Vol 3 – No 4.   December 1989.

FORMAT

FOR SPECTRUM USERS
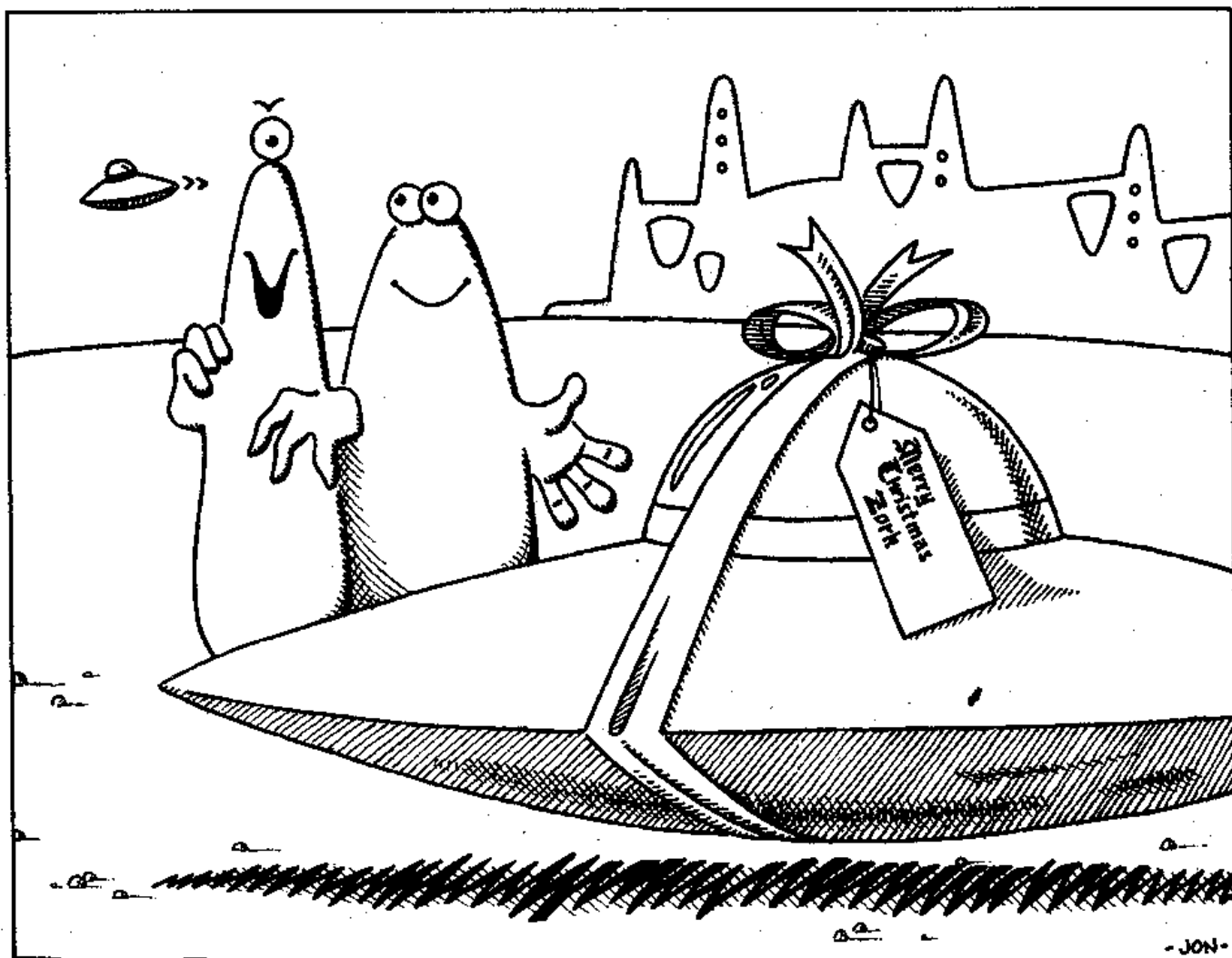
CHRISTMAS GREETINGS
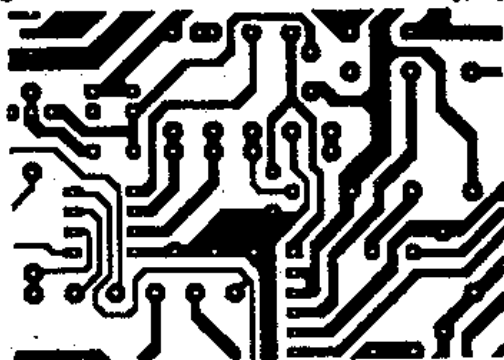WHERE EVER YOU ARE

CONTENTS

NEWS ON 4

SAM BUILDING.

Miles Gordon Technology have released details of sub-contractors building the new SAM Coupe computer. Where possible work is being undertaken in the UK, the only real exception being the keyboard assembly which is made in the far east.

A & A (Electronics) Ltd of Treforest in Mid Glamorgan will be doing the final assembly job on the Coupe using a PCB made by Kamcircuits Ltd in Wiltshire. The plastic upper case comes from Hereford where Plastic Injection Moulding Ltd have their home. The metal base plate, onto which everything else bolts, is made by Alar Engineering Ltd of Cardiff.

Production is set for 2,000 units a week to begin with an expected rise, through 1990 to around 20,000 units per week in the run-up to next Christmas.

DAVE HOOD'S NEW 'HORIZONS'.

Dave Hood, famed master of Betterbytes, has been commissioned to write the Introductory Tape for the SAM Coupe. Packaged with each machine, the tape will contain a series of demo routine to show of the graphics and programming power of the computer. The other side of the tape will contain the art package 'FLASH' that has been written by Bo Jangeborg.

CODE MASTERS CD COMPILATION.

30 Code Master games are to be re-released on a compilation CD. Claimed as being the fastest way of loading a game into the Spectrum (have they not heard of discs?) the CD will be on sale before Christmas.

The compilation contains many of

Code Masters hits including BMX Simulator, Street Football, Treasure Island Dizzy and Fruit Machine. The CD will retail at £20, not cheap until you work out that its only 66 pence per game.

SPECTRUM TV ADVERTS.

In a bid to revive Spectrum sales over the Christmas period Amstrad have started a TV advertising campaign. Featuring the +2a packaged, with Light-pen and software, the advert is already running in several ITV areas.

MAPLIN WINTER SPECIAL.

Electronics company MAPLIN have sent out their Winter Special Offer leaflets. Of major interest to FORMAT reders will be their Printer Stands. An 80 column stand costs £7.95 (order code YT33L) with a 132 column version at £8.95 (code YT65V). The stands are made of heavy gauge wire with 'easy clean' plastic coating and feature a paper stack beneath the stand and a 'fold out' paper catcher at the rear.

Maplin can be contacted on 0702-554161. Please mention FORMAT when ordering.

DEVIL'S TOOL.

As readers of FORMAT you are obviously:- A) someone who likes computers and B) a person with very good taste in reading matter. Well heed my warning - the Christian Exclusive Bretheren are out to halt the computer revolution. They say computers are "an imitation which rivals what God has put into persons... making man increasingly independent of God". The Bretheren are, among other things, trying to withdraw their children from school lessons involving computers.
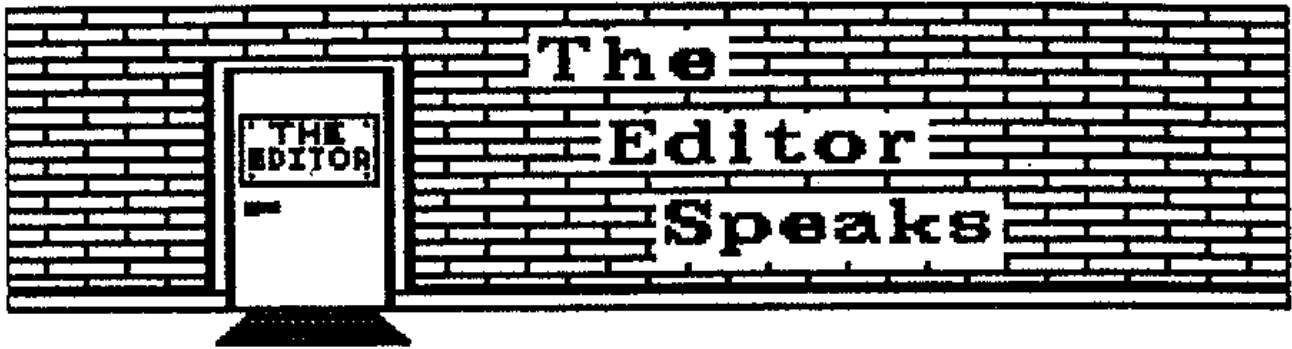
Christmas here again. Call me a big kid if you like but this is my favourite time of year. Lots of good food, drink and a little free time to play a few games on the computer. The old Psion Scrabble is still the game I like to play most. Not only is it for up to four players but the computer can play any hand or just act as umpire. It's time there were more games like this around - intellectual, stimulating, and not just you against the computer. What's your top 'intellectual' game? Write and tell us about it and why you like playing it.

The Autumn subscription drive is still going, all entries upto the second post on Tuesday 2nd January will be included so get them in quick.

My mention of a possible 'One Day Workshop' in Gloucester sometime next year has produced a small response so far. The idea is for two or three speakers to address the gathering (on Spectrum and SAM matters) before breaking up into special interest groups. After lunch there will be a chance to swap round at least once so you wont have time to get bored. There will be ample time during the workshop to meet other FORMAT readers. Cost will be about £15 (including morning and afternoon refreshments) but before I can book a venue and fix a final price I need to know how many people to allow for. If you would like to attend please drop me a line, without obligation, (mark the envelope 'WORKSHOP'). If there is enough support then I can make firm plans.

Several readers have commented on listings. Some like the indented style some don't. Others want a return to the full page-width printing we used to use. Well I can't go back to full width, it's far too wasteful of space. But I would welcome your comments to deside if some change is required, I'm open to suggestions.

Sorry to people who ordered back-issue or tapes in October. I was very late in sending out these orders due to disputes with the post office over missing items posted in previous months. After much hassle it has been agreed that items (other than the normal monthly issue) will now be signed for by the post office. It took a time to write a program to generate receipts (I wasn't going to write them out by hand) but now things are organized it will speed dispatches up in future months.

On the subject of post, the January issue of FORMAT will be sent out just after Christmas to avoid postal problems, UK readers should get theirs during the first week of January but please remember, I'm in the hands of the post office so they could be a bit late. If by the 14th your copy still hasn't arrived then give me a ring.

I make no apology for running a very large article in this months FORMAT, Carol Brooksbank returns with the definitive article on Christmas cards, now there's no excuse for not sending cards for the festive season. Even if you have already sent your cards this year the article still contains lots of useful ideas even for the non-artist.

Well that's it until next year. Have a very merry Christmas and a happy and prosperus New Year.

Bob Brenchley. Editor.

YOUR LETTERS

Dear Editor,

May I congratulate your writers on coming up with such a varied mix of articles each month. I have had my Spectrum since 1985 and have used it mostly for games playing over the years. My friend introduced me to his DISCiPLE last year and as I was starting my A Levels I thought it would be a good idea to buy a disc system and wordprocessor to use for course notes and essays. I was lucky enough to get a second hand DISCiPLE and drive and then I purchased a copy of WORD MASTER from Cardex/PCG.

Word Manager is wonderful. It's easy to use (although the manual is a bit difficult to work with) and the results are first class with the Star LC10 I now have. Let's hope PCG will do a version for SAM, I'm sure it will be a winner with all that extra memory to play with.

Yours Sincerely, B.S.Welland.

Dear Editor,

I was very pleased to see the letter from Albert Olivera (Vol 3 No 2) concerning my INSTR$ routine published in Vol 2 No 11. It's nice to know my articles are read and put to use. Albert's modifications are excellent but, I'm afraid to say, un-necessary.

In the article I explained that the function passed 5 byte numbers to the machine code routine. These numbers are 'String Pointers' and, if you read the Spectrum ROM Disassembly, these give the string type, a pointer to the start of string and its length. These pointers can define a full string, an array element or a slice of a string.

i.e. D$
D$(1,5)
D$(7 to 26)

So, either the data string or the search key string could be any of the above. Having found one key string in your data all you do is to restart the search at one greater than the location of the first occurence.

Still I think it was marvellous how Albert worked to produce his method, I congratulate him.

Yours Sincerely, Ken Elston.

Thanks Ken for your very long letter which I have had to cut down to fit the space (I hope it lost nothing in the cutting).
Well readers, now you have two ways to do the same job. Don't say FORMAT doesn't spoil you with choise **Ed.**

Dear Editor,

Your magazine is excellent for those who are competent programmers but what about us mere mortals that just about manage to program in basic. I don't understand machine code and a lot of your articles seem to assume readers talk in LDs and POPs all the time.

How about a simple, an easy to follow, a really for dim-wits, course in machine code? I can't be the only one who wants this – can I?

Yours Sincerely, Stan Rogers.

Well Stan, quite a tall order that one. First, I can only publish what comes in. Second, it is very difficult to know where to pitch machine code courses, if its too easy anyone who knows machine code will turn the page, if its too difficult then it goes over the head of the beginner. Francis Miles is doing an excellent job with the 'improvers' but if there is enough demand we will try to organize a beginners course next year. **Ed.**

Letters printed may be edited for length or clarity. The writer of each months STAR LETTER wins an EXTRA 6 months subscription to FORMAT.

By: John Wase.

First, the bundlers. Again, may I thank everyone who's written in about Daniel Neidle's backup program. I now have copies which Carol Brooksbank assures me are totally debugged, so if you are still having trouble, drop me a line.

Next, Nigel French's disc numbering program. Nigel tells me there are a couple of bugs which have turned up. The first is that the wrong options are chosen if the program is loaded and the caps lock is not on. This is cured by altering line 60 to line 115 (make sure line 60 is deleted). The second fix, which enables you to alter disc number at any time is to alter the GOTO 160 in line 260 to GOTO 110. Hope this is now all clear. Many thanks, Nigel.

Next, I have a letter from John Elliott of Farnborough. My apologies for keeping you waiting, John: I have been pondering and asking around (official speak for "I don't really know..."). John writes that he has two printers, a serial 8056 printer (of which I've no experience) and a parallel Brother HR5 (of which I've no experience, either), and he needs several Greek symbols for equations. He says there is no half spacing with the 8056 printer (and I'm not exactly sure what he means by this). The plot is compounded because he likes the to-scale template A4 screen dumps via Screen$2 and the HR5, he often needs long rotorcraft calculations (a yard or two of paper at the time) and he complains that he likes thermal paper because he finds ribbons can sometimes knot.

Well, John, I have a pair of old Epsons, an FX80 and an RX80, both of which use ribbons, and neither of which knots them. I find Caspell Computer Services' Ribbon Refresh ideal for putting new life in them - I have a series of ribbons, and when I have used several, I give them a spray. Ordinary paper is no problem - mine is standard tractor feed stuff, and though it is perforated and the thermal stuff probably isn't, there seems to be no reason why perforated paper shouldn't be used - you don't need to tear it off at the perforation.

So, there should be no real reason why you shouldn't use any old printer and ribbon, provided it will do what you want. So let's look at what I was doing in the old ZX article which you mentioned. My first printer was the FX80, and I paid £100 more than the RX80 simply because it has in it a fair bit of RAM: 2K if I remember correctly. The amount of RAM in printers varies; it's one of the very non-standard features. Normally in the FX80 this acts as a buffer, but by altering a dip switch or giving a command, I can make it do other things. The characters are, of course, stored in ROM. However, by giving the FX80 a command, I can make it pour them into RAM, and stop using this as a buffer. Since they are in RAM, I can alter any of them should I choose, and that is the method I adopted. So I download some characters doing it the obvious way, for instance, I turn "a" into alpha and "u" into mu. One of my Tasword printer control codes is set to select the character set in RAM. To print an alpha, I select the set in RAM with the appropriate graphics symbol, type "a" and then deselect it. Because I do it this way, there's always a letter there, and this often helps to tell me if I've done something wrong when things don't work out as I had expected.

OK so far? Fine if your printer has the RAM and download facilities. Not

many of the older, cheaper ones do, however. But they often still have a little bit of RAM and you can download to this, select it as appropriate, and then press the appropriate key. Very often this system constrains you to only a few symbols - the Epson LX-86 is an example, allowing you something like a dozen only.

If this solution fails, then you will have to use something like one of the programs published in FORMAT which puts the printer into graphics mode, prints out the cipher, then puts the printer back into text mode. The problem there is that the printer copies an eight by eight pixel square which throws everything out of line. The solution is tortuous, but possible: follow with several blank graphics squares, then an appropriate number of back-spaces on return to text mode: when you define the character, don't use the last three pixels on the right.

If you decide to got another printer, the new dot matrix ones are getting cheaper all the time. Check that the bit image mode you need for your pictures is available, and the incremental line feeds are correct. (Like the old Epson MX series didn't support a high enough bit image density for many purposes, and the Shinwa CP80 made circles very oval because the pins were much thicker and the line feeds were less). And check that there is RAM available for downloading and that this is available. And finally, choose a make with a manual which explains how to do it. I took about 9 frustrating months, because the early manuals for the FX80 assumed that you knew how a printer worked before you read the manual.

You should be all right, then.

Talking of printers, I have a Silver Reed EXP400* which works like a charm from the +D or Discovery parallel ports, but fails completely from my Spectrum+3, presumably because some strange quirk of the +3's port signals: either the high voltages are not high enough, or they are not held long enough at high for the printer, or they are not a proper, square-cornered signal, or something. So now, in desperation, I'm going to try it on the +3's serial port, by passing the signal through a serial to parallel converter. I'll let you know how I get on.

Here's a little piece from Harold Burton, who never fails me. Harold mentions that he found Spectral Writer a great word processor for the Spectrum, particularly as it was free! He then goes on to provide instructions to convert it to the Disciple/+D as follows...

1. Load from tape and choose BLOCK OPTION D - exit to BASIC.

2. Alter the lines for loading and saving to DISCiPLE/PLUS D syntax, then

3. POKE 60957,207: POKE 60958,57: POKE 60959,201

4. RUN, then on BLOCK OPTION B, re-SAVE the whole program to disc.

When printing out, choose INTERFACE CODE 2.

Perhaps Harold would be good enough to send me a converted copy to play with and also the original code - this conversion could well also fit the Discovery interface. I will report.

Finally, here's a little anagram solver from Derek Crabtree of Weybridge.

```
  1 REM ****ANAGRAM SOLVER*********
  2 REM ***BY DEREK CRABTREE********
  3 REM ********1989***************
 20 RANDOMIZE : INPUT "NUMBER OF LETT
    ERS ";N$: GOSUB 100: IF NOT OK TH
    EN GOTO 20
 30 INPUT "LETTERS ARE ";Z$: GOSUB 16
    0: LET Y=0: IF NOT OK THEN GOTO 3
    0
 40 LET A$=Z$: FOR F=1 TO N
 50 LET X=1+INT (RND*N): IF A$(X)=" "
    THEN GOTO 50
```

DISCiPLE

ANATOMY

Part 4.   **By: Dick Guy.**

This month, as promised, we take a look at the ROM and RAM circuitry in the DISCiPLE. Also included is a basic overall circuit diagram to enable you to tie together all the individual circuits we have looked at so far.

First of all for those of you who are not familiar with the meaning of the abbreviations used I will expand on them.

<u>ROM</u> is the abbreviation for <u>Read</u> <u>Only</u> <u>Memory</u>. As the name implies ROM is memory which can only be read, obvious isn't it - or is it. If ROM has data contained within it, that data must have been written in at some time. This notion is true of any type of ROM, the important fact being that you, the user, cannot change the data contained by the ROM unless - that is - you have some very special electronic equipment. I should add here that not all ROM's can be changed, once they are programmed. The DISCiPLES ROM however can be, though I for one do not recommend it. The ROM used by DISCiPLE is a type known as PROGRAMMABLE ROM (or PROM). There are a variety of PROM types available but by far the most prominent is the Ultra Violet (UV) erasable form. Usually know as EPROM's these are both cheap and reliable, an essential virtue for the home computer user. If, like Bob [the editor of FORMAT] you are rich, then you can use EEROM or electrically erasable ROM.

<u>RAM</u> stands for <u>Random</u> <u>Access</u> <u>Memory</u>. As the name implies these devices are randomly accessible for both read and write operations. There are two types of RAM available for use. These are STATIC and DYNAMIC. The former are predominantly - though not entirely - manufactured using bipolar transistor technology and take the form of a 'flip-flop'. That is a dual transistor configuration having two clearly defined states, either on or off. Because of this arrangement static RAM has shortcommings which may be undesirable for some applications. These are that they require large amounts of current to function and, because two transistors are needed to give circuit operation, memory density is not what it could be. Dynamic memory overcomes these particular problems - but at a price. This type of memory is entirely manufactured in CMOS (Complementary Metal Oxide Silicon - it's a manufacturing process) and gives one bit of memory per transistor evidently doubling up on static \ capability. Being manufactured in CMOS the current consumption is reduced by a large degree. Dynamic RAM works on the principle of charging a capacitor to give the 0 or 1 required. This leads us to the price we have to pay for this type of memory. As the capacitor is an integral part of the on chip transistor its value is very small. Any capacitor once charged will, unless repeatedly 'topped up', start to discharge which is not very much use and the smaller the value the quicker the discharge, in most cases mille seconds (thousandths of a second). The solution to this problem is called 'Refresh' where each bit cell in memory is tested for value and that value rewritten to the bit cell thousands of times a second. Its no wonder dynamic RAM is expensive but it does allow millions of bit cells to be built onto a small slice of silicon.

On the DISCiPLE the RAM used is a 5565-PL15.This particular device has a 65536 bit memory organised as 8 bit x 8kbit. The circuit shows the RAM (IC7) having 13 address lines attached just enough to control our 8 Kbytes of memory. Three control lines are used. These are RD to read the memory, WR to
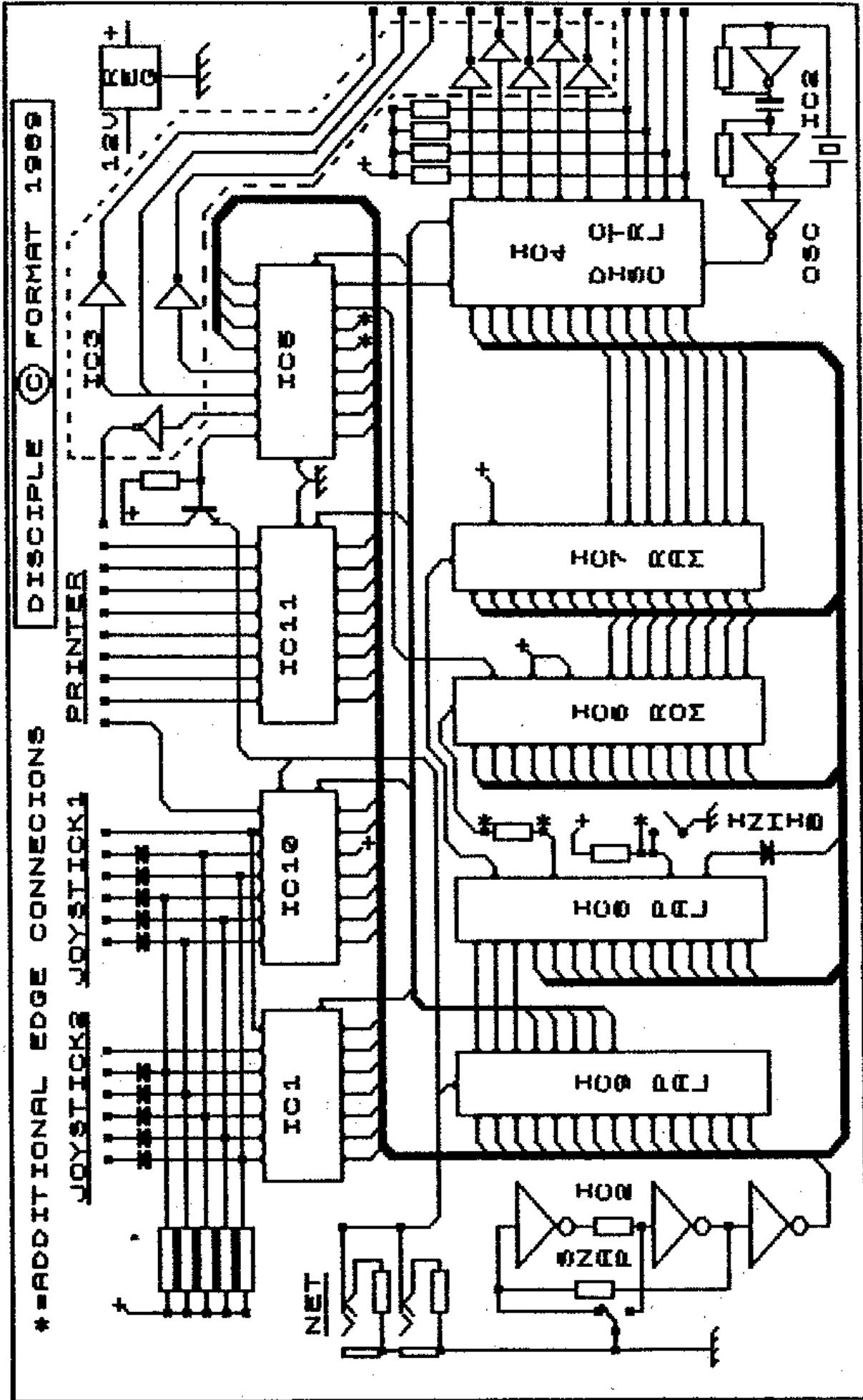
Fig 1. Full DISCiPLE Diagram.

write to memory and CS to select this particular chip. Note that the circuit has a bar over the control name. This bar means that the control signal must be low (ie 0) to select the function. Refresh for the RAM is transparent to to the user and is usually done during a CPU (Z80) instruction fetch cycle, but that's another story. The PL15 incidentally, indicates the memory access time. Just add a 0 to the 15 and call it nanoseconds (thats .000000150 second - or a twinkle of an eye).

As stated earlier the PROM used is UV erasable. The device used is a 2764 CMOS EPROM of 65536 bit cells organised as 8192 x 8 bit arrays. The big advantage of our ROM is of course that the data will still be there when next we power up the Speccy. The more observant of you may have noted that one of the ROM pins is marked OE. OE is used to help 'PAGE' the ROM when required. More on that subject in a moment. This time as expected there are only 2 control lines. These are RD and CS and the same control logic as applies to RAM is used.

When I first met memory paging I was totally confused. There may be others of you who feel the same so I will try to clarify the process. The name PAGEing is a good place to start. If you visualise a book all its 'pages' are joined together at the same place - the spine. In a computer the same logic applies only this time the spine becomes the 'busses' used and, just as in the book, every thing is connected in parallel. Last month TRI-STATE circuitry was described and it is common practice for all computer devices to have this facility. As you recall, a tristated device can have its pins mechanically connected to the same point as another device, but the latter will not be aware of the formers presence. If both devises on the bus have the tristate capability and some means can be found of switching one into tristate when the other is not tristate then we have a means of putting more memory into the computer without increasing complexity to much. That is we can have 'pages'

of memory in parallel with each other without any page knowing the others are there. This function is normally arranged by using the IC's output enable pin which controls the tristate function. Of interest more advanced CPU's such as the 8086 have this capability built in. For the DISCiPLE more hardware is required. (This process is also known as segment or bank switching).
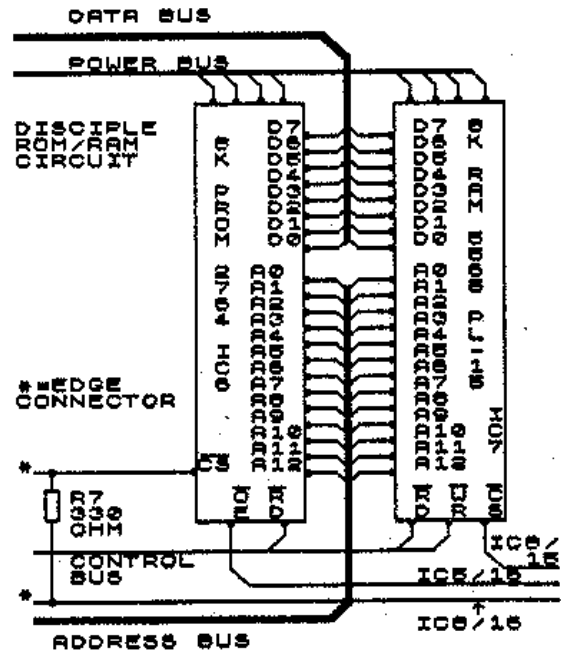

Fig-2 ROM/RAM Circuit

On the circuit this output enabling of the ROM is accomodated by OE. CS and RD are used to enable the ROM to be read once the appropriate lines have been energised. All the control signals are delivered by addressing IC's. More on them next month. Of interest the ROM CS signal is also applied to the DISCiPLE's rear edge connector and can be used to disable an external device if required. Of more interest is a further external connector on the edge connector which allows the DISCiPLE ROM to be controlled by an external device. Resistor R7 allows this to occur.

That's it for this month. Next month it's the final part of DISCiPLE ANATOMY which will cover the Network and PAL's. Meanwhile, if you have any questions on the DISCiPLEs hardware then write to me c/o FORMAT and I will try to answer them in a follow-up article next year.

HACK-ZONE

By: Hugh J. McLenaghan.

This month I want to review Steve Nutting's program 'PLUS D Toolkit'. As the package consists several small programs within the main one, I will review each section in turn and also give it a rating out of 10.

Toolkit 1 (Disc Repair Commands)

Command (Test):-

This command will do a thorough check of a newly formatted disc (35 minutes worth) and will display on the screen the corrupted sectors. When the program finishes all of its checking it will save a file at position 80 in the directory, this will stop the corrupted sectors from being used. If you use this command on a disc with data on it, then all data is lost!

Command (Map):-

This will repair sectors using the discmap which can be saved after using the TEST command.

Command (Restore):-

This will unerase files from the disc, this program will not check to see if the file is corrupted, therefore it will unerase all files and it is up to you to find out if it has been corrupted.

Conclusion.

Some people may find this set of routines useful although most people will not. While it will repair bad sectors, it will not check or repair discs with your data on them. Most of the sector errors I find, are after you have saved data on them, it is the data that I would want retrieved as well as the sector being repaired. My rating is 4/10.

Toolkit 2 (Tape, Clock, Data routines)

Command (Tape):-

If you wish to transfer normal tape loaders that have headers, then this is the option for you, as it can even cope with programs that are 49152 bytes long! Otherwise you will have to use some other sort of program, as it does not cope with headerless blocks of code. This is something that most Tape->Disc copiers SHOULD have as most code blocks are headerless. Programs that load faster than normal can not be transferred by this option.

Command (DataCompile):-

This will copy Machine-Code/Data from memory into DATA statements for the use of BASIC. If you give an address of under 16384, then it will copy the +D code into DATA statements, NOT the spectrum ROM.

Command (Rem):-

This will put a REM statement into your program will as many X's as you want. Machine-Code can then be put into the REM statement.

Command (Clock):-

The interrupt driven clock time is set with this command. Please note that the clock will have to be reset after the following processes:- BEEP's, Disc Access, or after the Alarm has gone off.

Command (Alarm):-

This sets the alarm time.

Command (clock Off):-

This will turn the clock off. Please note that to turn the command off you use O not C as it says in the manual.

Command (Position):-

This sets the position of the clock on the screen. The clock does not use the normal spectrum numbers, but uses it's own.

Conclusion.

This is a better toolkit than the

first one. The only bad thing about this program is having to reset the clock after disc access, but this cannot be helped. Rating 6/10

Toolkit 3 (Disc)

Command (Disc):-

Behind this command is a disc to disc copying program. It has a very nice layout, but it does not copy some of the important filetypes like:- Microdrive, Special, Opentype, and Execute. Although it does copy 48K Snapshot files, I feel that missing out these filetypes very much decreases it's use. Also this program will only work when you have 2 disc drives, if (like most) you only have 1 then it will NOT work.

Conclusion.

Although it is well laid out and a lot of effort has gone into this program it is let down by the types of files left out and also the NEED for 2 drives. Rating 6/10.

Toolkit 4 (48K Snapshot Compress)

Command (48K Compress):-

This command must be one of the most useful commands ever thought of by Steve. Once this command starts all or some of the snapshots on the disc will be compressed using a complex formula. This compression will take up to 5 minutes to get the best compression, it will then be saved to another disc. In fact one of my programs was reduced to 39% of it's original size! Although the program takes a while it is well worth it as it can reduce most games by at least 10%, therefore more games on the disc. Of course you cannot load the game as you normally would, you first have to load in this program and then get it to load the game.

Concluision.

Brilliant! No other words for it!!! Rating 10/10.

Toolkit 5 (128K Snapshot Compress)

Command (Snapshot BUTTON+6):-

To call up this command you press the snapshot button as usual and press 6 instead of 5. This program then compresses the program as it saves it. The compression technique is a very simple one, but is still can reduce the size of the snapshots by quite a bit. Like the 48K snapshot compress you must load in this program, then get it to load the snapshot. Rating 8/10.

Overall Rating and comments.

In my opinion this package is well worth the money, even if you are only going to use it for the snapshot compression programs. It is a good program with a few things which could have been written better, or more things added to existing options. I certainly will use it as much as I can. Overall Rating 7/10. Buy it!!!

Steve's Software, 7, Narrow Close, Histon, Cambridge,CB4 4XX. Price £3.60 incl P&P.

Multiface-Spot

As I have been sent quite a lot of pokes by two readers (and very thankful I am) I will make a Multiface-Spot a regular part of my articles. Published Multiface Pokes will be for a mixture of many old and new games. If you have any pokes you would like printed, then please send them in and you will get to show off to all of your friends that you have your name printed. So come on and send in the pokes.

The following pokes were sent by Sica Tullio Demetrio from Italy:-

```
AD ASTRA: 35853,0 = Infinite Lives
ALCHEMIST: 47544,201 = Infinite Energy
           47599,201
ARC OF YESOD 48K:- 47590,0 = Inf-Lives
CAULDRON:- 40050,0 = Inf-Lives
           57578,0 = Inf-Energy
           54752,252
           56571,201
COOKIE:-   35946,0 = Inf-Lives
DARK SIDE:- 47621,167 = Inf-Time
STARQUAKE:- 50274,0 = Inf-Lives
VIRUS:-     44912,0 = Inf-Lives
XEVIOUS:-   53757,0 = Inf-Lives
```

More Multiface Pokes next month. Please remember that my column cannot

continue without your input! Any comments, ideas, problems, conversions, etc. are all welcome. I want the Hack-Zone to be the readers column with things that you want, not things that I or editor wants. I need your letters, so PLEASE SEND them to me at the address at the bottom of the page.

Thanks for reading and see you next month.

Hugh J. McLenaghan,
36 Floorsburn Cresc.,
Johnstone,
Renfrewshire,
Scotland,
PA5 8PF.
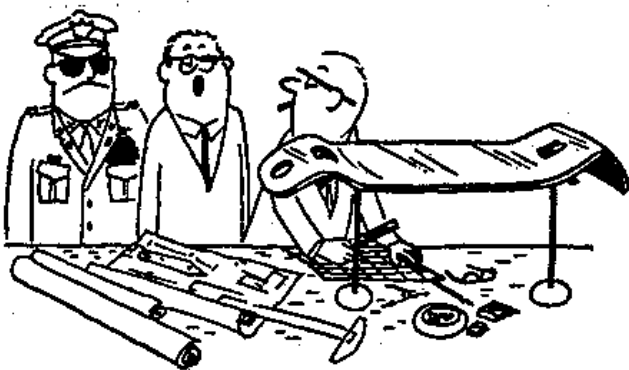
And this is our new Anti-Tank Weapon

```
 60 PRINT A$(X);: LET A$(X)=" ": NEXT
    F: PRINT ,: LET Y=Y+1: IF Y=40 T
    HEN PRINT #0;"PRESS ANY KEY TO CO
    NT": LET Y=0: PAUSE 0: CLS
 70 GOTO 40
100 REM ***CHECK INPUT********
110 IF N$="" THEN GOTO 190
120 FOR F=1 TO LEN N$: IF N$(F)<CHR$
    49 OR N$(F)>CHR$ 57 THEN GOTO 190
130 NEXT F
140 LET N=VAL N$: IF N>14 THEN GOTO 1
    90
150 LET OK=1: RETURN
160 IF Z$="" THEN GOTO 190
170 IF LEN Z$<N OR LEN Z$>N THEN GOTO
    190
180 LET OK=1: RETURN
190 PRINT #0;"ERROR IN ENTRY -PLEASE
    TRY AGAIN": BEEP .3,0: PAUSE 75:
    INPUT ,: LET OK=0: RETURN
200 SAVE d1"anagram" LINE 1
```

No guarantees - I've not given it a thorough test.

Finally, Christmas Greetings to you all. May next year be Blessed, Beautiful, Bountiful, Beatific, but above all, Bug-free!

By: Nev Young.

K.H.Tang of Leicester has found one of the few bugs in the PLUS D. Namely that when doing a small screen dump you can often get a completely black block and wonders if the pokes to fix this for the disciple can be used on the PLUS D. Quick answer: no. I'm afraid the printer routines for the PLUS D are held on ROM and can not be changed.

A Fletcher would like to delve into the hardware of his spectrum (A nasty +2A) to fix the incompatibility of the ROM. He asks is it possible to piggy back two different ROMs and select them by switches. Yes it is. The ROMs are direct pin compatible devices with each other and the similar sized EPROMS. You could piggy back them and select one or the other by use of the CS (Chip Select) line on pin 20 on the 28 pin devices. Pull the pin low to select the chip and high to make the chip go into hi impedance state. Your only problem now is 'Where to get a +2 ROM'. Don't be tempted to copy one onto EPROM as since 1st August 1989 this would carry a maximum two year jail sentence for copyright infringement (the same applies to copying any software).

I've had several people write about how to set up the MGT lifetime drive for their machine. So I phoned MGT and asked for a manual so I could give a definitive answer via FORMAT. MGT sent me a glossy advert. Two out of ten for effort MGT. I'll try again and let you know in a latter issue. Meanwhile why not phone the nice guys at Swansea and ask them how to do it.

A Plea for help from F.A.Reader of St. Albans. I have to pass this on to the rest of the world to see if there is any one who can help. His ZX SPDOS disc interface from Abbeydale Designers has gone and broke. Does anyone know a place to get it fixed or how to get the disciple to read the discs?

R.C.Atkins of Reading is about to plunge into machine code but is confused about where in memory it can go as other peoples code seems to RANDOMIZE USR at different places. Well Rusty you can put your code anywhere above address 16384 but to make it safe and not crash your BASIC you have to put it above RAMTOP. RAMTOP can be moved to almost any address by using the basic CLEAR command. For example to put you code at address 50000 you would do CLEAR 49999 at the start of your basic program. Your code will be safe even after you do a NEW command as the spectrum never touches any memory above RAMTOP. (Unless you have a +2 which always corrupts a couple of bytes 65316/7)

AT LAST! A RESPONSE. Some time ago I had a letter about GENS3 giving a protected message during a PUT. As I don't know the product I phoned someone else and gave their answer. Well David Kennedy of London to the rescue. He has written to me and explained that the protected message simply means that the file exists. But there is no overwrite facility. So you have to PUT with a different name. He also points out that overwrite was a feature he added to GENS in his articles on expanding GENS in Vol 1 issues 7 through 11.

Mr M.Chapman of Sheffield is having lots of problems typing in programs printed in FORMAT. Deep breath and here goes:-

1. Incremental Backup program Vol 1. This gives 'B Integer out of range,510:1' when ever run.

2. No and Name Vol 2 no 10. Gives '1,NEXT without FOR,0:4'. As there is no line 0 then is there a misprint or have I done something wrong?

3. SIDEWRITER Vol 2 no 1. Prints '??????L????'

4. Autoload Vol 1 no 5 gives 'N Statement lost 370:4'

Answers:-

1. IBU was written before the PLUS D was invented and so needs to be converted. Change line 105 to read 'LET dp=8192' Also see the corrections in vol 1 no 10. (Note this may apply to other programs that use POKE @ to alter main memory)

2. You've done something wrong.

3. Do a POKE @6,1 before running the program to stop the PLUS D from trapping the escape codes.

4. Sounds like you haven't got enough 'x's in line 10. The program replaces these with the machine code and if there are too few then the machine code will overwrite the rest of the program.

Thats all for this month. Remember If you don't write to me I can't write this page. I also have to point out that I can not answer questions personally so DO NOT send me return postage etc. I will attempt to answer as many queries as possible but only through the magazine.

Write to FORMAT or directly to me at:-

HELP PAGE,
3, Mitchell Place,
Falkirk,
Stirlingshire,
Scotland,
FK1 5PJ.

+ - + - + - +

CHRISTMAS CARDS

By: Carol Brooksbank.

The festive season is upon us again, and everyone is rushing around buying Christmas cards by the dozen, but have you ever thought of putting your Spectrum to work on this?

Three ways come to mind. You could print cards which you send through the post in the normal way; you could send a card on a disc or tape for your Spectrum-owning friend to print out; or you could produce a greeting program which the recipient loads into his Spectrum and runs.

If you plan to print your own cards, there are one or two technicalities to bear in mind. Your printer may not handle card very well - my Epson doesn't. It does not always feed smoothly, and sometimes, even with the head adjusted right back, the ribbon feeds unevenly and jams. But my local photocopy shop is a gold mine of card and paper in a wide range of colours, and I have found that printing the front and inside of the card on paper, then cutting it out very carefully and pasting it on matching or toning card, gives an excellent result. As long as you smooth all the bubbles out of the paste it is impossible to 'see the join'.

Remember, if you find you can print direct onto card, that you can hinge a card at the top or the left hand side, so the printout must be placed at the bottom or on the right of the page. If you are printing from within a program like 'THE ARTIST 2' which has fixed margins, you may have turn your design upside down or sideways on the screen. The greetings inside are added by putting the card through again, using the second side, (upside down if
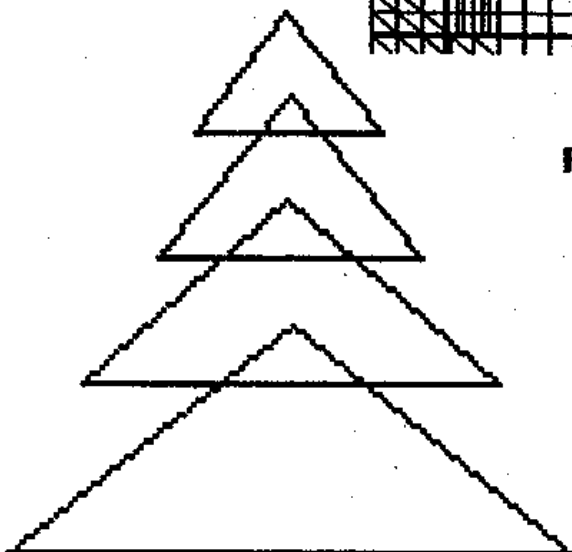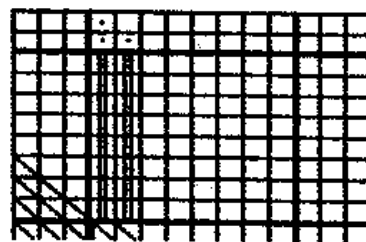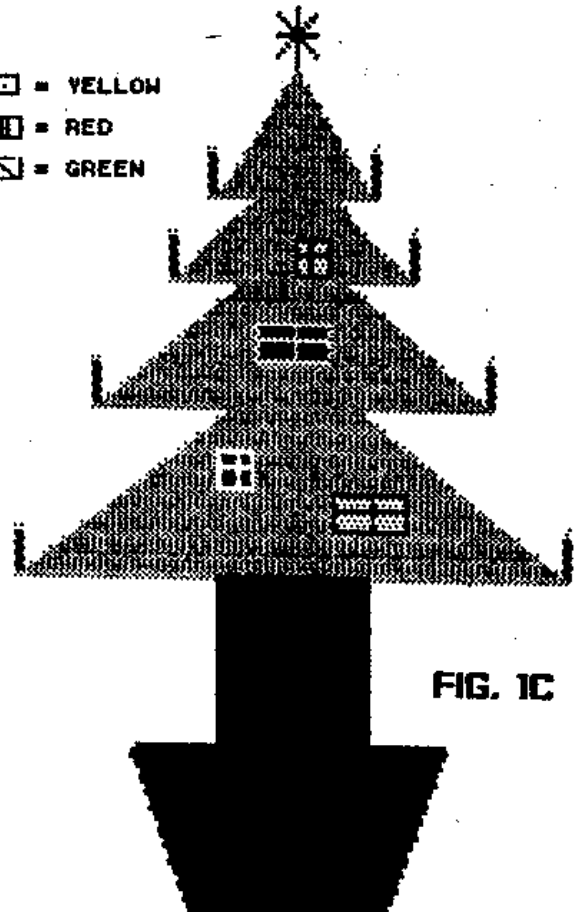

□ = YELLOW
⊞ = RED
◪ = GREEN

FIG. 1B

FIG. 1C

FIG. 1A

hinging at the top). You will need to experiment to discover exactly where to put the two printouts to get the results you want.

You have no problems about making the printout look interesting and attractive if you happen to own a colour printer. I don't, but I colour the designs on screen just as though I did, and then use shaded screen dumps. The textures add a great deal to the finished print, even in black on white.

My favourite program for shaded screen dumps is PCG's DTP PACK. It lets you vary the size of the graphics, keeping the true proportions or distorting them as required, and the textures used indicate the different colours very clearly. ART STUDIO's shaded dump elongates the design too much. THE ARTIST 2's dump, though available in two sizes, doesn't have such clear colour definition and both shaded dumps are sideways on the paper. And there is always SAVE SCREEN$ 2, of course - with good colour definition textures, but a bit large for a Christmas card if you use the whole screen.

You don't have to stick to black and white. Ribbons for many printers are available in colours, and you can even do two colour printing - printing part of the design, changing the ribbon and the screen, and putting the paper through again to print the rest. But it is difficult to place the paper exactly the second time, so keep the blocks of colour well away from each other. I don't recommend trying to put red berries on green holly leaves by this method! If you have difficulty buying coloured ribbons, a firm called Aladdink will refill your worn-out black one with one of six colours for about the price of a new ribbon.

On a card for the receiver to print out, I would keep the picture and greetings on one side of the paper, so that he does not have to put it through twice. And if you produce something that has to be printed via a program like DTP PACK, make sure the

person who gets it actually has a copy of the program. If in doubt, stick to screens which can be printed with simple screen dumps.

For a greetings program which the recipient loads and runs, you can use more than one screen. THE ARTIST 2 has a useful compressor which lets you keep several screens in memory and display them as required from BASIC. You could include some Christmas music to accompany them, especially if both you and the receiver own 128K Spectrums, (Listing 1), but I have even done this quite succesfully using BEEP, for someone who owns the old rubber-key 48K version. There is a program called THE MUSIC BOX by Melbourne House which lets you make excellent music with BEEP.

But the fun part of making Christmas cards is designing them. If you are a talented computer artist you need no advice from me. The rest of this article is about artwork for those who can't draw - and most people can draw better than I can!

Anyone with a graphics program can draw a Christmas tree. Figs 1a to 1c show you how to transform a series of triangles. The only problem is that the corners of the triangles must be lined up carefully with the character squares if you want to put coloured candles on as I have, or you will get an attributes clash. (If we all get a SAM in our Christmas stocking we shall not have to worry about this next year, but in the meantime, Fig 1B shows you how it is done.) Fill in the triangles with solid fill, add a rectangle for the tree trunk, a few lines for the pot, and some parcels which correspond with one or two character squares so they can be in contrasting colours. Set all the attributes, and the result is Fig 1C.

Another easy-to-draw Christmas motif is a snowman. A circle for the head, some curves and straight lines for the body, hat, mouth and pipe, a triangle for his nose and some dots for eyes and buttons, and there he is - on the card front in Fig 2. ART STUDIO and

A HAPPY CHRISTMAS

Christmas Greetings
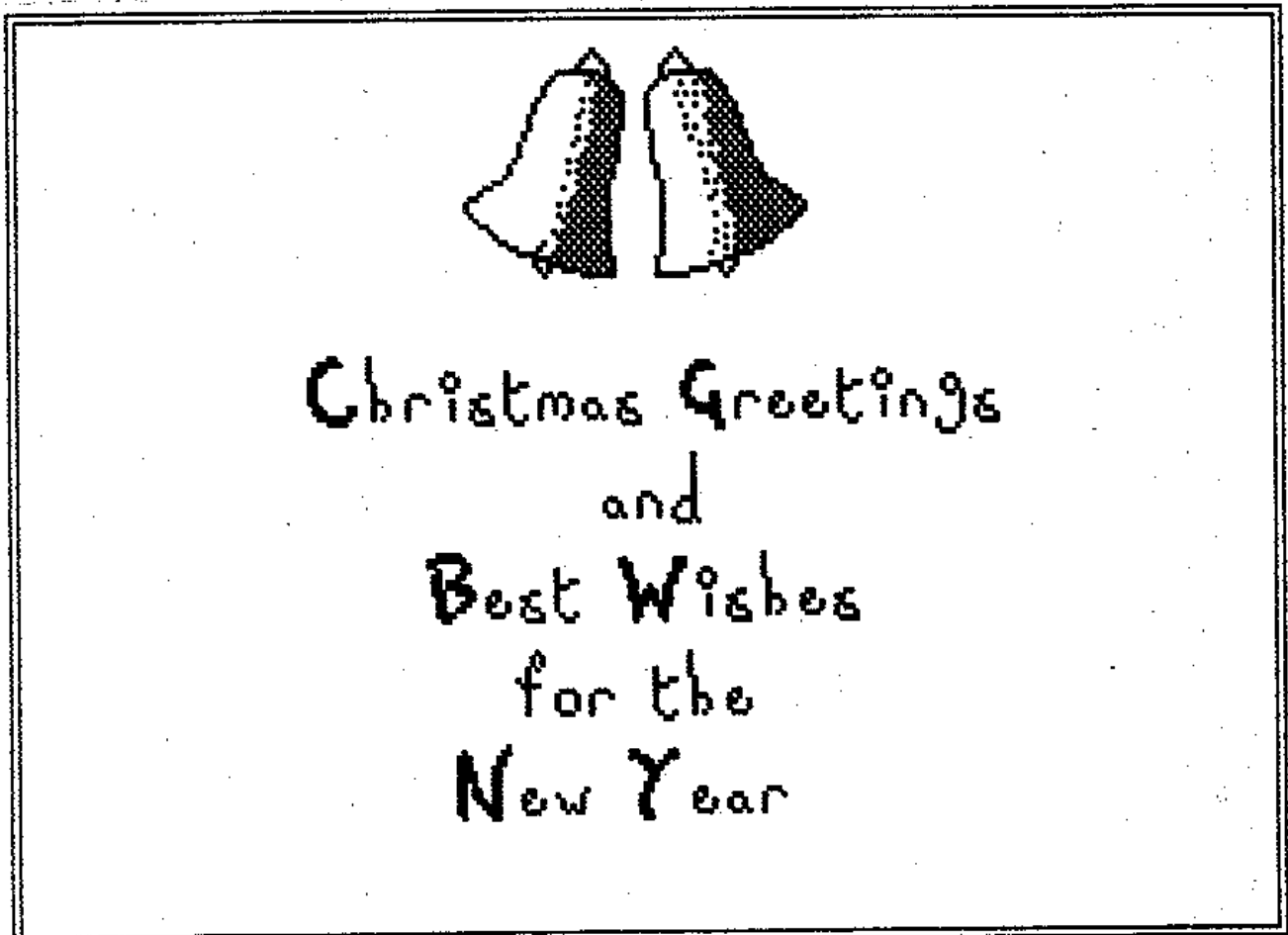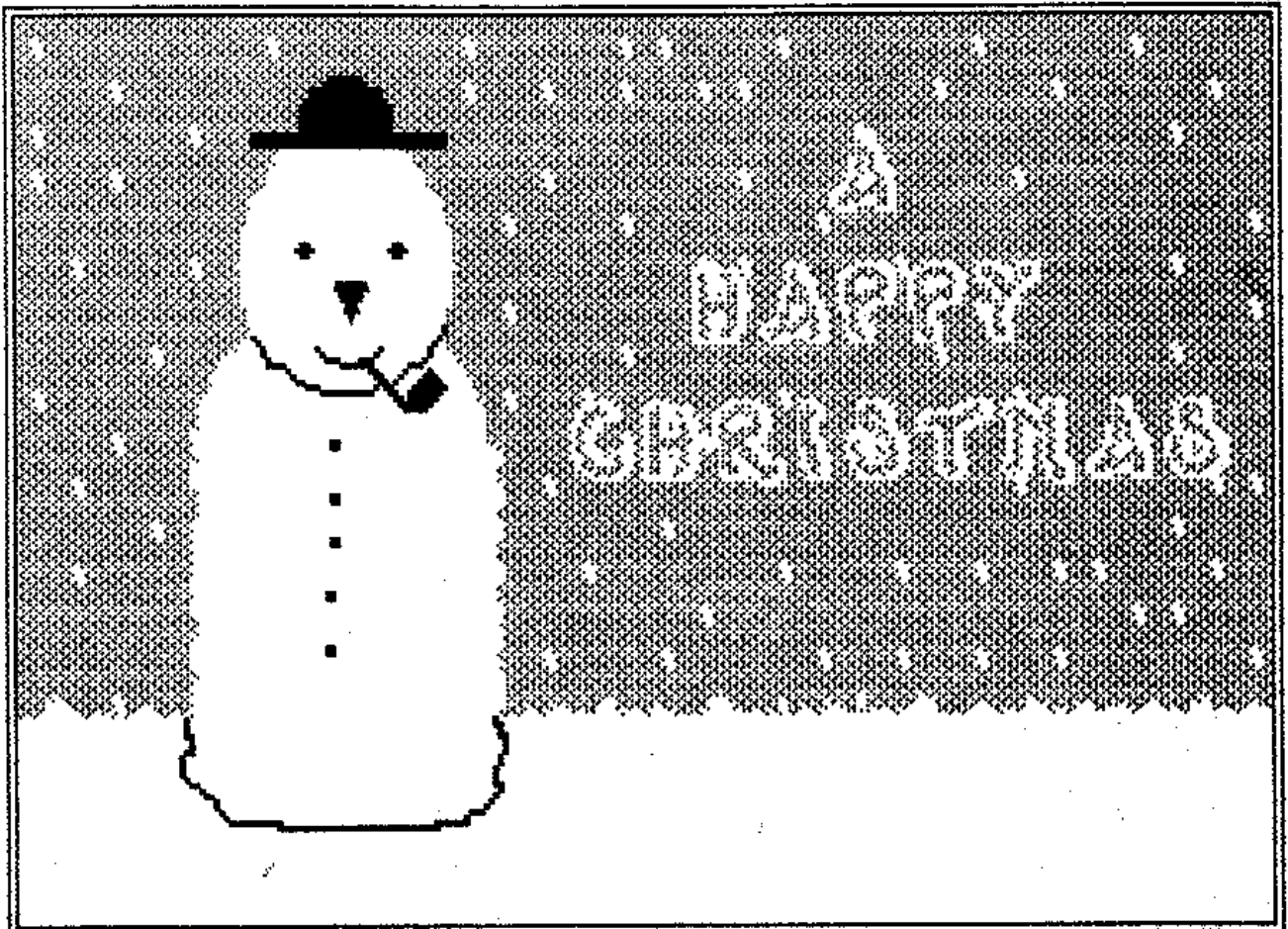and
Best Wishes
for the
New Year

Fig 2.

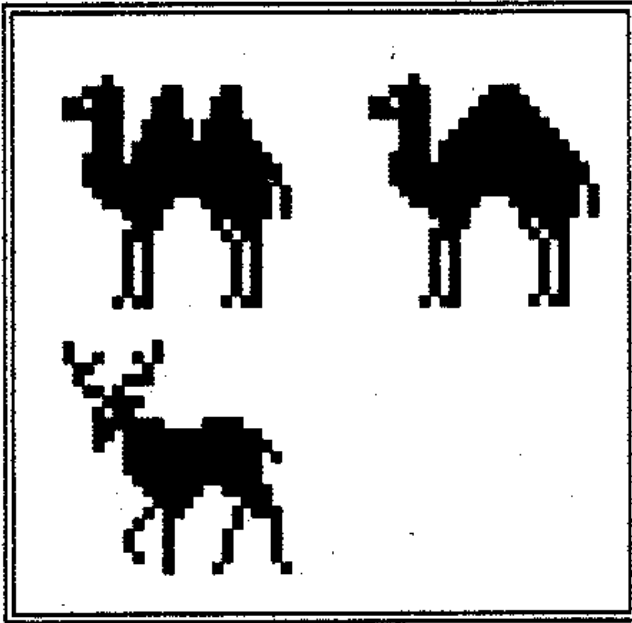THE ARTIST (the original - not ARTIST 2) both have a curved line mode.

Fig 3.

Your snowman will look more realistic if you use the graphics program magnify mode and go round the outline adding a few pixels here and there to make it uneven instead of a crisp line. I have done the same with the horizon. The snowflakes are added by using the cut-and-paste or multiple window modes to dot them at random about the sky.

The non-drawing artist will find sprites (designed by other people) very useful. The two-humped camel and the reindeer in Fig 3 came from the 'Screen Shot' Step-by-step programming book (Vol 4). The one-humped camel is produced by filling in the gap between the humps and rounding off a bit. The camels are used on the card front in Fig 4, with one camel slightly enlarged using the window rescale option of ARTIST 2. The 'wise men' are simply blobby shapes, and Bethlehem is a series of boxes, lines and curves.

If you can't draw Santa's sleigh, one-and-a-half reindeer sprites linked by harness, outside a window, is enough to suggest that it is there. (Fig 5). The curtains are a handy fill pattern from THE ARTIST 2.

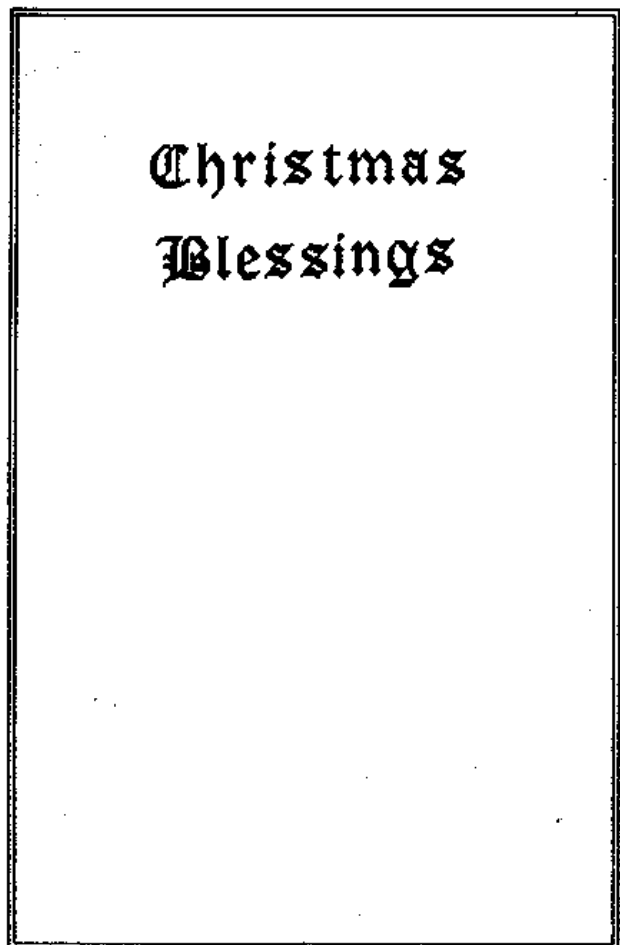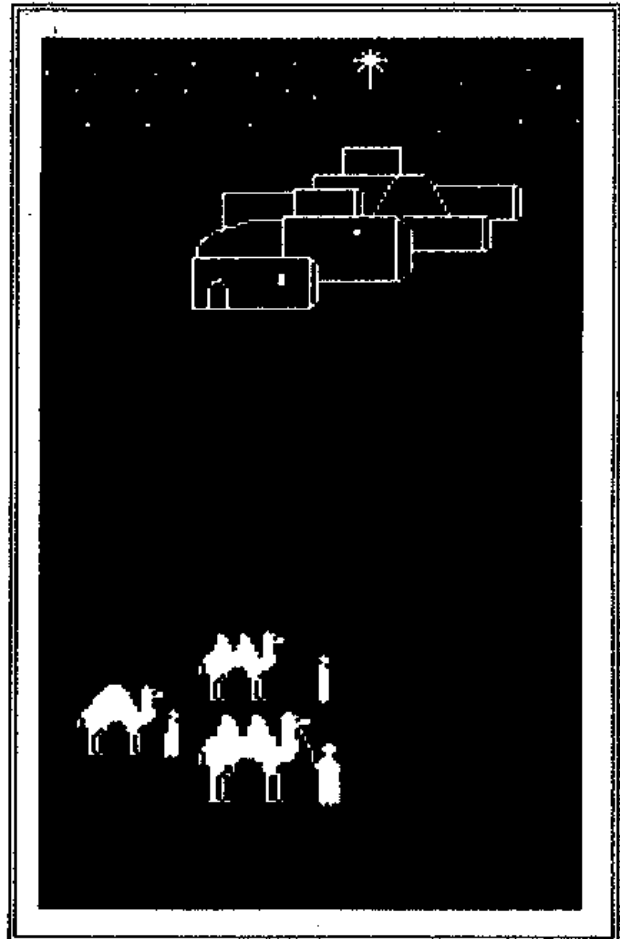Clip art is a rich source of motifs. Use the snapshot button to make

Fig 4.

20

screens from any program you like, and THE ARTIST 2's insert mode or ART STUDIO's scrapbook will let you incorporate bits and pieces in your own design and modify them as you wish.

Fig 5.

The bells in Fig 2's greeting insert started life in ART MASTER'S demo program. They were animated, so I had to freeze the program several times before I got a bell hanging at just the right angle. Fig 6 shows some modifications. If you reduce an original you may have to tidy up missing pixels, and rescaling should always be done before shading is added, because textures get very messy when rescaled.

Finally, there is lettering. Most graphics packages offer a range of fonts and some, like ICON GRAPHIX 128, are very good. All the lettering in Fig 2 is ICON's 'Janice' font. The lettering on the card front was produced separately, using the outline mode, saved as a screen and merged into the snowman picture using ART STUDIO's merge window mode.

Old English lettering (see Fig 4) is more difficult to come by. The Gothic font in ARTIST 2 is only useful if printed very small. The slightest degree of enlargement makes it ugly and unreadable. The lettering I have used comes from the optional extra

HODIFYING CLIP ART
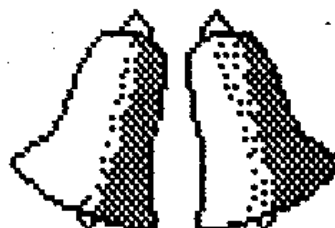

1. ORIGINAL

2. INVERT

3. COPY AND REVERSE TO MAKE A PAIR

4. REDUCE

5. TIDY UP MISSING PIXELS

6. ADD SHADING AND TOP RINGS

Fig 6.

font pack 2) available for PCG's DTP PACK. I had to do some radical modification, because the font can only be used for direct printing from DTP, and I wanted to make a graphic screen and turn it sideways for printing.

So I loaded it into the font editor, and took a series of screen snapshots. Four letters are visible at once in the editor, so it took 22 screens to get the whole font! They are also large and distorted, so I used THE ARTIST 2's window insert and rescaling modes to improve them, and ended up with the whole font on three screens, upper case, lower case, and figures and signs. These I then loaded into ART STUDIO and made a font scrapbook, each letter a separate insert. As a result, I now have a beautiful gothic font which can be used in screens. It is larger than the printout you get in DTP PACK, and it can be outlined or enlarged more if required, so it can also be used to produce 'illuminated' capitals for DTP PACK gothic printouts. (Fig 7)
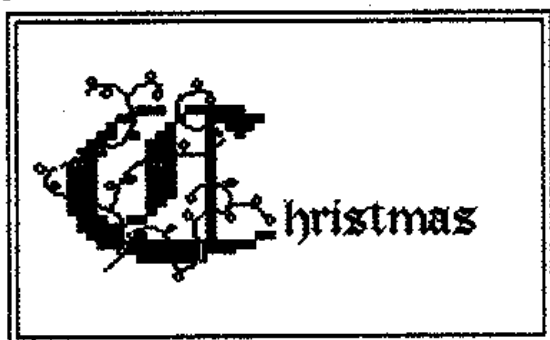

Fig 7.

DTP PACK has only six fonts which can be used directly in screens, but several of the printing fonts are very attractive, and when I feel strong enough to go through this process again – it took ages and more patience than I can usually summon up – I shall convert some more of them.

LISTING-1 for 128k Spectrums.

Assumes the ARTIST 2 compressor routine is use to create screens file.

```
10 CLEAR 49999: BORDER 2
20 LOAD d1 "screens"CODE 50000
30 INK 2: PAPER 2: POKE 50002,1
```

```
40 CLS : RANDOMIZE USR 50000
50 LET a$="O4N5EAN3ABA#GN5#F#F#FBN3B
   05#CO4BAN5#GEEO5#CN3#CO5D#CO4BN5A
   #FN3EEN5#FB#GN7A"
60 LET b$="O4N5EEN3EEEEN5DD#F#FN3#F#
   F#F#FN5EEEEN3EEEEN5DDN3EEN5DDbN7#
   C"
90 PLAY a$,b$
100 INK 2: PAPER 2: POKE 50002,2
110 CLS : RANDOMIZE USR 50000
120 LET c$="V15(O4N5CFFFGN3AGA$BO5N5C
    O4A$BN3AFN5GGN8F)O4N3FAO5N6CN3DCO
    4$BAGFGA$BO5N5CO4CFAGFN7CCN5FFFGN
    3AGA$BO5N5CO4A$BN3AFN5GGN8F"
130 LET D$="V11(O4N5CCDCN3DEN5FFEDDFF
    EN8F)N5FN6EN3DN5ECCFECCC$bN3a$bN7
    CCN5CDCN3DEN5FFEDDFFEN8F"
190 PLAY c$,d$
200 INK 2: PAPER 2: POKE 50002,3
210 CLS : RANDOMIZE USR 50000
230 LET e$="T200(O5N6CO4N3$BN5AGFGAFN
    3GA$BGN6AN3GN5FEN7F)N6GN3AN5$BGN6
    AN3$BO5N5CO4GN3ABO5N5CN3DEN5FEDN7
    CN6CO4N3$BN5AGFGAFO5N3DDDDN6CO4N3
    $BN5AGN7F"
240 LET F$="T200(O4N6AN3GN5FEDEFcN3EF
    GEN6FN3DN5ccN7c)N6EN3FN5GEN6FN3FN
    5FEFFAAGFN7EN6AN3GN5FEDEFcN3FFFFN
    6FN3GN5FEN7F"
290 PLAY e$,f$
300 INK 2: PAPER 2: POKE 50002,4
310 CLS : RANDOMIZE USR 50000
320 LET g$="(O4N5BN3AN5GN3E#FG#FN6E)N
    5GN3GN5AN3AN5BN3BO5DCO4BABAN5GN3#
    FN6E"
330 LET H$="(O4N5GN3#FN5EN3E#DDDN6E)N
    5EN3EN5#FN3#FN5GN3GEAGEEEN5EN3#DN
    6E"
390 PLAY g$,h$
400 INK 2: PAPER 2: POKE 50002,5
410 CLS : RANDOMIZE USR 50000
420 PLAY a$,b$
```

I hope this article will reassure those who think they can't draw that Spectrum artwork is for everyone. The art packages make the donkey work easy for the non-artist, and a little ingenuity, a good eye for spotting things in other people's programs that you could pinch and modify a bit, and a snapshot button, will do the rest. Christmas cards, which are usually best if the design is simple, are a very good starting point.

So may I be the first to wish you a very happy, and artistic, Christmas.

PROFILE

Reviewed By: John Wase.

Glensoft Profile comes as a package with a 40 page manual and a disc. In the first copy I was sent lurked a very evident bug. Soon after its receipt, the postman brought a fix on tape, but something weird seemed to have happened to the disc, for I couldn't get it to go. However, a quick call to Glensoft produced another disc. If their general customer service is as good as this, you should have no complaints.

By this time I had sussed out that the thing was writing to the original disc as part of the installation routine. My own fault: normally I make a backup copy as soon as I receive a disc and play with the backup. So a backup, sector by sector copy I made: I was relieved to find that this is possible (I've recently had several pieces of software which have incorporated extra tracks, extra sectors and other dodgy devices. It's particularly frustrating if you've just a spare half-hour (and I often am limited like this) make a sector-by-sector backup, print a label, find the right colour code stickers to suit the system. And next time I have half an hour, why, the backup doesn't work! Particularly unforgivable when the computer writes to the disc as this one does. However.....all was well here).

Using the backup, I installed the thing for two 80 track drives smoothly and without problems. The instructions warned about certain DISCiPLEs and PLUS Ds... It was all very orderly.

So what have we got. The first section is essentially a disc manager, in intent rather like the Disc Manager of Betterbytes. This one does not personalise your discs. Indeed, it doesn't even autonumber them, nor, for that matter is an autocatalogue made

on disc. The screens aren't as pretty as Dave Hood's, either (he's the Betterbytes man). So whilst the intent might be similar, the execution is totally different, for you are invited to label your discs with sticky labels and then number them (horrors!) and then type the titles (and side of the disc, if single sided drives are used) into what is, in effect, a dedicated database.

It's quite a good database for the job. One could knock up something similar with Masterfile if one wanted; it arranges everything alphabetically on entry, and then displays it, with options to edit, load, delete, search or print out to printer: one entry, the lot or merely alphabetical pages. If you've already got Masterfile or Betterbytes Disc Manager, and are happy with them, fine. If not, well this dedicated database comes as a package, anyway, and it is pretty well organised.

However, most readers will be much more interested in the next section, the file copier. Betterbytes Disc Organiser has a copier which is very easy to use and which will allow a file on a straight, unprotected disc to be copied, but will not copy snapshots or microdrive files: open type files are prone to error. Provided you can find the catalogue entry, Profile is claimed to copy anything. So I tried it....

The opening screen gives you the choice – drive 1 to 1 or 2, drive 2 to 2 or 1. So if you've got a mixture of sizes of drive (as I have) and your source disc has arrived in some obscure format which fits only, say, drive 2, you can still copy it. This bit is very well thought out.

You then select from the source disc

catalogue and type in the file name precisely as given. No easy bar-select here. The software searches for the file, finds it, checks for duplicates and space on the target disc, laboriously builds the catalogue map and saves the file. It needs you to sit by the brute and give several keypresses along the way before you can go on to the next file and it won't copy a whole selection in one go, either. Moreover, it takes a jolly long time, for it is essentially doing copies of sectors after it's looked at the new catalogue and worked out where to put them. So make sure a large jug of coffee is on hand, or that you have something else to do as well. However, I can report that it all works. It works for opentype files, microdrive files and snapshots. Fantastic. So, for those files you've never been able to transfer before, here's the solution. It's probably worth getting just for this feature.

The next section is the Network section for DISCiPLE owners. I was unable to test this for one of the DISCiPLEs here is a series 2 and it doesn't work with that. The software is intended to install the Network, and allow any file to be copied, even microdrive or snapshot. This has to be very useful for schools which use the DISCiPLE. I don't know of many amateurs who might use the network, but I'm open to correction. As the file copying routines appear similar to those in the backup routines just tested, it's probably not going to work at breakneck speed, but it will work.

The next section is a disc editor. This is an enthusiast's section allowing interrogation and editing of sectors. The value in each byte of a sector can be displayed, 128 at a time, in hex or decimal, and there are ASCII code display facilities. You can erase half a sector (fill it with zeroes), or swap (combine the first half of a sector from one file with the second half from another): this will enable you to recover a sector from two defective recordings. You can type in new values and resave updated

sectors. You can examine, play with an update the catalogue. You can dump it all out to a printer. It's all another sort of Pick Poke-it, really, but aimed at repairing defective discs as well (who keeps on getting all these defective discs?). This is a program for someone who really knows what he/she is doing, quite unlike the Betterbytes offering in their Disc Organiser which merely attempts mechanically to insert the minimum number of zeros to repair the damage, then leaves you to sort the rest out, so it's good for a goon like me. (In any case, what more does one normally need...)?

So what of my overall impressions? Well, the database is dedicated to make life a little bit easier, and works. I didn't have time to fill it with a thousand titles and see how quickly it sorted, but as it sorts on entry, it shouldn't be too bad. The network is rather specialised. The Doctor is a Real Doctor – for enthusiasts who know what they're doing. The copier is slow, needs you to press a lot of keys and will copy only one file at a time, but will copy anything, but anything, even onto a disc already half full of files.

In comparison, the existing Manager and Organiser from BetterBytes are much easier to use, the copier is a doddle, but they will only copy a restricted range of files and worse still, allow you to select only one, resetting each time.

Profile therefore fills a much needed gap, allowing you to make copies of things you couldn't before. I still would use Disc Organiser for some tasks and at the moment would recommend getting both, for they are not expensive and each has features worth using. What a pity that neither allows you to select a list of files from one disc and shift the lot onto another, whilst you go away and make coffee.

Profile. Available from Glensoft, 8, The Glen, Bryncethin, Bridgend, Mid Glamorgan CF9 9LX, and costing £9.95
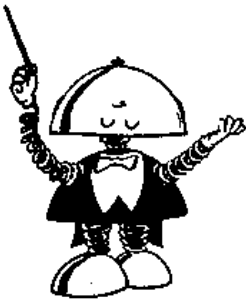
By Bob Brenchley.

MGT have finished their mail-out of brochures on the SAM Coupe. If you haven't received yours yet then contact MGT on their usual number.

November 6th saw a large gathering of programmers and software company representitives in Swansea for the first SAM Developers Meeting. Proto-type machines were put through their pases. Bruce Gordon gave details of the machines internal structure and working while Dr Andy Wright explained some of the inner secrets of the new SAM Basic. Bo Jangeborg was also on hand to give an excellent demonstration of his graphics package 'FLASH' which is to be bundled with SAM (it might interest you to know that it can load Atari ST screen files from disc).

The first production run of SAM Coupe machines is now under way and it looks like deliveries to expectant users will start at the end of November as expected. Around 50 machines have been built by hand for developers and reviews. As I have said so much, in past issues of FORMAT, about the capabilities of the Coupe I will leave doing a review until I have a full production version (complete with manual and software) in my hands, but believe me - IT IS A FANTASTIC MACHINE.

Now that Bruce Gordon has finished the main circuit board (see photo) it has been possible to finalise the details on how existing DISCiPLE and PLUS D users can connect disc drive. As most of you will know by know, the Coupe uses Ultra Slim 3.5 inch disc drives which plug into the front of the machine. These drive packs contain built-in disc controlers and are interchangable between the drive 1 and
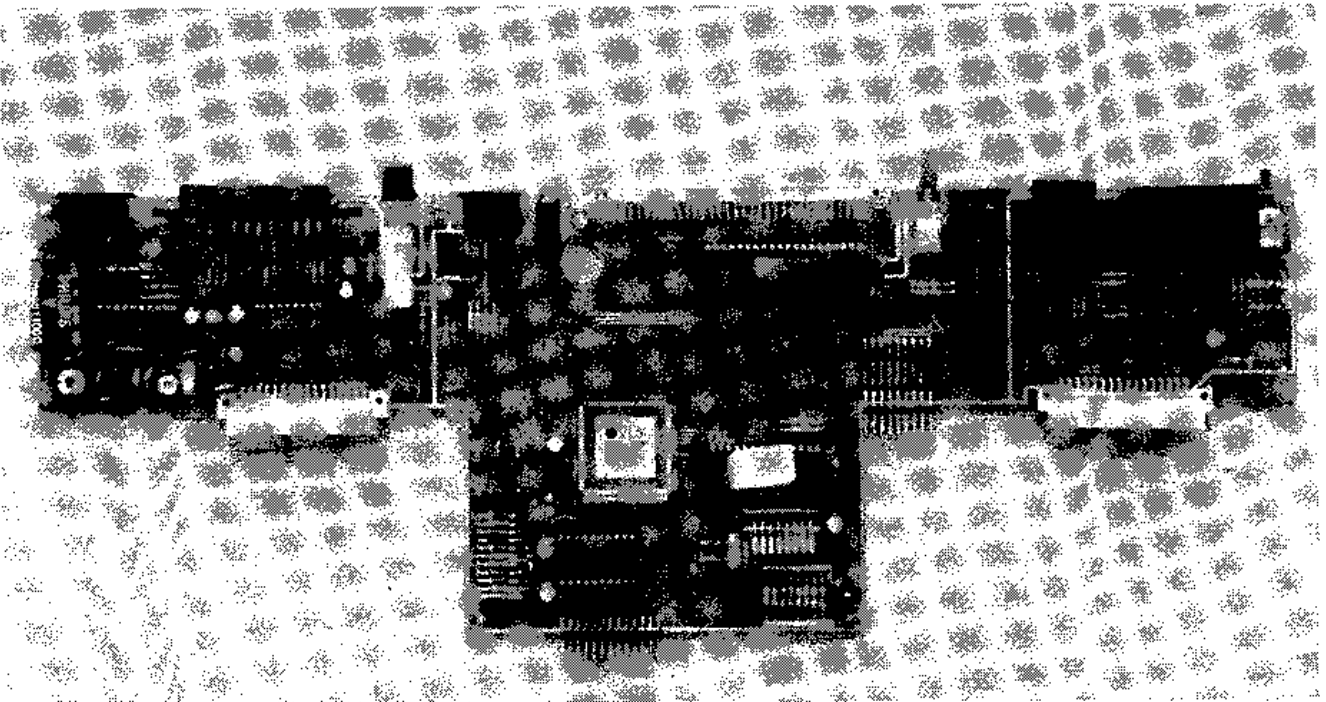
drive 2 slots. It had been intended that the controller board the drives are mounted on would be available to existing MGT users with a connector for your existing drives fitted in place of the drive mechanism. Well I am now pleased to report that a better method has been found. On the SAM price list/order form included with the brochure you will find reference to an 'Interface for MGT External Drive' this is a small board that allows you to plug in Single or Dual drives, 3.5 or 5.25, in fact any drive that will connect to your DISCiPLE or PLUS D. The board also contains a parallel printer port. This means you can go on using your DISCiPLE or PLUS D on your Spectrum and just swop the disc and printer cables over to SAM when you need to. Even better, you could buy switches (called 'T' switches) and cable so that both machines could use the periferals at the flick of a switch. Its also worth noting that the price of £19.95 is a special low price intended to help existing MGT users to transfer to SAM, I don't know how long it will be kept at this price.

While on the subject of the SAM order form I think a few explanations are required. First, the Parallel / RS232 Communications Interface. This is a bi-directional (input & output) interface designed to allow you to connect printers, modems and many other items. You will not need it if you have a Centronics printer and the Disc/Printer interface I talked about earlier, in fact the two interfaces are not compatible with each other as they both latch the same printer port.

Next, the SAM Coupe Advanced Technical Manual (which is the same as the developers manual that has been available for a few months). Be warned – this is VERY TECHNICAL. I would not recommend the manual to anyone who does not have an in-depth understanding of machine code and hardware. Most people would be better waiting for us to publish these details in future issues of FORMAT, and I'm not just saying that to boost magazine sales.

Lastly, the 256k Add-on Memory pack. This plugs into its own special slot inside SAM (no ZX81 RAM Pack wobbles here) and you will be pleased to know that opening SAM's case to fit it will not invalidate your guarantee. The memory board turns SAM into a massive 512K super machine with all the space available to basic and machine code programmers.

The SAM Coupe recorded message HOTLINE is still _very_ busy, several people have phoned the normal MGT number to say they can't get through. Please be patient, the line runs 24 hours a day, 7 days a week, try again at a different time. For those of you who missed earlier FORMAT's the Coupe number is 0792 791275. The message is updated weekly and, over the next few weeks, will give progress reports on SAM production.

SAM basic is proving excellent to work with. It's faster than the Spectrum of course, but it is also much more flexible. Features include procedures, IF..THEN..ELSE structures and more versatile loop controls. But I think the crowning glory must be the BLITZ command. This allows you to RECORD a list of graphics commands into a string variable. Now BLITZ the string and SAM basic does the rest. As the basic commands are interpreted once, when they are RECORDed, the BLITZed version is often much faster. At the same time you can reposition and rescale the graphics if you need. More on this and other Basic commands next month.

Just one final word on the SAM front for this month. Many people have asked "what does SAM stand for?". Well I know what it originally meant, but I would think there are many things the initials S.A.M. could mean. Why not send your ideas in, some of the best will be printed in the Feb'89 issue. I will give an extra 3 months subscription to the 5 I like most, as usual the editors decision if final.

If you get a SAM Coupe for Christmas drop a line to the letters page and let others know how you get on.

FASTER ᵀᴴᴬᴺ BASIC

By: Ian Cull.

Part 2. Hisofts Basic Compiler.

Last time we discussed four ways of getting programs to run more quickly - tweaking the code, learning a new language, programming in assembly language, or using a compiler. Any program, written in any language (including assembler) can be tweaked, but the improvements generally are not phenomenal. We will look at tweaks later ...

As an aside, you could try changing your Spectrum! The various versions of ZX Basic (16K, 48K, 128K and +3/+2A) all run at slightly different speeds - my Spectrum timings are (without the PRINT statement inside the loop) :-

	PRIMES1	PRIMES2
+3 Basic	39.2	60.0
48K Basic	32.4	41.3

Learning a new language is not a simple task, and so the best bet is to use a compiler. Compilers are available to compile many languages, but the best option is to use a Basic compiler since then there is, in theory, no learning needed and no rewriting of existing programs.

Hisoft offer a very powerful Basic compiler, with versions for all Spectrums. The compiler, once loaded, occupies 11K of memory - although 128K versions store themselves in the Ram-Disc, so occupying very little main memory; they also support the PLAY command (and the resulting code can be run on 48K machines, where the PLAY code is simply ignored).

All interaction with the compiler is via a number of commands; on 48K machines you type a * followed by a single letter (C for compile, etc). 128K machines have a menu called up by pressing TRUE VIDEO & INV VIDEO together; then the required letter is pressed.

Hisoft Basic Compiler functions

*C - Compile the whole program, to machine code below RAMTOP; RAMTOP is moved down and code start address & size are given.

*R - Run the latest compiled code (same as RANDOMIZE USR xxxxx).

*X - Clear & Reset RAMTOP; this discards the compiled code (each new compilation takes up more memory).

*T - Variables info; used to analyse an executing program.

*ERASE - Basic program - leaves the compiler in memory.

*D - Compile Data only - useful for very large programs.

*E - Compile except Data.

Variable Types

The compiler supports normal floating point variables as well as integers (-32768 to 32767) and positive-only integers (0 to 65535) and strings, by default up to 255 characters in length. Special compiler instructions (e.g. REM : LEN A$ < 20) specify the maximum length of any individual string, as well as starting and stopping compilation, specifying which variables are to be integers, etc.

An integer variable takes up less memory (2 bytes instead of 5) and can be processed much quicker than a normal one (leading to faster code). However, the accuracy of a normal variable is sometimes needed -

examining the code to identify which variables can be integers is often difficult; so the compiler has a function (INFO) which allows the program to be run under ZX Basic (somewhat slower than normal) and a report obtained indicating what variables were used, and what type they can be. This mode also reports the maximum length of strings used - this is needed since strings must have a maximum length (255 unless otherwise specified).

Most Spectrum Basic Compilers are very limited as to what code can be translated - that is how they get the code to run faster than Basic. The Hisoft compiler, however, accepts almost any Basic program (not CLEAR, LOAD/SAVE, RUN and a few other commands that will cause few problems). Some programs need special treatment - for example, if any GOSUB or GOTO commands have computed line numbers (e.g. GOSUB 100*N) then the compiler can be told to produce slightly slower code rather than just giving up.

Other limitations are that DATA statements cannot reference variables (DATA 100*3 is OK, DATA 100*X is not) - this allows the compiler to convert the DATA to a table of values once, instead of every time the program is run. Also, the compiler only supports 1 and 2 dimensional arrays (you cannot have A(1,2,3) for example); and the VAL"..." function must be of the VAL"123" form, so VAL"N*N" cannot be processed (however, the 128K/+3 compiler has a way of dealing with this problem).

Not Much Faster Than Basic?

As a result of the power of this compiler, most programs can be compiled without any alteration but speed improvements will only be of the order of 2 to 5 times. This is reasonable, but could be much better.

If the code is tweaked, making it more efficient once compiled, then improvements of 10 to 20 times (or more) are possible - the major benefit of this way of writing programs is that the code can be debugged in the normal way using ZX Basic then compiled once it is working fully. The amount of tweaking possible depends on the program (how many variables can be made integers, for example).

PRIME testing

To see how fast the Hisoft Basic compiler code can be, I passed PRIMES1 & PRIMES2 (printed last month) through it. I used the +3 compiler for these tests, and remove the PRINT statements from inside the code (leaving only the 'Prime 100 is' message as output). In order to activate the compiler, I added the line 1 REM:OPEN # - REM: lines are commands to the compiler, and OPEN# is the command to begin compilation.

Compilation is fast (less than 1.5 seconds) but is not automatic - messages are given during the early passes, and a key must be press to continue compilation. After compilation, PRIMES1 executed in 8.6 seconds (4.5 times quicker), and PRIMES2 executed in 5.2 seconds (11.5 times faster).

Next, since both programs only use integer variables, I inserted the line 1 REM: INT+ P,PTOP,PCNT ... (after the INT+ you list all variables which are to be positive-only integers). This 'declaration command' has to preceed the OPEN£, which I moved to line 2.

Now, PRIMES1 runs in 6.5 seconds (6 times FTB), but PRIMES2 manages an amazing 1.3 seconds (46 times FTB). This is to be expected, since PRIMES2 is actually a very simple program (the sieve method of calculating primes is renowned for its speed), and the poor show of ZX Basic is evidence of how slow it is. PRIMES1 has a lot of calculations (multiplies & divides) which are hard for the Z80 to do.

Amazing though these results are, further tweaking is possible. Removing the (redundant) '<>0' from line 110 and compiling gives a time of 0.95 seconds (62 times FTB since only 0.5

seconds is saved in +3 Basic using this tweak)! Also replacing the code in lines 150 & 160 with a FOR...NEXT loop gives a compiled time of 0.85 seconds, although +3 Basic improves to 42.8 seconds!

Of course, there is more to compilation than speed — code size is also important. PRIMES1 results in 514 bytes of code (the Basic is 494 bytes), but PRIMES2 runs in 298 bytes (from 423 bytes of Basic). These are VERY good results (often compiled code has an overhead of 8K or more).

Compilation speed, as mentioned already, is also quick. I compiled a small program which takes 18 seconds to poke some code into memory — compilation took 2.6seconds and the resulting code executed in 2.2seconds, so compiling & running was still 3 times faster than the Basic (this doesn't include the loading time of the compiler, however).

WARNING: These results for the PRIMES programs are particularly good — I chose them as examples deliberately. A large Basic program (GLOBALPLOT from Chezron Softwares OUTLET disc magazine, No.18) run in compiled form twice as fast as Basic, but still took 22 minutes!

Summary

The compiler comes with a good 46 page A5 manual, with a tutorial section and good appendices (but no index) and some example programs — a PACMAN style game (8 seconds to compile from 6150 bytes of Basic to 9635 bytes of code, including 1300 bytes to check for the BREAK key). A FROGGER style game offered similar improvements. The manual also discusces ways of tweaking programs and differences between ZX Basic and compiled code (which are few). The resulting machine code can be compiled to run at any address, and the compiler does not need to be loaded to run the code.

In summary, Hisofts Basic Compiler is an excellent piece of software for those wanting to write faster than Basic programs without having to learn any new languages — a bonus is that the code is protected (it is almost impossible to take a compiled program and recreate the Basic). The only bad point is the price; £24.95 on tape or £29.95 for the improved Spectrum +3 version (which has additional commands for creating disc data files so is excellent for anyone making serious use of the +3).

Contact Hisoft at The Old School, Greenfield, Bedford MK45 5DE (or telephone 0525 718181).

* + * + * + *

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MICROSECOND

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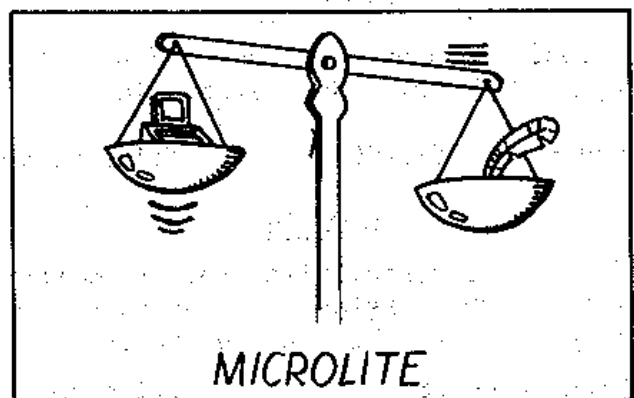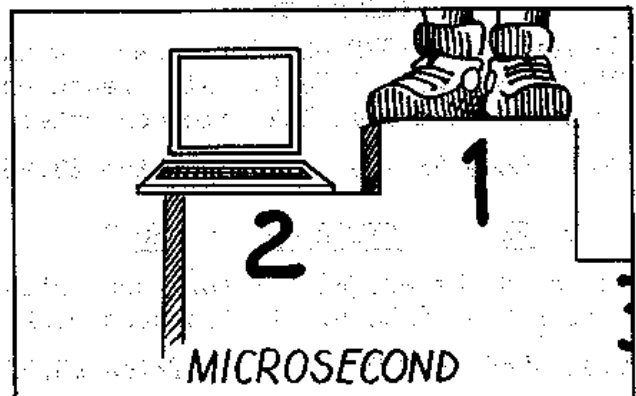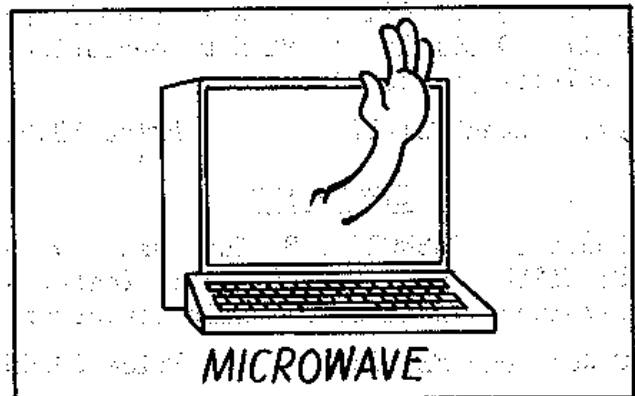
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PANGOLINS

By: Nev Young.

Here is the game of PANGOLINS revisited. It is played by you thinking of an animal, or anything at all for that matter, and it then asks simple questions that can be answered by yes or no until it eventually makes a guess at what you are thinking about. If it guesses wrong then you tell it what you were thinking of and a simple yes no question that it can ask to test for that animal in the future. The game will then have learned that new animal.

It is an example of a tree structured database but with a fun application. It can be used quite well in schools in a variety of guises. I have rewritten it from the example given in the Sinclair manual and claim nothing for the original idea. I have completly rewritten it in a modula form to make it easier to follow although I have used some otherwise little used constructs in BASIC.

I have not bothered to add pretty screens or menues into the program, I will leave that up to you as improving someone elses program is the best way to learn programming. I'm sure FORMAT will print any good amendment / enhancements readers come up with.

Self leaning programs like this were the · beginnings of artificial intelligence systems that we (nearly) have today. Once written it should be run for the first time only by the command RUN 570. After that it is just RUN as normal.

Note for Interface 1 users. Replace the 'd*' in the LOAD and SAVE commands (lines 700, 750 and 800) with '*"m";1;' and also put an erase command before each save. Other disc users should be able to get things working by altering those lines to match their systems.

The Listing.

```
10 REM PANGOLINS REVISITED.
20 REM original program
30 REM (c)SINCLAIR
40 GOTO 720
50 DEF FN y()=VAL a$(p, TO 4)
60 DEF FN n()=VAL a$(p,5 TO 8)
70 DEF FN q$()=a$(p,9 TO )
80 REM get y/n
90 PRINT #0;"Answer Y or N"
100 LET x$=INKEY$: IF x$="" THEN GOTO
    100
110 IF x$>"Z" THEN LET x$=CHR$ (CODE
    x$-32)
120 IF x$<>"N" AND x$<>"Y" THEN BEEP
    .1,4: GOTO 80
130 BEEP .1,15
140 IF INKEY$<>"" THEN GOTO 140
150 LET yes=(x$="Y")
160 LET no=NOT yes
170 CLS
180 RETURN
190 REM print instructions
200 RETURN
210 REM play game
220 LET p=1: CLS : PRINT "Think of an
    animal"
230 PRINT "press enter when ready": I
    NPUT LINE q$: CLS
240 IF INKEY$<>"" THEN GOTO 240
250 PRINT FN q$()
260 GOSUB 80
270 IF yes THEN LET p=FN y()
280 IF no THEN LET p=FN n()
290 IF FN y() THEN GOTO 250
300 PRINT "Are you thinking about",FN
    q$()
310 GOSUB 80
320 IF yes THEN PRINT "Thought as muc
    h": GOSUB 340: GOTO 210
330 IF no THEN GOSUB 390: GOTO 210
340 REM play again
350 PRINT "Play again"
360 GOSUB 80
370 IF yes THEN RETURN
380 IF no THEN GOSUB 670: STOP
390 REM add item
```

```
400 PRINT "This must be something new
    "'"Please tell me what it is"
410 INPUT i$: IF NOT LEN i$ THEN GOTO
    410
420 CLS
430 PRINT "Please give me a simple qu
    estionthat I can use to tell"'i$'
    "from"'FN q$()
440 INPUT j$: IF NOT LEN j$ THEN GOTO
    440
450 CLS
460 PRINT "What is the answer for"'i$
    '"to the question"'j$
470 GOSUB 80
480 LET a$(e, TO 8)="0   0"
490 LET a$(e+1, TO 8)="0   0"
500 IF yes THEN LET a$(p, TO 4)=STR$
    e: LET a$(p,5 TO 8)=STR$ (e+1)
510 IF no THEN LET a$(p, TO 4)=STR$ (
    e+1): LET a$(p,5 TO 8)=STR$ e
520 LET a$(e,9 TO )=i$
530 LET a$(e+1,9 TO )=FN q$()
540 LET a$(p,9 TO )=j$
550 LET e=e+2: LET a$(1000)=STR$ e
560 GOSUB 340: RETURN
570 REM initial setup
580 DATA "00030002does it eat ants","
590 DIM a$(1000,38)
600 FOR p=1 TO 3: READ a$(p): NEXT p
610 LET a$(1000)="4"
620 GOSUB 670
630 RUN
640 REM dump the data
650 CLS : FOR p=1 TO 20: PRINT FN y()
    ,FN n(),FN q$(): NEXT p
660 STOP
670 REM save/quit
680 PRINT "Do you want to save all th
    e     animals?"
690 GOSUB 80
700 IF yes THEN SAVE d*"pangdata" DAT
    A a$()
710 RETURN
720 REM start of program
730 LET top=1000:
740 DIM a$(1000,38)
750 LOAD d*"pangdata" DATA a$()
760 GOSUB 190
770 LET p=1000: LET e=FN y()
780 GOSUB 210
790 GOTO 780
800 SAVE d*"pang" LINE 10
```

```
00000000an ant","00000000a pangol
in"
```

THE SECRETS OF
WORD MANAGER

SPECTRUM MACHINE CODE MADE EASY

INTERRUPTS. – Part 2.

By: Francis Miles.

Last month I explained that "Word Manager" uses the user-controlled maskable interrupt 'IM 2' to run its printout routine PTYPE when "slow print" is called for.

Let's have a look at PTYPE: it's a long subroutine, 6500 lines of assembly language, but most of it is minor nuts-and- bolts stuff. An interrupt subroutine can be as complicated as you like, but any particular path through it must be fairly short, say not more than 100 or so instructions; because it's going to be called 50 times a second, and will slow down your main program proportionately.

Two important "Word Manager" system variables are:-

TYPE – holds the address of the next byte to be sent to the printer;

MISFL – is one of the flag system variables: it is unique among the flag variables in that some of its flags (1 and 0; don't worry about what they mean) may be set either inside or outside an interrupt routine. You will see the importance of this soon.

As · soon as the chip comes to a RET in the interrupt program it jumps back to wherever it interrupted the main code and goes on as if nothing had happened. But one must ensure that the interrupt routine does not change the contents of any of the registers: PTYPE starts by putting AF, BC, etc on the stack and concludes by taking them all off again, before its RET.

```
5190 PTYPE EQU $
5200 ;Send char in TYPE to printer
5210 ;& reset TYPE (Called by IM 2.)
5220 ;Stack registers, including AF'
```

```
5230 ;and MISFL.
5240      PUSH AF
5250      EX AF,AF'
5260      PUSH AF
5270      PUSH BC
5280      PUSH DE
5290      PUSH HL
5300      PUSH IX
5310      LD A,(MISFL)
5320      PUSH AF
...
```

Note that AF has been stacked three times: once for AF, once for the alternate AF', and once for the system variable MISFL. Every register and system variable which is changed anywhere in the interrupt routine has to be stacked and restored to its original value on returning. This is done at the exit from the routine, PT.END, where everything is POPped in exactly the reverse order to lines 5240-5320, including an EX AF,AF' and a LD (MISFL),A. It also restores the interrupt with CALL IRR, because the interrupt switches itself off each time it fires; and finally returns to wherever the main program had got to when the interrupt fired.

The first things done by PTYPE are to check the BREAK key and to check if the printer is ready for the next byte (if the printer isn't ready, it jumps straight on to PT.END). Then:-

```
5530 ;Put the code from TYPE in A.
5540      LD HL,(TYPE)
5550      LD (LASTYP),HL
```

[LASTYP records the address of the last byte printed, for various purposes.]

```
5560      LD A,(HL)
5570 ;Jump using the offset table to
5580 ;the routine for code A.
5590 PT.PTY LD HL,PTY
```

[PTY is the base address of the table just below.]

```
5600    LD E,A
5610    LD D,0
5620    ADD HL,DE
5630    ;Now HL is PTY + char code.
5640    LD E,(HL)
5650    ;D was 0: DE+BAS will find
5655    ;the routine.
5660    LD HL,BAS
5670    ADD HL,DE
5680    JP (HL)
```

[JP (HL) just means "jump to HL". I don't know why the brackets are used - they give quite the wrong impression.]

PTY is a list of 149 single-byte offsets, most of them zero: line 5680 jumps to BAS + offset, so if the offset is zero it jumps to BAS, which is a routine for printing out normal letters, etc. The other offsets make addresses for routines which deal with more complicated codes: 94 up arrow and 95 underline deal with bold and underline printing, 32 space has to handle switching-off bold and underline as well as printing a space, etc.

Character codes 126 to 149 all have special effects, for example 145 means "print the page number", and 133 means "form feed to start a new page, printing a page number if required". These special character code routines usually switch TYPE out of the text into "loop lines", which send preset strings of bytes to the printer for these special effects, and some of the bytes in these strings may again be special character codes used recursively. Each routine, including BAS, ends with a jump to PT.END.

I only have space to look at one of these routines. Before it starts printing, "Word Manager" puts a code 128 at the end of text (and removes it after printing is finished). This is the "last character" code, but it doesn't actually stop the printout routine: the offset 128 in PTY jumps to a routine switching TYPE into a "loop line" which first does a form feed and maybe a page number at the

bottom of the page. The "loop line" ends with code 129, the real "terminator"; this again makes an offset through PTY which jumps to:-

```
8080    ;End: is it the last copy?
8090 PT.129    CALL LCOP?
8100    JR NZ,PT.DCP
```

[If more than one copy is to be printed, and some are stillleft to do, the printout starts all over again.]

```
8110    ;Yes, last copy finished.
8120    DI
```

[The interrupt isn't wanted any more just now.]

```
8130    ;Increment page number and blank
8140    ;upper part of the text buffer.
...
```

[skip all that]

```
8200    ;Fast or slow?
8210    LD A,(IRRP)
8220    AND A
8230    JP Z,ABORT
```

[IRRP is 1 for slow print. If it's zero (fast print) a jump to ABORT - even though we are inside a subroutine with the contents of seven registers on the stack (lines 5240-5320) - gets us out of the endless loop in lines 4390-4400 and back to the main menu.]

```
8240    ;If slow, reset the interrupt.
8250    XOR A
8260    LD (IRRP),A
8270    JR PT.END
```

PT.END, as I mentioned above, restores the interrupt with CALL IRR (in this case all it does is restore IM 1 ready for the eventual return to BASIC) and unstacks all the registers, before returning to wherever the main program had got to when the interrupt fired. The user - who has been writing and editing text all the time the slow print was working - notices nothing except that the printer stops printing.

Next month I will start looking at System Variables and Flags.

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