WACCI

HAPPY NEW YEAR 1999

WACCI 1999 BUG

Basic Tutorial, Z80 chips, Games and much much more.

Benefits of Membership

The best magazine for serious CPC users.
Index covering issues 1-104.
Telephone helpline (indispensible)
Bargain buys/wanted list from Market Stall.
Discount off goods from advertisers.
List of PD discs, tapes, library books and services.
Above all the advice, assistance and friendship from other WACCI members. Benefit List: by *Ernie Ruddick*

Production Method

WACCI is created using Protext and Promerge on a CPC and transferred over to a PC using SANKO, MAKEBMP, PROCLIP, MULTICON, MODE 1-2 and lots of luck. The magazine is then printed on a Epson Stylus 200. WACCI is printed and collated by A 2 Z!

Contents

Thanx & Stuff

Hi all and a very happy New Year to you all. Carol and I had a great time and no Rob, Angela I didn't have to much to drink. Carol bought me a Power Saw for Christmas so I guess I'll be busy watching her putting some shelves up soon. Oh! what a hard time us husbands have. Okay that's enough of this senseless chit chat and now on with the show. Happy reading.

Last Month

In Decembers issue I gave you all some special offers, well what I can now say is that the 3 for the price of 2 PD discs is here for a little while longer, so make Dave Stitson very busy and get your orders in. *See page 30.*

Just to remind you of the prices: Two 3.5 at a £1.00 each or two 3" disc at £2.50 each and get the third for free.

Adverts

It has come to my attention that SD MircoSystems have changed their address. Their address is:

**PO Box 99
Thetford
IP24 1NA**

E-mail: SDMICRO@aol.com.
Telephone number: 07000 736427

This is a message to

ComSoft, OJ Software, Trading Post and any others that have at times had an advert in WACCI.

Please either e-mail at jebowley@wacci.demon.co.uk telephone 01733 330890 or drop me a note to inform me any of your details have changed. *Thanks*

Ideals For Articles

Roger Graves gave us some ideas about what to write about, his article is on page 19. So please have a look and above get writing.

Big Thanks

My special thanks goes to Christine Raisin this month she worked so hard putting together a series of help and tips for the PC and any help anyone can give her will be most welcome.
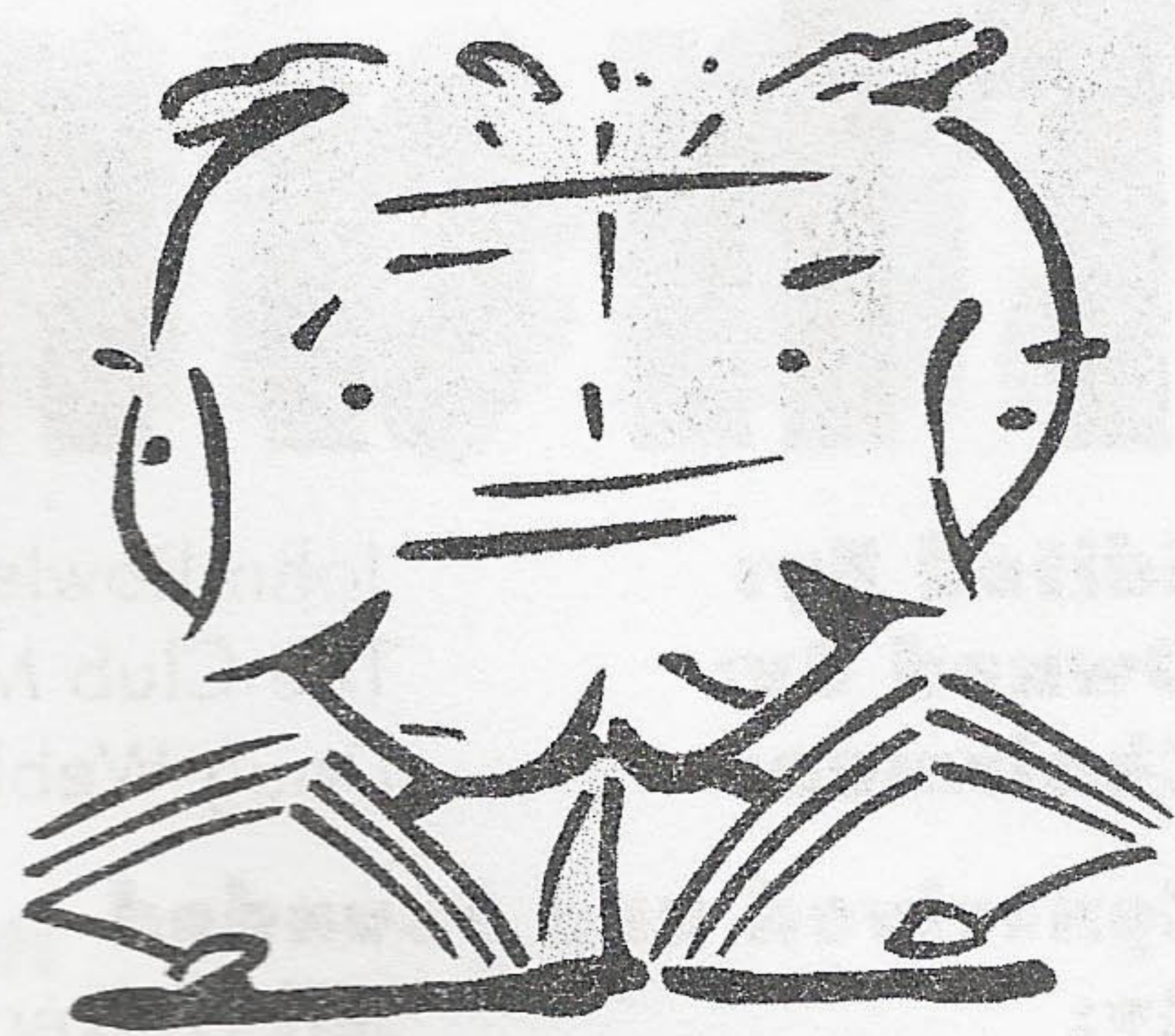
That's about it

As I come to the end of this page I can't help feeling that I've forgotten something to tell you all, *oh well!* It will have to wait until next time, so for now all I have to do is to wish you all happy reading and thanks to all those who have helped make this issue possible. *Thanks*
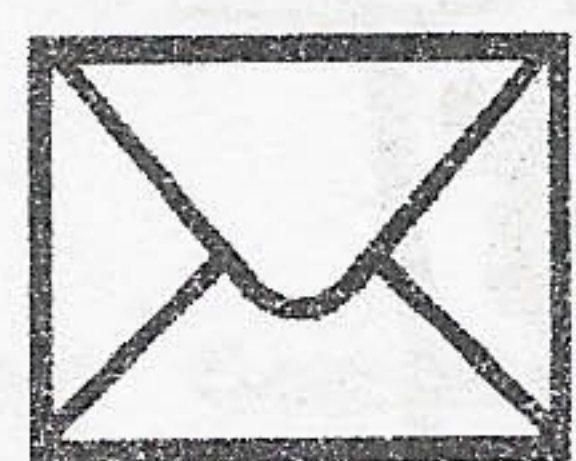
Bye for now
John

Fair Comment

with John

Ideas and more ideas

Dear WACCI, It's only natural to question the future of WACCI and the convention as the years wear on. I can't help wondering what proportion of the membership is still using the machine. I stopped several years ago, returning for the odd games session, but leaving the serious stuff to a PC.

I keep a nostalgic interest, remembering happily the fun I had programming the machine and marvelling at some of the ingenious games. But the technology has moved on. For me, the Amstrad now represents a monument to the past.

It was a triumph in its day, but it's been superseded and there are few jobs I could throw at it now. Although I once did all my writing on the CPC, its limit of a few thousand words is laughable today.

If most WACCI members share my nostalgic view and are no longer breaking new ground with the machine, this should affect the future direction of both the magazine and the convention. It has been suggested that the next convention should be a multi-format event. I would favour it being merged with events covering other 8-bit computers, particularly the Commodore, Spectrum and BBC. The logistics become a nightmare, but there is probably enough interest out there to pull off (even now) a pretty healthily-attended event.

If most members are interested in retro-gaming with the Amstrad today there might be a case for merging the event with an event for 80s arcade consoles. In the magazine, I would be interested in more coverage of CPC websites and coverage of emulators. These are my only regular contact with the machine nowadays.

Perhaps someone could write a **"This month in history"** column, drawing on back issues of WACCI and AA to remind us of the products we've enjoyed over the years.

Since many of us can now get the games from the internet, a reminder of which titles hit the headlines and why might be a fun introduction to what's worth rediscovering or playing for the first time now. It might be possible to run a column inviting members to write a paragraph about their favourite game and why they loved it so much. These could be supported with web addresses where newcomers could download the game. It might also be possible to run a tips and tricks column, like AA's old Hot Tips column, so that members could contribute ideas without needing to write at length.

I hope that these ideas are of some use. One of their strengths is that they would enable everyone to contribute a small amount, rather than burdening one person with writing a few pages. If only half the membership committed to writing a paragraph a month, John's problems generating content would be history. Best wishes for the new year.

Sean McManus
sean@liquidizer.demon.co.uk

<<Hi Sean, You've raised a lot of good points and I agree with you completely. Multi-format convention is a good idea. Angie I dare say will be busy in the coming weeks looking for another venue, since Angie was rather upset with Bescot last year and when I hear

anything, then you will all know, but first we would like to know from the membership if they would like another convention, as yet I've had only one letter in favour of another convention.

Any ideas about articles are always very welcome and some of what you have suggested will be put into practise in the near future.

Just a thought! Sean would you like to do articles about CPC related websites? And perhaps then we will make a list and include them within WACCI each month. A little while ago Angela Cook did something on this very subject so an update would be very welcomed. –*John*>>

Bi Monthly
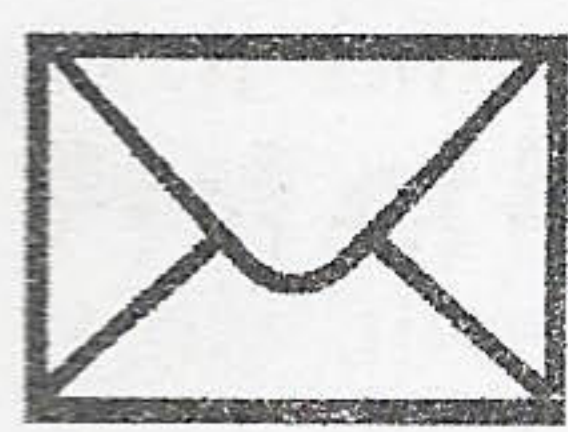
Dear John and fellow Waccers. Firstly may I wish everyone a very Happy New year, may we all have very many more of them.

Now with regard to the bi-monthly debate. I have to admit I had very serious worries about the prospect of a bi-monthly magazine, I felt that the club would fall apart as many members might have felt as I did, that taking the plunge would possibly herald the end of WACCI as we know it.

But, to my pleasure I find that WACCI is as good now as it always was thanks to John and his team of brilliant writers that fill the pages with glorious articles and reams of valuable information. The bi-monthly debate has, in my opinion

now, been useful for opening up the question of WACCIs future but has been firmly put to bed by John and the team. The only problem that has now arisen (and it's a biggie!) is finding extra things to fill in my time waiting for the next WACCI!

Regards and best wishes.
Daniel Appleyard

<<Hi Daniel. Many thanks for your letter. I sit wondering how I should your answer so I read it and read again and all I can say is I'm happy that going bi monthly hasn't upset you to much however if articles and letters were to come in more than they already are then it is possible to go back to a monthly magazine. –*John*>>

Orinoco Flow
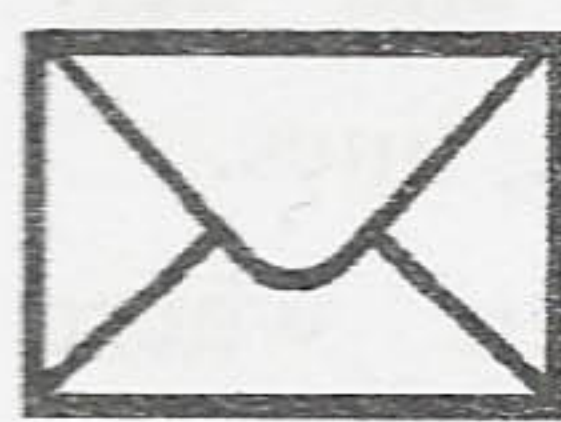
Dear John. What's happened to the picture of the editor on the "Thanx & Stuff" page? Why is WACCI being edited by a Womble?

Has WACCI finally gone underground? Anyway Orinoco, er, I mean John, I just wanted to say that you can put me (or this letter anyway) in the "Yes I'm interested in the 99 Convention" pile (in September).

Could I put in a request to Angie for a few game instructions as well, please? I've just pick-up some games, several of which are devoid of instructions, and, as luck would have it, they look to be the most interesting ones. The games in question are: **BAT, BATTLE**

COMMAND, HEAVY METAL, IRON LORD, and LE JEU DU ROY. Any help with these would be most welcome. One more thing, I seem to remember that someone was writing a program which allowed clip-art to be imported into a Protext document. Any idea whether or not it's finished, and if so, where it's available from?

Best wishes,
Martin Bela

<<Hi Martin. What's a Wobble? I'm sorry, but I to young to know what one of them is! I've to ask my friend down in Wimbledon Common. Anyway the program your on about is called Proclip and its available from Dave Stitson or me its on PD Disc 130. I'm sure if Angie can help you with the games instructions she will pop them in the post for you once she has read this. –*John*>>

Printer Port
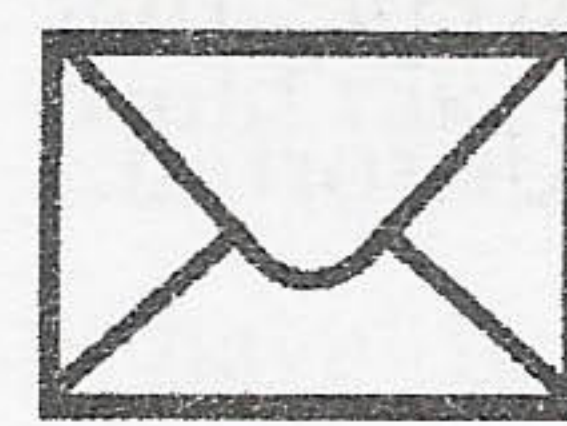
Dear WACCI, Have I found a new use for Merline-Serve's Wizard 8 bit printer port?

There are two screen dump programs listed in my DMP 2160 dot matrix printer's manual, but neither is suitable for screen mode 2. Maybe there is an appropriate program in the WACCI Homegrown or Public Domain software library, but I decided to write one as an exercise.

The printer spaces dots vertically at a density of 72 per inch, with a choice of horizontal densities.

Alternate rows of pixels on the CPC screen are not used, so a horizontal density of 144 dots per inch might seem to be best for preserving the shapes of mode 2 drawings, but is not provided by the DMP 2160.

Furthermore, vertical lines of dots appear nearly continuous, so if such lines were drawn on the screen down alternate columns of pixels and could be reproduced by the

```
O   *  O   *O   *    O*
O  OO  O   O  OO  O   O
O   *  O*  O   *    O
```

printer using such close spacing then the gaps between them would be almost completely overlapped by the dots; for example the letter m would become just a blob.

90 dots per inch is the lowest horizontal density available to leave margins at the sides of an A4 page, rows accommodating 640 dots being required, and gives a satisfactory printout, except that the shape of the screen is distorted.

An alternative is to print the display on its side; this simplifies programming because the computer memory relates to the screen in horizontal bytes while the printer requires bits arranged vertically.

Choosing a density of 72 dots per inch each way, preventing distortion requires some means of filling the empty rows. Each row of dots can be printed twice, but then horizontal lines on drawings look too thick. Interpolation between the rows gives the best appearance, but lines of text are best separated,

say by using the TAG command, otherwise the tails of g j p q y , and ; become joined to characters below.

The diagram shows patterns including two, three or four dots in two alternate pixel rows, upper and lower, and either one or two pixel columns. If there is only one of these dots in a column it will be called unmatched, and is represented by an asterisk. Where

```
O   OO              upper row
O   OO              interpolation
*O   OO             lower row
```

there are two such unmatched dots in adjacent columns, as in part of a sloping line, two extra dots are interpolated, but otherwise interpolation is confined to sites between matched dots. This prevents messy blobs where orthogonal lines cross, and ugly thickening of some sloping lines.

Some anomalies occur where sloping lines meet others, but are unavoidable without excessive complication. An 8 bit printer port makes programming the interpolation much easier, but is not needed for the upright dump. The program could readily be adapted to suit other printers.

Two things puzzle me which some other member may be able to explain. Why does a BASIC program recorded on disc using the SAVE "PROGRAM" style give the error message "EOF met" when attempting to MERGE if it contains a MOVE or PLOT command? And why does the CLS command not work while characters are TAGged?

DAVID HOOKER

<<I hope a member can help, maybe Richard Fairhurst or Stuart Paterson might be able to explain this. On reading your letter I feel it should have been made an article however time was pressing so here it is. *–John*>>
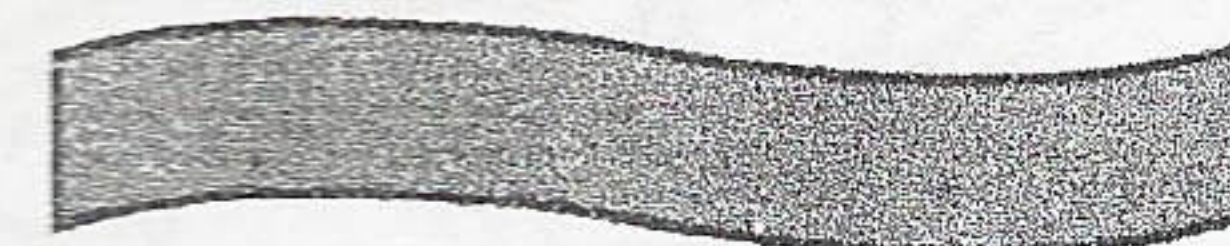
BASIC COMPILERS

I would like to start a discussion on Basic Compilers. Is anyone interested in the subject? If I tell you what I believe, perhaps someone "out there" can put me on the right track.

Summary
In general terms I understand that there are two types of high-level language with which computers like ours can be programmed, Interpretative and Compiled. The CPC has Basic built-in, and it is the best-known (only?) Interpretative language.

Interpretative
The big advantage of Basic is that you can run a program as soon as you have written it, then edit out faults and run it again straight away.

The disadvantage is that it is slow. This is because each statement in a Basic program has to be interpreted in turn, that is, translated into the 1's and 0's that the hardware understands, in fact, machine code.

This is done for each and every statement each and every time the program comes across it. Hence the lack of speed.

Compiled
In contrast, a Compiled program cannot be run as soon as it is

written. There is an intermediate stage, called Compiling, where the statements in the program are converted for once and for all into machine code.

In effect a complete new low level program has been produced. It can now be run, and, because no interpretation is required during run-time, it will run very much faster than the equivalent Basic program. If it has a lot of computing and very little operator input, this can be a big advantage.

The disadvantage, of course, is that it cannot be easily edited and run again, because the compiling stage has to be gone through, even for a trivial change in the program. It is possible, but very difficult and risky, to alter a compiled program at the machine code level, but it is not for the faint-hearted.

Best of both Worlds

It has always seemed to me that the ideal solution is a Basic Compiler. You write your program in Basic, test and edit until it does what you want (It never does first time, does it?!) It's speed is not so vital at this stage. Then once the program is fully tested and verified, it can be compiled.

This produces a machine code program which will run faster, perhaps much faster than the un-compiled program, and because it has come from a fully tested program, it will not need editing. If a program produced using this approach was then marketed, it would have the advantage of all compiled programs - that unscrupulous programmers would

find difficulty in hacking and pirating, because what was sold would be "pure" machine code.

Discussion

The funny thing is, I haven't seen any articles on this subject. I know that there are Basic Compilers on the market. In fact, the Hi-Soft Turbo Basic Compiler was on the Market Stall in WACCI issue 96. I also know of BLITZ and BC. But, as I say, never an article nor any indication that this is the way to go. Is it me, or has the master-plan some flaw that I don't know about?

Then again, the benefits of compiling will depend on the efficiency of the Compiler. So, this is where you come in. Is it common, are there snags, and, most important, is there one Basic Compiler that is streets ahead of its rivals, or are some better than others at particular jobs????

Now its over to you.
Stuart Paterson

<<Hi Stuart. Amstrad basic is very quick and obviously machine code is a lot quicker. There were a few basic compilers around and marketed by Ocean software one called Laser Basic and another that I can't recall at present, both of these were for compiling game code more than anything and in fact I have both right here somewhere amongst the pile of WACCI's and other bits and bods. However if you would like to do a review on them give me a call and I'll send them to you.

The BC program that you also mentioned was once thought of to be PD but it turned out that this

wasn't the case and every PD Library had to withdraw it from their catalogues. –*John*>>
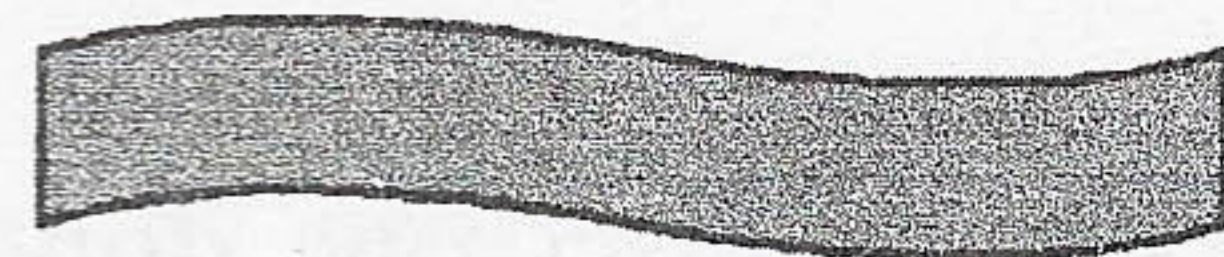
Keeping Out Of Trouble
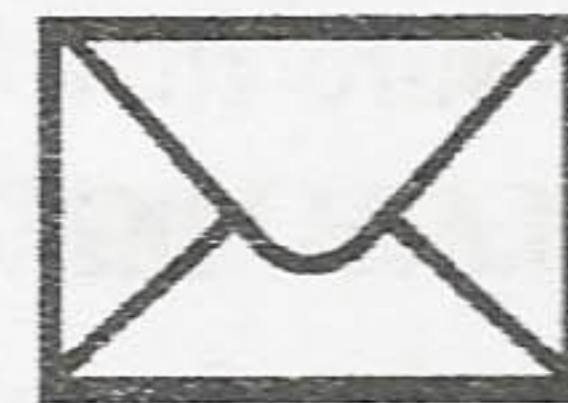
Dear John. I would like to start by wishing all WACCI members a belated Merry Christmas and a Happy New Year and to thank all those who have helped me. I wrote to you about a printer problem (Issue 124) and the answer you gave me worked fine, since then I have tried other things and I managed to find another way without using PROTEXT. So now I have a couple of ways of printing a listing on A4 paper.

Having bought several P.D. discs and the service I had from our friendly Librarian DAVE STITSON has been really great also I purchased a couple of books from STUART GASCOIGNE and the same goes for STUART as well. I know some big companies that could take some lessons from them.

I have now been a member for about twelve months (by the way I will be renewing my subscription) and I have learnt a lot during that time from the WACCI mag.

My brother gave me this 6218 plus so that I could have something to do in my retirement and I'm glad he did. When I got it I didn't Have a clue about computing but I'm learning and the series "ARNOLDS BASIC" is just the job for me. I ought to get the PD Disc but I would like to get a 3-1/2 disc drive first, has anyone out there got a

spare one they don't want? (I shall have to write to Angie's market stall.)

Thank you to everyone for the articles you write and also to you JOHN for working so hard to get WACCI out for us, I am sure that everyone really appreciates the sterling work you do. One other thing since I have had this computer my wife SYLVIA says that she is a computer widow, I sit here in the spare room trying to learn how BASIC works and I lose all sense of time, but as she says it keeps me out of trouble.

Yours Sincerely
Brian Nicholas
FROME

<<A happy new year to you. I glad that the advice I gave you worked. Dave and Stuart take a bow! Arnolds Basic as I've said many times is the best Basic Tutorial that I've seen.

Paul Fairman the author worked very hard putting this tutorial together. One good things about computers is that time flies and as you said at least it keeps you out of mischief. -John>>
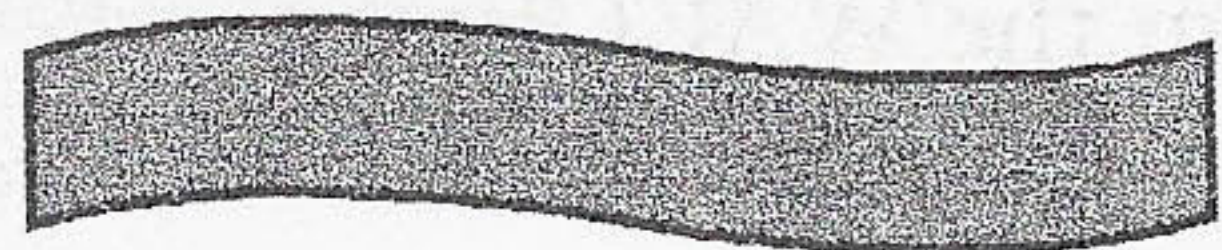
News Good Or Bad
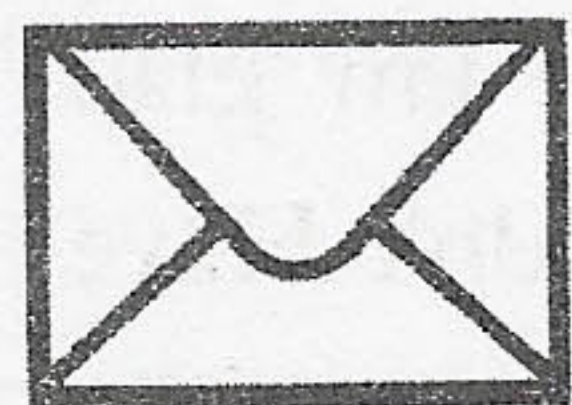
My thanks to our close friends Chris & Christine Raisin who got me started on a 6128, but Mostly for the contacts you arranged for me. Also to Dave Caleno and Peter Curgenven for the endless supply of games and info:

For a short time Richard Latham who was the only one who answered my advert for contacts in WACCI. Simon Lucas who said exactly the same to me when I answered his advert and lastly Peter Rogerson. Who meets me nearly every week come rain or shine on Mansfiled Market.

My last thoughts are from the convention this year I prepared my database on disc and had several printed versions too I might add. Handed them all out etc.

NO REPLIES: NO REPLIES: HAVE WE ALL JUST BASICALLY LOST INTEREST? I'LL QUOTE A MESSAGE FROM THE X FILES:

"IS THERE ANYBODY OUT THERE"?

If there is please excuse my disheartened approach, but I joined WACCI for support and help from its members.

THAT'S THE WHOLE POINT OF THE CLUB ISN'T IT.

If help is at hand, and you find you can really help, please do so. All we're asking for is a small piece of your time: Help me and others like me make our collection complete. This includes you too Mr. Editor.

Reply to

Paul Wass
86 JENFORD ST
MANSFIELD
NOTTS
TEL. 01623 451464

<<Hiya Paul. Helping one and other is the main purpose of WACCI and this is something we all want to do most of the time. I understand your feeling of disappointment, I at times feel the someway. I feel like a nagging old hen asking month after month for more and more letters and articles and sometimes feel what's the point however the members do come through in the end where it matters and a little patience is all one needs.

All you really need to do is keep asking and in time you will get the response that you want. I know that you've wrote a very good article about copying tape games to disc and this will appear in WACCI soon.

What Paul want's is to get every tape game that was ever released for the Amstrad so if any members out there as got some tapes games that he and she no longer wants then please send them to Paul.

A lot of commercial games are now PD and it would take me ages to compile a list so any help here would be most welcome. So would game reviews. -John>>
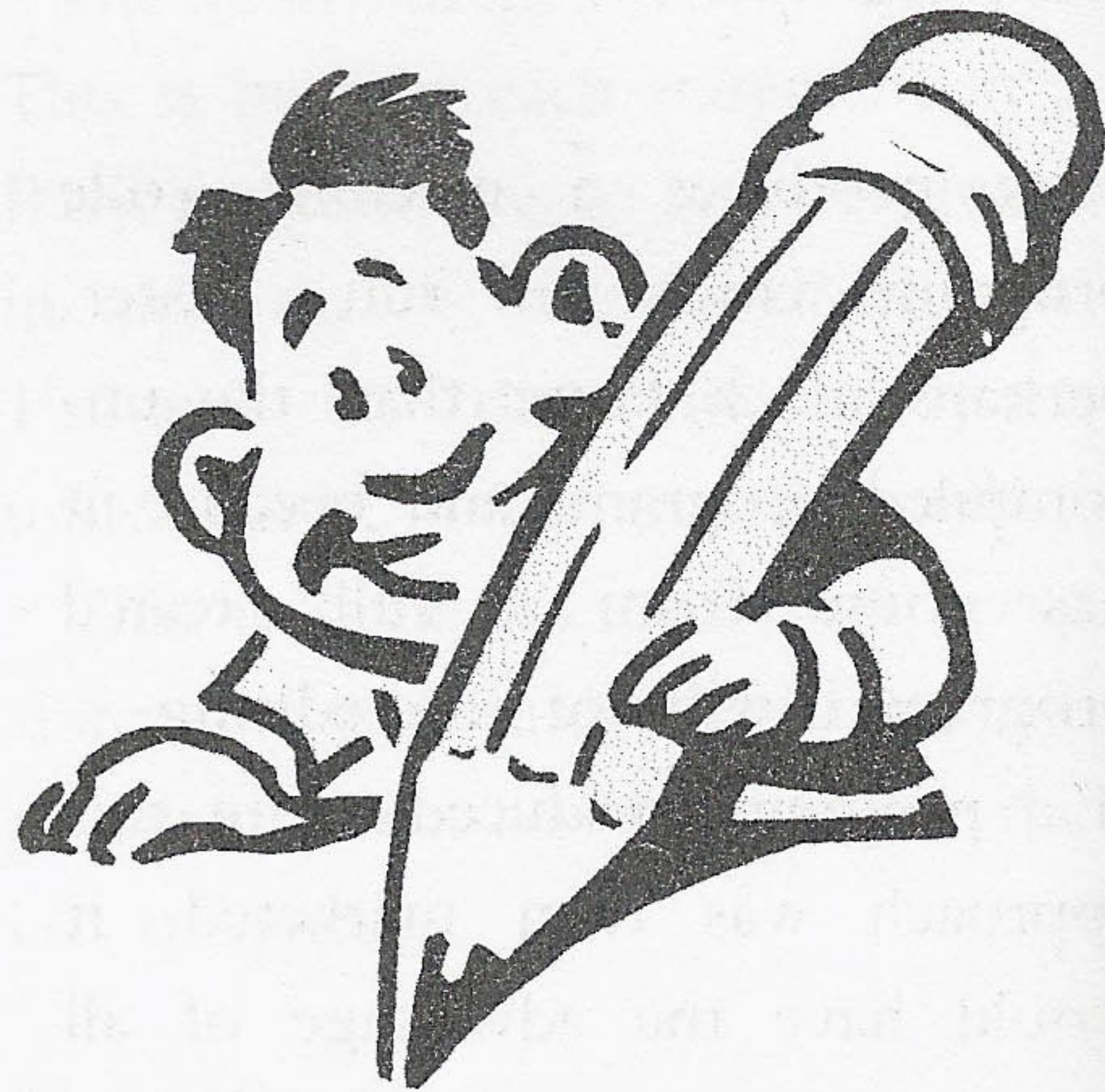
Keep your letters coming

-8-

Arnolds Basic by Paul Fairman

PRINT ERR will tell you the ERROR NUMBER that last occurred. Type "ERROR number" to find out quickly what the error code means.

RESUME must be used after a ON ERROR GOTO command has been used. RESUME 200 would resume normal execution at line 200.

RESUME NEXT is similar to RESUME, but the normal execution of instructions continues at the next instruction after the error.

ERROR LIST

1 .. UNEXPECTED NEXT - The user has used a NEXT command which wasn't meant to be there because BASIC wasn't in a FOR NEXT loop, or the variable used after NEXT wasn't in a loop.

2 .. SYNTAX ERROR - Within the programs line there is a silly little error that the user has made such as a spelling/typing mistake. Read through the line properly to find the mistake.

3 .. UNEXPECTED RETURN - Er sorry user but I am not a GOSUBed sub-routine.

4 .. DATA EXHAUSTED - Not enough DATA statement have been entered or the READ command goes too far, reading after the last DATA command.

5 .. IMPROPER ARGUMENT - Something impossible is being tried to done by the user such as

LOCATE 0,3 which is simply not possible.

6 .. OVERFLOW - The numbers being used are too big for the CPC to deal with.

7 .. MEMORY FULL - The BASIC program you are working on is absolutely massive and the CPC has run out of memory. MEMORY FULL will also be sprung up if you are using the MEMORY command to set naughty values. Another less common cause of this error is the structure of the program is to complicated for BASIC to handle with tons of FOR NEXT GOSUB RETURN etc.

8 .. LINE DOES NOT EXIST - You plonker. The user is trying to GOTO GOSUB etc to a line that doesn't exist at the moment.

9 .. SUBSCRIPT OUT OF RANGE - Those jolly things called arrays are being used and the subscript used is out of the normal range expected by BASIC. Let's say you have done the DIM a$(500) command, but then you say PRINT a$(534), then this error will pop up because the a$ array is only reserved for up to 500 bits, and 534 exceeds this.

10 .. ARRAY ALREADY DIMENSIONED - Excuse me, you have already DIMed that variable. You can't DIM it twice.

11 .. DIVISION BY ZERO - A mathematical operation is being

divided by zero, which is impossible so don't do it.

12 .. INVALID DIRECT COMMAND - No no. The command given cannot be entered like that, it MUST be within a program, not in what is known as direct mode.

13 .. TYPE MISMATCH - Another silly error. For instance the command INPUT a has been given and the next line is something like IF a="sausage" THEN GOSUB 4000: REM (I like sausages).

This cannot be done because "a" is a numeric variable (see VARIABLES section miles away) and it being treated as a string variable. Can't be done in normal circumstances sorry.

14 .. STRING SPACE FULL - That's it. Too many strings used.

15 .. STRING TOO LONG - A string when converted or not is too big because it goes over 255 characters long.

16 .. STRING EXPRESSION TOO COMPLEX - Well in other words the string expression that you have been working on goes beyond the capabilities of CPC BASIC.

17 .. CANNOT CONTINUE - A CONT command (continue) has been entered by the user, and say the program has been edited in some way since stopped, continuation is not possible. It is a pain in the arse when this happens.

18 .. UNKNOWN USER FUNCTION - User is trying to use a FuNction that hasn't been defined previously with a DEF FN command. See part six.

19 .. RESUME MISSING - ON ERROR GOTO command has been used and the end of the program has been reached while in that error handling routine.

20 .. UNEXPECTED RESUME - A RESUME command has been used but the program is not processing an ON ERROR GOTO routine so such a command is not available.

21 .. DIRECT COMMAND FOUND - A line without a reference number has been found when loading from tape or disk. This will occur by trying to RUN an ASCII text file.

22 .. OPERAND MISSING - The thing you are typing is not complete because it needs what is called an operand. Typing MODE on its own will provoke this error message as a MODE number is needed after the MODE command.

23 .. LINE TOO LONG - Line goes over 255 characters when converted to it's full version, which is too big.

24 .. EOF MET - The ASCII file being operated on has been finished, and the user it trying to continue reading it. Rather like reading past the back cover of a book; impossible.

25 .. FILE TYPE ERROR - The reading of a file is being done an

incorrect method such as trying to OPENIN a BASIC program.

26 .. NEXT MISSING - Hang on! You can't have a FOR command without a NEXT command to go with it.

27 .. FILE ALREADY OPEN - The user is attempting to open a file when one is already open. Closing files is done with CLOSEIN or CLOSEOUT.

28 .. UNKNOWN COMMAND - A RSX (external command) has been entered that has not been set. RSX's are things like |BASIC which resets the computer or |DIR which calls the directory of a disk up. Extra RSX's can be created using machine code programs.

29 .. WEND MISSING - A WHILE loop is being attempted but there is not a WEND to be found that will go with it. **30 UNEXPECTED WEND** - Why have you just typed WEND when there is not WHILE WEND loop in progress?

31 .. FILE NOT OPEN - Unfortunately, a file is being worked upon but it is not open. Say you have a book and you want to read it, or just rip pages out of it. You must open it before reading or tearing it to pieces.

32 .. BROKEN IN - ESC has been used when in the middle (or anywhere) of loading a file.

Error trapping in my telephone directory program is done so that when an error is detected by the ON ERROR GOTO command at the start of the program the error

processing routine goes into operation which then detects what type of error has occured. None of the errors above will happen because there simply are no syntax errors or situations where an improper argument can fly onto the screen; the program has been tested to a degree that this cannot happen. So what errors can occur? Take a look below:

Disk ERRors (DERRs)

144 - The disk is not in the disk drive.

145 - Renaming a file to another filename that already exists on that disk cannot be done. This would leave two files with identical filenames which AMSDOS does not allow.

146 - The file that has been attempted to gain access to doesn't exist on the disk in the drive, compare this to reading a book that is buried in the back garden. Well, if you want to that is.

147 - The directory on the disk cannot exceed 64 entries. An attempt has been made to violate this rule.

148 - There is no 'K' left on the disk. The disk is full.

149 - A change of disks has occured whilst a text file was open.

150 - A read only file cannot be erased, renamed etc.

The above are disk errors which are detected from BASIC using the DERR command which means Disk ERRor. Note how this is done at the end of the telephone directory program, and note also the RESUME instruction.

Future Proofing your CPC
by Simon Lucas

It was a cold Tuesday afternoon. Not content with working I decided to relax by surfing the net. Whilst browsing I became pleasantly surprised at the wealth of Amstrad-related information available including emulators, downloadable games, CPC games on CD and even a new operating system for the CPC! I was busy downloading games, info, BTL disczines and other stuff when the teacher said, 'Oi! The internet is designed specifically for educational use only-get on with your work' Doh...!

Emulators

Many of the existing emulators have been updated, and many more new ones have surfaced including the new 32-bit CaPriCe Emulator (!). This emulator is well presented and has a very nice intro screen graphic introducing the program. It performs and works like CPC EMU by Marco Vieth (Available from PD Disk 113), but is still in the early stages of development.
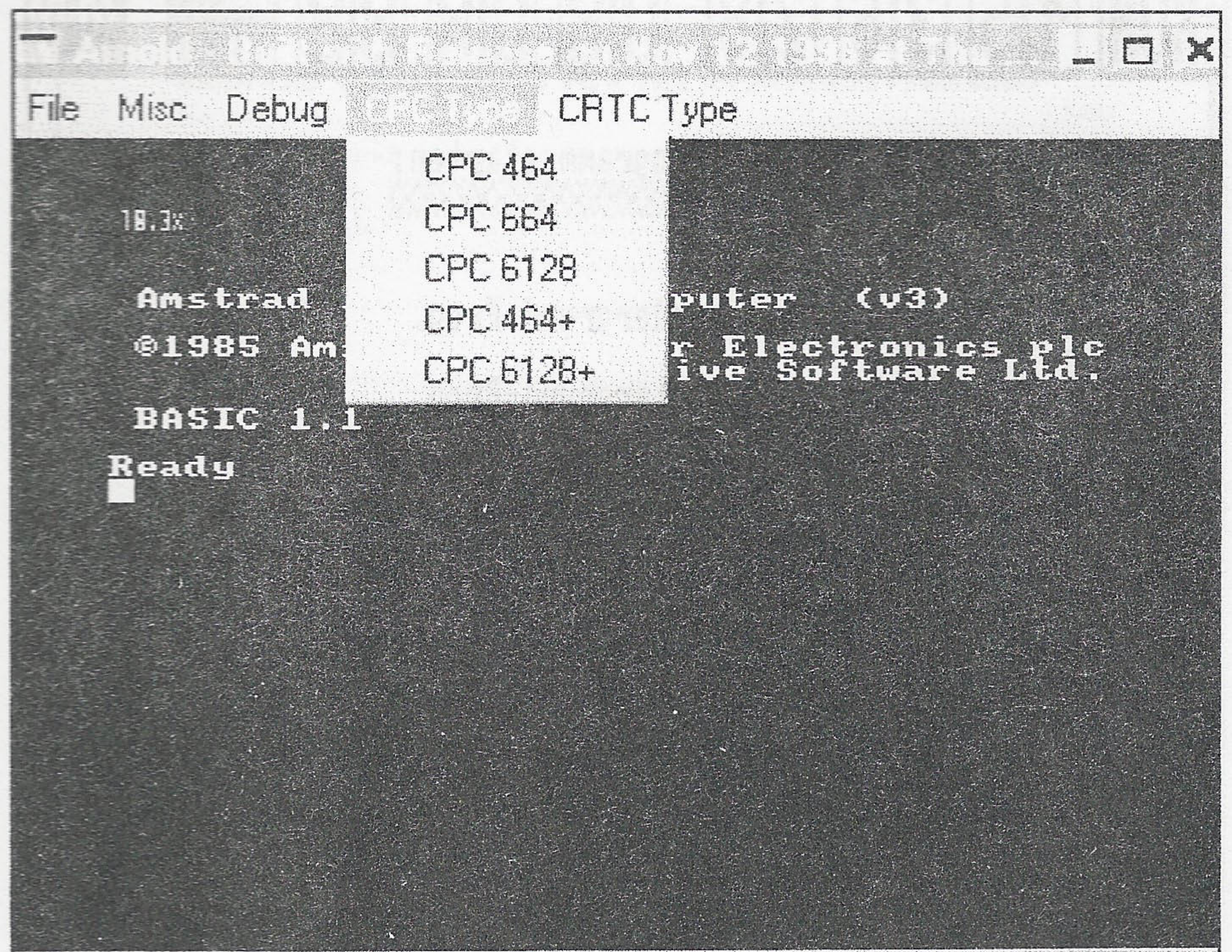
The second emulator is a revised version of CPE by Bernd Schmidt (kept up to date by Ulrich Doewich) and is currently on version 5.2i. In my opinion this emulator beats the rest on sheer ease of use, graphics and almost everything else.

This emulator includes very accurate sound reproduction and identical graphics to the CPC screen (other emulators suffer from blocky graphics which are not as good as the original CPC screen).

The program will only work in the good graphics mode if you have VESA support on your PC video card. Most PCs post '95 have VESA support, but you can download or borrow (from me) the trial version of Scitech's Display Doctor which updates your video card to support this mode. You do not need an expensive computer to run this emulator as it runs fast on my DX 2/66 (i.e. very slow computer), and can even run in Windows 3.1.

Kev Thacker's Arnold Emulator

Another very promising looking emulator is Kevin Thacker's new emulator called Arnold, designed to run in the Windows '95 environment. This is a very very slick emulator with all the usual features of Windows '95 incorporated into the interface. The emulator supports the Plus range of Amstrad computers and it even has a long list of the different video (CRTC) chips so that even the fancy demos will run without problems. Did I mention overscan? Sound Emulation? Extensive ROM support? It has the lot. The downside of course being that you

have to have a fast computer (runs at a pathetic pace on my DX 2/66) with a reasonable video card and it requires DirectX 5.0 (Audio and visual accelerators which come free with Windows '98, but also available from me). This emulator is one to watch out for.

Transferring Files

Several utilities have been released to enable easy transfer of your files between computers, including CpdRead and CpdWrite. These utilities let you copy almost any

One last emulator worth a mention is by Richard Wilson (of ParaDOS fame). This goes one stage further not yet seen on an Amstrad Emulator in that it actually reads the Amstrad disks in the PC drive, so you insert and remove disks just as a normal CPC. Unfortunately I have not seen this one yet but I'll keep you posted.

New OS For The CPC?

Whilst browsing I came across a site dedicated to a new operating system that was developed in

'It is compatible with all disk formats..contains comprehensive dating tools and is 64k (takes 4 ROMS). It is programmed 100% in assembler and there is a provision for the faster, 16-bit chip the Z280.'

It has low-level routines with a machine monitor and I believe it supports hard drives. It is also user-friendly in that it is icon driven. The documentation is available from the internet at: http://www.home.pages.de/~futureOS, or write to me and I will send you the documentation in German.

CPC Going Digital?

If you want to have access to thousands of Amstrad games and emulators on one CD, then there are several available at the moment. One such CD is available from the STS/BTL lads with many more appearing on the internet all the time. (Check the News Desk anytime now for more information on how to purchase the CDs). However, CDs never came out specifically for use with the CPC despite Codemasters' promise that it would appear.

There may well be a chance that the CPC could go digital as my brother is planning on buying a CD copier.

Does anyone remember AA 107 and the article about bizarre and useless programs?

One of the programs mentioned was one that converted your disk files into tape messages so that you could back them up onto the slow unreliable tape format. Useless

RUN - Programm starten:

1.) Vordergrund-Prog.

2.) Hintergrund-Prog.

3.) RAM-Programm.
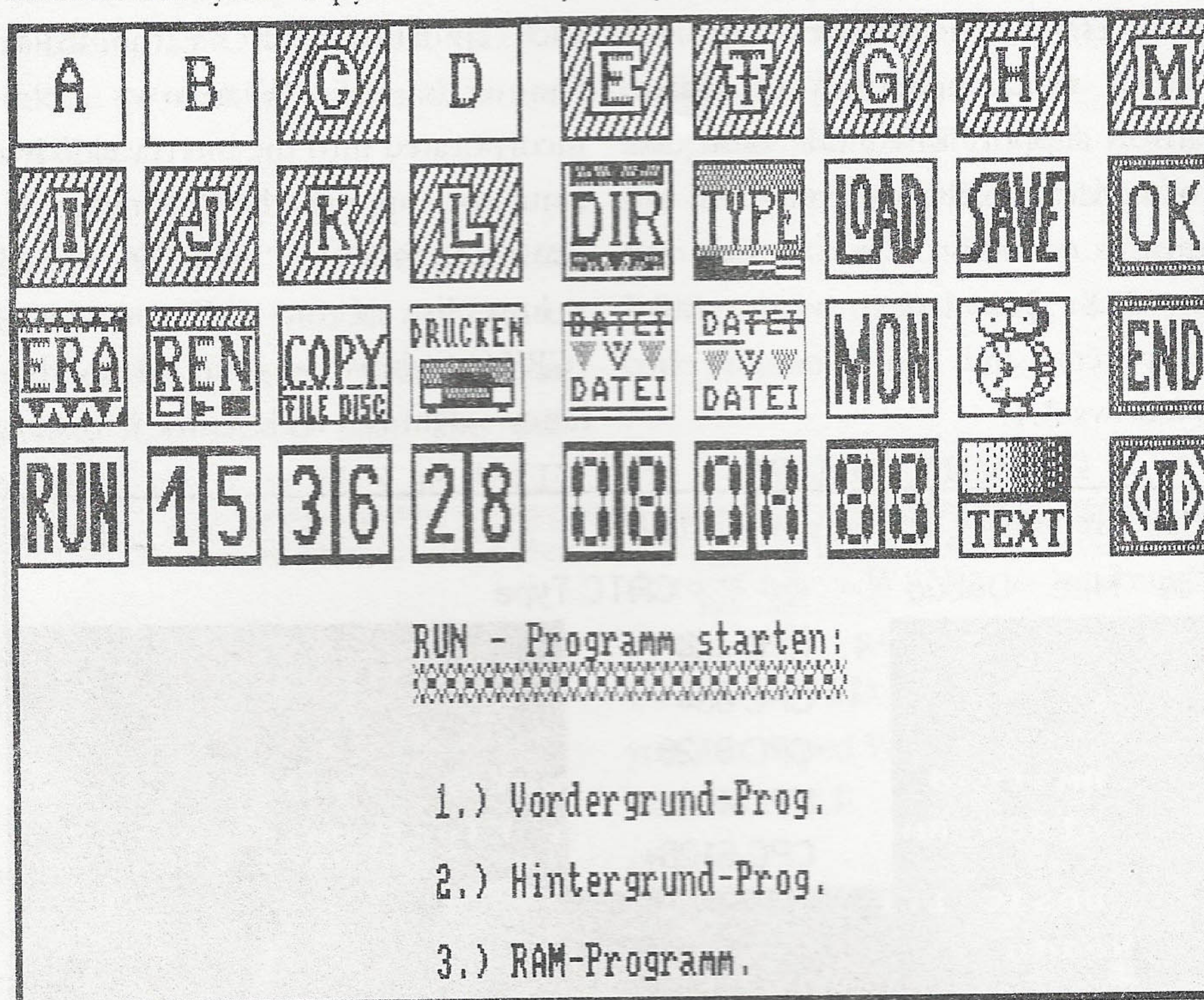
Future OS - Will it be in English

type of disk format to a file that an emulator can read (must be on 3.5" disks of course). The Cpdwrite program is useful if say, you have backed up some of your programs onto the PC or have a file obtained from the internet and you wish to copy it onto 3.5". Both of these programs are available from the internet or me but hurry as I am selling my PC and getting an iMac soon...

Germany called Future OS. I had first heard about it via the Robot Software Catalogue, but when I enquired about it it was unavailable, and still appears to be. If anyone can translate German then contact me as I have the full information on it. Here is an extract from what I can translate but it is far from complete (documentation takes up 5 A4 pages):

Huh? Well the program may now come in useful as CDs are much more reliable and because of their reliability it would be possible to record at higher speed, meaning faster loading times. Now in theory it should certainly be possible to transmit the high-pitched tape messages via the tape socket lead into the Line in of the CD copier, the result being your programs stored on a 74-minute audio CD. All you would have to do is connect the tape socket lead to the headphone or Line Out socket of your CD player and press play.

MiniDiscs could be used in the same way, except it is possible to record in mono, meaning you can fit 148 minutes onto one MiniDisc.

If you think that this may not work for some reason then contact me at the address below, although I would probably already have tried it by then...

If you are interested in getting the emulators mentioned in this article but you don't have the internet, then write to me, along with any other enquiries to:

73 Palace Road
Hampton Court
East Molesey
Surrey
KT8-9DN

Simon

Market Stall

Have you got anything to sale or are you looking for a piece of software or hardware if so then contact:

Angie Hardwick 23 Station Place, Bloxwich. WS3 2PH

Wanted: Pendown, Wordstyle, Pandora and DR Draw. Also Lost Patrol.

PLEASE CONTACT:
Graham Ridgwell 110, Orchard Road, South Ockendon, Essex RM15 6HH TEL: 01708-852961

FOR SALE: Amstrad CPC 6128 Plus, Amstrad DMP 2000 Printer c/w 2 spare ribbons, Epson LX400 Printer,Multiface, Brunword Mk4 Rom, 26 various Amstrad Books, 100 discs containing loads of games, serious utilities and PD, c/w all manuals. £100.00 the lot ONO.

PLEASE CONTACT:
Graham Swithenbank Sandal, Wakefield, West Yorkshire WF2 6SQ TEL: 01924-258047.

FOR SALE:
CPC 6128 Plus c/w system discs, Colour Monitor and all manuals.

This system has been modified by the installation of a selector switch on the keyboard which allows the user to choose either the built in 3" drive or the upper drive of the twin 3.5" drive unit as the A Drive. The lower 3.5" drive always remaining as the B drive. Also Rombo Rom Boards c/w Des 1 & 2, Promerge Plus, Protext, Parados

& Utopia, in addition a Nirvana Rom is fitted on top in an unboxed Romboard c/w manuals. Also Seikosha SL-90 24pin Printer c/w manual and spare ribbons.

Other general items as follows: CPC 6128 Manual, Prospell 3" disc c/w manual, Proprint 3" disc c/w manual, Question of Sport 3" disc, Powerpage 128 3" disc. All the above items are open to offers.

PLEASE CONTACT:
Doug Webb 4, Lindsay Drive, Chorley, Lancs. PR7 2QL TEL: 01257 411421

Special points of interest:

- Copying Files/ Discs
- Pitfalls buying a PC
- Scanning Pages
- Drag a File

Grateful Thanks

My thanks go to Angie Hardwick for her help and encouragement. to write the article on how I did the job for her. Thanks for your help and advice. To Clive Bellaby for help in Word.

Notes to you all

I hope you find this as interesting as I have in creating it. I need your support and input if we hope to keep these pages.

I have tossed out a few ideas here. It would be nice to see some response, I know Angie will still do her bits on *"How To"* but the more we get in, the more interesting this could become.

Thanking you John for giving us the chance.

Bye for now.
Christine Raisin

Copying files or discs

Recently I had to copy some file from one disc to another, but the computer kept telling me *"access denied or you can't copy to the same file"*. Words familiar them read on.

First I set-up a temp directory on the C:\. This I did by going into My Computer, click on the C: drive this logs onto the window with the contents of the C: drive. From the **File Menu** click **New** this will put a new directory folder in the window, and the words **new folder** will be flashing, delete these words and type in **Temp** or whatever you wish to call the directory you will use. *(From now on I will call this directory Temp)*.

Click on this directory to open the window. Then click on the top bar where it says the name of the directory, keeping the mouse button down dray the window to the button right-hand corner of the screen. You can then close the C: window down by the X or Exit. Then put your disc to copy in the: A: drive, go to My Computer click on the 3.5 icon to log in the disc. Next go to the **Edit Menu** and go down to **select all** this highlights all the files up in the window you logged in of the 3.5. Now go to the **Edit Menu** and click copy. *(This copies the files to the Clipboard)* Then in the **Temp** window go to **Edit Menu** and click paste, all the files will appear in the window. *(this pastes them back from the Clipboard)*.

Now remove the source disc from A: and put in the destination disc to copy to. Now go to the **Temp** window, if all the files are not highlighted then go to the **Edit**
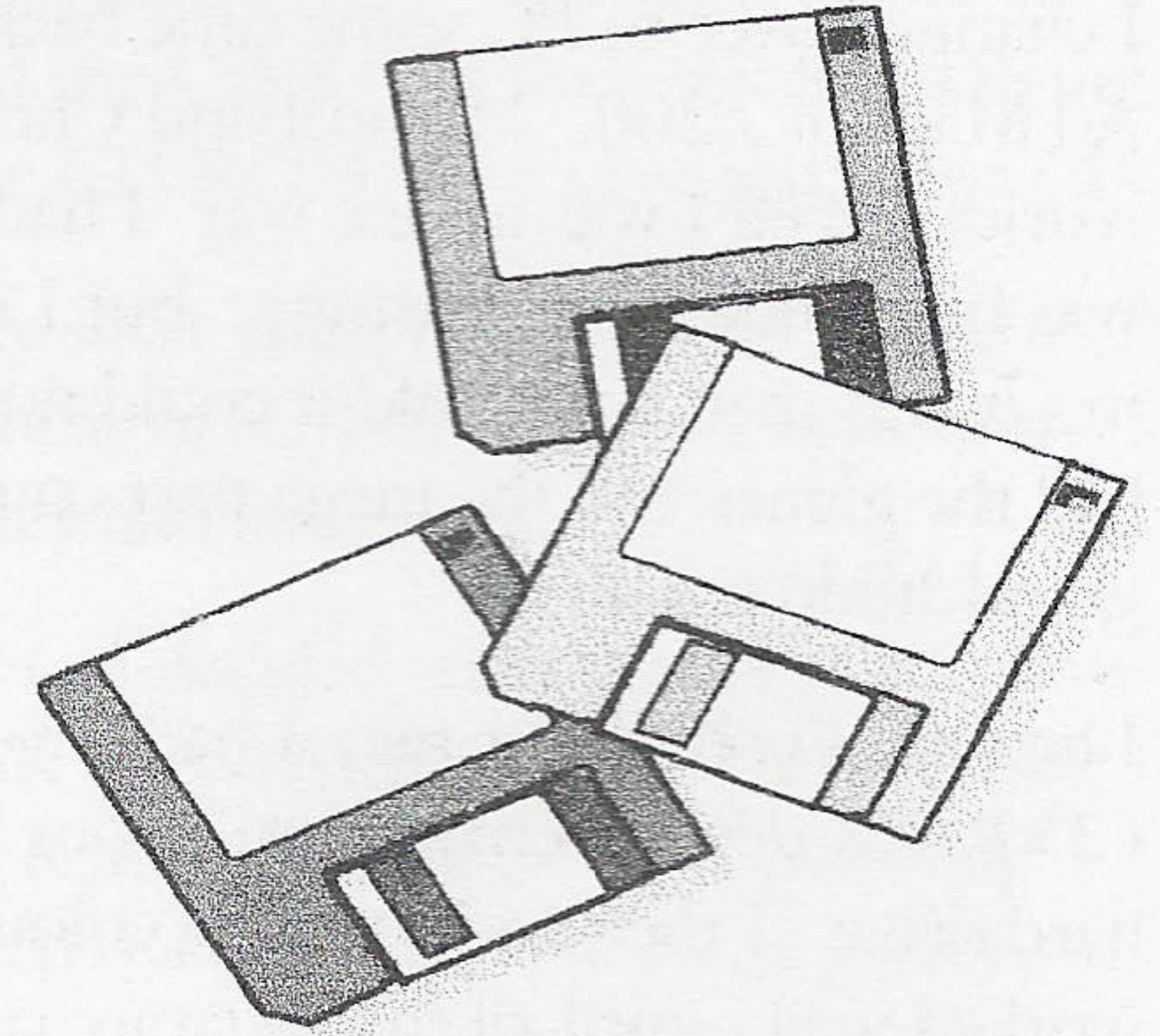
Menu and click **select all**. Then in the **temp** window right click mouse button anywhere on the white part of the window and a menu appears. On that menu choose **send to** and on the list that appears click 3.5 disc drive. All the files will then copy over to the destination disc. *Hey Presto*! Job done.

Now if my computer had in **the File Menu Copy Disc** this would have been much easier. I would have opened My Computer, right clicked the mouse button and a window with two boxes would have appeared. Each box contains the drives on the computer. Then you just click on the 3.5 drive to highlight them. Now the computer tells you to put in the **Source Disc** and press OK when ready. The computer will read the information, then ask for the **Destination Disc**. Once you change the disc you press OK, and the computer puts the files to the disc. Much simpler than the above.

I had to reinstall windows to recoup this **Copy Disc** into the **File Menu**. If anyone knows how this should have been done, would you write a *"How To"* and send it to me, and I will print in these pages.

The Pitfalls Of Buying A PC When In The Dark
by Christine Raisin

*On reading my WACCI this month, something jerked my memory of time past, a
the pitfalls that I came across. In Fair Comment, a letter from Frank Cosgrove's
asking for information on changing to a PC and help to avoid the pitfalls. Believe
me there can be some.*

I changed over to PC some time back; my first was an Amstrad PC7386X with Mega drive. I saw this advertised in t
Ad Mag for £200. My husband Chris went to Liverpool to fetch it for me. Thinking I would be getting the best of r
worlds. Well I was in one way I had a PC 386, which I learnt the basic's on, and I had the Mega drive for games. 1
was fine while I was learning, but I soon wanted a CD ROM drive fitting. I was told it could be done, until I took
in, it was then I was told it could not be upgraded without losing the mega drive. Now that seems a shame when we
had the games and the mega part could not be made to run on its own, so I kept it as it was running well and still is
grandchildren love it.

I had my PC built for me. I had a tower unit 386 sx 25, 3.5 floppy drive 5 1/4 drive, 1.2gig hard drive, a quad sp
CD ROM drive, 8 meg ram 30 pin SIMMs, sound card and video card all fitted in at a cost of £90 plus £110 for th
hard drive. I then had to buy a colour monitor cost £100, making the whole cost £300. Not a bad deal really and i
worked well, until all the software coming out wanted 486 or better.

Then came the next upgrade to a 486 dx 66. I must admit this upgrade was done because Chris won £150 on Count
Cash line and we both had an upgrade, cost £75. We looked at it this way, what we hadn't had we wouldn't miss,
have the entertainment for some time to came . Oh dear was we fools! Thinking we would be able to put the bigger
games on the machines, only to find they needed more memory, so had to upgrade the SIMM's to 16 meg, cost £2
now had a machine that I could do what I wanted to.

I was running Windows 3.1, Dos 6.22, Works 3, Publisher 95, Bookshelf 95, Grolier Encyclopaedia 96, Compt
Encyclopaedia 95, plus a few more. I know only one should be necessary but I do a lot of competitions and I can't g
to the library so having most of the encyclopaedia's makes finding what I want easier. I like making my own greetin
cards so I also collect clip art. I had to get a program to log all this into so as to know where to find it all. I choose
Multimedia Organiser which uses Power Album this program gave me problems for a while until John Bowley spotte
conflicted between two programs while here on a visit. These little things do come to try us. Now that can be an
understatement because with computers they can be things one doesn't understand.

I really believe my computer was running well until just before the Christmas season, my son had said jokingly it wo
be nice to see a virus on a computer. Low and behold two days later I got junkie on mine. This virus hits all COM
I did not have protection on the machine at this time. Well one always thinks it won't happen to them! Also not
knowing enough about computers I lost all on the hard drive.

When it was reformatted to remove the virus it also took off the hard drive driver. This meant I only had access to h
the 1.2 gig hard drive. No one had told me about any driver for the hard drive. The builder of the computer never
me anything and was reluctant to come out to repair it. I had two computer chaps to look at it but neither knew wh
do. Let's cut a long story short here. The computer needed the On track driver to run the hard drive, as this was ho
was set up. It took me a while to get this information out of the builder. Once I learnt this, the third chap that cam
out was able to set my computer up again. This chap downloaded this off the Internet before he came out to repair
computer for me. Each of these visits cost me £30s. Total cost £90s to get back up and running. Then I had to reb
up the computer, which took days. I was also told my computer was running slow and sluggish when using the CI
ROM drive. This was replaced with a 24 speed CD ROM drive, a cost of £35. People still said it was slow. I for
had not noticed this it was what I was use to. I must say here that a computer will only go as fast as the operator can
handle it.

My last upgrade came when my insurance policy matured giving me the finance to go ahead. I had a VX Pro
motherboard with Pentium 166 mx chip, 2 Mb S3 Virge DX, 2 16 Mb SIMMs, 2.1 hard drive, A4 Flatbed Scann
Windows 95 OSR 2. Total cost of upgrade and scanner £425.00. I had all my own parts returned, as I was givin
these to my son to up grade his computer. That upgrade took place in January this year, so is still under guarantee.
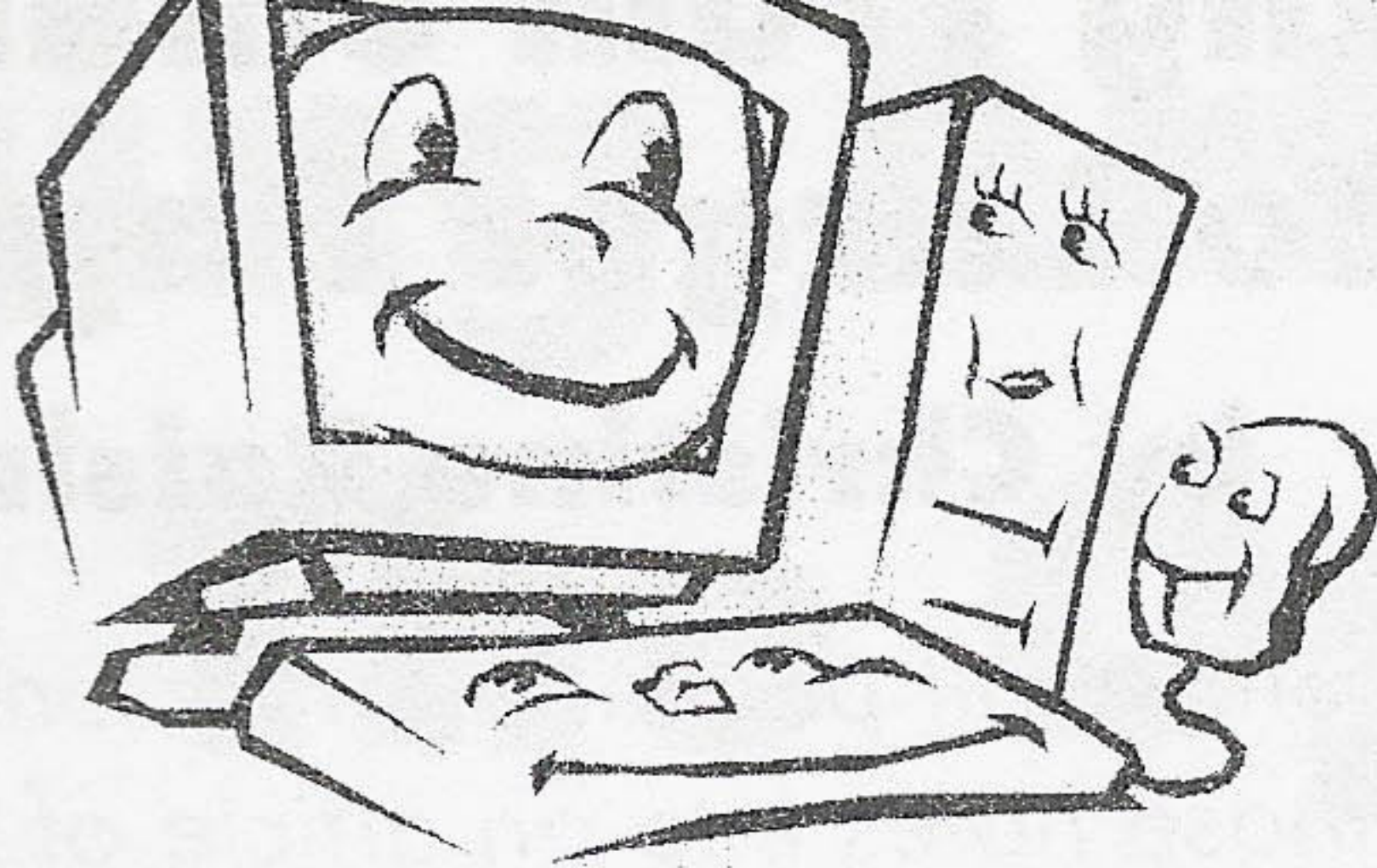
Three weeks ago my hard drive went down and now has bad sectors on. I contacted the firm, got put off until I s
had contacted Standard Of Fair Trading. I was told the firm had gone out of business but they would honour the

From this
to this.

Why not?

What more upgrades
needed! If only I'd
known all about it.
Hope this helps.

agreement, by changing the hard drive, *but they didn't do it!* I now learn they have gone into liquidation. The one good thing is that a computer chap had got me up and running, but again it cost me £25 to set up the computer. I first thought it was operating fault in the system files, only to find the next day it was the hard drive, it refused to reload windows. This caused the CD-ROM drive to go crazy and the door came open and the CD ROM flow out like a flying saucer. We then reformatted the drive to find that it had bad sectors on it. I had the CD ROM drive changed, cost £45.

What did I say above this was my last update, *no such luck!* I wanted to upgrade my son's computer as I had brought him a Flight Simulator and the machine was not powerful enough. He would not hear of it, but said, *"if I upgraded mine he would have my parts"*. I saw his logic I was getting something for my money and so was he.

That was the start of this section. We checked the papers for firms near us for prices. I decided what I wanted and how much I intended to spend. I brought a Super Socket 7 motherboard with a AMD 6K 2 266 MMX Chip, Heat-sink & Fan 4 MB S3 trio 3D AGP Graphics Card, PCI 64 bit Sound Card, 64 100 MHz Ram. Well that what I ended up with. First off they could not get the chip I wanted and put on 233 Cyrix chip which over heated. They had guarantee to exchange if I had problems with it, or didn't like its performance. The sound card gave us trouble in setting up, because there was a conflict with the video card.

The firm did set up the sound card when they put the new chip and 64 meg Dimm ram in (because my 32 Dimm was the wrong type) but did not set-up the video card. After putting in the Video card the conflicts where back. This had four of us nearly tearing our hair out with frustration. Windows 98 was put on in the hope that it could solve the problems by detection. No such luck. In the end I had the sound card taken out and the on board sound card turned on. *Hey Presto!* The machine was back up and running. This took us 2 weeks of distress and frustration for all of us. Total cost £276.46 + £40.00 for the three visits of a friend to come and set the machine up, *when we fail*.

The motherboard cost £55.21, CPU Chip cost £98.96, Heat-sink & Fan cost £6.11p, 64 100 MHz ram cost £72.00, PCI 64 bit Sound Card cost £30.96, and 4 MB AGP Graphic's Card cost £32.22p

My son also had problems in putting together his machine. The new Hard Drive and the old one would not go back to back. All these details I'm not sure about so best make no comments on, but it shows that these computer are not easy to upgrade because of compatibility.

I would say to anyone changing to a PC look before you leap. Check out prices, go to a reliable company if you want a good guarantee, be aware of advertisements in newspapers, magazines and companies at computer fairs. Always check out the credibility and reputation of a company. Then before you buy sit down and think what you are going to use the computer for. Remember always that you will learn as I did, the programs on the PC have help at hand at the press of a key, so is much easier to learn to use them. This encouraged me to try more and more. *(Just one instance is what I am doing now)*.

This word processor helps with spelling and grammar, so helps me to put something like this together. When I make a mistake in it, the program underlines in red as a spelling mistake and green when the grammar is wrong. A click the toolbar for tools and then click Spelling and Grammar. I am then helped to correct the mistakes. This makes things much better especially when spelling and grammar are not your best subject. Therefore one also must consider your own interests and whether you will be encouraged to advancing them.

If you have children remember they use computer at school and will want to do homework projects on the computer and will want the latest games. These games can take up a lot of drive space and need a lot of memory. I feel the biggest thing to remember is modern technology, it is advancing all the time. You can buy a computer today and tomorrow it is out of date. The best advice is to be very careful and be aware of what you are letting yourself in for.

Whatever you decide to do, I wish you luck and enjoy what you are doing, have fun while doing it. Computers have a habit of confusing you, frustrating you, but they also give pleasure and enjoyment, not to mention all the things you will learn while in the quest of learning. *Best of luck and many happy hours of computing*.
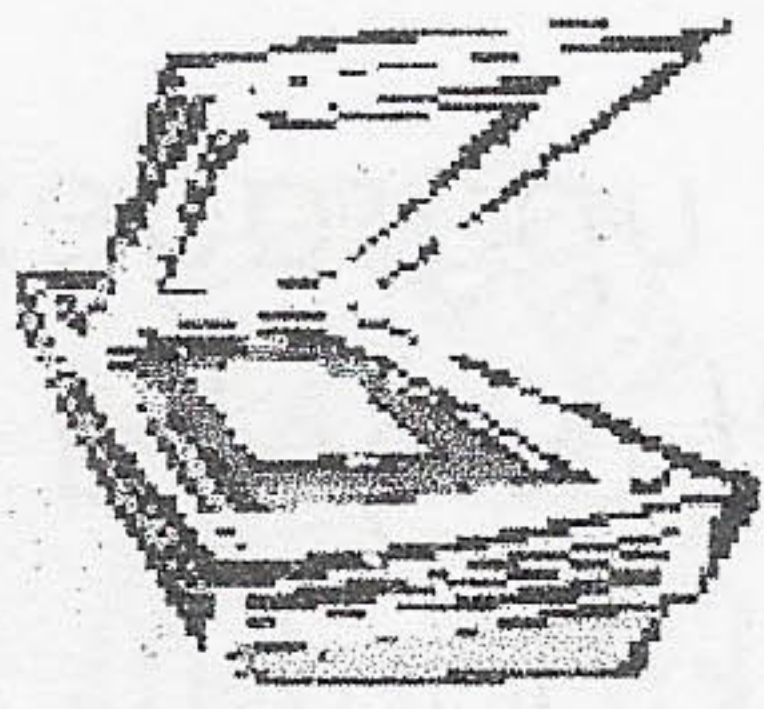
Scanning From Small Pages To Larger Pages
by Christine Raisin
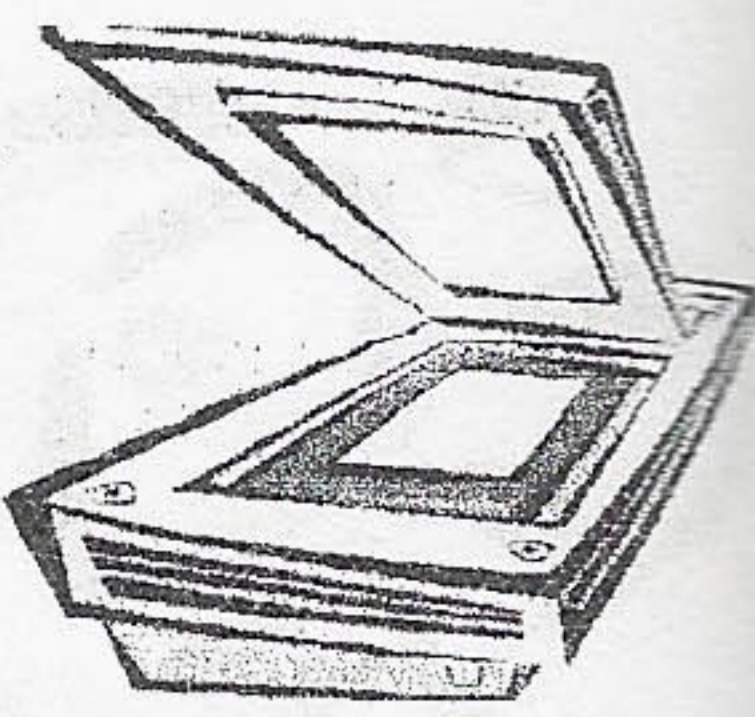
I had reason to scan some pages from small pages to larger ones and jotted down some notes, so a not to forget. I hope now that I turn those notes into an article of some interest, in hope that they will b useful to someone else.

I have a Mustek Scan Express flatbed scanner on the parallel port through a data switch so that my printer an ABC Citizen runs on the same port. The reason for this is my printer doesn't work through the scanner port. The scanner is run on the Twain Driver. I use iPhoto Plus software to scan in the documents. I am sure anyone could change these details to those of their own software.

I open iPhoto Plus and from the **File Menu** choose printer page set-up: I set to Letter *81/2" x 11"* manual feed Vertica Page. Then from **File Menu** select source to select the Twain Driver. I make sure the data switch is set B, as this is the scanner. Then from the **File Menu** choose Acquire this brings up the scan imaging. This gives me a choice to pre-scan so I can see what it will scan like and size the part I wish to scan. I was able to pre-scan two pages vertically each time then sized off one page to scan. When it has scanned it into iPhoto Plus I choose the scan imaging which asks *"turn off lamp"* I say yes. I now have the page image on the screen where I can size it to make a neat page. To do this click onto the size Icon button. I begin by clicking the top left-hand corner and moving the mouse to the bottom right hand corne before I release the button.

Then go to **Edit Menu** choose **Crop.** This resizes the image. Go to **Edit Menu** again click **Resolutions** set to Printer 180. Edit Menu choose **Resample** tick the **Keep Aspect Ratio** this brings up another Imagine window. This window is the page image that will be printed. Go to **File Menu Print** or click the Print Icon. This brings up the **Printer Menu** make sure here that it is set by a tick in **Scale To Page.** I then have to change the data switch to A, to change to the printer, then click **Print.** When it has finished printing I have a nice large page instead of a small one. From then o it is just repeating the process but at the pre-scan moves to the next page to be scanned in or turn over to the next two pages.

I have finished up with a nice file on the subject that I was doing, which was over 100 pages. I place two pages back to back and put them into a multi-punched pocket, which makes a page, which I then place into a cover to make my file. Quite neat and easy to find as the covers are different colours and there is a label that can be written on to say what's in the folder. I hope that this is helpful to someone. I know how long it took me to find my way around to doing this, so I hope someone can make their job that bit easier. *Good luck to anyone that tries it.*

How To Drag A File
by Angie Hardwick

Ok you may say what do I want to do that for, well if a friend sends You a file for sounds etc you wi need to drag it from your 3.5" floppy onto your hard drive, so it's useful to know how too!

1)   Click on Start.
2)   Click on Windows Explorer.
       Minimize the Explorer Window by clicking on the square button top right of the screen in-between the minus and the X.
3)   Click on My Computer.
4)   Click on 3.1/2" Drive Icon, which brings up the contents, left click on the icon, you will see a ghost image, hold down the left button on your mouse and **DRAG** over into the windows explorer window, you ca put the Ghost icon into any hard drive folder where a plus sign appears on the ghost icon.

    This way you can take one of the files from your floppy disc direct to your hard drive **BUT** say you want to copy over all the files. **THEN** follow steps 1 to 4 of the above instructions then go to **EDIT,** click on Select all, this will highlight all the icons, put the mouse pointer on one of the Icons, the ghost of all the icons will appear. Keep your mouse button pressed down and drag the whole lot to your hard drive. Then as before the ghost icon will show a plus sign showing you if you can drop the files into that particular location. *So if I can do it now you can!*

Bringing Articles Into The Open

All of us, at some point have read the Editor's request for the readers to write and send in articles for publication in WACCI. I myself am a relative newcomer to the WACCI scene even though I have had a trusty old CPC 6128 for more years than I care to remember. At this year's Convention I commented on the fact that the Editor asked for articles, but did not offer any ideas to throw into the pot to get us all thinking ..... "Now that's a point - I could write an article on that !!!"

So, that is what I'm doing now. Hopefully I will 'dangle enough carrots' that will tickle your creative taste buds and get you motivated, thus flooding the WACCI scene with enough articles to make War & Peace look like a floppy little pamphlet.

All the topics mentioned below could have been covered in previous issues, but some of you may be like me and not have copies of those articles. Therefore there would be no harm done in repeating any topic(s) that we (the readers) would like in the magazine.

Topics:
* Word Processing packages - commercial vs Public Domain (PD)

* Art Packages and any relevant PD software that either enhances a commercial package or adds further facets to a program.

* Music Packages that don't require hardware vs those that do and, again any PD support programs.

* How about letting the other members know about any other Conventions or Trade Shows that have CPC items for sale and give us a 'before and after' article - some other members may be able to attend: if not this time then next time.

* Articles including Reviews on your favourite games or utility programs (especially PD programs as they never seem to have enough info. or reviews).

* If you have experience in machine code programming how about an article including some of your subroutines (i.e. check if a key is pressed or splitting screen into 3 separate windows e.t.c.)

* Anyone with experience in use of ROMs - let us thicker people have some help with the more common ones like Maxam, Maxam 1.5, Utopia, Parados, etc. Let us know all the clever little tips and pointers.

* Any electrical wizkids out there - an article on something as simple as 'An Idiots Guide to Disassembling your CPC so that You Can Clean It' or more advanced instructions on 'How to Build Your Own Disc Drive'.

* A large (ish) article could be written on PD Utility programs and the benefits or drawbacks that they may have. You could include instructions, hints and tips, names of commercial or PD programs that they support etc.

* How about a printer comparison article - DMP series vs Citizen series or any other combination.

* Adventure programs - commercial and PD - reviews, hints & tips. Which format(s) of adventure game you prefer and why ? (e.g. text only - pictures & text - icon driven !?!)

* Finally, write an article similar to this one, but listing the types of articles you would like to have information on.

I hope that this may give some of you an incentive to write an article for the other members - PLEASE don't worry about your spelling or grammatical skills; nobody's perfect and I am sure that you can all write confidently enough for the rest of us to read easily and clearly.

Remember - if in doubt, keep it short and simple. Who knows, if this article gets printed I might just write another one myself - but I would be even more pleased to see it motivate others to write as well !!!

One last point - please send articles, preferably, on 3.5" disc in Protext format to the Editor. (3" discs and other word processing programs can be accepted). Thanks for reading - see you soon,

ROGER Graves

LOOKING AT THINGS THE
MULTIFACE WAY
by PETER ROGERSON

I can hear it now, brethren. You've seen the headline and come to the rash conclusion that the dreaded Rogerson is about to get technical. But fear not: he's not got the most famous black box of them all, the Multiface Two. And because it's going to explain a thing or two about time we all had a treat he's going to look at one of the greatest CPC games ever crafted by the wit and wisdom of the programer's art. Hurrah!

Over half of us CPCers have disc machines, either the 664, the 6128 or the 6128+, even a 464 with DD11 interface neatly attached. The actual proportion is probably higher than that, what with the low cost of replacing a faithful 464 with a used 6128. I shudder when I think of the way prices have plummeted. All that technology for under a tenner!
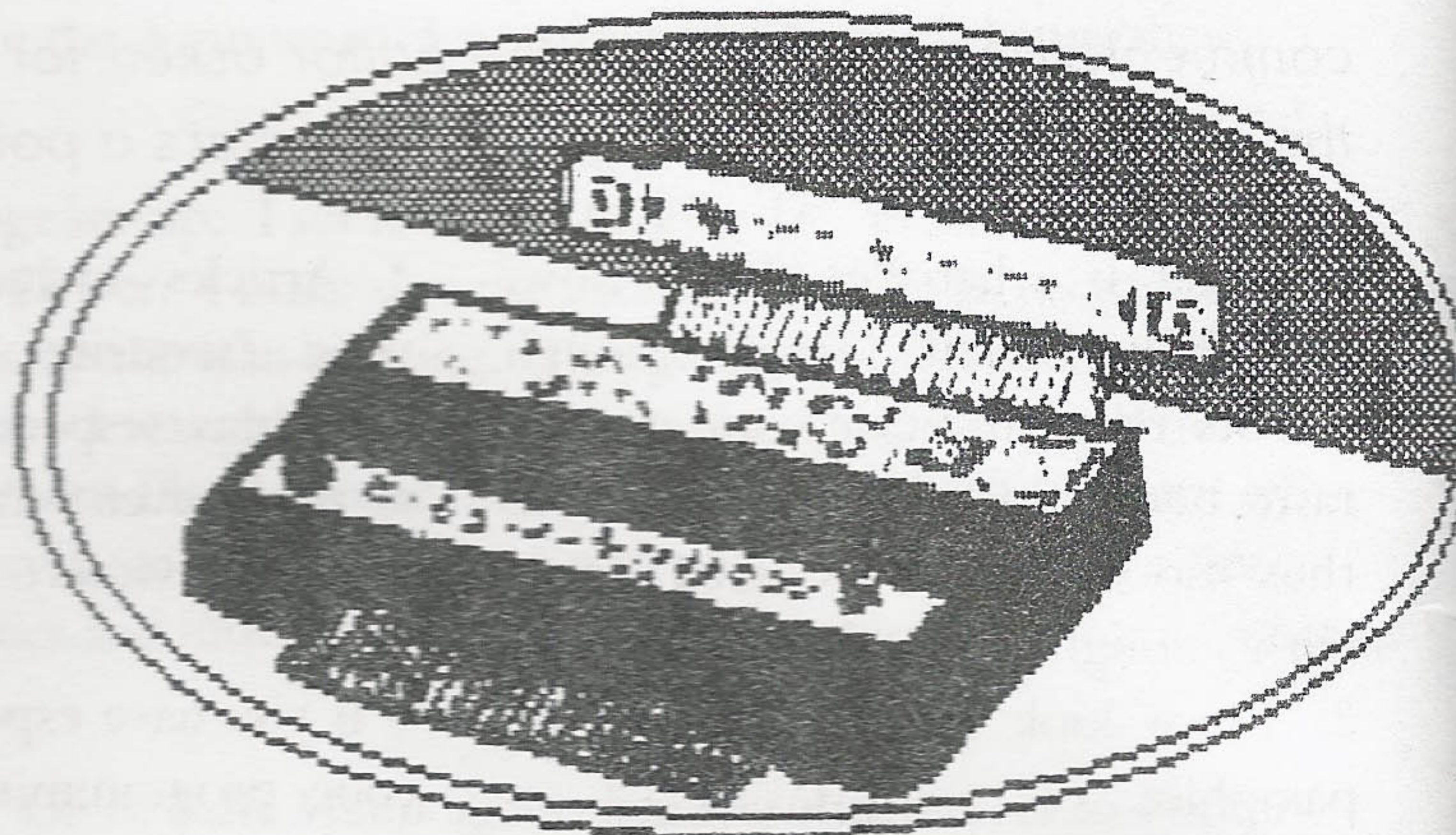
Anyway, most of the software available via the kindly services of Mr and Mrs Carboot Sale comes on tape, and tapes have got a few things against them. Firstly, that dreadful screen message "read error b" which means rewinding back to the start and trying again. And it's sod's law that dictates that errors are more likely to come either at the very beginning of a tape or (shudder) close to the very end. And rewinding from the very end in order to Try Again is No Fun At All. And that's because of the second thing that's wrong with tapes: they take epochs to load. Mountains are thrust into being by forces beneath our turbulent planet as the cassette tapes grind away. Ice ages come and go, and the loading screen is barely in place. Empires rise in blood baths and fall in frail old age, and finally the tape clicks to a standstill and the computer crashes. I could go on for ever, but John wouldn't like it.

There are plenty of software solutions to the problem of transferring those old tapes onto user-friendly discs. The Bonzo series of programs spring to mind, and even the JL-COPY basic file transfer program manages some of those that use standard Amsdos tape routines. And there are others, too, lost somewhere in that Cyberspace to which old programs go to be forgotten.

But I'm not thinking of software. It's hardware that's on my mind, and to be more specific the best-known of a generation of little black boxes that plug onto the expansion outlet at the back of the CPC - the famous Multiface 2. But before I explore the transfer capabilities of the device I'd better point out that it has many more uses. But they are of a technical nature and as I said at the beginning I'm no technical bod. To summarize, pokes that alter gamecode can be entered, code can be changed in all manner of ways and even a program called "Insider" can be installed in the Multiface's own RAM where it is, they tell me, an invaluable tool for programmer and hacker alike.

Back to transferring tape programs. Here's how you would go about it. Firstly, plug your Multiface on the back of your CPC. Secondly, type !TAPE and load the program you want to transfer. Thirdly, when it's loaded press the red button on the Multiface. You will be prompted to continue with menu that offers you an option to Save. Press the S and you will be asked for a 7-letter filename. Provide this, press D for Disc and your cute little disc drive will start whirring. It's all as easy as that. But note: in order to re-run your saved game/utility/whatever the Multiface will have to be attached to the back of your computer. Unless, that is, you obtain a little program called Anti-Multiface, which provides an extra loader that enables the program to be truly independant. But note again. It isn't 100% compatible with software and versions created with it will only run on 128k machines.

By the way, if you've been playing that favourite game of your and for once progress further than ever before and fear that you'll lose your last life before getting even further, then read on. The Multiface will come to your rescue and you can save the game at that point so that next time you play it you will be able to carry on from that rarely-reached point.

So there we have a couple of rather valuable functions of the little black Multiface box. But without being technical, there are others. Take screen shots, for example. You might be like me wanting to write a review of a favourite game, or you may just enjoy fiddling about with your machine, doing that little bit more than playing games on it.

So let's describe the process of capturing screens. First of all load the game of your choice (or utility, though there's precious little point in capturing screen shots from most of the utilities I've got in my collection). When it's loaded, start playing it. Then when you get to the screen you want to capture press the red button and follow the same instructions as you did for saving the game to disc, but this time press "S" for screen

SWITCHBLADE

before the "D" for disc. And there you'll have it. The screen will corrupt for a while as it's saved, but as soon as the drive stops whirring you'll get the menu back again. Pressing "R" will return you to the screen, and you'll be able to carry on playing the game.

The screen, once saved, can be loaded into MicroDesign Plus and converted into a .DR file. There are some on this page, oh best beloved. But before they're acceptable they'll probably need their colours changing, the reason being that those that arrive from Multiface can sometimes be incompatible with a black and white display. Those from this month's favourite game, for instance, were treated to a change of inks using the Ink Change option in MD+. That way they're clear, though subtely different from the game screen. And the odd thing is the screen display of Switchblade is largely black and white! But there aren't any shades of grey in the CPC palette, and the display has been achieved via the programmer's book of Jiggery Pokery. Or something like that.

Switchblade. There we are: I've mentioned it. And that's the game I'm going to look at this week. Treat the essay on Multiface Two as being over, and let's go.
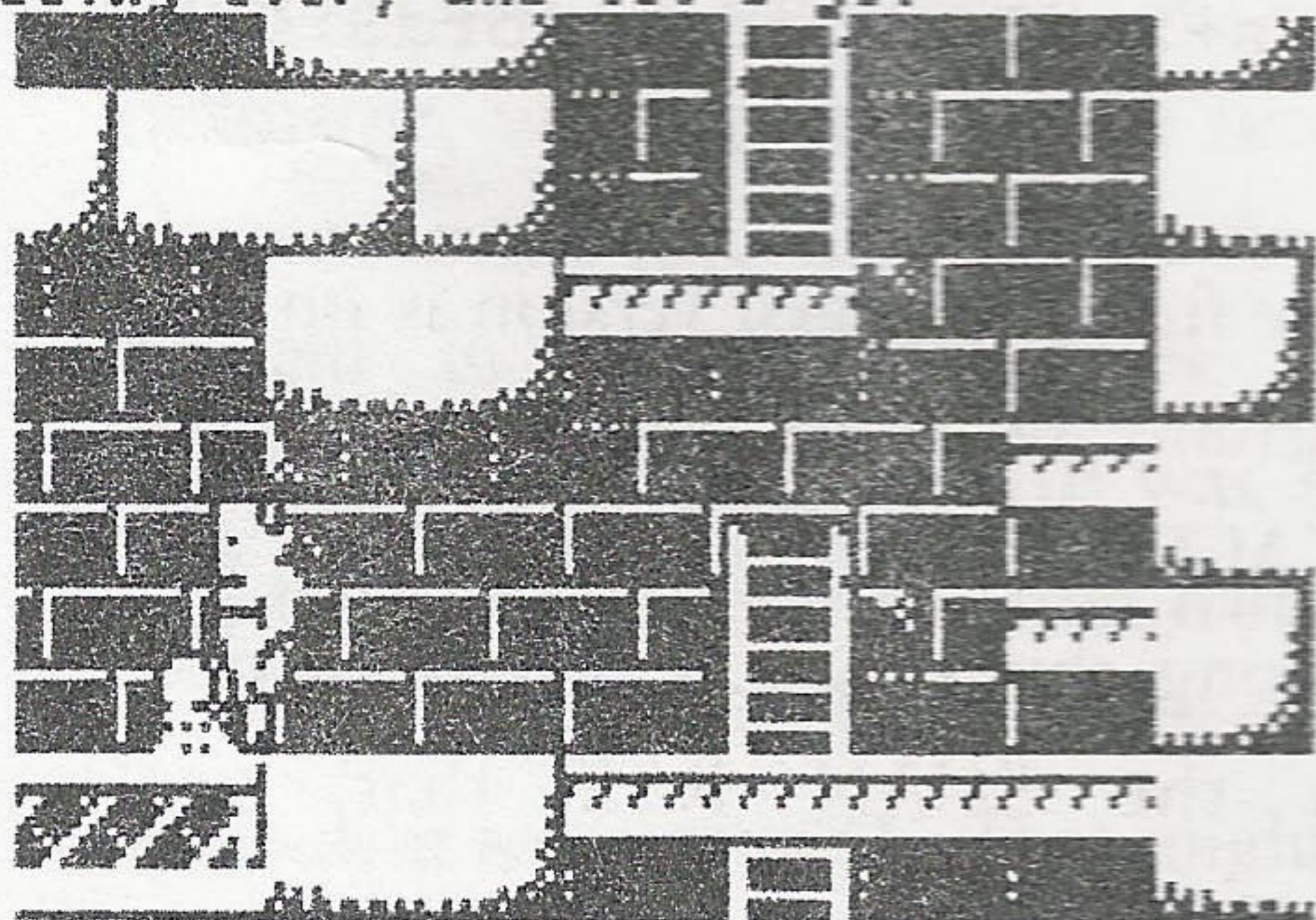

HIRO. NOW WHERE SHALL I GO NEXT?

The first thing you'll notice when you first get into Switchblabe is the size of the game. For a game that runs on an ancient 8-bit computer it's amazing how much territory is shoe-horned into a small space.

It first came out on cartridge for the plus machines and Gremlin in their wisdom couldn't see why an ordinary CPC version shouldn't do well, so it was released on disc.

You play the part of Hiro who's got the unenviable task of finding broken parts of an ancient and noble sword and reforging it in order to save the world as he knows it. The brave and bold hero of the opening

screens becomes a cute little character once the game begins. But cute he might be, there's no doubt his resolution as he races through the Undercity in search of fragments of a broken sword.
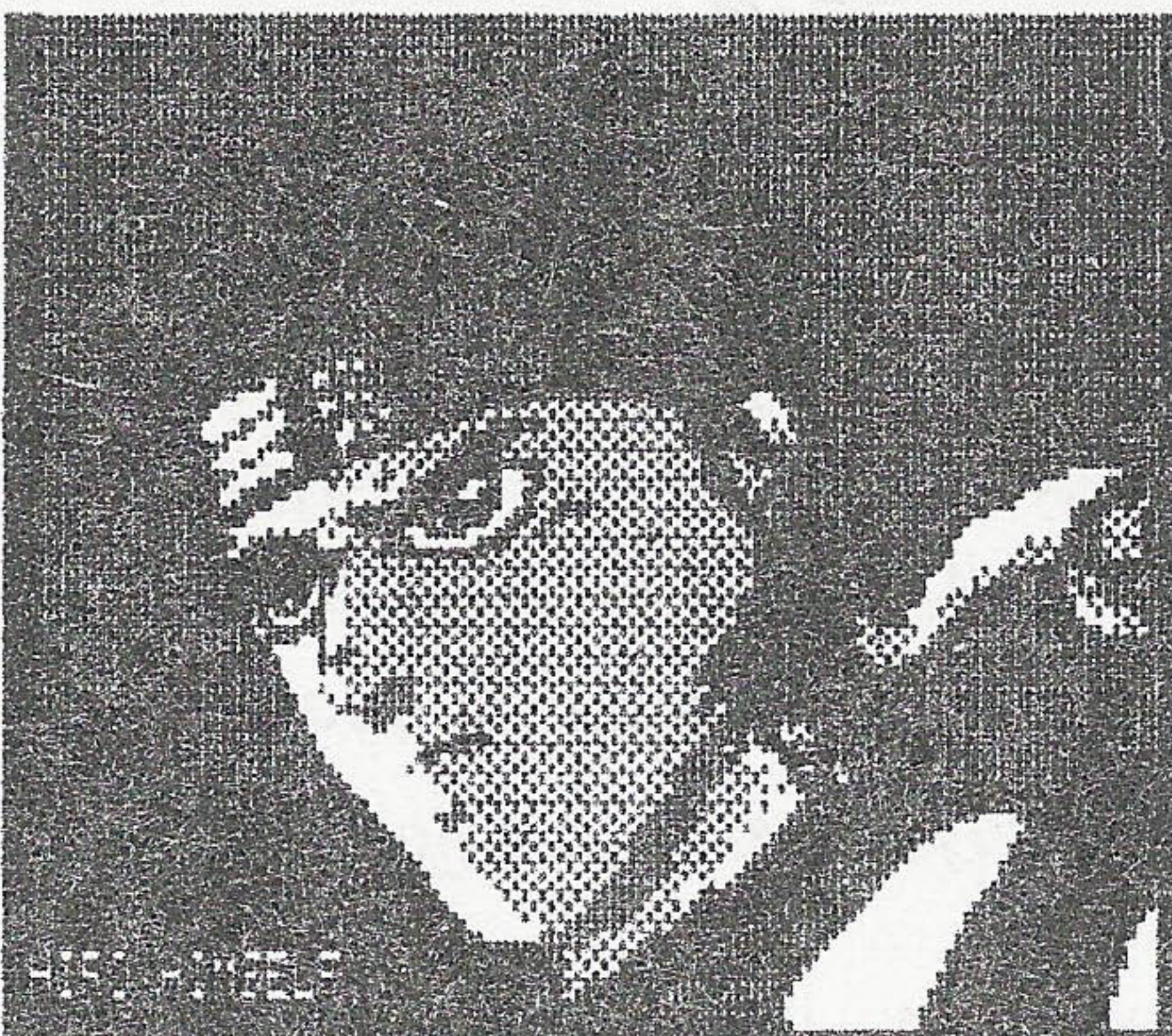

As I've said the game is huge and this can only be achieved by using the same background features many, many times. There's going to be a sameness about the Undercity, though the programmer's have used immense skill in creating a territory that varies subtly as you roam through its huge levels. You always know where you are despite the apparent sameness.

Besides power-ups and sword fragments there are jewels which give you points, the odd rare heart-shaped gem that restores your current life to 100% and letters that make the words EXTRA and BONUS at the bottom of the screen. The first letter, the B is on the second screen you reach (if you go the right way), but the rest are harder to locate and some of them are in urns you have to kick into submission.

As you progress along the game becomes more difficult. Your enemies become harder to vanquish. To start with you can stand on a box or step or ledge and kick them in the teeth a couple of times whilst remaining immune to their wrath. But in the later levels you have to be a great deal more canny. And the occasional guardian can't be kicked at all but requires an awesome amount of fire-power before he explodes in a wave of glorious anihilation.

If you see this game you must get it. I doubt if there's anyone actually stocking it, so it's the

boot sales and flea markets for you I'm afraid. If ever a software house feels benevolent enough to donate titles to the Public Domain then I beg them to donate Switchblade. It's too good to merely fade away as the last copy on Earth gets corrupted in the way that software invariably does. So if you're reading this, Mr Gremlin Graphics, you know what to do. I hope. And for no other reason than to provide future generations with a chance to marvel at the way the little lights come on as you pass them by, to guide you on your way through Undercity with its mutant population of life-sucking monstrosities.
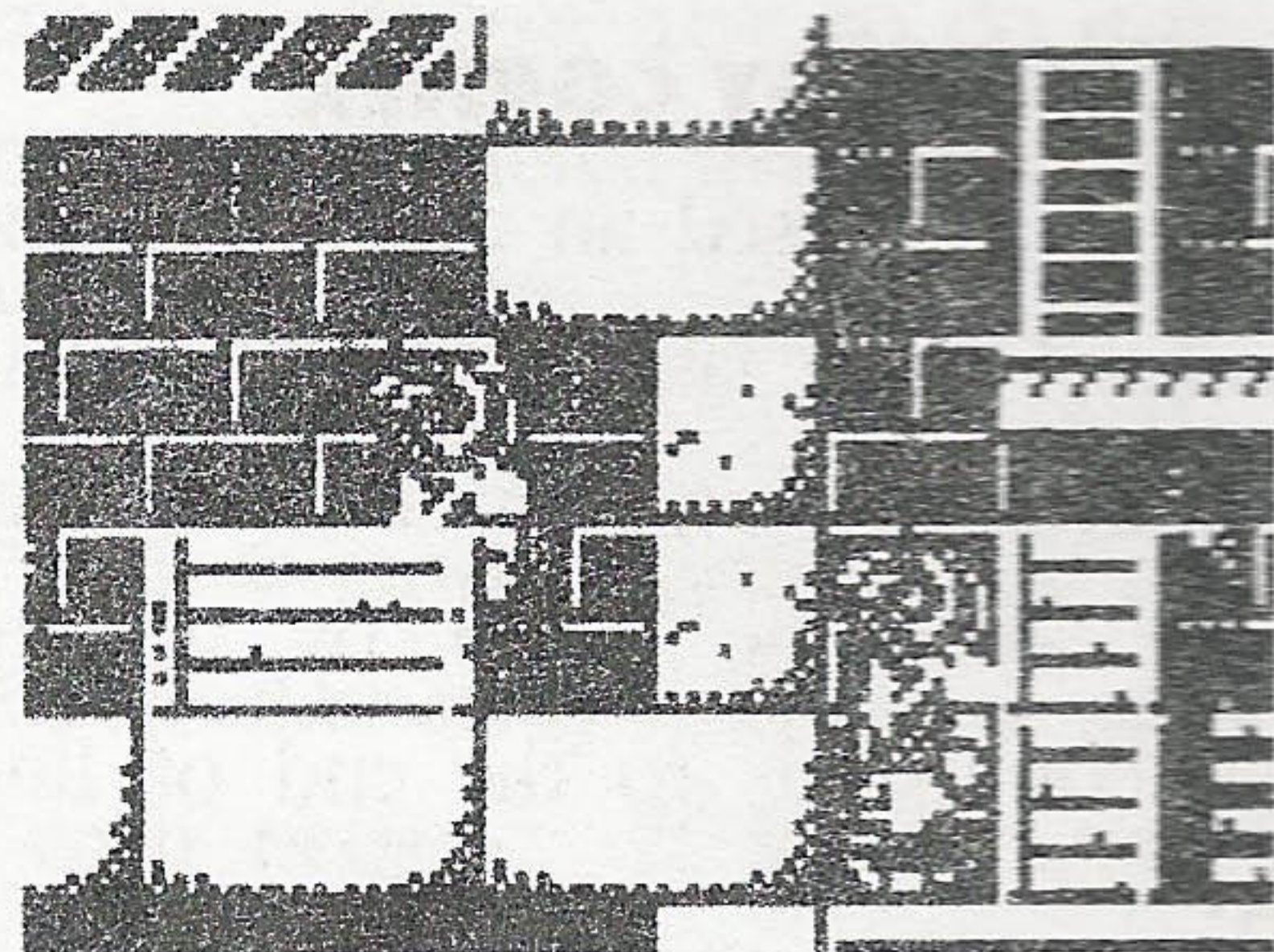
TWO OF THE NASTIES THAT HAUNT UNDERCITY. THE BRICKS WITH SPOTS ON THEM CAN BE KICKED DOWN.

Right, then, 'Nuff said. Now for my usual conclusion. In order to prepare this article I've used several of the pieces of software and hardware that I've been waffling on about this past few months. And they are as follows:
The CPC - a bog-standard CPC6128
Protext - on both disc and ROM. (I've used two of my CPC 6128s and only one of them has got a ROMboard).
MicroDesign Plus. If you haven't yet invested in the Plus enhancer to the original Hogsoft Micro-Design then you really must.
Dart scanner - if you spot one of these going cheap then snap it up. They're more fun than useful, but what's wrong with fun?
Multiface Two (courtesy of the ever-wonderful John Bowley, may he and his kin spend eternity in their own perception of Heaven).
Citizen 120D 9-pin printer.
So you see, with a bit of effort the CPC can produce the odd page of nonsense.

Programmers' Patch
by Matthew Phillips

Have you ever thought how boring your computer's memory is? To the Z80 processor it just looks like 65536 bytes, one after the other. That's all very well for storing the National Lottery results for the last 90 years, but to do something useful with it, we have to impose some sort of structure so that we can store, retrieve and manipulate complex data. Read on to learn about Mr Black the newsagent and his imaginative use of arrays and linked lists.

ENTOMOLOGY CORNER

Well, I promised an answer to the puzzle I set last month. The program as it stood contained a bug, which could be cured by adding these commands to the end of line 435:

    w$(nwords)="":lk(nwords,0)=0

It might seem unnecessary to set a previously unused element of a string array to the empty string, and to set a previously unused numerical variable to zero, because when you dimension arrays in BASIC that is how the variables start out. In fact, it would be unnecessary, but there is one circumstance in which these variables might have been used before and might have acquired different values.

Normally the value of nwords will just increase, but if we had built up a large vocabulary in memory, and then loaded an older smaller vocabulary file from disc, nwords would decrease. All the extra words we had taught it would still be there

in memory, but are not looked at because the program only looks at the wS and lk arrays up to the point set by nwords. If we then taught it a new word, or required a new dummy link (which is what line 435 is dealing with), nwords would increase again, and we have to make sure that any data remaining from the larger vocabulary are wiped so that they do not interfere with the

correct operation of the program. That is why we need to add those commands to the end of line 435. In fact, there is another line that needs altering. Line 160 should read:(see Fig 1.)

```
Fig 1.
160 IF cword=0 THEN nwords=nwords+1:w$(nwords)=word$:lk
(nwords,0)=0:cword=nwords
```

The fully debugged version is on the current Programmers' Patch disc, WACCI PD 98. While we are talking about bugs, I unearthed one in the SCAN RSX that was

```
10 DIM name$(5),nextname(5)
20 FOR x=1 TO 5
30 READ name$(x):GOSUB 140
40 NEXT
50 PRINT" x name$(x)"TAB(15)"nextname(x)"
60 FOR x=0 TO 5
70 PRINT x;name$(x);TAB(14);nextname(x)
80 NEXT
90 PRINT:PRINT"In order:"
100 x=0:WHILE nextname(x)>0
110 x=nextname(x):PRINT name$(x)
120 WEND:END
130 DATA Egbert,Alfred,Charlie,Bertrand,Desmond
140 REM insert into list
150 y=nextname(0):py=0
160 WHILE y>0 AND name$(y)<name$(x)
170 py=y:y=nextname(y)
180 WEND
190 nextname(py)=x:nextname(x)=y
200 RETURN
```

published back in WACCI no. 122 in June. The program was meant to print up BASIC lines that would not run on a 464, but as it stands it also prints up any line containing an RSX command!

A debugged version is now on the Programmers' Patch disc, with an enhancement which prints up lines containing RSXs with direct string arguments, which are not allowed on the 464.

CONTINUITY ANNOUNCEMENT

Last month we used the concept of the linked list in a rather complex situation to allow us to improve the AI program. I thought it would be a good idea to give a short programming example of a simpler linked list structure.

The structure consists of a string array, name$, used for storing names, and a numerical array, nextname, which points to the next element in the list. To find the first element in the list, we look at nextname(0). If nextname(0) was 3, say, then name$(3) is the first name in the list. To find the next name, we look at nextname(3). That might be 1, in which case name$(1) follows name$(3) in the list. Eventually we find a value x where nextname(x) is zero. This indicates that there are no further entries in the list.

The listing implements this structure. Five names are read one by one from the data line 130 into an array, name$. After reading each one, the subroutine at 140 is called, which inserts each new name into the correct position in the linked list by alphabetical order. The element we want to add to the list has just been stored in name$(x). We need to look through the existing list to see where it fits in, so we start variable y off pointing to the start of the list by setting it to nextname(0).

The important lines to look at are 160 to 180. The WHILE loop in 160 continues as long as y>0 (which means we haven't reached the end of the list), and while name$(y)<name $(x), that is while the name pointed to by y comes before name$(x) alphabetically. Line 170 stores the present value of y in py, and then moves y on to the next item in the list by setting y to nextname(y).

Upon reaching line 190, we know that py is pointing to a name that precedes name$(x) and that y is either pointing to a name that follows name$(x), or we have reached the end of the list. We have therefore reached the correct position to insert name$(x).

This is done in line 190 by setting nextname(py) to x, so that name$(x) follows name$(py) in the list, and setting nextname(x) to y, making whatever used to follow name$(py) follow name$(x).

After lines 20 to 40 have read in the data and inserted the names in the list, lines 50 to 80 go through the array printing up the contents, so that you can see how it all works. Follow the links through to check that it works.

Then lines 90 to 120 print up the list in order. We start by setting x to be zero, and while there is another element in the list, line 110 moves x on to the next element and prints it up.

WHAT'S IN A LIST?

What are the advantages of storing things in linked lists? Usually in BASIC we store the items in the right order in an array. The disadvantage of this approach comes when you have to insert a new item into the array in the right position.

All of the following elements in the array have to be shuffled down to make room. If you had a list of a hundred names, adding another name to the array would often entail moving down fifty or more strings, whereas inserting in a linked list just involves changing two numeric array elements. If you have to do quite a bit of this, a linked list approach can save a lot of time.

As well as storing names, you might have another array storing the address of each person. If you wanted to keep the names in order, then without the linked list approach you would also have to move the addresses around when inserting a new name in the array.

The linked list method means that this associated data can stay put. The information on the order of the elements has been transferred from the array to the linked list.

Using linked lists to keep things in order means you can store data in several different orders at once. If you introduce another array, "nextbirthday" for example, then that could be used to run through the names of the people in order of their birthdays through the year.

Inserting a new name in the list would involve putting them into the correct position in the nextname array according to the alphabetical position

-23-

of the name, and into nextbirthday according to the date.

Depending on the arrangement of the report that you required you would either use nextname or nextbirthday to run through the data and display it.

So far the first element in the list has been pointed to from nextname(0), and the linked list has included all the elements in the name$ array. Linked lists have much wider applications.

THE TALE OF MR BLACK

Mr Black the newsagent has 1208 customers. Their names and addresses are stored in the string arrays name$ and address$. Their delivery requirements are stored in the whichpaper$ array. Mr Black employs several newspaper delivery operatives whose names are stored in the paperboy$ array. A numeric array, called paperround, points to the first address on a paper boy's round.

For example, paperboy$(6) is Jim. The number at paperround(6) is 423, which means that Jim must start his round at address$(423), number 4 The Oval, delivering whichpaper$(423). He does not need to know that name$(423) is Mr Philip Sprout. What he does need to know is the next address on the paper round.

This is stored in the array nextaddress, which contains a linked list for each paper boy. Looking at nextaddress(423), we find that it is 27, and address$(27) is number 5 The Oval, which happens to be the house next door. Nextaddress(27) is 678, and address$(678) is 8 Queen's Gardens, just across the road. When he gets to the last address, stored in address$(67), nextaddress(67) is zero, which means he has reached the end of the paper round. This is a good thing, as his bag is empty.

Now, the only values of nextaddress we have looked at are those for the addresses on Jim's round, which means the other elements of the array can be used to store the linked lists for the other paper boys. Since no two of them deliver to the same address, there is no problem. For each paper boy paperboy$(n), paperround(n) points to the address at the start of the round.

Mr Black also has another linked list, nextname, and he uses this to print up the names of his customers in order. He also has a linked list called nextdebt so he knows who next to take to the small claims court.

DOUBLE DUTCH

There are lots more possibilities for linked lists. One important one I ought to mention is the doubly-linked list. It is easy enough in the example we have looked at to find the next item in the list, but sometimes it is useful to go up and down the list. If the list is long it is most efficient to have a second linked list which holds the items in reverse order. We could call this previousname.

DOUBLE GIN

That sounds a good idea! See you next month for a spot of arboriculture.

Matthew

Replacing the 3" Disk Drive

A little while a go I was reading this article about replacing the internal 3" disc drive on CSA8 news-group and I thought it would be of interest to the WACCI readership so I asked the author if he would have any objection if I was to publish it in WACCI and Pierre kindly agreed for me to do just that so thanks Pierre – John>>. This article was written by Pierre " Cob Killer" Thevenet

Connecting a 3.5" drive to a CPC as drive A: (instead of the original 3" drive)

Please note that this modification has little interest if you don't have a PC (or Amiga, or maybe another machine) with which you can write disk images onto a floppy (using an utility like the excellent cpdwrite, available at your favorites ftp sites).

It can be very interesting if (just like me) you ruined your 3" drive. I think you can have two 3.5" drives on your CPC using this method, though I never tested it. The second one would probably need a separate power supply, though.

With a 3.5" drive, you can read any kind of floppy, including special copy-protected formats. Every .dsk image I wrote back to 3.5" floppies worked perfectly.

Be sure to understand what you are doing before you act ! This is quite easy to do but not that easy to explain, overall in a written way.

This works fine on my CPC, and everything you do is at your own risk. I cannot be held responsible if you burn your floppy drive, your

34-pin socket	26-way cable
1-5	not connected
7	26 (red wire)
8	25
9-10	not connected
11	24
12	23
....	....
30	5
31	4 \ Side selection
32	3 /
33	2
34	1

You should get something like this :

```
26                              1
||||||||||||||||||||||||||
||||||||||||||||||||||||||
```

Cable from CPC's Disk Controller

```
// ||||||||||||||||||||||||
|| ||||||||||||||||||||||||

o o o o o o o o o o o o o o o o
o o o o o o o o o o o o o o o o
1                              34
```
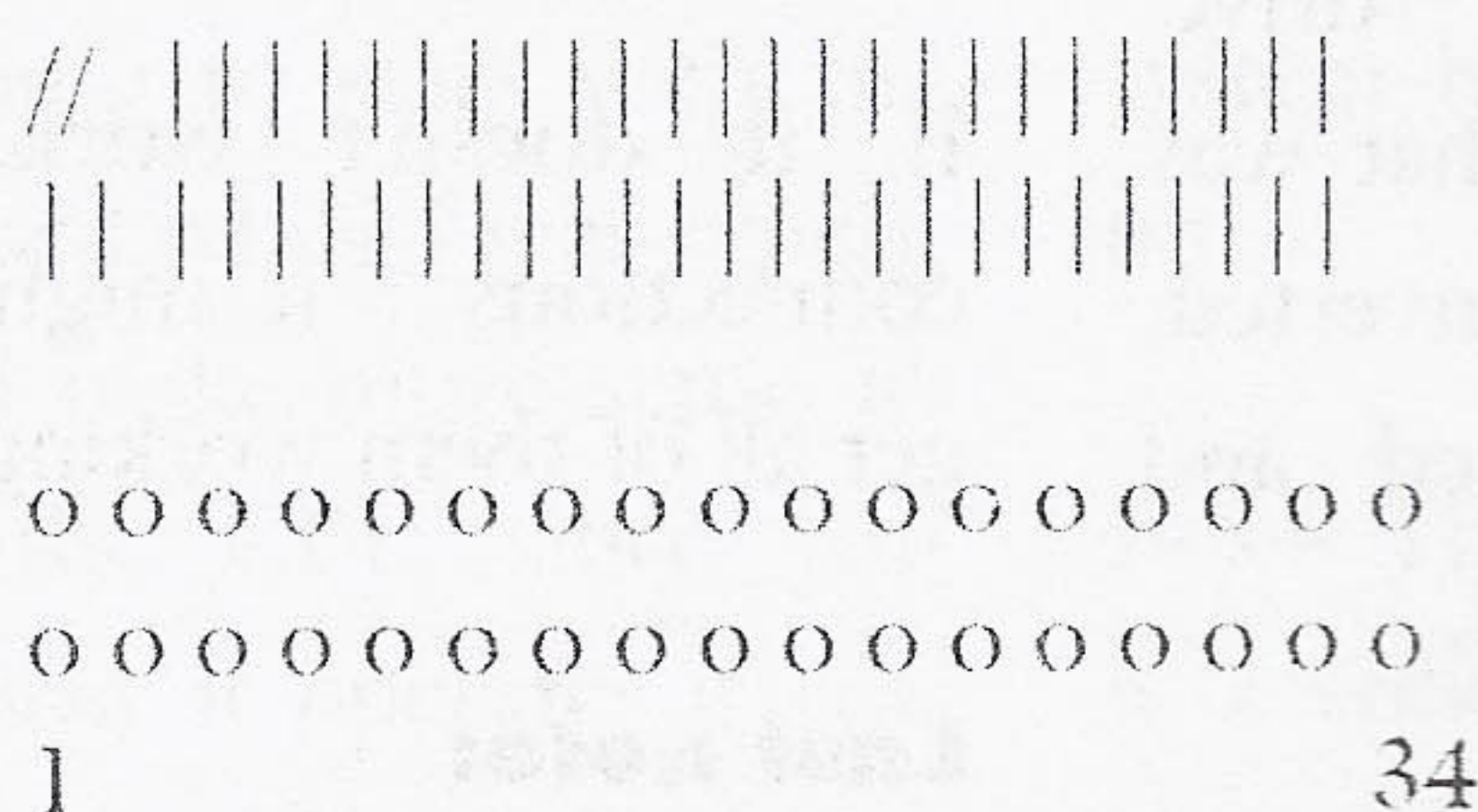
computer, trash your floppy disks or anything like that. I used a very standard TEAC 3.5" floppy drive for this.

1. Take the 26-pin connector from the Amstrad and remove it from the cable (with a screwdriver, for example). To do this, remove the

"cap" by pushing a screwdriver between this cap and the cable. You might have to force it a little bit. Gently pull the cable - in order to avoid pulling the pins with the cable. You should get a **"raw"** 26-pin connector, put it in a safe place in case you want to plug your old 3" drive again.

2. Get a 34-pin connector (the one that can connect to a standard 3.5" drive). You might take a spare one from your PC's floppy cable, but this is not the method I would recommend. Buying a brand new one shouldn't be very expensive. Pull the cable, as mentioned above.

3. Plug the CPC cable into the 34-pin socket.

NB: Keep in mind the way pins are numbered on the 34-pin connector:

```
1 3 5 7 9
o o o o o
  o o o o
  2 4 6 8
```

All you have to do is disconnect wires 26-25 from the remaining of the cable. You might want to cut a bit of your CPC cable in order to get a "**clean**" cable. Trying to put the existing "holes" into the pins is not a good idea, in my opinion. Push the wires into the pin with a small screwdriver. Don't forget to push between the two ranks of pin.

4. The power supply from the CPC should plug into the 3.5" drive. However, it will not work that way the +5 and +12 wires are inverted. Cut the power supply's red and orange wires, and invert them.

5. (optional): you can disconnect wires 3 and 4 from the CPC, and plug a switch instead. This will let you select which side of the floppy you want to use (you have a double-sided 3.5" drive, don't you). Switch off: side 0, switch on: side 1.

6. First test: plug the 3.5" drive, and turn on your CPC. Watch the drive's

LED it should be "**half-lighted**" (just as the 3" drive is when it is on and not running). If it is very bright (like when it is running), you probably reversed the 34-pin connector. Turn it over and it should work.

DO NOT LEAVE A FLOPPY INSIDE

while making this test, for if the connection is wrong, your floppy disk will be **RUINED**. (actually, all data should be lost but you still can format it).

7. Try it with a floppy disk! If it is not CPC-formatted, you will get this familiar "**read fail**" noise and error message. If you have a HD drive and HD floppies, don't forget to put a bit of tape over the hole on the right of the floppy (NOT the write-protection one), because CPC's FDC can only handle double-density disks.

It might be possible to permanently force the drive to consider all floppies as DD, but I don't remember which pins are involved, and I don't really mind either. If anyone wants to work it out ...

If it doesn't work, check your connections : it might be tricky to get all of them working.

Last note:

This is actually much like the way indicated in the FAQ for connecting a 3" drive to a PC (Juan Perez Delgado's information), but the other way round. You can refer to this text for further information.

Pierre

Please note
Please be warned if you do decide to undertake the task of replacing your 3" disc drive WACCI or the author will not be held responsible.

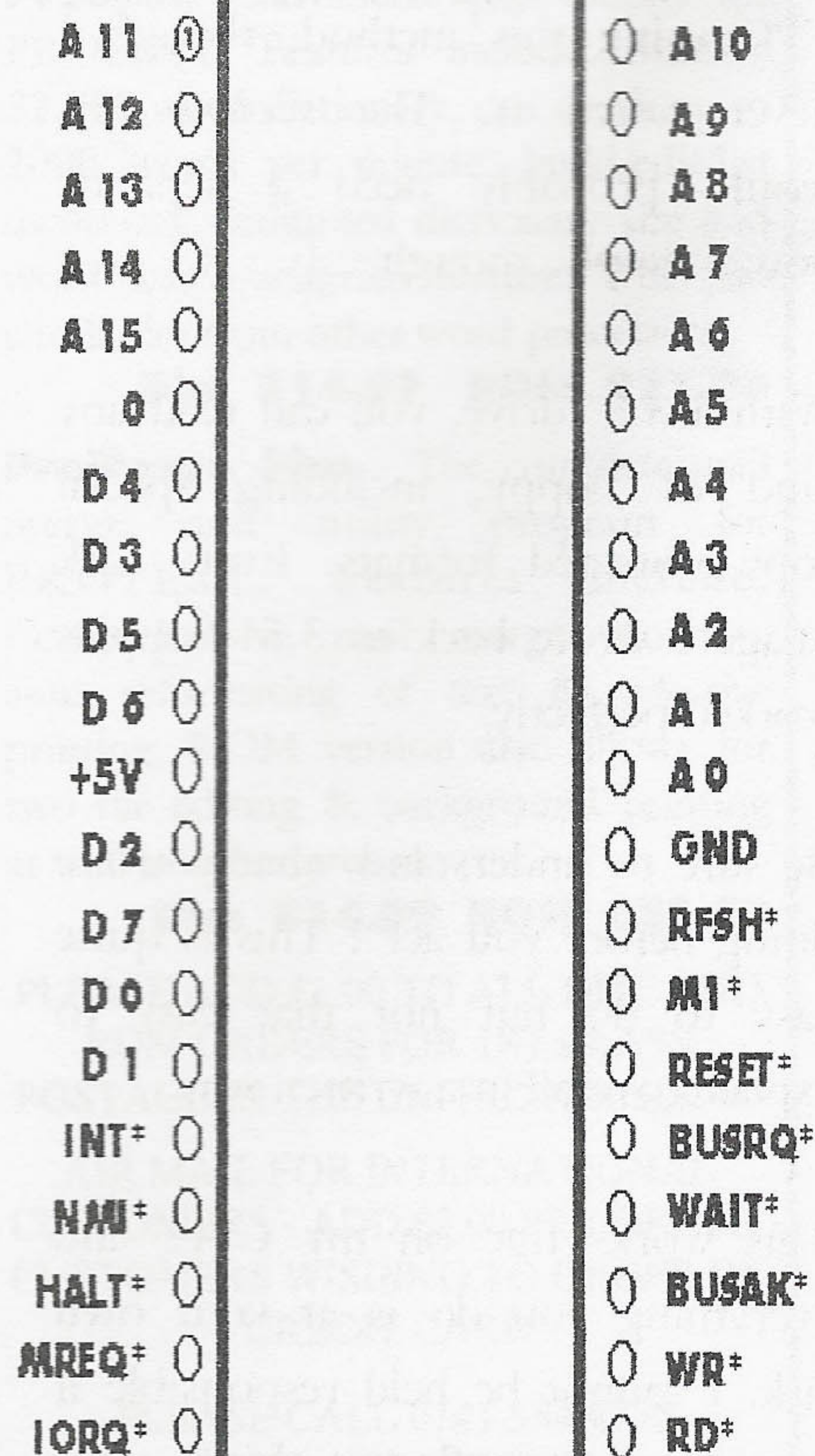But if you do decide to change your 3" disc drive we would love to hear from you. - *John*

Z80 Chip
In the next article you can read all about the Z80 chip that is the heart and soul of our Amstrad CPC's.

When I was doing the layout of James article I thought it would be a good idea to have a diagram that you could all refer to and so that is just what I have done. It was just a shame that I couldn't find the space to fit it in James's article.

So please accept my apologies and happy reading.

John

A11	A10
A12	A9
A13	A8
A14	A7
A15	A6
⌀	A5
D4	A4
D3	A3
D5	A2
D6	A1
+5V	A0
D2	GND
D7	RFSH*
D0	M1*
D1	RESET*
INT*	BUSRQ*
NMI*	WAIT*
HALT*	BUSAK*
MREQ*	WR*
IORQ*	RD*

A-Z of CPC Chips

by James Hoskisson

It occurred to me the other day that what WACCI needs is a good helping of technical stuff, so here it is, especially for you WACCI members, a whole series on each of the chips inside the CPC. I'd better warn you that since this stuff is fairly technical you will probably have to use machine code to apply a lot of it.

Introduction

Those of you of a pedantic nature may have already pointed out that there are too many chips in the CPC to discuss in detail so, for the purpose of the series.

I have decided to concentrate on the main chips: the CRTC, the FDC, erm.... the PPI, err.... hang on I'll just look them up..... the VGA, the Centronics Port Latch, and the most important one, the CPU.

If all of those names look like a five-year-old has had some fun with my keyboard, you'd be almost right, but I managed to persuade my dad to do something more constructive.

Anyway I assure you that they do mean something and I didn't just make them up to make me sound clever. You'll find out what they stand for in following issues (obviously Centronics Port Latch isn't an abbreviation).

I should mention here that this article is about the hardware aspects of the CPU and presumes that you have some knowledge of the programming side of things. This information should be useful to anyone who wants to make hardware for their CPC, or is just interested in how the whole thing works.

I should also point out that although the article is called the A-Z of CPC Chips, it isn't, basically. This is because I felt that I should start with the CPU so all the other chips can be understood in relation to this one, it being the chip that controls all the others.

Contrary to the order I have listed the chips, I'm going to start with the CPU. I was going to start with the FDC but I realised while I was typing it that it would make more sense to explain about the CPU since you need to know how it operates if you want to know how to use the other chips.

Introduction Take 2

First things first, as promised, I will now reveal to you what CPU stands for. It stands for Central Processing Unit. I'm not going to bother explaining why it's called that because it's pretty self-explanatory. If you wanted to imagine your CPC as a living thing this chip would be the brain, and come to think of it the heart as well.

The CPU in our dear old Arnold is the Z80A, made by Zilog. It was designed as a more advanced version of the Intel 8080 chip. It's amazing how those people at Zilog came up with such an original name for it!

This article is going to concentrate on the hardware aspects of the chip rather than the commands, as these have been covered several times. The way the chip operates the whole system has hardly ever been touched on.

Bus – The Only Way to Travel A bus is a collection of 'lines' (I'm talking about 'lines' as in tracks on a PCB here) that relays information in parallel, with each 'line' conveying one bit of information.

The Z80 has two buses, a Data Bus, and an Address Bus. The Data Bus is an 8 bit bus which means it has 8 'lines' to transmit and receive the information. The address bus is 16

bit, which means that it has 16 'lines' to transmit and receive information on. The more lines a bus has the bigger the number that can be transmitted on it is. The biggest number the data bus can relay is 255 because it only has 8 bits, whereas the address bus can relay any number up to 65535 because it has 16 bits.

You may be wondering as to the relevance of the size of the bus. Well basically, the bigger the bus the CPU can deal with, the more powerful the processor, because it can address more memory at the same time.

The Z80 can only address a maximum of 65536 bytes at a time due to only having a 16 bit address bus (2^{16} = 65536.) You're top of the range PC, with a 32 bit processor, can address 4294967296 bytes at once (2^{32}.)

To put that number in some kind of context that is 4096 Mb. That's a lot more memory than our humble CPC can address. That is why on the 6128 Amstrad came up with the solution of 'paging' the extra 64K of RAM over the first 64K so that it could be accessed by the user.

This is one reason why there are very few programs which actually use the extra 64K in the 6128. Once the RAM has been paged over the original, the information that was in the first 64K of RAM can't be accessed any more, making the programmer's life very difficult.

So What Are All Those Other Pins For? The address and data buses are the major part of the functioning of the Z80, but there are other pins on the chip which perform various other

tasks. Many of these are connected directly to the expansion connector at the back of CPC, as well as to the other chips. One of the pins i.e. The NMI pin is only connected to the expansion connector because Amstrad felt that if it was made available to the user it would be possible to disrupt the disc I/O operations and a few other things.

This actually turned out to be a bit of an oversight on Amstrad's part. I'll explain later. The Z80 CPU has 40 pins with 24 pins for the two buses and two pins for the 0v and the 5v supplies. This leaves 14 pins that need explaining, so I'll take them in turn: (All the pins are active low)

INT This pin is used to cause a maskable interrupt to occur A maskable interrupt is one which can be turned off by using the DI instruction. A Non Maskable Interrupt can't be disabled in this way.

This pin is activated by the VGA chip every 300th of a second and the program counter is put on the stack. The Z80 then jumps to &38 (depending on what interrupt mode it is in) and it is then re-directed to the interrupt handling routine.

The interrupt handling software decides whether it is supposed to do anything and if it does it jumps to the interrupt routine. If it isn't supposed to execute any interrupts it returns from where it left off.

This is why disc operations have to be performed with interrupts disabled, even if the Z80 isn't supposed to execute any interrupt routines.

NMI This pin is much like the INT pin except it isn't actually connected to anything. It can be accessed from the expansion port by the hardware but is only used by the Multiface II, as far as I know.

The main difference between this pin and the INT pin is that this interrupt is a higher priority than the maskable interrupt. When this pin is activated the Z80 stops what it is doing, after the current instruction, pushes the Program Counter on to the stack, and then jumps to &66 in memory.

The main flaw in Amstrad's design for the CPC was to make this pin available on the expansion port. This meant that any program could be frozen while it was executing and the code saved to disc. This meant that any programs could be copied by the multiface, which freezes the programs and then switches in its ROM to intercept the jump to &66 in memory. After that the Multiface can manipulate anything in memory and then return to where it left off because the Program Counter was pushed onto the stack. The anti-multiface program could then be used to load up any games that were saved by the multiface without the multiface having to be plugged in.

HALT This pin is an output from the processor. When this pin is low it means that a HALT command has been executed. The HALT command waits until there is an interrupt, i.e. the NMI or INT pin going low. After the interrupt has been dealt with the processor then continues from after the HALT instruction. In essence this pin is just to tell the hardware that the CPU is waiting for an interrupt.

MREQ This is an output pin and is used by the processor to distinguish between I/O commands and memory read and writes. This pin goes low whenever the CPU is reading a byte from RAM.

This pin and the IORQ pin are necessary so that the hardware can distinguish between a read/write to memory and a read/write to a port address. These are needed because both the hardware and the RAM are accessed by addressing them on the Address Bus, and then the data is sent or returned on the Data Bus.

This avoids the Data Bus being corrupted by two devices responding to the same address, e.g. If there wasn't an MREQ or IORQ pin and there was a command to write a byte to address &BC00 the CRTC register would be written to as well as the memory address.

IORQ This pin functions in exactly the same way as the MREQ pin except that it is used to tell the hardware that the address on the Address Bus is for the hardware and not for the RAM.

RD This pin is an output from the CPU. It goes low to indicate that it is trying to read a value from either memory or a hardware register. It is used so that the hardware can synchronise sending the data with the CPU.

WR This pin is like the RD pin, only it is used to synchronise the memory and hardware write operations, by the CPU.

WAIT This pin is an input. If the hardware isn't ready for any data that is to be read or written it can take this pin low until it is ready to send/receive the data. The CPU will wait until the line is high before the data is sent/received.

RFSH This pin goes low when the CPU is refreshing the RAM. This happens on the last two clock cycles of every op-code fetch. When the CPU is refreshing the RAM it needs exclusive access to the Address Bus, so it takes this line low to indicate to the external hardware that they can't use the Address Bus.

The RAM chips in the CPC are dynamic. This means that once a bit is written to the RAM it needs to be constantly re-written, otherwise the bit will be lost because the current constantly leaks out of the micro condensors in the RAM chip. The CPC automatically re-writes the bits every time it executes an instruction.

This is done by addressing each row in the memory chip. The CPU refreshes one row per command that it fetches from memory. After it has refreshed them all once it starts all over again, and so on.

M1 This pin is a bit of a dual-purpose pin. It is used in conjunction with the IORQ and the MREQ pins. If it is low and the MREQ line is low it indicates that the CPU is now fetching an instruction from memory.

If M1 is low and the IORQ line is low it indicates that an interrupt has occurred and that any hardware devices can place a byte onto the Address Bus. This is only applicable, though, if the CPU is running in interrupt mode 0 (it usually runs in Interrupt mode 1).

RESET This pin is an input. When it goes low the CPU is reset. This means that the PC is reset to &0000 and all the other registers are reset to 0. Interrupt mode 0 is selected and interrupts are enabled.

BUSRQ This pin is an input. If any hardware wants to use the Address Bus and the Data

Bus to access other chips without having to go through the processor this pin is taken low. When this pin is taken low the Address Bus, the Data Bus, the IORQ, the MREQ, the RD, and the WR pins are all taken to the high impedance state so that when the external device tries to put any information on these pins it won't blow the CPU.

BUSAK This pin goes low after the BUSRQ pin goes low. It indicates to the hardware that it is ready for it to use these lines. While the hardware is using the data bus directly the RAM isn't refreshed so if the Address Bus is going to be used for any extended period of time it will have to refresh the RAM itself.

CLK This pin is an input. It provides the clock rate that the CPU operates at. In the case of the Z80A processor the CLK pulse is 4MHz. The clock rate is generated by the VGA and is also available for use by external hardware devices on the expansion port.

Next Issue
You should now be fully conversant with how the CPU synchronises data read/writes with other hardware, so next month we will look at the FDC chip. So, until the next thrilling instalment, bye.

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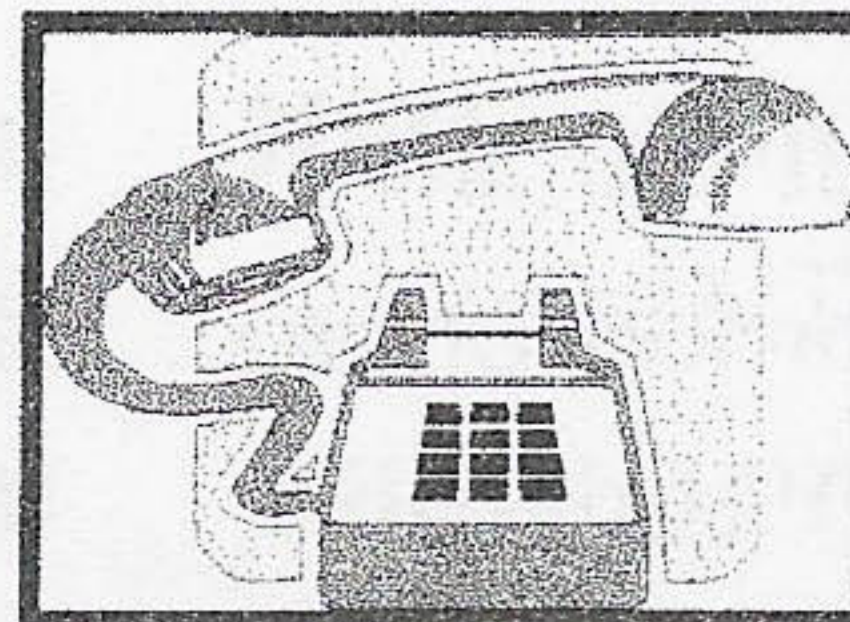
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-30-

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