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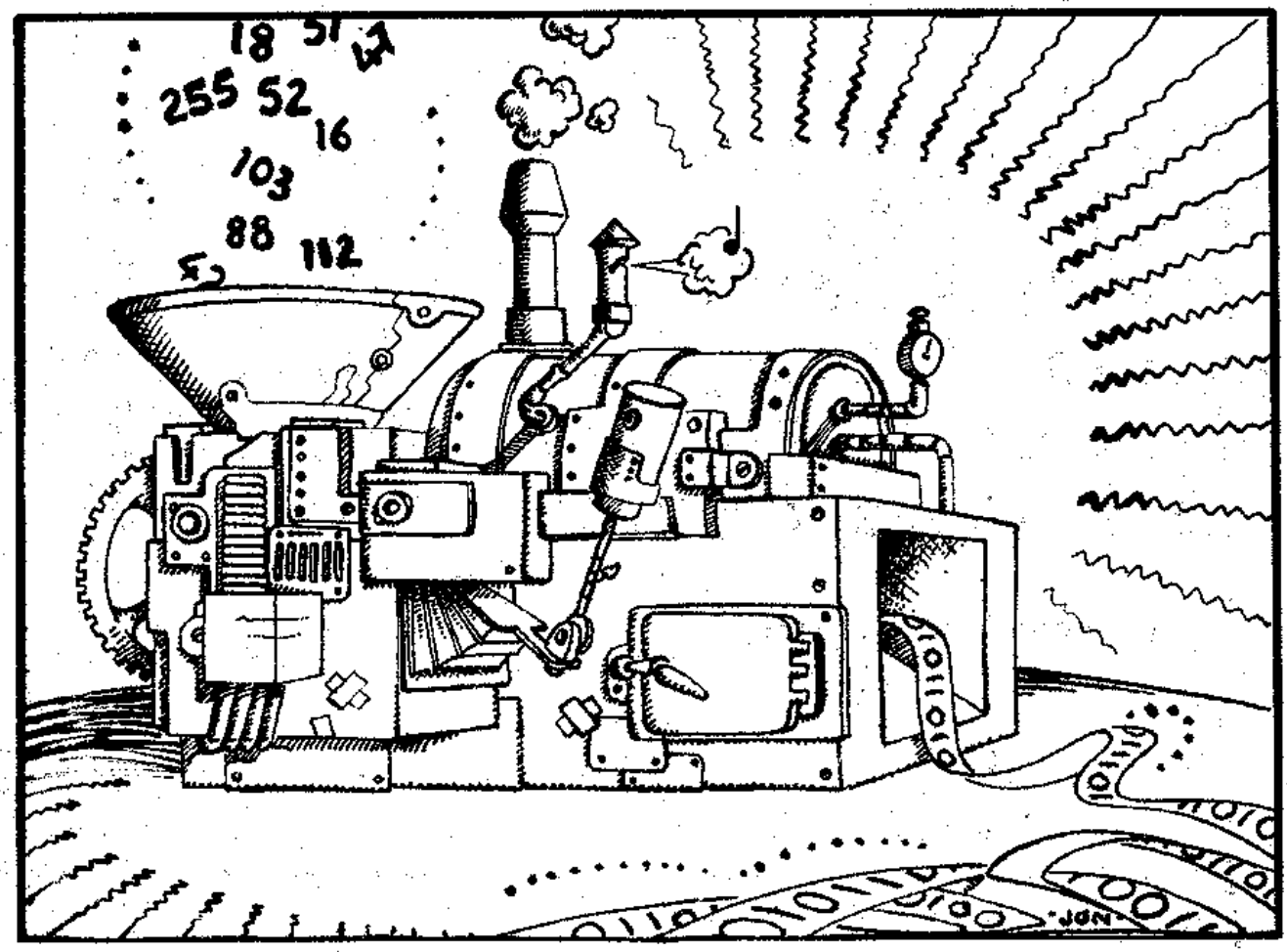
FORMAT

THE MONTHLY MAGAZINE FOR
SPECTRUM, DISCiPLE & PLUS D USERS



Centronics To RS232
The Hardware Solution

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THIS MONTHS ADVERTISERS:-

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Hello, and a warm welcome to the first FORMAT of 1989. I trust you all had a very good Christmas and that 1989 has got off to a good start for you. My thanks to everyone who sent me a Christmas card, they really helped to brighten up my office.

1988 was a very good year for FORMAT and the User Group. Membership now stands at around 1200 and, although there was a drop-off following the postal strike, subscriptions are now coming in faster than ever before. However FORMAT is not about to rest on its laurels, 1989 will see thing get even bigger and even better, so keep reading.

This issue has been very difficult to put together, not because I had difficulty in finding things to put in. No, its because of the articles I had to leave out due to lack of space. I try to get a balanced mix of articles in each issue but its always a problem deciding which should be held over for a future issue. I'd like to print more pages (and I'm sure you would like to see more pages) but I can only do that by increasing the subscription rate or by taking more advertising in FORMAT. Working on the basis that 1 page of adverts will pay for the printing of 4 pages of FORMAT you can see that adverts should NEVER exceed 25% of the magazine. This is the way I would prefer to go so we need more adverts. But I cant handle advertising myself (I just dont have time). What I now need is someone to handle advertising sales on a very part-time basis. I cant afford to pay proper wages but I will cover all necessary expenses. So if you have a bit of time to spare, and an interest in seeing FORMAT grow even bigger, then give me a ring.

And now to a new feature I hinted at in the last issue, the YOUR REVIEW section. Most of us have a utility or some other program we use almost every day, well nows the time to tell everyone else about it. Write a review, including details of why you use that program (instead of some other). If we publish it you will get a free years subscription to FORMAT.

Watch out next month for full details of the MGT INNOVATION AWARD. MGT are going to be looking for innovative ideas, both in hardware and software, which have a practical application in the world of computers. Its no good coming up with an idea with limited appeal, MGT will be looking for things as revolutionary as the Joystick or Spreadsheet were, when the were first introduced. So get your thinking caps on.

Finally this month a reminder that full INDUG members (those who have taken a full years subscription to FORMAT) are entitled to a 5% discount on all purchases made through MGT. Just ring through your order (or write), quote your membership number and claim your discount. Your membership number is always printed on the top lefthand corner of the label we use to post FORMAT.

See you next month.

Bob Brenchley. Editor.

NEWS ON 4

SIR CLIVE'S HAPPY NEWS

Computings most eligible batchelor has announced his plans to marry this summer. Sir (uncle) Clive is to wed Bernadette Tynan in June. 22 year old Bernadette met Clive (48) at a meeting of MENSA the society for people with high IQ ratings so it looks like beauty and brains made an irresistible package.

We are pleased that Uncle Clive has found his ideal partner, but would like to warn him to watch out in case Mr Sugar tries to put in a take-over bid.

MGT PRICE CHANGES

MGT has announced a price increase on their PLUS D and 3.5" Disc Drive package. The price goes up by £10 to £159.95 from 15th Feb. The price of a PLUS D or separate disc drive remains unchanged. The TWO FACE has already gone up to £29.95.

In the other direction the price of the Star LC10 is now down to £219.95 with the colour version at £259.95 also down in price. MGT also have a special price on 3.5" blank discs at £12.95 for ten.

SPECTRUM STILL THE BEST SELLER

Despite the bad press the Spectrum received following Amstrads blunder with the +2a (see the last few months FORMATS) the Spectrum still showed every other computer that it still has more people appeal than any other machine. The pre-christmas sales figures show the Spectrum way out in front with 44.6% of sales. The poor old Commodore 64 limps into second place with 23.6%, which is still not bad when you compare it with the next best sellers. Yes those much hyped computers the Atari ST and Commodore Amiga managed a meagre 4.6% and 3% respectively.

Even more revealing is the sales figures from a major independent retailer. They give the Spectrum +2 60%, the +3 20% and the C64 15%. Their sales figures give the ST and Amiga just 2% each. Could it be that buyers are at last realising that 16 bit computers dont live up to the hype?

BLACKPOOL SHOW SET TO BREAK ALL RECORDS

News that MGT will be showing the first working version of SAM at the NORBRECK show (Sunday January 29th) looks like helping to set new attendance records. MGT will have a large stand and FORMAT will also be there. It is good to see a show outside of London being so well supported. DON'T MISS IT.

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If you have any news items you want to pass on then send them in. Please mark the envelope NEWS in the top left corner.

YOUR LETTERS

Dear Editor, *STAR*LETTER* *STAR*LETTER*

In reply to your article on Caesar's Cipher in FORMAT Vol 2 No 4, I wonder how many of your readers are aware that the Spectrum has its own Cipher and Security system built in. Here is a simple one line program that shows exactly how it works.

```
1 POKE 23606,8: PRINT AT 10,7; "MERRY XMAS BOB"
```

When you run this you will get NFSS!YNBT!CPC on the screen, and in the bottom left hand corner you will also see 1!PL-2;3 which translated means 0 OK,1:2 Before getting it back to normal by POKEing 23606,0 try listing it, it makes a most unusual listing which will still run. Now add this line which will make it totally secure:-

```
2 PAUSE 0: POKE 23607,0
```

when you run this you will get the same result as before on your screen, but now press any key and down in the bottom left hand corner you will get what looks like a medal ribbon, press the BREAK Key and now run the Program, it will look as though it has crashed and even worse when you try to list it, to get back to normal you must carefully POKE 23607,60 then POKE 23606,0. I wonder if any of your readers have any POKES that they would like to pass on, useful or not some can be fun. Here is a more serious one, it lets you hide your name within the program, and no one can see it or list it. Type in and run this:-

```
1 REM YOUR NAME etc.
2 POKE (PEEK 23635+256*PEEK23636),64
```

alternatively you can POKE line 2 in as a direct command, your name will disappear and you can then type in your Program or if you have a program on tape you can MERGE your Program on top of it and re-save in onto a new tape. May I take this opportunity to thank you for an excellent Magazine it seems to get better and better each month.

Yours Sincerely, D.G.Cattermole.

Dear Editor,

I have a very good tip for Spectrum users that I would like to pass on. If, like me you are constantly plugging and unplugging things from your Spectrum then the edge connector suffers from a build-up of dirt and grease. You can clean this with a rubber (the best are the pencil shaped ones used by typists) but the problem still comes back. A longer term fix is to gold plate your connector. Expensive? No, not realy. Mail order companies, like SCOTCADE (0274 578043) or those that produce the special offer leaflets for ACCESS card users, have carried adverts for a gold plating 'dip'. Depending on size this will cost £4-£15 and can be painted on to the Spectrums edge connector.

Yours Sincerely, Steve Davidson.

Letters printed may be edited for length or clarity. The writer of each months STAR LETTER wins an EXTRA 3 months subscription.

PCB DESIGNER REVISITED

By: Dick Guy.

In the September 88 issue of FORMAT, I did a review of the KEMSOFT PCB DESIGNER. At the time I considered the program to be the ultimate Speccy program. Well KEMSOFT have just released an upgraded and much expanded version and so I thought you would welcome a second look at the package.

Although still called "PCB DESIGNER", I feel the title a little misleading as the new program is more of a development system incorporating all the original PCB DESIGNER ideas, plus a lot lot more. The new program arrived on cassette as a suite of 22 (yes that's right 22) routines, together with a new enlarged manual. Only 16 of the routines need be saved as 4 demonstration programs are also included. The first program on the cassette is a "READ ME" file and I strongly recommend all who get the cassette version to thoroughly read this before attempting to save to disc. I didn't and in consequence got into a right mess, so be warned.

Following the READ ME file is a set-up file which is automatically loaded. This saves all the CODE files to disc without any bother. The BASIC shell programs were next. Following the on-screen instructions allow these to be saved as well. This point was one where I came unstuck and, in consequence, I recommend you do a screen print of the instructions (in case like me you hit the wrong button and clear the screen). If you do, you will have to reload the set-up file to regain the screen required. The basic programs are all saved using Microdrive syntax, which for one program I forgot and used the normal DISCiPLE syntax. For some reason this program wouldn't load, so again it was back to the beginning.

The final program is a microdrive "RUN" type program which loads the MASTER MENU. The READ ME file recommends this be changed to AUTOLOAD before saving. I tried this and came unstuck again as all the sub-menu's then had to be changed to load the correct MASTER MENU program. My answer in the end was to SAVE a one line program called AUTOLOAD to load the RUN program.

However, finaly all was done and the great moment came. The program loaded perfectly. The new version is immediately obvious from the start as now the MASTER MENU is displayed. The options available are as follows:-

a. PCB DESIGN - this is identical to the original version.
b. LAYOUT DESIGN - which enables a component overlay to be produced. It may also be possible to develop a double sided board using this routine though I haven't tried it yet!
c. ICON DESIGN - identical to the original version.
d. CIRCUIT DIAGRAM DESIGN - which allows compatible circuits to be designed.

e. PRINTER ROUTINES - these are for quality printing including a 2X print for photo reduction purposes.

All the above programs contain a draft print routine. Providing a suitable printer is available (more on this later) the print routines may be used immediatly. Each program has its own sub-menu which enables rapid switching from one routine to another, all via the MASTER MENU. The 3 main routines (PCB, LAYOUT and CIRCUIT) all have a suite of inbuilt ICONs to allow the normal design operations to proceed rapidly, so anyone having the early version will have no problems adapting to the new version, as all the commands are carried over to the new.

The ICONMAKER is used to design those symbols which are not provided, which you may find necessary. Again the main limitation of the program is the printer required to make full use of the facilities. The program has been designed to use the EPSON LX/RX/FX range of printers which use ESC * to select graphics mode. However KEMSOFT have now taken the needs of close compatibles into account and by POKING the necessary addresses with the data provided, printer routines can be made to work. There is however one proviso and that is the printer MUST meet the following criterea:-

a.It must be a CENTRONICS printer.
b.It must be a 9 pin head.
c.Head pin spacing must be 1/72 inch.
d.Dot pitch must be 80 dot per inch or a multiple, (ie 160dpi)
e.Use ESC "K" or "L" with above dot pitch.

Otherwise scaling will all be wrong, or garbage will be printed. For those of you with machine code skills it is not to difficult to write your own printer dump routine to suit the program and your printer. In fact I had to do just this to suit my TANDY DMP 130. Regrettably the quality of the final product is not as good as KEMSOFT's as they smooth off all the lines and curves. However it has the same facilities i.e. draft, quality and magnified prints, and to date has been very succesful. Should anyone wish for details I may be contacted through FORMAT. For those of you with an RS232 printer - fear not. The RS232 interface for the DISCiPLE and PLUS D starting on page nn of this issue will allow the program to be used, provided your printer meets the rest of the above requirements.

Every aspect of the system is covered in a very well written manual. It guides you through each of the demo routines in a clear and easy to follow manner

Now a few notes on the experience I have gained from the early version. Producing the board should not be done using a "health lamp".I tried to do some boards using one of these lamps and paper transparentiser as was my normal practice. Unfortunatly the heat from the lamp caused the ink to run and the result was a mess. I now use two different ways depending on the size of the board. For large boards - the health lamp(!) and good quality TRACING paper. For small boards - good quality fine grain paper + transparentiser and a U/V lamp recommended for checking the security markings on property. These are battery operated and suprisingly quick to use. I made a small frame to hold mine.

Again, to those of you who are interested in the hardware side of life, I recommend this package wholeheartedly. A great deal of thought has gone into it's production and once transfered to disc is simplicity itself to use. Where else can you buy a development system such as this for £30 with all the facilities it has to offer.

Finally I have already mentioned the article on an RS232 Interface you will find in this issue. Well all of the layouts and circuit diagrams where done using this package. I hope in future issues of FORMAT to make even more use of all the PCB Designers facilities. In the not to distant future one article will be a circuit diagram of the DISCiPLE itself, so keep reading FORMAT....

WRITING FOR FORMAT

We are always on the look-out for articles and programs to publish in FORMAT. Articles can be on any subject related to the Spectrum or computing in general. From half a page to a long series.

Don't worry too much about spelling and things like that (the Editor can't spell either) we will sort things out. Just put it down as clearly as you can. It is best if you send your article as a word processor file, on disc or tape, but please include a printed copy so we can look at it straight away. Pack any pictures flat or include SCREEN$ files. Send your work to our address on page 2 or give us a ring to talk about it.

DOS COMMAND CODES

By: Bob Brenchley.

This month I want to look at error handling when using command codes. Last time (Vol 2 #4) I explained how to SAVE and LOAD a simple Code file from machine code and I will be adding to those routines to help explain things as we go along.

First though, a full list of the error codes, these are lifted straight from the DISCiPLE. Some have no meaning on the PLUS D (networking for instance).

DOS ERROR MESSAGES

0	Nonsense in GDOS	17	Invalid CODE
1	Nonsense in GNOS	18	Reading a WRITE file
2	Statement END error	19	Writing a READ file
3	BREAK requested	20	O.K. GDOS 3
4	SECTOR error	21	Network OFF
5	FORMAT data lost	22	Wrong DRIVE
6	NO DISC in drive	23	Disc write PROTECTED
7	No "SYSTEM" file	24	Not enough SPACE on disc
8	Invalid FILE NAME	25	Directory FULL
9	Invalid STATION	26	File NOT FOUND
10	Invalid DEVICE	27	END of file
11	VARIABLE not found	28	File NAME used
12	VERIFY failed	29	Not a MASTER station
13	Wrong FILE type	30	STREAM used
14	MERGE error	31	CHANNEL used
15	CODE error	32	Only used in command codes
16	PUPIL set	33-127	NOT USED.

In each case you will find the DOS error code followed by the DISCiPLE error message that would be printed if the error occurred in Basic (except code 32), the wording is slightly different in some cases on the PLUS D.

OK, thats the error codes, you will have encountered many of them when using Basic, but how do they affect command codes? Well when an error occures in a command code a return is made with 'carry' set and the 'a' register holding the error number from the above list. Lets add an error test into last months LOAD routine, type in these lines, after loading demo #2, note the new version of line 190 with the lable 'HEAD':-

```
00131          JR   NC,HEAD  ;if no error jump to read header
00132          CP   26  ;test error code
00133          JR   2,FNF  ;jump to file not found routine
00134          JR   ERROR  ;jump to other error routine
00190   HEAD   LD   DE,HD00
```

Line 131 is just to jump to the header loading routine if there has been no error detected. Line 132 tests for error code 26 - File Not Found. Line 133 will jump to your file not found routine (to print a message or stop the program) while line 134 jumps to a routine to handle any other type of error. You could have received other errors in this situation i.e. 6 (no disc in drive) or 4 (a sector error). Your error routine would need to test for each error in turn and carry out any message printing needed.

Error code 32 was used by older versions of the DOS to signal errors while executing a command code. From version 3d of GDOS and version 2a of G+DOS this code is really redundant as all routines now give a correct error message in the range 0-31. However it is always possible that I have missed something hidden deep in the shadow system, please let me know if you find anything.

Very rarely you may get an error code greater than 127. This is a Spectrum ROM error report with 128 added to it, so an error of 132 is realy error 4 - Out of Memory.

When opening a file for saving you could get error code 28 (file name used). In Basic this would generate the Overwrite Y or N message but from machine code you will need to print a suitable message yourself. Then, if told to, you will need to ERASE the file (HERAZ - code 65) and then loop back to try the open command again.

Not all errors will apply to calls to command codes but those that do are normally self explanatory if you refer to the above list. I have to admit that I have never tested command codes with network operations so I don't know what the results would be but if anyone has time to play around with them I would like to hear the results.

Finally this month two command codes that give you total control over you disc - HRSAD which reads a sector from disc and HWSAD which writes a sector. With these two the UFIA is not used, instead the following controls need to be set up:-

```
LD A,drive-number
LD D,track-number
LD E,sector-number
LD IX,address for load/save
```

Remember the drive number is 1 or 2, track number are 0 to 79 for side 1 and 128 to 207 for side 2, sector numbers are 1 to 10. The address can be anywhere in memory but you may find problems, particularly on the +2, if you write from the lower part of memory which is also being used by the ULA to generate the TV picture. This can cause a delay in sending bytes to the disc resulting in sector errors. Use the top end of memory if you can. If not do a read after the write to verify things worked.

Having read a sector from disc the first 510 bytes will contain the data if its part of a normal file. The last 2 bytes contain the track and sector number of the next sector in the file (if there is one). Do not attempt a load with a sector number of 0, this will cause a system crash.

Next time I will be looking at OPENTYPE files.

OHMS LAW CALCULATOR

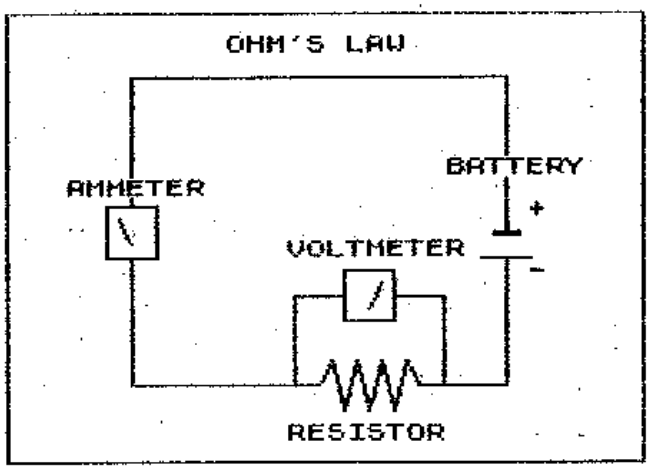
By: Hans Mellar.

The following program was written to accompany part of small course I gave, in electronics and computing, at the local night school. Its not very original (I've seen several like it befor) but it is a help to you if you are just starting with electronic theory. I hope it proves useful to many FORMAT readers, the program will run on all models of Spectrum.

When the program is run you will see a little display that helps you understand what measurements are being made (see Fig 1). Press any key and you will be asked which of the values (Resistance, Voltage or Current) you want to calculate. You will then be prompted to enter the two known parameters of the circuit and the result will be printed. All results are rounded to two decimal places which should be ideal for most users.

```
  1 REM OHM'S LAW
  2 REM (C)1988 FORMAT
  3 REM
 10 BORDER 1: PAPER 1: INK 7: CLS
 20 GO SUB 5000
 30 LET I$=INKEY$
 40 CLS
 50 PRINT AT 10,0;"What do you want to find?"''"1) RESISTANCE"'"2)
VOLTAGE"'"3) CURRENT"
 60 PRINT #0;"PRESS KEY TO SELECT";
 70 LET i$=INKEY$: IF i$="" THEN  GO TO 70
 80 IF I$>"0" AND I$<"4" THEN  GO TO 1000*VAL I$
 90 GO TO 70
1000 CLS : BORDER 2: PRINT  INVERSE 1;"CALCULATING RESISTANCE"
1010 INPUT "Please enter voltage in VOLTS   ";V: PRINT '"Volts=";V
1020 INPUT "Please enter current in AMPS    ";C: PRINT '"Amps=";C
1030 LET R=INT ((V/C)*100)/100
1040 PRINT ''"The resistance is ";R;" OHM";("S" AND R>1);"."
1050 GO TO 4000
2000 CLS : BORDER 3: PRINT  INVERSE 1;"CALCULATING VOLTAGE"
2010 INPUT "Please enter resistance in OHMS ";R: PRINT '"Resistance=
";R
2020 INPUT "Please enter current in AMPS    ";C: PRINT '"Amps=";C
2030 LET V=INT ((R*C)*100)/100
2040 PRINT ''"The voltage is ";V;" VOLT";("S" AND V>1);"."
2050 GO TO 4000
3000 CLS : BORDER 4: PRINT  INVERSE 1;"CALCULATING CURRENT"
3010 INPUT "Please enter voltage in VOLTS   ";V: PRINT '"Volts=";V
3020 INPUT "Please enter resistance in OHMS ";R: PRINT '"Resistance=
";R
3030 LET C=INT ((V/R)*100)/100
3040 PRINT ''"The current is ";C;" AMP";("S" AND C>1);"."
```

```
3050 GO TO 4000
4000 PRINT #0;"PRESS ANY KEY"
4010 PAUSE 1: PAUSE 0
4020 RUN
5000 PLOT 200,150
5010 DRAW -150,0
5020 DRAW 0,-50
5030 DRAW -10,0
5040 DRAW 0,-20
5050 DRAW 20,0
5060 DRAW 0,20
5070 DRAW -20,0
5080 PLOT 50,85
5090 DRAW -5,10
5100 PLOT 50,80
5110 DRAW 0,-50
5120 DRAW 75,0
5130 DRAW 5,10
5140 DRAW 5,-20
5150 DRAW 5,20
5160 DRAW 5,-20
5170 DRAW 5,20
5180 DRAW 5,-20
5190 DRAW 5,20
5200 DRAW 5,-10
5210 DRAW 35,0
5220 DRAW 0,50
5230 DRAW 10,0
5240 DRAW -20,0
5250 PLOT 200,90
5260 DRAW -5,0
5270 DRAW 10,0
5280 PLOT 200,90
5290 DRAW 0,60
5300 PLOT 200,89
5310 DRAW 5,0
5320 DRAW -10,0
5330 PLOT 115,30
5340 DRAW 0,35
5350 DRAW 20,0
5360 DRAW 0,10
5370 DRAW 20,0
5380 DRAW 0,-20
5390 DRAW -20,0
5400 DRAW 0,10
5410 PLOT 155,65
5420 DRAW 20,0
5430 DRAW 0,-35
5440 PLOT 145,60
5450 DRAW 5,10
5460 PRINT AT 8,3;"AMMETER"
5470 PRINT AT 11,14;"VOLTMETER"
5480 PRINT AT 7,22;"BATTERY"
5490 PRINT AT 20,14;"RESISTOR"
5500 PRINT AT 9,26;"+";AT 12,26;"-"
5510 PRINT AT 0,11; INVERSE 1;"OHM'S LAW"
5520 PAUSE 500
5530 RETURN
```



ADVENTURE CORNER

By: Paul Rigby.

Have you ever reached a position in an adventure where you sit back in your chair, pause to sip a mug of coffee, and think to yourself, "This so called adventure is complete and utter rubbish!", or words to that effect? Have you, during such moments, declared that you could, easily, write a better game in no time at all?

If you have thought seriously about undertaking such a task, how would you do it? This month I would like to introduce, to all of our budding adventure authors, the various ways an adventure can be produced. In doing so I will briefly go beyond the boundries of the Spectrum. This is because it is important, for any new adventure author, especially one who wishes to sell their masterpiece, to be aware of the alternatives - alternative adventure creation systems, alternative computers and alternative markets. Even if you, the author, will be using the Spectrum as your target machine, that is, the computer the adventure will be created on and, initially, played on.

The most popular method of creating adventures is via the, so-called, adventure utilities (A suite of programs specially designed to create adventures). Many have hailed the utilities as bringing programming to the masses. Which can be no bad thing in itself. After all, the most eminent brains in the world constantly strive to produce a usable and powerful language which is, above all, easy to learn. Basic being the obvious example, more of which later. There have been a number of utilities available for some time, and some of which were more successful than others. The less successful include the Genesis Adventure Creator from CRL, the Biro adventure system which was leased from the software house Ram Jam with the resultant game only to be published with their approval (!) and an interesting utility published by CRL, under their Powerhouse label known as the Adventure Builder System. It originated from the respected adventure author Tom Frost (of Tartan Software) who developed a variety of machine code programs used within his own adventures into a full utility complete with graphics program. However, no adventures, to my knowledge, have been created with it. The most successful utilities on the Spectrum used by a variety of adventure authors have been The GAC (Graphic Adventure Creator) by Incentive, The Quill by Gilsoft and The PAW (Professional Adventure Writer) also by Gilsoft.

But utilities are not the only way to produce adventures. In the early days of adventuring many adventures were created using Basic. However Basic is notoriously slow compared to other languages and the games suffered due to the slow response given to the user input and the computer reply. But, many computer enthusiasts have adopted Basic as their first language and have, consequently, gained a full working knowledge of it. There is no reason why this valuable

knowledge should go to waste because Basic can play a part within an adventure program. I am sure that many of you will have developed your knowlege of Basic; speeding up selected routines, increasing memory by decreasing code, and so on (and, if not, check out the excellent articles by Clive Bish and Nev Young in the Format back-issues).

For Basic to be viable in adventure games you really need a selection of Machine-Code routines to speed things up. Machine-Code (or Assembly Language) is a horrible language to learn but really operates at the heart of your Spectrum producing instant reponses due to you dealing with computer instructions in their purest user form. Machine-Code blends well with Basic and many successful adventures have used this combination, with the majority of the code being Machine-Code. (An ideal book to introduce Machine-Code, if you can find it, is Mastering Machine Code on your ZX Spectrum - by Toni Baker). Many programmers have stated that they find utilities restricting and that actually programming the computer enables them to manipulate the code in anyway they wish. This is a valid point, and one which I hope to develop in a future issue.

Other powerful languages are available for producing adventures but, unfortunately, they are only available on the more powerful computers such as IBM PC's and the other 16-bit computers. But, for the record they include: "C", which is very popular on the ST/Amiga at the moment; Lisp, which has long been used by Infocom - the long standing masters of the adventure; Prolog, which has, so far, not been properly exploited by the adventure authors. Rumours have reached me that the first Prolog driven adventure will appear in the near future. This language can easily be used for programming artificial-intelligence ; Finally, the Expert System Shell has possibilities for an adventure where character interaction is important.

It appears though that, for Spectrum owners at least, the Utility rules the roost. Therefore, next month, I will be looking at what a Utility actually is in a little more depth and, if you are thinking of buying one, recommending a Utility for your needs. However, to bring this month to a close I would like to begin a series on one of the most dreaded subjects in Adventure Lore - Mazes. The very mention of the word sends a shiver down the spine of even the boldest adventurer. Many adventurers loath mazes, a few enjoy the challenge a maze can give but, like them or not, they are here to stay.

So what are they? Well, for the benefit of those new to adventures, a maze is really a separate entity within the host adventure. It is a self-contained puzzle on a big scale and takes the form of a number of locations connected together in a variety of ways, but rarely logical. That is, if you moved North to a location and then returned South you may not return to your original starting point. In fact you may not be able to move South at all! The hallmark of a maze is that the majority of the locational descriptions are the same. So the player cannot tell where he is by locational description alone. One or two locations may be different. These are the locations which hold a vital piece of equipment or information which is needed to progress further into the adventure. It is normally the case that these locations are buried within the

maze and are very difficult to get to. As I have said moving within a maze is rather illogical - so the normal compass movements go out the window. Consider Fig-1, a casual glance may lead the beginner to think that all mazes are an absolute mess! Well, in a way, they are! In fact, they are designed to be. With the intention of confusing the intrepid adventurer. Notice, for example, how going east, south and west from Location 2 brings you back again so that, in effect, you have not really moved at all. Also notice that moving from seven different directions from three different locations bring you back to Location 2 and that only one direction, north from Location 3, brings you to Location 4 - the room with the Treasure. Thus it is more difficult to enter Location 4 just by blindly stumbling around the maze in a random fashion. A map has to be made in order to reach the Treasure.

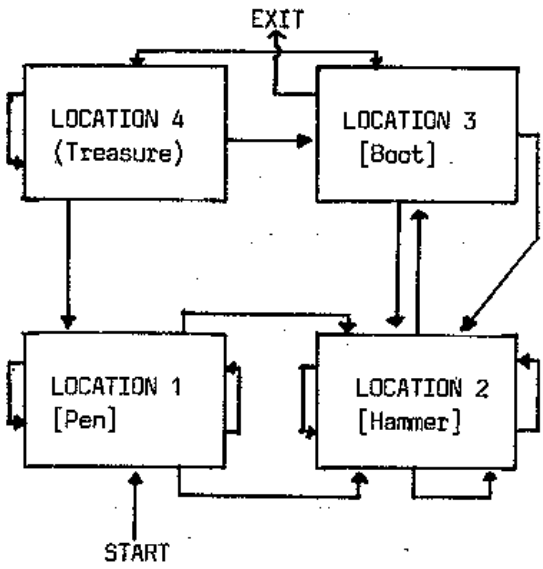


Fig 1.

There are many ways to map a maze. Not all methods will work with all mazes and some methods may be unique to one particular maze but the following method can be successfully used in the a large proportion of mazes. Basically, it involves dropping objects from your inventory. When you enter a maze reach for a clean piece of paper and mark this area as the entry location to the maze. Using Figure 1 as an example the entry location will be Location 1. Now, drop one object from your inventory - which, for our purposes, will be a pen. Then move west. The location description, which is the same for Locations 1,2 and 3 has not changed but, and this is the important thing, the pen you have just dropped can still be seen. You now know that you have not moved from your original maze location. Going east will give the same result. However, moving south leads the pen to disappear signifying that this is a new location. Drop a second object, for example, a hammer and try all the directions. Eventually, moving north will bring you to a new location. Again, drop an object, a boot, to mark your place. If you move east from Location 3 the program will tell you that you can now see a hammer. So this is Location 2 again. Keep trying all of the directions, drawing an arrow from the base location to the new location, and, eventually, you will appear in Location 4 to find the Treasure, which so happens to have a different location description from the rest of the maze. The map can then be used to find the exit to the maze (NOTE: This example uses the four points of the compass to move from location to location. However, when you are in a maze try all EIGHT points of the compass, ie NW,SW,NE,SE, and UP and DOWN).

Next month I will be continuing this mini-series with a look at some other methods of traversing a maze. In the meantime I would like to hear about your experiences in the dreaded maze. How do you tackle them? Have you come across a particularly difficult, strange or original maze? In fact, if you have any tales to tell regarding mazes write to me, care of Format.

So until then - **Have a Happy Adventuring New Year!**

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RS232 INTERFACE

By: Dick Guy.

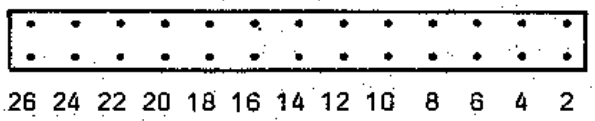
"Oh no"; I hear you all groan; "not another RS232 interface". Dont turn the page over just yet, as not every RS232 interface can be used directly with the DISCiPLE or PLUS D's (or most other computers for that matter) centronics port. This one can, so you dont even have to write printer drivers or change your system program, as all the clever stuff is done by hardware.

Parity	Link1 (L1)	Link5 (L5)
inhibit	-	open
even	open	closed
odd	closed	closed

Word length	Link2 (L2)	Link3 (L3)
5 bits	closed	closed
6 "	open	closed
7 "	closed	open
8 "	open	open

Stop bits	word length	Link4 (L4)
1	5,6,7,8	closed
1.5	5	open
2	6,7,8	open

Fig 1. LINK SETTINGS



PIN	1	Printer Strobe	OUT
	3	Data bit 0	OUT
	5	Data bit 1	OUT
	7	Data bit 2	OUT
	9	Data bit 3	OUT
	11	Data bit 4	OUT
	13	Data bit 5	OUT
	15	Data bit 6	OUT
	17	Data bit 7	OUT
	19	N/C	
	21	Busy	IN
	2-22	(even numbers) =	Ground(0v)

Fig 2. DISCiPLE or PLUS D PRINTER PORT

The maximum baud rate, as the circuit stands, is 9600 baud but this can easily be changed, as can the minimum baud rate of 300, by changing a crystal/divider chain combination to suit your needs, by providing a reference frequency input to IC4 of 16 * the required baud rate. The presented circuit allows selection of 6 of the normal rates using wire links. Other printer parameters are selected using 5 additional wire links (see Fig 1). To suit the Speccy Interface 1 RS232 standard, all these links should be left open, otherwise wirelink to common (ground) as required.

CIRCUIT DESCRIPTION.

A circuit diagram is given in Fig 3 which should be easy to follow.

IC4 is a Universal Asyncronous Receiver Transmitter (UART), and is a very ingenious device which allows simultaneous transmission and reception of data. We are only interested in the transmit function in this article.

Data bits 0 to 7 are fed in from the DISCiPLE's centronic printer port. (I have also tried a PLUS D and it works equally well). The printer port connector is shown in Fig 2 this is viewed from the side of the DISCiPLE or the back of the PLUS D.

IC2 is a simple crystal oscillator based around an LSTTL IC. Spare inputs on this IC should be taken to +5 or common, to prevent

instability. IC3 is a CMOS divider which provides the frequencies required for the indicated baud rates. The one selected is fed to pin 40 of IC4. Links L1-L5 select transmitter format as per Fig 1.

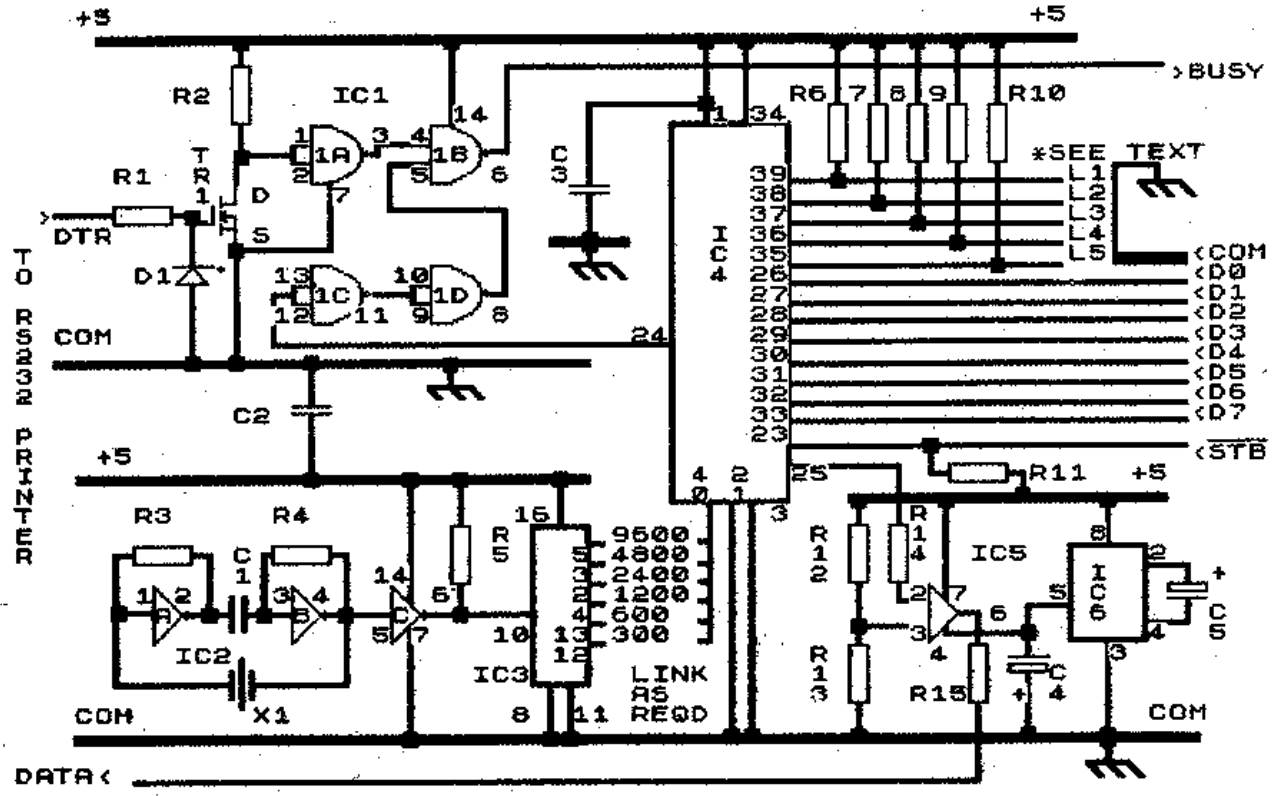


Fig 3. THE CIRCUIT DESIGN

The serial TTL output is fed to IC5 which converts the signal to RS232 levels. The negative voltage required is generated by IC6.

IC1 is a BUSY line generator controlled by the UART (printer buffer full) and the printer (printer busy). This latter signal may be called a number of things, DTR is favourite, so consult your printer handbook before connecting it.

TR1 is an enhancement mode FET (field effect transistor) used to interface the RS232 input levels to TTL. No pin outs have been included for the printer connector as this will be dependant on your printer. Only 3 connections are needed

a) Data out - the data to be printed
b) Printer busy - an input from the printer,
c) Common.

No circuit for voltage regulation has been included as this is easily done using a regulator IC such as 78L05 or 7805. Current requirements are 20m/Amp at 5 volts, so battery power may be used.

The layout shown (Fig 4 & Fig 5) is for veroboard. Other ways are, of course, available and can be used if you so wish. I chose veroboard for the perpose of this article so that more readers may be tempted to try their hands at this project. The layout shown can be followed or you may prefer to do your own.

Cost to build will be around £10. Adverts in the electronics hobby

press should be consulted for addresses and current prices.

The above is only a brief synopsis of what the circuit does. It is hoped that in the near future sufficient space will be available in FORMAT for a short course on "hardware", provided there is sufficient demand. As there will obviously be a wide spectrum of computing knowledge a suitable level must be found to keep the expert interested without switching the novice off.

In order to assess the level of interest would anyone with hardware queries write to me at FORMAT and I will do my utmost to answer.

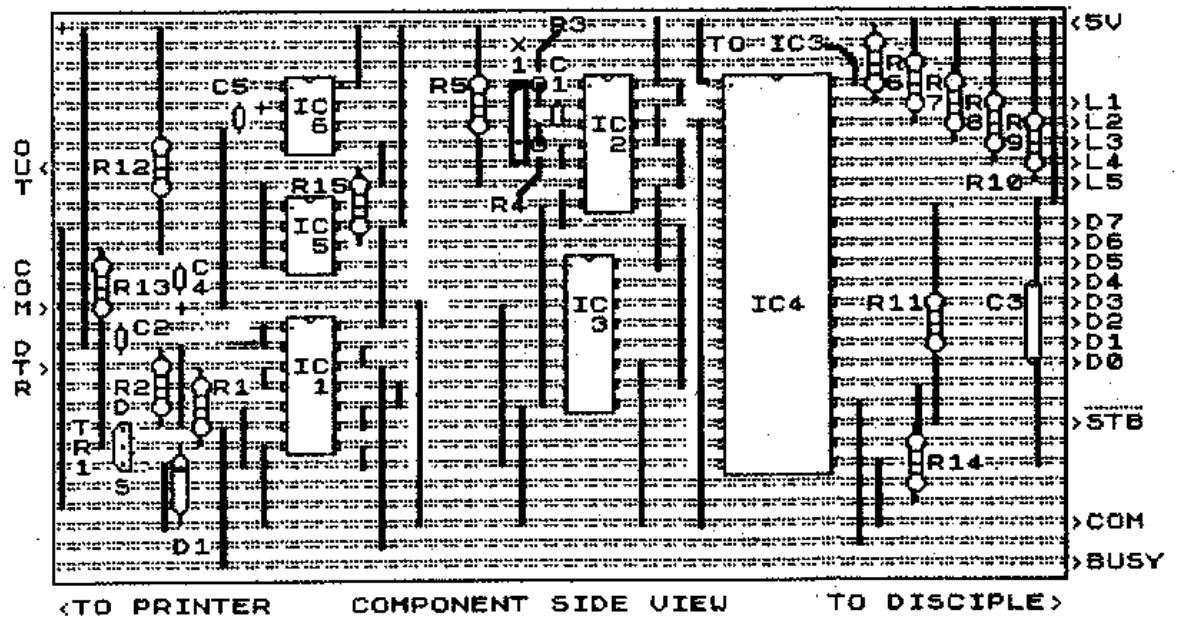


Fig 4. VEROBOARD LAYOUT - COMPONENT SIDE

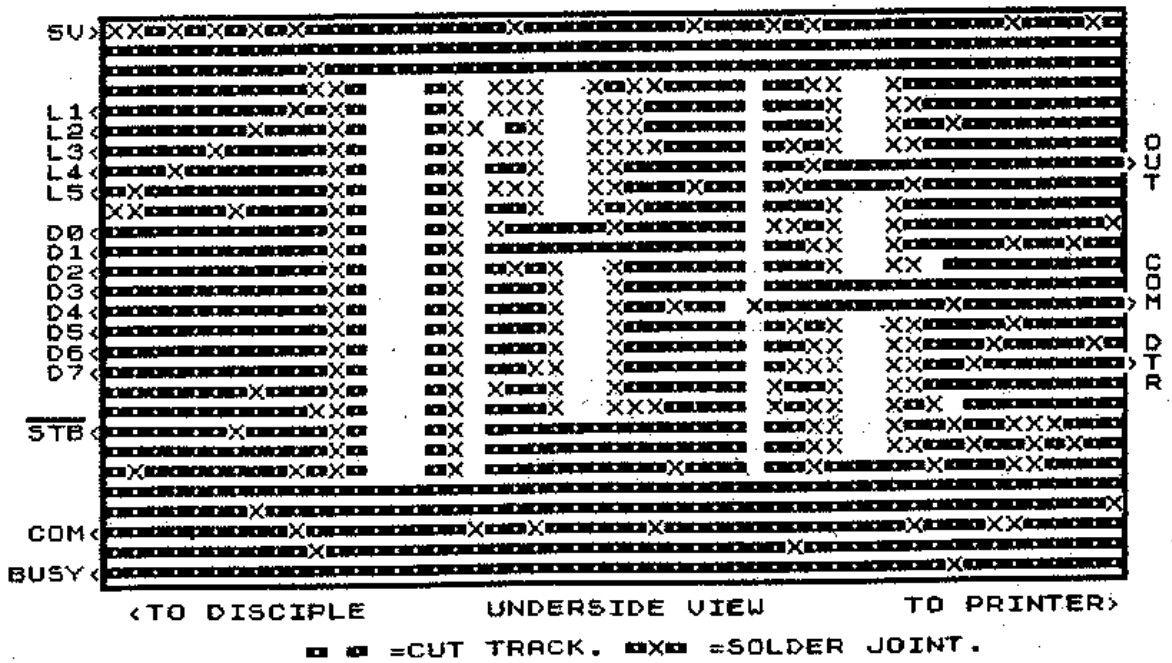


Fig 5. VEROBOARD LAYOUT - TRACK SIDE

THE SAM SPOT

By: Bob Brenchley.

SAM is the super, Z80 based, computer that MGT will be launching in April. As I am working very closely with MGT on the project, FORMAT will usually be first with news on SAM. As I am pledged to secrecy I can not answer questions (by letter or phone) regarding the inner workings of SAM. However, after clearing the subject matter of articles with MGT, I will be giving you the full details on SAM over the coming months. Please remember that some fine details may still be subject to change.

First bit of news this month should be of great interest to DISCiPLE / PLUS D owners who are members of INDUG. Last month I told you that an adaptor would be produced by MGT to allow your disc systems to work with SAM. Well now I can give you some firm details. As an existing MGT user you will receive a small adaptor board which fits inside the base model of SAM and will allow you to connect your current disc drives either to SAM or to your Spectrum + DISCiPLE / PLUS D. This means you will be able to swap between your present set-up and your new SAM without needing to change or modify any of your hardware.

The hardware design of SAM has now been completed and Bruce Gordon is working on the printed circuit layout and making final mods to the case design (MGT have promised full pictures for next month). The Gate Array Chip (ULA) is now under pre-production testing in the far east and the first handful of these fantastic chips should arrive next month.

SAM BASIC is being written by Dr Andy Wright, famous for his Betta Basic on the Spectrum. Several people have asked me how SAM BASIC will compare with Betta Basic, well all I can say at the moment is it will be different. Betta Basic had to work in conjunction with Sinclair Basic. It relied on Spectrum ROM routines in order to save space in its own code. This was like a straight jacket, it prevented Andy doing some things he would like to have done and made many more things very difficult to implement. As he is now writing the whole of SAM's basic ROM he is freed from many of the constraints he has been forced to work under in the past. SAM BASIC will of course draw widely from ANSII Basic (which Spectrum Basic itself was also written to conform with) and Betta Basic but it will also have many features native to SAM.

It is also true that SAM BASIC will not use the same token structure as Spectrum Basic. With many more Command and Function Keywords this would be impossible. However it is intended that a utility will be available (hopefully at launch) which will convert a basic program saved from a Spectrum into SAM format. Of course if you type a basic program into SAM the format and tokens will be handled automatically.

Next month I hope to bring you more details of SAM (including an INDUG priority order scheme) so keep reading. Remember, if you want to be the first with news of SAM, FORMAT is for you.

MIDI

MIDI FOR BEGINNERS PART 5 - BY RAY ELDER.

First of all thank you for the letters I received from readers interested in this topic. May I just take a moment to make a general comment which covers several inquiries about my background, some readers have asked how I became interested in this subject and where I went to learn about it.

I must admit to having no formal musical or technical training whatsoever but I have spent some seven years of my life as a professional musician, mostly in cabaret bands, and I am a competent bass guitarist with some limited keyboard ability. I have a working knowledge of music theory but mostly a natural 'feel' for what sounds right - as does most of us, we all know what we find pleasing to listen to!

My interest in MIDI developed after about two years of computer madness when the EMR interface became available for the Spectrum, the opportunity to combine my two passions was too much and I have been experimenting with computer aided music for the last five years. My own tastes tend to be for music which has a strong melody and interesting moods, as those who have purchased the tape I am offering will have observed. However, enough about myself and on with the show..

DEVELOPING 'FEEL'

The most often heard criticism of computer aided (as opposed to generated, which is another thing altogether) music is that it is very 'robotic' or 'mechanical' and this must be acknowledged as being true. It is not unavoidable however, and in this part of the series I hope to give some ideas that may help to prevent this.

Most of my early compositions suffered from this problem and because of it I almost lost interest and abandoned MIDI in favour of traditional recording equipment, fortunately perseverance and the luck to find many articles and to have some friends who were also experimenting with CAM helped me to develop my ability beyond this stage, and it is not difficult, just a matter of some basic theory.

IDEAS.

Now I am not pretending to be an expert on psychological matters and in fact most of the technical side is beyond me, but in a simplified form we can understand and utilise some simple ideas relating to the way our ears/brains work to improve our music.

'Feel' in music has always been an elusive quality, why does some music excite, some relax, some get your foot tapping and some make you turn off and ignore it? A producer/inventor called Michael

Stewart - he was invoved in the design of a piece of equipment called 'The Human Clock' which synchronised a live rhythm, produced by a drummer for example, to a sequenced piece of music - published an article based on his research and analysis of different types of drummers and came to a simple, but as far as I'm concerned accurate, conclusion.

He said that "feel is the difference between WHEN an event comes and when we EXPECT it to come". If something, say a snare drum, comes a microscopic second before the beat each time the 'feel' is noticed and is different to when it comes a microscopic second behind the beat.

Apparently, according to those versed in the field of psychoacoustics, the brain releases specific chemicals when it is surprised and other chemicals when events come as expected. Should events continue in a predicted manner then the brain releases a 'ignore' chemical which blocks out the event altogether.

This feature of expected events and surprising events and the interplay between them is a very powerful, if not THE most powerful effect on our music.

Because computers are accurate and work to an internal clock it is possible to use these features to get absolute accuracy in timing, usually with the 'Quantise' option, and as the music becomes more technically correct so it becomes more mechanical! Quantise is an important and invaluable aid to computer music, but use with care...more on this later.

BASIC RHYTHM.

Lets look at the most common rhythm, 4/4, although most of what I am about to say applies to nearly all the common time signatures.

As a piece of music is playing you can count along with it, 1, 2, 3, 4, 1, 2, 3, 4,....The first and third beat are often referred to as the 'down' beat or 'on' beat and the second & fourth beats are the 'up' beats or 'off' beats. Usually the bass drum hits the down beats and the snare drum hits the up beats. Extra bass or snare hits help to fill in and give texture to the drum part. Often a closed hi hat will hit all four or even double up to play eight hits to the bar (one count of four is called a bar).

TIMING.

Now if your drum machine will allow 96 or more parts to the bar then you can program feel by moving these hits back or forward slightly. Specific movents have accepted effects, moving the up beat snare hit forward by one 96th. - behind the beat - can add liveliness or drive to the track, and putting it back - behind the beat - it is relaxed or even dragging.

I often program a basic pattern then make two or three copies where I adjust the timings of an odd snare or bass hit. When I use the pattern in a chain or song I occasionally, as randomly as I can make it, add them in. This simple and literally unnoticable variation works wonders in reducing the 'ignore' message the brain

receives and can really liven up a track. Beware of overdoing it though.

If I am working with a system which will not let me move events like this then I try to play the drum part live into the sequencer, human error, provided its not extreme, produces the same effect. All you have to do now is to resist the temptation to quantise the track!

If playing the whole rhythm part is too difficult then program the bass, hi hats etc. for the whole song and just add, say, the snare part live, even this will increase the feel significantly.

This applies not only to drum parts but to any rhythmic instrument, vamped piano, guitar etc.

SPACE.

One of the most easy mistakes to make is to use every voice and note you can lay your hands on. Silence and space is an effective enhancer to music. It is very tempting to use that great organ sound all the time, but if it appears perhaps only in the chorus part of the song it becomes more noticeable and hence more effective. Avoid using too many sounds at the same time, it is very easy to 'clutter' up a song.

For example a bass line that plays on every beat soon becomes lost, played with occasional and various missing beats and it becomes quite pulsating. Remember some of the effective pieces of music you have heard and how a little can go a long way - eg. Every Breath You Take, Bolero, The Look of Love....

Let drum fills and rolls happen without any other instruments, then come back in with a 'bang'.

FIRST THINGS FIRST.

This may sound obvious, but the mind takes note of the first sound it hears and gives that priority over subsequent sounds. Therefore if you have a phrase that you want to be prominent move it forward in time, remember we are only talking minute amounts, it can have the effect of making it as noticeable as almost doubling that instruments volume!

Likewise if you have a fill sound, such as stings or organ, put that slightly behind the other instruments in the beat - this is helped by sounds which have a slow build up when played, but they can lead to other problems which we'll be looking at in the next article.

COMBINATIONS

This technique is not only for use with single beats, experiment for yourselves. For instance, moving a whole drum bar fill forward by 1/96th. at the end of a phrase and before the beginning of another will add urgency to the part and bring the listener into the next section with more interest.

Whole sections can be moved in such a manner, if a solo is not

prominent enough then the tendency is to increase the volume, it really is much more effective to move it forward, or conversely, move the main rhythm instrument back in time for the duration of that part.

Experimentation is the order of the day and if you develop a technique of moving beats, bars and sections of music/instruments then you will soon develop an appreciation of mood and feel - who said computer aided music was limiting and monotonous, just wait until you play them your tracks!

AND NOW A WORD FROM OUR SPONSOR -

To finish this month I would like to mention once more that I have a tape of my own original music available (audio not computer program) for £3.99. In response to request from readers who have purchased them as 'an example of what can be done' I have included extra songs which are not originals, although they are on the tapes I am sending out I must emphasise for copyright reasons that these extra recordings are free and not part of the purchase price.

Any correspondence or tape orders can be sent directly to me, Ray Elder, at 1 Periton Court, Parkhouse Rd. Minehead, Somerset TA24 8AE. And I'll do my best to answer any queries or help with any problems. I would also recommend looking at the magazine Sound On Sound when browsing in your local W.H.Smiths as they often have well written articles on MIDI and music techniques. (I do not have shares in either SOS or W.H.Smiths - more's the pity!).

Have a happy musical new year!

HACK-ZONE

By: Hugh J. McLenaghan.

It's time again, yet another month has past. I hope that everyone had a merry Christmas and a very happy New Year. This month it's the turn of another conversion, this time it's Pro BMX Simulator. You must first type in the following program which will transfer the main program to disc:-

```
 10 CLEAR VAL "24575"
 20 FOR a= VAL "23296" TO VAL "23309"
 30 READ z: POKE a,z: NEXT a
 40 DATA VAL "55",VAL "62",-SGN PI,VAL "221",VAL "33",NOT PI, NOT P
I,VAL "17",NOT PI,NOT PI,VAL "205",VAL "86",VAL "5",VAL "201"
 50 CLEAR
 60 PRINT "Start Tape"
 70 FOR a=SGN PI TO VAL "5": READ z,add,len: POKE VAL "23298",z: PO
KE @VAL "22637",add: POKE @VAL "22640",len: RANDOMIZE USR VAL "23296
": NEXT a
 80 DATA NOT PI,VAL "256",VAL "17",-SGN PI,VAL "256",VAL "6e4",-SGN
 PI,VAL "256",VAL "6e4",-SGN PI,VAL "16384",VAL "6912",-SGN PI,VAL "
24576",VAL "40959"
 90 SAVE d*"BMXSCR"SCREEN$
100 SAVE d*"BMXCODE1" CODE VAL "24576",VAL "40959"
110 POKE @VAL "22637",VAL "49152": POKE @VAL "22640",VAL "2946"
120 RANDOMIZE USR VAL "23296"
130 SAVE d*"BMXCODE2" CODE VAL "49152",VAL "2946"
```

What you do is rewind the tape with the main program of the standard version on. You then run the above program and start the tape, NOTE that you MUST stop the tape after the main block of code has loaded so that the program can save the data to disc. You then restart the tape after it has finished saving.

After you have copied the standard version, turn the tape over to the EXPERT version and change the names in the above program to read BMXP instead of BMX. You then run the program and do as you did before.

Once this is complete it is time to save the other levels to disc. To do this reset your computer and type the following program:-

```
 10 CLEAR 44999
 20 FOR a=23296 TO 23356: READ z: POKE a,z: NEXT a
 30 DATA 221,33,200,175,17,232,3,62,255,55,205,86,5,221,33,128
 32 DATA 213,17,127,42,62,255,55,205,86,5,221,33,0,192,17,130
 34 DATA 11,62,255,55,205,86,5,201,33,200,175,17,128,213,1,213
 36 DATA 1,232,3,126,245,26,119,241,18,11,120,177,32,245,201
 40 CLS
 50 FOR a=1 TO 2
 60 IF a=1 THEN PRINT "Insert Quarry Racing.": GO TO 80
```

```
 70 PRINT "Insert Desert Riding."
 80 RANDOMIZE USR 23296
 90 RANDOMIZE USR 23336
100 LET a$="BMXDATA"+STR$a+"C"
110 SAVE d*;a$+"0" CODE 54656,1000
120 RANDOMIZE USR 23336
130 SAVE d*;a$+"1" CODE 54656,10879
140 SAVE d*;a$+"2" CODE 49152,2946
150 CLS
160 NEXT a
170 PRINT "Done!"
```

After typing in and running the program you will now have a disc with all the files from PRO BMX Simulator on it. You will not need the tape any more, so you can now put it away safely. Now for the hard work! We are now going to convert the STANDARD version first. What you must do is:-

```
PRINT USR 0 this will clear out unwanted code
CLEAR 24575
LOAD d*"BMXCODE1" CODE
```

Next, load up the Hexloader printed in Hack-Zone (FORMAT Vol 2/2). N.B. No other hexloader will work with the listing! Run the hexloader and type 33117 for start address and 33205 for finish address, then type the following hex:-

BLOCK 1

```
33117: 3AB05CA72004F3EDE 33165: 9882CD3597CDD3816
33125: 56FB3A64823CFE330 33173: DD216782CD3682383
33133: 20023E3132648232E 33181: 1E3AB05CA7280FCDE
33141: 7382328282DD2158C 33189: 1060DD217682CD368
33149: 82CD36823839CD2CF 33197: 82CD1A603809E1C32
33157: 942180D5CD359721A 33205: 03600000000000CD8
```

Now rerun the hexloader and type 33292 for start address and 33412 for finish address, and ten type the following :-

BLOCK 2

```
33292: 434845434B204449A 33356: CF3DC900000000009
33300: 5343212020200104D 33364: 00000000010000064E
33308: 0D414E4420505245A 33372: 04424D58444154414
33316: 535320414E59204BD 33380: 30433001000064040
33324: 45590000000000003 33388: 424D584441544130D
33332: 0000CF3BD8114F823 33396: 43310100006404423
33340: 0609CF3C121310FA1 33404: 4D584441544130437
33348: ED5B5282ED4B5082F 33412: 32433231000107116
```

You can now exit the hexloader and return to BASIC. You must now save the converted version back to disc, use the following:- SAVE d*"BMXCODE1" CODE 24576,40959

Now we can convert the expert version. This is the hard bit, you MUST follow these instructions closely or you will get lost & not convert the game properly.

First load the main block with:- LOAD d*"BMXPROCD1" CODE

As before we will use the hexloader to convert MOST of the game. You first of all type 33691 as the start address and 33785 as the finish address. Now type in BLOCK 1 of hex (ie this is the same first block as for the standard version, 33117-33205). Next type 33914 as start and 33978 as finish address and type the hex in BLOCK 2 from address 33332 to 33404 inclusive. After that exit the hexloader and type the following POKEs as direct commands:-

```
POKE @33244,15311: POKE @33246,4568: POKE @33264,33934
POKE @32748,50: POKE @33038,33954: POKE @33043,33954
POKE @33046,33969: POKE @33049,33984: POKE @33053,33942
POKE @33056,33908: POKE @33061,44: POKE @33067,53
POKE @33070,34006: POKE @33073,53: POKE @33082,33809
POKE @33086,33957: POKE @33104,33972: POKE @33107,33908
POKE @33248,33933: POKE @33260,33936
```

PLUS D users must subtract 7528 from each address. I use POKE @ as this allows double length (2 byte) pokes.

You can now save this to disc with:- SAVE d*"BMXPROCD1" CODE 24576,40959

The above pokes are needed as these relocate the machine-code in the program. The final thing we now have to do is to put two BASIC loaders on the disc. The first one is as follows:-

```
 10 REM XXXXXXXX
 20 FOR A=23760 TO 23767: READ Z: POKE A,Z
 30 NEXT A
 40 DATA 243,49,254,95,251,195,0,96
 50 CLEAR 24575: LOAD d*"BMXSCR" SCREEN$
 60 LOAD d*"BMXCODE1" CODE
 70 LET Z=PEEK 49152
 80 POKE 49152,13: POKE 23388,17: POKE 23728,0
 90 LET A=PEEK 49152:IF A=13 THEN GO TO 120
100 POKE 23728,1: POKE 23388,17: LOAD d*"BMXCODE2" CODE
110 POKE 23388,16
120 PAUSE 1: POKE 49152,Z
130 RANDOMIZE USR 23760
```

Save this with:- SAVE d*"BMXSTD" LINE 10

Next change BMX's to BMXP' and save it as :- SAVE d*"BMXEXP" LINE 10

That's the conversion done. I hope that you have a lot of fun playing it.

Please remember that the HACK ZONE is here to help you. If you have any questions then please write to me c/o FORMAT and I will do my best to solve your problems.

If you have any conversions, POKEs or tips then I would love to hear from you. Send your contributions to me c/o FORMAT and I will give you full credit if I include any item in print. Please keep items as short as possible and, if possible, send any programs/conversions on tape so I can check them out.

Bye for now!

SECTOR-MAP

By: Andrew Brown.

The idea for this program came after using the excellent IBU program by Nev Young (see FORMAT Vol.1 issues 5 to 7). This only copies live sectors of a disc when doing a back-up. And I thought a utility to see exactly which sectors on a disc are used by a file would be handy - result SECTOR MAPPER - all in basic (I don't understand machine code yet) but still fast enough for most people.

It works by loading the directory tracks into memory and then scanning for non-erased files. The program then follows the chain of Track & Sector numbers down through the file. It also checks that the right number of sectors are found.

```
   1 REM DISC-FILE SECTOR MAPPER
   2 REM Version 1.3  June 1988.
   3 REM (c)1988 By Andrew Brown.
  10 CLEAR 29999
  20 PAPER 1: INK 7: BORDER 1: CLS
  30 PRINT  INVERSE 1;"  DISC-FILE SECTOR MAPPER v1.3  "
  40 INPUT "Disc Drive Number: ";D
  50 IF D<1 OR D>2 THEN  GO TO 40
  60 INPUT "SCREEN= 'S' : PRINTER= 'P'";R$
  70 LET C=2: IF R$="P" OR R$="p" THEN  LET C=3
  80 LET BUFF=30000: FOR T=0 TO 3: FOR S=1 TO 10
  90 LOAD @D,T,S,BUFF
 100 LET BUFF=BUFF+512: NEXT S: NEXT T
 110 FOR p=0 TO 79
 120 LET PNT=30000+P*256: IF PEEK (PNT)=0 THEN  GO TO 270
 130 DIM N$(10)
 140 FOR I=1 TO 10: LET N$(I)=CHR$ PEEK (PNT+I): NEXT I
 150 PRINT #C'' INVERSE 1;"P";P;TAB 5;"""";N$;""":-"
 160 LET T=PEEK (PNT+13): LET S=PEEK (PNT+14)
 170 LET SIZE=PEEK (PNT+12)+256*PEEK (PNT+11)
 180 LET COUNT=0
 190 PRINT #C;T;"/";S;" ";
 200 LOAD @D,T,S,60000
 210 LET T=PEEK 60510: LET S=PEEK 60511
 220 LET COUNT=COUNT+1
 230 IF ((T>3 AND T<80) OR (T>127 AND T<208)) AND (S>0 AND S<11) THE
N  GO TO 190
 240 IF SIZE<COUNT THEN  PRINT #C; FLASH 1;COUNT-SIZE;" EXTRA SECTOR
(S) FOUND."
 250 IF SIZE>COUNT THEN  PRINT #C; FLASH 1;SIZE-COUNT;" SECTOR(S) SH
ORT."
 260 INPUT ,: REM prevent scroll message.
 270 NEXT P
 280 STOP
9999 SAVE d1"SECTOR-MAP" LINE 1
```

STREAMS & CHANNELS

By: Nev Young.

Question:- What are a STREAM and a CHANNEL and what is the difference between them?

Answer:- A stream is a flow of data into or out of the computer. A channel is what controls the stream and defines the type of data and how it is used.

Of course it goes a lot deeper than that. On the basic Spectrum there are 19 streams and 4 channels. The 4 channels are K for keyboard, S for screen, P for printer and R for workspace. You can forget about R because you can't use it. It simply adds data to the current line when editing BASIC. The 7 streams -3 to +3 are set initially to channels K,S,R,K,K,S and P.

Contrary to popular belief OPEN# and CLOSE# can be used on a basic Spectrum to create streams 4 to 15 of type K S and P. You can also change streams 0 to 3. For instance if you have a program that has many PRINT statements and you want to send all the output to the printer use OPEN #2,"p" and all data that normally goes to the screen will go to the printer. There are obvious dangers in playing with streams 0 and 1 as you can quite easily lock up the Spectrum. If you try to CLOSE # streams 0 to 3 they will not be closed, only reset to their original values. It is not possible to open or close streams -3 to -1 from basic and if you did the machine would most certainly crash.

I should point out that there are (at least) two bugs in the CLOSE # routine. Firstly no error is reported if the stream is not of type K,S or P and no check is made that the stream is open to start with. This has the effect that closing a stream with any other channel type will crash the machine. (That is why you use CLOSE #* on the DISCiPLE / PLUS D).

You may be wondering why do things this way at all. The answer is simple. It makes programming the ROM easier. This is because only 3 routines are required to use any stream of any type and the channel information will lead the program to the correct part of the ROM without any difficult decoding in the ROM program itself. These 3 routines are used to select a stream and then get data into or send data out of the stream.

The first of these is chan_open and is at address 5633 (1601h). By loading a value in the A register and calling this routine the stream is opened and made 'current'. From then on all input and output is done via that stream. If the stream has not been OPENed then an error will occur (Invalid stream). The input and output routines will either get a byte into the A register from the stream or send a byte from the A register to the stream. These are at

addresses 5606 (15E6h) (input) and 5618 (15F2h) (output). You do not need to call the output routine as the short instruction RST 16 (10h) will call it for you. (This is why many people say the output routine is at address 16). RST 16 is the normal way of using an output routine.

To understand how these work you need to see how the stream and channel information is stored and what all the parts are for. The stream info is stored in the system variable STRMS at address 23568. This contains up to 19 offsets. If an offset is 0 then the stream is closed. If you add one of these offsets to the value stored in CHANS you will have the address of the channel info for that particular stream.

The basic channels are 5 bytes long and contain three things:-

1 the address of the data output routine.
2 the address of the data input routine.
3 the channel type K S or P.

An example may be useful here. Let us see how to select stream 2 and send a character to the screen.

First select the channel

```
LD A,2
CALL 5633
```

The routine at 5633 (1601h) will pick up the value held at STRMS + (A+3)*2 , remember streams -3 to -1 have to be skipped over, The value at 23578 will be 6. This is added to the value stored in CHANS (23631) and the result stored in CURCHL. That is the end of the routine. As you can see if the value at 23578 had been 0 that would indicate a closed stream.

Now send a character to the screen.

```
LD A,'x'
RST 16
```

This will jump immediatly to 5618 (15F2h) where the value held in CURCHL is fetched into the HL register. So HL points to the start of the S channel. The DE register is loaded with the address stored at the start of that channel and then the routine at that address 2548 (09F4h) is called. This is the main screen (and ZX printer) character output routine.

What if you had tried to read a character from the screen? You will, of course, get an error but how? When you call the input routine at 5606 (15E6h) the same events occur as for output except that the second address held in the channel is loaded into DE and then called. This address happens to be 5572 (15C4h) which is a call to ERROR J (Invalid I/O device).

Each different channel has different input and output routine address as required. A channel type letter is also given, these are given in upper case although when you OPEN a channel you can use either upper or lower case.

The initial channels are therefore:-

```
DEFW 2548 (09F4h) Print_out
DEFW 4264 (10A8h) Key_input
DEFB 'K' Channel K

DEFW 2548 (09F4h) Print_out
DEFW 5572 (15C4h) Error J
DEFB 'S' Channel S

DEFW 3969 (0F81h) Add_char
DEFW 5572 (15C4h) Error J
DEFB 'R' Channel R

DEFW 2548 (09F4h) Print_out
DEFW 5572 (15C4h) Error J
DEFB 'P' Channel P

DEFB 128 (80h) End marker
```

Now things get a little complicated when we want to add a new type of channel to the system, for example, type D for disc.

Next month I will give you details of the DISCiPLE and PLUS D's disc READ and WRITE channels. See you then.

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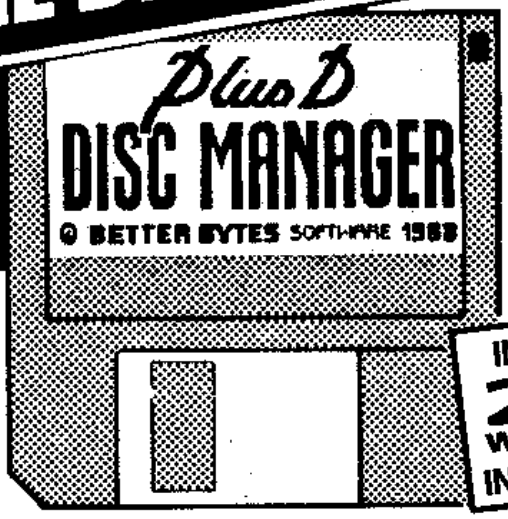

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