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FORMAT

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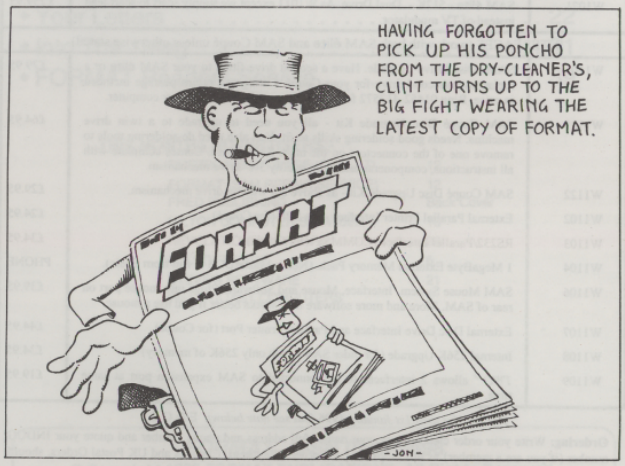

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STOP PRESS With effect from the 1st December we will be dropping the TV modulator versions of the SAM Elite (order codes W1010 & W1011). As the majority of new sales have, for some time, been to people who prefer the superior quality picture that a monitor brings, we have decided to take this step to help us prevent a price rise due to the spiralling price of certain components.

CONTENTS

Vol.9 N°2. **October 1995.**

- News On 4 4
- The Editor Speaks 4
- Short Spot 5
- Small Ads 12
- PC Goes SPECTRUM 13
- Fastfile Sorting & Printing - Part 3 17
- Your Letters 22
- Into The 1Meg 31
- FORMAT Readers Service 39

THIS MONTHS ADVERTISERS:-

CHEZRON SOFTWARE (OUTLET)	12
FORMAT (SAM REPAIR SERVICE)	12
FRED PUBLISHING	Back Cover
HILTON COMPUTER SERVICES	18
REVELATION SOFTWARE	26
S.D.SOFTWARE	6
STEVE'S SOFTWARE	21
WEST COAST COMPUTERS	2

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The Editor Speaks

Last month's FORMAT proved that even the best laid plans don't always work. It ended up over two weeks behind schedule and all because of the weather. Going, as it did, from the longest, hottest, driest, period in years - to one of the wettest Septembers I can remember, did not make our computer systems happy - especially the laser printer. I always thought summer started the day the kids went back to school but not this year it seems.

Anyway, normal production service now resumed. The laser printer is holding up and my computer has survived an encounter with Windows 95. For those of you with IBM type machines - don't waste time on Windows 95, you get stuck with MS-DOS (you can't install another DOS with W95) and lots of DOS based programs are very unhappy. Added to this they have made so many changes from W3.1 that you spend ages trying to do something that was easy on your old system just days before. W95 is also slower (unless you have 32bit applications).

Anyway, to leave room in the envelope for the usual Show Leaflet, and because of the lateness of last month's ***FORMAT***, this issue is a little thinner. Still, I've cut the editorial by half, and, as there has been so little news since the last issue went to press, I've done the same with News On 4, so there is still lots of space for the articles.

Talking of articles, unusually there seems to be more articles for the Spectrum flowing in at the moment and not enough for SAM. Come on SAM users, get typing. How about a nice article on IF THEN.... ELSE? I've had several requests for that one.

See you all on the 14th.

Bob Brenchley, Editor.

NEWS ON 4

Z80 GAMES BONUS

B.G.Services have announced that the discs they are now shipping of Z80, the Spectrum emulator for MS-DOS machines, are all HD (1.44Mb) format. Because this leaves a lot of free space on the disc they have obtained permission from a number of authors to include 'ready converted' Spectrum titles on the disc.

The games include Alien Highway, Android (1&2), Cyclone, HATE, Highway Encounter, Dictator, Jumbly, Maziacs, Meteoroids, Popeye, 3d Tanx, Trap Door (1&2) and several others.

The discs cost the same, £15 for the normal version, £20 for the version with full DISCiPLE emulation. Existing registered users can obtain a disc with the games on for £3.50 (to cover costs) by writing to BG asking for Games Pack 1.

QUAZAR VIDEO

New software from Quazar is said to bring multimedia to SAM. Planned for launch in time for the October Show in Gloucester, Colin Piggot's Video Construction Kit allows you to take animations and tie them to sound events. Animations are stored in compressed form and are decompressed in real-time at an average of 6 frames per second.

The software comes on three discs packed with examples and step-by-step guides. Look out for it on the 14th or send an SAE to Quazar, 204 Lamond Drive, St.Andrews, Fife, KY16 8RR.

>> SCOTLAND SHOW <<

Yes, there is going to be one, Sunday the 12th November, on the outskirts of Edinburgh, near the airport. More details next issue (if we can get it out in time) or ring either us at ***FORMAT*** or Colin Macdonald at Fred Publishing.

SHORT • SPOT

YOUR HINTS, TIPS AND PROGRAMMING IDEAS

Edited By:- John Wase.

You know; it's amazing. I decided that we'd had enough of lottery programs some months ago. I wasn't going to keep on printing rows and rows of similarly boring programs that merely printed out a series of lottery numbers. The ingenuity of our readers is, however, endless, and nearly everything I've been sent this month has a lottery slant, while still being interesting enough to include! So, let's start this month off briskly with the lottery itself. Geoff Bridges of Headington, Oxford, has done it! Yes, folks, he's got a nice little lottery listing for Spectrum or for SAM, in 10 lines only. Check this one out, then type it in!

```
 10 DIM a(50)
 20 FOR c=1 TO 6
 30 LET b=INT (RND*49+1)
 40 IF a(b) THEN GOTO 30
 50 LET a(b)=B
 60 NEXT c
 70 PRINT  "Your   selected
    numbers are:"'''
 80 FOR d=1 TO 50
 90 IF a(d) THEN PRINT ("0" AN
    D a(d)<10);a(d);" ";
100 NEXT d
```

Many thanks Geoff.

Ettrick Thomson has come up with a whole raft of ideas on improving Roy Burford's recent program; 'rounding', so I've sent them on to Roy for him to digest. No doubt we'll get some nicely rounded ideas coming back from Roy in due course. Many thanks to you both.

Peter Williamson of Sleaford writes that there have been many programs published in ***FORMAT*** recently which have selected at 'random' six lottery numbers. Peter never actually bought any tickets himself, as the astronomical odds against winning put him off! However, he was persuaded to join a small syndicate that entered 20 lottery number groups each week. Checking the lottery numbers against the syndicate's list was a chore so Peter produced a small program for SAM that does the job with a series of nested FOR NEXT loops.

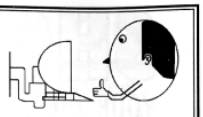
The syndicate numbers are held in a two dimensional array S(). The 6 lottery numbers are held in a single array L(). Each lottery number in turn is compared with the syndicate numbers. Every time a match is made on a syndicate line, the score is totted up in another array M(). To save wasted effort, when a match is made, the matching operation jumps to the start of the next syndicate line, when Z is given the value of 6. At the end of the operation, a print-out shows how each line scored. If a line scored more than four hits, then a special print-out highlights the fact. The lottery numbers and bonus number are also displayed for that final print-out.

The loops, especially those with a large number of syndicate lines, take time to process, allowing one to go and have a cup of tea to steady the nerves while waiting for the moment of truth!

So much for lotteries for this month. Peter's also sent in another snippet - of the sort which always delights me to find. Did you know that SAM's gone potty? Well, weird. You didn't? Well; he has!

Take this little program...

SDSOFTWARE



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As used by Format Publications to transfer articles and programs for this mag.

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Please add £2.00 to price for each 3" disc required.

Please add £0.50 postage for each order (£1.20 outside UK).

** Using SpecMaker Spectrum emulator*

S. D. Software, 70, Rainhall Road, Barnoldswick, Lancashire, England, BB8 6AB.


```
20 GET A
30 PRINT A
40 LET A=A+1
50 PRINT A
```

If you run this program and enter a numeral, then the numeral will be printed out. However, if you enter a letter; say B, one would expect the syntax checker to come into operation and protest with the notice 'B NOT KNOWN'. This would certainly happen if line 20 were INPUT A.

Instead, SAM has a nervous breakdown, and produces a number. If you enter A, then the first print-out is 10. The second print-out is 11, so the number produced is acting as a variable. From where does the number originate? It is not the ASCII Code number, nor yet the keyboard matrix number. All the keys produce numbers. The RETURN key gives 214, the DELETE key 213. So by using the GET A command, one can produce a value of 213, or what-have-you for the variable A. Have any of our knowledgable and talented readers any explanation for this strange behaviour?

Many thanks for those contributions, Peter.

Cynthia's sudden death has reduced many things to a state of chaos; among them, some of my piles of work. David Laundon submitted a letter, I suspect some time ago, which has turned up in a bag where it shouldn't have been. So, my apologies, David, that this is published long after you wrote it. Moreover, I can't find the associated disc, so I am having to transcribe the information. Errors are therefore likely to be mine!

David writes that he owns a SAM Coupé, and has written a program which some machine code writers are likely to find useful. This has come about from writing a few small, relocatable routines, which David normally loads into the general-purpose buffer space at 20224 to 20736 (4F00H- 5100H) which then finds a free page or a space in the heap to move themselves to, (the mouse driver program which comes with the SAM mouse does this). This saves a lot of hassle in the Basic program. The only problem is that it is impossible to save a CODE file to auto-load at that address and auto-run. This is because the buffer-space is cleared by Basic before every command, so the code would be cleared before you could SAVE it. David's solution was to save the code from a normal address (usually 32768) and then change the LOAD and EXECUTION addresses in the disc directory afterwards. This brings us to this Short Spot program which changes the start and execution addresses of a saved CODE file to the 'general-purpose buffer space' address. David hopes that you can understand all of this, as he fears he hasn't explained it very well. Well, I think it's clear enough, David, so here goes:-

```
10 CLEAR 32255: MODE 4: CLS #
   : PEN 15
20 PRINT "Program to convert
   files to auto load in gene
   ral purpose buffer space"'
   '"Copyright David Laundon
   1995"
30 DIM n$(10)
40 INPUT "Enter filename: " L
   INE n$
50 FOR t=0 TO 3:'FOR s=1 TO 1
   0: READ AT 1,t,s,32256: FO
   R d=0 TO 1
60 LET st=32256+d*256,m$=MEM$
   (st+1 TO st+10): IF n$=m$
   THEN GOTO 90
80 NEXT d: NEXT s: NEXT t:  P
   RINT AT 21,0; "File not fo
   und",: GOTO 40
90 IF ((PEEK st) BAND 63)<>19
    THEN PRINT AT 21,0;"Wrong
    file type",
100 IF ((PEEK (st+239)*16384+D
   PEEK (st+240))>768 THEN PR
   INT AT 21,0;"File too big"
   ,: GOTO 40
```

```
110 PRINT AT 21,0,,
120 POKE st+236,96: DPOKE st+2
    37,36608: POKE st+242,1: D
    POKE st+243,36608
130 WRITE AT 1,t,s,32256
140 PRINT AT 20,0;"Done. Now j
    ust enter'"LOAD """;TRUNC
    $ m$;"""CODE  to use"
```

Many thanks, David.

Arthur Telling of Poole carefully photocopied snippets from all sorts of magazines, and filed them in the last decade. He sent two huge files to Bob, and they arrived here eventually by devious means; again, just before chaos time. I've now had time to look at some, and there are quite a few little features which I think will interest our readers. For instance, Don Thomasson in *Computing Today*, March 1993, has a feature on 'PEEKING THE SPECTRUM'. Here's a few notes on his submission...

"There is one infuriating characteristic of the Spectrum, and that's for a memory mapped display. Whereas such a display allows the character in a given screen position to be determined by a simple PEEK into memory, the display store itself is arranged in what appears at first sight to be total chaos, and PEEKs by the uninitiated give no useful information. The manual warns the user of this and suggests the use of SCREEN$ as an alternative, but that is no good with user-defined graphics, which are seen as spaces. Experiment shows that the eight bytes forming the character at the top left corner of the screen are held in locations 16384, 16640, 16892, 17152, 17408, 17664, 17920 and 18176. 16384 is the start of the display memory area, and the other addresses are obtained by adding 256 successively, so we can write:-

```
Address=16384+256*(n-1)+32*x+y
      =16128+256*n+32*x+y
```

where the address contains the n^{th} byte of the character in line x, column y.

This, of course, fails completely after eight screen lines have been examined. An entirely new block starts, 2048 locations after the first, and we have:-

```
Address=18176+256*n+32*(n-8)+y
      =17920+256*n+32*x+y
```

And after these eight lines...

```
Address=20224+256*n+32*(x-16)+y
      =19712+256*n+32*x+y
```

And so on. So what? well, in the program below, just input a number and the screen fills with characters. Then a scan starts in which the eighth byte of each character is compared with the number which was input. If the two are equal, then the character is converted to reverse video by PRINT OVER. Otherwise, the character remains unaltered. Input zero and most of the characters will change. Those that do not are characters with descenders with at least one high bit in the last byte. Input 56 and p and q will be picked out. To save tedious experiment, the numbers worth trying are 0,6,8,16,24,32,56,60,64 and 255. The second input allows you to state a colour and then another check number, so that you can put a colour against a specific last byte. Not a particularly useful program, though quite amusing.

Now create some user graphics and extend the original program so that it prints them by changing the 95 entries to 132. If you use a bit of craft, you can make the lowest line of each special graphic give a different number, preferably one not in the list given above. The program will then pick out this number, identifying each graphic individually. And if the current values of x and y are already known, all that needs to be done is to define the base and

perform the PEEK. The rest of the program is essentially identical with the original. The byte examined need not, of course, be the last one forming the character. If the graphics make a different byte more convenient, all you have to do is to change the base scale. You could even use the SCREEN$ function to compare the bytes read by the computer with the character pattern data stored near the top of the ROM, but this is likely to be an overkill, and on the Spectrum would almost certainly need machine code to stop you dozing off. OK: that's essentially it. Now, readers, have you ever used this approach in your programming before? Do write and let me have any new/old snippets which employ this principle.

Here's the program:-

```
 10 INPUT N
 20 LET A=0
 30 LET B=INT(A/95): LET C=A-95
    *B
 40 PRINT CHR$(C+32)
 50 IF A,703 THEN LET A=A+1:GOT
    O 30
 60 INK 2 70 FOR X=0 TO 21
 80 FOR Y=0 TO 31
 90 LET BASE=18176
100 IF X>7 THEN LET BASE=19968
110 IF X>15 THEN LET BASE=21760
120 LET D=(BASE+32*X+Y)
130 IF PEEK(D)=N THEN PRINT OVE
    R 1; AT X,Y;"RV SP"
140 NEXT Y: NEXT X
150 INPUT M: INK M
160 INPUT N
170 GOTO 70
```

Get typing!

And Finally... Let's stick with the Spectrum, this time with the PLUS D. Miles Kinloch of Edinburgh, a frequent contributor, has once again in the nick of time, sent me a useful contribution. As he says in his letter, these days, it's not always easy finding fresh inspiration for programs and articles where the Spectrum's concerned, as it's getting so long in the tooth, and all the best ideas already seem to have been scooped up! However, something always seems to spark his imagination eventually, and his latest contribution is, as I mentioned, a routine for use with the PLUD D. It's called PERMAVAR, and works through the DOS to make any of the Spectrum's system variables act as a pseudo-ROM address, that is, the variable takes on a fixed value. This is achieved by tacking a little piece of code onto the PLUS D's interrupt routine, which works by constantly POKEing a byte into the address 50 times a second, in much the same way as the PLUS D overwrites the printer channel.

Miles mentions that trying it out can be a source of considerable amusement, exploring the novel effects it can produce! Some wreak havoc; others are relatively benign. One or two could even be rather useful: key repeat rate, keyboard click and warning buzz, for instance. Anyway, Miles doesn't want to make it too easy, so he'll leave you to experiment! So, as he says, long may the Spectrum flourish!

Here's the program.

```
  1 REM        PERMAVAR
  2 REM   By Miles Kinloch
  3 REM       (PD) 1995
  4 REM
 10 BORDER 6: PAPER 6: PEN 0: C
    LEAR 39999: GOSUB 1000
 20 PRINT INVERSE 1;" PERMAVAR
    "; INVERSE 0;"  IS A TINY R
    OUTINE (5BYTES) WHICH IS IN
    STALLED IN THE DOS, FORCING
     ANY SPECTRUM SYSTEM VARIAB
    LE TO A 'PERMANENT' VALUE.
    IT OCCUPIES AN AREA OF PLUS
     D MEMORY UNUSED BY ANY OTH
    ER DOS-RESIDENT UTILITIES O
    R PATCHES, SO IS SAFE TO US
    E IN COMBINATION WITH OTHER
     SYSTEM FILE MODIFICATIONS.
     WORKS WITH EITHER G+DOS 2A
     OR BETADOS.": GOSUB 390
 30 CLS #: PRINT AT 8,8;"1. ALT
```

```
ER BYTE"'' TAB 8;"2. ALTER
BIT"'' TAB 8;"3. INFORMATIO
N"'' TAB 8;"4. PERMANENTLY"
' TAB 11;"MODIFY DOS"
 40 LET k$=INKEY$: IF k$<"1" OR
  k$>"4" THEN GOTO 40
 50 GOSUB 100*(CODE k$-48): GOT
O 30
100 CLS
110 INPUT "Address (23482-23737
)? ";ad'"Byte value (0-255)
? ";byte: IF ad<23482 OR ad
>23737 OR byte<0 OR byte>25
5 THEN BEEP .8,-15: GOTO 11
0
120 PRINT "ADDRESS TO ALTER: ";
ad'"PERMANENT BYTE VALUE: "
;byte
130 INPUT "Are these details co
rrect (Y/N)?"' LINE a$: IF
a$="N" OR a$="n" THEN GOTO
100
140 IF a$<>"Y" AND a$<>"y" THEN
 BEEP .8,-15: GOTO 130
150 PRINT '''"PRESS [I] TO INST
ALL - PRESS ANY OTHER KEY T
O RETURN TO THE MENU.": PAU
SE 1: PAUSE 0: IF INKEY$<>"
I" AND INKEY$<>"i" THEN RET
URN
160 LET dis=ad-23610: IF dis<0
THEN LET dis=256+dis
170 POKE @552,253: POKE @553,54
: POKE @554,dis: POKE @555,
byte: POKE @556,201: POKE @
16,8744
180 RETURN
200 CLS
210 INPUT "Address (23482-23737
)? ";ad'"Bit number (0-7)?
";bit'"Bit value (0-1)? ";v
: IF ad<23482 OR ad>23737 O
R bit<0 OR bit>7 OR v<>0 AN
D v<>1 THEN BEEP .8,-15: GO
TO 210
220 PRINT "ADDRESS TO ALTER: ";
ad'"BIT NUMBER: ";bit'"PERM
ANENT VALUE: ";v
230 INPUT "Are these details co
rrect (Y/N)?"' LINE a$: IF
a$="N" OR a$="n" THEN GOTO
200
240 IF a$<>"Y" AND a$<>"y" THEN
 BEEP .8,-15: GOTO 230
250 PRINT '''"PRESS [I] TO INST
ALL - PRESS ANYOTHER KEY TO
 RETURN TO THE MENU.": PAUS
E 1: PAUSE 0: IF INKEY$<>"I
" AND INKEY$<>"i" THEN RETU
RN
260 LET dis=ad-23610: IF dis<0
THEN LET dis=256+dis
270 POKE @552,253: POKE @553,20
3: POKE @554,dis: POKE @555
,134+bit*8+64*SGN v: POKE @
556,201: POKE @16,8744
280 RETURN
300 BORDER 1: PAPER 1: PEN 7: C
LS : PRINT "At address 8744
 in the DOS, is the text "
"BRUCE"". You might be for
given for concluding these
 must just be 5 spare loca
tions where Bruce Gordon p
ut his name - but you'd be
wrong!"
310 PRINT '"These bytes actuall
y have a very important fun
ction in life: they are use
d by the 128K snapshot rout
ines, to determine the stat
e of RAM paging. What happe
ns is, when a snapshot is m
ade, the PLUS D first of al
l POKEs these bytes into t
he current page at 49152; t
hen it tests each bank in t
urn until it finds the word
 ""BRUCE""."
320 PRINT '"In practice, any ra
ndom sequence of bytes will
 do, so why not use ones th
at could carry out some ot
her productive task as well
...": GOSUB 390
330 PRINT "Not much you can do
in 5 bytes, though, is ther
e? Or is there...In actual
fact, they are just enough
to squeeze in an ""IY+dis""
instruction, followed by a
RET. Call this via the PLUS
 D's 8@16 interrupt facilit
y, and you have a means of
altering any one of the Sp
ectrum's system variables 5
0 times a second, effective
ly overriding any attempt
by the user (or the Spectru
m ROM) to change its conten
ts!"
340 PRINT '"The PLUS D ROM empl
```



```
oys a technique similar to
 this, in overwriting the p
rinter channel every 1/50
of a second with its own po
rt. PERMAVAR simply extend
s this idea to the system v
ariables, and exploits the
fact they can all be index
ed by the IY pair.": GOSUB
390
350 PRINT "Some useful ones to
try, might be REPDEL (23561
), REPPER (23562), RASP (23
608) and PIP (23609). Oth
ers have more exotic effect
s:FLAGS 2 (23658) Bit 3, gi
ves you permanent Caps Lock
 (even in Tasword and Wordm
aster!). Another one which
would certainly cause grief
, is 23728..."
360 PRINT '"Note also that some
 sys. vars. which,under no
rmal circumstances would ha
ve no lasting effect, can,
on the contrary, have a
very profound effect when t
hey can't be changed at al
l!!!"'"You can either appl
y the routine to a whole by
te, or to a single bit. The
 latter would be useful for
 those which operate on a b
it-wise basis, such as FLAG
S etc.": GOSUB 390
370 PRINT "To turn the routine
off (system variables permi
tting!), enter POKE @16,833
5. To re-activate it POKE @
16,8744."'"In the option w
here the whole byte is affe
cted, the byte value can be
 changed with POKE @555,n (
where n is in the range 0-2
55)."'"As PERMAVAR works i
n conjunction with the PLUS
 D's POKE @16 facility,this
 may disable any other code
 which utilises this featur
e."
380 PRINT '"If you wish, you ca
n permanently modify your D
OS to include the PERMAVAR
routine. It need not necess
arily be active when the DO
S is booted: if you prefer,
 it can be 'dormant' until
POKE @16,8744 is executed."
390 PRINT #0; AT 1,8; BRIGHT 1;
 PAPER 2; PEN 7;" PRESS ANY
 KEY ": PAUSE 1: PAUSE 0: C
LS : RETURN
400 CLS : IF NOT USR 4E4 THEN P
RINT AT 12,0; FLASH 1;"ROUT
INE MUST FIRST BE INSTALLED
!": BEEP .8,-15: PAUSE 1: P
AUSE 130: RETURN
410 INPUT "Modify G+DOS or Beta
dos (G/B)?"' LINE m$: IF m$
<>"G" AND m$<>"g" AND m$<>"
B" AND m$<>"b" THEN BEEP .8
,-15: GOTO 410
420 INPUT "Do you wish the rout
ine to be active on booti
ng (Y/N)? "; LINE t$: IF t$
<>"Y" AND t$<>"y" AND t$<>"
N" AND t$<>"n" THEN BEEP .8
,-15: GOTO 420
460 INPUT "Which drive? ";d: IF
 d<>1 AND d<>2 THEN BEEP .8
,-15: GOTO 460
470 PRINT "INSERT DISK WITH A "
;("G+DOS " AND (m$="G" OR m
$="g"));("BETADOS " AND (m$
="B" OR m$="b"));"FILE"'"IN
 DRIVE ";d: GOSUB 500
480 IF m$="B" OR m$="b" THEN LO
AD dd;n$CODE 40960: FOR a=4
1512 TO 41516: POKE a,b(a-4
1511): NEXT a: GOSUB 520: S
AVE dd;n$CODE 40960,6850: R
ETURN
490 LOAD dd;n$CODE 8192: FOR a=
552 TO 556: POKE @a,b(a-551
): NEXT a: GOSUB 540: SAVE
dd;n$CODE 8192,6656: RETURN

500 INPUT "Enter DOS filename:
"; LINE n$: IF LEN n$>10 OR
 NOT LEN n$ THEN BEEP .8,-1
5: GOTO 500
510 CLS : DIM b(5): FOR a=8744
TO 8748: RANDOMIZE a: LET b
(a-8743)=USR 40019: NEXT a:
 RETURN : REM Determine cur
rent DOS POKEs
520 IF t$="Y" OR t$="y" THEN PO
KE 40976,40: POKE 40977,34
530 RETURN
540 IF t$="Y" OR t$="y" THEN PO
KE @16,8744
550 RETURN
```

```
1000 RESTORE : FOR a=4E4 TO 4002
     9: READ x: POKE a,x: NEXT a
     : RETURN
2000 DATA 219,231,167,1,0,0,42,1
     6,32,17,40,34,237,82,211,23
     1,192,3,201,219,231,42,118,
     92,6,0,78,211,231,201
9999 SAVE d1"PERMAVAR" LINE 10
```

Many thanks, Miles.

Finally, the usual plea: please send all your snippets and ideas (how about a few Christmas items, it is just round the corner you know) to:-

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And thank you; all of you. See you next month.

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PC GOES SPECTRUM

Reviewed By:- Peter Collier.

About 3 years ago, I bought my first decent PC (I'd used them at school and college, but couldn't afford a decent one at home). When I got it, a friend gave me some software to get me started. Amongst this software was a disc with some familiar games on it: Jet Set Willy, Manic Miner and Horace Goes Skiing. There was also a program called VGASpec. "It's a Spectrum emulator!", said my friend. Sure enough, I managed to load Manic Miner and it ran and seemed okay. When I checked out the documents, they were all in Spanish, and I soon found that there were a lot of short-falls with this program. But, I was hooked by the idea, and after much searching and trying of emulators, found Z80 by Gerton Lunter.

Z80 is a very comprehensive Spectrum emulator. What is an emulator? Well, it is a program which allows the software of one machine to be run on another. It reads machine code, re-directs graphics, sound and I/O in such a way that it appears that the original machine is being used. Z80 goes further than this, emulating external hardware and standards too, but more of that later. The point is that all the Spectrum software that you spent so many years collecting and using needn't die with the purchase of a new machine.

Z80 comes in two forms; a shareware version which has some features missing or disabled (including the speed control), or the fully registered version which is available with or without DISCiPLE/PLUS D disc emulation. Here I review the fully registered version 3.03.

The program arrives on a single DS/DD disc. On this is an installation program and some archives. Installation is straight-forward with a brief wait of about 2 minutes while 2 megabytes of software and documentation is copied to the PC hard disc. Once this is complete, I strongly recommend at least a brief look at the manual, which is included with the files installed. The manual is very comprehensive. It's about 80 pages long and gives you not just the details of how to use Z80, but also lot's of information about how the Spectrum works.

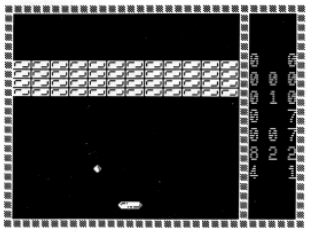
On running the emulator, you are greeted with a title screen giving the author's name and the version details. This then clears to give you the familiar Sinclair copyright notice. Pressing any of the keys produces a keyword, just as a real Spectrum 48k would. The custom keys, such as Symbol Shift and Graphics are covered by other keys such as CNTRL and ALT on the PC. A picture of a Spectrum keyboard appears by pressing ALT-F1. Useful if you really want to use 48k for writing programs. If this seems too much like hard work, the 128k Basic mode allows you to type the Basic keywords in a letter at a time.

Pressing the F1 key gives you a list of what functions each of the F-keys have. You can SAVE, LOAD, change hardware settings, change joystick types (Sinclair,

Cursor, Kempston and programmable are all available here), generate an interrupt, and alter tape and microdrive options. The main menu is F10, and all other menus are available through here too. I have found that it is usually easier to flick through the main menu and sub-menus than to use the F-keys, although I do use the HELP and LOAD menus as well.

The next thing is to get software into the machine. You can type in Basic and machine code programs just as you would on a real machine, but sooner or later you are going to want to use commercial programs. The emulator can load programs in several different ways. The most common is using snapshot files. If you've ever used a DISCiPLE or Multiface with a real Spectrum, then you would be familiar with this idea. The whole of the Spectrum's memory, plus it's register values and pointers are sent to disc as a file. The program, when re-loaded, will be in exactly the same state as when it was saved. Z80 can read and write a number of different formats of snap which makes it compatible with the other main emulators available, and Multiface and DISCiPLE snaps too, although mainly for compatibility's sake. Programs can also be loaded from cassette tape (using an interface or using a PC sound card) and from .TAP files, which are virtual tapes stored on disc. Once a tape is loaded into the emulator, it can be saved to disc using one of the snapshot formats. There are other ways of transferring data, such as using audio files and data files (for extra game levels, etc.) but these are not immediately obvious and I would recommend familiarity with the way that the emulator operates before getting involved in this side of things.

Z80 comes with a selection of programs, so let's load some up! Pressing F3 brings up a loading menu, and RETURN gives access to a catalogue of the current directory. I select SMASHOUT.Z80. 2 seconds later, the program is loaded and running. Smashout is a Breakout clone, complete with sound effects and colour.



It has all the look and feel of a real Spectrum program, but it is too fast to play easily. I use a 486 machine and it runs the emulator at about 280% of the original Spectrum speed! Gerton has thought of this, however. F10 to the main menu, C to change settings and C again to alter the speed. I enter 100% and return to the game. Now the emulator is slowed down and playing at the correct speed. The graphics are fluid and clear. Actually, the graphics are probably clearer than on a real Spectrum because of the clarity of the PC's screen. The emulator will work in graphics modes from CGA and Hercules right up through to VGA. Obviously, if you have the more Basic screen modes, then the colour and picture quality is going to be reduced, but still usable. I have used Z80 on a PC emulator on a UNIX machine. This let me change between lots of different graphics modes and drivers. Z80 handled them all with ease. If you have certain types of card, you may need

to make adjustments to the .INI file (which holds default settings for the emulator) to get perfect operation, but I doubt you will have any real problems.

While on the subject of hardware, the PC can be a 8086 upwards, but for 100% speed or better, I would say that you need at least a 386 SX. If you want to use 128k mode properly, you also need EMS memory available to speed up the memory paging. You can use it without, but I don't recommend it. The Spectrum's beeper is copied by the PC speaker. It sounds clear and loud enough. Actually, that's a disadvantage when it tries to emulate the so-called 'multi-channel sound' effects that have been done on the Spectrum. These played on the fact that Spectrum sound was muffled and fuzzy, so may sound a little odd on a PC. If you have a Sound Blaster compatible sound card, then 128k sound is beautifully clear and tuneful - actually better than my Spectrum +3! The only drawback here is that a few programs cause the music to be interrupted, causing some speed variations. It's generally very good, though, and can always be turned off from the menus if you don't want it.

The Spectrum's keyboard is fully emulated, with the emulator making good use of the excess PC keys to cover the non-standard Spectrum ones. The PC cursor keys have a double function. They act both as Speccy cursor keys, and as the joystick emulation. All of the main joysticks are emulated (Kempston, Sinclair, Cursor, etc.) and can be controlled with a PC joystick or the keys. I use a joypad with mine and find it excellent. You can also make use of the PC mouse as a control option - either as an AMS mouse, or a joystick. Also emulated is the Sinclair Interface 1, (with re-direction of RS232 and full microdrive emulation), Romantic Robot's Multiface 128, (allowing your old multifaced programs to run), emulation of the ZX printer for Epson and LaserJet printers, and optional emulation of PLUS D/DISCiPLE disc interface. This allows the use of these discs in the PC drive. The only thing missing is the cassette interface - well, actually, it's not! For a modest price, BG Services will sell you a tape interface which plugs into your PC parallel (printer) port. It has sockets for Spectrum tape leads to be plugged into, and a small adjusting screw which can be used to calibrate it for best performance. To load or save programs just use the emulated Spectrum like a real one. Connect the cassette player to the interface, type LOAD"" and away you go. There can be problems with tapes which use speed loaders and SpeedLock type protection systems, but these are usually overcome by switching the emulator to 'REAL' mode. This locks out the screen refresh (except for the loading bars) and if used with an emulator speed of around 100%, usually loads even these programs. Other factors can also be altered, such as switching register emulation on or off, to account for the ways in which software houses have tried to protect their copyright over the years. To date, only one cassette (out of about 150 of mine) has had loading problems, and even then it was still usable to some extent.

There are also a host of utility programs included with the emulator. These allow things such as conversion between snapshot formats, reading of audio from the Sound Blaster or tape interface (for example, to save 'extra levels'), read the PLUS D/DISCiPLE discs and a program called CONVERT

which allows different file formats to be interchanged. For example, Spectrum screen bytes to a .GIF picture file, or Spectrum ASCII to PC ASCII. These utilities make an already excellent product unbeatable. I have not yet thought 'I wish I had a utility to...' because it's all here.

So, the emulator's pedigree is very impressive, but what can you do with it? The answer is 'Just about anything that you could do with a real Spectrum!' All of the Z80 is emulated, even down to the fine tuning such as the R-register (often sneakily used as copyright protection in Spectrum software) and the full Z80 instruction set - official and un-official op-codes. The emulator comes with a full set of the Spectrum's ROM's (both 48k and the 128k ROM's - not +3 though). These are important. Amstrad made an announcement some time ago that the Spectrum ROM's could be included in emulators, provided that their copyrights were not violated. This means that there has been no need to try to 'reverse engineer' the ROM's. These are the real binary dumps from a Spectrum - warts and all. This is one of the keys to compatibility, together with Gerton's amazing attention to detail - I had a problem with an older version, that I couldn't load the game 'The Addams Family'. I sent Brian Gaff a copy of the tape and got back a working snap. When the next version of the emulator came out, I found that the bug had been fixed and the software would now load! If you want to use modified ROM's (against Amstrad's wishes, I should say) or write a new operating system yourself, then you can replace the ROM's with these very easily.

Software is available from many different sources. The immediate source is your own tapes and discs, for which you will need some time to copy them to the PC (and probably some practice too!) There are also snaps available commercially of some well-known games/ programs. Unfortunately, there is a very awkward copyright problem in the 8-bit computer world. There are a lot of programs which software companies are sitting on, which either can't or won't be released into the Public Domain for distribution. A few (mainly independent) programmers have released their work, realising that they can make no more money from these, but not wanting them to be lost. There are also a few companies actually trying to find some of their old games which they have lost! (Check out the pages of ***FORMAT*** for some available snaps!) There have been other distributors trying to sell CD's full of stuff!

The final source is via the Internet. Yes, I know everybody harks on about the Net and the Web these days, but from the point of view of the Spectrum emulator user, it is a goldmine of snapshots, cheats, tips and general information. If you have access, I recommend having a dig around.

I have had experience of emulators of all kinds (Spectrum, Dragon, ZX81, PC, C64, AtariXL) and this is easily the most accurate emulation of them all. If you want to write a Basic program, you can do it. If you want to write machine code or assembler, you can do it. (Z80 even has a monitor included). If you want to play games, you can do it. If you want to use a wordprocessor or spreadsheet, you can still do it. All of the joys of a Spectrum are there.

Z80 Version 3.03 Author: Gerton Lunter.
UK Distributor: B.G. Services. Price: £20 Full Version, £15 Reduced Version (no PLUS D/DISCiPLE emulation)

FASTFILE
Sorting & Printing

Part 3. **New Routines for *FASTFILE* By:- Cliff Jackson.**

Before we can get down to adding new printing features to *Fastfile* we must think about layout. One of the first things to do when planning a printing routine is to decide on the maximum length of each entry so that the number of columns can be fixed. Usually a compromise results after allowing for spaces between the columns to aid clarity. *Fastfile* was not designed for printing all the text and the very nature of its variable-length structure goes against tidy printing. We must therefore look at entry-length.

A typical entry in my *Fastfile* would be "STOPNESSUN DORMA (TURANDOT) PUCCINI:LP43STOP" (World Cup fans may recognise) but examination of b$ revealed a few entries with over 40 characters before the colon which separates the name details from the location. As the average length of an entry was 25 characters, I decided to settle on 3 columns of text as follows: 35 chars for name, 2 spaces, 5 chars for location (with colon omitted) and 2 spaces. Repeated 3 times this uses 130 character spaces from a possible maximum of 132 on my (dot matrix) printer in Condensed mode. It was therefore necessary to shorten some of the offending entries. *Fastfile*'s 'Amend' routine will do this but identification of entries requiring treatment is difficult. Incidentally, as I have inserted a colon in every entry, by giving the colon as the Search 'Key', I get a list of every consecutive entry but there must be a better way!

I had previously written a routine to transfer data from b$ dimensioned at 39502, as in the original article, to a new b$ file dimensioned to 38000. This was to make space for additional basic which I 'customised' into my *Fastfile* to deal with the separate inputs of name and location. The colon was also added automatically. I have not found a way of changing a dimension directly without losing data as the cunning spectrum automatically re-dimensions the array from the header data when loading. Saving the string, re-dimensioning to a different value and re-loading will not work - you are back where you started.

Because there is so little space in memory with b$ dimensioned to 39502, even without the basic in place (the variables created by the program use up memory), it was necessary to split it into two parts. "B$mod1" and "b$mod2" are the result and, as it happens they split quite naturally.

The first part reads the data into c$ and when a STOP token is found, c$ is printed to disc and this is repeated until the '*' marking the end of the data is found. The second part is auto-loaded and reads the data back into b$ after dimensioning. This gives the opportunity to shorten b$ if, like me, you have added to *Fastfile*'s basic and cannot face the task of re-keying data. This option will not be available to tape users.

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Initially the colon in my *Fastfile* was preceded and succeeded by spaces and I realised that this was a silly waste of space so by making line **40 IF b$(n)=" " AND B$(n+1)=":" THEN LET c$=c$+":": LET n=n+2: GOTO 90** (lines 42 and 45 were added later), I could remove the spaces and by altering line 160, re-dimension b$ at one pass. It was at that time that I encountered the problems on re-loading b$ which 'fastsetup' has overcome.

Now enter and save "b$mod1" and "b$mod2"

```
  5 REM "b$mod1"
 10 CLS : LET c=0: LET tot=1: L
    ET c$=""
 15 INPUT "Drive? ";dr: CAT dr
 17 INPUT "Filename? ";n$: LOAD
     d*;n$ DATA b$()
 19 POKE 23658,8
 20 OPEN #5;d*"compB$" OUT
 30 FOR n=2 TO LEN b$
 40 IF b$(n)<>":" THEN GO TO 50
 42 IF LEN c$<36 THEN GO TO 50
 45 CLS : PRINT c$''LEN c$;" ch
    ars": INPUT "Amended title
    (max 35) ";c$: IF LEN c$>35
     THEN BEEP .1,.1: GO TO 42
 50 IF CODE b$(n)=226 THEN PRIN
    T tot;" ";c$: PRINT #5;c$:
    LET tot=tot+1: LET n=n+1: L
    ET c$="": POKE 23692,8
 70 LET c$=c$+b$(n)
 80 IF CODE c$(1)=42 THEN PRINT
     tot;" ";c$: PRINT #5;c$: L
    ET tot=tot-1: GO TO 100
 81 IF b$(n)=" " AND b$(n+1)="
    " AND b$(n+2)=" " THEN LET
    c$="*": PRINT tot;" ";c$: P
    RINT #5;c$: LET tot=tot-1:
    GO TO 100
 90 NEXT n
100 CLOSE #*5
110 LOAD d*"b$mod2"

 10 REM b$mod2
150 OPEN #5;d*"compB$"IN
160 LET h=1: LET c$="": DIM b$(
    39502): LET b$(1)="": LET n
    =2
170 INPUT #5;c$: PRINT h;" ";c$
    : POKE 23692,8
180 IF c$(1)="*" THEN LET b$(n)
    ="*": GO TO 300
190 LET c$=c$+"": LET h=h+1: LE
    T len=LEN c$
200 LET b$(n TO n+len)=c$
210 LET c$="": LET n=n+len: GO
    TO 170
300 CLOSE #*5
310 PRINT '''New value for ""n"
    " is ";n;''' FLASH 1;"PLEAS
    E NOTE CAREFULLY"
320 SAVE d*"b$compact" DATA b$(
    ): VERIFY d*"b$compact" DAT
    A b$()
```

Save "b$mod2" with LINE 10 to ensure that it auto-runs after being loaded by "b$mod1". Edit lines 40 etc as you require and run "b$mod1" to produce "b$compact" which can be re-loaded into *Fastfile* by using 'fastsetup'

I have a number of data storage routines which sort and print varying quantities of data. The print-outs range from 1 to 4 columns as appropriate, economy of paper being a factor with the larger projects. Initially my routines skipped through the array, printing each successive entry across the paper and giving a line-feed after the appropriate number of columns.

This is readable but you have to scan across columns as well as vertically making it easy to miss an item. A vertical arrangement as in a telephone directory is much easier to use so I developed a routine to calculate the numbers of the strings to be printed in columns 2,3 and 4 on the first line e.g. L/PRINT a$(1); a$(61); a$(121); a$(181), with a few spaces included and the numbers represented by variables.

A full page was quite simple but problems arose when the last page arrived or if there was less than a full page to print. However I gradually developed my routine to cope with this last page with only one entry proved

particularly difficult). The print routine for *Fastfile* is a (much) modified version.

With *Fastfile* the arithmetic is rather more complex however, as, having decided how many lines to print, the routine then has to count through b$ to find the actual address in memory of the first byte of each column rather than just calculate b$(61) etc.

Clearly this would be slow in basic so a machine code routine was written just to find and store the addresses for the routine to use. The idea of writing the whole print routine in machine code is a little daunting at present but who knows? Here is the Assembly listing.

```
        ORG 65400
;using the udg area this time
D0      EQU 65380 ;start b$
D1      EQU 65382 ;start col. 1
D2      EQU 65384 ;start col. 2
D3      EQU 65386 ;start col. 3
D4      EQU 65388
;start col. 1 "next" page if
;more than 1
D5      EQU 65390 ;page length
;set by basic "b$printer"
D6      EQU 65392
;stores number of entries to be
;printed on last (or only) page
;i.e. less than 3*60=120 in this
;case
SETUP   LD HL,(D0);from basic
        LD (D1),HL
;start of col. 1 stored
START   LD HL,(D1)
;re-start point when a second
;pass needed e.g. for last page
        LD BC,(D5);page length
        LD DE,0
;clear "entries per page" reg
;needed for part-page only
FIND1   INC HL
;start search for end of col. 1
        LD A,(HL)
        CP "*";is it the end?
        JR Z,LASTP;jump if yes
        CP 226;is it "STOP"?
        JR NZ,FIND1;if not loop
        INC E
;"stop" found so increment entry
;count
        DEC C
;and dec. line count
        JR NZ,FIND1
;loop again if not last line
        LD (D2),HL
;end found so store addr.
        LD BC,(D5)
;re-load page length for count
;to continue
FIND2   INC HL
;start search for end of col. 2
        LD A,(HL)
        CP "*"
        JR Z,LASTP
        CP 226
        JR NZ,FIND2
        INC E
        DEC C
        JR NZ,FIND2
        LD (D3),HL
;store end col 2 addr.
        LD BC,(D5)
;re-load line length
FIND3   INC HL;do it all again
        LD A,(HL)
        CP "*"
        JR Z,LASTP
        CP 226
        JR NZ,FIND3
        INC E
        DEC C
        JR NZ,FIND3
        LD (D4),HL
;store addr. end col 3
;also start of col 1 of next
;page.
        RET
;to basic to print a full page
LASTP   LD (D6),DE
;store number of entries
;as this is not a full page:
;basic will do the calculations.
END     RET
;ready to print last/only page
LENGTH  EQU END-SETUP+1
```

You will see several similarities to the sort routine but it is much simpler. If it finds the '*' EOF marker before a page-full of entries has been counted then it tells basic how many entries to print. The correct page length is calculated by basic and passed to the machine code for a final pass using the new page length to find amended column start addresses.

For those of you without an assembler, here is a Basic loader:-

```
 10 REM basic loader for "b$printC" code
 20 CLEAR 49999: LET c=0: RESTORE 100
 30 FOR a=50000 TO 50080: READ b: LET c=c+b: POKE a,b: NEXT a
 40 IF c<>10318 THEN PRINT "Error in Data": STOP
 50 SAVE "b$printC"CODE 50000,81
 60 STOP
100 DATA 42,100,255,34,102,255,42,102,255,237
101 DATA 75,110,255,17,0,0,35,126,254,42
102 DATA 40,54,254,226,32,246,28,13,32,242
103 DATA 34,104,255,237,75,110,255,35,126,254
104 DATA 42,40,33,254,226,32,246,28,13,32
105 DATA 242,34,106,255,237,75,110,255,35,126
106 DATA 254,42,40,12,254,226,32,246,28,13
107 DATA 32,242,34,108,255,201,237,83,112,255
108 DATA 201,0,0,0,0,0,0,0,0,0
```

Next time we will actually get down to printing.

Editor's Note: *Fastfile*, a versitile data storeage program for the Spectrum by Clyde Bish, first appeared in Vol.2 N°8 As volume 2 of ***FORMAT*** is now technically Out Of Print there will be some readers who do not have access to the original *Fastfile* article. Being the kind, helpful people that we are, we will reprint the article (and send it to you with your next ***FORMAT***) if you send in a request with two first-class stamps (or two IRCs) to cover photocopying.

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Canon BJC4000 £295

YOUR LETTERS

Dear Editor,

In response to your request for letters on 'How I Got Started With Computers'.

It all started in the sixth form, back around 1968. One of the masters started a computer club, only we didn't have a computer - that would have been ludicrously expensive in those days. No, we had special pads into which we slotted partly-punched cards and then punched out holes with a special stylus to create a line of Fortran code: 'Port-a-punch' it was called, I believe. Each card would need around thirty or so holes, and a full program would use lots of cards! We wrote short programs and made lots of mistakes.

The carefully-ordered stacks were then posted to Cambridge, where they were fed into the University's Titan mainframe. About ten days later, they would come back with lists of error messages from the Fortran compiler. So each week's work was done in the dark, not knowing how last week's had gone. At some point the Titan was given a machine which sorted the cards by line number, which helped a lot - until the technicians dropped them all and had to post back everybody's work in one big jumble for us to sort out (after all, they had no way of knowing whose line 10 went with which line 20). Needless to say, only one or two of us ever got a program to actually run. Unfortunately for ***FORMAT*** I was one of them, otherwise I might not have been hooked and you would have been spared my story!

Next year brought progress. There was an Army training camp nearby with an ICL mainframe which spoke an ICL assembly language called PLAN, and we were unleashed on it. This system used punched tape, and we sat at rows of workstations comprising an IBM golf-ball typewriter, a tape puncher, a tape reader and a drawer-full of electronics. We then went to a different room where a technician fed our precious tapes in to the computer. To our chagrin, we were not allowed anywhere near the techie bits: the technicians were well used to squaddies, and perhaps wisely felt unable to distinguish us from such life forms.

Amazing! One could type straight onto tape, erase (well, overwrite really) back to a mistake if spotted soon enough, run the tape through the compiler and have the first bug spotted all in one evening! Editing facilities were minimal, but I believe one could duplicate lengths of tape automatically so that debugging did not involve complete re-typing. When the compiler was updated to look for errors in our entire tape rather than stop once it met the first one, this was a great step forward. Less impressive was the introduction later on of something very hi-tech - a Visual Display Unit, or VDU. Its dismal green screen occupied a place of honour in the middle of the room, trailing cables like an SF movie. The technicians didn't understand it, if I remember rightly because the manual was late in coming and incomplete when it did.

I leaped on the thing with cries of joy and tried to teach it noughts and crosses. Then I met my first bug. Yes, children, even back in 1970 operating systems had bugs in. Eat your heart out Microsoft! A certain tape of mine would cause the system to freeze - the processor waiting for the VDU to say something, and the VDU waiting for the processor. The only known way out was to wipe the core-store memory clean and reload the operating system, a process which took about half an hour and ruined our evening's computing. No-one could find a bug in my code, but eventually I was banned until I had fixed it. Being an honest chap, I merely rewrote the identical program on a new tape and said I thought I'd fixed it. To my astonishment I had! Afterwards, close comparison of the two tapes revealed an extra character inserted in the old tape - it turned out to be a control character which did not print out on the work-station golf-ball, and to this day I don't know how it got there. But I left school before I finished my program.

If you want more of this, let me know and I will tell you of the Cambridge Titan and the Ballad of Eskimo Nell, the calculator victim of a hit-and-run driver which became a transplant donor, the software company director who took my wedding photographs, and ....

Your sincerely, Guy Inchbald

Ah! PLAN, now there was a language, ADX this, PERI that, even a few STOZ instructions for good measure.

And as to the Ballad of Eskimo Nell??? I just can't wait for your follow-up Guy. ***Ed.***

Dear Editor,

You had asked the readers to come up with new ideas to increase the readership base of the magazine. Since the glossies have disappeared, there is no way to contact the old Spectrum owners. However, most of them must have migrated to PC based machines. So the obvious place to put a small ad is in the classified columns of the PC magazines. Also, how about Internet? Brian Gaff should be able to help here. From my personal experience, I can vouch that if people come to realize that ***FORMAT*** is still thriving, they might rejoin, at least for the sake of nostalgia. I myself rejoined the Indug when I saw your ad in one of the last issues of a glossie, I think it was SU. Once you are not in touch for a long time, the tendency is to assume that the group must have died a natural death like others, especially if you do not advertise in any publications. I myself was quite surprised to learn that you are still going strong and that coupled with the new acquisition of a PLUS D system persuaded me to rejoin. By the way, could you please let us know the present strength of membership?

Your two year membership offer is quite attractive to overseas readers since you offer a rebate and we save on bank charges as well. You need to display your sub rates in every issue so that people who are already members will be less inclined to quit, especially if they see the attractive 2 year offer.

I have seen many complaints about Spectrum owners being left out in the cold. I have the same feeling, even though I have Beta Basic 4.0 which is one of the best pieces of software that I have used, and I use a Pentium PC at my work place! You can easily mimic SAM Basic routines using the Beta Basic, but I still do not know how to implement the following functions: RECORD and BLITZ. Also, supplying a list of SAM variables and the Spectrum equivalents would be useful.

You had asked readers to suggest the titles of books they want to see published and them moaned that not many responded. I am not surprised. If you check your readership list, you will note the bunch consists of two groups: the old die-hard Spectrum followers and the newcomers who are new to the scene,

mainly after getting their computer from car boot sales or even from older relatives who have migrated to greener pastures. The old timers still have collected most of the good books at the height of Spectrum era and will not be interested in getting them again. The newcomers will not know about the existence of such books anyway. So what you need to do is to publish a list of books as possible candidates for future publication. I am sure that you would get a far better response this time.

I am very much interested to see a hard drive for Spectrum. However, price will have to be very reasonable for the system to succeed. I imagine that if someone can come up with a modification for the PLUS D, say with a new ROM to convert the little beast into a hard drive interface, it has a better chance of success, and it will be cheaper for the developer as well.

Please inform Jon Nixon that his covers are excellent and bring us a smile as soon as the wrapper is opened. Also, best wishes to you all and last but not least, wish ***FORMAT*** a very Happy Birthday and Many Many Returns of the Day!

Yours sincerely, P.A.Basheer, (U.A.E.)

We hope to start pulling back some 'deserters to the IBM' by including a regular column for those using the Z80 Spectrum Emulator (and possibly other emulators as well). I would also like to see a regular Beta Basic section, if only I could find someone to run it and find a way to get Beta Basic listings onto the MS-DOS machine for type-setting. Anyone interested?

A hard drive for the Spectrum would be a possibility, the only problem is working out how to store the operating system. With SAM's 512K of memory, setting aside 16K or even 32K is not a problem, but with the Spectrum you would need to use a shadow ROM system like the PLUS D's and that is not as easy as it sounds. But, if someone does it, we will let you know.

And thanks for all your other comments. ***Ed.***

Dear Editor,

I have over the years used a number of computers and now mainly use a 486 IBM PC clone - however I still find the Spectrum an interesting machine to use and its operating system to tinker about with - using the Z80 emulators on the 486 makes this so easy. 'Pinball' on a rock steady VGA loading from a hard disc is light years away from wobbly TV screens and cassette tapes.

I saw some of the early SAM's demonstrated at the ALL FORMATS computer fairs, and was always impressed by their capabilities. I can't justify buying yet another computer though. Would a SAM emulator for the IBM PC clones be a realistic prospect - perhaps a 'stripped down' shareware edition at shareware prices first and then a registered full version say £20 to £30? This would boost the use of SAM computers and especially the software no end.

I'd be interested to hear your comments and views on this...

Yours sincerely, Andrew C.More.

Now I'm not saying a SAM emulator for IBMs is not possible.... But I think it would need a powerful PC to run it if it was ever written. And anyway, the SAM is a much better looking machine to have on your desk that a PC, so why emulate when you can have the real thing? ***Ed.***

Dear Editor,

It's raining at long last as I write this letter and its cool. That's the weather over with!!

Now to serious things. Please find enclosed a cheque for my annual subscription. There is a tricky question on the renewal form. What 3 articles did I enjoy the most.

WELLLL.. SAM, Spectrum, the rest, PLUS D and Adverts they are all good in that order.

Least enjoy???? I'm thinking. NONE. Bob's taste is very good - just like mine, and I like it as it is.

Bob will jump down my throat when he sees my answer on the renewal form. For the third part, just joking!!!

PAGE 41 + ???? I know.

I hope that's not our Bob skiving off on page 27 Vol 8 No 12 of last months mag.

No more chit chat? I'm hoping to see you both on the 14th as it would be nice to see the faces behind the voices on the phone.

Yours sincerely, Don Spowart.

We look forward to seeing you Don. ***Ed.***

Dear Editor,

Sincere thanks to Jenny for providing so promptly copies of the Assembly Listing relating to the BJ Dumping article - Vol 8, No 1 page 23.

My request arose because Anthony Henn's code refused to run on my Canon BJC 4000. I had already looked through the letters pages of the issues immediately following publication in the hope that another reader had encountered a similar problem and had written in with a solution. I did in fact find that J.W.Cranfield had difficulties but must say that he received a rather dismissive reply.

When I received the Assembly Listing, which is very well commented, it soon revealed the problem. I could not find in the Canon handbook some of the printer control codes used in the program! This seemed at first to suggest that there were major differences between these two printers from the Canon stable but then I recalled reading elsewhere in the hand-book that the printer's 'BJ' (IBM X23E emulation) mode should be selected for high-res graphics.

And sure enough, the 'missing' codes are listed in the 'BJ' section which seems to be identical to the 'IBM' mode on my Star 24-pin printer which has never been used because, like 'BJ' mode, it lacks some of the control codes relied upon by both my own and most proprietary software - hence Canon's recommendation to retain the default Epson HG setting. The solution was easy. Switch off the printer. Set Dip-switch 11 to 'off'. Switch on again and out came a splendid shaded dump. Congratulations Anthony.

I hope this information is of use to some readers. I had already written a small Basic program to load and call the code and have now added a screen reminder that 'BJ' mode should be selected - and later de-selected.

Yours sincerely, Cliff Jackson.

Dear Editor,

Thank you for the renewal reminder which I now enclose with my cheque for another 12 issues.

In common with other members I have difficulty in answering your questionnaire as I find something of interest on most pages. My main favourites as ever are everything and anything by Carol Brooksbank, John Wase's Short Spot (I'm so glad he is able to continue), the Help Page and, of course, reader's letters.

So for me, more of the same will be fine.

Belated thanks are due for re-copying my Driver disc earlier this year. Notepad now works fine.

Every month I turn to the inside of the back cover to check the advert for the DUC and I see it still seems to be a device which allows the use of two joy-sticks, presumably at dawn, for a fight to the death. Also I am not sure if this cable prolongs the life of the hardware or the software.

I know I am being facetious, tongue in

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cheek though, but if duel could be changed to dual and ware to wear it would help to maintain the professional look of ***FORMAT*** which rightly is important to you (us).

I was interested in J C Blomleys letter on page 36 of Vol 12 where the idea of hardware kits from West Coast was raised and I wondered whether Bob would like to comment.

You and Jenny must occasionally still be surprised by reader's reactions. I thought his comment about travel distances to Mr Haslam was innocuous enough and fair comment.

On the subject of hardware, I believe the hard-disc for SAM is materialising, but do you know if any work is being done on making the VTX5000 modem compatible with SAM.

If this could be achieved we could send letters etc. directly to you as well as transfer data between members suitably equipped.

Thank you again for all your hard graft.

Yours sincerely, Maurice Smith.

Dear Editor,

Would you be interested if I wrote a short piece on the transfer of data between the Z88 notebook computer and 128 Spectrum via the RS232 port cable pin-outs and programs to do this, and transfer to disc via PLUS D.

Anyway keep up the good work and thanks for a good mag.

Yours sincerely, Kevin Cross.

Yes please..... ***Ed.***

Dear Editor,

Regarding my article 'Exploring SAM MIDI' which you kindly published in the August issue of ***FORMAT***, there is one point in my article that may cause some puzzlement amongst the readers. Actually I made a mistake in typing out the two test programs. In Keyboard tester, line 150 should read `OUT 253,127+C: OUT 253,PTCH: OUT 253.0`.

Line 90 in 'Piano Tester' should also read the same, as 127+ channel number is the note switch off signal. I typed in 143+channel, which is the note start signal. Actually both programs work as they stand because the two lines set the note volume to zero effectively stopping the note.

I thought I had better point out my mistake though, in the interest of accuracy.

Incidentally I have used my main programs over the past 18 months and various improvements have 'come out in the wash'. I have provided SAM PD with my latest improved software. I have transcribed many difficult pieces of music to floppy disc and played them on my keyboard. The latest effort was Rachmaninoff's Prelude which featured a large number of eight note chords. The program coped without any problems.

If any readers try out my programs and run into difficulties then I would be happy to help out with extra information.

Yours sincerely, P.J.Williamson.

Many thanks, glad we were finally able to find space in ***FORMAT*** to run the article which I am sure many people will have found very useful. ***Ed.***

Dear Editor,

When will the hard drive be developed/released for the Elite/Coupé here in Britain? How much will it cost? I understand the full 540MB hard drive will allow anyone to snapshot complete SAM discs onto the hard drive and approx. half of it could be used to hold up to 225 diskette images - is this true of the British hard drive or is it only possible on the German version. Will Nev Young be responsible for the hard drive DOS and if so how will it compare to the current SAMDOS and

MasterDOS? Also, what will the similarities be to hard drives on other machines (Amigas, PC's etc.) and will there by any MAJOR differences?

I will be subscribing to ***FORMAT*** shortly (please send some new forms and a hardware list). Is it true that West Coast is no more - has a new buyer been found? Does SAM have a future? (I will always be supporting it!).

Did you know that ESCOM are relaunching the C64 in all the East European countries.

Did you know that ESCOM are re-launching the Amiga (with some new packages/hardware - hard drive etc.) for £399? This could be beneficial to the Elite scene.

Well that's all for now. I look forward to reading my letter in ***FORMAT***.

Yours sincerely, Alec Carswell.

Even as I type this reply, the Genius himself, the one and only, the great Nev Young, is sat just across the office from me. Busy playing DOOM on his PC, oh, sorry, that should read busy writing the HDOS operating system. Why here? Cos he can get some peace and quiet, lots of cups of tea, and he has me to crack the whip every time he slacks off.

Honest though, it is still too early in the day to say much about HDOS. The hardware is similar to the German system, but that is about all. 540mb? Well, yes, maybe (we have had a 1.27Gb drive on it this week) but I would hope that a more sensible size drive can be found for production versions - around the 85 to 100mb would be ideal I think. I sincerely hope it will have little to do with MS-DOS. ***Ed.***

Dear Editor,

In response to your request for letters on 'How I got involved with Computers' I submit the following:

I had a long passing interest in computers, from the articles in my electrical engineering journals, but my 'hands-on' experience did not start until about 1980 when the College of F.E. where I lectured in engineering, obtained a micro by South Western Technical Products. I cannot recall even knowing it's technical details, but it was blessed with twin 5¼" drives and a 14" mono screen. It used upper case text only and the functions were limited, eg., for trigonometry there were COS, SIN and ATAN only so manipulation was needed for the rest. One of our female mathematical colleagues gave all staff, a few at a time, a 'computer appreciation' talk over the machine. The college was small at the time and eventually all students had the same experience.

I was 'hooked' and very fortunately was able to pick up the rudiments of Basic from the same colleague, as the mathematicians and engineers happened to be sharing the same workroom at the time. I took early retirement in 1984 and acquired my first home computer in July '87, a beautiful 64K (total memory rating) Radio Shack TRS-80-II business micro (circa 1980) with one 8" built-in drive, one expansion ditto and a 132 column d.m. printer. I eventually gave this away to a TRS-80 pen-pal and currently own a 16K ZX 81 with typewriter style replacement keyboard and a ZX Spectrum+ 128K from a car boot sale enabling colour computing for the first time. A few drives and share a Star LC-100 colour printer.

I hope this is the sort of piece you can use.

Yours sincerely, Roy Burford.

Dear Editor,

I am a new subscriber to ***FORMAT***, and found your letters page very interesting. I agree with Ray Smith (August 1995 P33-35), there are far too few +3 programs available, why can't The Fractal Collection, or an alternative, be supplied on +3? The same goes for Prince of Persia, which sidestepped the

Spectrum and went straight on to the SAM, even though there were more Spectrums in use. Because of the lack of suitable software, my new software exists almost entirely of PD.

I have a good many PD Programs in my collection, but because of my lack of technical knowledge, I am unable to load many of them because they do not load with the normal loader, or LOAD "".

A comprehensive article explaining the various loading methods, in simple terms, would be of great value to me, and perhaps to other casual users.

Yours sincerely, Philip Court.

One of the problems with the +3 is that it is different. The discs have a small capacity and the DOS is not as flexible as on DISCiPLE, PLUS D or Discovery. This, coupled with the smaller user-base, has led to the +3 being neglected.

But the +3 is a Spectrum, and the differences are minor when you know the Spectrum well. The trouble is that most of the techie people (who can write the articles you want to read) seem to have older Spectrums with alternate disc systems. As I have said before, articles on the +3 will appear once we get some sent in.

PoP was under development for the Spectrum at one point but the software house pulled the plug on the project. ***Ed.***

Dear Editor,

Please accept my enclosed re-subscription to ***FORMAT***. I must apologise for the delay, but I have been on holiday and so have only just got round to it.

I am also writing to add my name to the list of customers who have had items not returned from Blue Alpha Electronics.

On 25th August last year I sent my faulty SAM Sampler to Blue Alpha for repair. According to my bank statement, the enclosed cheque for £20 was cashed on the 14th September, and I have heard nothing since.

I look forward to hearing from you and to another 12 issues of ***FORMAT***.

Yours sincerely, Colin Borland.

Ah! Holidays, say no more, I have to go on them as well - a whole week without a computer - ahhhhhh!!!

Anyway. There is still no news on Mark Hall at Blue Alpha. His family do not reply to letters and there never seems to be anyone at home when people call. If, as we all hope, Mark is on the road to recovery, the we will hear from him one day. Until then, sadly, there is nothing more we can do. ***Ed.***

Dear Editor,

I am in receipt of your renewal notice (copy enclosed). I don't know whats the matter with you people, I only paid the damn thing last April (copy of bank statement enclosed) also I keep receiving two issues of the same month and what is more they come together by the same post as two separate envelopes.

J.W.Hurley.

Right, checked records (well Jenny did in her normal 'I will solve this mystery if it takes me all day' kind of way) and we have an answer. You were a full member of INDUG, that is, you got your monthly ***FORMAT***, but then you replied to one of our adverts for Associate Membership. Why you did that we cannot guess. Anyway. Last year, when we sent out letters to Associate Members, telling them that we were stopping that scheme and offering them a chance to convert to full membership, you sent in another membership application. In April this year you renewed your first subscription because it was due, your second subs running out caused the latest renewal notice to be sent. In other words you have been paying two subscriptions since (I think) October 1994., hence the two copies of ***FORMAT*** each month. Did it not dawn on you that something must be

wrong? Two issues with two different membership numbers? If only you had contacted us as soon as you started getting two copies each month then we could have closed one down and transferred the remaining subs to your first membership number. ***Ed.***

Dear Editor,

Thank you for the renewal slip and information. Why oh why could you not have answered my letter of 31st May? This would have avoided any frustration or anger, and would have avoided the other letter being sent to you dated 6th September. Its no wonder that people lose their patience when they feel they are being ignored.

I still feel that most of my comments are justified, even if some confusion arose on my part, concerning the last issue in my subscription. I certainly did not receive a renewal form at the time. Perhaps it would be a good idea to quote the issue number on the address labels so that people know when their last issue is. One example is "WACCI" magazine for the CPC. They actually state (in my case): "Your last WACCI issue is number 92". I found that to be quite helpful. On my labels for PD Power I just quote the start and end issue numbers pertaining to any ones subscription.

I won't be re-subscribing for the time being, as I have computer equipment to repair plus I'm assisting some PD groups and Bill Richardson (especially after his heart attack recently which left him quite ill for a while - not surprising as he is in his mid 70's. I heard that some magazine had given some grief during his illness which I find a disgrace. A case of money first with some people.

Yours sincerely, Martin Sherwood.

As we have often said before, we can't answer every letter that comes in - if we did then there would never be enough time to produce ***FORMAT*** each month. However, this does give me the opportunity to point out, once again, that every address label does carry a member's expiry date. If you look at a label the top line gives your membership number, your expiry date as MMYY, and a two digit sort code we use. If your expiry date was, say, 1095, then your membership would run out at the end of October 1995, that means the November issue would be your last. We do send out a renewal with the last two issues so there is never any fear of people not knowing when their subs are due (OK, it is possible for us to miss putting one in, but the odds of missing it two months running are too small to worry about).

Now let me turn to Bill Richardson. We now understand that Bill has been seriously ill. However, neither he, nor anyone at his company, saw fit to let people know for several months. Yes, I would imagine that he has received a lot of agro from some people - very understandable given the situation.

If your mention of *SOME MAGAZINE* is a dig that refers to us, then I think you are probably unaware of the full facts and have jumped to the wrong conclusion - something I know you seem to make a habit of. The facts are that if invoices go unpaid, month after month, there comes a time when you have to write a friendly letter pointing out that if payment is not received then adverts cannot continue to be run. Hardly 'giving some grief' is it? It is also true to say that if he had been up to date with his accounts then his spell in hospital would not have caused the problems it has for him.

In the meantime we of course wish him a speedy recovery. ***Ed.***

Letters may be shortened or edited to fit on these pages although we try to edit as little as possible.

This is **YOUR** letters page so it is up to you to fill it with interesting things. Come on, get writing, any subject even remotely related to computers. Just keep things as short as you can so we can fit in as many as possible each month. Please write clearly or type your letters. Send them to the address on page 3 or fax them to us on 0452 380890.

Into The 1Meg...

A Look At Using SAM's 1Mb RAM Extension By:- Carol Brooksbank.

I have heard several people ask "What can I do with a 1-Meg extension other than format ramdiscs?"

If you are working in Basic, the answer is not a lot, but that certainly does not mean that all you can do with all that extra memory is save and load files temporarily. You can use the ramdisc to access the 1-meg memory for the bulk of your program. It does mean that you must use well structured programming, making the main spine of your program as short as possible, and calling subroutines and procedures to perform the program's various tasks. Routines which work together will be saved as separate blocks of program, and when the program is loaded these blocks will be copied to the ramdisc, but the main program is loaded into memory.

Suppose, for instance, your program has a menu with ten different options. The main part of the program, the menu, will be loaded into memory, while ten blocks of Basic which perform the menu options will be copied to ramdisc. When a menu option is selected, the main program will MERGE the block for that option into the Basic program in memory. When its operation is complete, and the program returns to the menu, the merged lines will be deleted. Your program is constantly modifying itself in use, and although the total program, permanently in memory plus options merged in when needed, may add up to nearly 1.5meg., there will never be more Basic in memory at any one time than the internal memory can handle.

With a 512K SAM, if you have only one screen and do not use OPEN TO to reserve extra pages for Basic, you can format one ramdisc with 4 directory tracks and 160 tracks total, (a normal size 80-file, 780K disc), and another with 2 directory tracks and 110 tracks total, giving another 40 files in 540K, or 1 directory track and 110 tracks total, giving 20 files in 545K.

If you want to open more screens, or reserve more pages for the main spine of your program, you will, of course, have to make do with smaller ramdiscs. For instance, if you OPEN TO 25, reserving 400K for your internal memory Basic, you can still have a full size ramdisc, plus another with 1 directory track and 46 tracks total (20 files in 225K), and still have room to open 2 extra mode 4 screens.

This sort of programming gets away from the concept of the ramdisc as just another disc like a floppy, and uses it as programming memory. But do not underestimate the ramdisc, even if you only use it for saving and loading files. I much prefer a ramdisc to an external drive 2, for things like copying discs. It is much quicker to put your master on the ramdisc and copy from that to drive 1, than it is to copy from drive 1 to drive 2.

The ramdisc comes into its own if you want to use a lot of screens in a program. You could use every spare bit of memory for opening screens, but each one gobbles up 2 pages of memory. It is far more

memory efficient to open just 2 screens, (one to view and one to load with the next screen) and keep your screen files on a ramdisc. Even if you do not compress your screen files, each one will only occupy 24.5K on your ramdisc, while an opened screen will use 32K. If you think that might result in slow loading of screens, try this little experiment. Copy as many screens as you can find to your ramdisc, but make sure they are SCREEN$ files. If you have any saved as code blocks, use LOAD "D1:name" SCREEN$: SAVE "D3:name" SCREEN$. Now use FOR X=1 to however many screens you have: LOAD X: NEXT X to display them. You will find that you have to introduce a PAUSE if you want to see what they are!

Although Basic users have to use their ingenuity to use the 1-meg for programming, machine code users can access its pages direct, simply by paging them in. There are some restrictions - one is that you can only page them to high memory, starting at 32768. The usual rules about paging apply, of course. You must make sure that when you bring in a page, you jump to the right address on that page, or rather that you have the right code at the address you jump to, just as you would when paging in internal memory. Another restriction is that it is not easy to page the screen in and out when external memory pages are paged in. Using RST 16, when you have external pages at 32768, will cause a crash. You need to copy your text to be printed to screen or printer to an address below 32768 and then page out the external pages before using RST 16. If you have a lot of text to print, you must do it a line or two at a time, because there is not a lot of room below 32768 for your Basic and a temporary store.

Those of you who followed 'Machine code without tears' will remember that port 251, the High Memory Page Register, is used to bring pages to address 32768. Bits 0-4 of that port hold the page number, bits 5-6 have to do with the colour look-up table, and do not concern us here, but bit 7 is the key to using the 1-meg. If bit 7 is reset (0), the page at 32768 will come from ordinary internal memory. If bit 7 is set (1), the page will come from the external 1-meg.

So let us write a little bit of machine code to try out external memory paging.

```
          ORG 30000
HMPR      EQU 251
MESSAGE   EQU 32768
PRESHIGH  DEFB 0
```

We shall load the code to 30000, so that it is not paged out when we bring in the external pages to 32768. Two variables are stored, the HMPR port number and the address at which we are going to store a message in the 1-meg page. Finally, we leave a 1-byte store for the value of HMPR before we change it, so that we shall be able to restore the paging to normal after we have finished with the external pages.

```
START     CALL ONEMEG
ESSMEM    LD DE,MESSAGE
          LD A,MESSLEN
          LD B,A
          LD HL,MESSTART
MESSLOOP  LD A,(HL)
          LD (DE),A
          INC HL
          INC DE
          DJNZ MESSLOOP
          CALL NORMAL
          RET
MESSTART  DEFM "THIS IS IN 1-MEG
                PAGE 6"
ENDMESS   EQU $
MESSLEN   EQU ENDMESS-MESSTART
```

We begin by calling our own subroutine (below) to page in external pages to 32768. We then poke the message bytes into the start of that page,

by pointing DE to MESSAGE (32768), HL to the start of the message bytes, putting the message length in B and using a simple loop to copy the message. Afterwards, our own subroutine NORMAL (below) will page out the 1-meg pages before returning to Basic.

```
1MEGPR    CALL ONEMEG
          LD HL,MESSAGE
          LD DE,31000
          LD BC,MESSLEN
          LDIR
          CALL NORMAL
```

This is the routine which prints the message to screen. First we must page in the 1-meg page, and copy the message bytes to 31000 so that the printing routine can access them. We then page out the extension pages.

```
          LD A,2
          CALL 274
          LD HL,31000
          LD B,MESSLEN
PRLOOP    LD A,(HL)
          RST 16
          INC HL
          DJNZ PRLOOP
          RET
```

This is a simple print to screen routine which you met many times in 'M/C without...'

```
ONEMEG    IN A,(HMPR)
          LD (PRESHIGH),A
          AND @11100000
          OR @10000110
          OUT (HMPR),A
          RET
```

This is how we page in extension pages. First, the current value at HMPR is fetched and stored so that we can put things back to normal later. AND @11100000 clears out the page number, without disturbing bits 5-7. OR @10000110 puts BIN 110 (denary 6) into bits 0-2, so that page 6 will be selected. Bit 7 is set, so that the external page 6 will be used, rather than internal page 6. Bits 5-6 are undisturbed, and bits 3-4 will be at 0, because we do not need them to specify page 6. The new value is sent to HMPR, and external page 6 is paged in. You can specify any external page number by putting the appropriate number in bits 0-4.

```
NORMAL    LD A,(PRESHIGH)
          OUT (HMPR),A
          RET
```

This last subroutine fetches the original value of HMPR, and sends it to the port, thus paging out external page 6 and restoring the normal paging.

```
END       EQU $
LENGTH    EQU END-PRESHIGH
```

And finally, we end the source code as we always do, with an end marker and length calculator.

If you assemble this code, use CLEAR 29999 and load it to 30000, CALL 30001 (START) will store the message in page 6 of your 1-meg extension. CALL 30046 (1MEGPR) will copy the message to screen. You must, of course, do these calls in the right order.

But, I hear you ask, how do we know this is really extension page 6 and not internal memory page 6? For the doubters among you, this program will prove it.

```
          ORG 30000
HMPR      EQU 251
MESSAGE   EQU 32768
PRESHIGH  DEFB 0
START     CALL ONEMEG
MESSMEM   LD DE,MESSAGE
          LD A,MESSLEN
          LD B,A
          LD HL,MESSTART
MESSLOOP  LD A,(HL)
          LD (DE),A
          INC HL
          INC DE
          DJNZ MESSLOOP
          CALL NORMAL
          RET
MESSTART  DEFM "THIS IS IN 1-MEG
          PAGE 6"
ENDMESS   EQU $
```

```
MESSLEN     EQU ENDMESS-MESSTART
NORMEM      IN A,(HMPR)
            LD (PRESHIGH),A
            AND @11100000
            OR @00000110
            OUT (HMPR),A
            LD DE,MESSAGE
            LD A,MESS2LEN
            LD B,A
            LD HL,MESS2
NORMLOOP    LD A,(HL)
            LD (DE),A
            INC HL
            INC DE
            DJNZ NORMLOOP
            CALL NORMAL
            RET
MESS2       DEFM "THIS IS IN INTER
            NAL MEMORY PAGE 6"
ENDMESS2    EQU $
MESS2LEN    EQU ENDMESS2-MESS2
1MEGPR      CALL ONEMEG
            LD DE,31000
            LD HL,MESSAGE
            LD BC,MESSLEN
            LDIR
            CALL NORMAL
            LD A,2
            CALL 274
            LD HL,31000
            LD B,MESSLEN
PRLOOP      LD A,(HL)
            RST 16
            INC HL
            DJNZ PRLOOP
            RET
NORMPR      IN A,(HMPR)
            LD (PRESHIGH),A
            AND @11100000
            OR @00000110
            OUT (HMPR),A
            LD A,2
            CALL 274
            LD HL,MESSAGE
            LD B,MESS2LEN
NMPRLOOP    LD A,(HL)
            RST 16
            INC HL
            DJNZ NMPRLOOP
            CALL NORMAL
            RET
ONEMEG      IN A,(HMPR)
            LD (PRESHIGH),A
            AND @11100000
            OR @10000110
            OUT (HMPR),A
            RET
NORMAL      LD A,(PRESHIGH)
            OUT (HMPR),A
            RET
END         EQU $
LENGTH      EQU END-PRESHIGH
```

You will see that in the section below NORMEM, OR @00000110 (page 6, but with bit 7 reset) is used, so the second message is stored in internal memory page 6, at the same address used for the first message stored in external memory page 6. If these are not different page 6s, the second message overwrites the first.

In NORMPR, which prints the second message, internal memory page 6 is paged in again, and we do not have to copy the message to 31000, because RST 16 can page the screen in and out with any internal page in situ.

Now, if you assemble this code and load it to 30000, the following CALLs will run the program.

CALL 30001 (START) Stores the 1-meg message

CALL 30046 (NORMEM) Stores the message in internal memory page 6

After this, you can do the following calls as often as you like and in any order you like, to print the appropriate message to screen each time.

CALL 30109 (1MEGPR) Prints the 1-meg message

CALL 30142 (NORMPR) Prints the message in internal memory page 6

If you enter PRINT after each printing call, the new message will start on a new line. You know the messages are on different pages, because neither is lost by printing the other, though both are stored at 32768, on page 6.

So I hope that you will now be more adventurous with your 1-Meg extensions. They are much more than extra discs which you have to remember to copy to a floppy before you switch off.

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