
9930 IF A$="6" THEN LET dy=1
9940 IF A$="7" THEN LET dy=-1
9999 RETURN

```

If interrupts are enabled slower methods have to be used such as listing LD (HL),A and INC HL instructions or LDI instructions.

Fast and slow

It is worth designing your program so that heavily used data and routines do not occupy the lower 16k of RAM. This is because all RAM from 4000h to 7FFFh is considered by the hardware as the screen bank of memory. Every time the video hardware requires a byte to put out to the TV, and the CPU is fetching data from the lower RAM, the CPU is temporarily stopped in mid instruction. This can make it 30 per cent slower.

Character Generator

This month's program is a BASIC utility I use to design graphics made out of character size building blocks. It can also be used to design custom character sets. It includes a load and save routine so that sets can be stored on tape or, with a small change, to disk or microdrive. To use one of your custom sets in BASIC programs POKE the Spectrum variable CHARS with 256 less than the address where you load the character set (see page 173 of the Spectrum manual).

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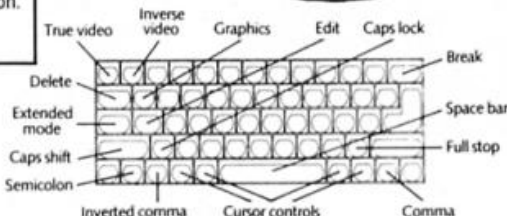
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PROFESSIONAL TOUCH

MOONLIGHT MADNESS

Bubble Bus
£7.95

I always used to hate, loathe and utterly detest Bob-a-Job Week when I was a cub scout, and judging from the scenario of this latest Bubble Buss title, things haven't changed much over the last twenty years. Having wandered down a huge drive to an old mansion, you ring the bell whereupon your call is answered by an even older man. He explains that he is a mad professor and is somewhat surprised that you have got even this far, having managed to avoid his guards and booby traps. Such is his surprise that he promptly drops down with a heart attack although not before blurting out that his pills are locked in the safe and you will need sixteen keys to open it.

Honestly, the lengths some people will go to in order to avoid paying up but you nobly

decide to do your good deed for the day and try and get the pills. The mansion consists of a series of doors, switches, platforms and monsters and your task is to wander round, collecting the keys and generally avoiding getting killed. If you are standing next to a door, pressing fire will move you through into the room behind. Stand next to a switch though and the fire activates the appropriate mechanism. Not all of these are beneficial so the temptation to go round pressing everything in sight must be avoided. Typical effects include building extra platforms, activating lifts and mobilising monsters. Getting to where you want to go often requires both timing and planning. One annoying feature is that certain doors lead to a row of eight doors with a large pair of eyes above. This is some sort of maze and it is possible to get out again, it just takes some patience. So frustrating is this element of the game that two people who tried the game thought it was a bug and re-loaded the game (there is no way to abort your current game).

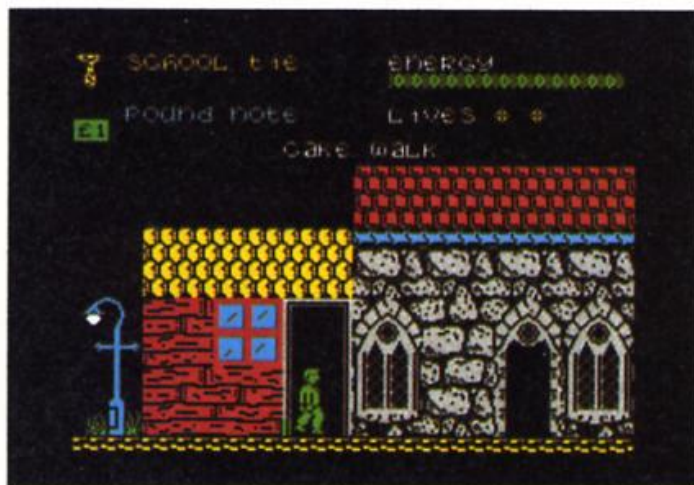


Other features are annoying too. You can redefine the keyboard but the pause and music on/off keys are not affected so I found that every time I tried to move right, I paused the game. This is just bad programming and something that should have been picked up in playtesting. The game looks and plays very much like Booty which is no great surprise as John Cain wrote them both. Like Booty, Moonlight Madness would be all right at budget price but is

not very good value as it stands. Keeping to the boy scout theme, be prepared before you buy this one.



GRIM



THE HAPPIEST DAYS OF YOUR LIFE

Firebird Silver
£1.99

Firebirds latest pocket money game is a schoolboy caper featuring an animated scallywag out to retrieve the headmasters wallet that he's nicked and then lost. Can he avoid expulsion? This largely depends on your ability to steer him through the school building and grounds searching for clues to the whereabouts of the heads dosh.

All the basics of the game work well enough, the graphics are large and bright and despite the odd annoying attribute clash, quite pleasing to look at. The number of rooms and outside locations is quite surprising and its quite a lot of fun just exploring. There are no really nasty surprises as the

flying energy sappers such as hovering canes and twirling jellies in the school kitchen present little hazard. You can pick up any two objects of which there seem to be an almost unlimited supply. Quite which objects were meant to help you eluded me and all you get from the instructions are some rather cryptic hints such as, "map your way to the secret passage, turning over a new leaf en-route."

However if you like problem solving games in the hunt the object type vein this will probably appeal. Well worth the price on presentation alone it may not give you the happiest day of your life or even a wildly exciting one but if you want to settle for an afternoon of quiet diversion this game will do.

GOOD



BUMP, SET, SPIKE

Mastertronic
£1.99

Here's something a little different for sports simulation fans — doubles volleyball! This latest offering from Mastertronic's Entertainment USA range is a highly enjoyable game and the first attempt to my knowledge to put volleyball on the Spectrum.

You are in control of two players against a pair controlled by the computer. Its a keyboard only game and you define your own keys. Its deceptively simple however to work out the best arrangement of keys so that you can switch easily between your two players. I had to redefine them several times before I found an arrangement that meant I wasn't accidentally hitting the wrong key. This I should add was down to my cackhandedness. To get good team work between your two players rather than just bashing the ball back first time requires a lot of dexterity on the keyboard.

Controlling the ball is quite simple, when the ball comes to your player and you are in a position to hit it you press the fire key and a cross is shown going up the court to where the ball will land. Release the fire key and the ball is on its way. It's not perhaps the most sophisticated of games but there are some nice touches — for instance if you hit the ball high into the air it crosses unexpectedly in front of the scoreboard at the top of the screen.

One game playing tip which is not down to my skill but rather an oversight in the pro-

gramming is that there are blind spots from where the computer opponents seem unable to return the ball. If you serve on the left hand side of the court to a point just inside your opponents baseline they are stymied. Using this tactic will of course take a lot of the edge off the game if you choose to exploit it but its handy if you need a vital point and certainly doesn't detract from the game if you are sporting and choose to ignore the computers achilles heel.

The animation is fair and as simulations go it's pretty representative of the game itself even though its only two a side (but as even doubles will give you a bad case of entangled fingers two players are certainly enough).

For the enjoyment it gives it's more than good value for the price and seems to suggest that there is potential for someone somewhere to produce a fully fledged full price volleyball simulation. For now though Bump Set and Spike is in a class all by itself.

PS. There is however one curious feature about the game. The crowd, who are totally immobile throughout all seem to be wearing white masks over their faces and the entire game looks as though it's being played in front of a gathering of the Klu Klux Klan or are my eyes deceiving me?



GREAT

GAMES

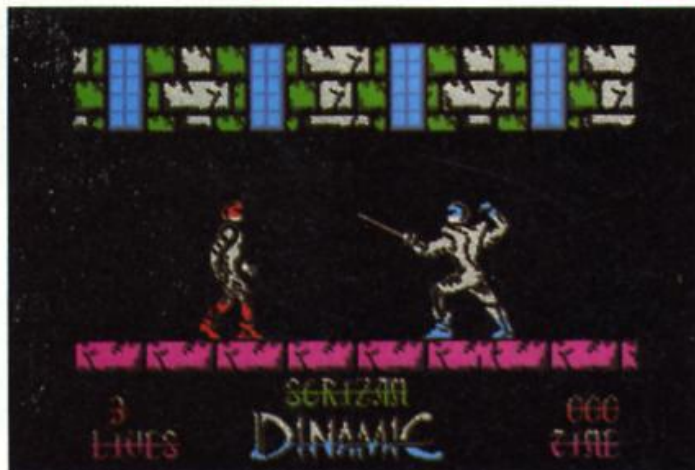
SGRIZAM

Americana
£2.99

Not only does this game have an absolutely unpronounceable name, it's also virtually unplayable — or at least it's not a game that I can imagine anyone wanting to play.

Supposedly set in the 25th century, Sgrizam casts you in the role of the warrior Mirdav who has been entrusted with the task of rescuing the Princess Dooxaphin. Naturally, being a princess, Dooxaphin (Doxie to her friends no doubt) is dead beautiful and if you can rescue her you get to win a huge dowry and her hand in marriage, so off you go to rescue her from her captors on the planet Kindos.

Tucked away in a cell in the Castle of Kindos, Dooxaphin can only be rescued by you battling



your way along the corridors, dodging or killing the creatures that will stand in your way. These include zombie ducks, swordsmen, snakes, rats and the like. Most of these can't be killed, but by ducking or jumping at the appropriate moment you can avoid them.

Getting hit three times ends the game, and whenever I or anyone else played Sgrizam each game lasted about three seconds.

The trouble is that there's so little game in here — you can walk along the corridor, jump/duck to avoid the animal,

or jiggle your sword in the direction of one of the armed enemies that comes along occasionally and that's about it. There doesn't seem to be much skill involved in the sword-play and simply avoiding the stream of creatures that comes wandering along (always from the same direction, so you don't even get to run backwards and forwards to add a little variety to the game) gets monotonous in a very short time.

The graphics are quite good for a budget game, and Mirdav is a large, well animated sprite that wouldn't look out of place in a more sophisticated arcade/adventure. It's just a pity that the gameplay itself is so dreary.



GRIM

RETURN TO OZ

US Gold
£7.95

Yet another spin off from a film title and no, it's not about going back to Australia, but rather it involves that magical land of Yellow Brick Roads, Emerald Cities and the Wicked Witch of the West. Some time has passed since your first visit and you are desperate to return to see your friends, especially as you have a feeling that all is not quite as it should be with the Cowardly Lion, the Scarecrow and the Tin Woodman. The problem is, Aunt Em wants you to stay firmly put

in Kansas and doesn't like you even mentioning Oz.

The game is a menu driven graphic adventure that is designed to appeal especially to young children. There is nothing to type in apart from your name at the beginning and everything is controlled by just three keys — space to highlight a particular option from the menu, enter to select that option and shift to return to the main menu. There are six main options to choose from; Look, Talk, Search, Get, List and Leave. The list option (Inventory) is further subdivided into Quit, Drop and Use. When you select an option, all the relevant items on the screen are highlighted and again, the space bar switches between them.

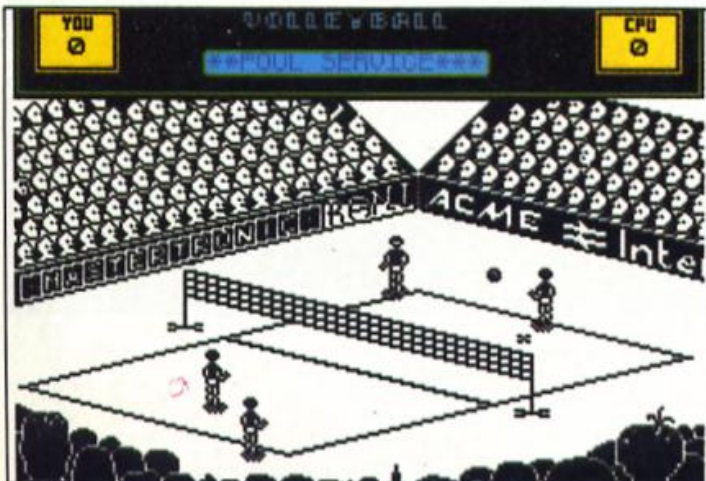
The main problem with the game is that the graphics are truly awful. Pictures of what you have found are small and not easily distinguished and items or areas that are supposedly highlighted remain indistinct and wishy-washy. There are also difficulties in using the space bar to highlight different objects but this may be a peculiarity of my rubber keyboard. Certainly, I found that I had to press the keys up to half a dozen times before the next item was highlighted and it would be all too easy to dismiss something as not significant because you couldn't select it.

The game is designed to make adventuring easy, but I found that it had just the opposite effect and my frustra-

tion increased considerably, the longer I played. As for the story, it follows the film closely but I think that you would have to be a real fan of the film to get much fun out of the game. One final quibble. All over the packaging are notes crediting the Walt Disney organisation who produced the film but there is not a single mention of L. Frank Baum the original author. Take my advice and go and read the book instead.



GROAN



THRUST

Firebird
£1.99

I'd seen this played on the C64 and I'd heard some good things about it, so I was interested to see a Spectrum version of Thrust turn up in the office a little while ago.

Thrust is a simple enough game, and quite old fashioned in many ways, being a sort of cross between Asteroids and Lunar Lander. The game puts you in control of a small space craft shaped like an upside down 'V' which hovers above the surface of a planet. At first it is slowly drifting down towards the ground, but quite quickly speeds up as gravity draws you downwards. Using the rotate left/right and thrust controls you have to guide your craft over the surface of the planet and collect the energy pod.

Controlling the craft is difficult enough, as there's gravity and your own momentum to contend with, but there's also the problem of the Lympet guns which defend the pods. The guns are powered by nuclear plants and if you can fire enough shots at the plants the guns can be deactivated temporarily, but if you overdo it you'll end up sending the plant critical and destroying the whole planet (which isn't a good idea).

Then add to all that the problem of your every decreasing fuel supply and the tricky task of collecting additional fuel from the supply pods on the surface and you're faced with a game that is made up of several simple tasks which combine to make quite a tricky game. Hovering over the planet isn't too hard, and neither is picking up the fuel or energy pods, but when you try to do both these things and conserve your fuel and dodge bullets at the same time, that's when things start to get tricky.

There is just one pod on each planet, and once you've collected that you just head skywards and the game will move you on to the next planet. The first couple of planets aren't too much trouble, but on the later planets the pods and spare fuel get hidden away in deeper and more complex caves, and are protected by more and more guns, so it's not a game you'll master in a few minutes.

The graphics are quite simple, but the animation and responsiveness of your craft are all quite smooth (and at least the simplicity of the graphics allows you to avoid attribute problems). My only doubt about the game is that because you have to go through all the planets in a fixed order you might get a bit fed up going through all those early planets in order to master the later ones. Oh, and once you've chosen your control keys you can't redefine them without

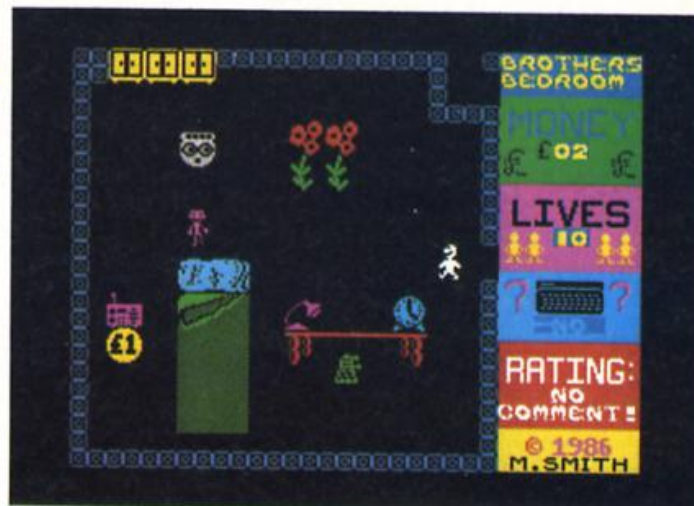
THINGY AND THE DOODAHS

Americana
£2.99

The standard of budget software seems to be varying quite a lot these days. On one hand there's a small number of games that make full price titles look overpriced, but at the same time there are still a lot of budget games that really ought never to have seen the light of day.

Then, on the other hand, there are games like Thingy and the Doodahs which are neither incredibly good nor incredibly bad and which make a poor reviewer's life hell because you can't rave over them or indulge yourself by giving them a good drubbing. So what do you say about them?

Well, the plot of the game goes like this; Thingy (a little sprite type person with an idiotic grin) has gone and broken his Spectrum and has to replace it with a new one before his parents find out. The only way for him to do this is to go off in search of the money to buy a replacement (just £60 apparently — do Americana know more about Amstrad's plans for the Speccy than they're letting on?), and this will take him on a journey around some 200 locations, including rooms in his house and the



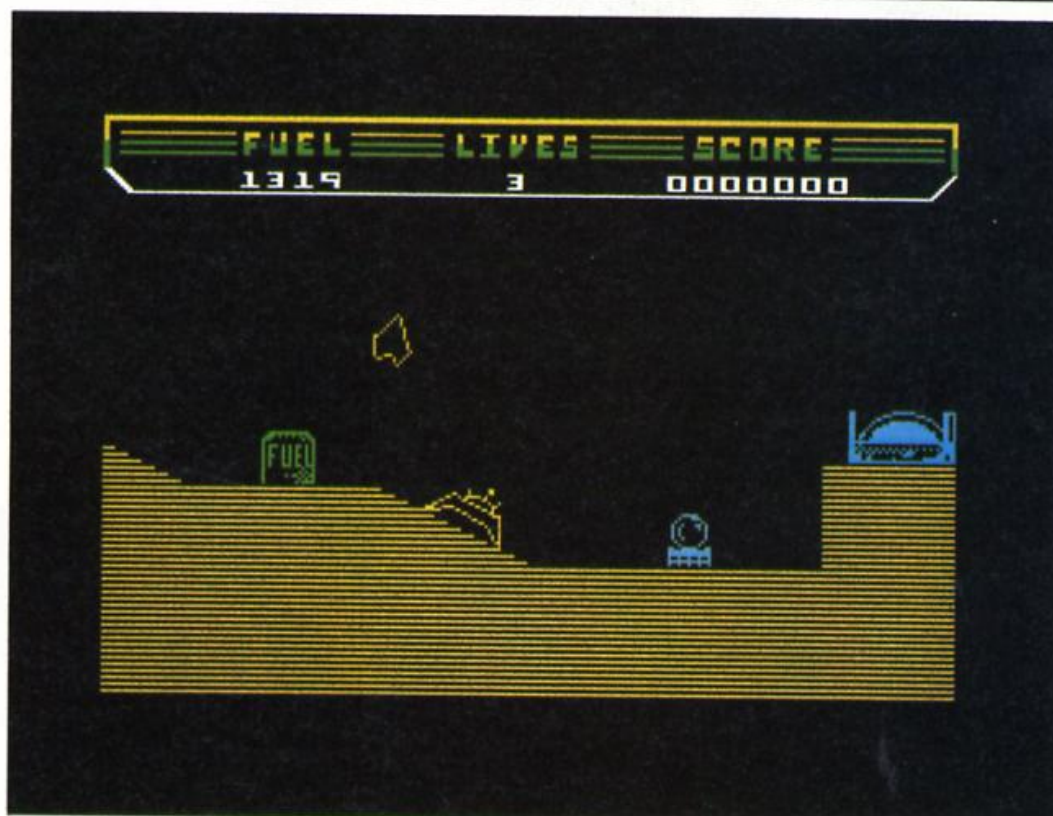
neighbouring countryside.

As usual though, there are monsters out to get him. In this case it's a bunch of creatures known as Doodahs, which come in various types. There are Whatsisnames, Thingummy-bobs, Whachamacallits and So-and-So, and they're all equally deadly.

Thingy is a good old fashioned maze game with £1 coins as the objects that you've got to collect. It's not badly done, but it does look fairly dated — most of the passage ways and monsters are small character sized blocks, making use of the UDG facility, so the game looks reminiscent of others that you could have bought three years ago. It's not fast and furious, but dodging

around the Doodahs and the passages of the maze is quite complex in places and the author has clearly put a bit of thought into the layout of all the rooms.

I can't really recommend Thingy and the Doodahs one way or the other. It's not such a bad game that you'll regret every penny you part with to buy it, but neither is it the sort of game that is ever likely to be remembered two months after you bought it. The word that describes it best is 'average'.



starting from scratch and re-loading the game again, so it's not a good idea to play the game with a friend unless he/she wants to use exactly the same controls.

Thrust is an old fashioned

game that isn't going to set the world alight, but it's been well enough thought out to be challenging and fun for a few rainy afternoons and it's probably one of Firebird's better budget releases of recent months.



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SHORT CUTS

STAR
CUT

Ray Elder presents
another prize winning
collection of readers'
routines

Printing Windows

Robert Glavas, a regular writer from Bury, sent us an unusual program to allow you to print a section or window of the screen to a ZX or Alphacom printer. The Machine code is relocatable and once you entered or reloaded the program load in your previously save screen by LOAD "" SCREEN\$ and type GO TO 1. Answer the prompt and the required window will be produced. (LISTING 1)

Reflections

Mark Batts of Abbots Langley supplied us with LISTING 2, a program to drive you round the bend. Try it.

A Sound Program

Supplied by Michael Toner who lives in Belfast, this short program LISTING 5, will liven up the old Beep. Once entered and RUN just type RANDOMIZE USR 65511 to have your ears tickled.

Random Selection

Ian Skillen proves the ZX81/TS1000 is surviving in Chicago, but his routine for selecting non repeated random numbers over a set number of selection can be used on any ZX computer. (LISTING 6)

QL Dump

A rare beast indeed from Mr L.W. Tomlin of London. More of a tip really but for slowly fading QL. He tells us that there is a screen dump utility on the EASEL cartridge called GPRINT_PRT and should work with any Epsom type printer.

Load it by typing
a=RESPR(2000):LBYTES
MDV1_GPRINT_PRT,a

When you want to print a screen either from within a program or after loading a predesigned screen simply type CALL a

I tried it with a Shinwa CP80 and it worked.

Break & Display

From the Netherlands comes LISTING 3 and 4, courtesy of Rene Uittenbogaard, one is to add some protection to your program (3), and (4) splits the screen into two sections, the top half staying unchanged but the lower half scrolling up. Great for adventure game writers.

Your program goes from line 20 onwards and all you have to do is use the command PRINT FN p\$("Text goes in the string") with a maximum of 32 characters at a time.

LISTING 3

```
5 CLEAR 60898: FOR f=60899 TO
60970: READ a: POKE f,a: NEXT f
10 DATA 205,124,0,59,59,225,1,
15,0,9,235,42,61,92,115,35,114,2
01,118,205,142,2,123,254,255,32,
248,58,58,92,254,12,40,10,254,16
,40,6,254,20,40,2,24,25,60,50,12
9,92,253,54,0,255,33,0,0,34,66,9
2,33,0,0,34,68,92,59,59,195,125,
27,195,3,19
15 REM initialise with
RANDOMIZE USR 60899
```

LISTING 4

```
5 CLEAR 59999: FOR f=60000 TO
60081: READ a: POKE f,a: NEXT f
10 DATA 33,0,72,205,141,234,33
,224,72,22,8,30,32,1,32,7,9,126,
1,224,248,9,119,35,29,123,179,32
,240,1,224,0,9,21,122,178,32,229
,33,0,80,205,141,234,201
11 DATA 22,8,30,224,1,32,0,9,1
26,1,224,255,9,119,35,29,123,179
,32,240,1,32,0,54,0,35,11,120,17
```

LISTING 1

```
10 LET MC=60000
20 RESTORE : FOR F=MC TO MC+54
READ A: POKE F,A: NEXT F
30 DATA 62,3,205,1,22,1,0,0,81
,122,254,0,40,+6,62,32,215,21,24
,-11,42,132,92,9,197,17,248,255
40 DATA 6,8,126,18,197,1,0,1,9
,193,19,16,-11,62,164,215,193,3,
121,254,32,32,-31,62,13,215,201
```

```
90 REM general program
100 INPUT "STARTING ROW?";R1: I
F R1<0 OR R1>21 THEN GO TO 100
110 INPUT "FINISHING ROW?";R2:
IF R2<R1 OR R2>21 THEN GO TO 110
120 INPUT "STARTING COLUMN?";C1
: IF C1<0 OR C1>31 THEN GO TO 12
0
130 INPUT "FINISHING COLUMN?";C
2: IF C2<C1 OR C2>31 THEN GO TO
130
140 POKE MC+6,C1: POKE MC+48,(C
2+1)
150 FOR F=R1 TO R2: PRINT AT F,
0,: LET L=USR MC: NEXT F
```

```
7,32,248,21,122,178,32,222,201
15 DEF FN p$(a$)=(STR$ USR 600
00)( TO 0)+CHR$ 22+CHR$ 21+CHR$
0+a$
```

Examples

JETPAE



ULTIMATE
PLAY THE GAME

LISTING 2

```
10 LET x=0: LET y=0
20 INPUT "Type a word in pleas
e",a$
30 IF LEN a$>10 THEN GO TO 20
40 PRINT AT 0,0:a$
50 FOR s=0 TO LEN a$+8
60 FOR t=175 TO 168 STEP -1
70 IF POINT (s,t)=1 THEN GO SU
B 105
80 LET y=y+5: NEXT t: LET y=0:
LET x=x+3: NEXT s
100 STOP
105 PLOT 0,75: DRAW 255,0
110 PLOT x,75+(y-3): DRAW 0,3
120 PLOT x,75+y: DRAW 3,0
130 PLOT x+3,75+y: DRAW 0,-3
140 PLOT x+3,75+(y-3): DRAW -3,
0
150 CIRCLE x+1,80-(y+3),2
160 RETURN
```


LISTING 5

```
10 LET A=USR "P"
20 FOR J=0 TO 31: READ B: POKE
A+J,B: NEXT J
30 DATA 6,255,197,6,75,62,6,21
1,254,16,252,193,16,236,201
40 DATA 33,0,10,43,126,211,254
,6,205,5,32,-3,175,132,200,24,-1
4
```

LISTING 6

```
10 PRINT "HOW MANY SELECTIONS
?";
15 INPUT NS
16 PRINT NS
20 PRINT "HOW MANY GAMES ?";
22 INPUT NG
25 PRINT NG
30 DIM N(NG)
40 FOR I=1 TO NS
50 LET K=INT (RND*NG)+1
60 IF N(K)<>0 THEN GOTO 50
70 LET N(K)=K
90 NEXT I
92 STOP
100 PRINT "NUMBERS"
1000 FOR I=1 TO NG
1010 IF N(I)<>0 THEN PRINT N(I)
1020 NEXT I
1030 COPY
1040 STOP
```

Program Protection 2

Tony Porritt offers the system they use in Cleveland for protecting their listings. At this rate ZXC readers will have the most secure programs in the world: Remember to only add line one after your program has been tested and is bug free else you're stuck..... LISTING 7

LISTING 7

```
1 LET L=USR "a"-768: POKE 236
06,L-256*INT (L/256): POKE 23607
,INT (L/256)-1: DATA 15,30,12,1,
9,31
2 REM program starts here
```

3D Window & Text

Two from Alec Goodyear, the first to draw a 3D 'window' on the screen, as written you have to enter the positions, but these dimensions could be built into a

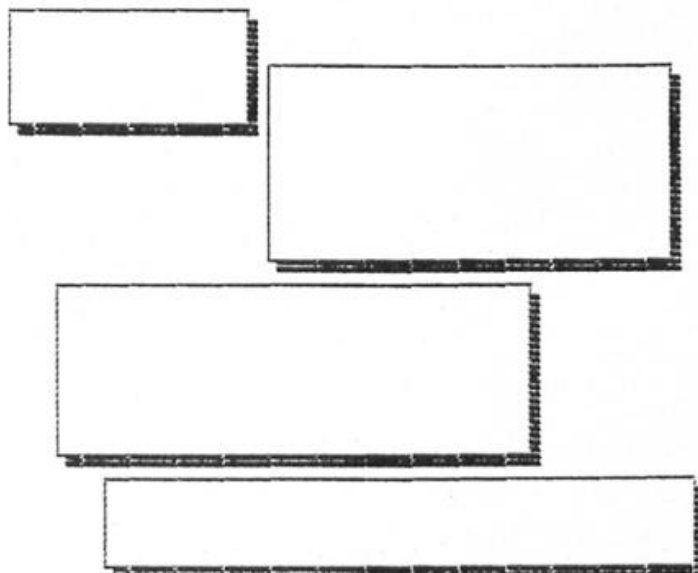
program, and the second to allows text to be input to a specified position and length. Again the parameters could be built into a program if desired.

LISTING 8

```
10 REM 3D Window
20 INPUT "ROW : ";R
30 INPUT "COLUMN : ";C
40 INPUT "HEIGHT : ";H
50 INPUT "WIDTH : ";W
60 INPUT "COLOUR : ";P
100 LET A$=""
110 FOR N=R TO R+H-1
120 PRINT AT N,C: PAPER P;A$(1
TO W)
130 NEXT N
140 LET R=(22-R)*8
150 LET C=C*8-1
160 LET H=H*8+1
170 LET W=W*8+1
180 PLOT C,R: DRAW W,0: DRAW 0,
-H: DRAW -W,0: DRAW 0,H
190 FOR N=R-H-1 TO R-H-3 STEP -
1
200 PLOT C+3,N: DRAW W,0
210 NEXT N
220 FOR N=C+W+1 TO C+W+3
230 PLOT N,R-3: DRAW 0,-H
240 NEXT N
```

LISTING 9

```
40 INPUT "ROW : ";R
50 INPUT "COLUMN : ";C
60 INPUT "MAX NUMBER OF CHARS
: ";M
70 PAUSE 50
100 LET I$="": LET A=0: LET B=0
110 PRINT AT R,C;
120 IF B=50 THEN LET B=0
130 LET B=B+1
140 IF B<26 THEN PRINT "_";: GO
TO 160
150 PRINT " ";
160 PRINT CHR$ 8;
170 LET K$=INKEY$: IF K$="" THE
N GO TO 120
175 PAUSE 70
180 LET K=CODE K$
190 IF K<32 OR K>127 THEN GO TO
220
200 IF A=M THEN GO TO 120
210 PRINT K$;: LET A=A+1: LET I
$=I$+K$
220 IF K<>12 THEN GO TO 250
230 IF A=0 THEN GO TO 120
240 PRINT CHR$ 8;" ";CHR$ 8;CH
R$ 8;: LET A=A-1: LET I$=I$(1 TO
A)
250 IF K<>13 THEN GO TO 120
260 PRINT " "
300 PRINT AT 21,0;"THE STRING W
AS : ";I$
```



Topsy Turvey

This routine is an interesting means of turning the display upside down, the code is loaded to 32000 but it is relocatable and can be placed anywhere you wish. Use it by RANDOMIZE USR address. This one came from the I.O.W. and was written by David Hiscock. LISTING 10.

LISTING 10

```
10 RESTORE : LET t=0
20 FOR I=0 TO 117: READ a: POK
E 32000+I,a: LET t=t+a: NEXT I
30 IF t<>10795 THEN PRINT "ERR
OR IN DATA!!"
40 DATA 17,0,88,33,160,90,6,11
,14,32,197,26,79,126,18,113,193,
19,35,13,32,244,197,1,64,0
50 DATA 167,237,66,193,16,232,
```

```
17,0,64,33,160,87,6,6,14,3,197,6
,8,197,6,32,26,79,126,18,113
60 DATA 19,35,16,247,229,235,1
,224,0,9,235,225,1,32,1,167,237,
66,193,16,227,229,235,1
70 DATA 224,7,167,237,66,235,2
25,9,193,16,210,13,121,254,2,32,
10,17,192,64,33,224,79,6,2,24
80 DATA 194,254,1,121,192,17,0
,72,33,160,79,6,3,24,180
```


NEXOR

The Andromedans (alien flavour of the month) have been tinkering with an awesome doomsday machine. Your interstellar DIY mission is to put it back together.

NEXOR
Design Design
£7.95

They're at it again — it seems that you can't go near a computer game these days without being besieged by hordes of aliens who are just falling over themselves to invade earth and sample the delights of Miami Vice, Stephen King novels and Chinese take aways.

This time it's the Andromedans' turn to have a crack at us, but fortunately Our Boys have been eating their Shredded Wheat and have pushed the Andromedans back to their last stronghold in Orion. All it needed was the completion of the Nemesis weapon to knock out that last stronghold, but then the enemy launched a desperate attack on the NEXOR complex where the weapon was being developed and only you have survived to keep Nemesis out of their hands. Scattered throughout the multi-

levelled complex are two sets of five modules; only one set needs to be collected to complete the weapon (the others will be destroyed when the complex self-destructs), then if you can find the blueprints and repair the transporter beam you'll be able to keep the weapon out of enemy hands.

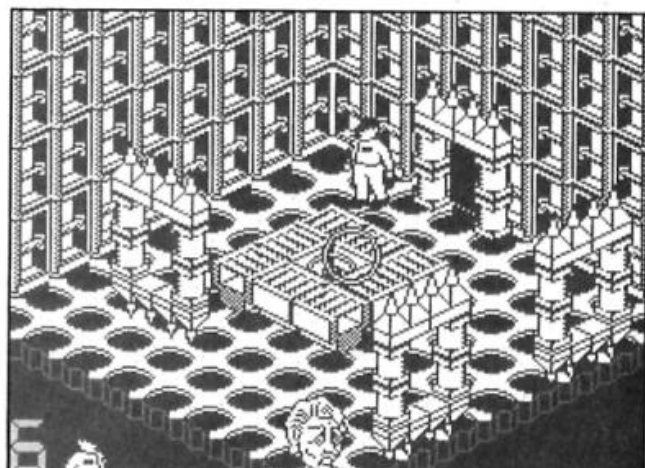
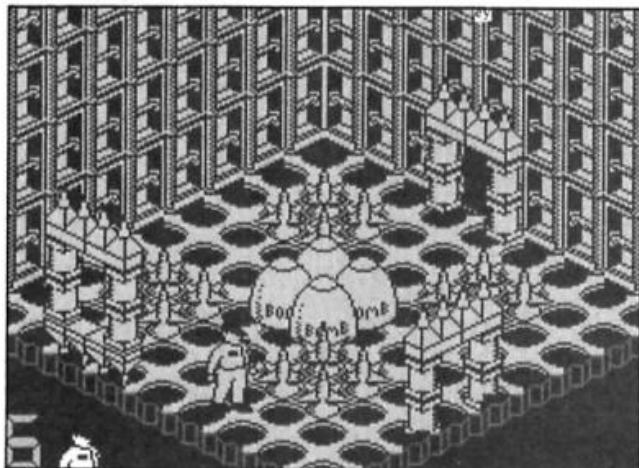
The NEXOR complex might look a little familiar, since it's drawn in the style of two-coloured 3D graphics that have become more or less standard for arcade adventures ever since Knight Lore arrived to harry the nation's joysticks. All the usual paraphernalia is here — moving walkways, deadly spikey things, tables and blocks that have to be moved around to allow you to reach inaccessible exits, and an assortment of robot sprites who sneakily don't appear until the second time you pass through a room so that they can take you by surprise.

You control the figure of the head of security as he attempts to locate the Nemesis modules and repair the transporter beam. You're unarmed so the only way to avoid fatal collisions is by some smart movements using the usual back/forwards, left/right and jump controls. Modules are collected automatically as soon as you touch them, and as you collect each one you are told how long is left before the whole place self-destructs.

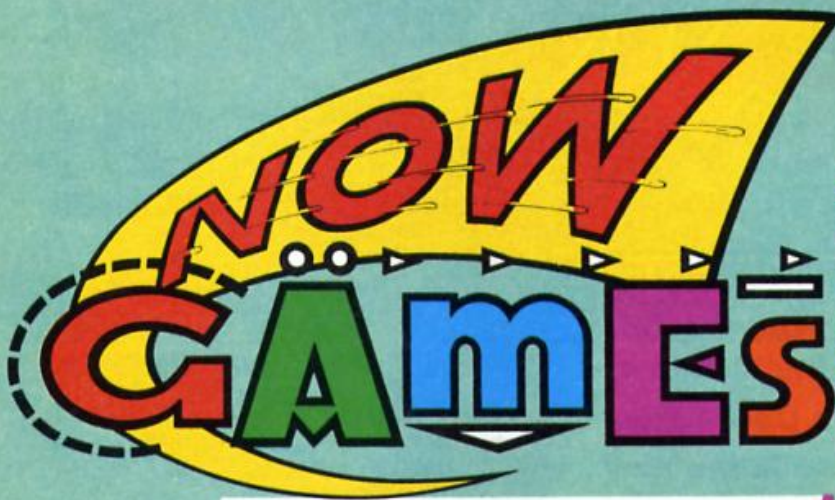
The presentation and graphics are all well up to the sort of standard that people expect from Spectrum games these days, but I couldn't help thinking that NEXOR lacked a bit in gameplay. In these sort of games, half the fun lies in the

exploration and discovery of all those fiendish obstacles that lie between you and the objects you need to collect, and working out how to get past them. But in NEXOR much of the exploration simply isn't very interesting, and finding the modules just becomes a matter of wandering around for long enough. Many of the rooms are full of bombs and other features, yet present no other challenge than walking in and then straight out again because the path through the room is totally obvious. There are a few rooms with some tricky puzzles in, but these are in the minority. Apart from the modules you can only carry one object at a time, and most of these can only be used in the room where you found them (you can't carry them from room to room), so there's no element of judgement involved in deciding which objects to take with you or to leave behind.

Although the programming of NEXOR is well up to scratch the design of the game is rather unimaginative. It's no use filling a room full of nicely drawn objects if none of them do anything. NEXOR has adopted the style of games like Knight Lore and Alien 8, but with little of the substance that made them so addictive.



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DAN DARE

PILOT OF THE FUTURE

Dan and the Mekon are back! Dan Dare takes to the skies in the new biggle from Virgin.

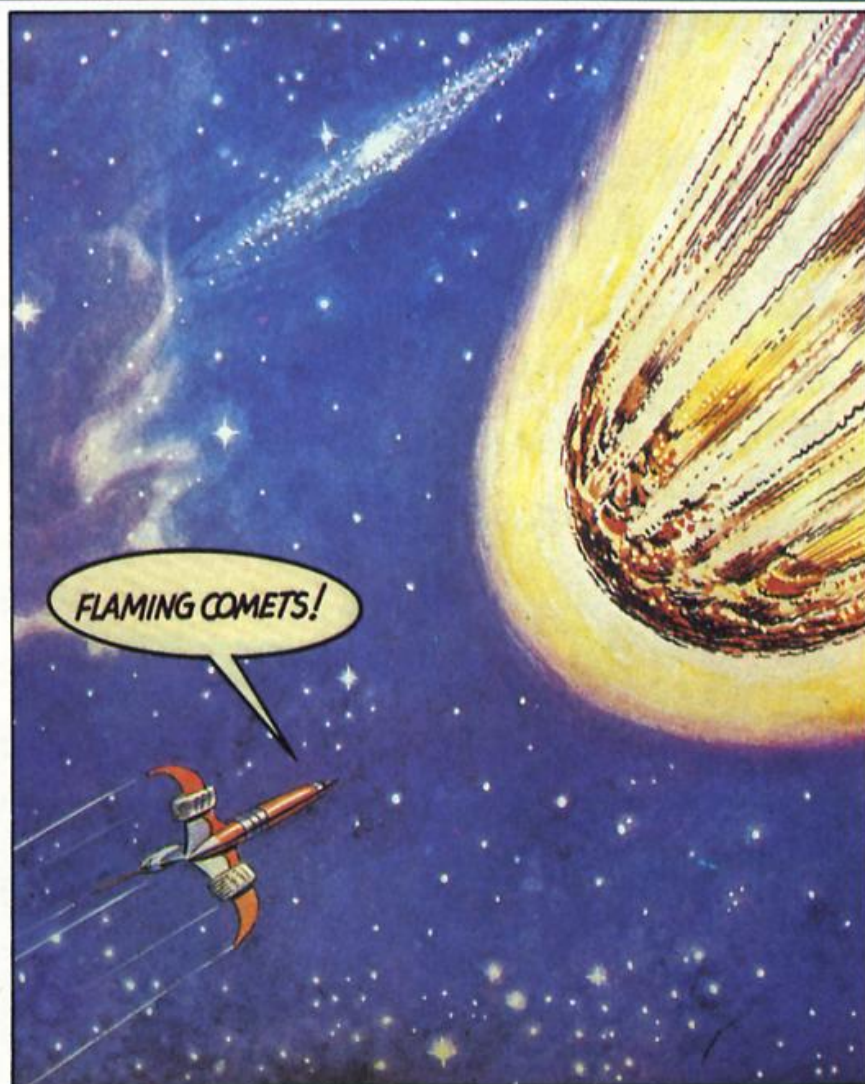
**Dan Dare
Virgin Games
£9.95**

■ It didn't take Virgin quite as long to get Dan Dare off the ground as it's taken Ocean with Knight Rider, and now that the game is here it seems that, just for once, the wait was worthwhile. In fact, Dan Dare bears some resemblance to another Ocean game in that it's like a simpler version of 'V'. That's not necessarily a criticism since although 'V' was quite impressive I found that game a bit too fiddly to be addictive.

Dan Dare, on the other hand, does away with the complicated icons of 'V' and concentrates on shoot'em-up action, with just a touch of platform hopping and object collecting thrown in as well.

The plot is explained by a small comic strip that comes packaged with the game: it all starts when a futuristic Eamonn Andrews jumps and tells Dan — 'This is your life'. At which point none other than the Mekon himself makes a comeback and takes over the broadcast, warning all the television viewers in the Solar System of his latest fiendish plot. Heading towards the Earth under Mekon's control is a hollowed out asteroid large enough to destroy the entire plant upon collision. Inside the asteroid is a self-destruct mechanism that can be activated in order to prevent the collision, but the Mekon will only destroy it if he is declared absolute Ruler of The Universe.

Of course it goes without saying that having old green bonce as ruler of the universe is



By permission of IPC Magazine Youth Group

a prospect too horrifying to contemplate, so the Earth authorities have no choice but to refuse his demands. But how to save Earth?

Dan's jaw

Back in the television studio Dan's jaw sets firmly, his upper lip goes thrusting skywards and Digby (the ever faithful, but utterly useless sidekick) heads for the nearest McDonalds, prior to getting Dan's ship, The Anastasia, ready for take-off.

Within minutes Dan and Digby are on course for the asteroid, ready to take on the Mekon and his followers, the Treens, and save the Earth — just like the good old days.

Inside, the hollowed out asteroid contains five sectors full of armed Treens, corridors, ledges and grav shafts (lifts, connecting different floors). In each of the five sectors there is one control element for the self destruct mechanism, and only when you've collected the element in each sector can you gain entrance to the next sector



(assuming that you've managed to find the relevant locked door).

The screen display shows two floors at a time, so you can often see the Treens descending from above or an object that you might want to collect, and this adds to the atmosphere of the game as it makes the action seem that much busier when you can see other things going on around Dan.

You've got just two hours to complete your mission, and although Dan can't be killed, the Treens can shoot at him and drain his energy which results in Dan being captured and carried off to the cell in that sector. Escape from the cells is no problem but it does result in the loss of ten minutes and much of the skill of the game lies in how good you can get at fighting the Treens as the loss of time is likely to be your major obstacle in completing the game.

The laser that Dan is armed with isn't 100% accurate, and your supply of ammunition is limited so you have to learn when to stand to fight and when to turn that jaw in the other

direction and run away, hopefully to pick off the Treens on some other screen.

The action here is similar to that in the Commando type of game, with Dan and his laser faced with hordes of alien soldiers, but the animation is unusually good and the element of uncertainty in using your laser adds to the excitement of the game. And, since getting shot too many times cuts into your time rather than simply killing you, combat becomes a matter of judgement instead of just endless rounds of kill or be killed. As I mentioned earlier, there are times when running away is the wiser course.

Inside the asteroid

The five sectors of the asteroid add up to quite a lot of corridors, and it's probably a good idea to make some sort of rough map as you go along in order to remember some of the important locations. Each time you find one of the control elements these have to be returned to the control room in sector 1. That's my only doubt

about the game, since you have to go through the sectors in a fixed order and return to the control room each time you might eventually get a bit bored with retracing the same routes by the time you get into the final couple of sectors. Of course the system of corridors is sufficiently complex to allow you to vary your routes but I found it quicker to get around, and easier to remember my way, if I stuck to roughly the same routes each time.



Still, that doesn't make Dan Dare any less enjoyable especially as the main challenge is to improve your combat skill and speed in completing the mission, not simply finding the correct route through the corridors. And the game is very well presented, with one nice touch being the way that the screen is presented like a frame from a comic strip, with captions and messages from the Mekon flashing on screen every now and then in the same way that dialogue accompanies the illustrations in a comic.

Because of the delay in getting the game ready, and the speed at which software is improving these days, Dan Dare isn't quite as impressive as it might have been had it appeared last year when it was originally planned, but even so it's still a highly enjoyable and playable game and might even be the best game yet from Virgin.



NIGHTMARE RALLY

A top notch rally game from Ocean with detours into other dimensions.

Nightmare Rally
Ocean
£7.95

This rally is far more than a straightforward dash from A to B over difficult terrain. Strange effects have been built into the route which transforms it into a trip through the Twilight Zone.

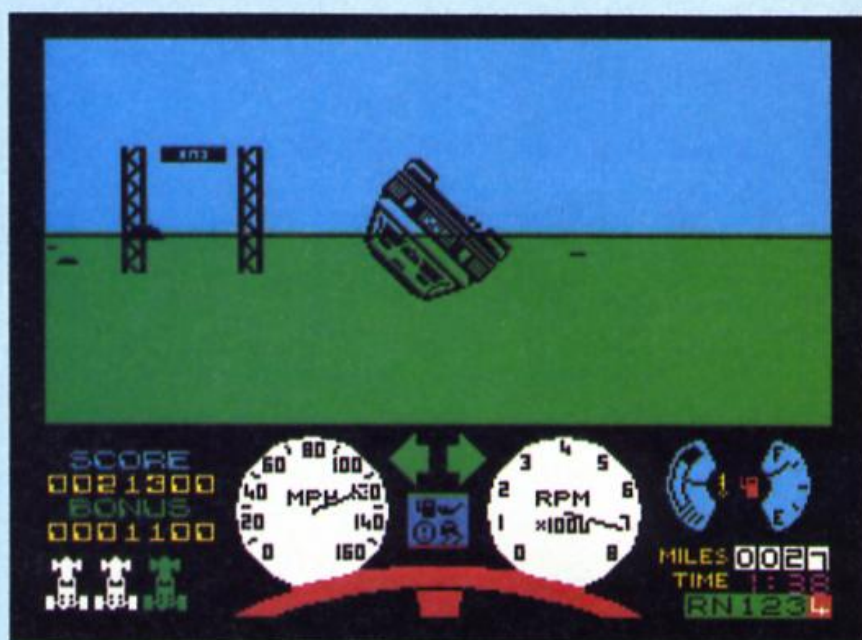
Not only do you have to complete each stage within a set time limit you must also amass bonus points to progress and to do this you get involved in some very strange manoeuvres indeed.

The landmarks dotted over the landscape include marker flags indicating the course and fuel dumps which give you an instant tank up. It's important to go round the flags the right side as indicated on the dashboard layout below the main screen and refuelling is essential for you to reach the finishing gate on the first stage.

That's the basic set up but there are many surprises in store. Reckless driving is in fact encouraged — make for the hills, jump over them and you get bonus points and if you hit them at an angle the car does an impressive somersault and you get even more points.

But if you want to sample the more bizarre side of the rally head for the magical standing stones. Ramming these head on produces a strange range of effects. Sometimes you will just stop dead but particular stones will variously cause your car to take to the air, reverse the screen so you are driving with the sky above you or create a curious blurring effect on the landscape.

All these effects are graphically so convincing that you immediately accept them as a part of the game. The perspective shifts are also very smooth giving a real sensation of speed. Searching out all the screen effects can distract you from reaching your objective but it's worth expending a few lives just to test them out and after a few outings you discover that they can actually help you. Flving over trees and obelisks, for instance, brings in some valuable bonus points. On some stages, diversions from the main



course are essential to collect the necessary bonus points.

Sometimes the weather conditions alter and fog descends cutting visibility down completely so that objects seem to appear out of nowhere. Each stage presents different challenges.

The first is a flat plain strewn with objects to collide with for a bonus point accumulation and others to strictly avoid. Only experience will tell you which is which.

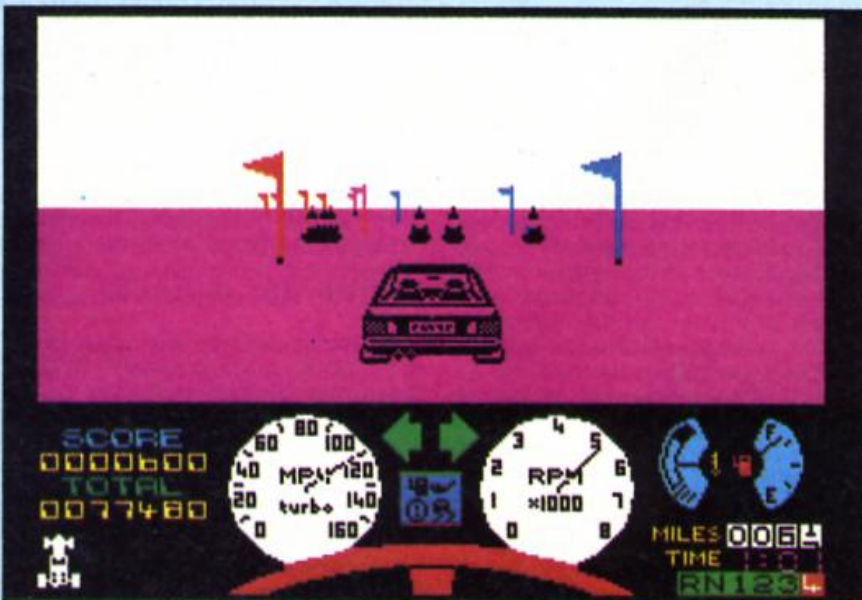
The second stage is completely different being a winding course over an icy surface. Choosing the correct speed is important here but you'll find that even successfully getting through the flag gates is

not enough to get you to the next stage. Also on the course are numerous cones which you must clip to get you the required points tally.

Nightmare Rally is an excellent game for anyone who likes being behind the wheel of a computer simulation. Very challenging, very unpredictable, this game is highly addictive and highly recommended.



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ALSO AVAILABLE... MARK II 3D CYRUS II FOR SPECTRUM 128K

**Interface One owners
can add some new
commands to Sinclair
Basic, with this
program.**

By Paul Matthews

Any Spectrum user with Interface 1 will know that it allows the use of microdrives, RS232 devices, and the ZX net. However, a less well known feature is the facility to extend Spectrum BASIC by changing the syntax of certain keywords. This feature is used by my routine to provide the Spectrum user with six extra commands. They are:—

PLOT *x,y which will PLOT anywhere on the screen. Co-ordinates (O,O) are in the very bottom left hand corner, where it is not usually possible to PLOT. So the normal PLOT O,O becomes PLOT *O,16 and PLOT O,175 becomes PLOT *O,191.

POKE *a,b where b is a number from 0-65535. This means that a 16-bit number can be POKEd with the low order byte going into location a and the high order byte going into the location (a+1), i.e. POKE *23735, 64900 is equivalent to POKE *23735, 132 and POKE 23736, 253.

combination). p and i are the PAPER and INK colours to be changed (07=Black-White, 8=all colours). nf is the new flash and brightness intensities (0=neither, 1=bright, 2=flash, 3=both, 8=leave as they are). Finally, np and ni are the new PAPER and INK colours (0-7=Black-White, 8=leave as it is, 9=contrast).

ATTR 1,0,6 TO 1,7,1 will change all characters which are bright yellow INK on black PAPER to bright blue INK on white PAPER.

ATTR 8,8,0 TO 1,8,9 will change all characters with black INK (no matter the PAPER colour and flash or brightness intensities) to bright contrast INK (either black or white) on the original PAPER colour. Note: one of the powerful features of this command is that the whole screen can be changed by setting the first three numbers to '8'. e.g. ATTR 8,8,8 TO 8,1,8 will change the entire screen to blue PAPER.

INVERSE which swops over the PAPER and INK colours in the attribute file, without altering the

SPECTRUM EXTEND

POKE AT a, aS which will POKE a hexadecimal value held in aS into location a. e.g. POKE AT 23296, "C9" will put C9 (201 dec) into location 23296. If there is more than one hexadecimal number (which can be separated by spaces) then they are put into the locations following a. e.g. POKE AT 23296, "3EFEC9" and POKE AT 23296, "3E FE C9" are both possible and will POKE 3E (62 dec) into location 23296, FE (254) into 23297 and C9 (201) into 23298. Therefore, this command could be used to enter machine-code easily and quickly.

ATTR f,p,i TO nf,np,ni which will search out specified attributes and replace part or all of each found, with a new attribute. f is the flash and brightness intensities to be changed (0=none, 1=bright only, 2=flash only, 3=both, 8=any

flash and brightness intensities.

SIN which stands for "Screen INvert" and will invert all the characters on the screen.

NOTE: INVERSE and SIN have the same visual effect but INVERSE affects ATTR (as bits 0,1 & 2 and bits 3,4 & 5 of each attribute are swopped over) but does not affect POINT whilst SIN affects POINT (as all pixels set are reset and vice-versa) but not ATTR.

New Vector

The key to extending the BASIC is the "new" system variable VECTOR. Whenever a syntax error occurs, the "shadow" ROM (i.e. that in Interface 1) is paged in and checks the syntax to see if it's one of the Micro-drive commands, if not, it jumps to the



ED BASIC

location pointed to by VECTOR. Therefore, to add commands you need only change VECTOR to point to the beginning of your own machine-code routine. This is done in the set-up routine (lines 210 - 240 of the assembly listing. Lines 210 - 20 set up the "new" system variables, as these are not usually set-up until an error occurs). Before you can use the extra commands the set-up routine must be called by a line such as LET a = USR 64900 (64900 is where I placed the routine in memory. However, if you assemble it, you can put it anywhere you want by changing Lines 10 and 20. Once assembled, though, the routine cannot be moved.

When a non standard command is found, the routine will be called. However, the "shadow" ROM will be paged in which means that if you want to use of any of the "main" ROM

routines you cannot use call as that would CALL a "shadow" routine. Instead, you have to use an RST # 0010 instruction (#denotes hex) followed by the address of the "main" routine. This "shadow" routine pages in the "main" ROM, calls the required "main" routine and then pages out the "main" ROM. In this article, the restart routine has been given the name CALBAS. On entry to the routine pointed to by VECTOR, another system variable CH-ADD will be pointing to the command of the error-statement. To find out what command this is, the "main" routine GET CHAR (#0018) is used. This puts the character pointed to by CH-ADD into the A register. The next characters in the statement can then be found by using NEXT CHAR (#0020) which increases CH-ADD by one and puts the character now pointed to, into the A register.

Keywords

I have used five different keywords and, as you can see, they do not all have to be common commands e.g. ATTR (a function) is being used. Also note that if the syntax of your new command is the same as that of the original (e.g. PLOT and POKE in this article) another character (e.g. an asterisk) has to be placed after the keyword or the ROM will not recognise it. However, if you do not like the present keywords, you can make your own up e.g. *Renum or *Delete, but these have to be typed out in full and each letter must be checked by increasing CH-ADD and then comparing the character. The asterisk, which could be any shifted symbol, is necessary to get the cursor out of K mode.

It can be seen (in lines 270 - 380) that the first thing to be done, once called by the ROM, is to get the code of the error command into A, and then check this against the five new commands (not six, POKE is used twice). If one of these commands is found the appropriate routine is called, otherwise the normal error routine (#01F0) is called instead, which produces either a flashing question mark or 'nonsense in BASIC'.

Interesting points to note in my routine include the fact that POKE is used twice. This is done by jumping to the second routine when the asterisk after the POKE fails. Only if the character also fails to be an "AT" sign is the error routine called. Another thing to be noted is that the ATTR scanning routine (i.e. when it actually looks at the screen) is really only four lines in length. However, this is increased by also allowing ATTR to have new INK and PAPER colours 9 which cannot be easily changed in the same way.

I hope my routine provides useful commands and that this article will help you to write your own commands. For further information, I advise you get Ian Logan's "Spectrum Microdrive Book", and "The Complete Spectrum ROM Disassembly" by Ian Hogan and Frank O'Hara.

SPECTRUM EXTENDED BASIC

Listing 1

Machine code loader.

```

1 REM Six Extra Commands
  by Paul Matthews
10 CLEAR PEEK 23732+256*PEEK 2
3733-636: LET p=PEEK 23730+256*P
EEK 23731+1: LET m=253-PEEK 2373
1
20 CLS #: PRINT TAB 3: FLASH 1
: " Loading ~6 Commands~ Data ~"
30 FOR f=p TO p+439 STEP 20: L
ET t=0: FOR g=0 TO 19
40 READ a: LET t=t+a: POKE f+g
,a: NEXT g
50 READ s: IF s<>t THEN PRINT
"Error in Data Between Adresse
s" f: and " f+19: BEEP .1,0: BE
EP .1,12: BEEP .1,0: STOP
60 NEXT f: PRINT TAB 5: "Data E
ntered Correctly": BEEP .1,12: B
EEP .1,15: BEEP .1,20: BEEP .1,1
5
70 PRINT "The Routine will
now be saved." "To re-load the
routine at any time, enter th
e following: " "CLEAR "ip-1": "LO
AD " "CODE "ip: ",440" "LET a=US
R "ip
80 SAVE "6 Commands" CODE p,440
85 REM or to Microdrive with:
SAVE "m" i: "6 Commands" CODE p,
440
90 PRINT "To use the Extra
Commands now, you need only en
ter the last of the above stateme
nts."
95 REM Address 64900:
100 DATA 207,49,33,141,253-m,34
,103,92,201,215,24,0,254,246,202
,109,253-m,254,244,202,3276-m-m
110 DATA 225,253-m,254,171,202,
122,254-m,254,221,202,04,254-m,2
54,178,194,240,1,215,32,0,3610-(
m*3)
120 DATA 205,183,5,33,0,64,126,
47,119,35,124,254,00,32,247,24,3
3,215,32,0,1866
130 DATA 254,42,32,43,215,121,2
8,205,183,5,215,140,30,245,215,1
40,30,193,79,62,2493
140 DATA 191,144,56,96,215,176,
34,215,236,34,195,193,5,215,32,0
,254,172,32,0,3,2570
145 REM Address 65000:
150 DATA 215,128,20,254,44,40,2
,231,0,215,32,0,215,140,20,205,1
83,5,215,241,2421
160 DATA 43,197,213,215,153,30,
197,225,209,193,120,254,0,32,7,1
77,254,1,40,223,2703
170 DATA 56,204,26,254,32,40,19
,205,46,254-m,7,7,7,11,197,79,
19,26,205,1701-m
180 DATA 46,254-m,177,193,119,3
5,19,11,24,216,214,40,254,10,216
,214,7,254,16,216,2543-m
190 DATA 215,249,36,254,42,32,1
76,215,121,20,205,183,5,215,153,
30,197,215,153,30,2754
195 REM Address 65100:
200 DATA 197,225,193,113,35,112
,24,130,215,32,0,205,183,5,33,0,
00,126,230,192,2346
210 DATA 07,126,7,7,7,230,56,17
8,07,126,15,15,15,230,7,170,119,

```

```

35,124,254,1903
220 DATA 91,32,230,195,193,5,21
5,121,20,215,125,20,254,204,194,
239,253-m,215,121,20,2906-m
230 DATA 215,125,20,205,103,5,2
15,140,30,254,10,40,55,254,0,56,
7,1,7,7,1861
240 DATA 32,2,14,0,197,215,140,
30,254,10,40,36,254,0,56,9,1,56,
56,32,1458
245 REM Address 65200:
250 DATA 0,14,0,24,4,7,7,7,79,2
25,9,229,193,205,37,255-m,197,21
5,140,30,1893-m
260 DATA 6,255,254,0,40,5,56,6,
215,60,34,1,0,240,197,215,140,30
,193,254,2233
270 DATA 0,32,6,120,230,56,71,2
4,7,40,233,7,7,7,177,79,205,37,2
55-m,209,1026-m
280 DATA 33,0,00,126,160,105,32
,40,126,162,171,119,123,162,203,
07,40,10,230,56,2161
290 DATA 126,40,2,230,56,246,7,
203,111,40,2,230,7,119,123,162,2
30,56,40,0,2054
295 REM Address 65300:
300 DATA 102,203,07,40,2,230,19
9,119,35,124,254,91,32,205,195,1
93,5,197,215,140,2756
310 DATA 30,193,254,0,32,5,120,
230,192,71,201,254,4,40,149,15,1
5,177,79,201,2206

```

Listing 2

Demo of the new commands.

```

1 REM *****
  Demo Program, type in
  machine code first ! *
  *****
5 CLEAR 64899: LOAD "6 Comm
ds" CODE
10 LET a=USR 64900: GO TO 9000
15 REM Change values in lines
5 and 10 for use in 16K
20 RESTORE
30 FOR f=0 TO 7: FOR g=0 TO 7
40 PRINT AT f*2,g*4: INK f: PA
PER g: " FLASH 1: " BRIGHT 1
: " FLASH 0: "
50 PRINT AT f*2+1,g*4: PAPER f
: INK g: " FLASH 1: " BRIGHT
1: " FLASH 0: "
60 NEXT g
70 READ a: PRINT INK 0: PAPE
R 0: FLASH 0: BRIGHT 0: AT f*2,0:
"INK="a: AT f*2+1,0: "PAPER="a:
80 NEXT f
90 PRINT AT 17,0: INK 1: "1st &
4th Numbers: " "0=none,1=BR,2=FL
,3=FL+BR,8=all" INK 2: "Others:
0 to 7=Black to White, 8=All. A
lso 9=Contrast for 5&6th"
100 INPUT "ATTR " f: " i: " i: " i:
: " TO " f: " i: " i: " i:
110 IF f<0 OR p<0 OR i<0 OR f<
0 OR p<0 OR i<0 THEN GO TO 10
0
120 IF (f>3 AND f<8) OR p>8 OR
i>8 OR (f<3 AND f<8) OR p<9
OR i<9 THEN GO TO 100
150 FOR g=0 TO 31: PRINT AT 21,

```

```

g: INK i-(INT (RND*8) AND i=0):
BRIGHT INT (RND*2): FLASH INT (R
ND*2): PAPER p-(INT (RND*8) AND
p=0): " & ": NEXT g
100 PRINT #1: AT 0,0: INK 3: "Pre
ss any key to demonstrate: " AT 1
,0: INK 0: "ATTR " i: INK 1: " i:
INK 2: " i: " i: " TO " i: INK 1: f:
: " i: INK 2: p: " i: " i: PAUSE 0
200 ATTR f,p,i TO f,p,i,11
250 POKE AT 23296,"0601 CD000E
C9": REM LD B,+1 CALL 0E00 RET
260 LET a=USR 23296: PRINT #1: A
T 1,0: INK 9: "Press any Key(exce
pt ~) to Cont"
300 PAUSE 0: BEEP .1,10: BEEP .
1,15: BEEP .1,20: BEEP .1,12: IF
PEEK 23560<>CODE "i" THEN GO T
O 20
1000 DATA "Black","Blue","Red","
Magenta","Green","Cyan","Yellow"
,"White"
9000 REM Instructions
9010 CLS : PRINT INK 3: AT 0,6: "
Six Extra Commands" AT 1,7: "by P
aul Matthews"
9020 PRINT AT 3,0: "This 440 Byte
routine gives the user the foll
owing new Commands:"
9030 INK 1: PRINT AT 6,0: "PLOT #
x,y " i: INK 2: "which can PLOT eve
n on the bottom two lines."
9040 PRINT AT 9,0: "POKE #addr,num
" i: INK 2: "which will POKE al6-
bit number into an address."
9050 PRINT AT 12,0: "POKE AT addr
,h# " i: INK 2: "which will POKE ad
dr with hex held in the string"
9060 PRINT AT 15,0: "ATTR f,p,i T
O nf,np,ni " i: INK 2: "which se
eks out attributes and changes pa
rt or all of each found."
9070 PRINT AT 19,0: "SIN " i: INK 2
: "i.e. "Screen Invert"
9080 PRINT AT 20,0: INK 0: "and" i:
INK 1: AT 21,0: "INVERSE " i: INK 2
: "i.e. "Attribute Inverse"
9090 PRINT #1: INK 3: "Press any
key for Demonstration"
9100 PAUSE 0: INPUT " "
9110 POKE AT 23296,"0615 CD000E
C9": REM LD B,+15 CALL 0E00 RET
9120 FOR f=0 TO 11: LET a=USR 23
296: NEXT f
9130 INK 0: PRINT AT 11,0: "SIN e
ffects the POINT command as each
pixel changes its state" "e.g. P
OINT (0,0) = "POINT (0,0)
9140 PRINT #1: INK 3: " Press any
key for Demo of SIN: PAUSE 0:
INPUT " "
9150 SIN : PRINT AT 14,0: "and now
POINT (0,0) = "POINT (0,0)
9160 PAUSE 50: PRINT AT 16,0: "IN
VERSE effects ATTR as all INK an
d PAPER colours are swapped e.
g. ATTR (0,0) = "ATTR (0,0)
9170 PRINT #1: OVER 1: INK 3: " P
ress any key for INVERSE Demo "
PAUSE 0: INPUT " "
9180 INVERSE : PRINT AT 19,0: "an
d now ATTR (0,0) = "ATTR (0,0)
" (but still POINT (0,0) = "POIN
T (0,0): "
9190 PRINT #1: INK 3: AT 0,0: " P
ress any key for ATTR Demo (N
ote: To stop demo press ~) "
9200 PAUSE 0: CLS : GO TO 20
9999 SAVE "6~ Demo" LINE 1

```


DEACTIVATORS.

Deactivators
Ariolasoft
£8.95

As chief of security at a top secret research centre, you are already in considerable hot water as a group of terrorists have bypassed your security system and planted a series of bombs, timed to detonate in sequence over a short period of time. As if that wasn't enough, they have also reprogrammed the guards to attack everything on sight. Your only hope of regaining some of your lost credibility is to send in a team of deactivating droids and get rid of the bombs as quickly as possible.

The building is on five levels and each one must be cleared in turn. At the bottom of the screen is a map showing the layout of the floor together with the location of your droids and the bombs. A series of icons can be used to select a specific droid and also to view any two adjacent rooms. These are drawn in 3-D perspective and show details of all the exits and objects present.

Clearing the level of bombs is no easy matter and there are several problems confronting the droids. Not the least of these is that they are limited in which rooms they have access to and this results in one droid having to pick up a bomb and throw it through a window into a different sector. It helps if you have another droid there waiting to catch it for there is always the chance that the bomb will detonate prematurely. You will also find circuit boards lying around and the object with these is to return them to the computer room. These are essential as they open up extra windows and doors, activate teleports and remove force fields. Your aim is to find a room at the corner of the building with a window leading to the outside through which you can dispose of the bomb.

On top of all this there are the guards to contend with. They will destroy you on contact and the only way to neutralise them is by persuading them to follow you through a hole in the floor onto the next lower level. Do this often enough and the guards will blow up. Still your problems aren't over. Because of the nature of the research establishment, some of the

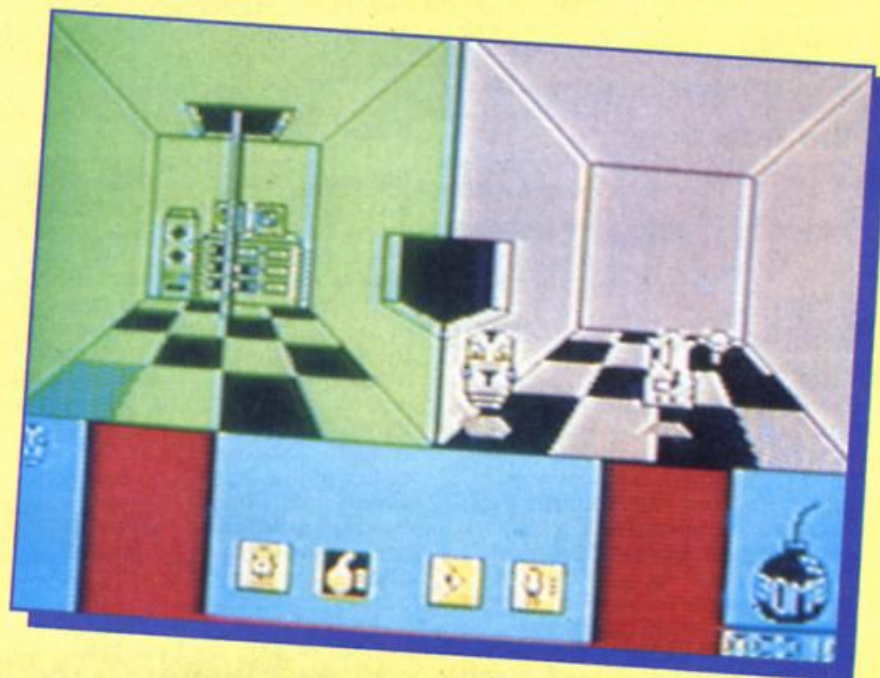
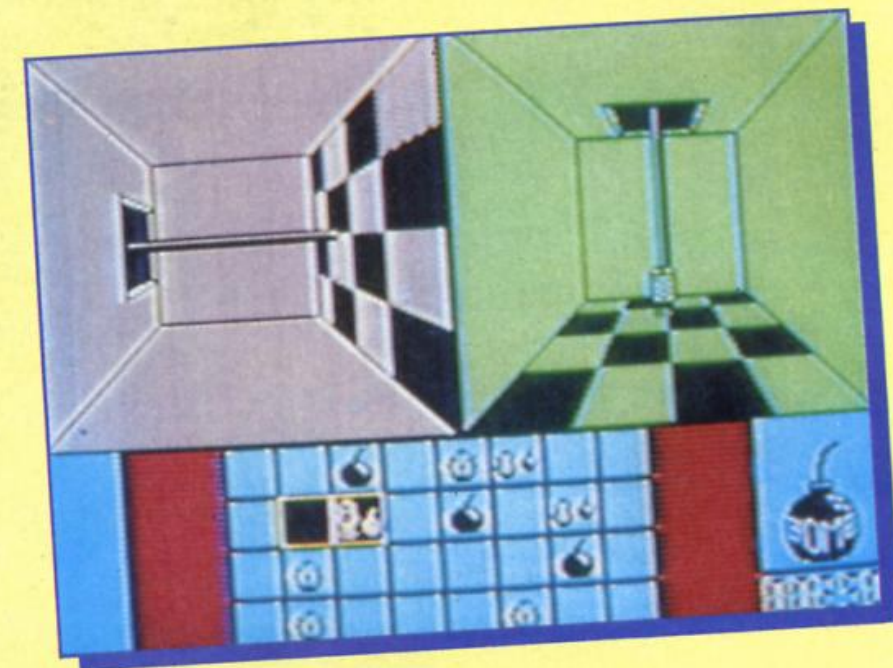
rooms have decidedly funny properties. The main difference you will notice is that they are all colour coded and this refers to the gravity level in the room. This ranges from $\frac{1}{2}G$ to $3G$ and affects your aim badly when you try to throw objects out of a room. At higher levels, rooms are rotated through 90 or 180 degrees, giving rise to another set of problems. Or a room may be blacked out totally.

Deactivators is an excellent mixture of strategy and action. It is not easy to work out the correct sequence of events that you must organise and a lot of

people will find that they are getting nowhere fast with the game. Certainly it is very daunting at first and it would help considerably if you could get a decent demonstration before deciding if it is the game for you. Love it or hate it, it will definitely give your grey matter a good working over.



GREAT



THE TRAP DOOR



What is the Bad Tempered Thing, how do you boil Slimies, and where does Terry Wogan fit in to all this? The answer's beneath the Trap Door.

The Trap Door
Piranha
£7.95

Not that long ago, Programmer Don Priestley wrote a computer game based on the Popeye comic strip and cartoon series, and for the game he came up with some new techniques that created some of the largest coloured sprites ever seen on the Spectrum, as well as masking techniques that almost made you forget about the Speccy's attribute problems. Unfortunately, the Popeye game

didn't set the world alight (though I thought it was excellent), but now Don Priestley and his mega-sprites have reappeared at the helm of the first game from the new Piranha label, *The Trap Door*, based on a new children's series produced by Terry Wogan's own production company, and due to be seen on television this autumn.

Berk and Drut

The main character in the series is a blue blob-like fellow by the name of Berk. Berk is the servant of the Bad Tempered Thing who lives in the upper regions of the castle whilst Berk rushes around in the castle cellar doing the Thing's bidding (which normally means getting his meals — worms, boiled slimies, that sort of thing).

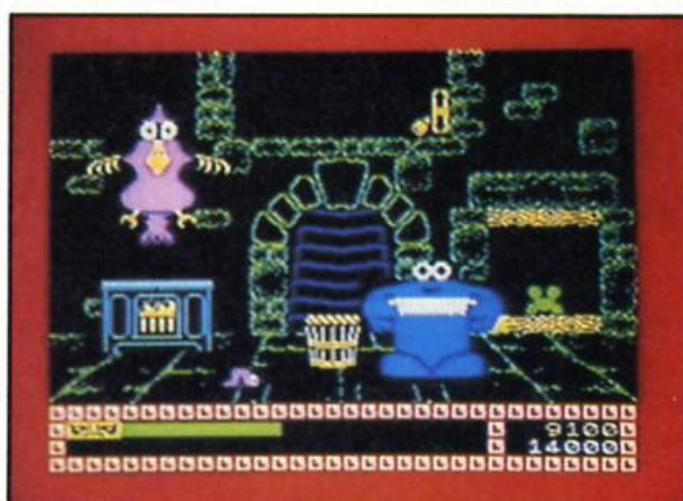
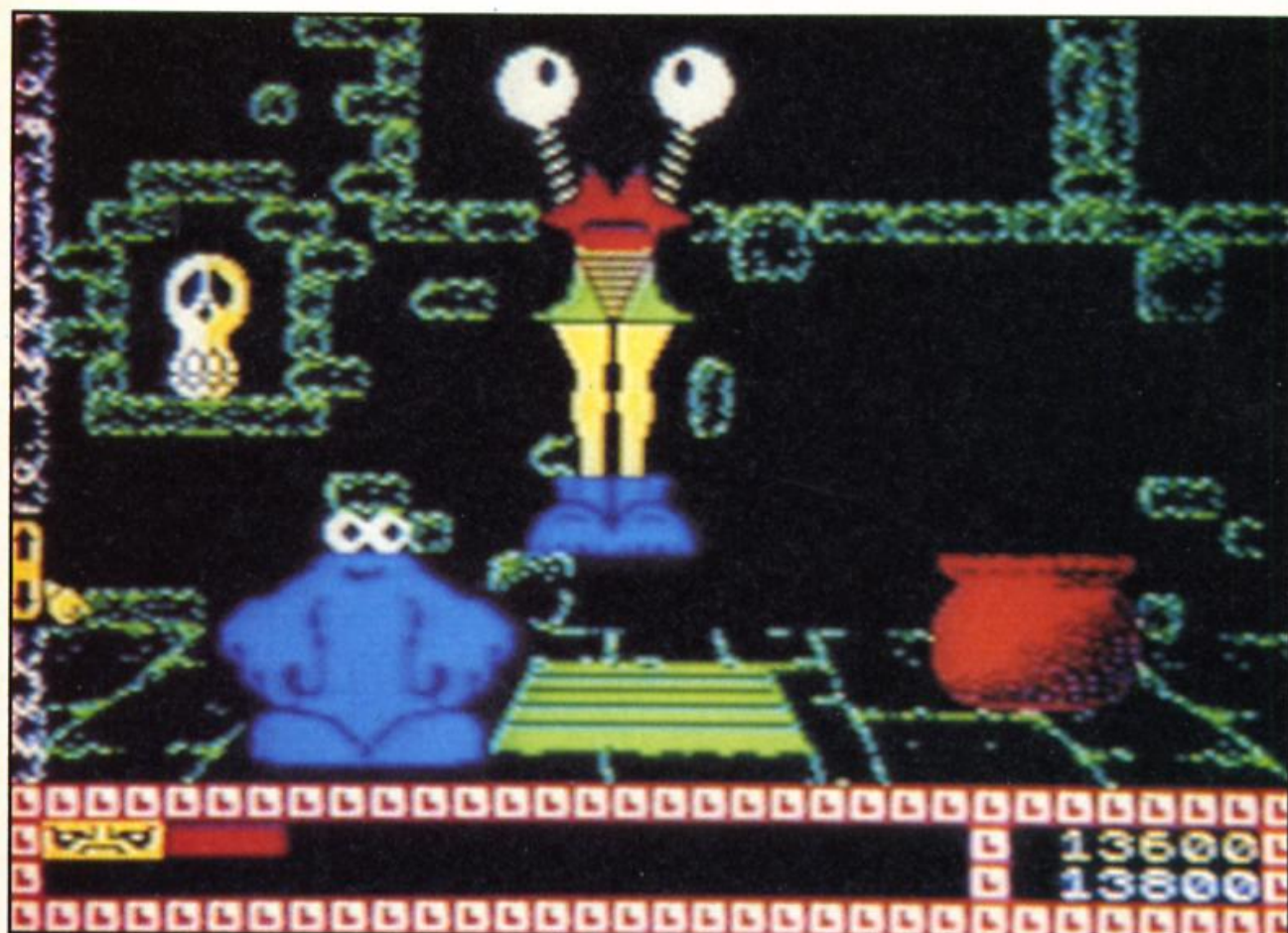
Also tucked away in the cellar is the Trap Door, beneath which lurk all sorts of weird creatures. Some of these things can actually help Berk in his chores, though others are just plain awkward.

In the game, you are in control of Berk and have to complete the tasks that will get

shouted down to you from upstairs. This involves looking for, and also making use of the creatures that will pop up from the trap door just about every time you open it. Along the way you'll have to solve some of the most devious and imaginative problems that you're likely to come across in an arcade/adventure. What, for instance, do you do with the bullet if you haven't got a gun and how do you make the bird lay eggs? Fortunately Berk has a friend called Boni, a disembodied skull who can provide the odd bit of advice if you're not sure what to do next.

Down in the dungeon

The playing area down in the cellar isn't all that huge, consisting of barely a dozen screens, but, as with the Popeye game, one of the things that makes the game so enjoyable is the 'layered' effect that allows you to move characters and objects not just up/down and left/right in two dimensions, but also into and out of the screen to create a real 3D effect. So,



although the number of individual screens is quite limited, there is a lot more that can be done than in most other games. There are passages and staircases that you can wander through, and a number of objects that need to be positioned carefully in order to complete your tasks.

Sprites

But the main feature of Trap Door is probably the quality of the graphics and animation. Berk himself is a sprite of not inconsiderable proportions, but some of the monsters that pop up out of the trap door are larger than anything that I've ever seen drawn on a Spectrum

screen, and yet they move around the screen smoothly and without any attribute problems. The animation is so good that it's fun to just sit and watch all the action in front of you. One of the nice things about the television program is the way that all sorts of little creepy crawlies just wander about doing odd things irrespective of what the main characters are up to, and this has been carried over into the computer game so that you can have Drut (a small yellow blob) chasing worms around the screen while Berk is busy trying to do something else. This adds to the atmosphere of the game and makes it feel almost like a real cartoon world.

Don Priestley's earlier

experiments with this type of game haven't been wildly successful, perhaps they fall rather awkwardly between the two types of arcade and adventure game (and also because the animation techniques are so costly in memory that a 48K doesn't really do them justice). But hopefully with the publicity surrounding the TV series people will take a close look at Trap Door and enjoy it as much as I did.





CYRUS II



Chess fanatics have never had it so good as another strong contender for the Spectrum grandmaster crown enters the arena.

Cyrus II Mark I
Alligata
£11.95

Cyrus II arrives on the Spectrum with a good reputation from its performance on other micros and with the recent release of Psi Chess and Colossus 4 Chess, Spectrum owners are being spoilt for choice.

There will obviously be a lot of debate on which is the strongest program available and Alligata have thrown down the gauntlet with a statement from their managing director included on the inlay which says, "I am confident this game will beat all existing Sinclair Spectrum chess programs published."

No doubt the makers of Colossus 4 Chess will dispute this. Making a comparative assessment of the two programs

with any degree of accuracy by playing them off against each other requires an awful lot of time — too much to fall within the parameters of this review. I'm sure both software houses will be letting us know the results soon enough.

Leaving aside the issue of which program can beat the rest, it has to be said the Cyrus II is a very strong player and there are all the features included which single it out as an excellent opponent.

There are no 3-D graphics (the Mark 2 version for the 128 will have them) but the screen display is very bright and clear. There are nine standard levels of play with thinking time ranging from two seconds to three and a half minutes. In addition there is an adaptable mode (Cyrus adapts to your response time), infinite mode (Cyrus will wait until you decide he can move) and a problem mode (Cyrus will search for a checkmate in five moves or less).

Other features include replaying the game, taking back moves, playing both sides, changing sides, hints from Cyrus and demonstration games. There is also a simple print-out facility, if you want to record game situations for posterity.

One big advantage with Cyrus II is that accessing

different modes is very simple with most commands being made with a single key entry.

Making the moves is also very straight forward by use of cursor keys (there is no joystick option). Simply move the cursor key to your chosen piece, hit enter, then move a second flashing cursor to your chosen square. Hit enter again and the move is made.

This program is a very welcome addition to the Spectrum chess scene and is recommended highly, the drawback however is the price. At £11.95 it's two quid more expensive than both Psi Chess and Colossus 4 and one wonders why it couldn't have been released at just under a tenner, like its rivals.

Cyrus II is a superb program and still worthy of a Monster Hit at the price but in a sector of the market which is now fiercely competitive it may have spoilt its chances with those who are after just one chess game.



MONITOR

If you're writing your own machine code programs you'll need a good monitor to help debug them — so here it is.

BY JON ELLIS

Over the course of writing many machine code routines I realised that I had no good program for debugging them. So, if you haven't got a program — write it yourself. Here is that program, a monitor which should provide all the functions you would normally need in the course of debugging a machine code program.

Numbers can be entered in either hex or decimal, regardless of the state of the number base toggle. Decimal numbers must all be five digits long, being bulked out with leading zeros if necessary. To enter a number in hex, type 'x' as the first character, and then the number in four hex digits, again using leading zeros if necessary. If only one byte is required then the low byte is taken, ie if you enter a number greater than 255 when the Monitor is expecting a number in the range 0 to 255, then your input will be taken as modulo 256.

After most functions have been executed the Monitor will pause for you to examine the results of the function, if any. To terminate this pause press either 'X' or BREAK and you will then be returned to the menu.

The Monitor is written so that you can treat the Spectrum as a Z80 processor only as far as possible. This means that, although the Spectrum operating system requires the iY register to have the value 23610 at all times, unless your routine is going to use the operating system, you may ignore this requirement. A similar situation occurs with the h'I' pair. The registers that are used when your routine is run are not those used by the Monitor or the Spectrum ROM.

To abort a function you should press BREAK which will return you to the menu.

Monitor Functions

The monitor offers a menu of 18 functions:

- 1) *Alter memory.* This function will prompt for a start address (see note on the input of numbers), and the program will then print the address and its contents. The Monitor will then wait for you to input the new value before moving on to the next byte. When you have filled up a screen, press 'X' for another page. At any time you may press BREAK to escape.
- 2) *Breakpoint.* This function enables you to place an instruction in the middle of the code that is being debugged. Which causes execution to be stopped, and control returned to the Monitor so that you can alter/inspect the registers etc. The breakpoint instruction is three bytes long, and thus two breakpoints should not be inserted less than four bytes apart otherwise a crash might occur on execution. The code that occupied the three bytes overwritten by the breakpoint instruction is stored, and will be replaced when the breakpoint is deleted. When you select this function from the menu it will prompt for the address at which the breakpoint is to be inserted. A total of nine breakpoints may be used at once. If all nine are in use then nothing will happen when the function is selected.
- 3) *Convert number.* This function will prompt for the input of a number and then print the number in decimal, hex, and binary.
- 4) *Delete breakpoint.* When selected, this command will display all nine of the breakpoints, and then ask for the number of the breakpoint to be deleted. (Note that you should enter the number of the breakpoint (1-9) not its address). The three bytes that were overwritten will then be replaced.
- 5) *Examine stack.* The Monitor provides 40 bytes of stack space solely for use by the object program. On entering the Monitor or resetting the registers, the stack is reduced to one word in length, this word being a return address inside the Monitor, which should prevent a crash in the vent of a RET instruction being executed at the end of the object program. On selection, this function displays all the words currently on the user stack.
- 6) *Fill memory block.* This command allows you to fill a block of memory with a specified value. It prompts for a start address, the length of the block to be filled, and the byte to be used.
- 7) *Jump to routine.* The function will prompt for the address to be jumped to, and execution will continue from this address using the values of the user registers (see later). This function is to allow for the object code to be tested. Ideally a breakpoint should be used at the end of the code to return to the Monitor, in which case the report 'BREAK at (address)' will be displayed. However a RET instruction should also work providing that the routine has used the stack correctly.
- 8) *Look at breakpoints.* This function displays the addresses of each of the nine breakpoints, an address of 0 indicating that the breakpoint is unused.
- 9) *Move memory block.* This command allows you to copy blocks of memory to other areas. It prompts for the start address of the block, the start of the destination area, and the length of the block to be copied.
- 10) *Number base toggle.* This toggle determines the base in which all numeric output from the monitor will be displayed. It toggles between hex, decimal and binary. Only some output can be displayed in binary due to the length of binard word (16 characters), other output being displayed in hex. The toggle defaults to decimal.
- 11) *One-step routine.* This is probably one of the most useful functions. It enables you to step through the object code one instruction at a time, whilst keeping track of the user register values. The Monitor will prompt for a start address, and will commence stepping from that address, updating the register display after each instruction and then pausing for you to inspect the registers. To move to the next instruction, press 'X'. To escape, press BREAK.
- 12) *Printers toggle.* When toggled to ON, this causes output from the View memory function to be dumped to the ZX Printer. The toggle defaults to OFF.

Instructions

The Monitor is written entirely in machine code and occupies the memory from 28350 to 32767, and is thus 4418 bytes long. This means that it will fit on a 16K Spectrum, but it is unlikely that the expansion opportunities offered by the User program feature will be utilised fully.

Type in listing 1 and save it — this is the hex loader. Run the program and you will be prompted for the string of hex digits and then for the check digit. Although the check digit might not look right it is actually more effective than a normal checksum, spotting the vast majority of transposition errors. When you have finished the program will save the finished code and then verify it.

Reset the machine and then type **CLEAR 28349: LOAD "MONITOR"CODE** as a direct command. After the code has loaded you should enter the Monitor with **RANDOMIZE USR 28350**. A menu of the 18 functions should be displayed. You should test each of the functions carefully. If you discover any errors then listing 3 should help — it displays the code you have entered in the same format as listing 2.

13) *Quit*. Returns control to BASIC.

14) *Register display*. This function displays the values of the user registers, both the normal and the alternate set. The current values of the interrupt vector register, i, and the memory refresh register, r, are also displayed. The value given for the program counter, pc, refers to the last instruction executed. The value of the stack pointer, sp, that is displayed refers to the user stack. The flags register of the normal af pair is shown expanded into bit format, with each of the six flags labelled. The value of the maskable interrupt flip-flop is also shown, the interrupts being enabled or disabled as appropriate when the user code is executed.

15) *Specify entry values*. This function allows you to change the values of the user registers, perhaps to test a subroutine whose parameters are passed to it in the registers. You can also specify the value of the zero flag and the carry flag. You should select the register to be altered by pressing the appropriate letter. To escape press BREAK.

16) *Use other program*. This function allows you to use another program and to call it from the Monitor. The function is not designed for the execution of the object program, but for the calling of some other utility such as a disassembler. When you quit the other program, control will return to the Monitor. The use of this function to call an assembler forms a very powerful development tool.

17) *View memory*. This displays the contents of memory from the specified start location, dumping also to the printer if the printer toggle is on. The routine displays 110 bytes per page, 20 bytes per page if using binary. When the page is full the computer will wait for you to press 'X' before proceeding to the next page. To escape, press BREAK.

18) *Zero registers*. This function restores the user registers to their original values that they held when the Monitor was first entered. In most cases this is 0, but the iy register defaults to 23610 and the hl pair defaults to 10072 as required by the Spectrum operating system. The user stack is also reset and preloaded with the return address mentioned earlier in the examine stack function.

Listing 1

Hex loader program.

```
10 REM *****
20 REM **   HEX LOADER   **
30 REM ** by Jan Ellis 1985 **
40 REM *****
50 CLEAR 28349
60 FOR F=28350 TO 32767 STEP 8
70 PRINT F;
80 LET CHECK=0
90 INPUT "Enter bytes:"; LINE
H#
100 IF LEN H#(>)16 THEN PRINT "
Error in length": BEEP .2,0: GO
TO 70
110 PRINT TAB 8;H#;
120 FOR G=1 TO 8
130 LET BYTE=16*(CODE H#(1)-48-
(7 AND H#(1)>"9"))+(CODE H#(2)-4
8-(7 AND H#(2)>"9"))
140 POKE F-1+G,BYTE
150 LET CHECK=CHECK+BYTE*G
160 LET H#(3 TO )
170 NEXT G
180 INPUT "Enter check digit:";
LINE C#
190 IF LEN C#(>)1 THEN GO TO 18
0
200 PRINT TAB 27;" ) ";C#
210 LET DIGIT=CHECK-9*INT (CHECK
/9)
220 IF DIGIT<>VAL C# THEN PRIN
T "Error in string - input again
": BEEP .2,-12: GO TO 70
230 NEXT F
240 PRINT FLASH 1;"READY TAPE
FOR SAVING"
250 SAVE "MONITOR"CODE 28350,44
18
260 CLS
270 PRINT FLASH 1;"READY TAPE
TO VERIFY"
280 VERIFY "MONITOR"CODE 28350,
4418
```

Listing 2

Hex data for the machine code.

28350	CDD777CD0678DD21	) 8	28778	72231A773ECD1223	) 2
28358	A27FDDCB00960175	) 8	28686	131A77015F777912	) 2
28366	0111207BCD3C2006	) 8	28694	23131A777812C9CD	) 8
28374	1221435011200036	) 5	28702	06783E43D7CD8479	) 1
28382	3A1910FB3E16D73E	) 3	28710	D822AA7F2AA37FE5	) 8
28390	0DD73E16D7FD3655	) 3	28718	010E0011457FCD3C	) 5
28398	F2DDCB006628003E	) 3	28726	2DD52AAA7F11050A	) 1
28406	4FD73E4ED7180DFD	) 3	28734	ED53A37FCD1C7801	) 3
28414	3655673E4FD73E46	) 4	28742	0900D1CD3C20D511	) 2
28422	D73E46D73E16D73E	) 8	28750	0410ED53A37F7CFE	) 3
28430	0BD73E19D73AA47F	) 3	28758	00DDCB00CE2004DD	) 1
28438	FE102822FE02280F	) 1	28766	CB00E0CD1C78010C	) 8
28446	FD36557B3E44D73E	) 2	28774	00D1CD3C20111002	) 7
28454	45D73E43D7181CFD	) 8	28782	ED53A37FCD1C78E1	) 4
28462	3655683E42D73E49	) 2	28790	22A37FC3A078DDCB	) 2
28470	D73E4ED7180DFD36	) 8	28798	00D6CD27713E16D7	) 5
28478	55703E48D73E45D7	) 5	28806	3E15D7AFD73E44D7	) 7
28486	3E58D7FD365538CD	) 8	28814	CD8479D87DFE0A30	) 6
28494	AB7701120021227A	) 6	28822	E50787856F260011	) 6
28502	EDB120EF11227AA7	) 8	28830	F37A195E23562301	) 1
28510	ED522B2911347A19	) 3	28838	0300EDB0AF2B772B	) 2
28518	5E2356EBCD706FC3	) 5	28846	772B772B772B77DD	) 3
28526	C16EE9CD06783E41	) 8	28854	360500012D001100	) 7
28534	D7CD8479D822AA7F	) 8	28862	5B21F87AE5EDB00E	) 8
28542	3E0DD7FD7E4FFE02	) 8	28870	2DE11E00CD1F7106	) 7
28550	2007CDAB78D8CD06	) 8	28878	0911F87A21005BC5	) 8
28558	782AAA7FE52AA37F	) 6	28886	E50605AFBE232004	) 5
28566	22A87F3E02BCCCD1	) 8	28894	10FA180AE1E50105	) 6
28574	71DDCB00CEE1E5CD	) 1	28902	00EDB0DD3405E123	) 8
28582	1C782AA87F22A37F	) 3	28910	23232323C110E001	) 8
28590	3E17D73E0AD73E20	) 7	28918	2D0021005B1E0018	) 8
28598	D7E1E57E2322AA7F	) 4	28926	20CD06783E46D7CD	) 8
28606	6F2600DDCB000ECD	) 4	28934	8479D822AA7FCDA6	) 7
28614	1C783E17D73E1AD7	) 1	28942	79D822AC7FCDB779	) 3
28622	3E20D7CDAD787DE1	) 1	28950	D85D2AAA7FED4BAC	) 8
28630	D87718A43AA77FFE	) 4	28958	7F73230B78B120F9	) 1
28638	09D0CD06783E42D7	) 6	28966	C9CD0678011B0011	) 8
28646	CD7379D822AA7F3A	) 2	28974	687FCD3C20060921	) 8
28654	A77F3C32A77F3D57	) 2	28982	F87A3E0A90C630D7	) 2
28662	0782825F160021F8	) 7	28990	C501080011837FCD	) 5
28670	7A19ED58AA7F7323	) 2	28998	3C205E2356232323	) 1
			29006	23E5EBDDCB00CECD	) 5
			29014	1C783E0DD73E0DD7	) 2
			29022	3E17D73E07D7AFD7	) 6
			29030	E1C110CEDDCB0056	) 3
			29038	C0C3A078CD06783E	) 6
			29046	4DD7CD8479D822AA	) 1
			29054	7FCD9579D822AC7F	) 4

MONITOR

29862	CDA679D8444DED5B	3	3	29726	1844131AFEED281A	3	8	30398	E60116BF0F0F6F3A	3	2
29878	AC7F2AAA7FEDB0C9	3	8	29734	FECB282221927A01	3	2	30398	C07FA2B532C07FC3	3	8
29878	DD7E00EE10DD7700	3	1	29742	0400EDB1282A2196	3	3	30406	F2755F16007D21AD	3	1
29886	C9CD066783E55D7CD	3	7	29750	7A011A00EDB12823	3	3	30414	7F1977C3F275D32	3	1
29894	7379D8CD706FDD21	3	2	29758	1824131AFE632815	3	4	30422	C17FC3F275CD0678	3	2
29102	A27FFD213A5CD921	3	8	29766	FE6B281118151313	3	8	30430	3E56D7CD08479D822	3	8
29110	5827D9C3A078DDCB	3	6	29774	1A21807A011F00ED	3	8	30438	AA7FCD066780616C5	3	8
29118	02662818DDCB025E	3	4	29782	B128051806DD3403	3	6	30446	78DD77843E16D73E	3	3
29126	2009DD36020ADD36	3	8	29790	DD3403DD3403DD34	3	3	30454	16DD9604D7AFD72A	3	8
29134	0105C9DD360210DD	3	6	29798	03DD3403060521D1	3	2	30462	AA7FDDCB00CECD1C	3	6
29142	360104C9DD360202	3	8	29806	7F36002310FBED4B	3	8	30470	7806053E16D73E16	3	2
29150	DD360118C9CD0678	3	6	29814	A57F06002AC47F11	3	4	30478	DD9604D73E05984F	3	7
29158	2AA37F22A87F7CFE	3	5	29822	D17FEDB022C47F11	3	1	30486	878781C607D73AA4	3	1
29166	02200621041022A3	3	2	29830	D17F1AFEE928092A	3	1	30494	7FFE022009C3E16D7	3	6
29174	7F01FC0011E37CCD	3	7	29838	B27F22C47FC3CB75	3	8	30502	3E16DD9604D73E17	3	3
29182	3C2021AE7F11DF7D	3	5	29846	FEDD2010131A18FE	3	7	30510	D72AAA7F7E2322AA	3	2
29190	060CC578FE032005	3	7	29854	E9201D2ABC7F22C4	3	1	30518	7F6F2600DDCB000E	3	7
29198	2323C110F5010300	3	2	29862	7FC3CB75FEFD2010	3	8	30526	CD1C783AA47FFE02	3	8
29206	CD3C20D55E235623	3	8	29870	131A1BFEE928092A	3	8	30534	280210BFC0D541FC1	3	6
29214	E5EBDDCB00CECD1C	3	2	29878	BE7F22C47FC3CB75	3	2	30542	D0109CDDCB0066C4	3	2
29222	70E1D1C110DC3E16	3	1	29886	1AFEDD200C131A1B	3	1	30550	AC0ECDAB078D0C3E8	3	2
29230	D73E04D73E08D72A	3	8	29894	FE45CA4B75FE4D20	3	8	30558	7622B27FE122AA7F	3	2
29238	A07F22A373AC17F	3	8	29902	7C1AFEF3CAB475FE	3	2	30566	ED73C27FED7BC67F	3	5
29246	6F2600DDCB000ECD	3	4	29910	FBCABA7521CF7A01	3	8	30574	219077E5ED73C67F	3	3
29254	1C783AA977FE0220	3	1	29918	2900EDB1C2BE75FE	3	4	30582	ED7BC27F2AB27FDD	3	8
29262	0621041022A37F3E	3	8	29926	C32053FECDD2824FE	3	4	30590	22BC7FDD21A27FDD	3	6
29270	16D73E10D73E08D7	3	1	29934	18CA7D75FEC92855	3	8	30598	CB00D6DD2ABC7FC3	3	6
29278	ED576F2600DDCB01	3	6	29942	FE10CA9D75CB7F20	3	5	30606	8E73CD066782AAA7F	3	1
29286	8ECD1C783E16D73E	3	4	29950	77E6072842FE0720	3	4	30614	2B2B2B22C47F0117	3	5
29294	10D73E10D7ED5F6F	3	8	29958	61FE0220BDDDD79	3	6	30622	00110B7FCD3C20CD	3	5
29302	2600DDCB010ECD1C	3	6	29966	D2CB75CD0C879ED5B	3	5	30630	1C78C3A078FDCB01	3	8
29310	782AC07F3E16D73E	3	5	29974	C47FED53AA7F2AD2	3	3	30638	AE76FDCB016E28F5	3	8
29318	13D73E07D7060878	3	8	29982	7F22C47F115F77A7	3	2	30646	CD541F3A005C3FC9	3	8
29326	FE06280DFE042809	3	5	29990	ED52C2C8752AC27F	3	2	30654	012300119D7CCD3C	3	1
29334	AFCB2517C630D710	3	6	29998	232322C27FC39077	3	5	30662	20CDBA77D0F50123	3	2
29342	053E78D7CB253E20	3	8	30006	CD0D79D2CB752AD2	3	6	30670	0011C07CCD3C20F1	3	8
29350	D710E42AA87F22A3	3	4	30014	7F22C47FC3CB75CD	3	3	30678	C9061621AE7F3600	3	8
29358	7F3E16D73E15D73E	3	5	30022	DD79C2CB75ED73C6	3	7	30686	2310FBED73C67F31	3	6
29366	0BD73E4FD73AC07F	3	3	30030	7FED7BC27FE1ED73	3	1	30694	FF7F218E73E5ED73	3	7
29374	FE0028083E4ED73E	3	8	30038	C27FED7BC67F22C4	3	7	30702	C27FED7BC67F3E01	3	2
29382	20D718063E46D73E	3	4	30046	7F110E73A7ED52C8	3	6	30710	32C07F21582722BA	3	6
29390	46D7DDCB0056C0C3	3	4	30054	1063CD0C8791AE63B	3	1	30718	7F213A5C22BE7FC9	3	6
29398	A078CD067821FF7F	3	3	30062	6F260022C47F1855	3	6	30726	FD3653383E07CD9B	3	8
29406	ED5BC27FA7ED52C8	3	8	30070	E618CDD079304E3A	3	8	30734	22CD6B003E02CD01	3	8
29414	01110011467ECD3C	3	1	30078	D27FCB7F28105FAF	3	8	30742	16FDCB30DECE9E5C5	3	2
29422	2045CB384083E1A8B	3	8	30086	57935F2AC47FA7ED	3	7	30750	DDCB0006DD460178	3	1
29430	D021FE7F3E0DD779	3	3	30094	5222C47F18375F16	3	8	30758	3DC5E5CD08578EBE1	3	6
29438	90C5E5DDCB008626	3	1	30102	002AC47F1918F2F5	3	8	30766	C10E000CA7ED5230	3	1
29446	006FCD1C783E17D7	3	4	30110	ED4BAE7F2AC07FE5	3	1	30774	FA190D202778FE01	3	8
29454	3E0AD7AFD7E1DDCB	3	3	30118	F105F5E122C07FED	3	8	30782	2022DDCB0046201C	3	3
29462	00CEESCD1C70E156	3	2	30126	43AE7FF110C2AF32	3	7	30790	DD7E02FE0A2823DD	3	8
29470	2B5E2BE5EB3E17D7	3	6	30134	C07F18113E0118F7	3	3	30798	CB004E200FFE1078	3	5
29478	3E14D7AFD7CD1C78	3	3	30142	DDCB00D621D17F22	3	4	30806	2006FE0338061812	3	6
29486	E1C110C8C3A078CD	3	6	30150	CA7FCD4573CDE371	3	2	30814	FE09300EDDCB00C6	3	5
29494	06783E4AD7CD7379	3	8	30158	DDCB0096CDA078DB	3	2	30822	79C630FE3A3002C6	3	4
29502	D022CA7FCD0678ED	3	2	30166	C3E373CDBE77D0FE	3	2	30830	07D710B33AA47FFE	3	5
29510	73C67FED7BC27FDD	3	3	30174	59C0ED7B3D5C3B3B	3	7	30838	0A2809FE103E6020	3	5
29518	CB005628084210E73	3	3	30182	C9CDBE77D0FE59C0	3	3	30846	023E62D7C1E1C9FE	3	5
29526	E53AC87FE0802001	3	3	30190	CD0D777C9CD067811	3	8	30854	00210100C08473AA	3	8
29534	F3DD2ABC7FFD2ABE	3	4	30198	577E01D0809CD3C20	3	7	30862	7F110000626FC547	3	6
29542	7F2AC07FE5F1ED4B	3	7	30206	11AE7F060E1A6F26	3	7	30870	051910FD545DC110	3	8
29550	AE7FED5B007F2AB2	3	3	30214	00DDCB008ED5C5CD	3	1	30878	F5C9FDCB30EDCAB	3	5
29558	7F08D92AB47FE5F1	3	8	30222	107ACD1C78C1D113	3	3	30886	77D0FE58C818F33A	3	6
29566	00ED48B67FED5B8B	3	3	30230	10EBDDCB00CE2ABC	3	8	30894	A47F32A87FDDCB00	3	5
29574	7F2ABA7F9DC3C97F	3	6	30238	7FCD187ACD1C78CD	3	8	30902	9E21CC7F0608CAB	3	4
29582	22B27FED73C27FED	3	6	30246	107A2ABE7FCD1C78	3	8	30910	77D0FE0C201C70FE	3	7
29590	78C67F5E122C07F	3	7	30254	DDCB000ECD187A3A	3	1	30918	0528F3FE042004DD	3	4
29598	ED43AE7FED53B07F	3	4	30262	C17F62600CD1C78	3	6	30926	CB009E3E00D73E20	3	2
29606	DD22BC7FFD22BE7F	3	1	30270	CD107A3AC07FE601	3	6	30934	D73E00D72B0410DE	3	4
29614	D9ED43B67FED53B8	3	6	30278	6F2600CD1C78CD18	3	2	30942	10DCFE262016FE30	3	2
29622	7F22BA7F215827D9	3	3	30286	7A3AC07F0707E601	3	2	30950	30D4FE3A3818DDCB	3	2
29630	00F5E122B47F08FD	3	2	30294	6F2600CD1C783E15	3	3	30958	005E20CAFE4138C6	3	8
29638	213A5CD0D21A27FFB	3	6	30302	D7AFD7CDAB77D0FE	3	6	30966	FE47300ADD0CB005E	3	7
29646	DDCB0056C0C3A078	3	6	30310	4130F0FE5430F4D6	3	8	30974	208CDDCB00DE7723	3	5
29654	CD06783E4FD7CD73	3	5	30318	401100586F260029	3	4	30982	D710B321CC7F7EFE	3	8
29662	79D022C47FED5BC4	3	4	30326	29292291936C4F5	3	6	30990	2611000020263E0A	3	6
29670	7FDD3603001AFEDD	3	8	30334	01130011327FCD3C	3	1	30998	32A47FE5DDE10605	3	8
29678	2030FEFD202CFEED	3	8	30342	20CDAD78D1D87AFE	3	8	31006	C578DD5CD08578D1	3	2
29686	201AFEC828062150	3	5	30350	0F3037FE11283FFE	3	2	31014	EBDD7E00D6302004	3	7
29694	7A011000EDB1205E	3	1	30358	13201CFE122810FE	3	1	31022	193D10FAEBDD23C1	3	1
29702	2107A0011A00EDB1	3	7	30366	102806228BC7FC3F2	3	6	31030	10E6102D3E1032A4	3	6
29710	20511055131A210A	3	4	30374	7522BE7FC3F275D0	3	1	31038	7F23E5DDE10604C5	3	6
29718	7A010000EDB12040	3	1	30382	E6016F16FE18007D	3	8	31046	783DD5CD08578D1EB	3	3

MONITOR

31054	DD7E00D630FE0A38	2	31718	6572206261736520	3	32382	423A00D6329202020	0
31062	02D607FE00280419	0	31726	746F676C65206E6F	5	32390	2020453A00D642920	6
31070	3D18FAEBC1DD2310	8	31734	77160C034F6E652D	2	32398	20202020443A00D65	8
31078	DEEBDD21A27F3A08	3	31742	7374657020726F75	1	32406	2920202020204C3A	3
31086	7F32A47FC9010E00	5	31750	74696E651600D0350	1	32414	0D6629202020202020	4
31094	11007ECD3C20CDAD	8	31758	72696E7465722074	3	32422	483A00D6729202020	4
31102	70D83E0DD7C9010E	4	31766	6F67676C65206E6F	2	32430	2046273A00D602920	7
31110	00112C7ECD3C20CD	4	31774	77160E0351756974	8	32438	20202041273A00D69	0
31118	AD70D083E0DD7C901	2	31782	160F035265676973	8	32446	292020202043273A	8
31126	0C00113A7ECD3C20	5	31790	7465722064697370	1	32454	0D6A2920202020202	5
31134	CDAD70D083E0DD7C9	2	31798	6C617916100035370	6	32462	273A00D6829202020	5
31142	011000110E7ECD3C	7	31806	656369667920656E	4	32470	2045273A00D6C2920	2
31150	20CDAD70D083E0DD7	6	31814	7472792076616C75	0	32478	20202044273A00D6D	8
31158	C9010E00111E7ECD	8	31822	6573161103557365	2	32486	29202020204C273A	8
31166	3C20CDAD70D083E0D	4	31830	206F746065722070	6	32494	0D6E2920202020204	7
31174	D7C9ED73C67FED7B	0	31838	726F6772616D1612	0	32502	273A00D6F29202020	3
31182	C27F2AC47FE5ED73	6	31846	0356696577206D65	3	32510	2049583A00D702920	1
31190	C27FED7BC67FC9E6	8	31854	6D6F72791613035A	7	32518	20202049593A00D71	4
31198	305F3AC07F577BE6	6	31862	65726F2072656769	8	32526	292020202020413A	7
31206	302022FE102015FE	1	31870	737465727316140B	7	32534	0D72292043617272	5
31214	20200A7B17171717	8	31878	100176322E31207F	5	32542	793A00D732920205A	7
31222	AACB7F18177B1FAA	0	31886	204A6F6E20456C6C	6	32550	65726F3A16010015	8
31230	CB5718107B1F1F1F	6	31894	6973203139303516	4	32558	0117090016150010	6
31238	AACB4718077B1717	5	31902	1505130110021201	3	32566	01456E7465722076	5
31246	17AACB772002A7C9	0	31910	41726520796F7520	1	32574	616C75653A100000	1
31254	37C9112F7F010300	8	31918	73757265203F2020	8	32582	0D17040044656369	3
31262	CD3C20C941424344	7	31926	592F4E2913001200	1	32590	6D616C3A200D1704	3
31270	45464A4C4D4E4F50	0	31934	1000161500202020	1	32598	004865783A200D17	1
31278	51525355565A716F	0	31942	2020202020202020	0	32606	040042696E617279	1
31286	DA6F1D707C70D082	2	31950	2020202020202020	0	32614	3A2016010A130110	5
31294	FF70357327717271	1	31958	2020202020202020	0	32622	01427265616B706F	6
31302	BC71D6739671D975	8	31966	2020202020160000	1	32630	696E747313001000	8
31310	E371F2759F71D0B76	8	31974	130110015A303020	2	32638	0D0D170700170900	0
31318	E775FEF6EEE6DED8	5	31982	5265676973746572	6	32646	2E2E2E2E200D0D13	5
31326	D6D3CEC63E303630	7	31990	2053657416020013	6	32654	0110021201427265	3
31334	2E2026201E181610	8	31998	0010024E6F726D61	1	32662	616B130010001200	7
31342	0E06011121222A31	0	32006	6C20526567697374	1	32670	2061742000050A00	1
31350	323AC2C3C4CACCCD	2	32014	6572733A16040410	8	32678	0000000000000000	0
31358	D2D4DADCE2E4EACD	2	32022	0041202D16041342	4	32686	0000000000000000	0
31366	F2F4FAFC7B736B63	6	32030	43202D1605034445	3	32694	0000000050270000	8
31374	5B534B4321222A36	0	32038	202D160513404C20	2	32702	3A5C0000FD7F0000	1
31382	262E3435464E565E	6	32046	2D16070010044570	1	32710	A46E01C300000000	6
31390	666E707172737475	5	32054	6360616E67650252	6	32718	0000000000000000	0
31398	777E068E969EA6AE	4	32062	6567697374657273	8	32726	C30E730000000000	5
31406	86BEFEF6EEE6DED6	8	32070	3A160903100004127	7	32734	C396730000000050	2
31414	C6C6EBE6AE6A69E96	6	32078	462720D16091342	7	32742	3000CF500C025C0E	8
31422	0E067E766E665E56	6	32086	274327202D160A03	5	32750	C057710EF3047317	4
31430	4E463E2E261E160E	0	32094	44274527202D160A	3	32758	C61EA761760C738E	0
31438	06FFFCFAF0F7F4F2	7	32102	1348274C27202D16	4	32766	733E000000000000	5
31446	F0EFECEAE8E7E4E2	5	32110	0C00100353706563	3			
31454	E0DFDCDAD0D7D4D2	5	32118	69616C2052656769	7			
31462	D0CFDCDCCAC9C8C7	7	32126	73746572733A160E	0			
31470	C4C3C2C030302020	7	32134	0310004950202D16	1			
31478	1810000000000000	2	32142	0E134959202D160F	8			
31486	0000000000000000	0	32150	035350202D160F13	0			
31494	0000000000000000	0	32158	5043202D16100449	3			
31502	0000000000000000	0	32166	202D16101452202D	6			
31510	0000000000000000	0	32174	1612001001466C61	0			
31518	0000000000000000	0	32182	67733A1612075320	7			
31526	000016000C130111	5	32190	5A202D2040202D20	1			
31534	0310074D4F4E4954	7	32198	50204E2043100016	6			
31542	4F52100011071300	2	32206	1500100249674655	4			
31550	160203416C746572	0	32214	7272757074733A10	2			
31558	206D0656D6F727916	2	32222	0016041816050016	2			
31566	0303427265616B70	2	32230	051016090A16091A	5			
31574	6F696E7416040343	6	32238	160A0A160A1A160E	2			
31582	6F6E76657274206E	3	32246	00160E10160F0016	1			
31590	756D626572160503	3	32254	0F103A2061646472	2			
31598	44656C6574652062	6	32262	65737312013E1200	0			
31606	7265616B706F696E	6	32270	1702003A206C656E	8			
31614	741606034578616D	7	32278	67746812013E1200	7			
31622	696E652073746163	6	32286	1702003A20627974	1			
31630	6B16070346696C6C	3	32294	6512013E12001702	7			
31638	206D0656D6F727920	1	32302	003A2066726F0D12	0			
31646	626C6F636B160003	8	32310	013E12001702003A	5			
31654	4A756D7020746F20	2	32318	20746F12013E1200	2			
31662	726F7574696E6516	6	32326	16000B1002557365	2			
31670	09034C6F6F6B2061	4	32334	7220537461636B10	3			
31678	7420627265616B70	8	32342	0016000910025573	4			
31686	6F696E7473160A03	8	32350	6572207265676973	5			
31694	4D6F7665206D656D	3	32358	74657273100000D61	6			
31702	6F727920626C6F63	0	32366	292020202020433A	3			
31710	6B160B034E756D62	0	32374	0D62292020202020	5			

Listing 3

Error checker.

```

10 REM *****
20 REM **      HEX DUMPER      **
30 REM ** by Jon Ellis 1985 **
40 REM *****
60 FOR F=20350 TO 32767 STEP 0
70 PRINT F;
80 LET CHECK=0
90 LET H$=""
100 FOR G=1 TO 8
110 LET byte=PEEK (F-1+G)
120 LET hi=INT (byte/16)
130 LET lo=byte-16*hi
140 LET H$=H$+CHR$ (hi+40+(7 AND hi>9))+CHR$ (lo+40+(7 AND lo>9))
150 LET check=check+byte*G
160 NEXT G
170 PRINT TAB 8;H$;
180 LET digit=check-9*INT (check/9)
190 PRINT TAB 27;" " * digit
200 NEXT F
210 STOP

```


Ride the thermals in Quicksilva's glide and destroy mission.

Glider Rider
Quicksilva
£8.95

This is a real dare devil mission. As Commander Glenn White you are dropped onto an island — your objective is to destroy the nuclear reactors that power the munitions plant owned by the Abraxas Corporation (Arms for Anyone, Anywhere, Any Reason).

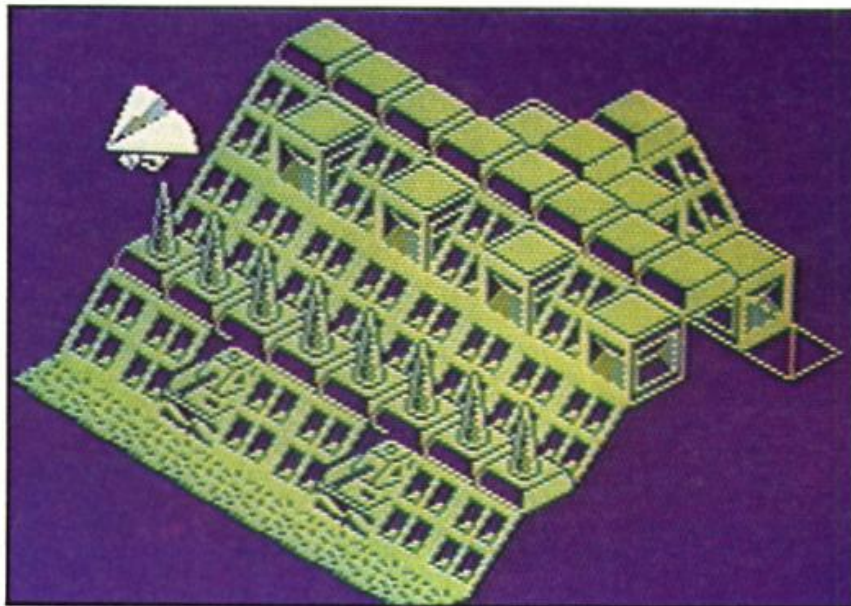
For the mission you have been provided with a trail bike which converts into a hang glider. The trail bike will take you over rough territory and the conversion to hang glider is very slick — simply find a slope, career down it, reverse direction and the hang glider opens out like a butterfly and you are in the air. Staying in the air however is a different matter as practically all the installations on the island are heavily defended by ground to air lasers which if they lock onto you mercilessly sap your energy rating.

Puttering about on the motorbike is enjoyable and the grand tour of the island is recommended before attempting your objective. You can drive round the perimeter of the island without too much interference from laser outposts and appreciate a) the size of the island and b) the excellent and well thought out detail in the contoured 3-D graphic landscape. Then find an incline and take off. Mastering the controls of the hang glider takes some time as it seems to react as an actual hang glider would — bank too steeply and it stalls. If you are over the ocean and ditch you are immediately consumed by predatory sharks.

Flying around and across the island is fun but it's when the serious business of bombing hell out of things gets underway that a few flaws in the game are revealed. You can only bomb installations from the glider and are given a ration of nine (extra supplies can be picked up from ammo dumps by using the bike) but the question is what do you bomb and how do you know when you've hit it?

The instructions are hazy at best, hinting that 'power units are vulnerable'. But what are power units? There are all kinds of structures on the island so where do you start? An index to buildings would have been a very useful aid.

GLIDER RIDER



The second problem is whether it's actually possible to destroy anything. Drop a bomb and there is no sign of an animated explosion.

One solution of course may be that I'm too jittery to control the hang glider or too myopic to aim properly but the fact is that I spent a great deal of time and concentration just attempting to register a hit on something — anything.

I tried dropping bombs from every conceivable height and angle on any potential target. The result? Nothing. (Bombs also have a disconcerting way of disappearing in mid air if you happen to switch screens as you fly over a target).

This, to say the least, is very annoying and it's all the more infuriating because everything

else about the game is very appealing. Making things difficult for the player is all very well but getting a toehold on the game should be easier than this. This fact is the only thing that prevents Glider Rider from becoming a Monster Hit. It's a game I shall return to again in an effort to crack it, but I can't help thinking that this one should have been called Mission Impossible (literally) if someone hadn't thought of the title first.



GREAT



THE BEST OF BEYOND

Christmas is coming
and Beyond are ready
with an early prezzie
for strategy and
adventure fans.

**The Best of Beyond
Beyond Software
£9.95**

Beyond have always been stronger on strategy/adventure than on arcade games (do I hear Superman being mentioned anywhere?), and now, just to tide us all over while we're waiting for Dark Sceptre and Star Trek to arrive, they've gathered together four of their best-known titles together onto a compilation tape.

The games assembled here have all had their fair share of acclaim — **Doomdark's Revenge**, **Shadowfire** and **Enigma Force**, with only **Sorderon's Shadow** as a slightly less well-known game.

It seems almost pointless to rehash Doomdark's Revenge, especially as Mike Singleton's 'landscaping' technique caused such a fuss when it first appeared in Lords of Midnight. But Doomdark took the technique even further, to produce a massive fantasy epic in which, playing the part of Prince Luxor and controlling various other characters and armies, you embark on a quest to free the land of Midnight from the threat of Shareth the Heartstealer. The game allows you to enter commands via single key entry (w=look, q=move), and the six thousand locations, 48,000 landscaped views and the various characters and objects that you have to deal with make for a vast and complex game that has been keeping hardened adventure addicts glued to their keyboards ever since it was first released.

A second tape in the package also includes a recording of a dramatised version of the story of Doomdark's Revenge — a must for lovers of purple prose.

The Shadow

Sorderon's Shadow is next on side one, and again there's a touch of the landscapes as you attempt to free the land of Elindor from the rule of the not-very-nice wizard, Sorderon.

If you can complete the nine tasks set by The Un-named One you may be able to cast the final spell that will end Sorderon's power. To complete these tasks you'll have to trek around Elindor collecting various magical objects from the characters who inhabit the land. The game is more of a conventional adventure than Doomdark, despite the landscaped graphics, and entry of commands is of the normal 'Get the sword, kill the oik' method rather than single key entry (though the command editor is fairly sophisticated). Sorderon's Shadow suffers a little bit because the landscaped graphics invite a not really appropriate comparison with Doomdark, possibly leading you to expect more than the game delivers. Underneath the visually attractive presentation, Sorderon's Shadow is a fairly good, but by no means outstanding adventure.

The Enigma team

Shadowfire and Enigmaforce (both written by Denton Designs) are sensibly put together on side two of the tape, as they both feature the adventures of the Enigma team. Shadowfire caused a huge fuss when first released as it was one of the first games to feature a truly sophisticated icon control system. Both games put you in control of Zark, Syllk, Sevrina, and Maul of the Enigma team



as they attempt to foil the plans of the galactic despot, General Zoff.

The challenge presented by the games lies in balancing the strengths and weaknesses of your team members and deploying them effectively against the forces controlled by Zoff. As with Doomdark, these games do not offer a single, clear cut path to victory and there's always room for improvement and new tactics. Shadowfire featured only the icon system and a static display of the characters and their positions, but in Enigma Force this had been upgraded to an animated display in which you could actually see the characters move in response to your commands.

My only quibble about these games was that I found the icon system a bit fiddly to cope with, but there's no denying the difficulty of the challenge that the two games present you with or the quality of the games' design. With four games like this all on the same tape Beyond have produced a high-class compilation which, assuming you haven't already got most of the games, represents good value for followers of adventure and strategy games.

Doomdark's Revenge



QL COLUMN

Anthony Stewart faces the inevitable.

THE PCW Show has come and gone for yet another year and there was hardly a QL in sight. Digital Precision was an exception and the company had the courage to flaunt its sentiments with a sign reading: "QL only and proud of it!" But everything else was Amstrad or Atari and even the new Spectrum +2 seemed to take a back seat to Amstrad's launch of an impressive-looking, inexpensive PC obviously aimed at capturing the poor-man's-IBM market. Sadly, the QL looks as dead as the proverbial door nail but let's postpone the obituary for a little while and talk about happier things for a bit.

THOR, CST's reincarnated, higher life-form, QL was there in force and it's a good-looking machine. CST and I have something in common; neither one of us can manage to get any comment out of Amstrad! While I'm still waiting for that elusive Amstrad PR man to "check with the client and get back to me", CST has been taking the bull by the horns and telexing the company directly to try and reach an accommodation over Thor's use of QL circuit boards. They haven't heard a ticky-boo so maybe it's not just me, maybe Amstrad doesn't talk to anybody about anything. I did have to grin, however, at the sight of a CST exec (company ID badges conspicuous by their removal) taking splashy hand-outs from a smiling, PC-promoting Alan Sugar. It's the sort of thing that makes you want to root for the underdog even if you aren't willing to put a few quid on him.

QL mouse

Those hard-to-find West Germans finally reappeared at the Show and I got a chance to play with their QL mouse and software (a desk-top manager and a Superbasic extension) package that sells for around £90. It seems excellent in all respects and makes an ideal alternative to Eidersoft's ICE and mouse combination (which costs about the same) but — save for the odd computer show — you can only reach these people by contacting them at Giga-soft in Dusseldorf (full address in the odd ZX Computing advert or supplied upon request) so Eidersoft probably doesn't have a lot to worry about.

There was no new QL software worth mentioning and, more surprisingly, very little new stuff for the Spectrum. So as not to totally waste my tube-fare, I got a couple of games for my Spectrum. In particular, Trivial Pursuit (from Domark) looks a winner and, for the less trivially-minded, action-games players amongst you, Strike Force Cobra (Piranha), Night Rider (Ocean) and TT Racer (Digital Integration) are providing my nine-year-old son (and his father) with endless hours of amusement. In case you suspect that his father is trying to avoid talking about the inevitable, you happen to be just about spot-on and — here it is — the QL is now history in the past tense. The quantum leap is dead and gone.

R.I.P.

I talked to quite a few of the major QL suppliers and software houses and, when I could get them to stop going on about the new Amstrad PC, they all said much the same thing. It's finished and Amstrad rules the day. Microdeal, which has supplied numerous QL games and an excellent flight simulator, told me (on their stall in the Atari exhibition) that nobody's really sending in any more QL software for possible publication. Obviously our games-designing friends throughout the land, having spotted the inevitable, have moved on to fresher and more profitable climates. Some of the other, more heavy-duty software houses said much the same thing after all the jargon was translated into day-to-day English. Alright, so there's Thor but it's a different type machine at a price few home-micro users are going to look at for long. As a business package or system for the richer home user, it looks very good but it's not the quantum leap that Sir Clive tried to give us at every-day prices.

So don't expect much in the way of new QL software. There will be some in the days to come but the flood gates that only started to open a few short months before Sinclair computers got themselves a new owner have shut again and we are back into a square-one-situation (or worse). But all isn't gloom and despair. There's a large amount of quality software for the QL already on the market to keep most owners in business

for the lifespan of their computers. Those of you who are toying with the idea of buying one ought to keep thinking and not look elsewhere too quickly. If you want a good computer at a rock-bottom price (which just might get a bit more rock-bottom before too long) which will last for a few years and which has a lot of very good software (which, if not exactly selling for next to nothing is economically priced and is definitely going to get cheaper), a QL is still something worth looking at.

The QL's ghost, like old John Brown's, goes marching on even if the body lies a-moulding in the ground. Go have a look at the new Amstrad PC but forget about all the flashy sales stuff telling us that it's the greatest thing since pop-top beer cans and fated to make IBM decline into obscurity. What you are going to see is the gadget that Sir Clive tried to market but didn't. It's got the built-in disc drive that the QL should have had instead of those temperamental microdrives. It has an excellent keyboard and comes with a monitor. The basic package costs some £399 and a few hundred more will give its owner a top-notch system. Amstrad's only mistake as far as I can see is to endlessly go on about the PC's IBM compatibility and why it's a better deal. Both are no-doubt true, but who really wants to buy an imitation IBM when they might just be able to save enough coppers to buy a real one?

All this is what Sir Clive tried to do a few short years ago (except that he had the guts if not the good sense not to go for an IBM clone) and it's just that Amstrad is profiting from his errors and their own undoubted marketing expertise. Amstrad is even promising us a high-quality chess package for the PC but what did Sinclair give us straight-away (when most software houses were still waiting to see how things were going to shape up)? A first-class chess package that's still unbeatable. When you do have a look at what will undoubtedly be a disgustingly successful business venture, remember the famous words of what's-his-name:

"Of all the words of paper of pen, the saddest are these. 'It might have been.'" I can assure you that Sir Clive will.

SPECTRUM/QL LINK-UP

They said it couldn't be done, but David Nowotnik shows how to get a Spectrum and QL communicating with each other.

Last month I described how data could be passed between the Spectrum and QL computers via their network ports. We discovered that while communication by this route is possible, certain incompatibilities between the two computers' network systems made data transmission and reception slow and unreliable. But both computers offer an alternative — the RS232 ports, and this, you should find, offers far greater reliability and speed.

As with network communication, you will need an Interface 1 for your Spectrum to allow the QL and Spectrum to 'talk' to each other. In addition, you will need a special lead. If you are handy with a soldering iron, then you might like to try making up your own lead. If not, then try one of the companies who regularly advertise in 'ZX Computing' and other magazines with special QL RS232 leads.

On both computers the connectors are non-standard for RS232 lines. At the QL end the connector is a British Telecom plug (the sort you'll have at the wall end of your telephone if your telephone is transferrable). And for Spectrum connections you'll need a nine pin D-plug; the sort that will fit into Atari joystick plugs. Both types of plug, and the lead to connect them can be obtained from specialist electronic and telephone supply shops.

The BT plug requires great skill (and a specialist tool) to wire up the five leads necessary to complete the link. If you don't have the confidence to try this for yourself, you could 'sacrifice' the RS232 lead supplied to link the QL to a printer, by removing the standard RS232 plug and connecting the D plug.

Pin connections to be made at both the QL and Spectrum ends are listed in table 1. The QL has two serial ports, and both are wired slightly differently, so decide in advance which serial port you wish to use (the examples used later on use ser1), and wire the D plug according to the appropriate column in the table. If you elect to sacrifice a QL printer cable, then the appropriate wire colours are shown alongside the D-pin number to which it is connected. D-pin numbers are shown in Fig.1. (viewing the plug from the back; the side to which leads are soldered). If you are wiring a BT plug, then pin 1 is the one farthest from the plastic leg of the plug.

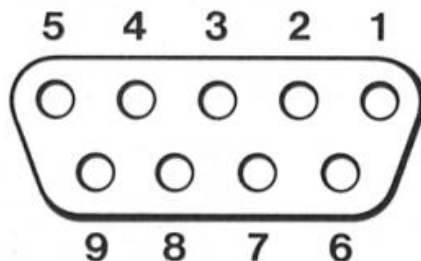


Fig.1. Diagram of D plug pin connections

Getting wired

Of the five wires which connect the two serial ports, two are for data communication (data flow is unidirectional on each wire), and two provide simple switches to permit transmitter and receiver to tell each other if they are ready for data communication. These work by placing a voltage on the line to indicate a state of readiness. That voltage is relative to 'ground', which is the fifth line to connect both computers.

Once you have connected or purchased your RS232 lead you might still have problems getting the two computers talking to each other. This is because the RS232 'standard' is far from being absolutely standard. With RS232 data is transmitted serially, i.e. one bit after another along a single line. This data can travel at different speeds, and transmitter and receiver must be set to talk and listen at the same speed. The speed of transfer is known as the baud rate (bits per second), and we'll see in a moment how the baud rate is set on both computers.

There are other possible RS232 mismatches between transmitter and receiver which can cause problems; things called parity bits and handshaking. Fortunately, the default setting on QL and Spectrum are similar, so they need not concern us here. But beware of these potential problems when linking your computer to any other device.

So, with your computer turned on, and RS232 lead connected, you are ready to test out your wiring efforts. Try the test routine in Fig.2. Type is the program lines to each computer, **SAVE** them, and **RUN** both computers. Once both programs are running, you need only type on the QL keyboard. The INPUT cursor will flash in window #0, and anything you type in and ENTER will (if all is well) appear on the Spectrum screen, then on the QL screen. The word or message has to be successfully transmitted to the Spectrum, then transmitted back to the QL before it appears on the QL screen. So, your message on the QL screen means that communication is working in both directions. Note from the listing that it is only necessary to open a single channel on both QL and Spectrum.

Table 1. RS232 Lead - wiring connections

D pin (connect to ser1)	BT Socket	D pin (connect to ser2)
7 black	1	7 black
3 white	2	2 white
2 green	3	3 green
5 blue	4	4 blue
4 red	5	5 red

Communication on a single RS232 channel is bi-directional.

The next step is to see which of the various BAUD rates is most reliable. The QL and Spectrum have six transfer rates in common. The listing in Fig.3 is designed to test them out. Again type in the listings, SAVE and RUN them.

In this test, the Spectrum is again the 'slave' of the QL, receiving messages, printing them on the screen, then transmitting them back to the QL, where they are tested for errors. The message transmitted appears in the DATA lines 60-90 of the QL listing. Also transmitted are a set of six control codes. These are code numbers which do not correspond to any of the character codes shared by the two machines. The Spectrum RS232 channel has been opened to type "b" (see your Interface 1 handbook) in line 40 to permit these characters to be transferred. In any Spectrum/QL RS232 communications, it is also preferable to use the "b" (binary) rather than "t" (text) option on the Spectrum side, otherwise odd results might occur.

So, the program loops round from 9600 Baud to 300 baud (line 150 in the QL listing, 40 in the Spectrum listing) sending the same message and set of numbers from QL to Spectrum, then back again. The result of every test is printed on both screens, with the number of errors, and time taken given on the QL screen. The test of time is carried out using the QL system variable at address 163886. Set to zero (line 160), it increments fifty times a second, so when it is PEEKed (line 290) and divided by 50, it gives the time taken more accurately than using DATE

Fig.2. Simple communication test routine

a) Spectrum listing

```
10 REM Test of RS232
20 REM
30 FORMAT "b";1200
40 OPEN #4;"b"
50 REM
60 INPUT #4;a$
70 PRINT a$
80 PRINT #4;a$;CHR$ 10;
90 IF a$="stop" THEN STOP
100 GOTO 50
```

b) QL Listing

```
10 REMark Test of RS232
20 REMark
30 BAUD 1200
40 OPEN #4, ser1
50 REPEAT loop
60 INPUT #0,a$
70 PRINT #4,a$; CHR$(13);
80 INPUT #4,b$: PRINT b$
90 IF b$="stop" THEN EXIT loop
100 END REPEAT loop
```

(which only gives the time to the second). After each test the program halts, waiting for you to press any key on the QL keyboard.

Time

There is a fixed time on each test devoted to the testing and printing of results, so the influence of different baud rates can only be judged by the differences in time taken. You should find that the accuracy of transfer should not vary much with speed, and very few faults

should occur. Surprising, the only fault I found was at the lowest transfer rate, 300 baud, when data transfer seemed to fail altogether. Try the test a few times for yourself, and confirm these results. It will mean that there is no disadvantage (in terms of reliability), and much to be saved in time by always selecting the maximum baud rate of 9600, which happens to be the default value on the QL.

Last month I gave you a program to transfer BASIC programs from Spectrum to QL using the network system. This

Fig.3 Test of speed and reliability

a) Spectrum Listing

```
10 REM Reliability Test
20 REM
30 LET x=19200: LET h$= CHR$ 10
40 LET x=x/2: FORMAT "b";x
50 OPEN # 4;"b": CLS
60 FOR j=1 TO 4
70 INPUT #4;a$
80 PRINT a$
90 PRINT #4;a$;h$;
100 NEXT j
110 INPUT #4;a$
120 PRINT #4;a$;h$;
130 PRINT
140 FOR i=1 TO 6
150 PRINT CODE a$(i)
160 NEXT i
170 PRINT "Baud = ";x
180 INPUT #4;a$
190 CLOSE # 4
200 IF x>300 THEN GO TO 40
```

b) QL Listing

```
10 REMark RS232 test program
20 REMark
30 x=19200: e$="": h$= CHR$(13)
```

```
40 DIM a$(4,28): RESTORE
50 FOR i=1 TO 4: READ a$(i): END FOR i
60 DATA "This is a test of speed and "
70 DATA "reliability of the transfer "
80 DATA "of data between the QL and "
90 DATA "Spectrum computers."
100 DATA 120,254,255,0,23,5
110 FOR i=1 TO 6
120 READ z:e$=e$& CHR$(z)
130 END FOR i
140 REPEAT loop
150 x=x/2: BAUD x: er=0: CLS
160 POKE_W 163886,0
170 OPEN #4, ser1
180 FOR j=1 TO 4
190 PRINT #4;a$(j);h$;
200 INPUT #4,v$: PRINT v$
210 FOR k=1 TO LEN (v$)
220 IF v$(k)<>a$(j,k) THEN er=er+1
230 END FOR k
240 END FOR j
250 PRINT #4;e$;h$;
260 INPUT #4:v$
270 IF v$<>e$ THEN er=er+1
280 PRINT "Baud = ";x: Errors = ";er
290 t=INT (PEEK_W (163886)/50)/10
300 PRINT "Time = ";t: seconds"
310 s$=INKEY$(-1): v$="next": PRINT #4;v$;h$;
320 PAUSE 50: CLOSE #4
330 IF x=300 THEN EXIT loop
340 END REPEAT loop
```


Fig.4. RS232 Transfer of Spectrum programs to QL

a) Spectrum Listing

```
9980 FORMAT "b";9600
9981 GO SUB 9997
9982 LET k=y-x: LET r=0
9983 OPEN # 5;"b": PRINT #5; STR# k; CHR# 10;
9984 FOR i=1 TO k
9985 GO SUB 9997
9986 LET z$= CHR$ ( PEEK (x+r))
9987 LET r=r+1: PRINT #5;z$;
9988 NEXT i
9989 CLOSE # 5
9990 STOP
9997 LET x= PEEK 23635+256* PEEK 23636
9998 LET y= PEEK 23627+256* PEEK 23628
9999 RETURN
```

b) QL Listing

```
100 REMark Import Spectrum Programs
110 REMark via the RS232 line
120 :
130 REMark Initialise
140 :
150 CLS :PRINT " Initialising - please wait"
160 a= RESPR (0)
170 IF a> 221184 THEN a= RESPR (a-221184)
180 NET 1
190 z$= CHR$(13)
200 position=a: RESTORE 1000
210 DIM keyword$ (91,10), key_len (91)
220 FOR i=1 TO 91
230 READ a$: keyword$ (i)=a$
240 key_len (i)= LEN (a$)
250 END FOR i
260 :
270 REMark Transfer program from Spectrum
280 :
290 BAUD 9600: OPEN #5, ser1
300 INPUT #5;num$: num=num$
320 PRINT "\" Receiving the program\" from the Spectrum"
330 FOR i=1 TO num
340 x$= INKEY$(#5,-1)
360 POKE position, CODE (x$)
370 position=position+1
400 END FOR i
430 CLOSE #5
440 PRINT "\" Transfer complete\""
450 :
600 REMark Create file of BASIC lines
```

```
610 :
620 PRINT " Place a formatted cartridge"
630 PRINT " in mdv2_, then press any key"\\
640 x$= INKEY$(-1)
650 DELETE mdv2_temp_bas
660 OPEN_NEW #4,mdv2_temp_bas
670 REPEAT loop2
680 REMark line number first
690 a$=256*PEEK(a)+PEEK (a+1): a=a+4
700 IF a$="9980" THEN EXIT loop2
710 REPEAT loop3
720 z= PEEK (a)
730 SELECT ON z
740 =32 TO 127: a$=a$& CHR$(z)
750 =128 TO 143: a$=a$&'('
760 =144 TO 164: a$=a$&'&'CHR$(z-79)&'&'
770 =165 TO 255
780 x$=keyword$ (z-164): x$=x$(1 TO key_len (z-164))
790 a$=a$&x$
800 =13: EXIT loop3
810 =REMAINDER : a=a+5
820 END SELECT
830 a=a+1
840 END REPEAT loop3
850 PRINT #4; a$
860 PRINT a$
870 a=a+1: IF a>position THEN EXIT loop2
880 END REPEAT loop2
890 CLOSE #4
1000 DATA ' RND ' INKEY$ ' ' PI ' ' FN '
1010 DATA ' POINT ' SCREEN$ ' ATTR ' AT '
1020 DATA ' TAB ' VAL$ ' CODE ' VAL '
1030 DATA ' LEN ' SIN ' COS ' TAN '
1040 DATA ' ASN ' ACS ' ATN ' LN '
1050 DATA ' EXP ' INT ' SQR ' SGN '
1060 DATA ' ABS ' PEEK ' IN ' USR '
1070 DATA ' STR$ ' CHR$ ' NOT ' BIN '
1080 DATA ' OR ' AND ' <= ' >= '
1090 DATA ' <> ' LINE ' THEN ' TO '
1100 DATA ' STEP ' DEF FN ' CAT ' FORMAT '
1110 DATA ' MOVE ' ERASE ' OPEN # ' CLOSE # '
1120 DATA ' MERGE ' VERIFY ' BEEP ' CIRCLE '
1130 DATA ' INK ' PAPER ' FLASH ' BRIGHT '
1140 DATA ' INVERSE ' OVER ' OUT ' LPRINT '
1150 DATA ' LLIST ' STOP ' READ ' DATA '
1160 DATA ' RESTORE ' NEW ' BORDER ' CONTINUE '
1170 DATA ' DIM ' REM ' FOR ' GO TO '
1180 DATA ' GO SUB ' INPUT ' LOAD ' LIST '
1190 DATA ' LET ' PAUSE ' NEXT ' POKE '
1200 DATA ' PRINT ' PLOT ' RUN ' SAVE '
1210 DATA ' RANDOMIZE ' IF ' CLS ' DRAW '
1220 DATA ' CLEAR ' RETURN ' COPY '

```

was reliable only when each byte value was transmitted as a number, and the channel opened and closed with each transmitted number. As you have seen, the RS232 line is far more reliable, allowing data to be sent as a stream of 8-bit characters at 9600 bits per second. To make use of this faster and more reliable transfer rate (particularly useful in longer programs) program transfer can be improved using the RS232 line. Fig.3. contains the listing of the transfer program converted for use with the RS232 link. To use the programs, **MERGE** the Spectrum listing with the program you wish to transfer, and **RUN** the QL program, with a microdrive cartridge in mdv2. Type and enter **RUN 9980** on the Spectrum. The program will be transferred, then translated to an ASCII file at the QL end, and stored on microdrive under the file name of 'temp_bas'. This can be loaded into the QL as a normal BASIC program. The QL adds the word 'Mistake' to the beginning of any line which is syntactically incorrect, and you may well see several of these when you list the program. In addition to these modifications, other changes will no doubt be necessary for the program to run successfully on the QL. But transfer of the program can save a lot of effort compared with re-typing the whole program.

Another benefit QL users could derive is in the transfer of the Spectrum screen display to the QL. Despite the limitations on its screen display, some excellent colour pictures can be created for the Spectrum. With comparatively little available for the QL in this respect, programmers could transfer their favourite Spectrum screen displays, then import them into a graphics program (e.g. GraphiQL) for modification. The listing in Fig.5. allows the screen display to be transferred.

Screens

Once both listings are entered and saved, **RUN** them. The Spectrum screen asks you to press play on your tape recorder. It assumes that you have a tape in the recorder containing the screen display you wish to transfer, and that the screen display file is the first file it will find on the tape. In the meantime, the QL screen is asking for a file name for the screen. Once the transfer is complete, the screen display is saved to microdrive 2 using that filename.

Once the display is loaded on the Spectrum screen, the border will flash, indicating transfer of data via the RS232 line. Attribute data is transferred first, and saved in an array

(att_array\$) in the QL. At the same time, the paper attribute colours are displayed on the QL screen. In order to achieve the spectacular displays on the Spectrum's limited display file, some clever tricks have been used, and PAPER and INK are not always what you think they are. By first printing all of the PAPER blocks, you can see the clever way Spectrum pictures are made up. Next all the pixels are transferred. This is a slow business; it's not the transfer rate which is a problem, but all the calculations which are necessary by both computers. The Spectrum has to calculate the byte address of each block of eight pixels. This it does in line 260 with the aid of a small machine code routine installed in the user defined graphics area of RAM (installed using the subroutine starting at line 1000 of the Spectrum listing). the QL works out which bits in each byte are INK, and which are PAPER, and laces the appropriate pixel colour on the screen. Unless you are fascinated by the picture slowly building up on the QL screen, go and enjoy a cup of tea while this is going on! The display will fill a QL monitor screen, so you may find it will overflow if you have a TV as your QL screen.

There can be many applications for the transfer of data between two computers. In

this article, and the one last month, you should see how this is possible (knowing the

limitations) between Spectrum and QL, and the principles developed could be applied to

any application you may require.

Fig 5. Transfer of Spectrum screen display to QL

a) Spectrum listing

```
10 GO SUB 1000
20 PRINT "Press Play on your tape recorder"
30 LOAD "" SCREEN#
50 OPEN #4:"b":9600
120 FOR i=0 TO 31
130 FOR j=0 TO 23
140 PRINT #4: CHR$(ATTR(j,i))
150 NEXT j
160 NEXT i
170 PRINT #4:"pixels":
230 FOR i=0 TO 192
240 FOR j=0 TO 31
250 POKE 32747,i: POKE 32755,i: POKE 32763,i
260 LET bt=16384+32*USR 32760+256*USR 32744+4*USR 32752+j
270 LET p=PEEK bt
280 PRINT #4: CHR$(p)
290 NEXT j
300 NEXT i
310 CLOSE #4
990 STOP
1000 RESTORE
1010 FOR i=32744 TO 32767
1020 READ a: POKE i,a
1030 NEXT i
1040 RETURN
1050 DATA 6,0,62,0,230,7,79,201
1060 DATA 6,0,62,0,230,56,79,201
1070 DATA 6,0,62,0,230,192,79,201
```

b) QL Listing

```
10 REMARK Spectrum Screen Transfer
20 :
30 INIT
40 INPUT ""File name for screen display "name$
50 PAPER_ATT
60 delay: PAINT_INK
70 SBYTES "mdv2_"name$,131072,32768
80 STOP
90 :
100 Define PROCEDURE INIT
110 WINDOW 512,256,0,0: PAPER 0
120 MODE B: CLS
130 DIM att_array$(32,24)
140 BAUD 9600
150 OPEN #4, ser1
160 END Define INIT
170 :
180 Define PROCEDURE BBlock (i,x,y)
```

```
190 BLOCK 16,10,16*x,10*y,i
200 END Define
210 :
220 Define PROCEDURE PAPER_ATT
230 LOCAL i,j,a$,att
240 FOR i=0 TO 31
250 FOR j=0 TO 23
260 a$=INKEY$(#4,-1): att=CODE(a$)
270 att_array$(i+1,j+1)=a$
280 att=(att&56)/8: BBlock att,i,j
290 END FOR j
300 END FOR i
310 END Define PAPER_ATT
320 :
330 Define PROCEDURE PAINT_INK
340 LOCAL z,z$,ok,i,j,k,row
350 row=0
360 FOR i=0 TO 191
370 FOR j=0 TO 31
380 z$=INKEY$(#4,-1)
390 att=CODE(att_array$(j+1,(i DIV 8)+1))
400 ik=att&67: pap=(att&56)/8
410 z=CODE(z$)
420 FOR k=7 TO 0 STEP -1
430 IF (z MOD 2) THEN
440 BLOCK 2,1+((i MOD 3)=0),2*(j&B+k),row,ik
450 ELSE
460 BLOCK 2,1+((i MOD 3)=0),2*(j&B+k),row,pap
470 END IF
480 z=z DIV 2
490 END FOR k
500 END FOR j
510 row=row+1+((i MOD 3)=0)
520 END FOR i
530 END Define PAINT_INK
540 :
550 Define PROCEDURE delay
560 LOCAL x$,count,c$
570 x$="pixels": count=0
580 REPEAT loop1
590 c$=INKEY$(#4,-1)
600 IF c$=x$(count+1) THEN
610 count=count+1
620 ELSE : count=0
630 END IF
640 IF count=5 THEN EXIT loop1
650 END REPEAT loop1
660 c$=INKEY$(#4,-1)
670 END Define delay
```

Shock horror! A new QL game from Rubicon Systems.

Dragonhold
Rubicon Computer
Systems
£19.95

In the early days of computer programs there appeared several rather simple attempts at role playing D&D type games. None provided the sophistication and variety of action of the original game but they had charm and varying degrees of success. These developed in many ways into the games we now know and love on most machines. The QL however, never attracted the same degree of enthusiasm and ingenuity that programmers lavished on other machines.

Dragonhold has many features in common with these early games, but I must add that they have tried quite successfully to combine adventure and animation and strategy. The problem is that fans of each specific genre may find this hybrid unsatisfying. I just hope that there are enough 'all rounders' to buy, enjoy and make this a success.

Dragonhold

The game is a traditional D&D type, you begin in the Dark Caverns and have to search for the Elixir of Life. There are six different areas and a host of creatures which react to you in different ways. You can attack or even talk to them if they are friendly.

Movement is achieved by cursor keys or joystick and is depicted graphically in the central window. Other windows provide information on status, text input, and messages, the graphics are mode 4 graphics and though not stunning, are certainly adequate for the game.

My greatest grievance against most arcade adventures is that there is usually no time to just sit and think. A Freeze option is supplied to allow this along with a full complement of save and load game options. The adventure elements are catered for in the most comprehensive system I have seen for this type of game, letter keys A to X have associated VERB or NOUN words to the extent of 11 verbs and 24

nouns. For instance, key O doubles as OPEN and OPAL. It means that adventure purists will find the joy of discovering the right words and the surprise of finding unknown objects has been eliminated. However when playing the game it adds greatly to the range of actions you can perform compared with a purely graphical program.

The ability to fight, converse and barter are all included and the options are very comprehensive. I found that its very lack of clever techniques, no icons, no multi-key combination presses, added to its appeal and soon I had become completely absorbed in the problems, not mind bending, but enough to make you pause for thought.

I liked it, a pleasant change and surprisingly addictive.



GREAT

Q

ERROR
TRAPPING

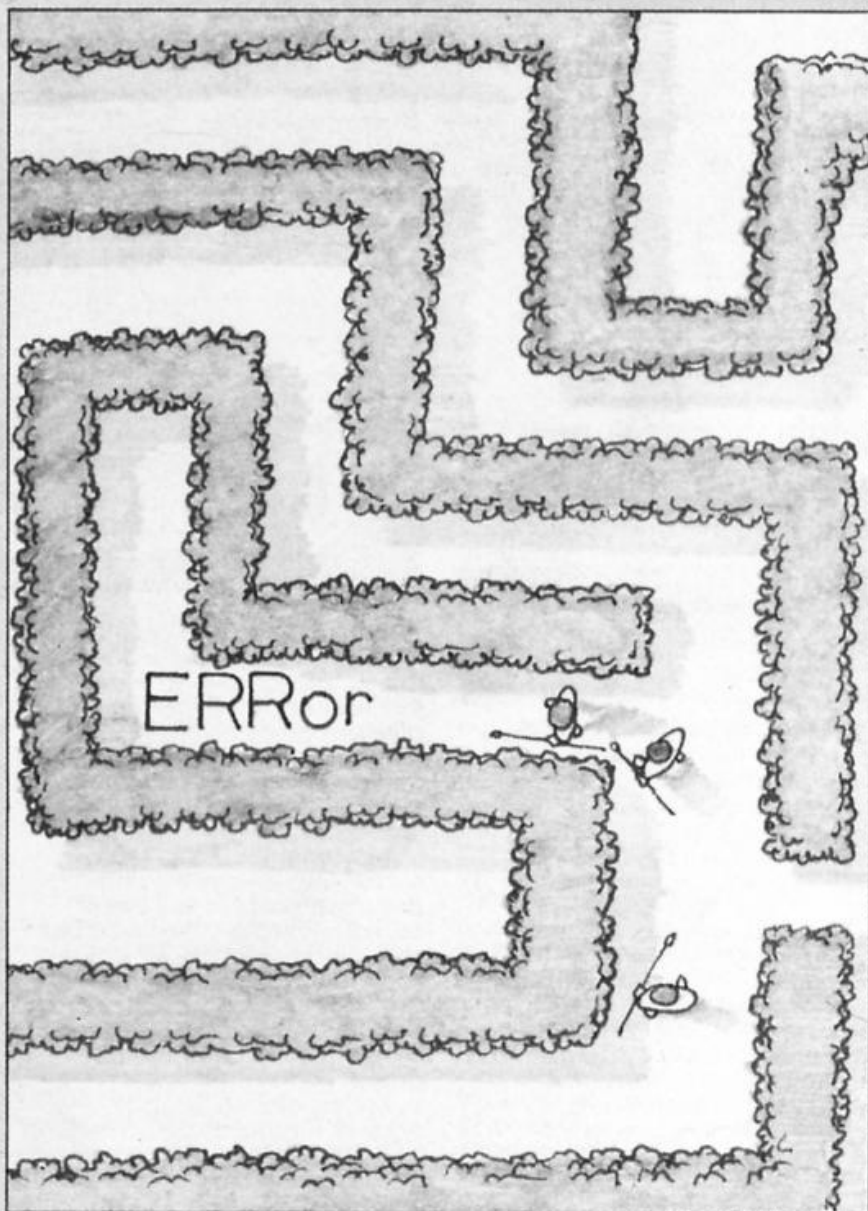
**Mel Mackaron presents
an invaluable aid for
QL programmers — a
simple and effective
error trapping
technique.**

The Sinclair QL is a wonderful computer, and SuperBASIC is a very good programming language, but, for the person trying to use his QL to write a fairly professional application, there has, until now, been a significant stumbling block: the 'absence' of an error-trapping command. Most micro-computers have a keyword combination such as ON ERR — GOTO xxx to help with controlling end-user errors or I/O errors. But nowhere in the Sinclair documentation, including the QL User Guide and the QL Technical Guide is there any mention of such an aid.

Ordinarily, the lack of such a command would not be a problem. If, in a utility you have written for yourself, an error occurs, you should know your program well enough to re-enter at a suitable point. But what about another user who does not have your knowledge of the program's structure? If he makes an error causing the program to terminate, he may not know how to get back in.

Rom Secrets

If you have faced this dilemma, you may have felt that you only had limited options: you could type a message to the user such as 'In case of an error, type "GOTO xxx" to re-enter the program; you could attempt to learn assembly language well



enough to write your own error-retrieval routines; you could give up. However, you do have a fourth option. Hidden in the QL's ROM (and not documented in the above-mentioned books) is the keyword combination **WHEN**

ERRor — RETRY — END WHEN.

The concept behind **WHEN ERRor** is fundamentally the same as an ON ERR — GOTO statement; however, the syntax and coding are somewhat different. Nevertheless, once you

know how to use this tool, you will be able to give your program a more professional appearance.

When beginning work with **WHEN ERROR**, you must remember a couple of rules. First, do not try to exit from it by using a **GOTO**. This may cause unpredictable results later on, such as a message like 'error during WHEN processing'. Second, the **WHEN ERROR** routine needs to precede the point at which the error could occur. Also, if you are using separate **WHEN ERROR** routines, remember that the latest one takes precedence. Therefore, you must always keep in mind the user's location in the program so that the correct errors will be trapped.

The four sample program segments I have included show different levels of error-trapping. In the fact, all we shall rely upon is that which is built into the computer. In the second, the programmer is protecting against anything except an I/O error. The third demonstrates a basic introduction to the **WHEN ERROR** construct. The fourth shows how you can trap for multiple errors within one routine. Within these segments, I have also tried to show a bit of what is generally termed 'accepted programming practice', something which may help you to improve your own programming.

Deliberate mistakes

All program segments rely upon two type of errors. First, we ask for a number to be entered. On the QL, if a string (such as 'hello') were entered instead of a number, you would get error -17 (error in expression). Then, we summon a directory of MDV2. If there were no cartridge in that drive, we would get error -7 (file or device not found). You should enter all listings (one at a time) and then RUN them. When you do run them, purposely make the errors you are testing for. In that way, you will learn how each trapping method works and how we are improving on the basic, machine-level trapping.

Listing One works only with machine-level control. In other words, when the computer encounters an error, program execution stops with an error message. You may then RUN the program again. While this method of detecting faults may be informative, it is also fairly primitive and frustrating, especially for the user who is not well-versed in the operation of computers.

Listing Two show what a reasonably competent programmer might do for error control. In this one, we are

Listing One

```
10 REMark This program demonstrates programming with no
20 REMark at error-trapping. It relies solely on machine
30 REMark level error reports.
40 REMark
50 MODE 0 : PAPER 0 : INK 7 : CLS : REMark Set Display
60 INPUT 'Enter a Number: ' ; num
70 PRINT 'Your number was ' & num
80 PRINT 'Press any key to continue...'
90 PAUSE : REMark waits for a keypress
100 CLS
110 DIR MDV2_
120 PRINT 'Program successfully completed.'
130 STOP
```

Listing Two

```
10 REMark This section demonstrates error-trapping efforts by
20 REMark the programmer who does not use WHEN ERROR. It
30 REMark checks for correct user input, but cannot control
40 REMark I/O errors efficiently.
50 REMark
60 MODE 0 : PAPER 0 : INK 7 : REMark Set Display
70 CLS : INPUT 'Enter a Number: ' ; num$
80 REMark Input is as a string which coercion will convert to
90 REMark a number.
100 IF num$ = '' : GO TO 70 : REMark User only pressed ENTER
110 IF num$(1) < '0' OR num$(1) > '9' : GO TO 70
120 REMark User did not enter a number
130 num = num$ : REMark Correct entry, so convert it
140 PRINT 'Your number was ' & num
150 carry_on
160 CLS
170 PRINT 'Following is a directory of MDV2'
180 PRINT 'If you get an error, type "GOTO 180"'
190 carry_on
200 DIR MDV2_
210 PRINT 'Program successfully completed!'
220 STOP
230 DEFINE PROCEDURE carry_on
240 REMark merely a routine to wait for a keypress
250 PRINT 'Press any key to continue...'
260 PAUSE
270 END DEFINE carry_on
```

Listing Three

```
10 REMark This program introduces WHEN ERROR. If an error
20 REMark occurs, the user is returned to that line number
30 REMark to try again.
40 REMark Procedures are heavily used to make flow of program
50 REMark clearer.
60 REMark
70 initialise
80 enter_num
90 directory
100 PRINT 'Program successfully completed.'
110 STOP
120 DEFINE PROCEDURE initialise
130 MODE 0 : PAPER 0 : INK 7 : REMark Set Display
140 END DEFINE initialise
150 DEFINE PROCEDURE enter_num
160 WHEN ERROR
170 PRINT 'INVALID ENTRY! (Must be a NUMBER)'
180 carry_on
190 CLS
200 RETRY : REMark Return to site of error. Try again. ▶▶
```



```

210 END WHEN
220 CLS
230 INPUT 'Enter a Number: ';num
240 PRINT 'Your number was ' & num
250 carry_on
260 END Define enter_number
270 Define PROCedure directory
280 WHEN Error
290 PRINT 'Microdrive ERROR.'
300 PRINT 'Place a program cartridge in MDV2'
310 carry_on
320 CLS : RETRY
330 END WHEN
340 DIR MDV2_
350 END Define directory
360 Define PROCedure carry_on
370 PRINT 'Press any key to continue...'
380 PAUSE
390 END Define carry_on

```

Listing Four

```

10 REMark This program allows the programmer to direct program
20 REMark execution from only one WHEN Error routine. It
30 REMark accomplishes this by PEEKing the QL's BASIC VARIABLE
40 REMark area to discover the error number.
50 REMark
60 WHEN Error
70 REMark a little bell to alert the user
80 BEEP 2000,12 : PAUSE 5
90 BEEP 2000,6 : PAUSE 5
100 BEEP 2000,9 : PAUSE 5
110 errnum = PEEK_L(PEEK_L(163856) + 298)
120 Select ON errnum
130 = -17
140 PRINT 'INVALID ENTRY! (Must be a NUMBER)'
150 carry_on
160 at x,y : CLS 4 : CLS 2
170 REMark Reset cursor; clear screen
180 RETRY
190 = -7
200 PRINT 'ERROR at MDV2!'
210 PRINT 'Place a PROGRAM cartridge in MDV2'
220 carry_on
230 CLS : RETRY
240 END Select
250 END WHEN : REMark Don't forget this line. It's VITAL.
260 initialise
270 enter_num
280 directory
290 PRINT 'Program successfully completed.'
300 PRINT 'You are now an expert error-trapper!'
310 STOP
320 Define PROCedure initialise
330 MODE 0 : PAPER 0 : INK 7
340 END Define initialise
350 Define PROCedure enter_num
360 CLS
370 x = 0 : y = 16 : REMark variables to hold cursor position
380 PRINT 'Enter a Number: ';
390 INPUT num
400 PRINT 'Your number was ' & num
410 carry_on
420 END Define enter_num
430 Define PROCedure directory
440 CLS
450 PRINT 'Following is a directory of MDV2'
460 DIR MDV2_
470 END Define directory
480 Define PROCedure carry_on
490 PRINT 'Press any key to continue...'
500 PAUSE
510 END Define carry_on

```

trapping within the program against a user entering a string instead of a number. However, as we have no control over I/O errors (such as 'format failed'), we only include a statement to the user telling him how to re-enter the program.

Listing Three is our first introduction to **WHEN Error**. It will handle any type of error, and its only drawback is that we must include a **WHEN Error** routine at the beginning of each procedure. (I have included procedures here to demonstrate the clarity and modularity you gain from using these in your program.) Because the computer knows an error has occurred (and which error it was), the **RETRY** command returns you to the specific line at which the mistake happened and re-executes from there.

Finally, in Listing Four we shall see how to PEEK the system variables on the QL to find the specific error code which was generated. By so doing, we can write just one error-trapping routine, one which will give a different result depending upon the code it receives. Finding the correct code works in this way: First, we must locate the base of the SuperBASIC area.

In the QL, this is not fixed, as it is in many other micros. Therefore, we find it by PEEKing memory location 28010h (163856 in decimal). The base of SuperBASIC is held as a 'long word', so we will use PEEK_L for this. The header associated with the SuperBASIC 'job' is 104 bytes (decimal) long, and we must add this to the start address. Last, we add the vector which points to the error code (BV_ERROR), which is 194 bytes (decimal) long, and PEEK the resulting address. This variable, too, is a 'long word', requiring us to again use PEEK_L. (Sounds complicated, doesn't it? But it isn't.) The formula for getting the error number is PEEK_L(PEEK_L(163856) + 298). Once we have this, it is quite simple to write a comprehensive block of code to trap our errors.

As a last note about **WHEN Error**, you should not think of it as providing copy protection for your programs. It does not recognise (CTRL)-(SPACE) (i.e. BREAK) as an error. Therefore, your program listings will be available to anyone who may be interested in them. However, if you force a program BREAK while an error is being processed, you may find yourself getting unpredictable (and unwanted) results at a later time.

Armed with an understanding of the QL's **WHEN Error** keyword and its syntax, you should now find that, while it is perfectly human to ERR, you will not be unduly punished for your mistakes.

**Time to enter our
competition and win
yourself a Gremlin
clock.**

OK, take the flying ducks off the wall. We've got something much better for you, something that will become the aesthetic centrepiece of any front room and wouldn't look out of place in Fergie and Andy's new place (in fact, I'm told that they wanted one as a wedding present but these things aren't easy to come by).

What is it? What else but a high-tech, technicolour Gremlin clock! We've gotten together with the guys at Gremlin to offer five of these clocks as prizes to ZX readers, and for ten additional runners up there are copies of Gremlin's latest game, the mega-addictive Trailblazer, to be won.

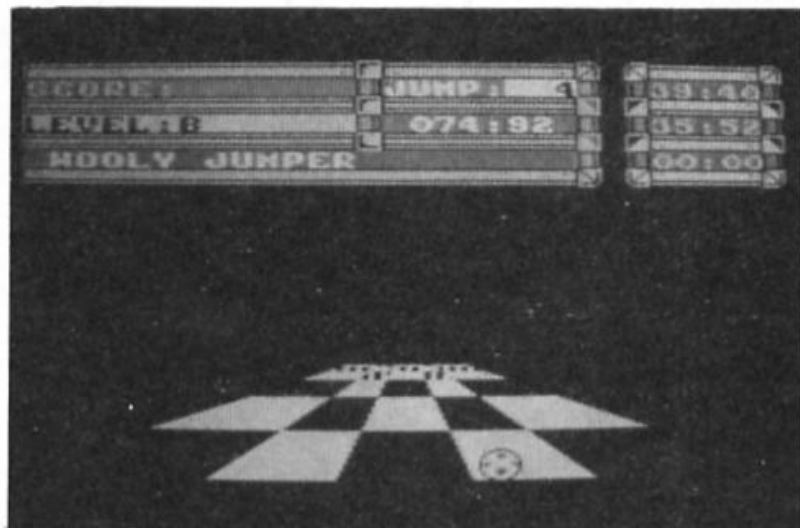
Anagrams

All you have to do to become the proud owner of one of these chronometric classics is to take the name of any Gremlin game, and see if you can come up with an interesting anagram made up out of that name. For instance, you could take Way of The Tiger and turn it into TOO FEW GET HAIRY (except that I cheated and made up an extra 'o', but you get the idea).

Just to get you started here are the names of a few Gremlin releases that you could use:
Monty on The Run
Jack The Nipper
Trailblazer
Way of The Tiger
Boulder

Once you've come up with an anagram, fill in the coupon on this page, and also write your anagram on the back of the envelope then send it to Gremlin Competition, ZX Computing Monthly, 1 Golden Square, London W1R 3AB.

Entries must arrive by first post on the 5th December 1985. This competition is open to all readers of ZX Computing Monthly, except employees of Argus Specialist Publications, Gremlin Graphics and Alabaster Passmore and Sons.



Trailblazer

Gremlin Competition

Game Title.....
Wacky anagram.....
Name.....
Address.....
.....
.....

Send your entry to Gremlin Competition, ZX Computing Monthly, 1 Golden Square, London W1R 3AB. Entries to arrive by 5th December 1985.

COMPETITION



COMPETITION



Do you know the latest evil plan hatched from Barbaric Bryan's hideously warped mind? Not content with locking me in this dark, damp and dismal dungeon, not content with cold custard torture, not content even with showing "The Price Is Right" on an out of reach video screen, 24 hours a day, he resorts to trying to ruin my macho image. I, of course, receive bulging bags of fan letters each day (I know they come, he just refuses to show them to me due to insane jealousy). The affront I am referring to is the "artwork" in the September issue. This portrayed me as having a concordian nose, and, in the drawing of a hand reaching out the grating, long, manicured and painted fingernails! But let my assure you reader, in reality I combine the best features of Mat Dillon and Richard Gere. Admittedly, the nails are longish, but I have been down here for three years and I certainly don't paint them. After all, how could I get to Boots? And if I did, they'd probably be right out of my shade of pink...

Snappy titles this month: HRH, Zzzz, and Moron (thankfully we did Journey To The Centre Of Eddie Smith's Head last month — it would have ruined the continuity). And, yonks after the Commodore version, Level 9's *Jewels of Darkness* has finally arrived for the Spectrum.

In last month's review of products from *Interceptor's* budget label *Players*, I said that

far better than pushing out those poor games would be to re-release some of the old *Interceptor* adventures. I'm glad to say that this is being done (not as a result of my comments, but who cares?). You can now buy *Heroes Of Karn*, *Warlords* and *Jewels of Babylon* amongst others for £1.99, a price they are ideally suited to. This is because they are all marred by a poor vocabulary and pretty brief text. They do have some beautiful graphics though and fun problems, plus often a level of difficulty suitable for beginners, which is quite rare these days. They're minor classics and no adventurer's collection should be without at least one at such a price. If you cannot find them in the shops for so little, send for details from *Interceptor* at Mercury House, Calleva Park Industrial Estate, Aldermaston, Berks RG7 4QW.

News of adventure organisations continually comes my way. The *Spectrum Adventure Exchange Club* I mentioned in August is still going strong, and the same people now run *Spectrum Adventurer*, a tape magazine which costs two pounds. I looked at issue four and was quite impressed. There are reviews of less well known products, which tend to be ignored by most magazines; a well written help section; an entertaining column by none other than John Wilson (under a pseudonym); plus other bits and bobs. The magazine text is large

and attractive. You also get part of a serialised adventure, which, although dealing with the hackneyed science fiction theme, seemed above average with some well written description (no graphics); certainly a keen adventurer could while away an enjoyable hour or two with it.

The main fault with the tape is that the magazine parts make little use of the computer medium. There is no index system and you are forced to flick through every page rather than choose a review, for example. A Ceefax style selection, or better still menu driven choices at the bottom of the screen, would greatly improve the product.

That said, *Spectrum Adventurer* is a good buy for the adventure nut; less devoted players won't find it as much fun. With enough reader support, it could become a very worthy mag indeed, and I hope they rectify the fault I mentioned (easily done). Write for more details to 4 Kilmartin Lane, Carlisle, Lanarkshire ML8 5RT.

Roger Garret's *Adventureline* is apparently ending soon, though I haven't heard officially. *Questionline* is still going strong though, and all adventure clubs must watch out — because Tony Treadwell is starting a new, commercial adventure only magazine soon.

But enough of these deranged ramblings ... let the reviewing begin!

HRH

8th Day
£8.95

Whilst I'm not a great advocate of censorship, some of this game is of dubious taste and parents may feel that their children need protecting from its "adult" humour. But providing you are not easily offended, I think you'll love this. HRH is the most biting computer satire since Denis Through The Drinking Glass; this time the subject matter is (mostly) our royal family, and the irreverence is limitless.

You are horrified when your eagerly awaited DHSS envelope contains someone else's giro; then you notice the name and address: it belongs to Queen Elizabeth. And if you have hers — she must have yours! How will she afford the Queen Mother's meals on wheels on such a small sum? Will she have to sell the corgis to MacDonalds? What about her Oxfam clothing bill...? There's nothing for it but to return her giro personally.

You start in a post office, next to Princess Di waiting for her family allowance, and Prince William who is impersonating his father with a pair of huge rubber ears. Close by are

You are outside a Unisex loo (apparently they're all the rage on the Continent). A huge crowd of screaming kids block the way south to a park cafe, around which an unofficial path leads southeast. The loo is west.

What Next?

↓ S
Crowds of children block you..

What Next?

↓ W
A park warden stops you- "OUT OF ORDER!"

What Next?

↓ SCORE

You have scored 15 from a possible 250.

further royals and before the end of the game you will have met the whole clan, on your travels around London. Their personalities will be familiar to all Spitting Image fans; drunken Margaret, Greek Phillip, stupid Edward, and Randy Andy who provides many of those "adult" jokes I mentioned.

The humour itself is also along Spitting Image lines; some crude, some more subtle. I won't spoil the fun by giving too much away, but I particularly liked Madame Tussauds, where pride of place in both the Chamber Of Horrors and the Gallery Of Famous Mur-

derers is taken by Margaret Thatcher. Later you face the gruesome task of impersonating her; yet when doing so, you won't be allowed into the palace!

Description is lengthy, entertaining and well written, and characters wander round in convincingly independent fashion. There are a few, fairly average split screen graphics.

An incredible amount has been packed into this Quilled game, not just text but many special messages and amazing complexity. While this is no fault, some of the commands — particularly EXAMINE — have

had their responsiveness sacrificed in order to fit everything in. Despite this misgiving, HRH is technically very sound. Vocabulary is adequate, but at a few points too obscure. Coming from a small company, I was pleasantly surprised at the skillful presentation. The actual game has polished appearance, RAM SAVE/LOAD is included; and the packaging competes with many of the software big boys. My only major gripe is that this is a pound or two overpriced for a mail order product.

The actual adventure isn't quite up to Monster Hit standard. However, I had so much fun playing HRH, and its sheer originality and energy comes as such a welcome breath of fresh air in the face of countless middle earth games from Level 9 et al, that I've given one anyway. 8th Day are a company to watch.

I sincerely hope they reach a distribution deal to get HRH into the shops, but in the meantime write to 18 Flaxhill, Moreton, Wirral, Merseyside L46 7UH.



Zzzz

Mastertronic
£1.99

You are trapped in your dream and must awake; though this game is more likely to have sent you to sleep in the first place. Dreaming could be the theme for an excellent adventure, but Zzzz fails because instead of capturing the weird nocturnal atmosphere or outrageous imagination of the best dreams, the authors have used the scenario as an excuse to fling together random and uninspired ideas. Also lacking is the warped logic which makes the wildest dreams feel continuous.

And Zzzz has many other faults, which is a shame because there are some good ideas. The best of these is the presence of icons replacing

common commands (directions, GET/DROP, etc.), while text input is retained for rarer words. Unfortunately, a massive bug means these have a life of their own and automatically select random commands, even while you are typing, making the game virtually unplayable. Furthermore, the delete key won't function as it's used for icon selection. John Wilson tells me that these faults disappear if a joystick interface is plugged in, but this is not mentioned in the instructions; besides, there should be no need. The instructions are dreadful by the way, picturing non-existent icons — they were written for the CBM version.

The non-icon vocabulary is small, and you are required to enter ridiculously obscure commands like THUMB A LIFT. Examine is usually unrespon-



sive. The text is reasonable but some of the graphics are pathetic. The whole thing is horribly unfriendly and not worth your time or money.



MORON

Atlantis
£1.99

Following the Marie Celeste earlier in the year, another science-fiction game from Atlantis, which also includes elements of time travel — killing two adventure clichés with one stone? Particularly stupid aliens called — you've guessed it — morons, stumble across the Pillars Of Time and promptly lose them in their spaceship. Said vessel is now on collision course with earth so you have a limited time to fulfill your task, which, naturally, is to collect the pillars and save the world.

Quilled and Patched, Moron offers split screen graphics at nearly all the numerous

locations, quite a feat given the memory limitations. These are attractive enough but look incredibly similar, even though there are subtle differences. Then again, I suppose a large

spaceship would appear somewhat monotonous.

To fit them all in, the text had to be sacrificed, or perhaps massacred would be more appropriate. There is not descrip-

tion at all, just a location title like "The Teleport Room". There are many objects lying around, which compensates a little, but purists should avoid. Vocabulary is strict but not awful.

I've said before that science-fiction games tend to bore me, and Moron has nothing new to offer. However, some of the problems here might while away the odd hour, though what I've seen strikes me as too easy for expert adventurers.

Moron is not a bad effort but strikes me as amazingly average, nothing new or notable. If there's nothing better around then this is no rip-off, but neither is it a must buy.



HELPLINE

Some help for David McCallum (not Illya Kuryakin himself, surely?), who's still stranded in sunny **Terrormolinos**. The correct hotel to go to is found by reading the brochure. Once in your room, drop your clothes, get and wear the trunks, then take, knot and wear the hanky. Suitably equipped with camera, snorkel and harpoon gun you'll be ready to start your holiday proper.

Meanwhile, back in Middle Earth, Michael Payne is troubled by trolls. The game is **The Hobbit**, naturellement. To kill the trolls and get the key, you must wait until dawn (i.e. keep typing WAIT until the program tell you it's light). However, you must do this when somewhere else, like the nearby path — otherwise it's boiled Michael on the trolls' menu.

In the decidedly more muddled world of **The Boggit**, the trolls are less easily dealt with — I suggest you listen very carefully to what the theologian says, then scour the washing powder shelves of your local supermarket. But before that, Stephen Page of Romford cannot escape his hole. He has found the diary (CLIMB CHEST for those who haven't) but cannot find the word combination to open the door. Turns out you were using the wrong birthday Steve: type Fordo's in!

Kris Daryani from Middlesex is struggling in an earlier satirical escapade of Fergus McNeil, **Bored Of The Rings**. He cannot find the poster of Rocky to give to the gay monsters. Well, starting by the pixie, enter the maze by going East. Then: E, N, E, E, S, W, S, E, GET POSTER, W, W, S, W. But don't hang around too long ...

Mitchell Blower writes about **Sorcerer Of Claymouge Castle**. "How do you find the towel and

how do you enter the castle without the seed spell?" he asks, referring to hints in a previous issue. The moat answers both questions. From nearby, GO MOAT. Obviously you must HOLD BREATH, before you SWIM DOWN, TAKE TOWEL, SWIM DOWN, SWIM FAST, and SWIM UP. You will now be in the castle, and can save the seed spell for opening a stone door, later. The moat will need a further visit, with a deep treasure dive that can only be survived by escaping with the Bliss spell.

David Heron from Perston has an (old style) 128 and is stuck late on in **Never Ending Story**. "How can I reach the top of the Ivory Tower, I keep going round in circles". That's because you are in a maze, Dave. The route through is like this: from the bottom of the main stairs go U, E, E, NE, U, W and W, where you will find some completely useless treasure, then W, SE, U, E, E, E, U to find the door. Just be polite and the game is near finished. The cape you have found has no use. And in response to a steady stream of enquiries, it is not possible or necessary to enter the Ivory Tower in part one.

Some more information about **Denis Through The Drinking Glass**. When I gave some hints a couple of months back, I may have misled you into exiting by the window first. In fact you need to journey out the front door to start with. Make sure you are wearing your suit, and carrying the letter (which you must hand in at the Private Eye offices), the Cherry Blossom (for dealing with Norman Fowler) and your teeth (from the tumbler in the bathroom). The gnashers should be worn in time to SMILE at the photographers. Before you leave for the first time, collect all the items you can and leave them in your room, as Maggie will lock you in on your return. BUY TICKETS from the copper in the road then head NE.

Thanks as usual to the help of Rochdale's John Wilson.

Help The Helpline

The helpline has been running over six months now, and in that time I must admit (though not too loudly, otherwise Bryan will whip me even harder) that some problems have come in which even I cannot solve. Now it is an undeniable fact that ZX readers are the most intelligent beings in the entire universe, so I call on you to do a good deed and help your fellow creature. Please, please, please help. Please ... (I think we get the gist Ed).

What I want you to do is fill in the "I can help solve" part of the coupon if you have completed any of the following games: **Eureka (Roman), Runes Of Zendos, Dragonworld, The Secret Of St. Brides, The Pawn, Smugglers Cove, The Moreby Jewels, Castle Colditz (K-Tel), Aksheron, Castle Blackstar or Return To Ithaca**. With a few exceptions those are rather obscure, but someone out there must have played them. If you have, just put the coupon in an envelope and I'll be in touch for help from you! Obviously an SAE is not needed in this case; and I'll be happy to give you any help in return.

Write to me

Whether you're stumped by Seabase Delta, harassed by Hunchback or bamboozled by The Boggit, we can help. Fill in the coupon and send it to: Mindplay Helpline, Deepest Dampest Darkest Dungeons, ZX Computing, No. 1 Golden Square, London W1R 3AB.

A few rules: British correspondents, please enclose a stamped, addressed envelope if you want a personal reply rather than wait for the magazine to come out. If you are writing from abroad, just enclose an envelope — I'll add the postage. I try to respond within two months but I can take longer (on the other hand, you might receive an immediate reply). I ONLY DEAL WITH ADVENTURES. Not arcade games; nor technical problems (write to Crosswires about those). I'm not too hot on adventures these days (Gargoyle games included). Finally, please write the name of the game you're writing about on the back of the envelope.

Another month's missive must draw to a close, but fret not, for I'll still be here next issue. Or will Bryan succeed in his twisted plans to bump me off? Or will I succeed in my twisted plans to bump Bryan off? There's only one way to find out — read Mindplay next month!

Title:

Company:

Problem:

I can help solve:

Name:

VENTURESPEAK

Part 2: Alan Davis' adventure series looks at command analysis.

This month brings you the second part of the VENTURESPEAK machine code program, and we'll be taking a look at the gentle art of "parsing the input" — or "command analysis", if you prefer.

You're going to need the machine code keyboard routine that you saved last month, as we need to patch this month's program onto it to produce a single block of code. Listing 1 is the assembly language program for the "parser" — this is the program which will scan through a typed input, checking the words against a set of vocabulary data. As you can see, it's a fairly lengthy routine so an assembler will make error-free entry considerably easier — but if you don't have an assembler all is not lost, since I've given a decimal dump of the code in Listing 2. All you need to do is type in Listing 3, RUN it, and then enter the numbers from Listing 2 in order, including the checksums after every fifth byte. Take things slowly, checking the screen

display against the listing as you go along, and all should be well. When you've finished, the program will save the code to tape for you as "PARSER" CODE 60400, 750.

Parsing

So far, so good. We now need to weld the keyboard and parser sections together as follows:

- 1) Reset the Spectrum using **RANDOMISE USR 0**.
- 2) Enter **CLEAR 59999** as a direct command.
- 3) Load in the keyboard code you saved last month (**LOAD "KEYBOARD" CODE**).
- 4) Load in this month's parser code (**LOAD "PARSER" CODE**).
- 5) Now save the whole lot as a single block with **SAVE "V-SPEAK" CODE 60000,1150** — and keep it safe somewhere until next month.

In addition to this single code block, it's probably wise to keep the two separate parts as well for the present, to facilitate checking in case you discover errors later.

Of course you'll be wanting to know just what this new routine does, and to test it out. We'll certainly be looking at how it works in this article, but as for testing it — well, I'm going to ask

you to be patient and wait until next month. You see, the problem is that our parser is actually fairly useless at present, because it doesn't yet possess a vocabulary! (Rather like a chap who, though highly intelligent, has no background knowledge to draw upon . . .) To put vocabulary into the parser we'll need the VENTURESPEAK EDITOR — and that's our task for next month.

For the present though, I'm going to explain the basic principles underlying the parsing system so that when the time comes for you to use it, you'll be familiar with all the main features. We can't discuss this in a vacuum, so in Figure 1 I've given a very elementary vocabulary of words which you might expect to find in a typical adventure (printed out from the EDITOR program, in fact). Figure 1 itself raises a few points which need to be mentioned before we go any further:

- 1) Only the first three letters of any word are significant. (This can occasionally give rise to some confusion because the parser can't distinguish between words such as "RAVEN" or "RAVINE", although in practice I've never found this to be a serious problem, myself. My game "RUNESTONE" uses only



three-letter parsing).

2) Vocabulary is divided into three distinct types: VERBS, OBJECTS, and PEOPLE. This has advantages over the usual simpler subdivision into VERBS and NOUNS because it helps the error-trapping process when you write your adventure, as you'll see later.

3) Each item of vocabulary is assigned a number between 1 and 254 inclusive. Synonyms are catered for by assigning the same number to different words, so that the verbs SAY, TELL, ASK, and TALK, for example, are all assigned the number 1. This is a good place to make an

IMPORTANT NOTE: generally you can assign any number you like to any verb you like, BUT IT IS ESSENTIAL THAT ALL VERBS IMPLYING SPEECH BE ASSIGNED THE NUMBER 1, if the parser routine is to work correctly.

Input

In practice what happens will go something like this. Your BASIC adventure program will invite input from the player by invoking the keyboard routine: LET M=USR 60000. The player then types in his command, presses ENTER when he's finished, and the routine returns to BASIC having stored the player's input as a string of bytes in the correct addresses above RAMTOP. We now want the parser to scan this stored command and decode it, so the next step is to call the parser routine with LET M=USR 60400. The parser now scans through the player's command, character by character, checking the words it finds against those in its vocabulary, ignoring any words it fails to recognise and skipping on to the next. It eventually stops, either when it reaches the end, or when it reaches a comma, full stop, or the word "AND" (these last items signifying that the player has typed in several commands at one go) and returns to BASIC.

The parser having done its job (almost instantaneously of course), we need to extract the fruits of its labours by PEEKing certain addresses. It makes for an easier life if the results of these PEEKs are assigned immediately to BASIC variables with suitably memory-jogging names, like this:

```
LET TELL=PEEK 61124
LET PERS=PEEK 61125
LET VB1=PEEK 61126
LET VB2=PEEK 61127
LET FK1=PEEK 61129
LET OB1=PEEK 61131
LET OB2=PEEK 61132
LET MORE=PEEK 61123
```

What this all amounts to is that you can extract from any one command the code numbers for up to three verbs, two objects,

Figure 1. Vocabulary list, with each verb, noun and object individually numbered.

VERBS		D		SHI	
SAY	1	DOW	10	ARM	6
TEL	1	DES	10	BOO	7
ASK	1	GET	11	CHE	8
TAL	1	TAK	11	BOX	9
L	2	PIC	11	DOO	10
LOO	2	DRO	12	PEOPLE	
H	3	PUT	12	SAM	1
HOR	3	EXA	13	FRE	2
S	4	REA	13	PET	3
SOU	4	GIU	14	JOH	4
E	5	OFF	14	JAC	5
EAS	5	FIG	15	JOE	6
H	6	KIL	15		
HES	6	ATT	15		
IN	7	HIT	15		
ENT	7	OBJECTS			
OUT	8	SHO	1		
LEA	8	DAG	2		
U	9	SPE	3		
UP	9	KNI	4		
CLI	9				
ASC	9				

Figure 2. Examples of command analysis.

EXAMINE THE DAGGER		PUT THE BOOK IN THE CHEST	
A		C	
COMMAND ANALYSIS		COMMAND ANALYSIS	
TELL :	0	TELL :	0
PERS :	0	PERS :	0
VB1 :	13	VB1 :	12
VB2 :	0	VB2 :	7
FK1 :	0	FK1 :	0
OB1 :	2	OB1 :	7
OB2 :	0	OB2 :	8
B		D	
SAY TO FRED "EXAMINE THE DAGGER"		ASK PETER TO GIVE THE KNIFE TO JOHN	
COMMAND ANALYSIS		COMMAND ANALYSIS	
TELL :	1	TELL :	1
PERS :	2	PERS :	3
VB1 :	13	VB1 :	14
VB2 :	0	VB2 :	0
FK1 :	0	FK1 :	4
OB1 :	2	OB1 :	4
OB2 :	0	OB2 :	0

and two people — so that your BASIC program can then perform the necessary condition tests appropriate to your adventure. A few examples should make things clear.

Examining

Figure 2 gives examples of the analysis of a range of commands involving the basic vocabulary of Figure 1. (You might like to know that these figures are all screen dumps from the VENTURESPEAK EDITOR in "test" mode). Let's start with the first and simplest command — 2(a): "EXAMINE THE DAGGER". Only two words are really relevant here — the verb "EXAMINE", and the noun (in this

case an object) "DAGGER". You'll see in the example that the parser has assigned the value 13 to VB1, 2 to OB1, and zero to everything else. Now look back at the vocabulary list in Figure 1, where you'll find that verb number 13 is "EXA" (for "examine"), and that object number 2 is "DAG" (for "dagger"). Makes sense? OK, then let's try something a little more complex.

The second example, Figure 2(b), shows the analysis of the command "SAY TO FRED "EXAMINE THE DAGGER" ", and we find VB1 and OB1 assigned just the same values as before (as we'd expect) but look: this time the variable TELL takes the value 1 (signifying speech) and the

Listing 1

HISOFIT GEN53H2 ASSEMBLER
ZX SPECTRUM

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Pass 1 errors: 00

```

20 +C-
30 PARSE
60400 40 ORG 60400
60400 50 INIT LD HL,START
60403 60 LD (HCON),HL
60406 70 LD (PTR),HL
60409 80 LD A,(COUNT)
60412 90 LD E,A
60413 100 LD D,0
60415 110 ADD HL,DE
60416 120 LD A,255
60418 130 LD (HL),A
60419 140 XOR A
60420 150 LD (TELL),A
60423 160 LD (PERS),A
60426 170 RSTRT XOR A
60427 180 LD (VB1),A
60430 190 LD (VB2),A
60433 200 LD (VB3),A
60436 210 LD (FK1),A
60439 220 LD (FK2),A
60442 230 LD (OB1),A
60445 240 LD (OB2),A
60448 250 CALL COMRA
60451 260 LD HL,(PTR)
60454 270 XOR A
60455 280 LD (EXTR),A
60458 290 CALL FILTER
60461 300 LD A,(EXTR)
60464 310 CP 1
60466 320 JP Z,SORT
60469 330 HL,(PTR)
60472 340 LD A,(HL)
60473 350 CP 255
60475 360 JP Z,SORT
60478 370 CP 44
60480 380 JP Z,END
60483 390 CP 46
60485 400 JP Z,END
60488 410 LD A,(FK1)
60491 420 END INC HL
60492 430 LD (PTR),HL
60495 440 SORT LD A,(VB1)
60498 450 CALL 1
60500 460 CALL Z,SHAP
60503 470 RET
60504 480 SHAP LD (TELL),A
60507 490 LD A,(VB2)
60510 500 LD (VB1),A
60513 510 LD A,(VB3)
60516 520 LD (VB2),A
60519 530 LD A,(FK1)
60522 540 LD (PERS),A
60525 550 LD A,(FK2)
60528 560 LD (FK1),A
60531 570 RET
60532 580 COMRA LD HL,(HCON)
60535 590 LD A,(HL)
60536 600 CP 255
60538 610 JP Z,ENDCON
60541 620 CP 44
60543 630 JP Z,SETCON
60546 640 CP 46
60548 650 JP Z,SETCON
60551 660 INC HL
60552 670 LD A,(HL)
60555 680 SETCON INC HL
60556 690 LD (HCON),HL
60559 700 LD A,1
60561 710 LD (HORE),A
60564 720 RET
60565 730 ENDCON XOR A
60566 740 LD (HORE),A
60569 750 RET
60570 760 FILTER LD A,(HL)
60571 770 CP 34
60573 780 CALL Z,SKIPSP
60576 790 CP 32
60578 800 CALL Z,SKIPSP
60581 810 CP 50
60583 820 CALL Z,SKIPSP
60586 830 CP 255
60588 840 RET Z
60591 850 CP 44
60592 860 RET Z
60594 870 RET Z
60595 880 INC HL
60596 890 LD A,(HL)
60597 900 CP 32
60599 910 JP Z,SINGLE
60602 920 CP 50
60604 930 JP Z,SINGLE
60607 940 CP 44
60609 950 JP Z,SINGLE
60612 960 CP 46
60614 970 JP Z,SINGLE
60617 980 CP 34
60619 990 JP Z,SINGLE
60622 1010 CP 255
60624 1020 JP Z,SINGLE
60627 1030 INC HL
60628 1040 LD A,(HL)
60629 1050 CP 32
60631 1060 JP Z,DOUBLE
60634 1070 CP 44
60636 1080 JP Z,DOUBLE
60639 1090 CP 46
60641 1100 JP Z,DOUBLE
60644 1110 CP 34
60646 1120 JP Z,DOUBLE
60649 1130 CP 50
60651 1140 JP Z,DOUBLE
60654 1150 CP 255
60656 1160 JP Z,DOUBLE
60659 1170 LD A,(HL)
60662 1180 SKIPSP INC HL
60663 1190 LD A,(HL)
60664 1200 CP 32
60666 1210 JP Z,SKIPSP
60669 1220 CP 34
60671 1230 JP Z,SKIPSP
60674 1240 CP 50
60676 1250 JP Z,SKIPSP
60679 1260 LD (PTR),HL
60682 1270 RET
60683 1280 SINGLE LD HL,(PTR)
60686 1290 LD A,(HL)
60687 1300 CALL SETPTR
60690 1310 LD A,(VCU1)
60694 1320 LD B,A
60695 1330 LOOP1 LD A,(DE)
60696 1340 CP 255
60698 1350 RET Z

```

Assembly language program.

```

60699 1360 LD (TPH0),A
60702 1370 INC DE
60703 1380 LD A,(DE)
60704 1390 CP B
60705 1400 JP Z,VBFH0
60708 1410 INC DE
60709 1420 LD A,(HL)
60712 1430 DOUBLE LD HL,(PTR)
60715 1440 LD A,(HL)
60716 1450 LD DE,(VCU2)
60720 1460 LD B,A
60721 1470 INC HL
60722 1480 LD A,(HL)
60723 1490 LD C,A
60724 1500 CALL SETPTR
60727 1510 LD A,(DE)
60728 1520 CP 255
60730 1530 RET Z
60731 1540 LD (TPH0),A
60734 1550 INC DE
60735 1560 LD A,(DE)
60736 1570 LD H,A
60737 1580 INC DE
60738 1590 LD A,(DE)
60739 1600 LD L,A
60740 1610 LD A,B
60741 1620 CP H
60742 1630 JP Z,FHD1
60745 1640 INC DE
60746 1650 LD A,(HL)
60749 1660 FHD1 LD A,C
60750 1670 CP L
60751 1680 JP Z,VBFH0
60754 1690 INC DE
60755 1700 LD A,(VB1)
60758 1710 VBFH0 CP 0
60761 1720 CP 0
60763 1730 JP NZ,VB1DUN
60766 1740 LD A,(TPH0)
60769 1750 LD (VB1),A
60772 1760 RET
60773 1770 VB1DUN LD A,(VB2)
60776 1780 CP 0
60778 1790 JP NZ,VB2DUN
60781 1800 LD A,(TPH0)
60784 1810 LD (VB2),A
60787 1820 RET
60788 1830 VB2DUN LD A,(VB3)
60791 1840 CP 0
60793 1850 RET NZ
60794 1860 LD A,(TPH0)
60797 1870 LD (VB3),A
60800 1880 RET
60801 1890 SETPTR INC HL
60802 1900 LD A,(HL)
60803 1910 LOOP2 CP 32
60804 1920 JP Z,NEHND
60806 1930 CP 34
60809 1940 JP Z,NEHND
60811 1950 CP 50
60814 1960 JP Z,NEHND
60816 1970 CP 255
60819 1980 CP Z,LAST
60821 1990 JP Z,LAST
60824 2000 CP 44
60826 2010 JP Z,LAST
60829 2020 CP 46
60831 2030 JP Z,LAST
60834 2040 INC HL
60835 2050 LD A,(HL)
60838 2060 NEHND INC HL
60839 2070 LAST LD (PTR),HL
60842 2080 POP AF
60843 2090 RET
60844 2100 TRIPLE LD A,(PTR)
60847 2110 LD A,(HL)
60848 2120 CALL AND
60851 2130 CP 1
60853 2140 RET Z
60854 2150 LD A,(PTR)
60857 2160 LD A,(HL)
60858 2170 LD (CHRI),A
60861 2180 INC HL
60862 2190 LD A,(HL)
60863 2200 LD (CHRI2),A
60866 2210 INC HL
60867 2220 LD A,(HL)
60868 2230 LD (CHRI3),A
60871 2240 CALL SETPTR
60874 2250 LD DE,(VCU3)
60878 2260 LOOP5 LD A,(DE)
60879 2270 CP 255
60881 2280 JP Z,DUNUB5
60884 2290 CALL SHORT1
60887 2300 LD A,(HL)
60890 2310 INC DE
60891 2320 INC DE
60892 2330 INC DE
60893 2340 LD A,(HL)
60896 2350 VBHCH1 CALL SHORT2
60899 2360 LD A,(HL)
60902 2370 INC DE
60903 2380 INC DE
60904 2390 LD A,(HL)
60907 2400 VBHCH2 CALL SHORT3
60910 2410 JP Z,VBFH0
60913 2420 INC DE
60914 2430 LD A,(HL)
60917 2440 DUNUB5 LD DE,(VCU0B)
60921 2450 LOOP6 LD A,(DE)
60922 2460 CP 255
60924 2470 JP Z,DUNUB5
60927 2480 CALL SHORT1
60930 2490 LD A,(HL)
60933 2500 INC DE
60934 2510 INC DE
60935 2520 INC DE
60936 2530 LD A,(HL)
60939 2540 OBHCH1 CALL SHORT2
60942 2550 LD A,(HL)
60945 2560 INC DE
60946 2570 LD A,(HL)
60947 2580 LD A,(HL)
60950 2590 OBHCH2 CALL SHORT3
60953 2600 LD A,(HL)
60956 2610 INC DE
60957 2620 LD A,(HL)
60960 2630 DUNUB5 LD DE,(VCU0B)
60964 2640 LOOP7 LD A,(DE)
60965 2650 CP 255
60967 2660 RET Z
60968 2670 CALL SHORT1
60971 2680 LD A,(HL)
60974 2690 INC DE
60975 2700 LD A,(HL)
60976 2710 INC DE
60977 2720 LD A,(HL)
60980 2730 FKHCH1 CALL SHORT2
60983 2740 LD A,(HL)
60986 2750 INC DE

```

```

60987 2760 INC DE
60988 2770 LD A,(HL)
60991 2780 FKHCH2 CALL SHORT3
60994 2790 LD A,(HL)
60997 2800 INC DE
60998 2810 LD A,(HL)
61001 2820 SHORT1 LD (TPH0),A
61004 2830 INC DE
61005 2840 LD A,(DE)
61006 2850 LD B,A
61007 2860 LD A,(CHRI)
61010 2870 CP B
61011 2880 RET
61012 2890 SHORT2 INC DE
61013 2900 LD A,(DE)
61014 2910 LD B,A
61015 2920 LD A,(CHRI2)
61018 2930 CP B
61019 2940 RET
61020 2950 SHORT3 INC DE
61021 2960 LD A,(DE)
61022 2970 LD B,A
61023 2980 LD A,(CHRI3)
61026 2990 CP B
61027 3000 RET
61028 3010 AND CP 65
61030 3020 RET NZ
61031 3030 INC HL
61032 3040 LD A,(HL)
61033 3050 CP 78
61035 3060 RET NZ
61036 3070 INC HL
61037 3080 LD A,(HL)
61038 3090 CP 66
61040 3100 RET NZ
61041 3110 CALL SETCON
61044 3120 LD A,1
61046 3130 LD (EXTR),A
61049 3140 DEC HL
61050 3150 CALL SETPTR
61053 3160 RET
61054 3170 OBFH0 LD A,(TPH0)
61057 3180 LD B,A
61058 3190 LD A,(OB1)
61061 3200 CP 0
61062 3210 RET Z
61063 3220 CP 0
61065 3230 LD A,(OB1DUN)
61068 3240 LD B,A
61069 3250 LD (OB1),A
61072 3260 RET
61073 3270 OB1DUN LD A,(OB2)
61076 3280 CP 0
61077 3290 RET Z
61078 3300 CP 0
61080 3310 RET NZ
61081 3320 LD A,B
61082 3330 LD (OB2),A
61085 3340 RET
61086 3350 FKFH0 LD A,(TPH0)
61089 3360 LD B,A
61090 3370 LD A,(FK1)
61093 3380 CP B
61094 3390 RET Z
61095 3400 CP 0
61099 3410 LD A,(FK1DUN)
61100 3420 LD B,A
61101 3430 LD (FK1),A
61104 3440 RET
61105 3450 FK1DUN LD A,(FK2)
61108 3460 LD B,A
61109 3470 RET Z
61110 3480 CP 0
61112 3490 RET NZ
61113 3500 LD A,B
61114 3510 LD (FK2),A
61117 3520 RET
61118 3530 START EQU 60318
61119 3540 COUNT EQU 60315
61120 3550 NCON DEFH 0
61122 3570 PTR DEFH 0
61123 3580 TPN0 DEFH 0
61124 3590 TELL DEFH 0
61125 3600 PERS DEFH 0
61126 3610 VB1 DEFH 0
61127 3620 VB2 DEFH 0
61128 3630 VB3 DEFH 0
61129 3640 FK1 DEFH 0
61130 3650 FK2 DEFH 0
61131 3660 OB1 DEFH 0
61132 3670 OB2 DEFH 0
61133 3680 UCU1 DEFH 0
61135 3690 UCU2 DEFH 0
61137 3700 UCU3 DEFH 0
61139 3710 UCU0B DEFH 0
61141 3720 UCU0C DEFH 0
61143 3730 CHRI DEFH 0
61144 3740 CHRI2 DEFH 0
61145 3750 CHRI3 DEFH 0
61146 3760 EXTR DEFH 0

```

Pass 2 errors: 00

```

AND EE64
CHR2 EE08
CHR3 EE09
COMRA EC74
COUNT EB98
DOUBLE ED28
DUNUB5 ED05
ENDCON EDA8
FILTER EC9A
FK1DUN EE61
FKFH0 EE9E
FKHCH1 EE34
FHD1 ED40
INIT EBF0
LAST ED47
LOOP1 ED17
LOOP2 ED37
LOOP5 EDCE
LOOP6 EDF9
LOOP7 EE24
LCON EEC3
HORE ED46
OB1DUN EE91
OB2 EEC8
OBHCH1 EEC8
PARSER 9A9A
PER5 EEC5
PTR EEC0
RSTRT EC0A
SETPTR EDB1
SHORT2 EE54
SINGLE EDB8
START EC4F
SHAP EC58
TPH0 EC22
VB1 EEC6
VB2 EEC7
VB3 EEC8
VBHCH1 EEC8
VCU1 EEC0
VCU2 EECF
VCU3 EED1

```

Table used: 826 from 850

variable PERS is given the value 2 (the number for Fred) corresponding to the person being addressed. Note that TELL is really only a flag which takes the value 1 or 0 according to whether speech is signified or not. It's the variable PERS which conveys the information about whom the player is trying to speak to.

So why do we need the extra variables on VB2 and OB2? Well, sometimes commands may involve two objects — and there may be instances when you want to distinguish between two slightly different types of action, such as putting objects ON or IN other subjects. Figure 2(c) shows the analysis of the command "PUT THE BOOK IN THE CHEST". See how the two verbs "PUT" (12) and "IN" (7) are picked up here, together with the two objects in order: "BOOK" (7) and "CHEST" (8).

The final example, 2(d) is of the type where speech to one person involves some kind of action with yet another person. And so the command "ASK PETER TO GIVE THE KNIFE TO JOHN" sets the speech flag (TELL) and sets PERS to 3 ("PETER"). As we'd expect, VB1 is 14 ("GIVE") and OB1 is 4 ("KNIFE") but in addition to this, FK1 has picked up the other person involved in the transaction ("JOHN"=4). We see here, by the way, how the separation of nouns into PEOPLE and OBJECTS eases the error checking process needed in every adventure. If a command is found to contain a verb such as "GIVE" or "FIGHT" (where some other person must of necessity be specified), it can be rejected as an unacceptable entry without further enquiry if FK1 is zero. Example 2(d) also illustrates the essential friendliness of VENTURESPEAK, particularly where speech commands are concerned. It matters not a jot what style of entry is used by the player — SAY TO PETER "GIVE JOHN THE KNIFE" for example, will be decoded with complete success by the parser.

I haven't mentioned how the system copes with multiple commands yet. Suppose the command GET THE SWORD AND GO NORTH has been entered. The parser will analyse the first part (GET THE SWORD) and then return to BASIC, but it will remember how far along the command it has scanned. If we LET MORE=PEEK 61123 (see above), the variable MORE will be assigned the value 1 — telling us in effect that another part of the command remains to be analysed. (For single commands MORE will be zero). This means we can arrange for the first command to be processed by an appropriate BASIC subroutine, and then test

Listing 2

Decimal dump of parser machine code.

ADDR.	BYTES	CHECK SUM
60400	33 158 235 34 190	650
60405	238 34 192 238 50	760
60410	155 235 95 22 0	507
60415	25 62 255 119 175	936
60420	59 198 238 88 197	731
60425	238 175 50 198 238	899
60430	50 199 238 50 200	737
60435	238 50 201 238 50	777
60440	202 238 50 202 238	931
60445	58 204 238 116 813	813
60450	238 50 192 238 175	883
60455	50 210 238 205 154	865
60460	238 50 210 238 254	1004
60465	1 202 79 235 42	550
60470	192 238 126 254 255	1065
60475	202 79 238 254 44	615
60480	202 75 235 254 46	813
60485	202 75 236 195 35	743
60490	236 35 34 192 238	735
60495	58 198 238 254 1	749
60500	204 88 236 201 50	779
60505	198 238 50 199 238	929
60510	50 198 238 202 744	744
60515	238 50 199 238 50	703
60520	201 238 50 197 238	924
60525	58 202 238 50 201	749
60530	238 201 42 190 238	909
60535	126 254 255 202 149	986
60540	238 254 44 202 139	875
60545	236 254 46 202 139	877
60550	236 35 195 119 236	821
60555	35 34 190 238 62	559
60560	1 50 195 238 201	685
60565	175 50 195 238 201	859
60570	126 254 34 204 246	964
60575	236 254 32 204 246	972
60580	236 254 58 204 246	998
60585	236 254 255 204 246	1109
60590	44 200 254 45 200	744
60595	35 126 254 32 202	649
60600	11 237 254 55 202	762
60605	11 237 254 45 202	748
60610	11 237 254 34 202	738
60615	11 237 254 255 202	959
60620	11 237 35 126 254	653
60625	32 202 40 237 254	755
60630	44 202 40 237 254	777
60635	46 202 40 237 254	779
60640	34 202 40 237 254	767
60645	50 202 40 237 254	791
60650	255 202 40 237 195	929
60655	172 202 35 126 254	824
60660	32 202 246 236 254	978
60665	34 202 246 236 254	972
60670	58 202 246 236 34	776
60675	192 238 201 42 192	865
60680	238 126 205 129 237	935
60685	237 91 205 238 71	842
60690	26 254 255 200 50	785
60695	198 238 19 26 194	661
60700	202 88 237 19 195	739
60705	23 237 42 192 238	732
60710	126 237 91 207 238	899
60715	71 35 126 79 255	516
60720	129 237 26 254 255	981
60725	200 58 194 238 19	701
60730	26 11 58 237 237	885
60735	128 188 202 77 237	884
60740	19 195 55 237 121	627
60745		
60750	109 202 86 237 19	733
60755	196 55 237 58 190	743
60760	238 254 0 194 181	787
60765	237 58 194 238 58	777
60770	198 238 201 50 199	894
60775	238 254 0 194 116	802
60780	237 58 194 238 50	777
60785	199 238 201 50 200	896
60790	238 254 0 192 50	742
60795	194 238 58 200 258	908
60800	201 35 245 126 254	861
60805	32 202 166 237 254	891
60810	34 202 166 237 254	893
60815	58 202 166 237 254	915
60820	255 202 167 237 254	1117
60825	44 202 167 237 254	904
60830	46 202 167 237 35	897
60835	195 131 237 35 34	632
60840	192 238 241 201 42	914
60845	192 238 126 205 100	861
60850	238 254 1 200 42	735
60855	192 238 126 50 215	821
60860	238 254 126 50 216	855
60865	238 35 126 50 217	866
60870	238 205 129 237 237	1046
60875	91 209 238 26 254	818
60880	255 202 245 237 205	1144
60885	73 238 202 224 237	974
60890	19 19 19 195 206	858
60895	237 205 84 238 202	966
60900	235 237 19 19 195	705
60905	206 237 205 92 238	978
60910	202 86 237 19 195	739
60915	206 237 237 91 211	882
60920	238 26 255 202	875
60925	32 238 205 73 238	786
60930	202 11 238 19 19	489
60935	19 195 249 237 205	905
60940	84 238 202 22 238	784
60945	19 19 195 249 237	719
60950	205 92 238 202 126	863
60955	238 19 195 249 237	938
60960	237 91 213 238 26	885
60965	254 255 200 205 73	987
60970	238 202 52 238 19	749
60975	19 19 195 36 238	587
60980	205 84 238 22 73	792
60985	238 19 19 195 36	587
60990	238 205 92 238 202	975
60995	158 238 19 195 36	646
61000	238 50 194 238 19	739
61005	26 71 58 215 238	688
61010	184 201 219 236 71	501
61015	88 216 184 201 897	391
61020	19 26 71 58 217	391
61025	238 184 201 254 65	942
61030	192 35 126 254 78	685
61035	192 35 126 254 68	675
61040	192 205 139 236 62	834
61045	1 58 21 58 21	358
61050	205 129 237 201 58	830
61055	194 238 71 58 203	764
61060	238 184 200 254 0	876
61065	194 145 238 120 58	747
61070	203 238 201 58 204	984
61075	238 184 200 254 0	876
61080	192 120 50 204 238	884
61085	201 58 194 238 71	762
61090	58 201 238 184 200	881
61095	254 0 194 177 238	863
61100	120 50 201 238 201	810
61105	202 238 184 200	882
61110	254 0 192 120 58	616
61115	202 238 201 0 0	641

Listing 3

Machine code loader program.

```

1 REM ** M/C LOADER
2 REM
3 REM
4 CLEAR 59999
5 PRINT "ADDR.",TAB 13;"BYTES"
6 PRINT "CHECK",TAB 26;"SUM"
7 FOR I=60400 TO 61115 STEP 5
8   PRINT I;
9   LET S=0
10  LET H=0
11  INPUT "NEXT BYTE?"X
12  POKE I+H,X:LET S=S+X:PRINT
13  TAB 6+H;"AND X<100;"AND
14  X<100;X
15  LET H=H+1:IF H<5 THEN GO TO 11
16  GO TO 12
17  INPUT FLASH 1;"CHECKSUM FOR THIS LINE?"C:PRINT TAB 27;"AND S<100;"AND S<100;S
18  IF C<S THEN PRINT "ERROR! ENTER THE LINE AGAIN."BEE
19  P 1,30:GO TO 30
20 NEXT I
21 SAVE "PARSER"CODE 60400,750

```

the variable MORE to see whether another analysis should follow, or whether a return to keyboard control is called for. However, the re-entry point to the parser routine is different should a continuation of analysis be necessary — on such occasions the parser is called with LET M=USR 60426. (This is because the usual entry at USR 60000

involves a tidying-up process which would cause the parser to "forget" the position it had reached on its previous scan).

A typical programming "flow chart", therefore, would be something like this:

- (1) CALL KEYBOARD ROUTINE (USR 60000)
- (2) CALL PARSE ROUTINE (USR 60400)
- (3) PROCESS COMMAND IN BASIC
- (4) "IF MORE THEN LET M=USR 60426" GOTO (3)
- (5) GO BACK TO (1)

I hope that by now you've begun to get some idea, in principle, of what VENTURESPEAK can do for your adventure writing. If you're burning for some "hands-on" experience, don't worry. You'll be able to try out all these examples (and as many others as you wish) yourself with the help of the EDITOR program next time, when I'll also be offering more detailed explanations of how to incorporate the system into your own programs. Till then ...

The first one is a brilliant addition for our giant REM project and we will be sending both contributors tokens of our appreciation . . .

I have sent you a contribution for your giant REM program. My machine code program will sort a specified character array into alphabetical order in a matter of seconds. eg. A 500 by 10 array in less than 2 seconds. This program is therefore very useful for filing programs.

The routine will only sort two dimensional character arrays and will produce an error code 2 if the variable has not been set up, or an error code 3 if the dimensions of the array are wrong the routine is called from basic by the command:

Where X\$ represents any character array. It is more convenient to define the variable, SORT, to hold the starting address and so the routine can be called by:

I have also written an example program to demonstrate my routine and this is listed from line 1000 onwards. To use this program simply change start address in line 1010 to the starting address of the routine.

Listing 1

If zeros are not liked any other character can be used by changing the 28 in line 50 to the code of the desired character.

Yours faithfully,
L.G. Baumann, Cowies Hill, S.A.

THE DISCOVERY COLUMN

John Wase with advice for Discovery Disc owners.

The Opus disc is notable for its reliability rather than speed in comparison with microdrives. If your principal use of the disc is for storing games, then reliability is probably the main criterion which you applied when you bought it. However, in contrast to a tape or a microdrive, a disc drive has the option of random access. In other words, if you specify a program out of fifty or so programs stored on the disc, then the disc operating system will immediately jump to the specified program. As you know, apart from the usual things one stores on tape, the disc system will also store lists of data, like telephone numbers. The Discovery unit is neat in the way it will set up special data files called Random Access Files: in this case it can jump to a specified item in the particular file. So if you just happen to be a tailor, and are storing the measurements of each of your customers' clothes on a separate file, the system allows you to pick out and load the file called "J.Jones" and then move immediately to, say, his arm or leg size.

Tracks and sectors

How is all this done? Well, the catalogue file occupies the first track on the disc, and the system always reads this first, comparing the information with that typed in (in our case, J.Jones). When it finds J.Jones on the catalogue file, it then reads information which tells it which track(s) and which sectors on those tracks are involved in storing the file. Then it knows which part of the disc to go to in order to find this information, which, of course, includes his arm or leg size.

Unfortunately, on the Discovery system, the catalogue file is only big enough to hold 110 records, and to make a living, you might want more than 110 customers. Well, the catalogue file can be expanded. I needed to do this for a specialised filing program, but unfortunately the Opus instruction book was printed before the catalogue file-handling routines were finalised, and in some versions which

include instructions, these actually don't work: if you have the later handbook, then the instructions have merely been omitted. The program in Figure 1 (which was obtained from Opus) should be used instead.

The listing

Having defined a function to simplify the reading of two-byte numbers (line 10) the program then asks you to input the drive number concerned and the number of blocks, or sectors (line 20). Line 30 opens the "CAT" channel to stream 0: stream 0 is a "funny" stream that doesn't always report errors. Line 40 then reads from the "CAT" channel and chickens out of more sectors are asked for than there is room. Finally, the new value is printed back to the "CAT" channel and the stream is closed (line 50).

Configuration of a Second Disc

Once you have got hold of the Discovery unit and become familiar with it, you might want to add a second disc unit with a power supply unit and the RAM chip, and you can get yourself almost a megabyte of storage in no time at all except that when you come to FORMAT the thing, all you get is 178K on the screen when it is catalogued. This is because the internal software, which as emptied itself from the EPROM into the RAM chip hasn't been told that there is a disc of a different configuration in drive 2. There are two ways to tell it, for now that the information is in the RAM instead of the EPROM, it can be altered. One way is to read an appropriately configured disc in the drive, i.e. borrow one from a friend. The internal software detects the configuration, and is altered accordingly. The other is to use a program to do it. Here is a program, direct from Opus, which will do the trick (Figure 2).

This program is constructed on much the same lines as the last. Thus, line 10 defines the familiar function, as before. Line 20 opens stream 0 direct to the Opus RAM, using the "CODE" channel. Line 30 checks the version; the program won't work with the old "Spectrodos" system.

Line 40 checks that the RAM has been properly fitted. Lines 50 and 60 use POINT to select an address, read a vector, adjust point and move to the new address, and repeat, so finding the location in which the information is to be stored. In line 70, you input the values for the number of sides (i.e. single or double sided), and the number of tracks (40 or 80). These are then put in the address which has been found (line 80), and the disc is formatted with the appropriate information in the title (line 90). If you have fitted your new disc as drive number 2, then change the "1" in line 90 to "2".

And . . .

If you have any programs or utilities for the Discovery disc, do send them for this column. We look forward to hearing from you.

Figure 1: Listing of the program to expand the catalogue file on the Opus system.

```
5 REM program "Expand Cat"
10 DEF FN a()=CODE INKEY#0+25
6*CODE INKEY#0
20 INPUT "drive:",d;"no of blocks",b
30 CLEAR #0: OPEN #0:"CAT":d
RND 16: POINT #0:2
40 LET m=FN a()*0+FN a(): IF b
>m THEN CLEAR #0: OPEN #0:d;"x"
OUT 2^31: STOP
50 POINT #0:1: RANDOMIZE FN a()
)*FN a()*0+b: PRINT #0:CHR$ PEEK
23670:CHR$ PEEK 23671: CLOSE #
0
```

Figure 2: Program to configure a disc

```
5 REM program "Config"
10 DEF FN a()=CODE INKEY#0+25
6*CODE INKEY#0
20 CLEAR #0: OPEN #0:"CODE "
30 IF USR B<2.1 THEN PRINT "Wrong version": STOP
40 IF USR 14070 THEN PRINT "RAM not fitted": STOP
50 POINT #0:B192: POINT #0:FN
a()+10: POINT #0:FN a()+1
60 POINT #0:FN a()
70 INPUT "Tracks (40,80):",t;"Sides (1,2):",s;"Insert new disk and press ENTER": LINE a$
80 PRINT #0:CHR$ t:CHR$ 18:CHR$
(65+4*(USR B<2.2)+16*(s=2))
90 FORMAT 1:STR$ t+" tr,"+STR$
s+" sd"
```




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Jewels of Darkness

**Peter Sweasey delivers
the verdict on the
revamped Middle Earth
Trilogy.**

**Jewels of Darkness
Rainbird
£14.95**

I very nearly didn't give this game a Monster Hit rating, but in the end I decided that even a below average Level 9 game is better than almost everything on the market. However, I'm extremely disappointed with Jewels Of Darkness; not so much for what it is, but because it isn't what it could so easily have been.

The games which form what was previously called the 'middle earth' trilogy are Colossal Cavern, Adventure Quest and Dungeon Adventure. The first is a version of the original mainframe game, with all the traditional puzzles, plus a special endgame where you rescue some elves in a race against time. Adventure Quest takes you, an apprentice magician, across varied terrain in your mission to destroy the Demon Lord. Dungeon Adventure is set just after said nasty's defeat, and sees you as an adventurer looting the treasure-filled caverns beneath his domain. The latter two have an obvious plot link but the first one "feels" very different and doesn't fit in particularly; the only common feature being the same starting point as AQ.

These are all well-crafted, enjoyable adventures, and no matter what I will shortly say this must be borne in mind. They remain impressive for their mass of locations and puzzles, the lengthy descriptions and varied responses (though not as wide-ranging as in Price Of Magik). In their original forms they have rightly become classics, and the versions in Jewels have been technically updated, though the actual games remain basically unchanged. They run faster and look (marginally) better. The sophisticated sentence constructions marvelled at in POM are mostly here too (like DROP ALL EXCEPT...). The marvelous type-

ahead multi-tasking feature is provided. The originals lacked an EXAMINE command; this has been added, along with other vocabulary dimensions through the additional information that can be gained. The combination of three tapes provides months of entertainment and problems solving for a bargain price. The Jewels of Darkness are a joy to play.

Why then am I not lavishing the games with further praise? It would have been easy for me to go into auto-pilot for this review (Level 9 — must be brilliant), but when looked at closely it contains faults which I would

criticise heavily in other games. Though these are minor shortcomings separately, taken together they spoil a potential masterpiece.

Presentation quality is poor. Descriptions, commands and responses are printed in the same yellow on black, with no gaps between them. Everything merges into an untidy mess, particularly if you play the full screen text version; yet this game above all others requires the player to read a tremendous amount. So why no use of a colour, or a more readable character set?

Then we have the 'graphics'. These are so stupefyingly





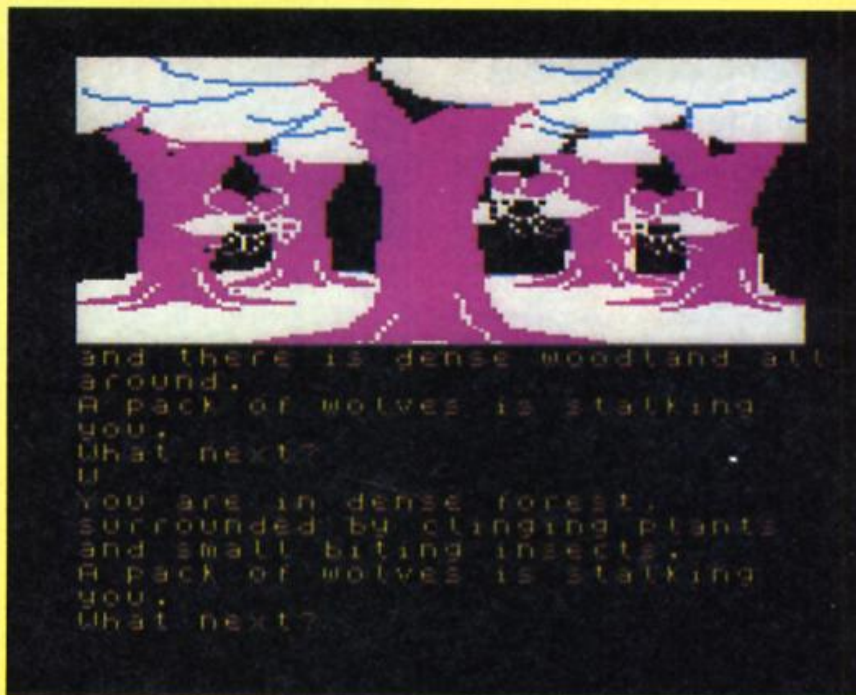
atrocious, so indescribably inept that I'd laugh if this wasn't a premier product. Just look at the lamentable screenshots we present here. I am not moaning at the inclusion of pictures — I realise they are necessary to gain wide distribution, and enjoy illustrations anyway — but these are so ghastly, no-one could want them. Have fewer of them, and make them monochrome, if it means higher detail and the creation of something worth looking at. Instead we have blotchy, vague shapes and mindlessly inappropriate colouring (purple trees?). An illustrated version of Colossal offers fascinating possibilities which L9 have completely thrown away. Fortunately, a non-graphics version with expanded text, mostly longer EXAMINE responses, is provided on the other side of the tape (ignore the cassette label which claims that side is for 128 users only — a stupid, unnecessary error.)

The games lack RAMSAVE/LOAD, which is fast becoming standard, and should certainly be included in such a major release as this. It is claimed the commands couldn't be fitted in the Spectrum's memory, though many of the versions for other computers include them, and they are tantalisingly mentioned in the instructions. Even if memory was too tight in the graphics version — and seeing as they had no difficulty including the commands in Price Of Magic, this surprises me — why are they not in the text-only version, utilising some of the memory freed by the welcome disposal of the "graphics"? I for one would prefer a few messages not to be expanded in exchange for these useful features. A double punishment is that when you resort to conventional tape storage, which in games this size is frequently necessary, you are forced to use the dreaded Lenslok: EVERY TIME! Why not have just one code to crack at the start?

There are other, tiny niggles which all add up. There's no abbreviation for LOOK, unlike virtually every adventure on the market. You are only given a score rating on death; if you type SCORE or QUIT, you are just given a number. If the rating routine is there in memory, why not use it? There are no proper editing facilities, just delete: annoying during long sentences.

Plus, I think more could have been done to update the games themselves. Some independent characters perhaps? And Colossal looks rather hackneyed these days, so some new problems would have been welcome.

Virtually every fault I've outlined is easily corrected. But

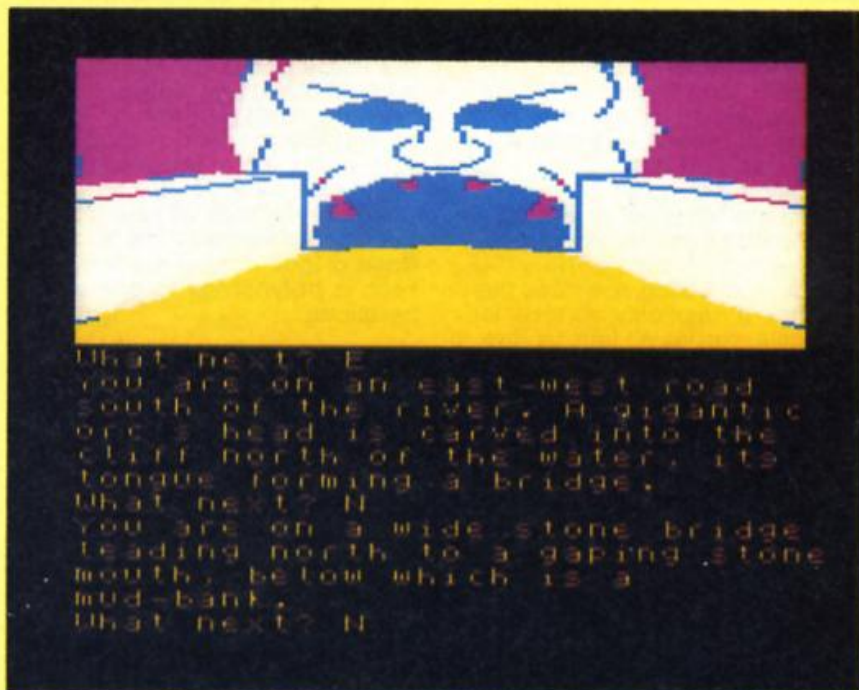


they're present, in what should be a particularly professional adventure, as a result of the Rainbird deal. Apart from the packaging, the BT tie-up seems to have had no effect. For example, there is no loading screen, just the same "Level 9" printed in different colours that has been used for several years. The adventures are good, so why not polish them to perfection? Nothing annoys me more than wasted opportunity.

The attractive packaging is better than most by the way. The instructions are excellent; plus there's a highly readable, entertaining novella, which sets the scene for the latter two games. I expected this to be dull, standard fantasy fare, full of silly names, but it was unexpectedly humorous and

gripping. Illustrations would have improved it though.

If you own more than one of these games already, then the revisions are probably insufficient to justify buying Jewels Of Darkness. If you have one or less, or if you are new to the world of adventuring or to the Spectrum, this package represents superb value for money and should keep you occupied for all the coming long, winter nights: perhaps the rest of 1987 as well!



Toni Baker rounds off the series with a look at the function generator.

There is just one calculator instruction left to cover. It is the function "series", otherwise known as the *function generator*, or *series generator*. Its code will be a value between 80h and 9F. The last five bits of the code form a parameter, so that 86h means "series 6", 8C means "series twelve", 99 means "series twenty-five", and so forth. This is the single most powerful instruction in the whole of the calculator set. It is the function with which SIN and EXP and others were written in the ROM. With it we may create our own designer functions, or implement mathematical functions which are not present (and not otherwise possible) on the Spectrum. The "series" function is the calculator's final frontier. Essentially, what the "series" instruction does is to evaluate a polynomial expression. "Polynomial" is simply a highbrow piece of mathematical jargon — it means an expression which looks something like this . . .

$$a_1 + a_2 X + a_3 X^2 + \dots + a_n X^{n-1}$$

I apologise to those of you not acquainted with mathematical notation. The same expression written in Spectrum BASIC would be as follows . . .

$$A(1) + A(2)*X + A(3)*X^2 + \dots + A(N)*X^{(N-1)}$$

The dots in the middle of the above simply mean "and so on until". If you know the value of N you can fill in the missing chunk and put the whole lot into a single BASIC expression. If you don't know the value of N then you would have to use a FOR/NEXT loop from 1 to N in order to work it all out. But what does it all *mean*? Let's take it apart and find out.

Firstly the number 'n' — this is called the "degree" of the polynomial (technically the degree is $n-1$, not n). The "series" instruction specifies the number 'n' explicitly, so that, for example, "series 6" tells us that n equals six; "series 8" would mean that n equals eight. The parameter, which is part of the hex code (bits 4 to 0) actually specifies the degree of the polynomial. You should note that since you only have five bits in which to specify this parameter, its maximum value (other than zero) is hex 1F, or thirty-one. Note also that if you specify n to be zero, the ROM will mistakenly interpret this as two hundred and fifty six.

MACHINE CODE



A polynomial expression such as we have been discussing consists of a number of terms, each separated by a "+" sign. The first term is a_1 , and the last term is $a_n x^{n-1}$. In general, the i -th term will be $a_i x^{i-1}$. The value of the whole polynomial is therefore the sum of all of its terms. There are n such terms, and each of them contains the variable 'x' (except the first one — this is because in the first term x would have to be raised to the power of zero, and anything to the power of zero is one). Because every term except the first one contains the variable 'x' (and the first term is simply a number to be added), it follows that the whole thing is simply a function of x . In other words — you put in a value for x at one end, and you get a new number out at the other. This is in common with all of the other functions of the Spectrum.

The 'x' in this case is the value at the top of the calculator stack. When the "series" instruction is encountered, the value 'x' is removed from the calculator stack, the expression is evaluated, and the result put back onto the calculator stack in place of the original 'x'.

All we need to know now are the value of the 'a's. You can think of the 'a's as being a BASIC array A() dimensioned up to n , so that the first term is simply $A(1)$, and the last term is $A(N)$ multiplied by $x^{(N-1)}$.

Before we look at how to specify the value of the 'A's, let's have a look at how we may use such a polynomial to calculate functions.

Polynomials

Suppose that the value of 'x' is somewhere between minus one and plus one (ie that x is greater than minus one, and less than one) — we can of course ensure this since we already know how to manipulate the calculator stack. If x is zero then the value of the polynomial will simply be a_1 , since all of the other terms will be multiplied by zero. If x is non-zero, but still between minus

and plus one, then $ABS(x^2)$ will be less than $ABS(x)$; $ABS(x^2)$ will be less than $ABS(x^3)$, and so on. It follows, therefore, that if the 'A's are all roughly the same size, then each term will be smaller than the last. Furthermore, if the 'A's themselves also get smaller (ie if $ABS(A(2))$ is less than $ABS(A(1))$; $ABS(A(3))$ is less than $ABS(A(2))$; and so on) then each term will be smaller still than the last. Indeed it is possible to ensure that the last term is so small, by comparison to the first term, that if any more terms were added it would be outside the limits of the computer's accuracy, and would thus make no more difference. For instance, if $A(1)$ equals 1, and if the last term equals 2^{-64} or less, then the Spectrum would have to round its answer up by simply ignoring the last term.

It is in theory possible to simulate any function whatsoever, provided that x is between minus one and plus one, that each term is suitably smaller than the last (although I can't go into the precise mathematical details of this condition in an article such as this), and that there are an infinite number of terms.

You see, with an infinite number of terms, we can make the polynomial closer and closer to the desired function with each new term. Unfortunately for us, we are only allowed a maximum of thirty one terms altogether. We can get round this problem by ensuring that the polynomial is close enough — it doesn't have to be *exactly* right. As long as the maximum error is smaller than the accuracy possible on the Spectrum, then the polynomial will calculate the function — at least to the limits of Spectrum accuracy.

So how do we work out the 'A's? — Well, mathematicians may care to use Taylor's or Maclaurin's Theorem (which I can't go into here), and everyone else will have to look the values up in books. Almost any A-level maths book (available from your local

library) will tell you what the correct series is to simulate SIN, or EXP, or whatever.

For instance, take the function 2^x . If x is between minus one and plus one then the function can be simulated by the following polynomial. 2^x is approximately equal to $1 + 0.69314718 \cdot x + 0.24022651 \cdot x^2 + 0.055504109 \cdot x^3 + 0.0096181291 \cdot x^4 + 0.0013333558 \cdot x^5 + 0.0001540353 \cdot x^6 + 0.000015252734 \cdot x^7 \dots$

(Incidentally — I didn't work out the above numbers — I got them out of a book. I advise you to do the same. Mathematicians are, of course, welcome to work as much out for themselves as they want).

How does this help us? Well — you see we are still restricted to only using values of x between minus one and plus one (note: if you want to use negative numbers on the Spectrum for the above formula you'll have to use " $x \uparrow 5$ " instead of " $x \uparrow 5$ ", and so on). This is no good — the Spectrum can calculate $\text{EXP}(x)$ for all values of x , not just small ones. To find the way round this problem we'll need to do a bit of maths. It's more difficult, but not, I hope, too difficult.

Firstly, note that $\text{EXP}(x)$ is defined as e^x , where $e = 2.7182818$

```
LET      u = x / (LN 2)
therefore: x = u * (LN 2)
therefore:  $e^x = e^{u \cdot (\text{LN } 2)}$ 
           =  $(e^{(\text{LN } 2)})^u$ 
           =  $2^u$ 
```

Now, since u is a floating point number, it must have an integer part, and a fractional part. Thus:

```
LET      i = INT u
LET      f = u - i
therefore: u = i + f
thus we   $e^x = 2^u$ 
have     =  $2^{i+f}$ 
           =  $(2^i) \cdot (2^f)$ 
```

Now, since f is a fraction, between zero and one, we can use a polynomial to simulate the function. The polynomial I gave earlier may be used to calculate 2^f . All we need to do now is to multiply the result by 2^i (where i is an integer). We can do this simply by adding i to the exponent byte of the five-byte form of the number. This is the procedure used by the ROM to calculate EXP for all values of x .

Listing 2

```
10 CLS
20 FOR I = 1 TO 255
30 LET X = I/12.5
40 LET Y = LN FN G (X)
50 LET J = Y*4+10
60 IF J<176 THEN PLOT I,J
70 NEXT I
```

Well, I won't bore you to tears with any more maths, but I hope you can see how ingenious little tricks like the above can be used to ensure that polynomial approximations are only used on numbers between minus one and plus one. Such ingenious little tricks are necessary, because the polynomial formula won't work with numbers outside this range (for instance — the value of $\text{SIN}(x)$ is always between -1 and $+1$, and yet, even if we used 256 terms, there would always be some large value of x for which $a_{256} \cdot x^{256}$ was greater than one. Clearly this would be the wrong answer. You must devise a means of ensuring that polynomial approximations to functions are always fed with numbers in range -1 to $+1$).

Instructions

Now — at last — we need to turn our attention to exactly *how* the values for the 'A's are passed to the "series" instruction. They are not specified explicitly — that would be too simple! Instead, we have to work out a new array, which I'll call $B()$, also dimensioned up to N . It is the values of the 'B's which are passed to the Spectrum. Therefore, our first task, knowing the value of the 'A's, is to work out the values of the 'B's. The BASIC program of Figure One will do this task for us. Don't worry too much about the algorithm used, just take my word for it — it works! (The mathematics required to prove that it works is beyond the scope of this article).

The program of Figure One doesn't print the 'B's in decimal — instead it prints them in the form required by the series instruction, converting them first to five byte form, and then to the compressed form used by the "stk-data" instruction. This form is also used by the "series" instruction.

Gamma Function

BASIC

```
DEF FN G(X) =USR gamma_fn
```

The number following the keyword USR should be the address of the label GAMMA_FN in the machine code program.

MACHINE CODE

EF	GAMMA	RST 28	x
C5		store M5	(M5 contains x)
31		duplicate	x,x
31		duplicate	x,x,x
27		int	x,x,INT x
03		subtract	x,x-INT x
31		duplicate	x,x-INT x,x-INT x
A2		const half	x,x-INT x,x-INT x,1/2
03		subtract	x,x-INT x,x-INT x-1/2
37		gt zero	x,x-INT x,x-INT x>1/2?
0066		jump true,G_HALF	x,x-INT x
89		series 9	
E412EAAF03			.00014011071

Listing 1

```
10 LET K = 0
20 INPUT "N = " :N
30 PRINT "N = " :N
40 DIM A(N)
50 FOR I = 1 TO N
60 INPUT "A(:"(I):" = " :A(I)
70 PRINT "A(:"(I):" = " :A(I)
80 NEXT I
90 GO SUB 340
100 PRINT
110 PRINT FN HS(N+128)
120 FOR I = 1 TO N
130 LET K = B(I)
140 LET Q = PEEK 23627 + 256*PEEK 23628
150 FOR C = 3 TO 1 STEP -1
160 IF PEEK (Q+C+2) = 0 THEN NEXT C
170 LET D = PEEK (Q+1)
180 IF D<81 OR D>143 THEN GO TO 210
190 LET D = D - 80 + 64*C
200 GOTO 240
210 LET D = D - 80
220 IF D<0 THEN LET D = D + 256
230 PRINT FN HS(64*C);
240 PRINT FN HS(D);
250 FOR J = 0 TO C
260 PRINT FN HS(PEEK (Q+J+2));
270 NEXT J
280 PRINT
290 NEXT I
300 STOP
310 DEF FN HS(A) = FN KS(INT (A/16))
    + FN KS(A-16*INT (A/16)) + " "
320 DEF FN KS(A) = "0123456789ABCDEF"(A+1)
330 REM CALCULATES VALUES SUBROUTINE
340 DIM B(N)
350 FOR A = 1 TO N
360 FOR B = 1+N-A TO N STEP 2
370 LET X = B-1
380 GO SUB 520
390 LET J = Y
400 LET X = (A+B-N-1)/2
410 GO SUB 520
420 LET J = J/Y
430 LET X = (B-A+N-1)/2
440 GO SUB 520
450 LET J = J/Y
460 LET J = J*2*(1-B)
470 LET B(A) = B(A) + J*A(B)
480 NEXT B
490 NEXT A
500 RETURN
510 REM LET Y = X FACTORIAL
520 LET Y = 1
530 FOR I = 1 TO X
540 LET Y = Y*I
550 NEXT I
560 RETURN
```



```

E7C62C2805      -.0015119361
EA0DCEC143      .0086552512
EC8C3556A3      -.034230555
ED5A25B37E      0.10651722
EF86344D75      -0.26211779
F018F3752D      0.59746487
FOEA14CE2B      -0.91437996
F17FDCCB17      1.9989256

```

```

                                x,GAMMA(x+1-INT x)
01      exchange      GAMMA(x+1-INT x),x
27      int           GAMMA(x+1-INT x),INT x
A1      const one    GAMMA(x+1-INT x),INT x,1
03      subtract     GAMMA(x+1-INT x),INT(x)-1
31      duplicate    GAMMA(x+1-INT x),INT(x)-1,INT(x)-1
30      eq zero      GAMMA(x+1-INT x),INT(x)-1,INT(x)=1
0017     jump true,G_1_TO_2 (Jump if INT(x)=1, ie if x is between
                                one and two).

                                GAMMA(x+1-INT x),INT(x)-1
31      duplicate    GAMMA(x+1-INT x),INT(x)-1,INT(x)-1
36      lt zero      GAMMA(x+1-INT x),INT(x)-1,INT x < 1
0017     jump true,G_LT_1  (Jump if INT(x) < 1, ie if x < 1).

```

The following deals with the remaining case, ie if x is greater than or equal to two.

```

38      end calc     GAMMA(x+1-INT x),INT(x)-1
CDD52D   CALL FP_TO_A A:= INT(x)-1
47      LD B,A       B:= INT(x)-1
EF      RST 28      GAMMA(x+1-INT x)
A1      const one   GAMMA(x+1-INT x),1

```

At each pass around the following loop, the topmost item on the calculator stack is assumed to be the "product-so-far", which I shall refer to as P_b . At any stage this will actually be the product $x(x-1)(x-2)\dots$ to $\text{INT}(x)-1-B$ terms. In addition, memory five will contain $x-\text{INT}(x)+B+1$.

```

                                GAMMA(x+1-INT x),P_b
E5      G_LOOP_1     recall M5    GAMMA(x+1-INT x),P_b,x-INT(x)+B+1
A1      const one    GAMMA(x+1-INT x),P_b,x-INT(x)+B+1,1
03      subtract     GAMMA(x+1-INT x),P_b,x-INT(x)+B
C5      store M5
04      multiply     GAMMA(x+1-INT x),P_b-1
35FA    djnz G_LOOP_1 GAMMA(x+1-INT x),P_0

```

At this stage the topmost item on the calculator stack is $x(x-1)(x-2)(x-3)\dots K$, where K is less than two (but greater than or equal to one).

```

04      multiply     GAMMA(x)
38      end calc
C9      RET         Return with correct value on calc stack.

```

The following applies for the case $\text{INT}(x)=1$. Note that since $\text{INT}(x)\neq 1$ it follows that $\text{GAMMA}(x+1-\text{INT } x)$ actually equals $\text{GAMMA}(x)$, and that $\text{INT}(x)-1$ equals zero.

```

EF      RST 28      GAMMA(x),0
02      G_1_TO_2    delete      GAMMA(x)
38      end calc
C9      RET         Return with correct value on calc stack.

```

The following deals with the case where x is less than one.

```

EF      RST 28      GAMMA(x+1-INT x),INT(x)-1
1B      G_LT_1      negate      GAMMA(x+1-INT x),1-INT x
38      end calc
CDD52D   CALL FP_TO_A A:= 1-INT x

```



In other words, if you input the 'A's — which technically are the coefficients of a power series (don't worry if you don't understand the terms), then the program will miraculously transform the numbers into a new set of numbers — those used by the "series" instruction. The program leaves no work to you at all. The output of the program is the complete series instruction (in hex) required to evaluate the required polynomial, including the initial "series" byte. For extra clarity, you could, if you so desired, add an extra BASIC line at 285 `PRINT B(1)` which would show you the 'B's in decimal as well as in hex.

If you now feed the bytes printed on the screen into a calculator program, then hey presto — your function will be operational!

Gamma

We shall demonstrate this procedure now by introducing a brand new function to Spectrum BASIC. It will be referred to in BASIC as `FN G()`, but the function will be defined mathematically as the `GAMMA` FUNCTION. It is very similar to the `FACTORIAL` function described last month, in that $\text{GAMMA}(x)$ equals $\text{FACTORIAL}(x-1)$ for all positive integer values of x, but whereas `FACTORIAL` only works for integers, `GAMMA` works for *all* numbers. A graph drawn of $Y = \text{GAMMA}(x)$ will form a smooth continuous curve, and for all values of x it is true that $\text{GAMMA}(x+1)$ equals $x * \text{GAMMA}(x)$.

Furthermore, I shall go through, in detail, the process by which the function is being created. First of all we need a polynomial. I came across such a polynomial approximation in the book "Mathematical Methods in the Physical Sciences" by Merle C. Potter. The polynomial is only valid if x is between 0 and 1, but is more accurate if x is near zero. For this reason I have chosen only to use values of x between 0 and 1/2. The polynomial calculates the value of $\text{GAMMA}(x+1)$ if x is in this range. The polynomial is as follows:

$$\begin{aligned} \text{GAMMA}(x+1) = & 1 - 0.577191652x \\ & + 0.988205891x^2 - 0.897056937x^3 \\ & + 0.918206857x^4 - 0.756704078x^5 \\ & + 0.482199394x^6 - 0.193527818x^7 \\ & + 0.035868343x^8 \end{aligned}$$

Now, as I have said, I want to make sure that the polynomial is only used for values of x between 0 and 1/2, and yet I want the `GAMMA` function, `FN G()`, to work for all values of x, so we must find a way around this problem.

Firstly, we can make use of the rule $\text{GAMMA}(x+1)$ equals $x \cdot \text{GAMMA}(x)$. We can use the rule repeatedly (in a loop) to reach any value of x , so long as the fractional part (the part to the right of the decimal point) is no greater than a half. For these remaining numbers we can use a different mathematical rule; for all x , $\text{GAMMA}(x) \cdot \text{GAMMA}(1-x) = \pi / \sin(x \cdot \pi)$

The first step, then, is to convert the polynomial into a "series" instruction. To do this we simply run the BASIC program of Figure One, and input 9 (because there are nine terms), and then input the nine numbers (1, -0.577191652, and so on). The program will print out the required form of the "series 9" instructions, which you will find incorporated into the main machine code program accompanying this article. The rest of it is just a hard slog, isolating the various cases, and dealing with them accordingly.

Incidentally, although I have used a loop to implement the $\text{GAMMA}(x+1) = x \cdot \text{GAMMA}(x)$ rule, this is not the only way of doing things. Another way would have been to call the GAMMA subroutine recursively (ie from within itself). I decided not to use this method because it would use up more memory on the calculator stack (an additional five bytes for each recursive call), but if you feel that that would not be too much of a disadvantage you might like to re-write the routine using this method.

Finally, the proof of the pudding is in the eating. The final test is whether or not it works. One way we can check is to calculate $\text{GAMMA}(1/2)$ — the answer should come out to be $\sqrt{\pi}$. The best way to check, however, is to plot a graph. The function should produce a smooth continuous curve. The BASIC program of figure two will plot such a graph, and I will leave it to you to draw your own conclusions from it.

Well that's it from me for this series. We have now covered everything the calculator can do (or have we?). We have covered every single calculator instruction possible (or have we?). This now concludes our series. I hope you have enjoyed reading it. Good programming, and may the force be with you.

(But — just a thought — what would happen if you used "invalid" calculator codes? codes between 3E and 7F? With code 43h for instance, control could be directed into RAM, and enable the use of user-defined calculator instructions — defined in machine code of course. Interesting? Maybe one day the saga may continue . . . But not for the moment).

47	LD B,A	B:= 1-INT x
EF	RST 28	GAMMA(x+1-INT x)
A1	const one	GAMMA(x+1-INT x),1

At each pass around the following loop, the topmost item on the calculator stack is assumed to be the "product-so-far", which I shall refer to as P_b . At any stage this will actually be the product $(x+1)(x+2)(x+3) \dots$ to $1-\text{INT}(x)-B$ terms. In addition, memory five will contain $x+1-\text{INT}(x)-B$.

E5	G_LOOP_2	recall M5	GAMMA(x+1-INT x), P_b
31		duplicate	GAMMA(x+1-INT x), P_b , $x+1-\text{INT}(x)-B$
A1		const one	GAMMA(x+1-INT x), P_b , $x+1-\text{INT}(x)-B$, $x+1-\text{INT}(x)-B$
0F		add	GAMMA(x+1-INT x), P_b , $x+1-\text{INT}(x)-B$, $x+2-\text{INT}(x)-B$
C5		store M5	
02		delete	GAMMA(x+1-INT x), P_b , $x+1-\text{INT}(x)-B$
04		multiply	GAMMA(x+1-INT x), P_{b-1}
35F8		djnz G_LOOP_2	GAMMA(x+1-INT x), P_0

At this stage the topmost item on the calculator stack is $(x+1)(x+2)(x+3) \dots K$, where K is less than one, but greater than or equal to zero.

05		divide	GAMMA(x)
38		end calc	
C9		RET	Return with correct value on calc stack.

Finally, note that numbers such that $x-\text{INT}(x) > 1/2$ are dealt with separately, for greater accuracy. These are numbers such as -1.5 to -1; -0.5 to 0; 0.5 to 1; 1.5 to 2; and so on.

EF		RST 28	x,x-INT x
02	G_HALF	delete	x
31		duplicate	x,x
A1		const one	x,x,1
01		exchange	x,1,x
03		subtract	x,1-x
38		end calc	x,1-x
CD7???		CALL GAMMA	Call the GAMMA subroutine recursively.
EF		RST 28	x,GAMMA(1-x)
01		exchange	GAMMA(1-x),x
A3		const pi/2	GAMMA(1-x),x, $\pi/2$
38		end calc	
34		INC (HL)	GAMMA(1-x),x, π
EF		RST 28	
C4		store M4	(M4 contains π)
04		multiply	GAMMA(1-x),x, π
1F		sin	GAMMA(1-x), $\sin(x \cdot \pi)$
04		mult	GAMMA(1-x)* $\sin(x \cdot \pi)$
E4		recall M4	GAMMA(1-x)* $\sin(x \cdot \pi)$, π
01		exchange	π ,GAMMA(1-x)* $\sin(x \cdot \pi)$
05		divide	$\pi / (\text{GAMMA}(1-x) \cdot \sin(x \cdot \pi))$
38		end calc	GAMMA(x)
C9		RET	

It can be shown algebraically that $\pi / (\text{GAMMA}(1-x) \cdot \sin(x \cdot \pi))$ is equal to $\text{GAMMA}(x)$. The proof of this is beyond the scope of this article, however I have made use of this fact to ensure maximum accuracy. It means that the "series" instruction is only ever passed values of x between zero and half. The last part of the program links the machine code to the BASIC DEF FN G statement.

2A0B5C	GAMMA_FN	LD HL,(DEFADD)	Point HL to user-define function record.
23		INC HL	
23		INC HL	HL: points to 5-byte form of 'x'.
CDB433		CALL STACK_NUM	Place x on calculator stack.
CD7???		CALL GAMMA	Calculate GAMMA(x).
C1		POP BC	Delete STACK_BC address from machine stack.
C9		RET	

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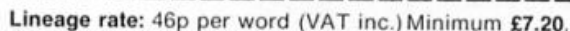
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Taking the latter first, Eastmon make a big thing about the fact that the DEFB's following a RST28 command are correctly interpreted (the 'use the calculator' command as Toni Baker's fans will know). It also correctly copes with the Interface 1 RST's.

You may or may not find this important, its useful to know that it'll cope though, especially if you use them a lot.

The program comes complete with a comprehensive, wordprocessed, dot matrix printed, fourteen page manual. It's all in there, but if your eyesight is not 20/20 then you may have problems with the tightly packed text.

Yep, it's easy to use and all the features that you are likely to need have been included, full printouts to any type of printer system and full details of the state of all registers at each step.

There is a choice of output, either a straightforward address, code, mnemonic print or a full frontal, everything exposed, printout in minute detail.

It may be late in arriving but it certainly does not suffer in comparison with established existing monitors. If you haven't got one and you spend a lot of time programming in machine code then this is highly recommended, it will certainly provide you with the information needed to track down that elusive bug; even in RST28 sections!

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Apart from working with most interfaces, ZXPRINT 3, KEMPSTON E etc (we tried it with them and it worked fine), the program provides options to invert the printed screen or add 'texture' in coloured sections to the copy.

You cannot create screens or pictures with it, these have to be generated by another graphics package such as their own excellent ANIMATOR1. In fact I would go so far as to suggest that it was developed as companion to this program and its more general application led them to market it separately.

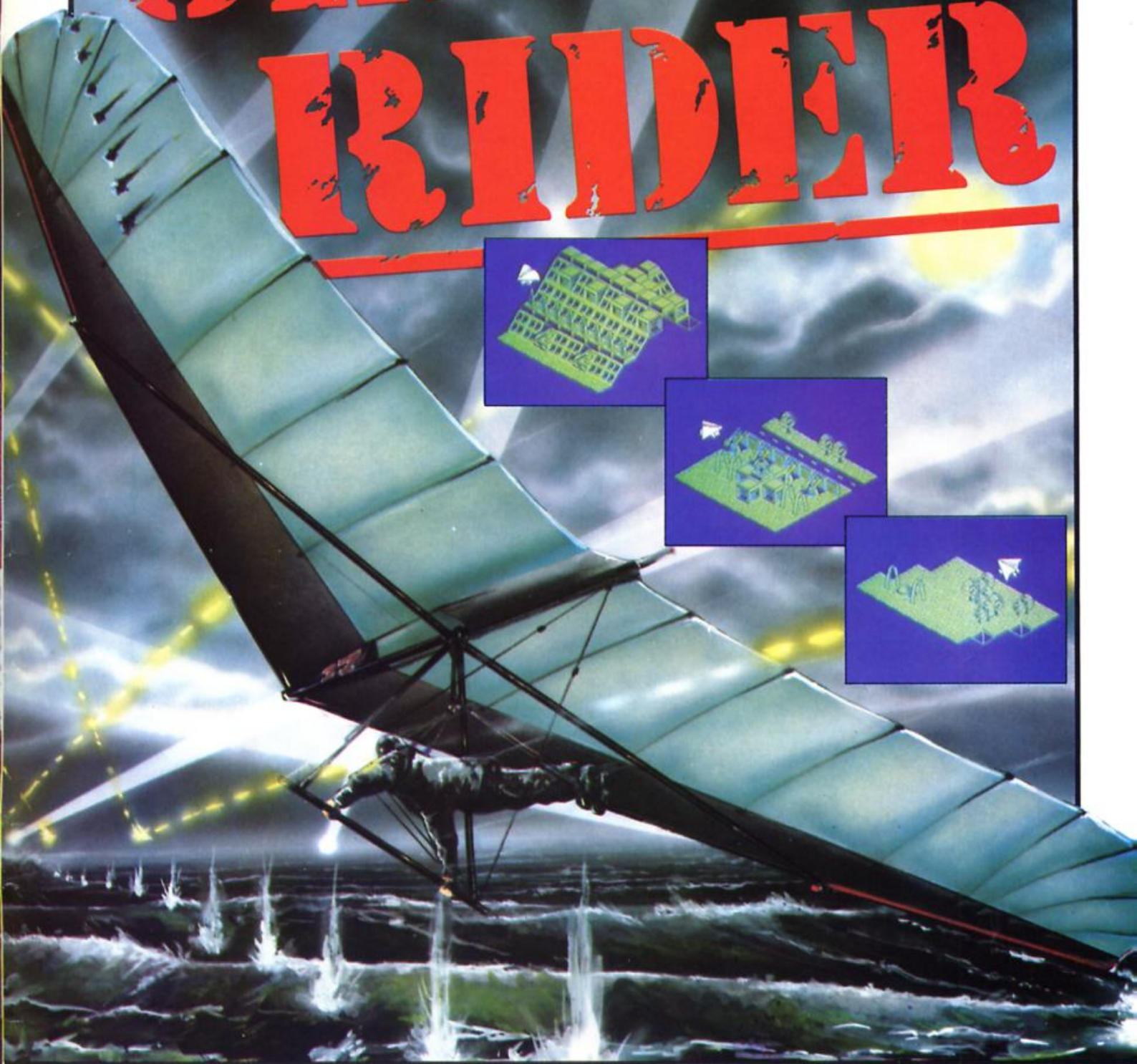
This is a simple and easy program to use and includes microdrive options, the only real difficulty came when fiddling with the expanded sections of a picture for the jumbo prints, but this isn't really a job you're likely to do too often anyway.

Really it would be more appropriately named Screen\$ Printer, but I have no quibbles and if you need the specialist functions of flexible screen\$ printing then this is the best I have seen (so far).

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