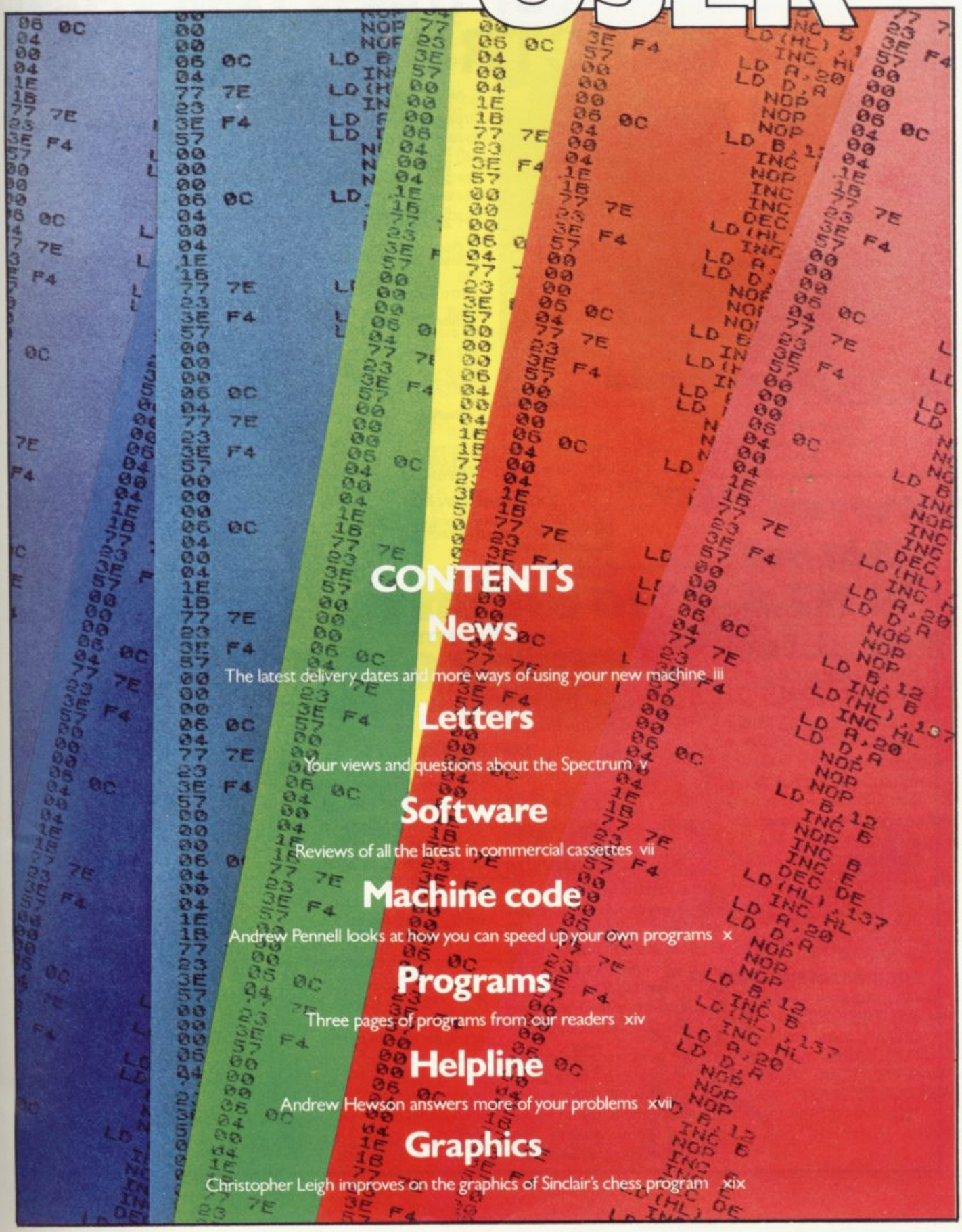
SPECTRUM USER



CONTENTS

20 BEST PROGRAMS for the ZX SPECTRUM £7.95

Mr HELPLINE — the man who answers your ZX queries in his column in *Sinclair User*, the author of HINTS & TIPS FOR THE ZX80 and HINTS & TIPS FOR THE ZX81 now presents his 20 BEST PROGRAMS FOR THE ZX SPECTRUM.

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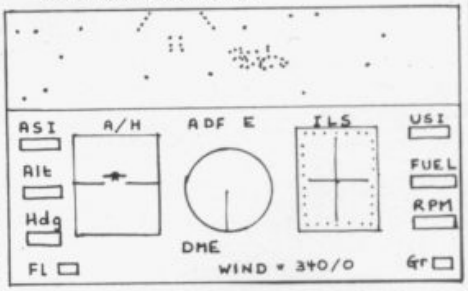

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Z80 OP CODES £1.45

A must for the beginner and the experienced programmer alike. This hand ready reckoner lists all 600 plus Z80 machine code instructions in decimal and hexadecimal with their mneumonics. Each Op Code is succinctly explained and cross-referenced. Supplied in a protective transparent wallet for easy reference and durability.

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Toolkit functions include:

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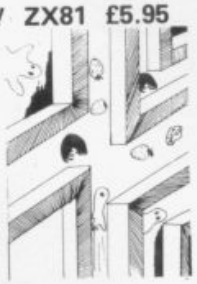

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Major link with Prestel promised early next year

A HUGE increase in the facilities available to owners of the Spectrum is promised early next year. A database of between 25,000 and 30,000 pages is being set on Prestel which can be used by Spectrum owners for the cost of an adaptor, which is expected to be produced for less than £50; an annual subscription to the database, possibly about £1 a week; and the price of a normal telephone call.

Called Micronet 800, eventually it will be available to owners of a wide range of micros, once adaptors have been produced for them. The Spectrum is one of the first machines for which an adaptor is being built.

Richard Hease, the man behind the scheme, says that the database will be set up by Christmas and he hopes the Spectrum adaptor will be ready early in January. One for the ZX-81 should follow shortly afterwards.

"I see these adaptors being needed only in the short term. Eventually I expect computer manufacturers to see the benefits of using this database and to include hardware needed within the machine," he says.

Subscribers to Micronet 800 will be able to get programs for the home, business and education, have the latest news and reviews on what is happening in the world of micros, and have the use of Telex and the handling of messages.

In the longer term it is intended to develop systems for specialised business areas.

The Micronet adaptor also allows users access to the existing database which is available on Prestel.

RICHARD HEASE
'I expect manufacturers to see the benefits'

Micronet 800 is a consortium of Prestel, ECC Publications which publishes *Sinclair User*, EMAP Computer and Business Publications/Telemap and Prism Microproducts.

CLIVE SINCLAIR
Apologised for delay

High hopes of end to delays

HOPES were high at the time of going to press that the backlog of deliveries for the Spectrum would have been removed by the end of September.

In a letter to *Spectrum User*, Clive Sinclair has apologised for the delay and offered a £10 voucher to those who have continued to wait. The voucher can be used against the cost of a ZX printer or rolls of printer paper.

He says production is running at 5,000 a week and should be increasing quickly.

It is expected that once the backlog has been cleared and production is keeping pace with demand from mail order, Sinclair Research will let the situation continue before making any decision about making the machine available in retail outlets.

A spokesman for the company said that although it was likely the Spectrum would follow the ZX-81 into the shops, there were too many imponderables at the moment for a decision to be taken soon.

It is unlikely that it will be available in the shops before Christmas. Last year the ZX-81 went on sale in W H Smith and was launched in the U.S. before Christmas and the resulting surge in demand caused delivery delays.

Nigel Searle, head of the computer division, has already said the mistake will not be repeated in connection with moving into the U.S. with the Spectrum.

Converter for 16K RAM is launched

MEMORY troubles are over on the Spectrum because of a new device from Steven Adams, called a RAM Converter. It is an adaptor which can be fitted on to the back of the Spectrum via the expansion bus allowing a 16K RAM pack, usable on the ZX-81, to be connected.

The converter will also allow the use of other add-ons while it is working. The add-ons must be memory-mapped from 16K to 32K of the machine memory.

Adams decided to make the converter because his work required more memory than the Spectrum 16K allowed. "I thought that it was such a waste to have all that ZX-81 gear hanging around."

The Converter is available for £7.

Sinclair replies to the critics

IN RESPONSE to many queries which I understand your magazine has received, I would like to explain the delivery situation for our new ZX Spectrum personal computer.

The response of the general public to our new computer has far exceeded our expectations and we have been swamped with orders. This and some small initial production delays have led, in turn, to considerable delays in delivery.

Regrettably, many of our customers may have to wait up to 12 weeks, from our receipt of their order, for delivery of their Spectrum and we are writing to them all to apologise for the inconvenience and to offer them the chance of an immediate refund.

For those customers who continue to wait, we shall be sending with each Spectrum, in compensation for the delay, a £10 voucher, which can be used in part-payment for a ZX printer or to buy a complete pack of five rolls of printer paper. We are also providing customers with a new demonstration tape containing:

A complete keyboard trainer to introduce the Spectrum.

Three major programs — an exciting game, Through the Wall, a drafting program, Draw, and Character Generator, which demonstrates user-defined graphics.

A series of illustrative programs — Bubble Sort, Evolution, Life, Monte Carlo and Waves.

I would like to assure you and all our customers that the initial problems with the Spectrum have now been completely overcome. Production is running smoothly at 5,000 units per week and will rise sharply in the coming months.

We are confident that our present back-log will be cleared by the end of September and hope that you will see current delays in the context of our successful delivery of more than 500,000 computers in the last two years.

Clive Sinclair,
Sinclair Research Ltd.

Growing software

I WAS very interested in your article on the Sinclair ZX Spectrum but I would like to know if programs for the ZX-81 could fit into the ZX Spectrum. If not, why are there no games for the ZX Spectrum of which I have heard?

Andrew McInees,
Ashton-Under-Lyne.

WITH THE information now available for the Spectrum I am thinking of buying one but as yet I have not seen much software for it.

Can the same amount of software be available for the Spectrum as the ZX-81. As there was no competitor for the ZX-81 we saw a flood of software for it.

Can the same be expected for the Spectrum with the news of Vic 10, a new Acorn and even a ZX-83 next year?

S Plumpton (age 15),
Maghull,
Liverpool.

• Sinclair Research says that ZX-81 programes can be converted for the Spectrum with relatively minor changes, as Spectrum Basic is a super set of ZX-81 Basic but, regrettably, ZX-81 cassette programs cannot be used with the Spectrum. There are, however, a growing number of commercial tapes on sale.

Colour printer

CONCERNING YOUR article Sinclairvoyance, in the July issue, the colour printer is already here, at least in prototype form.

Earlier this year Sony announced its Mavika system camera, a video camera producing still pictures on a 50-exposure video disc. The camera will be supported by a television interface for viewing and an "inexpensive" colour printer capable of producing inprint quality non-photographic prints. The system is due to be launched in 1983.

The first ZX hardware company to produce a Mavika-ZX interface should have an eager market.

The Mavika was received by the British Journal of Photography a few months ago. By now it may have more information on the printer.

Tony Bewlay,
Iver, Buckinghamshire.

Readers expect

I WOULD like to take this opportunity to congratulate you on your very good publication. I have found it of great use when using my ZX-81 and especially like the simplicity of the writing style, although this does not stop the articles being really informative.

Now I have purchased a Spectrum and expect your magazine to be of equal merit for this in the future.

S P Bird,
Southall, Middlesex.

Flickering doubt

FIRST I must congratulate you on your review of the Spectrum, which prompted me to order one. Having been a former ZX-81 owner. I am still wondering whether my new Spectrum will have the same flickering screen output when programmed in Basic.

As I want to program in Basic and not Assembler, I do not want a horrible flickering screen. Please could you find out, as no one I know has seen the Spectrum?

C.A. Howes,
Thornbury,
Plymouth.

• According to Sinclair Research there should be no problem with flickering screen output for the ZX Spectrum.

New horizons seen by Psion

HORIZONS is the new software cassette from Psion which is to be included in all orders of the Spectrum from now. It consists of a series of programs which will help the beginner master the machine. It is a welcome companion to the manuals.

The programs on side A include a description of the hardware architecture of the Spectrum, a keyboard trainer which explains the various functions and takes the learner around the keyboard, and a dictionary of the keywords on the keyboard. The dictionary is particularly useful to the beginner who is just learning about the version of Basic used on the Spectrum, pressing any key on which brings up the definition of the corresponding keyword on to the screen.

Side B includes several games, a program to design graphics characters and a program which is used to draw high-resolution graphics pictures.

The games on side B are very colourful and use user-definable and high-resolution graphics wherever possible. There is a good version of **Breakout**, which is very addictive.

Also included on side B are a sophisticated version of **Life**, a Bubblesort routine, and **Monte Carlo.**

The presentation cassette is very good. It should keep Spectrum users happy for hours and is well worth waiting for.

Complex patterns

THE GRAPHICS capabilities of the Spectrum take a good deal of exploring and getting used to. With a good knowledge of them you can produce very detailed pictures on the printer or the screen. Until then you could use **Phantasmagraphics.** The program demonstrates just what can be done with the Spectrum graphics. It produces 2D and 3D shapes on the screen according to the dimensions you enter at the start. The program also gives you control over the Ink and Paper and Border colours.

The display build-up of the 3D shapes is slow but that is the fault of the Spectrum graphics system and not of the program. It is interesting to see how the shapes build slowly and how they are formed.

Phantasmagoraphics can be obtained from Saxon Computing, 3 St. Catherine's Drive, Laconfield, Beverley, Humberside, for £6.95.

Golf in hi-res

THE high-resolution graphics of the Spectrum make games like this version of **Golf** possible. The computer displays the layout of each hole, using user-definable graphics for the fairway, rough, bunkers, woods and greens.

The ball is shown as a flashing dot until the player decides to play.

The player must first enter the direction of his shot, a number from one to twelve as on a clock face, and decide how hard the ball is to be hit.

The ball will then move to the new position on the screen. It could finish in the woods or in a bunker.

There are several tips which could be given as to how to get out of the woods and bunkers.

The courses are created randomly but there seems to be some kind of order to the conditions on certain parts of the course.

The game requires a certain amount of skill and patience. For someone who wants a quick arcade-type game it is not ideal. For the person who likes to reason-out moves, who likes quiet games of cunning and skill, this is a good game.

There are two lengths of course included in the game. You can go onto an eight-hole course or on the longer 18-hole course.

Golf is a good competitive game for one or two players, although there is no reason why any number of players should not take part in a tournament. It is pot luck as to whether you will get an easy hole or a difficult hole but that is all part of the game.

The scoring system of the game uses the par of the various holes on the course. After each hole the par for the

hole and the course so far is given. At the end of the course the overall par is given. So far we have managed only 22 over par.

Golf is available from R and R Software, 34 Bourton Rd, Gloucester GL4 0LE, for £3.75.

Storming meteors

THE meteors are rushing thick and fast in the new Quicksilva version of **Meteor Storm** for the Spectrum.

The player has three ships with which to wreak havoc on the screen. There are three types of asteriod to avoid or crash into, depending on how the feeling takes you. Once hit, the asteriods break into smaller versions of themselves and can still be dangerous. Two types of enemy saucer fly across the screen at odd intervals, giving the space pilot even more about which to worry.

The game is similar to the one produced by Quicksilva for the ZX-81 some months ago. The difference is that the screen display is in high-resolution graphics and the player's ship can move around the screen and go into hyper-space if it is in trouble.

As with the other Quicksilva game for the Spectrum, Space Intruders, Meteor Storm has an attract mode which informs the player of the points system and the play keys. It also provides a sample game to get the player used to the display.

Another interesting feature of this game is its capability for speech. This is from the Spectrum speaker during the game. It is not really loud enough to be intelligible.

Meteor Storm is produced by Quicksilva, 92 Northam Road, Southampton, Hampshire SO2 0PB, and costs £5.95.

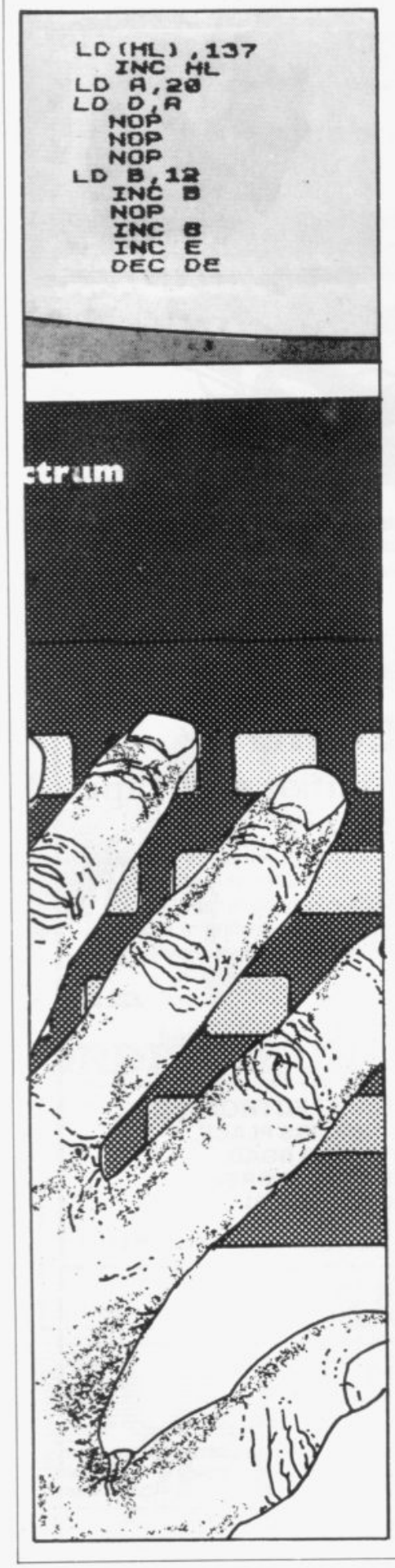
Avengers take wing

BEING BOMBED by a flock of alien birds from the depths of space can be an experience and it is in a new game for the Spectrum called **Winged Avenger,** which is based on the arcade game **Phoenix.**

Your laser base is at the bottom of the screen and you can switch-on a defence shield to protect if from the evil aliens.

The first three assaults on your base are carried-out by drones in an effort to soften you for the main attack by the big birds. The avengers flap about the screen in formation trying to destroy your base with laser and bomb.

You can return fire but the aliens are really difficult to hit. Winged Avenger is available from Work Force, 140 Wilsden Avenue, Luton, Beds. It costs £6.95.



Andrew Pennell looks at the architecture of Sinclair Research's new machine and finds there is much to interest the Zilog enthusiast as it is the first Z-80-based home computer with high-resolution graphics and colour

Finding ways of making use of machine code on the Spectrum

THE SINCLAIR SPECTRUM is the only Z-80-based home computer with high-resolution graphics and colour and represents a great challenge to Zilog enthusiasts.

The main difference between its predecessor, the ZX-81, and the Spectrum is the fact that the Z-80A is no longer used for the output of the television display, so that any programs run at the speed of the ZX-81 in FAST mode. The Ferranti custom-built ULA handles all the television display, by sharing the screen RAM with the Z-80.

As an assembler is not yet available for the Spectrum, Basic machine code must be entered in hex, and the powerful user-definable functions can be used to good effect converting between decimal and hex. The listing opposite shows several examples of the methods possible:

Those functions can then be used for assembly and disassembly.

I have only just begun to disassemble the ROM but already have discovered some very useful features. The RST codes do similar things to those on the ZX-81 but with two important differences.

RST 00 is equivalent to a switch-on and checks the RAM and sets up the system variables. RST 08 is used to terminate a program with an error message. When executed, the byte following the RST 08 instruction is taken as one less than the required report code. Thus, if the byte is 03, error 4 occurs and the message 'Out of memory' is produced. An interesting effect can be achieved if the byte is 28 (1Ch), when an error T occurs with the message '*f* 1982 Sinclair Research Ltd,'. That is an accidental result of the layout of the error message data.

> 'As an assembler is not yet available, basic machine code must be entered in hex and the user-definable functions can be used to good effect converting between decimal and hex.'

RST 10 is the print-a-character routine and is the only known way to output characters in machine code. On all other systems, the screen is memory-mapped, with each character occupying a byte. The Spectrum screen, however, is only bit-mapped, so it is impossible to POKE characters to the screen — only their colours.

Thus, to print a character at X,Y — taking 0,0 as top left — in machine code, it is necessary to load the accumulator sequentially with four bytes and execute a RST 10 after each. First, 22 (16h), the AT control character, then Y, then X, and finally the code of the character to be printed should each be output. All the values of the registers are preserved, as the alternate set is used.

●RST 18 loads the accumulator with the code of the character to be interpreted.

●RST 20 obtains the next character to be interpreted, ignoring any colour control codes.

●RST 28 is the complex floating-point calculator routine and works in a similar way to that on the ZX-81, by interpreting the data bytes which follow it. Note that the bytes are different and that, in particular, the EXIT byte is 38h and not 34h.

●RST 30 is the making-room routine and increases the workspace by BC bytes, after checking it is possible.

●RST 38 is the maskable interrupt routine and is used to increment FRAMES and to scan the keyboard. Thus, to load the accumulator with the ASCII value of the key being pressed, read the contents of location 23560 (5CO8h).

●RST 66 is the non-maskable interrupt routine and is potentially very powerful. Normally, no INT signals are received by the Z-80, so Sinclair add-ons must generate them. As it stands, the routine, if executed, results in the machine re-setting unless either 23728 or 23729 contain a non-zero number, which is not much use.

It appears that it has been designed for any interrupting hardware to SET bit 4 of location 109 (6Dh), converting a JR NZ to a JR Z. The hardware to do it may even be built into the ULA, just awaiting the appropriate signal. If that is done, then, on receiving an interrupt, the routine pointed-out by the previously-mentioned bytes is executed, if they are non-zero. It is interesting that the Sinclair manual claims those locations are 'not used' and there is no further reference to them in the whole ROM.

The brief machine code section in the manual mentions that the IY and I registers should not be used in any additional routines. In the former case, that is because the IY register contains 23610 (5C3Ah) and is used by the ROM to access the system variables, as it was in the ZX-81.

In the latter case, I have no idea why it cannot be used. Although it is loaded initially with 63 (3Fh), no further use is made of it and it can be changed with no ill-effects.

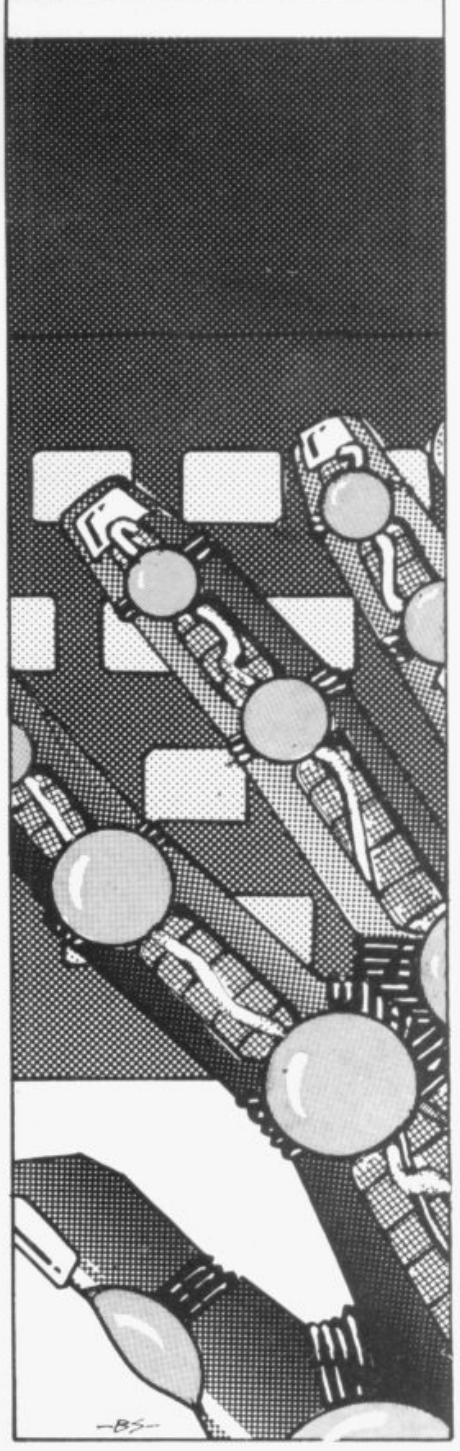
It may have been used in an earlier version, evidence of which exists on page 202 of the manual, when the command DELETE "filename" is mentioned to do with the microdrive, despite the fact that DELETE is not in the character set or the ROM — and not on the keyboard as a keyword.

'Evidence of an earlier version is in the manual when the command DELETE "filename" is mentioned, despite the fact that DELETE is not in the character set or the ROM and not on the keyboard as a keyword'.

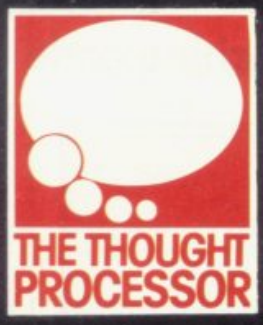
The alternate set of registers is best avoided, as it is used in the ROM routines, but HL' must never be used, as it is crucial to the floating-point calculations.

I hope that this gives a useful insight into the architecture of the Spectrum and will encourage further investigation. The massive ROM holds many secrets, only a few of which I have managed to discover in the brief time I have had my Spectrum.

```
77 7E
23
3E F4
57
00
00
00
06 0C
04
00
04
1E
1B
```



```
  10 REM Decimal to Hex
  20 DEF FN A$(A)=CHR$ (A+48+7*(
A>9))
  30 DEF FN A$(A)=FN A$(INT (A/1
6))+FN A$(A-16*INT (A/16))
  40 DEF FN B$(A)=FN B$(INT (A/2
56))+FN B$(A-256*INT (A/256))
  50 REM FN B$(A) gives one-byte
 Hex, FN C$(A) gives two-byte Hex
  60 REM Hex to Decimal
  70 DEF FN A(A$)=CODE A$-48-7*(
A$>"9")
  80 DEF FN B(A$)=16*FN A(A$(1))
+FN A(A$(2))
  90 DEF FN C(A$)=256*FN B(A$(1
TO 2))+FN B(A$(3 TO 4))
 100 REM FN B(A$) for one-byte, FN
C(A$) for two-byte hex
```



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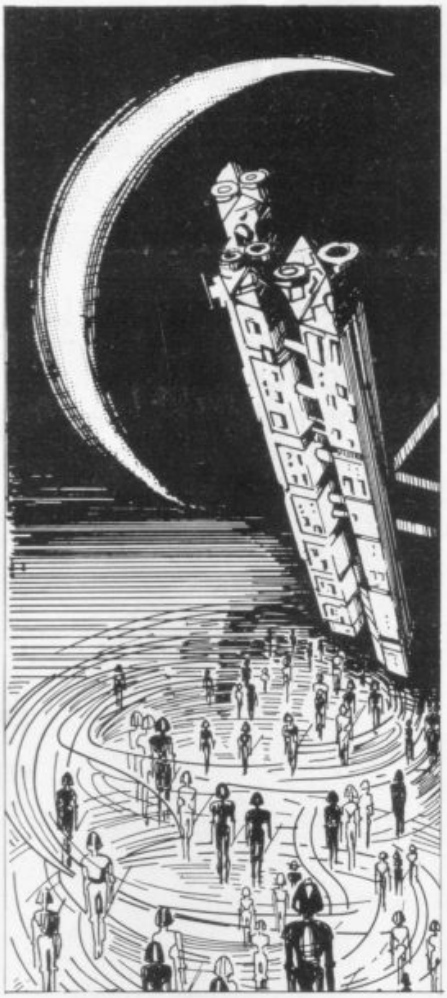


ALIEN DEFENCE

ALIEN DEFENCE is a traditional but still enjoyable Defenders game for the 16K Spectrum. You have a Laser Base, movable with keys 5 and 8, and you nail the descending alien hordes with key 7. Allow more than a limited number to pass, depending on the level of difficulty you have selected, and the game is over. Stopping them is made more difficult by their randomised movements and changes of colour. A Hi-Score routine is included to sharpen the competitive element. Submitted by D Frampton of Bridgewater, Somerset.

Graphics Notes:

70 — Graphic n, graphic shifted 8, graphic a, graphic t.
80 — Graphic i.
210 — Graphic b.
220 — Graphic u, two graphic 6s.
300 — Three graphic 6s, graphic 3, graphic 6, graphic 4.
350 — Graphic i.

```
    1 REM Aliens by Darren Frampt
on
    2 LET HS=0
    3 POKE 23609,255
    5 GO SUB 4000
   10 GO SUB 1000
   15 GO SUB 2000
   20 LET C=15
   25 LET x=0.0125
   30 LET H=INT (RND*6)
   40 LET I=INT (RND*20)
   45 LET K=0
   50 LET S=0
   60 LET IN=INT (RND*7): IF IN>7
 THEN LET IN=6
   70 PRINT BRIGHT 1; INK 1;AT 19
,C;"▗▟▙▖";AT 18,C+1;"▝▀▘"
   75 PRINT AT 0,0; INK 7;"Your S
core ";S
   80 PRINT BRIGHT 1; INK IN;AT H
,I;"▚": BEEP .01,40
   85 IF H=18 AND I=C+1 THEN GO T
O 300
   90 IF I=C AND H=19 THEN GO TO
300
   95 IF H=19 AND I=C+1 THEN GO T
O 300
   97 IF H=19 AND I=C+2 THEN GO T
O 300
  100 IF INKEY$="7" THEN GO TO 20
0
  110 IF INKEY$="8" THEN LET C=C+
(C<29): BEEP .01,40
  120 IF INKEY$="5" THEN LET C=C-
(C>1): BEEP .01,30
  130 PRINT AT 19,C-1;"    ";AT
18,C-1;"    ";AT H,I;" "
  135 LET H=H+1: IF H=20 THEN LET
 K=K+1
  140 IF H=20 THEN LET H=1: IF K=
z THEN GO TO 3000
  145 LET A=RND
  150 IF A<=.4 THEN LET I=I+2: IF
 A>=.5 THEN LET I=I-1
  155 IF I>30 THEN LET I=1: IF I<
1 THEN LET I=25
  160 GO TO 60
  200 BEEP x,4: BEEP x,6: BEEP x,
8: BEEP x,10: BEEP x,12: BEEP x,
14: BEEP x,16: BEEP x,4: BEEP x,
6: BEEP x,8: LET A=C+1: LET E=17
  210 PRINT INK 5;AT E,A;"▖▗"
  215 BEEP 0.01,5
  220 IF E=H AND A=I THEN PRINT A
T E,A; INK 4;"▚": BEEP .75,8: PA
USE 8: PRINT INK 3;AT E,A;"▚▚▚▚";
LET S=S+5: PAUSE 5: PRINT AT H,C
;"    ";AT E,A;"  ": LET I=I+5 AND
 I<25: LET H=INT (RND*10): GO TO
 70
  230 PRINT AT E,A;"  "
  240 LET E=E-1
  250 IF E=1 THEN GO TO 100
  260 GO TO 210
  300 PRINT FLASH 1; INK 1;AT 19,
I-1;"▚▚▚";AT 18,I-1; INK 6;"▚▚▚"
: BEEP 4,-15
  305 PRINT AT 0,0;"
"
  310 PRINT PAPER 1; INK 7; FLASH
 1;AT 3,0;"YOUR LASER HAS BEEN D
ESTROYED"
  320 PRINT INK 4;AT 4,0;"You Sco
red ";S;" points"
  321 IF S>HS THEN LET HS=S: INPU
T FLASH 1; PAPER 7; INK 1;"YOU G
AINED A HIGH SCORE,ENTER   YOUR
NAME ";N$
  322 IF HS>0 THEN PRINT INK 6;AT
 5,0;"High Score: ";HS;" points
by ";N$
  325 IF s=0 THEN GO TO 370
  330 PRINT INK 6;AT 5,0;"You sho
t down ";
  340 FOR F=1 TO 5.5
  345 LET P=INT (RND*5): IF P>7 O
```

```
R P=0 THEN GO TO 345
 350 PRINT INK P;"#";
 355 NEXT F
 360 PRINT INK 6;" Alien";: PRIN
T INK 6;"s" AND S>5
 365 GO TO 400
 370 PRINT INK 3; PAPER 7;"You s
hot down no Aliens"
 400 INPUT INK 7;"Another game?"
;A$
 410 LET A$=A$+" "
 420 IF A$(1)="y" OR A$(1)="Y" T
HEN CLS : GO TO 15
 430 STOP
1000 FOR F=0 TO 7
1010 READ A: POKE USR "I"+F,A
1020 NEXT F
1030 FOR F=0 TO 7
1040 READ A: POKE USR "B"+F,A
1050 NEXT F
1060 FOR F=0 TO 7
1070 READ A: POKE USR "U"+F,A
1080 NEXT F
1090 FOR f=0 TO 7
1100 READ A: POKE USR "M"+f,A
1110 NEXT f
1120 FOR f=0 TO 7
1130 READ A: POKE USR "A"+f,A
1140 NEXT f
1150 FOR f=0 TO 7
1160 READ A: POKE USR "T"+f,A
1170 NEXT f
1180 RETURN
1300 DATA 0,60,90,60,60,66,36,0
1400 DATA 0,0,16,56,16,16,16,0
1500 DATA 0,36,66,60,60,90,60,0
1600 DATA 1,3,7,15,29,63,95,95
1700 DATA 128,192,224,240,184,25
2,6,6
1800 DATA 0,0,0,0,0,24,60,126
2000 BORDER 0: PAPER 0: INK 7: C
LS : FOR F=0 TO 100
2010 LET A=INT (RND*225)
2020 LET B=INT (RND*150)
2030 IF A>255 OR B>195 THEN GO T
O 2010
2040 PLOT INK 7; BRIGHT 1;A,B: B
EEP .01,RND: NEXT F
2050 RETURN
3000 CLS : PRINT INK 3;AT 1,0;"Y
ou let too many Aliens pass, t
hey have captured Earth and all
s lost."
3010 GO TO 320
4000 BORDER 1: PAPER 1: CLS : PR
INT INK 6;TAB 11;"ALIENS"
4010 PRINT INK 7;AT 1,2;"You hav
e to defend Earth by shooting
the Aliens.To move your lase
r base use the cursor keys and
 key 7 to fire."
4020 PRINT INK 7;"You score 5 p
oints for each Alien you sho
ot."
4030 PRINT INK 7;AT 10,0;"Enter
 level of difficulty";AT 11,0;"B:
Beginner";AT 12,0;"G:Good";AT 13
,0;"E:Expert"
4040 INPUT A$
4050 GO TO (4060 AND A$="b" OR A
$="B")+(4070 AND A$="g" OR A$="G
")+(4080 AND A$="e" OR A$="E")
4055 GO TO 4040
4060 PRINT INK 3; PAPER 7;"You m
ust not let more than 20 Alien
s pass": LET I=20: PAUSE 200: RE
TURN
4070 PRINT INK 1; PAPER 7;"You m
ust not let more than 10 Alien
s pass": LET I=10: PAUSE 200: R
ETURN
4080 PRINT INK 2; PAPER 7;"You m
ust not let more than 5 Alien
s pass": LET I=5: PAUSE 200: RE
TURN
```

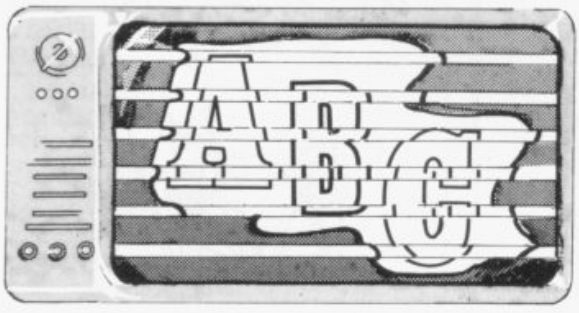
```
  2 BORDER 0: INK 7: PAPER 0
  3 DIM a$(8,8)
  4 CLS
  5 DIM t$(9): LET t$(1)="BIN "
  9 GO SUB 100
 10 FOR n=1 TO 8
 11 FOR m=1 TO 5
 12 LET a$(n,m)="0"
 14 NEXT m
 15 NEXT n
 16 REM sets up grid
 20 FOR n=0 TO 64 STEP 8: PLOT
87+n,144: DRAW 0,-64: NEXT n: FO
R n=0 TO 64 STEP 8: PLOT 87,144-
n: DRAW 64,0: NEXT n: PRINT AT 2
,11;"12345678": FOR n=1 TO 8: PR
INT AT 3+n,9;CHR$ (n+96): NEXT n
 23 INPUT "input x co-ordinates
 (1-8)";"type 9 to load charact
er";x: IF x=9 THEN GO TO 36: IN
PUT "input y co-ordinate (a-h)";
y$: LET y=(CODE y$)-96
 24 INPUT "input y co-ordinate
(a-h)";y$: LET y=(CODE y$)-96
 25 CIRCLE 83+x*8,148-y*8,2
 30 INPUT "input 1 for pixel ON
, 0 for OFF";;;"remember to pr
ess ENTER";p$
 32 IF p$="0" AND a$(y,x)="0" T
HEN GO TO 23
 33 PRINT OVER 1; INK 9;AT 3+y,
10+x;"■": IF p$="1" THEN CIRCLE
 OVER 1;83+x*8,148-y*8,2
 34 LET a$(y,x)=p$
 35 GO TO 21
 40 FOR n=1 TO 8
 41 FOR a=1 TO 8
 42 LET t$(a+1)=a$(n,a)
 43 NEXT a
 45 POKE USR k$+(n-1),VAL t$
 46 NEXT n
 60 INPUT "input c to continue
or a to";"stop";z$
 70 IF z$="a" THEN STOP
 75 IF z$="c" THEN GO TO 1
 80 GO TO 70
100 PRINT "USER DEFINED GRAPHIC
S";;"CHARATER GENERATOR"
110 INPUT "SELECT KEY a TO u";k
$: CLS : PRINT "letter selected
is ";k$
120 RETURN
130 SAVE "chr gen 11" LINE 1
```

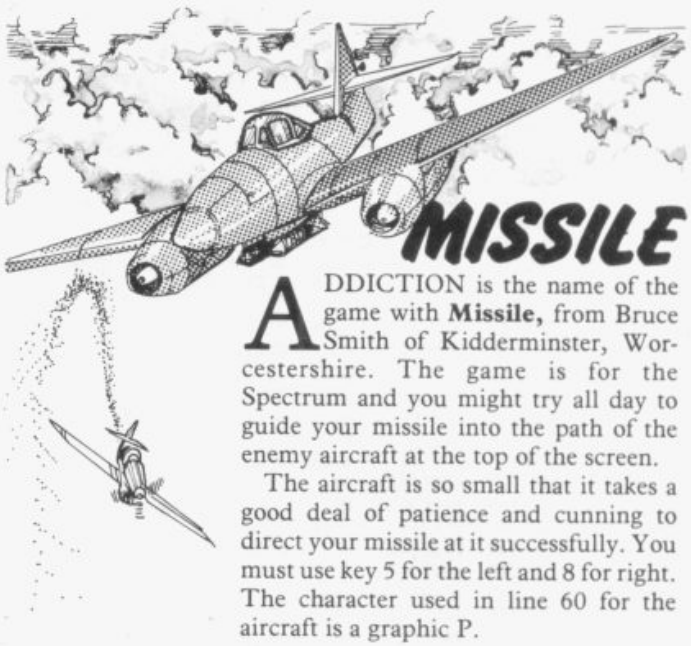
CHARACTER GENERATOR

TYPING-IN long lists of binary numbers to obtain user-definable graphics on the Spectrum can be very interesting. Here is a program to make it easy.

Character generator, by M Thurston of Gorton, Manchester, draws the character on the screen as you define it. The process of defining the 64 pixels is the same but they can be entered into memory without having to worry about all those POKE instructions.

After you have defined the character, you can store it.





MISSILE

ADDICTION is the name of the game with **Missile,** from Bruce Smith of Kidderminster, Worcestershire. The game is for the Spectrum and you might try all day to guide your missile into the path of the enemy aircraft at the top of the screen.

The aircraft is so small that it takes a good deal of patience and cunning to direct your missile at it successfully. You must use key 5 for the left and 8 for right. The character used in line 60 for the aircraft is a graphic P.

```
  1 LET r=0
  2 BORDER 2
  5 PRINT  AT 5,5;"
  "
 10 PRINT AT 10,0;"    By B.Smit
h  (Age 13)  12/7/82"
 40 FOR x=-50 TO 50: BEEP 0.005
,x: NEXT x
 45 CLS
 46 PRINT "MISSILE>>>> YOU ARE
IN A BOAT AT THE BOTTOM OF THE S
CREEN YOUR   TASK IS TO SHOOT THE
 PLANE AT    THE TOP OF THE SCREE
N   ONCE YOU HAVE FIRED YOU CAN G
UIDE YOUR    MISSILE 5=LEFT   8=R
GHT          0=FIRE <<<<
                GOOD LUCK   PRESS
 TO      CONTINUE ": INPUT a$:
 CLS
 51 PRINT AT 20,0; INK 5;"
                                "
 55 GO TO 500
 60 LET d$="
    "
 65 LET b$="  "
 66 LET e$="!"
 70 LET pd=0: LET pb=15
 75 LET he=18
 80 PRINT AT 4,pd;d$
 85 PRINT AT 19,pb;b$: LET pb=p
b+(INKEY$="8")-(INKEY$="5"): IF
pb>29 THEN LET pb=29: IF pb<2 TH
EN LET pb=2
 90 LET pd=pd+1: BEEP 0.009,10:
 IF pd=30 THEN LET pd=0
100 IF INKEY$="0" THEN LET r=1
110 IF r=1 THEN LET he=he-1
120 IF he=4 THEN GO TO 1000
130 IF r=1 THEN PRINT AT he,pb
;e$: FOR f=1 TO 5: NEXT f: PRIN
T AT he,pb+1;"  "
499 GO TO 80
500 POKE USR "P",BIN 00000000
510 POKE USR "P"+1,BIN 00000000
520 POKE USR "P"+2,BIN 00010000
530 POKE USR "P"+3,BIN 00001000
540 POKE USR "P"+4,BIN 01000100
550 POKE USR "P"+5,BIN 01111110
560 POKE USR "P"+6,BIN 00001000
570 POKE USR "P"+7,BIN 00010000
580 GO TO 56
1000 IF pb=pd THEN GO TO 1500
1010 LET r=0
1015 LET he=20
1020 GO TO 80
1500 CLS
1505 BEEP 1,0
1510 PRINT "Well Done You Got Hi
m  ,Another   Go (yes/no)"
1520 INPUT a$: CLS : LET r=0: IF
 a$="yes" THEN GO TO 50
```

Andrew Hewson answers more of your problems

Good reasons for upgrading

JUDGING from my postbag, many ZX-81 owners are trying to decide whether it would be better to purchase add-ons for their computers rather than selling to buy a Spectrum. Katie Quickenden of Faringdon, for example, suggests a number of areas where the ZX-81 might be improved.

Keyboard — The Spectrum keyboard is a great improvement. Its only annoying feature is that the two shift keys perform different functions and it is often necessary to press first one, then the other, and then the first again and so on.

Load, save, verify — I have yet to find anyone who finds LOADing unreliable with the Spectrum, whereas many people find the ZX-81 tiresome. The high speed at which the Spectrum LOADs and SAVEs is also a great advantage.

Number of cables and leads — No difference between the two machines.

Read and data statements — I do not make much use of them but if they are important to you, buy a Spectrum.

Repeat key — Well worth having.

Shift lock — Of small value, to my mind, but it is present on the Spectrum.

File handling — The method of handling cassette files on the Spectrum is rather clumsy but much better than no method at all.

Colour — I enjoy TV more if it is in colour. Similarly I prefer colour computing to black and white computing.

Other potential Spectrum purchasers are wondering whether to buy the 16K or the 48K machines. Richard Carsons of Epsom writes: **"I have read reports that the 16K Spectrum uses 7K to provide colour and graphics, leaving only 9K of usable memory. There are some marvellous 16K ZX-81 adventure games. Am I correct in thinking that they will not fit into what is left of the standard 16K?**

Broadly speaking, Richard is correct. A program which just fits into the 16K ZX-81 is unlikely to fit into the Spectrum without a major modification. Many so-called 16K programs, however, do not use all the available RAM. There is also a number of ways in which Spectrum Basic is superior to ZX-81 Basic, so it may be possible to reduce the space required without discarding any of the functions of a program.

> 'A program which just fits into the 16K ZX-81 is unlikely to fit into the Spectrum without a major modification.'

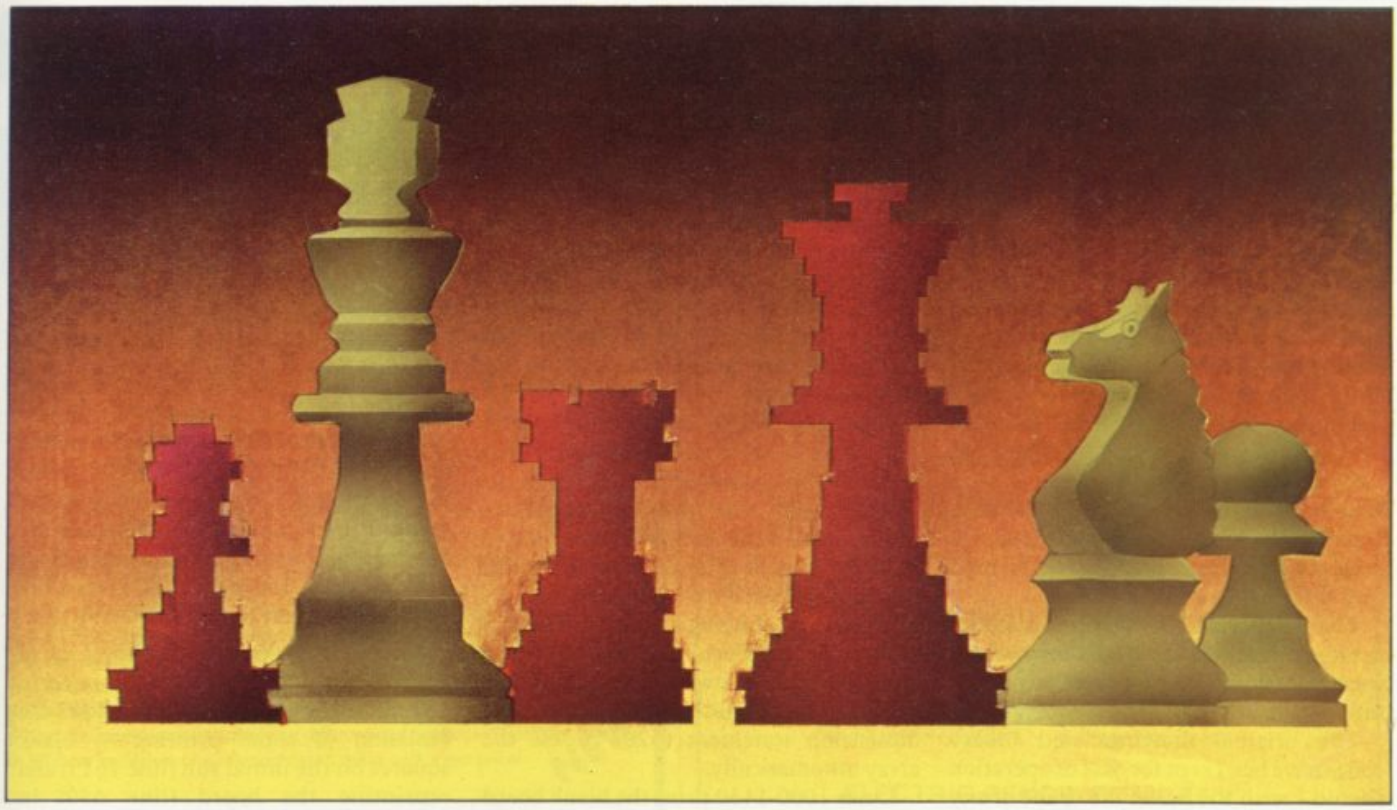
For example, the Spectrum allows multiple program lines with each program line, separated by a colon. A colon occupies only one byte in the program area whereas a program line has an 'overhead' of five bytes — one byte for the Newline character, two bytes to hold the line number and two to hold the length of the program line. There is no limit to the number of program lines which may be concatenated in this way and so a good deal of space can be saved. The only thing to stop you putting all your program on one line is that GOTOs and GOSUBs must be made to lines starting with a line number and that IFs skip to the next line number if the appropriate condition is not true.

Peter Feast is also considering whether to buy a Spectrum. He asks: **"I require the machine to store about 50 names and addresses, together with five further pieces of information in the form of variables and strings. Can the Spectrum cope?"**

I can provide only half an answer to the question because much depends on the space occupied by the software to manipulate his records, which in turn depends on the sophistication he requires.

As a general principle, storage of data requires much more memory than calculations or games. I would be inclined to buy the 48K machine. Supposing we allow 15 characters per name, 15 characters for each of three address lines and eight characters for a post code, then the names and addresses alone will occupy (4*15+8)*50, or 34,000 bytes. Each numeric variable occupies five bytes and strings can be any length, but allowing another 30 bytes for the variables and strings the data would probably occupy at least 6K in total.

That leaves just 3K for a program to enter, review, edit, save and print the data. That is sufficient for a machine code program but certainly not enough for one written in Basic.



Christopher Leigh details attempts to improve Sinclair chess pieces

Upgrading the manual

WHEN I received my Spectrum, just six weeks after it was arrived I working quickly through the instruction manual provided. I found very few mistakes and some stimulating ideas but the chess routine which was provided gave such a tiny display a magnifying glass was needed to distinguish the pieces. I set to work to write a bigger version.

I started with a piece of graph paper, thinking about the chess pieces and how they could be improved. The obvious aim was to make them bigger but that meant using more than one character space for each chess piece.

it would have been good to fill the screen with a 24*24 display but I settled for a 16*16 one. That meant that each chess-board square consisted of four printing spaces arranged 2*2.

Printing the board was fairly easy; the labelling was added later. A white screen was kept for ease of reading, though a black screen would probably look more impressive.

The board was printed using paper colour controls so that ink could be reserved for the pieces. It seemed more sensible than, for example, to print one large magenta and then to put green ink squares over it, which would have involved using "Inverse"; Inverse can be confusing.

Using the graph paper I drew the pieces, shading-in with a pencil each little square — representing a pixel — which needed inking-in. That was translated into a binary code which could be POKEd. The user graphics are of memory.

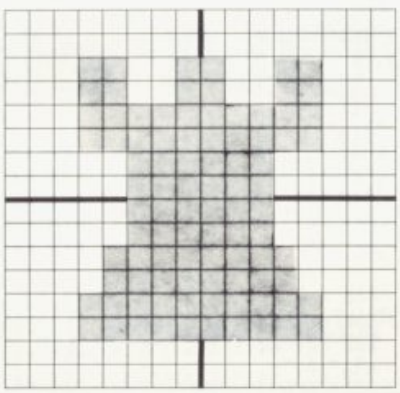
Three considerations affected the shape of the pieces. They had to leave enough margin to show clearly the colour of the square on which they were printed.

They had to be very clearly distinguishable. For that reason pawns were

continued on page xx

Figure 1.

DECIMAL	BINARY
0	00000000
0	00000000
25	00011001
25	00011001
31	00011111
31	00011111
7	00000111
7	00000111
7	00000111
7	00000111
15	00001111
15	00001111
31	00011111
31	00011111
0	00000000
0	00000000



BINARY	DECIMAL
00000000	0
00000000	0
10011000	152
10011000	152
11111000	248
11111000	248
11100000	224
11100000	224
11100000	224
11100000	224
11110000	240
11110000	240
11111000	248
11111000	248
00000000	0
00000000	0

continued from page xix

made smaller than other pieces. The third consideration was more awkward. Each piece occupies a 2*2 square, requiring four user graphics to define it. There are six different pieces in chess so that 24 graphic characters would seem necessary but only 21 are available.

The answer was to share some of them between pieces; the fourth quarter of the queen is the same as the corresponding quarter of the knight and the complete bottom half of the king is the same as that of the rook.

The rook consists of USR "a" followed by USR "b" with USR "e" and USR "d" underneath. Each drawing was labelled with the appropriate USR letter and then the binary codes worked out for each graphic. Each pixel is represented by a 0 for paper and a 1 for ink.

The codes can be POKEd into memory as binary numbers using BIN but as there were so many to do they were translated into decimal to reduce the typing.

The original drawings and binary codes have been kept for ease of operation should I wish to change the shape of any piece, figure one shows how this all works out for the rook.

With the pieces complete the most laborious part of the job was over. The next task was to put the pieces on the blank board. The user graphics could be typed-in but that would make any kind of game impossible.

The pieces must be held in a string or array. I settled for an 8*8*4 string array so that each board position was fully-defined and all four labels for the user graphics could be put into the array for each piece, which proved to be fairly simple. The use of upper- and lower-case letters gives the array an extra dimension so the computer always knows the colour of any pieces referred to.

Once the board array was set up, printing it was merely a question of getting the numbers correct so that the proper graphic was printed at the correct position. Number juggling was also needed when entering moves.

At that stage I was able to run the program and see if it worked. It did; I was bothered by the blank screen at the start of the program, which occurs while the machine processes lines 1-1000. To provent the player thinking something was wrong lines 70-90 were added.

Other improvements were made.

There was a long wait between printing white and black pieces. The Spectrum was printing blanks all over the centre of the board. Variable "w" was used to suppress such stupidity on the first run. On subsequent runs the player has to suffer space printing, as it is used to erase pieces which are out of place.

The complete listing is shown in figure two. The program puts board and pieces on the screen and then allows you to move them at will. Pawns automatically become queens on last rank, castling has to be done in two moves. Games can start with the pieces put in any position.

Lines 70-90 print a title and flashing "thinking!" so the screen is not blank during the few seconds it takes to run through the user graphics and setting-up the board array.

Lines 100-350 poke the user graphics. Since only 21 are available, three are used twice by the chess pieces.

Lines 500-640 set up the two-dimensional string array which is used to hold the positions and the make-up of each piece. Each letter of the string points to the user graphic which defines a quarter of the piece. The use of upper- and lower-case allows you to distinguish between black and white pieces. The dimension statement (520) re-sets the array automatically.

Lines 1000-1130 print the blank board using magenta and green. They were chosen to give maximum contrast and therefore clarity for the pieces which were black and white for simplicity. It is spaces that are printed using colour control characters (see page 115 of the manual) to define their paper colour. Remember to switch back to white paper after the fourth space.

Lines 1500-1620 print the pieces on the board using black or white ink. Paper 8 keeps the board squares their original colour. Lines 1580 and 1590 keep the print position within the correct 2*2 square.

Lines 2000-2200 enter the piece moves checking at 2120 that the move is within the board and allowing you to stop the game. Either capitals or lower-case are accepted in input, 2140 unprints the old position and 2160 prints the new, 2155 and 2156 convert pawns to queens.

The variable set in 2150 allows use of earlier lines as a subroutine. It is re-set in 1520. Variable w (set in 260) allows the omission of some printing — blank squares on the initial run (line 1615) and reprinting the board (line 650) in subsequent games. w is resent at 2190.

Figure 2.

```
  10 REM SPECTRUM CHESS
  20 REM
  30 REM © Christopher Leigh 19
2
  40 REM
  60 REM
  70 BORDER 1: PAPER 1: INK 6: C
LS
  80 PRINT AT 9,8; BRIGHT 1;"SPE
CTRUM CHESS"
  90 PRINT AT 12,10; BRIGHT 1; F
LASH 1;"Thinking!"
 100 REM
 100 REM Set up user graphics
 110 FOR n=1 TO 21: REM 21 user
graphics
 120 FOR m=0 TO 7: READ a
 130 POKE USR CHR$ (n+143)+m,a
 140 NEXT m: NEXT n
 150 DATA 0,0,25,25,31,31,7,7: R
EM rook
 160 DATA 0,0,152,152,248,248,22
4,224
 170 DATA 7,7,15,15,31,31,0,0
 180 DATA 224,224,240,240,248,24
8,0,0
 190 DATA 0,0,4,3,3,5,15,31: REM
 knight
 200 DATA 0,0,128,192,224,240,24
0,240
 210 DATA 25,1,3,7,15,15,0,0
 220 DATA 240,240,240,240,240,24
0,0,0
 230 DATA 0,0,1,3,7,6,14,8: REM
 bishop
 240 DATA 0,0,128,192,224,96,112
,16
 250 DATA 8,14,6,7,3,15,0,0
 260 DATA 16,112,96,224,192,240,
0,0
 270 DATA 0,0,25,25,6,6,1,1: REM
 queen
 280 DATA 0,0,152,152,96,96,128,
128
 290 DATA 15,15,15,15,15,15,0,0
 300 DATA 0,0,1,1,7,7,1,1: REM k
ing
 310 DATA 0,0,128,128,224,224,12
8,128
 320 DATA 0,0,0,1,1,7,7,7: REM p
awn
 330 DATA 0,0,0,128,128,224,224,
224
 340 DATA 7,1,1,15,15,0,0,0
 350 DATA 224,128,128,240,240,0,
0,0
 360 LET w=1: REM initial positi
on
 500 REM
 510 REM Initial positions - low
er case for white
 520 DIM b$(8,8,4)
 530 LET b$(1,1)="abcd": LET b$(
1,8)="abcd": REM rook
 540 LET b$(1,2)="efgh": LET b$(
1,7)="efgh": REM knight
 550 LET b$(1,3)="ijkl": LET b$(
1,6)="ijkl": REM bishop
 560 LET b$(1,4)="mnoh": REM que
en
 570 LET b$(1,5)="pqcd": REM kin
g
 580 FOR n=1 TO 8: LET b$(2,n)="
rstu": NEXT n: REM pawns
 590 FOR n=1 TO 8: LET b$(7,n)="
RSTU": NEXT n: REM black pieces
 600 LET b$(8,5)="PQCD"
 610 LET b$(8,4)="MNOH"
 620 LET b$(8,3)="IJKL": LET b$(
8,6)="IJKL"
 630 LET b$(8,2)="EFGH": LET b$(
8,7)="EFGH"
 640 LET b$(8,1)="ABCD": LET b$(
8,8)="ABCD"
 650 IF NOT w THEN GO TO 1520: R
EM skip board printing
1000 REM
1010 REM print blank board
1020 BORDER 7: PAPER 7: INK 0: C
LS
1030 PRINT TAB 8;"A B C D E F G
H"
1040 FOR n=1 TO 8: PRINT AT 2*n,
0;n: NEXT n
1100 FOR n=0 TO 3: FOR m=0 TO 3:
 FOR b=0 TO 1
1110 PRINT AT 2+4*n+b,8+4*m;"  
  ": REM 2 magenta paper spaces fo
llowed by two green paper spaces
1120 PRINT AT 4+4*n+b,8+4*m;"  
  ": REM coloured spaces the othe
r way round
1130 NEXT b: NEXT m: NEXT n
1500 REM
1510 REM print pieces
1520 FOR v=1 TO 8: FOR n=1 TO 8:
 LET t=0
1530 BRIGHT 0: PAPER 0: INK 1: F
OR m=1 TO 4
1540 LET b=CODE b$(v,n,m)
1550 IF b=CODE " " THEN GO TO 15
80: REM one space
1560 IF b>90 THEN LET b=b-32: IN
K 7: REM lower case is white
1570 LET b=b+79: REM convert to
graphics
1580 LET r=v*8+INT ((m-1)/2)
1590 LET s=6+2*n: IF INT (m/2)=m
/2 THEN LET s=s+1
1600 PRINT AT r,s;CHR$ b
1610 NEXT m: IF t THEN RETURN
1615 IF w AND v=2 AND n=8 THEN L
ET v=5: REM stops space printing
1620 NEXT n: NEXT v
2000 REM
2010 REM enter moves
2020 DIM a$(4): INPUT "Enter you
r move as eg. f1g2" ;"If you wish
 to stop enter 0";a$
2030 IF a$(1)="0" THEN GO TO 216
0: REM another game?
2040 LET n=CODE a$(1)
2050 IF n<75 THEN LET n=n-64: RE
M accepts capitals
2060 IF n>96 THEN LET n=n-96: RE
M and lower case
2070 LET v=VAL a$(2)
2080 LET n1=CODE a$(3)
2090 IF n1<75 THEN LET n1=n1-64
2100 IF n1>96 THEN LET n1=n1-96
2110 LET v1=VAL a$(4)
2120 IF v>8 OR v<1 OR n>8 OR n<1
 OR v1>8 OR v1<1 OR n1>8 OR n1<1
 THEN INPUT "Invalid move.  Try
 again ";a$: GO TO 2030
2130 LET b$(v1,n1)=b$(v,n)
2140 LET b$(v,n)="  ": REM fou
r spaces
2150 LET t=1: GO SUB 1530: REM e
rase piece
2155 IF b$(v1,n1,1)="r" AND v1=8
 THEN LET b$(v1,n1)="mnoh": REM
change pawn to queen
2156 IF b$(v1,n1,1)="R" AND v1=1
 THEN LET b$(v1,n1)="MNOH"
2160 LET v=v1: LET n=n1: GO SUB
1530: REM print piece in new pos
ition
2170 GO TO 2020: REM next move
2180 INPUT "Do you want another
game? y/n ";c$
2190 IF c$="y" OR c$="Y" THEN LE
T w=0: GO TO 500: REM reset boar
d
2200 BRIGHT 0: INK 0: STOP
```

ZX81 EDITOR

FOR ALL ZX81 PROGRAMMERS

Based on the editing facility available on a DEC system 10 mainframe computer the ZX81 EDITOR provides 7 powerful editing functions for the 16K ZX81.

Demonstration program:

```
 5 LET A$="VT4;ZA9EPKN>7QUZJKS"
10 LET B$=""
15 FOR N=1 TO 19
20 LET B$=B$+CHR$(CODE A$(N)+PEEK 256)
25 IF N=5 OR N=16 THEN LET B$(N)="""
30 PRINT B$
35 NEXT N
```

■MERGE
Combine editor with any other program. Option to continue combining indefinitely; available RAM only limitation.

■RENUMBER
"R increment"
eg) "R 10"

```
10 LET A$="VT4;ZA9EPKN>7QUZJKS"
20 LET B$=""
   etc.
```

■SUBSTITUTE
"S old text$new text$line no"
eg) "SNX15:35"

```
15 FOR X=1 TO 19
20 LET B$=B$+CHR$(CODE A$(X)+PEEK 256)
25 IF X=5 OR X=16 THEN LET B$(X)=""
35 NEXT X
```

■EXTEND
"E line no"
eg) "E 5"

```
5 LET A$="VT4;ZA9EPKN>7QUZJKS"L
```

Prints out the line so far with cursor at the end ready for you to extend or edit.

■TRANSFER
"T first line no, last line no:new first line no, increment"
eg) "T15,35:100,1"

```
 5 LET A$="VT4;ZA9EPKN>7QUZJKS"
10 LET B$=""
100 FOR N=1 TO 19
101 LET B$=B$+CHR$(CODE A$(N)+PEEK 256)
    etc.
```

■DELETE
"D line no:line no" Delete any block of program.

■SCROLLED LISTING
"S line no" Continuous scrolling list starting at beginning of program unless otherwise specified. Listing can be stopped at any time for editing.

■All standard editing functions provided by Sinclair can be used as normal.

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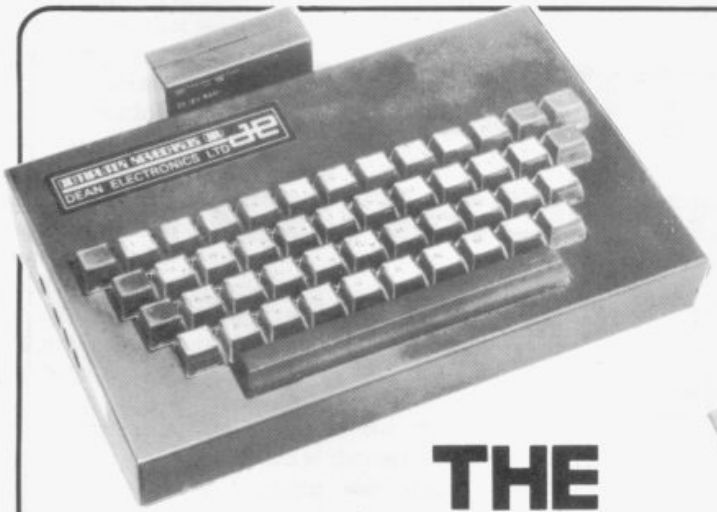

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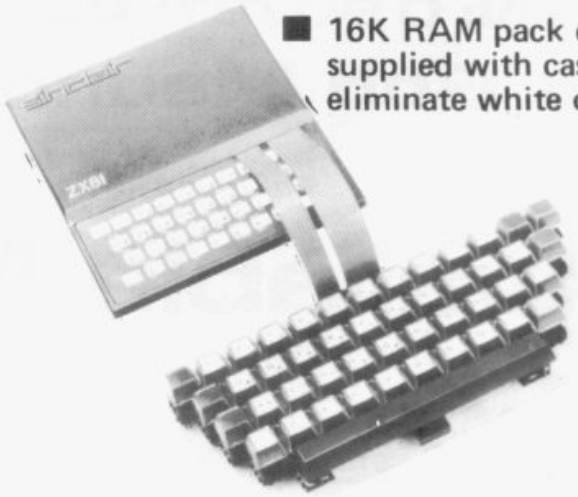

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