80-BUS NEWS

MARCH—APRIL 1984 VOL. 3 ISSUE 2

- REVIEWS
  - NEW GEMINI PROGRAMMER
  - NASCOM ENHANCED BASIC
- THE IVC AND THE SVC
- NASPEN FOR POLYDOS

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The Magazine for GEMINI & NASCOM USERS

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Letters to the Editor

Nascom Plus Typewriter

Congratulations to you and your team on 80-BUS News. Has anyone tried using an Olivetti or Sanyo dual purpose printer/electric typewriter on a Nascom 2 yet? For some user-friendly advice on this would be well received. Electric typewriters have limited graphics but good quality printing.

With all good wishes, Ambrose Lambert, Stratton on the Fosse, Bath.

POLYDOS

Hello, angry of Tonyrefail here (again). Just writing to let you know that (i) my Nascom has just committed suicide, (ii) my dandruff has entered the terminal stage, and (iii) since writing to you a few months ago on the subject of starting a program exchange group for POLYDOS users, a la Dr. Dark's `circle of iron', I have received NO letters from you or anyone else (I counted them twice, just to make sure, and it's definitely NONE!).

I know my letters tend to be a little flippant, but I hope you took the time to read my last letter before throwing it in the bin! Or perhaps the people who use Polydos are a bit more apathetic than 'yer average NAS-NUT, and I'm the only one `wot wrote to you'.

Anyway, if you do hear from anyone interested in starting a Polydos fan club would you please TELL ME ABOUT THEM. Or, if such a group already exists, could you put ME in touch with THEM?

Do you know how lonely it is living half-way up a Welsh mountain? It would be very nice to talk to someone. Well, it'd make a change from talking to the sheep, they all have BBC micros, and hence, can't run POLYDOS (BAA)!!!

Yours, D.G. Richards, Tonyrefail, Mid Glamorgan.

Nascom - Who Are They?

Could somebody who reads this letter who is someway involved with Nascom/Lucas Logic please tell us why we, that is the devoted keyboard bashers, never hear or see anything advertised or reviewed to run on the micro? I personally have had a Nascom/Gemini etc., since it first came out (October 1979 I think) and whilst Gemini have continued to advertise on their own and through the Microvalue group, Lucas apparently have gone into limbo, is it the lull before the storm?

I now am presently looking to upgrade my system to high resolution colour with a Pluto board, if I can find somebody that stocks it and doesn't only get to special order, so that I can receive via the computer the weather satellite pictures transmitted from such as Meteosat 2. I have at present got a system working on a BBC model B which works, but the colour resolution and definition isn't high enough (note this is linked to the Nascom via the RS423/RS232 port), so if there is anybody reading this who wants to get rid of a Pluto board (cheap!!) I would be very interested and then I could write a piece telling you how I did it.

One other point can somebody at Henry's tell me if there are any more SYS's for CP/M since number 15 and if the Utilities disc has been added to or revised in the last six months.

Yours faithfully, D.J. Roche, B. Tech (Hons) A.M.I.E.E., Workshop, Notts.

[Ed. - On the question of SYS, this was withdrawn from sale some months ago, as outlined in previous issues of this mag. As regards one of your other points "Dear Nascom - is there anyone alive there?"]

NasPen Problem Revisited

Thank you for the answers to my questions in a recent 80-BUS which have now been extracted for filing in an appropriate place (not a waste bin).

We do have our wires crossed on the bit "NasPen Problem". I am actually running a Nascom 2 with Nas-Sys 3 monitor BUT the NasPen was the same set of EPROMs that I had for Nas-Sys 1 monitor. It was during the time between writing to you for help, and the letter being published, and getting more frustrated in between, that I learned that it was all to do with the off-set on the READ command. I have since had my EPROMs modified and all is now well. What did cause some confusion was that in all the literature I could find, no mention was made that NasPen was different for Nas-Sys 3. (My original 2708 ROMs are labelled NasPen VS 1-1 and NasPen VS 1-2.) It occurs to me that it might be worth while mentioning this to anyone who might be considering obtaining NasPen from someone who no longer requires it. In short NasPen to run with Nas-Sys 3 is not the same as NasPen made to run with Nas-Sys 1.

Incidentally, when I contacted Lucas about it, they would not accept that my original copy was from a bona fide dealer at the time. I bought my NASCOM as a kit when RAM A cards were being included for free.

Thanks again for the reply and I felt that the record had to be straightened out.

Yours sincerely, H.B. Piper, Sheffield.

Some Suggestion

Here are a number of suggestions I would like to make and they maybe worth a few words in a future issue:

Submitting programs and/or articles

- Do you prefer "camera-ready" listings or tapes? (We don't all have disks.) If tapes are used, which format would be both general or convenient? (We don't all have the same word-processor if any.)
- Some feedback on submitted material would be, to say the least, encouraging! (I submitted a software version of a real-time clock and my last hope of hearing about it is that it was published in the issue I did not receive.)

To be pragmatical why not print in each issue the list of received and not yet published material? It would be enough to have one line per entry stating for example the name, status (reviewed or not/will/will not be published/kept for special issue/ etc.), and any particular comments (unreadable/simplistic/send more of the same kind/etc.)

Subscriptions Why not print the "subscription due date" on the mailing stickers? It could be a useful reminder!

Thanks for the magazine quality, Jean-Michel Dasnoy, Brussels, Belgium

[Ed. - Thanks for the suggestions, comments are always welcome and will be ~~ignored in the usual fashion~~ acted on where appropriate. Some form of magnetic media is always preferable to hard listings - preferably Nascom 2 or Gemini RP/M formats if tapes are to be sent, we can't cope with Nascom 1 tapes. As far as the actual data format,we can cope with NasPen or WordStar type files, and failing that just send a straight ASCII file. As far as sub. reminders are concerned, these are always included in the last mag(s) on your current sub.]

Deliberate Errors!

Many thanks for publishing my two programms, COMPARE and INTEL-HEX DUMP, in the (rather belated!) Vol. 2 Iss. 6 80-BUS NEWS. To save you all the aggro, I'll tell you where DRH put in the deliberate mistakes when he transcribed them!

Firstly, in COMPARE, in sub-routine TADDR (D025), a CALL CONOUT should follow the LD E,0AH at D02E. In INTEL-HEX DUMP, in sub-routine LOADBUFF (8015), an LD BC,16 should follow the LD DE,BUFFER at 8018. Again in INTEL-HEX DUMP, in sub-routine TYPENDFL (80BE), the instruction at 80D1 should be LD A,01 and not LD A,L. I hope the above help to solve any problems which anyone may have had.

On the topic of GEMPEN and DISKPEN, I have GEMPEN VG:1. My question now is:- Can I purchase DISKPEN VG:3 on tape to run under RP/M, from any of the usual GEMINI dealers, or does this latest version need to access disks whilst in use, for such things as HELP overlays. One further question:- presumably the GM829 FDC card copes satisfactorily with the interfacing to a TEAC FD 55E or 55F drive, but can GEMINI'S distribution CP/M disk be simply slotted in and expected to run? TEAC drives are somewhat cheaper than Micropolis!

Did DRH make any sense out of the AMTOR spec I sent him some time ago?

Is there any advantage in swapping to the latest version of the GM812 IVC monitor, which I now belive is in a 2732 as opposed to my version in a 2716, when I don't have the latest keyboard? Exactly what are the differences between the two versions - does the later one have any extra "goodies" in?

Sorry I haven't had time to submit anything else for your perusal, but hopefully others will have done so. Keep up the good work on the magazine - rest assured that it's much appreciated. Please, no more 6-month gaps though!

Yours truly, Martin Davies, Tewkesbury, Glos.

[Ed. - As far as I am aware it is not possible to use the latest PEN on tape as, as you have observed, it needs to be able to access the Overlay files, and coping with this with a tape recorder would present quite a problem!

With regard to the Teac drives and Gemini CP/Ms, yes these will run, although the standard Gemini products assume the 10mS track-to-track time of the Micropolis drives, rather than the 3mS capability of the Teacs. They will still run perfectly alright, it's just that they will be a little slower than they should be, and for some reason the Teacs make quite a bit more noise when stepping at the slower rate. The much awaited (and awaited) Gemini CP/M with BIOS 3 will get around this feature when (if) it appears!

The IVC monitor situation is covered in David Parkinson's article in this issue, and hopefully that will answer your final question.]

POLYDOS

In the latest pricelist from Gemini I noticed that Polydos will soon be discontinued. If you should find it interesting for 80-BUS News' readers we are still supplying PolyDos and other PolyData Nascom software.

Yours truly, Piezodan Aps, Bakkedraget 55, Dk-3480 Fredensborg, Denmark

Nascom Dying?

Please find my next years subscription enclosed. What reminded me, was the receipt of the final Nascom Newsletter. This seems to indicate that Nascom is dying. I trust that Gemini is going to keep the breed gong. How about publishing a review of where Gemini are and what we might expect in terms of product development. Thanks for an excellent magazine.

Yours truly, M G Nixon, Chelmsford

Don't Forget

Please don't forget us humble Nascom 2 owners without disks. Otherwise, keep up the good work.

Yours truly, K Ward, Kent

Comments And Praise

I did not write to complain but to add my voice to the many people who have praised your efforts over the last two or three years. The magazine has been interesting in so many ways, often when the articles have been on subjects outside my own particular interests. The useful point is that as my ideas have matured and the hardware built up - so ideas and articles that were not of interest before now become relevant.

The only comment that I can make about future issues is that I would like to see more descriptions of system software capabilities written either by the originator or by experienced users. As I live some way from any dealer, knowing what one would get by buying a particlar software package is somewhat vague. The articles on CP/M have been useful but could go further. Don't laugh, but I would like to run Cobol. Is CIS-COBOL at #400 the only option? Adverts in Byte indicate it is available for CP/M at $29! I would have liked to have seen comparative reviews of PolyDos vs. NasDos before I bought my FDC. And so on. Thanks again for a great magazine that gets the words worn off by reading again and again.

Yours truly, Nigel Chetwood, Twekesbury, Glos

Mis-quoted

My congratulations on yet another splendid issue of the 80-BUS News. Lawrence (alias Mr D G Richards) has rather quoted anything I may have said to him (whilst tired and emotional) out of context - honest! I don't really think you are the Mafia .....

Yours truly, C Blackmore, Taunton

Nas-Graphpac

I have been catching up on my reading and came across the free dump of Graphpac in one of last year's issues. I have typed it in, and find it works perfectly on my Nascom 3 under NasSys 3 and NasDos, with ROM Basic. The only minor difficulty is in plotting or drawing circles in the pen-flip mode - presumably because some points on the circumference are plotted twice and hence flip twice (i.e. don't change). I find a ratio of 375 is right for my screen, and 400 or 415 to get a round circle in a screen dump to my MX80FT 2. Thanks for the magazine and the free software.

Yours truly, C R Case, Rugby

Utility Disk

I recently bought a copy of "Henry's Incredible CP/M Utilities Disk" for use on my ageing Nascom/Gemini system running CP/M Version 1.4. As the documentation tells you (when you have worked out how to decipher the DQC files - hint, TYPE file UTILITY.HLP), not all the goodies will run under CP/M 1.4. Worse, some of the most useful programs which were version independent, refused to perform, or had irritating quirks.

Fortunately, some very minor patches soon cured these problems. Here they are (addresses assume programs are loaded at 100H):-

HELP.COM For the NASCOM display, change the byte at address 02A3H from 17H to 0DH. This changes the page length to the correct value. Use DISKPEN or similar to reduce line length in the HLP files to 47 or less characters.

UNERA11.COM The program needs the track number at 03FAH to be changed from 02 to 03. I also changed the skew table (all of it - hence the repetition after 18 values) commencing at 03DFH to the values on the G805 Disk System. These are:-

01, 05, 09, 0D, 11, 03, 07, 0B, 0F, 02, 06, 0A, 0E,
12, 04, 08, 0C, 10, 01, 05, 09, 0D, 11, 03, 07, 0B.

CAT.COM & CATUD.COM This cataloguing suite was one of the most useful features of this disk, and it refused to work! I found later by accident that it functioned perfectly if I first hit the RESET key to disable SYS, then ran on the skeletal CBIOS in ROM. The clue to the problem was in the documentation, the only two programs of the suite which would not function under SYS were those that DRH had `improved´.

The problem is calls to the BDOS to find the User code, with register C set to 20H. Replacing all these calls with three NOP´s (00H) was crude, but seems to work. Locations were, in CAT.COM - 016AH, 0182H and 01C1H and in CATUD.COM - 0325H, 033CH and 0A30H.

None of the above changes are guaranteed bug-free, but they work on my system. Together with the disk-repair utility, the squash-unsquash programs, the SUB replacement to SUBMIT and the 8080 to Z80 translation program, all of which seem to function quite satisfactorily, these programs are an essential feature of any disk system (no, I don´t get any commission!).

Yours truly, I P Forbes, Brighton.

Reply To Waldo

People of 80-BUS, greetings.

Being, as I am, an exceptionally cool person, and a lunatic of some years standing (piles, you know), I couldn´t let Waldo `D.R.´ Dobbs´ letter (80-BUS, Jan/Feb 84) go without comment.

As can be plainly seen from Waldo Dobbs´ letter, the man is a genius! He has an insight into the ways of non-Nascom `computer´ users which can only be described as prophetic, or at least, inspired.

I know the above to be true, for, know you, I have seen the `worthless diseased molluscs´ creeping around the magazine racks in W.H. Smiffs. More, I have seen these poor misguided non-Nascom fools salivating over the displays of Vic 20´s, ZX Spectrums, Orics and, may my larynx drop out for uttering it, BBC micros, in such shrines of capitalism as Dixon´s and Curry´s.

At the present time, I am in considering prosecuting B++t´s The Chemist for breach of the Consumer´s Act. Do you know what they did? They opened a department in their Cardiff branch in which they sell the above-mentioned `computers´, and they call it their Computer Department. Now, as we enlightened ones know, the definition of a computer department (in this context) is, and I now quote from Dai Pugh´s classic work `A Boyo´s Guide to Mysteries of the Universe´, "..a computer department, look you, is a section of a shop reserved for the sale of Nascoms, Geminis and 80-BUS-related products, look you, mun..".

Going back to the subject of Waldo Dobbs, I knew a guy called Waldo, in, like, one of my previous lives, you know. I wonder if it´s the same Waldo? Do you know where Waldo Dobbs has his being? Wouldn´t it be a real downer if it turns out that Waldo is nothing more than an A.I. algorithm in a program called Dobbs, heavy!! If you hear from Waldo Dobbs again, tell him I know a guy who knows a guy who grows the greenest weed this side of ´frisco. This stuff is g´teed to be a ticket to Cloud 9.

Talking of getting high, I hear that there will definitely be 6 issues of 80-BUS this year. It´s already August and I´ve only had one issue so far, that means there are five issues to come between now and Xmas. Wouldn´t that be a trip!

The PolyDos Users Group, which was the subject of my letter printed in Jan/Feb issue of the mag., is now under way (sort of). Membership of the group now stands at six, one of which was in response to the letter you printed.

As you've probably noticed, my letters tend to be a little on the `Crazy' side, this is in an attempt to overcome the mind-numbing apathy which seems to go hand-in-hand with owning a Nascom.

Yours, until the end of this life,

`Head-crash' Richards, Tonyrefail, Glam.

And Waldo Again

Dear Slimewort, Are you like, totally blind, man? How anything can read SCUZZBALL as SAUZZBALL is something I find totally unbelievable, man. It should be ovvious that a scuzzball is a monstrous and vicious citrus fruit, whereas a sauzzball is a totally, like, plastic imitation, man.

Like, finally, man, if you an issue devoted to the totally worthless greaseballs of amateur radio, you will find it inserted in a totally awesome part of your anatomy, man. Any circuits for spark-gap type RFI generators (for, like, N-1, with original NASBUG pre-T2 compatible software, man), would be mega-cosmically total, man.

Like, totally, (and very slightly less hazardous) yours, man.

Waldo `D.R.' Dobbs (man!)

[Ed. - we couldn't read your writing in your first letter, and in this one the second paragraph makes no sense at all. Any offers to educate this man(?), man? No prices for guessing the missing word. Until next time, Mr Humphries?]

More About Nascom

Having just received Vol 3 Iss 1 of 80-BUS News, I was pleased to see the letter from Dr D Plews concerning the lack of interest from Lucas Logic.

I have had some correspondence with Lucas over the last six months and have been disgusted with their attitude, also their decision to cease supporting publication of the Nascom Newsletter, which has therefore died.

I also believe that Nascom is dead.

Lucas have told me they don't like the tone of my letters but they don't seem to realise that it was the loyal customer who made Nascom what it was and still could be. Several weeks ago, I wrote asking what would be available from Nascom in the future and also how I could legally join Prestel and MicroNet with my Nascom 2 but have had no reply. Lucas have brought out very few new products and don't even have a legal modem system for use with Prestel/MicroNet.

I know of many people who have sold their Nascom due to the lack of support and interest from Lucas. Their promises when taking over Nascom seem to have been forgotten. I have looked around at other computers but the Nascom is still the best and most versatile. It would appear now that my only option is to keep my Nascom 2 and exxpand it with 80-BUS products, but even so, is the legal Prestel/MicroNet expansion possible?

One final plea: With the death of Nascom Newsletter could we have a regular (say every 8 to 10 weeks) edition of 80-BUS News.

Yours truly, Robin Scadden (G3TFM9), Stratford-on-Avon

NASDOS

CLIFF WERNHAM would like to hear from any other NASDOS users who also feel cut off from the outside world! Phone 01-398-1948.

MONITOR.COM and Other Stuff

by Adrian Perkins

Introduction

This "article" is a collection of hopefully useful bits and pieces, on both the hardware and software front. It is hopefully the first of several such articles, assuming the Editor approves and deems this blurb fit for publication. It hopefully contains something of interest for everybody, but mention of a certain operating system is made occasionally.

HS-1N Revisited

Some of you may recall that a while back I wrote a review of the HS1N digital cassette system for the Nascom. Somewhere in the article I mentioned the possibility of a Cassop-HS1N interface. What has happened to it? I hear you ask. Well, it's like this... At about the time the article was published, a friend at work, Tim, bought a Cassop system. Armed with the source code for the Cassop (and a tape with some Cassop files on it) I had soon patched my HS1N software to read the Cassop tape. Well, the catalogue actually, for some reason I couldn't read in any files. The effort on that sort of fell by the wayside as I proceeded to upgrade to disks (see below). The end result is that the interface software is half-written, and my trusty HS1N is up for sale, at a very resonable (i.e. cheap) price (see the Ads. section).

I had an interesting letter from a Mr I.P Coole of Imperial College, London. He too owns an HS1N, and has reported that the tape drives increase speed with age. This had lost him a lot of software before he found out what was causing it. Well, I haven't noticed any problems, and neither has Tim reported any problems, so maybe it is a batch problem. Maybe any other HS1N or Cassop owners can comment? The cure suggested by Mr Coole (short of using a frequency meter which he describes as "messy") is to always transfer all the required files onto a new tape before adding any files if the old cassette is more than a month old. I tended to do this anyway - I prefer assembler work, and the size of files I was using precluded the saving of more than two on one side of a tape. Thus when editing a file, I would always save the new version to a new tape. Being the only file on the tape, it would thus improve the load-time for next time. This may explain why I never noticed the speed problem.

Cheap Disks (or Doing it the Hard Way)

When I bought my Nascom 2 over four years ago, I did so primarily to learn about micros. But I kept on adding this and that to it, but at no time did I consider fitting disks to it. Disks are, after all, a bit too expensive for something that's just a hobby. That's why I bought my HS1N system in the first place. Shortly before my HS1N article was published, someone (I forget who) in the local user group (NasTug) announced the possibility of getting some cheap disk drives. Pertec were discontinuing the FD250 drive and were flogging them untested, unguaranteed at some #50-#60 each. I saw my chance to finally upgrade to disks at a price I could afford, so I put my name down on the list.

Several months later, my name finally reached the top of the list, and despite comments of "Just wait till they fall apart" from A Certain Person (a shameful thing to say about a product his company was only too happy to sell to customers a few months previously), I collected my drives (and handed over the money). The drives had been tested by someone in the club and declared "working". A bit of high-pressure salesmanship by a certain local(ish) company ensured that nearly all of us used the (then) new Vfc. It made sense to me: there "ain't a lot of room" in my Kenilworth case, and anything that puts an

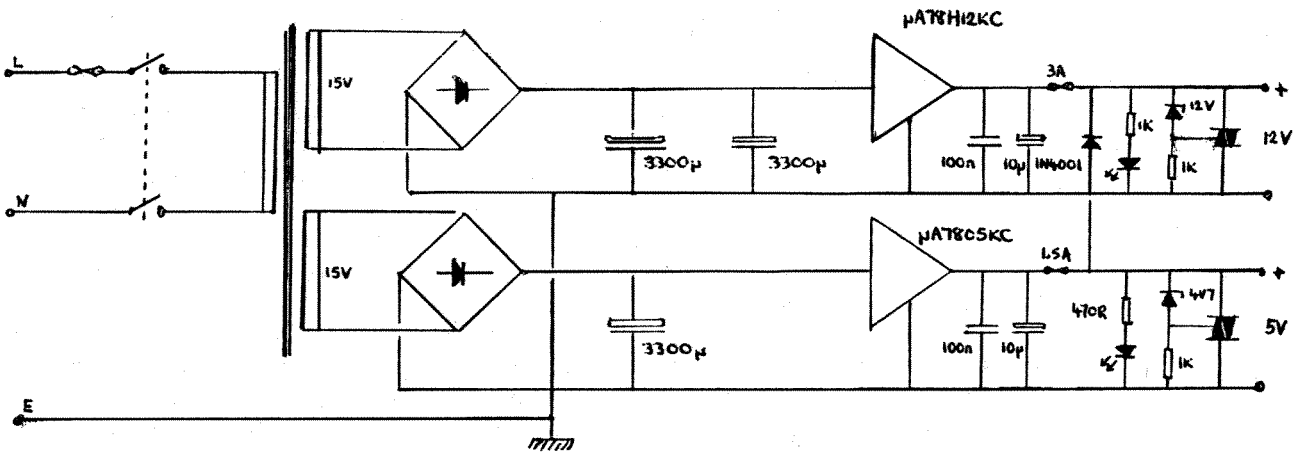
80x24 video and FDC on one card seemed like good news. Naturally, I bought the FDC-only kit version and it went together without any major snags (it needed a 'scope to set up, which I was able to borrow from work).

Next, I needed a PSU to power the drives. "No problem" I said, looking at the GM804K in Gemini's catalogue. "Don't do 'em any more" a smiling Dave Hunt informed me when I walked into Henry's to buy one. Well, I didn't want to buy the Gemini switch-mode job just to power a couple of disk drives, so I decided to design my own. The result is below. I hesitiate to say "professionally designed", since I don't exactly earn my pennies doing hardware design. Anyway, the spec. is as follows:

12 volts at 3 amps
5 volts at 1.5 amps

both outputs have short-circuit protection, are fused, and are crowbar protected.

The design is fairly standard, and can be built for under #30, including the crowbar protection.



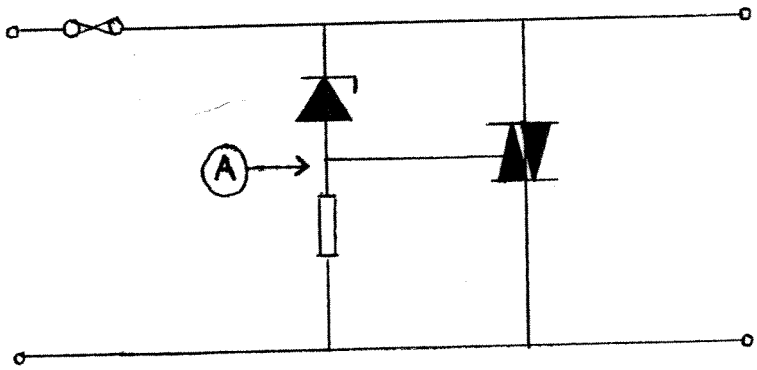
DISK DRIVE PSU
+12V @ 3A
+5V @ 1½ A

Protect Your Computer... With a Crowbar!

Many of you are probably wondering what the hell "Crowbar protection" is. Well, it isn't a way of protecting your prized computer against hoardes of plastic-box owners hell-bent on terrible revenge for all the nasty things we say about them... no, it's not that sort of crowbar. It is instead a neat little circuit you stick on the output of your power supply, and it ensures that should your 5v regulator in your computer PSU fail, and put unregulated voltage, or worse, mains, onto the 5v rail, your computer is safe. It works as follows: (see figure below).

Let us assume that all is well, and the PSU is outputting 5v. The voltage across the zener diode is 4.7v. This means that the voltage at point A is 0.3 volts. This isn't enough to trigger the triac, so nothing happens. Now let us assume that a fault has occurred, and the output voltage begins to rise. Because the voltage across the zener is constant at 4.7 volts, the voltage at point A will begin to rise. As soon as it reaches 0.7 volts, the triac turns

hard on, effectively short-circuiting the output and blowing the fuse. The triac will remain turned on until current ceases to flow through it (i.e. the fuse blows and/or the power is turned off). Note that the crowbar is fitted after the fuse: if it were fitted before the fuse, then should the fuse blow the computer would no longer be protected against peripherals putting what they like onto the 5v rail. I shall, in the best tradition of these things, leave it as "an exercise for the reader" to verify that the circuit also works should the power supply go more negative than -0.7v. It goes without saying that if you change the zener, you can use it on the other power rails.



CROWBAR PROTECTION CIRCUIT

Monitor.Com - The Bugfix(es).

Once I had got CP/M going, the first thing I did (alright - the second, first thing I did was to backup the master disk) was to install Monitor.Com, using NasSys 3 as the starting point. As many of you who are using this excellent piece of software are probably aware, there are a couple of minor "bugs" in the software, which are only significant if you (a) use overlays, and (b) like filling the disk up! Before describing how to fix these "features", I shall describe how I found them and what I did.

To help ease the transition to disk and CP/M, I modified Zeap, Nasdis, Debug to use the revised screen addresses, and I also took the opportunity to relocate them to 1000 hex. I was soon "REVASing" files, and then loading Zeap in over NasDis to edit the file. Needless to say it didn't appear to work: the start of the "REVASed" file appeared to be total garbage. The excellent debug facilities of NasSys soon pointed me in the right direction: the Fetch routine appeared to be loading the last 128-byte block twice. I verified (using DDT) that it wasn't a "feature" of CP/M itself, and so dis-assembled the disk drivers that Chris had added. I then referred to the CP/M manuals to find out what the code did.

It appeared that the Fetch routine was loading each 128-byte block, and then checking the BDOS error code. Thus when the end-of-file was reached, this wouldn't be detected until after the buffer (which contained the previously-loaded block) had been copied (again). Luckily, most of the disk drivers in Monitor.Com appear to be written in 8080 code, rather than more compact Z80 code, so the "patch" (what a horrible word "Patch" is!) is fairly simple. It consists of moving a few instructions and changing a few more instructions. (Note that you can use Monitor.Com for this one - anyone using DDT earns themself the "Dodo of the Decade" award.) Note also that all addresses given assume that Monitor.Com was typed in at the same addresses as in the original (Micropower), and sub-sequent, articles.

1 - Move the bytes at #A21 to #A30 inclusive up to #A24 using the I command.
2 - Add the following bytes at #A21: B7 20 12.
3 - Add the following bytes at #A34: 18 E3.

The code should now look something like this:

```
getblock:
        ld de,fcb
        ld c,read_seq
        call jbdos
 ; New code follows
        or a            ; set flags
        jr nz,err       ; eof, so jump
 ; original code
        ld hl,buffer
        ld de,(argl)
        ld bc,128
        ldir
        ld (argl),de
 ; New code
        jr getblock
 ; original code
err:
        cp 1
        ...etc
```

This appears to work: I've had no more problems since patching this in. I also took the opportunity to change the bytes at #996, #9B5, #A50, #A65 and #A8D to #C9. This changes the SCAL ZMRET codes to simple RET codes, and enables the F and P routines to be called from user programs (eg the ":" command in Zeap).

Now for the second problem: the P routine appears to "hang" when the disk is full. The patch ain't so simple: it requires additional code on the end of Monitor.Com, and where this goes will depend on where your particular copy ends (I had tacked a printer driver onto the end of mine).

1 - Change the bytes at #97C to C3 xx xx where xxxx is some spare memory after your Monitor.Com (the code here should look like this):

```
        ld de,fcb
        ld c,write_seq
        call jbdos
        cp 0            ; Set error flags
        jp z,write_block
; Here if error - disk full - New code
        jp full_error
; original code, no longer executed
        ...
```

2 - Add the following code at address xxxx :
11 5C 00 0E 10 CD 05 00 CD 24 09 EF 44 69 73 6B 20 66 75 6C 6C 2E 0D 00 C9.

The code should look something like this:

```
Full_error:
        ld de,fcb
        ld c,close_file
        call jbdos
        call swap       ; Swap CP/M and NasSys page 0
        rst prs
        defm "Disk full."
        defb cr,0
        ret
```

A Fix for Sys

Many of you disk users who are running under a certain O.S. are doubtless using Richard Beal's excellent, although unfortunately no longer available, Sys overlay BIOS. I certainly am, and excellent though Sys is, I have encountered one or two minor problems. The "fix" I am suggesting here is to make the "Automatic Page Throw" code a bit more intelligent. One problem is that although my printer (an MX80 F/T) recognises form feeds, it doesn't do an automatic "skip over perforation", so I set the appropriate option to allow Sys to do this. When you do this, Sys converts form feeds to CR/LFs. I didn't like this, so I patched (there's that word again) Sys to output form feeds unaltered. A problem exists, however, in that if a form feed is issued when the printer is already at the top of a page, an extra page throw is sent which results in a page being wasted. Things are further complicated when you consider that some utilities may try to "help" by issuing extra CR/LFs to ensure the perforation is skipped. An example may be NasDis running under Monitor.Com. With Sys and Revas both supplying extra CR/LFs, the listing can get "out of step", so to speak.

The solution I have come up with is to make the "Skip perforation" code in Sys more intelligent: if the printer is already at the top of the page, Sys will "throw away" any extra form feeds, CRs and LFs that may be sent before any printable characters are sent for that page. This code hasn't had the fullest of tests, but I have checked it against a few trial runs of outputting files which, because I have also got the "line length" check built into Sys, had caused problems before. The listing is the part of module Sysb4.Mac, which contains the printer driver. Both "new" and "old" code is shown, with switches to select the one you want. This should help you if you want to type in my "additions".

[Ed. - Mr Perkins article now goes into a discussion as to the rights and wrongs of the current legal situation re. BIOS copyright, SYS, etc. As the comments he makes are wholly mis-informed they have been removed, as to comment on them would be sub-judice.]

NASIO

It's good to see that the Editor is trying to draw up a map of all the I/O ports used by the various boards available. However, the bit about Nasio support perhaps doesn't go far enough, since some manufacturers don't do Nasio properly. The 80-Bus specification says that Nasio is taken low to indicate a Nascom I/O address, which to me means whenever you try to access ports 0-7 inclusive, which are the ports used on the N2 card. Therefore it should be high at all other times. It is also an open-collector line. Now some manufacturers simply invert address line A7 and call it "Nasio". I know that Map do this on both the ram and vfc. The clue comes in their documentation, which says that the Nasio link is to be made "...only if no other card is generating Nasio". This implies that the line is NOT an OC line, and that bus

```
; Part of Sysb4.Mac. Original code by Richard Beal.
; Modified by Adrian Perkins 1-Jan-1984 to support the following:
; ajp001 - Perform page throw by form feeds, not CR,LF
; ajp002 - When at top of page, "throw away" spurious CR, LF, CS
;
ajp001  equ true        ; true for form feed, false for CR,LF
ajp002  equ true        ; true for "intelligence", false original
;
        if ttycs or lptcs or ullcs
; Routine to support automatic form feed
;  and perforation skip
        if ajp002
top_flag:       defb 0  ; 0 = top-of-page, #0 = not at top
lhs_flag:       defb 0  ; 0 = at lhs of page, #0 = chars on this line
; Ignore CR, LF, CS if at top lhs
ckcs:   ld a,c
        cp lf
        jr z,ck_top
        cp cr
        jr z,ck_top
        cp cs
        jr z,ck_top
        ld hl,lhs_flag
        r
        ld (hl),1
        jr ckcs1
ck_top: ld a,(top_flag)
        r
        or a
        jr nz,ckcs1     ; If NZ not at top
        ld a,(lhs_flag)
        r
        or a
        jr nz,ckcs1     ; If NZ not at lhs
        pop hl          ; Discard print address
        ret
ckcs1:  ld a,c
        else
ckcs:   ld a,c
        endif
        cp lf
        jr z,lf1        ; Handle line feed
        cp cs
        ret nz          ; Ignore if not CS or LF
; Handle CS
        pop hl          ; Get return address
        ld (lstcl),hl   ; Save return address
        r
        if ajp001
        jr skips
        else
cs1:    ld a,(lcnt)     ; Get line count
        r
        or a
        jr z,skips      ; Perforation skip
        dec a           ; Next line
        ld (lcnt),a
        r
        call feed       ; Do CR/LF
        r
        jr cs1          ; Loop until end of page
        endif
; Handle line feed
        if ajp002
lf1:    ld hl,top_flag
        r
        ld (hl),1
        ld hl,lhs_flag
        r
        ld (hl),0
        pop hl          ; Get return address
        else
lf1:    pop hl          ; Get return address
        endif
        ld (lstcl),hl   ; Save return address
        r
        call feed1      ; Do LF
        r
        ld hl,lcnt      ; Decrement
        r
        dec (hl)        ; .. line counter
        ret nz          ; Not at end of page
        if ajp001
        ld c,cs
        endif
; Perforation skip
        if ajp002
skips:  ld hl,top_flag
        r
        ld (hl),0
        ld hl,lhs_flag
        r
        ld (hl),0
        else
skips:  ld a,(lskip)    ; Lines to skip
        r
        or a            ; Could be none
        jr z,ckcsx
        ld b,a
skips1: push bc
        call feed
        r
        pop bc
        djnz skips1
        endif
ckcsx:  ld a,(plpag)    ; Reset line counter
        r
        ld (lcnt),a
        r
        if ajp002
        jr feed2
        else
        ret
        endif
; Send CR/LF through the calling routine
feed:   ld c,cr
        ld hl,feed1     ; Return address
        r
        push hl
        ld hl,(lstcl)   ; Caller address
        r
        jp (hl)
; Send LF through the calling routine
feed1:  ld c,lf
        if ajp002
feed2:
        endif
        ld hl,(lstcl)   ; Caller address
        r
        jp (hl)
        endif
```

conflicts would ensue if more than one card tried to generate Nasio. This is borne out by the circuit diagram for the ram. (Incidentally, Map say that the circuit diagram for the VFC is "now available".) Now some of you may look up the NasBus issue 3 spec (in the N2 manual) and cry "Nasio is not an OC line!", so who is right? Well, my Nascom I/O card generates Nasio correctly, and treats it as an OC line, so I guess it was either a misprint or Nascom changed their minds.

I know this may seem a trivial point to go on about, it's just that I like all I/O peripheral cards to generate Nasio, so that I can unplug, say, the I/O card and still have a working Nascom. I initially connected the Nasio link on my Map VFC, as well as having the I/O card generating Nasio, and consequently took a VERY long time getting the RS232 on the I/O card to work properly, all because the I/O card and the VFC were arguing over Nasio.

RS232

This brings me neatly onto my next topic. I was surprised to read that Rory O'Farrell has been having problems PIPing COM files over the RS232 interface. A short time ago I had a similar problem, in that I needed to get some files transferred from an ICL PC to my Nascom. I tried using PIP, and like Rory didn't have much success. It would open the file, but didn't seem to "know" when the ICL PC had finished transmitting. The file was probably in memory, but I didn't know where. I also encountered problems of different buffer sizes (no RS232 handshaking!). I solved this by writing a very simple program to run under Monitor.Com which read characters from the serial interface into memory. Then when the ICL PC had finished transmitting, I pressed RESET, re-loaded Monitor.Com, and, because the cold boot loader leaves the TPA alone, there was my file in memory, waiting to be saved.

The ICL PC had preceeded the file by sending about 40 NULLs, and terminated the file with about 40 more nulls (and a control-z character!), but by using DDT on the ICL PC I was able to determine the exact size of the file, and how it began, so it was easy to identify where the required program was. Very simple, and so much easier and quicker than using a disassembler!

Re-Inventing The Wheel

It has occurred to me while upgrading to CP/M that I would need to translate all my Zeap files to Macro-80 format, and all my Nascom Basic files to MBasic format. This will doubtless require the writing of some simple (or not so simple?) program. Now how many other people have written such utilities? Quite a few, I would imagine. What a total waste of time and effort if such routines already exist! I wholeheartedly agree with Dr. Darks comments about "idle bodies" in this context. Such routines would be so massively useful to Nascom (and Gemini owners who have switched from Nascom?) that I am sure Mr Editor would publish such an article were it to be submitted. This is why Dr. Dark's "Ring of Rust" software circle has got to be a good idea, in that everyone can swap such useful little utilities. As I write, I am not on the "ring" yet, but then I only wrote to Chris a week or so ago asking to be included.

Why have I not written such utilities yet? Well, I have just written a Zeap to Macro-80 preprocessor, which will be put on the "ring" in due course, and, of course, written up into an article for this magazine just as soon as I have written a Nascom Basic to MBasic preprocessor.

Another Hardware Tip

Here is a hardware tip that is so massively useful, and yet has never been put into print... The scenario: you've just built (from a kit) the latest goodie for your computer. The time comes to check the board for bad joints, etc. Problem: the board is covered in flux splashes, making it difficult to check the board properly. I have discovered that proprietary Dry-Cleaning fluid is excellent at removing (fresh) flux from boards.

The technique is simple. Hold the board to be cleaned upside down (solder side uppermost), and at an angle (with the edge connector at the top). Apply a smallish amount of the fluid to the board, enough to wet the board. Using an old toothbrush (or similar), scrub the solder joints to ensure that the flux is loosened and dissolves in the fluid. Allow the fluid to run to the bottom of the board, carrying the flux with it (now you see why the edge connector has to be at the top - flux is a good insulator!), and allow to drip off the board and evapourate. Repeat with another small amount of fluid to "rinse" the board. If, after this lot has evapourated the board is sticky to the touch, there is still some flux left on the board, and another scrub/rinse is required.

There are several points to note: this stuff evapourates very fast, so unless you can afford to "slosh it around" work on small areas of the board at a time. Second, and more important, this stuff is POISONOUS, so make sure the room is WELL VENTILATED (don't want to lose any readers!). Third, for some reason this only works on fresh flux: it won't work on that board you made six months ago. This is probably due to the flux oxidising, or something.

The end result will be a VERY professional finish, and it will be simplicity itself to find bad soldered joints. I tried this on my Ram after it didn't work first time, and was surprised how many bad joints this revealed. Once these had been fixed, I plugged my Ram back in, and it burst into life (so to speak).

CP/M 3

There has been a little discussion on CP/M 3 in this magazine, together with Mr Editor's thoughts on the matter. I know next to nothing about CP/M 3 except what has already been said in these hallowed pages. Now some of you may be wondering why Map80 are supplying CP/M 3 when Gemini aren't. Well the reason is simple (so I am told). CP/M 3 works with the MapRam, but Gemini can't get it to work on their GM833 Ram Disk! Mind you, my source was rather biassed... [Ed. - Yes, it was! Gemini could have supplied CP/M Plus (that is its official name) some 18 months ago, when they had it running using multiple GM802 RAM boards. However they decided that there would be insufficient demand given the market at that time, and the costs (to the customer) involved. With the arrival of the Gemini GM862 256K board I suppose there is always an outside chance that Gemini may change their minds, but I wouldn't hold my breath waiting ....]

Open Letter to Richard Beal & Dave Parkinson

In one of his book reviews, Rory said "oh, for a book on CP/M using Z80 mnemonics!". Doubtless the entire disk-based readership of this magazine agreed. So some on you two, you know more about CP/M than the rest of us put together, so how about a Z80 CP/M book? (It could even be published by the 80-BUS News Publishing Company Ltd Plc Inc...).

DOCTOR DARK'S DIARY – EPISODE 21.

This looks as if it will be a short article, judging by the notes I have made, which are also short. The plain fact of the matter is that I have been wickedly neglecting the trusty Marvin for another computer! Actually, several computers, some of which are quite large, while one of them is a Spectrum. The non-Spectrum computers belong to British Telecom. Well guessed, it's a not very obscure reference to Prestel.

For the benefit of anyone from another planet who may be reading this, Prestel is a mighty collection of databases you can access by phone, if you have the right gear to do it. At present, Marvin is not the right gear at all. I hope that one day he will be, however, even though the technical people at Micronet thought I was joking when I rang them up to ask about the chance of connecting a Nascom. All it will need is a suitable modem and the easy bit, some software (a joke). The modems available at the moment are quite good, but I think I can wait long enough to be able to get a very good one for less money. The Miracle one, with autodial and auto-answer, costs about #200 by the time you have added VAT and the like. Once it has a bit more in the way of competition, perhaps the prices will slide down. Then I will be able to flog the Spectrum and VTX 5000 modem I am using, and put Marvin to work as a Prestel terminal, as well as all his other uses.

The ability to store frequently read Prestel pages on disc, so that they can be read without piling up telephone call charge units would be nice, as would the clarity of the Pluto display, compared with the blur of a Spectrum! Now that you know I am on Pretzel, you know how to send messages to me without all the expense of buying postage stamps. Incidentally, for those of you wondering if you should subscribe to Micronet 800, I can honestly say that they are hopelessly slow to update their pages, so much so that they make Micropower magazine look regular (it is, it just happens to be an annual!) by comparison. The letters to the editor, which Micronet say is updated "at least twice a week" have now stayed the same for in excess of three weeks. The main thing the "micro-news" reporters write about is what it is like to be a micro-news reporter, what they ate at the Sinclair QL's launch, what they drank at the Microfair, and so on. They are nearly as bad as yours truly...

Mention of the possibility of a price slide for modems has reminded me of another thing that should have slid, but has not. The price of 4164's seems to be very stable, which is not good news, as I have a nice new 256K RAM board with 32 empty sockets. The terrible world shortage of silicon must be to blame! Joking aside, the shortage of RAMs and TTL is getting to be a real pain. My new board has 33 sockets empty, actually, as Maplin have let me down. I tried to buy a 74LS32 from them, a simple enough request, you might think. But no! The message from their computer was "code D", which on translation seems to mean "we haven't got them, and we don't know when we will get them, and we bet you can't get them anywhere else before we get them". I also got the impression that they didn't much care, either. Maybe one of the other firms will come up with the goodies... (Generous readers with spare 74LS32's, please don't send them! I have just spotted one I can pinch from a board I am not using at present!)

Spectrum Tape Format Conversions.

I have been sent a couple of interesting programs to do with this. Dr M D Hendry sent a machine code program to run on the Spectrum, which makes it dump to tape in Nas-Sys tape format at 300 Baud. Very crafty, and I think I suggested he should send it in for possible publication. Dennis McLaren sent in a Nascom machine code program that reads Spectrum tapes, dumping the result

in memory. It is quite short, and I would have put it here, but for two things. One, I would have deprived the author of the chance of getting paid for his work. Two, the program doesn't distinguish between the header blocks and the program data, it just stores everything it reads. But the amount of tape format compatibility between the two machines is a surprise. If I ever find the time, I really must write a program to transfer things to and fro properly. Or perhaps one or both of the above named programmers will get it together first, and save me the bother!

More Bit Power Please!

I thought I saw an advertisement for a sixteen bit Galaxy computer recently! If there is such a thing in existance, it would be nice to know more about it, such as what processor it uses, whether the board is to 80-BUS standard and whether it can be bolted onto Marvin. If the manufacturers would like it reviewed by me, they have only to pop one in the post! Meanwhile, I have sent a request via Prestel to the ACC for information about their 68000 board, which could well make a nice project for me. I have not built anything for a long time, and feel the need to solder something! I was not able to get the 64 transputers I wanted...

General Stirring.

There must be more than one school using Nascoms, judging by the different photographs one sees in various computer programmers' magazines. It would be nice to hear from the people who are using these machines, and to know what they are using them for, whether they read this magazine, and whether they want any kind of help from us!

And if I was in charge of the Nascom part of Lucas, I know which magazine I would send my newsletters to, so that they would be published in the year they were written!

Sorry this is so short, but I have to get back to M203, the Open University cure for sanity, otherwise I will never know enough maths for the unbelievable graphics program I will one day get round to writing!

END.

SMALL ADS

Wanted.
Pertec FD 250 double-sided, single-density disk drive, suitable for GM805 system. J M Harding (051-608) 1796.

For Sale
Nascom 2 cased, with 64K RAM, 'A' board (4 MHz, no waits). #220 ono. Cliff Wernham, 01-398 1948.

Nascom 2 with 32K RAM, BASIC toolkit, graphics ROM, assembled in case, with manuals, #100. Crofton 9" green screen monitor, #40. J Curtis, 01-669 7061, (Wallington, Surrey).

Nascom 2, 32K RAM, together with IVC card, GM815 Dual Floppy Disk System and GM809 Controller card, Grange micro-cassette system, Imprint ROM, and PolyText, PolyDos and full documentation/manuals on above. Offers please on whole system or parts thereof - any reasonable offer considered. Call Peter Wood, Potters Bar 54896.

A POLYDOS Version Of NasPen

By Alan Melia

Because many Nascom users, who, like myself, started with cassette systems, would have bought and installed NASPEN, it was felt that a POLYDOS compatible version might be more acceptable than a change to say POLYTEXT. Personally, being mean, and having spent my pocket money for this month, I wanted to get my cassette text files onto this excellent disk operating system. The advantage of POLYDOS is a good manual, with some very useful examples of how to use the PolyDos subroutines, and a relatively simple guide to producing purpose-built file-handling overlays. Armed with these tools and a trusty Nasdis listing of my Naspen, I set to work to try and produce a usable system.

First Naspen was copied to disk, and the ROM was removed to leave RAM at B000 to BFFF. A careful investigation of the Nasdis listing showed that the NASPEN command decoding table started at B999H. The table consisted of a three byte entry for each command, the table being terminated by a catch-all jump to a 'command error' subroutine.The first byte is the ASCII value of the command symbol,the second and third give the address of the routine to execute the command (bytes reversed, of course). I determined to reallocate the "R" and "W" commands to the new disk routines to retain some compatibility with the original usage. I further decided that I required to keep the cassette routines to retain compatibility with several other local 'Nascomaniacs'. A skim through the handbook for Naspen will confuse by offering duplicate commands for cursor-up and cursor-down, "+ & -" as well as the normal cursor keys. Thus I determined to replace the "+ & -" with commands "r & w" for cassette read and write, and altered the "R & W"entries in the table to point to the new disk routines in the overlay. This means that only a simple patch is required, rather than a full re-assembly job. A further modification that was found necessary was to re-program the "return to Nas-sys". The original Naspen return reinitialises Naspen by jumping to 0000H rather than that well-loved line, DF 5B. Unfortunately it was not sufficient to add the "DF 5B" code, as the rentry to PolyDos leaves the keyboard in "typewriter" mode. So a few more bytes of code were required to reset "K0". First, a seperate file was written and debugged. This file contained the code nessessary to access the PolyDos routines, and had to be loaded before Naspen was called. The ploy worked quite well, but flushed with success, I decided that it would be far tidier if the extra file was loaded automatically when Naspen was called. The proceedure used was to rename Naspen with an extension "NP" instead of the more usual "GO" machine-code extension. An overlay routine was then written and called "NPfh.OV". The overlay program is loaded and executed automatically when you type "NASPEN".The overlay loads NASPEN at B800 and the extension file "NASPEX" at B000. It then initialises the printer and cold-starts NASPEN. The sequence of operations is then as follows:-

1) Call Naspen by typing "NASPEN" after the "$"prompt

2) PolyDos sees that NASPEN has the extension "NP" so it loads the file "NPfh.OV" into the overlay area (C800 onwards), and executes it.

3) NPfh.OV loads the NASPEN file and the extensions "NASPEX.GO" and jumps to the start of NASPEN at B800H. If this confuses, read the POLYDOS manual on overlay file handlers.

```
;***** NASPEN extension file "NASPEX.GO"****
;
        REFS    SYSEQU
        REF
;This Program is an add-on for NASPEN to allow
;text files to be loaded and dumped to disk via
;POLYDOS using the NASPEN commands W & R .The
;tape commands are retained by replacing the
;+ & - commands by r & w. This program and the
;main Naspen code are loaded by the overlay
;'NPfh.OV' which also performs a cold start.
;The printer routine intercepts the codes and
;converts a "CTRL D" into an "escape" code
;which should allow printer control strings to
;be embedded in the text.
;
WARMST  EQU     0B806H
;
;
        ORG     0B000H
        IDNT    $,$
        JP      WARMST          ; Warm start NASPEN from B000H
        JR      DREAD           ; Read file routine is at B003H
        JR      DWRITE          ; Write file entered from B006H
        JP      PRINT           ;
        JR      QUIT            ; Exit routine (resets printer)
QUIT    LD      HL,0            ; SET UP FOR
        SCAL    "K"             ; NASSYS KO (UPPER CASE DEFAULT)
        SCAL    ZMRET           ; BACK TO POLYDOS
;
;******* Text entered from disk **********
DREAD   RST     PRS             ; Comments as POLYDOS manual
        DB      ' Load which file? ',0
        SCAL    ZINLIN
        LD      HL,20
        ADD     HL,DE
        EX      DE,HL
D1      LD      HL,S1FCB
        LD      B,110B
        SCAL    ZCFS
        SCAL    ZCKER
        SCAL    ZRDIR
        SCAL    ZCKER
        SET     4,B
        SET     5,B
        SCAL    ZLOOK
        SCAL    ZCKER
        LD      HL,(S1FCB+FLDA)
        LD      DE,(S1FCB+FSEC)
        LD      A,(S1FCB+FNSC)
        LD      B,A
        SCAL    ZDRD
        SCAL    ZCKER
        RET
;
```

```
;******* Text saved to disk *********
DWRITE  RST     PRS             ; Comments as POLYDOS manual
        DB      ' File name? ',0
        SCAL    ZINLIN
        LD      HL,14
        ADD     HL,DE
        EX      DE,HL
        LD      HL,S1FCB
        LD      B,100B
        SCAL    ZCFS
        SCAL    ZCKER
        SCAL    ZRDIR
        SCAL    ZCKER
        LD      HL,0
        LD      (S1FCB+FSFL),HL
        LD      HL,(NXTSEC)
        LD      (S1FCB+FSEC),HL
        EX      DE,HL
        LD      A,(101BH)       ; GET MSB OF END
        SUB     10H             ; SUBTRACT START ADDR
        LD      B,A             ; STORE IN B
        LD      A,(101AH)       ; GET LSB OF END
        OR      A               ; SET FLAGS
        JR      Z,P1
        INC     B
P1      PUSH    BC              ; STORE FOR LATER
        LD      HL,0
        LD      L,B
        LD      (S1FCB+FNSC),HL
        LD      HL,1000H
        LD      (S1FCB+FLDA),HL
        LD      (S1FCB+FEXA),HL
        POP     BC              ; GET NO OF SECT BACK
        SCAL    ZDWR
        SCAL    ZCKER
        LD      HL,S1FCB
        CALL    ENTR
        RET
ENTR    SCAL    ZENTER
        RET     Z
        CP      31H
        RET     NZ
        PUSH    HL
        LD      HL,FSFL
        ADD     HL,DE
        BIT     0,(HL)
        LD      A,33H
        JR      NZ,SKIP
        SET     1,(HL)
        POP     HL
        JR      ENTR
SKIP    POP     HL
        RET
; THIS IS A ROUTINE FOR THE EPSON RX80 PRINTER
;with CENTRONICS INTERFACE
```

```
;
BASE    EQU     4H
CENPAD  EQU     BASE
CENPBD  EQU     BASE+1
CENPAC  EQU     BASE+2
CENPBC  EQU     BASE+3
;
;INITIALISE THE PORTS,PORT B TO O/P,PORT A B.D
;
PRINT   PUSH    BC
        PUSH    DE
        PUSH    HL
START   PUSH    AF              ; SAVE CHARACTER
        CALL    INIT
;EXAMINE BUSY LINE TIL FREE
LOOP    IN      A,(CENPAD)
        RRA
        JR      C,LOOP
;PRINTER FREE SO SEND A CHAR
        POP     AF
        PUSH    AF
        CP      4               ; Is it "CTRL D"
        JR      NZ,NOTESC       ; no
        LD      A,1BH           ; yes, output an "escape" code
NOTESC  OUT     (CENPBD),A
        NOP
        LD      A,0F0H
        OUT     (CENPAD),A
        NOP
        LD      A,0FFH
        OUT     (CENPAD),A
        POP     AF
        CP      0DH             ; is it end of line
        JR      NZ,DONE         ; no
        LD      A,0AH           ; yes, then output a lf char.
        JR      START
DONE    CP      0AH             ; did we op a lf?
        JR      NZ,NOTLF        ; no
        LD      A,0DH           ; yes, put back cr for RET to main
NOTLF   POP     HL              ; routines
        POP     DE              ; get back registers
        POP     BC
        RET
INIT    LD      A,0FFH          ; set up PIO for centronics H/S
        OUT     (CENPAD),A
        OUT     (CENPBD),A
        OUT     (CENPAC),A
        LD      A,0FDH
        OUT     (CENPAC),A
        LD      A,0FFH
        OUT     (CENPBC),A
        XOR     A
        OUT     (CENPBC),A
        RET
        END
```

```
;**** POLYDOS Overlay "NPfh.OV" ********
        REFS    SYSEQU
        REF
PRINT   EQU     0B007H
;This Program is a POLYDOS file handler for
;NASPEN.This overlay allows text files to be
;loaded and dumped to disk via an extension
;program NASPEX. The extension program
;adds the disk facilities using the NASPEN
;commands "W" & "R" .The cassette commands
;are retained by replacing the "+" & "-"
;commands by "r" & "w". The extension file is
;loaded at B000H, and contains a printer driver
;for the Epson printer allowing some of the
;control codes to be output to the printer. This
;overlay initialises the printer on a cold start
        ORG     0C800H
        IDNT    $,0
        DB      'NPfh'
        LD      DE,FNAME1       ;Point to filename string
        CALL    D1              ; load it into memory
        LD      DE,FNAME2       ; next string
        CALL    D1              ; load it
        CALL    PRINIT          ; Initialise EPSON RX80 printer
        JP      0B800H          ; Cold start NASPEN
;****** DISK FILE LOADING ROUTINE *******
D1      LD      HL,S1FCB        ; Comments as POLYDOS manual
        LD      B,110B
        SCAL    ZCFS
        SCAL    ZCKER
        SCAL    ZRDIR
        SCAL    ZCKER
        SET     4,B
        SET     5,B
        SCAL    ZLOOK
        SCAL    ZCKER
        LD      HL,(S1FCB+FLDA)
        LD      DE,(S1FCB+FSEC)
        LD      A,(S1FCB+FNSC)
        LD      B,A
        SCAL    ZDRD
        SCAL    ZCKER
        RET
;*****  PRINTER INITIALISATION *******
PRINIT  LD      HL,INIT$G       ; point to init. string
        LD      B,(HL)          ; load length of init. string
        INC     HL              ; bump on pointer
P2      LD      A,(HL)
        CALL    PRINT           ; This routine is in the extention
        INC     HL              ; file just loaded
        DJNZ    P2              ; loop til done
        RET
;FILES TO BE LOADED BY OVERLAY ROUTINE
FNAME1  DB      'NASPEN.NP'     ;MAIN NASPEN CODE
FNAME2  DB      'NASPEX.GO'     ;FILE WITH EXTENTIONS
INIT$G  DB      0BH,1BH,40H,1BH,43H,42H,1BH,4EH,6,1BH
        DB      6CH,8
        END
```

The extension file is a chance to add some extra facilities to NASPEN. I have included a printer driver for a centronics driven RX80. The main reason for this was that I found I had three program modules fighting over the print format if I used the built-in POLYDOS routines. It also gave the opportunity to invent a way of putting control sequences to printer. The main problem is that Naspen will not store an "escape" character, because this code is used to terminate a Naspen command. I have used a "Control D" which can be stored in with the text, to replace the "escape". This means that most if not all of the print-modes of the EPSON RX80 can be switched on and off, at will, by embedded "escape" strings. A further addition of the extension file is that the system can be restarted by a NAS-SYS "EB000" command which warm-starts NASPEN. The overlay file will have been lost, because the "Exec" overlay will have been loaded by the return to POLYDOS but it is not required once the main Naspen programs have been loaded and cold-started the first time. The warm start proved most necessary with the disk system, because it is easy to call a wrong file-name, or one that already exists. Either of these errors will blast you back into POLYDOS command level. (Rather like a touch of the snakes and ladders.) Obviously a rather more sophisicated file handling routine would allow for default file extensions and would automatically overwrite an existing file, renaming the existing version as a ".BK" backup version. The fun of getting that going is all yours!! An even more useful addition would be to toggle the screen with some unused memory and allow the operator to view the disk directories whilst in Naspen.

Some further minor changes were made to Naspen to indicate differences from the original prom version, the title was changed to read "NASPEN PDOS4". The initialisation routine was changed to give 32000 bytes free instead of the original 11000. Although this is supposed to slow down the operation of some commands, I have not found it as big a disadvantage as the space restriction.

There are a few points to take note of before committing your epic novel, or autobiography to "Polypen". DON'T use the "NP" extension for any other files. I use the extension "nt" for my Naspen text files. Remember to patch the printer reflection on your files before you submit them to "Polypen". The disk save routines save all memory from 1000H.

To avoid compromising copyright on the PolyDos listing I have not included the comments. If you have bought PolyDos you will have a manual which explains all. I was amazed by the ease with which I managed to effect these changes, and it speaks volumes for the quality of the manual that the first successful assembly of the file-writing routine worked first time. (For a comparison note how many non-Digital Research textbooks are recommended for CP/M tinkerers).

Next Issue

Subject to probable change the following items should appear in the next issue of 80-BUS News, a special `back-from-holiday´ issue !

- a review of the new PEN
- Dave Hunt back from holiday
- the FINAL part of the BASIC disassembly
- Part 2 of the IVC/SVC Insight
- Lawrence back from holiday
- an improved(?) NAS-SYS 3
- Aunt Agatha back from holiday
- 128K on a RAM A !!

Is there any truth in the rumour that Dave Hunt, Aunt Agatha and Lawrence all went away together?

NASCOM

ROM

BASIC

DIS—ASSEMBLED

PART 6

BY CARL LLOYD—PARKER


```
F75B CD44F8     DIV10:  CALL    STAKFP          ; Save FPREG on stack
F75E 012084             LD      BC,8420H        ; BCDE = 10.
F761 110000             LD      DE,0000H
F764 CD54F8             CALL    FPBCDE          ; Move 10 to FPREG

F767 C1         DIV:    POP     BC              ; Get number from stack
F768 D1                 POP     DE
F769 CD13F8     DVBCDE: CALL    TSTSGN          ; Test sign of FPREG
F76C CAB0E3             JP      Z,DZERR         ; Error if division by zero
F76F 2EFF               LD      L,-1            ; Flag subtract exponents
F771 CDD1F7             CALL    ADDEXP          ; Subtract exponents
F774 34                 INC     (HL)            ; Add 2 to exponent to adjust
F775 34                 INC     (HL)
F776 2B                 DEC     HL              ; Point to MSB
F777 7E                 LD      A,(HL)          ; Get MSB of dividend
F778 321210             LD      (DIV3),A        ; Save for subtraction
F77B 2B                 DEC     HL
F77C 7E                 LD      A,(HL)          ; Get NMSB of dividend
F77D 320E10             LD      (DIV2),A        ; Save for subtraction
F780 2B                 DEC     HL
F781 7E                 LD      A,(HL)          ; Get MSB of dividend
F782 320A10             LD      (DIV1),A        ; Save for subtraction
F785 41                 LD      B,C             ; Get MSB
F786 EB                 EX      DE,HL           ; NMSB,LSB to HL
F787 AF                 XOR     A
F788 4F                 LD      C,A             ; Clear MSB of quotient
F789 57                 LD      D,A             ; Clear NMSB of quotient
F78A 5F                 LD      E,A             ; Clear LSB of quotient
F78B 321510             LD      (DIV4),A        ; Clear overflow count
F78E E5         DIVLP:  PUSH    HL              ; Save divisor
F78F C5                 PUSH    BC
F790 7D                 LD      A,L             ; Get LSB of number
F791 CD0910             CALL    DIVSUP          ; Subt' divisor from dividend
F794 DE00               SBC     A,0             ; Count for overflows
F796 3F                 CCF
F797 D2A1F7             JP      NC,RESDIV       ; Restore divisor if borrow
F79A 321510             LD      (DIV4),A        ; Re-save overflow count
F79D F1                 POP     AF              ; Scrap divisor
F79E F1                 POP     AF
F79F 37                 SCF                     ; Set carry to
F7A0 D2                 DEFB    (JP NC,nn)      ; Skip "POP BC" and "POP HL"
```

```
F7A1 C1          RESDIV: POP     BC              ; Restore divisor
F7A2 E1                  POP     HL
F7A3 79                  LD      A,C             ; Get MSB of quotient
F7A4 3C                  INC     A
F7A5 3D                  DEC     A
F7A6 1F                  RRA                     ; Bit 0 to bit 7
F7A7 FA54F6              JP      M,RONDB         ; Done - Normalise result
F7AA 17                  RLA                     ; Restore carry
F7AB 7B                  LD      A,E             ; Get LSB of quotient
F7AC 17                  RLA                     ; Double it
F7AD 5F                  LD      E,A             ; Put it back
F7AE 7A                  LD      A,D             ; Get NMSB of quotient
F7AF 17                  RLA                     ; Double it
F7B0 57                  LD      D,A             ; Put it back
F7B1 79                  LD      A,C             ; Get MSB of quotient
F7B2 17                  RLA                     ; Double it
F7B3 4F                  LD      C,A             ; Put it back
F7B4 29                  ADD     HL,HL           ; Double NMSB,LSB of divisor
F7B5 78                  LD      A,B             ; Get MSB of divisor
F7B6 17                  RLA                     ; Double it
F7B7 47                  LD      B,A             ; Put it back
F7B8 3A1510              LD      A,(DIV4)        ; Get VLSB of quotient
F7BB 17                  RLA                     ; Double it
F7BC 321510              LD      (DIV4),A        ; Put it back
F7BF 79                  LD      A,C             ; Get MSB of quotient
F7C0 B2                  OR      D               ; Merge NMSB
F7C1 B3                  OR      E               ; Merge LSB
F7C2 C28EF7              JP      NZ,DIVLP        ; Not done - Keep dividing
F7C5 E5                  PUSH    HL              ; Save divisor
F7C6 21E710              LD      HL,FPEXP        ; Point to exponent
F7C9 35                  DEC     (HL)            ; Divide by 2
F7CA E1                  POP     HL              ; Restore divisor
F7CB C28EF7              JP      NZ,DIVLP        ; Ok - Keep going
F7CE C3BCE3              JP      OVERR           ; Overflow error

F7D1 78          ADDEXP: LD      A,B             ; Get exponent of dividend
F7D2 B7                  OR      A               ; Test it
F7D3 CAF5F7              JP      Z,OVTST3        ; Zero - Result zero
F7D6 7D                  LD      A,L             ; Get add/subtract flag
F7D7 21E710              LD      HL,FPEXP        ; Point to exponent
F7DA AE                  XOR     (HL)            ; Add or subtract it
F7DB 80                  ADD     A,B             ; Add the other exponent
F7DC 47                  LD      B,A             ; Save new exponent
F7DD 1F                  RRA                     ; Test exponent for overflow
F7DE A8                  XOR     B
F7DF 78                  LD      A,B             ; Get exponent
F7E0 F2F4F7              JP      P,OVTST2        ; Positive - Test for overflow
F7E3 C680                ADD     A,80H           ; Add excess 128
F7E5 77                  LD      (HL),A          ; Save new exponent
F7E6 CA54F7              JP      Z,POPHRT        ; Zero - Result zero
F7E9 CD79F8              CALL    SIGNS           ; Set MSBs and sign of result
F7EC 77                  LD      (HL),A          ; Save new exponent
F7ED 2B                  DEC     HL              ; Point to MSB
F7EE C9                  RET
```



```
F7EF CD13F8      OVTST1: CALL    TSTSGN          ; Test sign of FPREG
F7F2 2F                  CPL                     ; Invert sign
F7F3 E1                  POP     HL              ; Clean up stack
F7F4 B7          OVTST2: OR      A               ; Test if new exponent zero
F7F5 E1          OVTST3: POP     HL              ; Clear off return address
F7F6 F233F6              JP      P,RESZER        ; Result zero
F7F9 C3BCE3              JP      OVERR           ; Overflow error

F7FC CD5FF8      MLSP10: CALL    BCDEFP          ; Move FPREG to BCDE
F7FF 78                  LD      A,B             ; Get exponent
F800 B7                  OR      A               ; Is it zero?
F801 C8                  RET     Z               ; Yes - Result is zero
F802 C602                ADD     A,2             ; Multiply by 4
F804 DABCE3              JP      C,OVERR         ; Overflow - ?OV Error
F807 47                  LD      B,A             ; Re-save exponent
F808 CDCDF5              CALL    FPADD           ; Add BCDE to FPREG (Times 5)
F80B 21E710              LD      HL,FPEXP        ; Point to exponent
F80E 34                  INC     (HL)            ; Double number (Times 10)
F80F C0                  RET     NZ              ; Ok - Return
F810 C3BCE3              JP      OVERR           ; Overflow error

F813 3AE710      TSTSGN: LD      A,(FPEXP)       ; Get sign of FPREG
F816 B7                  OR      A
F817 C8                  RET     Z               ; RETurn if number is zero
F818 3AE610              LD      A,(FPREG+2)     ; Get MSB of FPREG
F81B FE                  DEFB    (CP 2FH)        ; Test sign
F81C 2F          RETREL: CPL                     ; Invert sign
F81D 17                  RLA                     ; Sign bit to carry
F81E 9F          FLGDIF: SBC     A,A             ; Carry to all bits of A
F81F C0                  RET     NZ              ; Return -1 if negative
F820 3C                  INC     A               ; Bump to +1
F821 C9                  RET                     ; Positive - Return +1

F822 CD13F8      SGN:    CALL    TSTSGN          ; Test sign of FPREG
F825 0688        FLGREL: LD      B,80H+8         ; 8 bit integer in exponent
F827 110000              LD      DE,0            ; Zero NMSB and LSB
F82A 21E710      RETINT: LD      HL,FPEXP        ; Point to exponent
F82D 4F                  LD      C,A             ; CDE = MSB,NMSB and LSB
F82E 70                  LD      (HL),B          ; Save exponent
F82F 0600                LD      B,0             ; CDE = integer to normalise
F831 23                  INC     HL              ; Point to sign of result
F832 3680                LD      (HL),80H        ; Set sign of result
F834 17                  RLA                     ; Carry = sign of integer
F835 C31BF6              JP      CONPOS          ; Set sign of result
```

```
F838 CD13F8     ABS:    CALL    TSTSGN          ; Test sign of FPREG
F83B F0                 RET     P               ; Return if positive
F83C 21E610     INVSGN: LD      HL,FPREG+2      ; Point to MSB
F83F 7E                 LD      A,(HL)          ; Get sign of mantissa
F840 EE80               XOR     80H             ; Invert sign of mantissa
F842 77                 LD      (HL),A          ; Re-save sign of mantissa
F843 C9                 RET

F844 EB         STAKFP: EX      DE,HL           ; Save code string address
F845 2AE410             LD      HL,(FPREG)      ; LSB,NLSB of FPREG
F848 E3                 EX      (SP),HL         ; Stack them,get return
F849 E5                 PUSH    HL              ; Re-save return
F84A 2AE610             LD      HL,(FPREG+2)    ; MSB and exponent of FPREG
F84D E3                 EX      (SP),HL         ; Stack them,get return
F84E E5                 PUSH    HL              ; Re-save return
F84F EB                 EX      DE,HL           ; Restore code string address
F850 C9                 RET

F851 CD62F8     PHLTFP: CALL    LOADFP          ; Number at HL to BCDE
F854 EB         FPBCDE: EX      DE,HL           ; Save code string address
F855 22E410             LD      (FPREG),HL      ; Save LSB,NLSB of number
F858 60                 LD      H,B             ; Exponent of number
F859 69                 LD      L,C             ; MSB of number
F85A 22E610             LD      (FPREG+2),HL    ; Save MSB and exponent
F85D EB                 EX      DE,HL           ; Restore code string address
F85E C9                 RET

F85F 21E410     BCDEFP: LD      HL,FPREG        ; Point to FPREG
F862 5E         LOADFP: LD      E,(HL)          ; Get LSB of number
F863 23                 INC     HL
F864 56                 LD      D,(HL)          ; Get NMSB of number
F865 23                 INC     HL
F866 4E                 LD      C,(HL)          ; Get MSB of number
F867 23                 INC     HL
F868 46                 LD      B,(HL)          ; Get exponent of number
F869 23         INCHL:  INC     HL              ; Used for conditional "INC HL"
F86A C9                 RET

F86B 11E410     FPTHL:  LD      DE,FPREG        ; Point to FPREG
F86E 0604       DETHL4: LD      B,4             ; 4 bytes to move
F870 1A         DETHLB: LD      A,(DE)          ; Get source
F871 77                 LD      (HL),A          ; Save destination
F872 13                 INC     DE              ; Next source
F873 23                 INC     HL              ; Next destination
F874 05                 DEC     B               ; Count bytes
F875 C270F8             JP      NZ,DETHLB       ; Loop if more
F878 C9                 RET
```



```
F879 21E610     SIGNS:  LD      HL,FPREG+2      ; Point to MSB of FPREG
F87C 7E                 LD      A,(HL)          ; Get MSB
F87D 07                 RLCA                    ; Old sign to carry
F87E 37                 SCF                     ; Set MSBit
F87F 1F                 RRA                     ; Set MSBit of MSB
F880 77                 LD      (HL),A          ; Save new MSB
F881 3F                 CCF                     ; Complement sign
F882 1F                 RRA                     ; Old sign to carry
F883 23                 INC     HL
F884 23                 INC     HL
F885 77                 LD      (HL),A          ; Set sign of result
F886 79                 LD      A,C             ; Get MSB
F887 07                 RLCA                    ; Old sign to carry
F888 37                 SCF                     ; Set MSBit
F889 1F                 RRA                     ; Set MSBit of MSB
F88A 4F                 LD      C,A             ; Save MSB
F88B 1F                 RRA
F88C AE                 XOR     (HL)            ; New sign of result
F88D C9                 RET

F88E 78         CMPNUM: LD      A,B             ; Get exponent of number
F88F B7                 OR      A
F890 CA13F8             JP      Z,TSTSGN        ; Zero - Test sign of FPREG
F893 211CF8             LD      HL,RETREL       ; Return relation routine
F896 E5                 PUSH    HL              ; Save for return
F897 CD13F8             CALL    TSTSGN          ; Test sign of FPREG
F89A 79                 LD      A,C             ; Get MSB of number
F89B C8                 RET     Z               ; FPREG zero - Number's MSB
F89C 21E610             LD      HL,FPREG+2      ; MSB of FPREG
F89F AE                 XOR     (HL)            ; Combine signs
F8A0 79                 LD      A,C             ; Get MSB of number
F8A1 F8                 RET     M               ; Exit if signs different
F8A2 CDA8F8             CALL    CMPFP           ; Compare FP numbers
F8A5 1F                 RRA                     ; Get carry to sign
F8A6 A9                 XOR     C               ; Combine with MSB of number
F8A7 C9                 RET

F8A8 23         CMPFP:  INC     HL              ; Point to exponent
F8A9 78                 LD      A,B             ; Get exponent
F8AA BE                 CP      (HL)            ; Compare exponents
F8AB C0                 RET     NZ              ; Different
F8AC 2B                 DEC     HL              ; Point to MBS
F8AD 79                 LD      A,C             ; Get MSB
F8AE BE                 CP      (HL)            ; Compare MSBs
F8AF C0                 RET     NZ              ; Different
F8B0 2B                 DEC     HL              ; Point to NMSB
F8B1 7A                 LD      A,D             ; Get NMSB
F8B2 BE                 CP      (HL)            ; Compare NMSBs
F8B3 C0                 RET     NZ              ; Different
F8B4 2B                 DEC     HL              ; Point to LSB
F8B5 7B                 LD      A,E             ; Get LSB
F8B6 96                 SUB     (HL)            ; Compare LSBs
F8B7 C0                 RET     NZ              ; Different
F8B8 E1                 POP     HL              ; Drop RETurn
F8B9 E1                 POP     HL              ; Drop another RETurn
F8BA C9                 RET
```

```
F8BB 47          FPINT:  LD      B,A             ; <- Move
F8BC 4F                  LD      C,A             ; <- exponent
F8BD 57                  LD      D,A             ; <- to all
F8BE 5F                  LD      E,A             ; <- bits
F8BF B7                  OR      A               ; Test exponent
F8C0 C8                  RET     Z               ; Zero - Return zero
F8C1 E5                  PUSH    HL              ; Save pointer to number
F8C2 CD5FF8              CALL    BCDEFP          ; Move FPREG to BCDE
F8C5 CD79F8              CALL    SIGNS           ; Set MSBs & sign of result
F8C8 AE                  XOR     (HL)            ; Combine with sign of FPREG
F8C9 67                  LD      H,A             ; Save combined signs
F8CA FCDFF8              CALL    M,DCBCDE        ; Negative - Decrement BCDE
F8CD 3E98                LD      A,80H+24        ; 24 bits
F8CF 90                  SUB     B               ; Bits to shift
F8D0 CD92F6              CALL    SCALE           ; Shift BCDE
F8D3 7C                  LD      A,H             ; Get combined sign
F8D4 17                  RLA                     ; Sign to carry
F8D5 DC65F6              CALL    C,FPROND        ; Negative - Round number up
F8D8 0600                LD      B,0             ; Zero exponent
F8DA DC7EF6              CALL    C,COMPL         ; If negative make positive
F8DD E1                  POP     HL              ; Restore pointer to number
F8DE C9                  RET

F8DF 1B          DCBCDE: DEC     DE              ; Decrement BCDE
F8E0 7A                  LD      A,D             ; Test LSBs
F8E1 A3                  AND     E
F8E2 3C                  INC     A
F8E3 C0                  RET     NZ              ; Exit if LSBs not FFFF
F8E4 0B                  DEC     BC              ; Decrement MSBs
F8E5 C9                  RET

F8E6 21E710      INT:    LD      HL,FPEXP        ; Point to exponent
F8E9 7E                  LD      A,(HL)          ; Get exponent
F8EA FE98                CP      80H+24          ; Integer accuracy only?
F8EC 3AE410              LD      A,(FPREG)       ; Get LSB
F8EF D0                  RET     NC              ; Yes - Already intger
F8F0 7E                  LD      A,(HL)          ; Get exponent
F8F1 CDBBF8              CALL    FPINT           ; F.P to integer
F8F4 3698                LD      (HL),80H+24     ; Save 24 bit integer
F8F6 7B                  LD      A,E             ; Get LSB of number
F8F7 F5                  PUSH    AF              ; Save LSB
F8F8 79                  LD      A,C             ; Get MSB of number
F8F9 17                  RLA                     ; Sign to carry
F8FA CD1BF6              CALL    CONPOS          ; Set sign of result
F8FD F1                  POP     AF              ; Restore LSB of number
F8FE C9                  RET
```



```
F8FF 210000      MLDEBC: LD      HL,0            ; Clear partial product
F902 78                  LD      A,B             ; Test multiplier
F903 B1                  OR      C
F904 C8                  RET     Z               ; Return zero if zero
F905 3E10                LD      A,16            ; 16 bits
F907 29          MLDBLP: ADD     HL,HL           ; Shift P.P left
F908 DA45F0              JP      C,BSERR         ; ?BS Error if overflow
F90B EB                  EX      DE,HL
F90C 29                  ADD     HL,HL           ; Shift multiplier left
F90D EB                  EX      DE,HL
F90E D215F9              JP      NC,NOMLAD       ; Bit was zero - No add
F911 09                  ADD     HL,BC           ; Add multiplicand
F912 DA45F0              JP      C,BSERR         ; ?BS Error if overflow
F915 3D          NOMLAD: DEC     A               ; Count bits
F916 C207F9              JP      NZ,MLDBLP       ; More
F919 C9                  RET

F91A FE2D        ASCTFP: CP      "-"             ; Negative?
F91C F5                  PUSH    AF              ; Save it and flags
F91D CA26F9              JP      Z,CNVNUM        ; Yes - Convert number
F920 FE2B                CP      "+"             ; Positive?
F922 CA26F9              JP      Z,CNVNUM        ; Yes - Convert number
F925 2B                  DEC     HL              ; DEC 'cos GETCHR INCs
F926 CD33F6      CNVNUM: CALL    RESZER          ; Set result to zero
F929 47                  LD      B,A             ; Digits after point counter
F92A 57                  LD      D,A             ; Sign of exponent
F92B 5F                  LD      E,A             ; Exponent of ten
F92C 2F                  CPL
F92D 4F                  LD      C,A             ; Before or after point flag
F92E CD36E8      MANLP:  CALL    GETCHR          ; Get next character
F931 DA77F9              JP      C,ADDIG         ; Digit - Add to number
F934 FE2E                CP      "."
F936 CA52F9              JP      Z,DPOINT        ; "." - Flag point
F939 FE45                CP      "E"
F93B C256F9              JP      NZ,CONEXP       ; Not "E" - Scale number
F93E CD36E8              CALL    GETCHR          ; Get next character
F941 CD70EE              CALL    SGNEXP          ; Get sign of exponent
F944 CD36E8      EXPLP:  CALL    GETCHR          ; Get next character
F947 DA99F9              JP      C,EDIGIT        ; Digit - Add to exponent
F94A 14                  INC     D               ; Is sign negative?
F94B C256F9              JP      NZ,CONEXP       ; No - Scale number
F94E AF                  XOR     A
F94F 93                  SUB     E               ; Negate exponent
F950 5F                  LD      E,A             ; And re-save it
F951 0C                  INC     C               ; Flag end of number
F952 0C          DPOINT: INC     C               ; Flag point passed
F953 CA2EF9              JP      Z,MANLP         ; Zero - Get another digit
F956 E5          CONEXP: PUSH    HL              ; Save code string address
F957 7B                  LD      A,E             ; Get exponent
F958 90                  SUB     B               ; Subtract digits after point
F959 F46FF9      SCALMI: CALL    P,SCALPL        ; Positive - Multiply number
F95C F265F9              JP      P,ENDCON        ; Positive - All done
F95F F5                  PUSH    AF              ; Save number of times to /10
F960 CD5BF7              CALL    DIV10           ; Divide by 10
F963 F1                  POP     AF              ; Restore count
F964 3C                  INC     A               ; Count divides
```

```
F965 C259F9     ENDCON: JP      NZ,SCALMI       ; More to do
F968 D1                 POP     DE              ; Restore code string address
F969 F1                 POP     AF              ; Restore sign of number
F96A CC3CF8             CALL    Z,INVSGN        ; Negative - Negate number
F96D EB                 EX      DE,HL           ; Code string address to HL
F96E C9                 RET

F96F C8         SCALPL: RET     Z               ; Exit if no scaling needed
F970 F5         MULTEN: PUSH    AF              ; Save count
F971 CDFCF7             CALL    MLSP10          ; Multiply number by 10
F974 F1                 POP     AF              ; Restore count
F975 3D                 DEC     A               ; Count multiplies
F976 C9                 RET

F977 D5         ADDIG:  PUSH    DE              ; Save sign of exponent
F978 57                 LD      D,A             ; Save digit
F979 78                 LD      A,B             ; Get digits after point
F97A 89                 ADC     A,C             ; Add one if after point
F97B 47                 LD      B,A             ; Re-save counter
F97C C5                 PUSH    BC              ; Save point flags
F97D E5                 PUSH    HL              ; Save code string address
F97E D5                 PUSH    DE              ; Save digit
F97F CDFCF7             CALL    MLSP10          ; Multiply number by 10
F982 F1                 POP     AF              ; Restore digit
F983 D630               SUB     "0"             ; Make it absolute
F985 CD8EF9             CALL    RSCALE          ; Re-scale number
F988 E1                 POP     HL              ; Restore code string address
F989 C1                 POP     BC              ; Restore point flags
F98A D1                 POP     DE              ; Restore sign of exponent
F98B C32EF9             JP      MANLP           ; Get another digit

F98E CD44F8     RSCALE: CALL    STAKFP          ; Put number on stack
F991 CD25F8             CALL    FLGREL          ; Digit to add to FPREG
F994 C1         PADD:   POP     BC              ; Restore number
F995 D1                 POP     DE
F996 C3CDF5             JP      FPADD           ; Add BCDE to FPREG and return

F999 7B         EDIGIT: LD      A,E             ; Get digit
F99A 07                 RLCA                    ; Times 2
F99B 07                 RLCA                    ; Times 4
F99C 83                 ADD     A,E             ; Times 5
F99D 07                 RLCA                    ; Times 10
F99E 86                 ADD     A,(HL)          ; Add next digit
F99F D630               SUB     "0"             ; Make it absolute
F9A1 5F                 LD      E,A             ; Save new digit
F9A2 C344F9             JP      EXPLP           ; Look for another digit
```



```
F9A5 E5         LINEIN: PUSH    HL              ; Save code string address
F9A6 2146E3             LD      HL,INMSG        ; Output " in "
F9A9 CD10F2             CALL    PRS             ; Output string at HL
F9AC E1                 POP     HL              ; Restore code string address
F9AD EB         PRNTHL: EX      DE,HL           ; Code string address to DE
F9AE AF                 XOR     A
F9AF 0698               LD      B,80H+24        ; 24 bits
F9B1 CD2AF8             CALL    RETINT          ; Return the integer
F9B4 210FF2             LD      HL,PRNUMS       ; Print number string
F9B7 E5                 PUSH    HL              ; Save for return
F9B8 21E910     NUMASC: LD      HL,PBUFF        ; Convert number to ASCII
F9BB E5                 PUSH    HL              ; Save for return
F9BC CD13F8             CALL    TSTSGN          ; Test sign of FPREG
F9BF 3620               LD      (HL)," "        ; Space at start
F9C1 F2C6F9             JP      P,SPCFST        ; Positive - Space to start
F9C4 362D               LD      (HL),"-"        ; "-" sign at start
F9C6 23         SPCFST: INC     HL              ; First byte of number
F9C7 3630               LD      (HL),"0"        ; "0" if zero
F9C9 CA7CFA             JP      Z,JSTZER        ; Return "0" if zero
F9CC E5                 PUSH    HL              ; Save buffer address
F9CD FC3CF8             CALL    M,INVSGN        ; Negate FPREG if negative
F9D0 AF                 XOR     A               ; Zero A
F9D1 F5                 PUSH    AF              ; Save it
F9D2 CD82FA             CALL    RNGTST          ; Test number is in range
F9D5 014391     SIXDIG: LD      BC,9143H        ; BCDE = 99999.9
F9D8 11F84F             LD      DE,4FF8H
F9DB CD8EF8             CALL    CMPNUM          ; Compare numbers
F9DE B7                 OR      A
F9DF E2F3F9             JP      PO,INRNG        ; > 99999.9 - Sort it out
F9E2 F1                 POP     AF              ; Restore count
F9E3 CD7OF9             CALL    MULTEN          ; Multiply by ten
F9E6 F5                 PUSH    AF              ; Re-save count
F9E7 C3D5F9             JP      SIXDIG          ; Test it again

F9EA CD5BF7     GTSIXD: CALL    DIV10           ; Divide by 10
F9ED F1                 POP     AF              ; Get count
F9EE 3C                 INC     A               ; Count divides
F9EF F5                 PUSH    AF              ; Re-save count
F9F0 CD82FA             CALL    RNGTST          ; Test number is in range
F9F3 CDBBF5     INRNG:  CALL    ROUND           ; Add 0.5 to FPREG
F9F6 3C                 INC     A
F9F7 CDBBF8             CALL    FPINT           ; F.P to integer
F9FA CD54F8             CALL    FPBCDE          ; Move BCDE to FPREG
F9FD 010603             LD      BC,0306H        ; 1E+06 to 1E-03 range
FA00 F1                 POP     AF              ; Restore count
FA01 81                 ADD     A,C             ; 6 digits before point
FA02 3C                 INC     A               ; Add one
FA03 FA0FFA             JP      M,MAKNUM        ; Do it in "E" form if < 1E-02
FA06 FE08               CP      6+1+1           ; More than 999999 ?
FA08 D20FFA             JP      NC,MAKNUM       ; Yes - Do it in "E" form
FA0B 3C                 INC     A               ; Adjust for exponent
FA0C 47                 LD      B,A             ; Exponent of number
FA0D 3E02               LD      A,2             ; Make it zero after
```

```
FA0F 3D        MAKNUM: DEC     A               ; Adjust for digits to do
FA10 3D                DEC     A
FA11 E1                POP     HL              ; Restore buffer address
FA12 F5                PUSH    AF              ; Save count
FA13 1195FA            LD      DE,POWERS       ; Powers of ten
FA16 05                DEC     B               ; Count digits before point
FA17 C220FA            JP      NZ,DIGTXT       ; Not zero - Do number
FA1A 362E              LD      (HL),"."        ; Save point
FA1C 23                INC     HL              ; Move on
FA1D 3630              LD      (HL),"0"        ; Save zero
FA1F 23                INC     HL              ; Move on
FA20 05        DIGTXT: DEC     B               ; Count digits before point
FA21 362E              LD      (HL),"."        ; Save point in case
FA23 CC69F8            CALL    Z,INCHL         ; Last digit - move on
FA26 C5                PUSH    BC              ; Save digits before point
FA27 E5                PUSH    HL              ; Save buffer address
FA28 D5                PUSH    DE              ; Save powers of ten
FA29 CD5FF8            CALL    BCDEFP          ; Move FPREG to BCDE
FA2C E1                POP     HL              ; Powers of ten table
FA2D 062F              LD      B,"0"-1         ; ASCII "0" - 1
FA2F 04        TRYAGN: INC     B               ; Count subtractions
FA30 7B                LD      A,E             ; Get LSB
FA31 96                SUB     (HL)            ; Subtract LSB
FA32 5F                LD      E,A             ; Save LSB
FA33 23                INC     HL
FA34 7A                LD      A,D             ; Get NMSB
FA35 9E                SBC     A,(HL)          ; Subtract NMSB
FA36 57                LD      D,A             ; Save NMSB
FA37 23                INC     HL
FA38 79                LD      A,C             ; Get MSB
FA39 9E                SBC     A,(HL)          ; Subtract MSB
FA3A 4F                LD      C,A             ; Save MSB
FA3B 2B                DEC     HL              ; Point back to start
FA3C 2B                DEC     HL
FA3D D22FFA            JP      NC,TRYAGN       ; No overflow - Try again
FA40 CD72F6            CALL    PLUCDE          ; Restore number
FA43 23                INC     HL              ; Start of next number
FA44 CD54F8            CALL    FPBCDE          ; Move BCDE to FPREG
FA47 EB                EX      DE,HL           ; Save point in table
FA48 E1                POP     HL              ; Restore buffer address
FA49 70                LD      (HL),B          ; Save digit in buffer
FA4A 23                INC     HL              ; And move on
FA4B C1                POP     BC              ; Restore digit count
FA4C 0D                DEC     C               ; Count digits
FA4D C220FA            JP      NZ,DIGTXT       ; More - Do them
FA50 05                DEC     B               ; Any decimal part?
FA51 CA60FA            JP      Z,DOEBIT        ; No - Do "E" bit
FA54 2B        SUPTLZ: DEC     HL              ; Move back through buffer
FA55 7E                LD      A,(HL)          ; Get character
FA56 FE30              CP      "0"             ; "0" character?
FA58 CA54FA            JP      Z,SUPTLZ        ; Yes - Look back for more
FA5B FE2E              CP      "."             ; A decimal point?
FA5D C469F8            CALL    NZ,INCHL        ; Move back over digit
```



```
FA60 F1        DOEBIT: POP     AF              ; Get "E" flag
FA61 CA7FFA            JP      Z,NOENED        ; No "E" needed - End buffer
FA64 3645              LD      (HL),"E"        ; Put "E" in buffer
FA66 23                INC     HL              ; And move on
FA67 362B              LD      (HL),"+"        ; Put "+" in buffer
FA69 F270FA            JP      P,OUTEXP        ; Positive - Output exponent
FA6C 362D              LD      (HL),"-"        ; Put "-" in buffer
FA6E 2F                CPL                     ; Negate exponent
FA6F 3C                INC     A
FA70 062F      OUTEXP: LD      B,"0"-1         ; ASCII "0" - 1
FA72 04        EXPTEN: INC     B               ; Count subtractions
FA73 D60A              SUB     10              ; Tens digit
FA75 D272FA            JP      NC,EXPTEN       ; More to do
FA78 C63A              ADD     A,10+"0"        ; Restore and make ASCII
FA7A 23                INC     HL              ; Move on
FA7B 70                LD      (HL),B          ; Save MSB of exponent
FA7C 23        JSTZER: INC     HL
FA7D 77                LD      (HL),A          ; Save LSB of exponent
FA7E 23                INC     HL
FA7F 71        NOENED: LD      (HL),C          ; Mark end of buffer
FA80 E1                POP     HL              ; Restore code string address
FA81 C9                RET

FA82 017494    RNGTST: LD      BC,9474H        ; BCDE = 999999.
FA85 11F723            LD      DE,23F7H
FA88 CD8EF8            CALL    CMPNUM          ; Compare numbers
FA8B B7                OR      A
FA8C E1                POP     HL              ; Return address to HL
FA8D E2EAF9            JP      PO,GTSIXD       ; Too big - Divide by ten
FA90 E9                JP      (HL)            ; Otherwise return to caller

FA91 00000080  HALF:   DEFB    00H,00H,00H,80H ; 0.5

FA95 A08601    POWERS: DEFB    0A0H,086H,001H  ;100000
FA98 102700            DEFB    010H,027H,000H  ; 10000
FA9B E80300            DEFB    0E8H,003H,000H  ;  1000
FA9E 640000            DEFB    064H,000H,000H  ;   100
FAA1 0A0000            DEFB    00AH,000H,000H  ;    10
FAA4 010000            DEFB    001H,000H,000H  ;     1

FAA7 213CF8    NEGAFT: LD      HL,INVSGN       ; Negate result
FAAA E3                EX      (SP),HL         ; To be done after caller
FAAB E9                JP      (HL)            ; Return to caller

FAAC CD44F8    SQR:    CALL    STAKFP          ; Put value on stack
FAAF 2191FA            LD      HL,HALF         ; Set power to 1/2
FAB2 CD51F8            CALL    PHLTFP          ; Move 1/2 to FPREG
```

```
FAB5 C1          POWER:  POP     BC              ; Get base
FAB6 D1                  POP     DE
FAB7 CD13F8              CALL    TSTSGN          ; Test sign of power
FABA 78                  LD      A,B             ; Get exponent of base
FABB CAFAFA              JP      Z,EXP           ; Make result 1 if zero
FABE F2C5FA              JP      P,POWER1        ; Positive base - Ok
FAC1 B7                  OR      A               ; Zero to negative power?
FAC2 CA0E3               JP      Z,DZERR         ; Yes - ?/0 Error
FAC5 B7          POWER1: OR      A               ; Base zero?
FAC6 CA34F6              JP      Z,SAVEXP        ; Yes - Return zero
FAC9 D5                  PUSH    DE              ; Save base
FACA C5                  PUSH    BC
FACB 79                  LD      A,C             ; Get MSB of base
FACC F67F                OR      01111111B       ; Get sign status
FACE CD5FF8              CALL    BCDEFP          ; Move power to BCDE
FAD1 F2E2FA              JP      P,POWER2        ; Positive base - Ok
FAD4 D5                  PUSH    DE              ; Save power
FAD5 C5                  PUSH    BC
FAD6 CDE6F8              CALL    INT             ; Get integer of power
FAD9 C1                  POP     BC              ; Restore power
FADA D1                  POP     DE
FADB F5                  PUSH    AF              ; MSB of base
FADC CD8EF8              CALL    CMPNUM          ; Power an integer?
FADF E1                  POP     HL              ; Restore MSB of base
FAE0 7C                  LD      A,H             ; but don't affect flags
FAE1 1F                  RRA                     ; Exponent odd or even?
FAE2 E1          POWER2: POP     HL              ; Restore MSB and exponent
FAE3 22E610              LD      (FPREG+2),HL    ; Save base in FPREG
FAE6 E1                  POP     HL              ; LSBs of base
FAE7 22E410              LD      (FPREG),HL      ; Save in FPREG
FAEA DCA7FA              CALL    C,NEGAFT        ; Odd power - Negate result
FAED CC3CF8              CALL    Z,INVSGN        ; Negative base - Negate it
FAF0 D5                  PUSH    DE              ; Save power
FAF1 C5                  PUSH    BC
FAF2 CDC7F6              CALL    LOG             ; Get LOG of base
FAF5 C1                  POP     BC              ; Restore power
FAF6 D1                  POP     DE
FAF7 CD08F7              CALL    FPMULT          ; Multiply LOG by power
```



```
FAFA CD44F8      EXP:    CALL    STAKFP          ; Put value on stack
FAFD 013881              LD      BC,08138H       ; BCDE = 1/Ln(2)
FB00 113BAA              LD      DE,0AA3BH
FB03 CD08F7              CALL    FPMULT          ; Multiply value by 1/LN(2)
FB06 3AE710              LD      A,(FPEXP)       ; Get exponent
FB09 FE88                CP      80H+8           ; Is it in range?
FB0B D2EFF7              JP      NC,OVTST1       ; No - Test for overflow
FB0E CDE6F8              CALL    INT             ; Get INT of FPREG
FB11 C680                ADD     A,80H           ; For excess 128
FB13 C602                ADD     A,2             ; Exponent > 126?
FB15 DAEFF7              JP      C,OVTST1        ; Yes - Test for overflow
FB18 F5                  PUSH    AF              ; Save scaling factor
FB19 21B6F6              LD      HL,UNITY        ; Point to 1.
FB1C CDBEF5              CALL    ADDPHL          ; Add 1 to FPREG
FB1F CDFFF6              CALL    MULLN2          ; Multiply by LN(2)
FB22 F1                  POP     AF              ; Restore scaling factor
FB23 C1                  POP     BC              ; Restore exponent
FB24 D1                  POP     DE
FB25 F5                  PUSH    AF              ; Save scaling factor
FB26 CDCAF5              CALL    SUBCDE          ; Subtract exponent from FPREG
FB29 CD3CF8              CALL    INVSGN          ; Negate result
FB2C 213AFB              LD      HL,EXPTAB       ; Coefficient table
FB2F CD6AFB              CALL    SMSER1          ; Sum the series
FB32 110000              LD      DE,0            ; Zero LSBs
FB35 C1                  POP     BC              ; Scaling factor
FB36 4A                  LD      C,D             ; Zero MSB
FB37 C308F7              JP      FPMULT          ; Scale result to correct value

FB3A 08          EXPTAB: DEFB    8                       ; Table used by EXP
FB3B 402E9474            DEFB    040H,02EH,094H,074H     ; -1/7! (-1/5040)
FB3F 704F2E77            DEFB    070H,04FH,02EH,077H     ;  1/6! ( 1/720)
FB43 6E02887A            DEFB    06EH,002H,088H,07AH     ; -1/5! (-1/120)
FB47 E6A02A7C            DEFB    0E6H,0A0H,02AH,07CH     ;  1/4! ( 1/24)
FB4B 50AAAA7E            DEFB    050H,0AAH,0AAH,07EH     ; -1/3! (-1/6)
FB4F FFFF7F7F            DEFB    0FFH,0FFH,07FH,07FH     ;  1/2! ( 1/2)
FB53 00008081            DEFB    000H,000H,080H,081H     ; -1/1! (-1/1)
FB57 00000081            DEFB    000H,000H,000H,081H     ;  1/0! ( 1/1)
```

```
FB5B CD44F8     SUMSER: CALL    STAKFP          ; Put FPREG on stack
FB5E 1106F7             LD      DE,MULT         ; Multiply by "X"
FB61 D5                 PUSH    DE              ; To be done after
FB62 E5                 PUSH    HL              ; Save address of table
FB63 CD5FF8             CALL    BCDEFP          ; Move FPREG to BCDE
FB66 CD08F7             CALL    FPMULT          ; Square the value
FB69 E1                 POP     HL              ; Restore address of table
FB6A CD44F8     SMSER1: CALL    STAKFP          ; Put value on stack
FB6D 7E                 LD      A,(HL)          ; Get number of coefficients
FB6E 23                 INC     HL              ; Point to start of table
FB6F CD51F8             CALL    PHLTFP          ; Move coefficient to FPREG
FB72 06                 DEFB    (LD B,n)        ; Skip "POP AF"
FB73 F1         SUMLP:  POP     AF              ; Restore count
FB74 C1                 POP     BC              ; Restore number
FB75 D1                 POP     DE
FB76 3D                 DEC     A               ; Cont coefficients
FB77 C8                 RET     Z               ; All done
FB78 D5                 PUSH    DE              ; Save number
FB79 C5                 PUSH    BC
FB7A F5                 PUSH    AF              ; Save count
FB7B E5                 PUSH    HL              ; Save address in table
FB7C CD08F7             CALL    FPMULT          ; Multiply FPREG by BCDE
FB7F E1                 POP     HL              ; Restore address in table
FB80 CD62F8             CALL    LOADFP          ; Number at HL to BCDE
FB83 E5                 PUSH    HL              ; Save address in table
FB84 CDCDF5             CALL    FPADD           ; Add coefficient to FPREG
FB87 E1                 POP     HL              ; Restore address in table
FB88 C373FB             JP      SUMLP           ; More coefficients
```

LAST

PART

NEXT

ISSUE!

GEMINI GM860 EPROM PROGRAMMER REVIEW

By D. W. Parkinson

At long last the Gemini EPROM programmer is with us. At least I assume it is with us and not a holographic projection, as our Editor claimed it didn't exist an issue or two ago! (I quote - "What EPROM programmer?" - Vol 2 Iss 5.)

What you get
i) A box 8.25" x 4.25" x 2" - the programmer.
ii) A disk.
iii) A manual.
iv) A connecting cable.

What you need.
i) A disk-based MultiBoard system. (e.g. Gemini Galaxy)
ii) A mains plug.
iii) Money. (#150+VAT)
or alternatively
i) A Z80 based system with a PIO.
ii) A mains plug.
iii) The ability to program & an understanding of Z80 assembly language.
iv) Money. (#150+VAT)

What does it do?
It will program all Intel compatible single supply EPROMs from a 2716 (2kx8) to a 27256 (32kx8).

Now taking each item in turn:
The Box and cable: This is a mains powered unit containing the programmer. It has a 28-pin ZIF (Zero Insertion Force socket) sticking out of the top along with two LEDs, (one to indicate `power on', the other for `ZIF socket powered up'). On the front is a mains on/off switch and fuse, and on the rear a mains lead emerges and there is a 34-way IDC connector. The programmer has been designed to interface to the main computer via a PIO. The interface comprises an 8-bit bi-directional bus, together with a clock line and an address line. Gemini have selected and ordered the connections such that the programmer can be plugged straight into the Centronics socket on the back of a standard Galaxy. The supplied connecting cable is just under 3' long, with a 34-way IDC connector on one end, and a Centronics plug on the other.

Note: This does not mean that the programmer can be plugged into any Centronics type interface. On the Galaxy the Centronics socket is connected internally directly to a PIO without any intervening buffers. Thus the full bidirectional capability of the PIO's data port is available to the control software. Similarly the Centronics `Busy' printer status line can be used as an output line in this application.

If you don't have a Galaxy, or would rather connect the programmer direct to another PIO within the Galaxy you have two options open:
a) Make up your own cable to connect the 34-way IDC of the programmer to the usual 26-way PIO connection of the Nasom or Gemini boards. (Details are given in the documentation.)
b) Buy the internal `PIO-to-Centronics' cable that is used within the Galaxy and plug the supplied cable into that. (The `PIO-to-Centronics' cable is in the current Gemini catalogue at #15).

The internal power supply of the progammer provides all the necessary voltages, and no power is drawn from the main system. As well as the various programming voltages (25V, 21V, 12.5V) the EPROM supply voltage can be raised to 6V, the level necessary if the "intelligent programming algorithm" is to be implemented for the larger EPROMs (see below).

The programmer's box is made of metal and consists of an interlocking U-shaped base (coloured black), and a U-shaped lid (coloured grey). With the metal construction of the box and the internal mains transformer the weight of the programmer is such that it sits nicely on a flat surface without any tendency to scoot about while EPROMs are changed. Taking the lid off the box reveals a very neat and compact arrangement. The main programmer logic is contained on a single PCB that runs the length of the box. Underneath this PCB is a toroidal mains transformer and a smaller pcb that carries the power supply components.

The Disk: This holds three programs:-

PROG.COM The programmer software.
CPROG.COM A configuration program for PROG.COM
PROGINIT.MAC The low level assembly language drivers used within PROG.COM.

The disk is in Gemini QDSS format (i.e. single sided Galaxy format - 96tpi) which can also be read by double-sided sytsems (QDDS format). The manual indicates that you should be able (via your dealer) to exchange it for DDDS or SDDS formats (the early Gemini 48tpi formats). Failing that you can ask for a paper listing of PROGINIT.MAC instead. Some dealers may be able to provide other formats.

The Manual: The eight page manual covers the installation of the programmer, and the use of CPROG and PROG. Also a brief section is included on how Microsoft's M80/L80 combination can be used to create ROMable programs. There is no description of the internal circuitry of the programmer nor is there any information on how it should be driven by any program other than that supplied. (But see PROGINIT.MAC below.)

Using the Software

The configuration program **CPROG** allows the user to change two parameters within **PROG.** The first is the base address of the PIO that is driving the programmer, and the second is the default EPROM type that PROG assumes when it is invoked. The latter option saves the user the irritation of having to use the `Change EPROM type' option every time that PROG is used.

The main program **PROG** drives the programmer, and transfers data in both directions between disk files and a EPROMs via a buffer that it maintains in memory. When invoked it puts up a heading together with a menu from which the following options can be selected:

0 - Return to CP/M.
1 - Change EPROM type. This brings up a sub-menu offering the choice of 2716, 2732, 2732A, 2764, 27128, and 27256.
2 - Read an EPROM into the buffer. This prompts for an EPROM to be inserted into the socket, and then reads it into the buffer.
3 - Read a disk file into the buffer. (A prompt for a file name will appear.)

4 - Edit the contents of the buffer. Allows simple editing of the contents of the buffer.
5 - Display the buffer. Displays the buffer contents on the screen using the conventional Hex/ASCII display format (as in Gemdebug, Nas-Sys etc).
6 - Write the buffer to a disk file. (A prompt for a file name will appear. If the file name you give already exists you will be asked for confirmation that it is to be overwritten.)
7 - Write the buffer to an EPROM. (i.e. Program the EPROM.)
8 - Verify the EPROM is erased. Prints out any locations within the EPROM that are not OFFh.
9 - Verify an EPROM against the buffer. The two are compared and any differences are listed to the screen.

The heading also displays three things of interest. i) Whether the memory buffer contains any data. ii) The type of EPROM currently selected. iii) The name of the last file read/written to/from the memory buffer. Items (ii) and (iii) I find quite useful, especially if you're trying to program multiple files into multiple EPROMs.

The Int$_e$ligent Programming Algorithm

The software implements the `Int$_e$ligent programming algorithm' (IPA) for the larger EPROMs (2764 and upwards). For those of you that haven't met this, this is a technique for vastly speeding up the programming of the latest EPROMs.

In general EPROMs are programmed by presenting the appropriate address and data to the EPROM along with a suitable write pulse. (Certain `programming' voltage levels have to be present on other pins.) The write pulse duration is specified at 50mS. This figure of 50mS has to cover the worst case, and in fact most data cells within an EPROM program in a fraction of this time (Intel claim 16% of the time i.e. 8mS), and the difficulty lies is determining when a cell is adequately programmed. With devices such as the 2716 the resultant programming time of about 100 seconds was not a burden, but 14 minutes for a 27128 is another matter entirely, (let alone 28 minutes for a 27256!). The latest EPROMs have been designed and tested so that a (faster) modified programming technique can be used, which still results in the same guaranteed long term data retention characteristics. A simplified version of this algorithm is as follows:

1) Set up the programming conditions and set Vcc=6v (rather than the usual 5v)
2) Apply address & data and set a software counter N=0.
3) Apply a 1mS write pulse. Set N=N+1.
4) Read back the data (with Vcc still at 6v) and compare with the original. If it has not programmed go to 3 (unless N=15).
5) Apply a pulse of 4NmS to complete the programming.
6) Verify & move on to next address.

i.e. You try in stages until the byte is programmed, then you give it a final big `bash' (4 x what you've given it so far) to ensure that the cells are well and truly past the threshold. The 6v Vcc level also ensures that the internal threshold level that determines whether it is a `1' or a `0' that you are reading is back is higher than normal. This gives an increased programming margin that leads to increased reliability.

In practice I found that 2764s I was using programmed in about 90 seconds using this algorithm.

Observations
PROG (Version 0.7) is a reasonable program that provides all that is necessary (and a little more) for easy straight-forward programming of EPROMs. The ability to load and save data to/from various files is a useful feature, as is the limited editing. Those requiring more extensive editing features (such as block moves or block fills) will have to resort to loading the data file under a debugger such as Gemdebug, ZSID, or DDT and using their facilities. The display option is useful as it lets you visually check the buffer contents before programming. (This ensures that you have loaded the correct file and that it does contain what you think it does.)

The only obvious omission is the ability to program a limited range of addresses within the EPROM. At the moment it is a case of `all or nothing´. (Mind you the software does not bother to program any byte that is OFFh, so this can be got around in a roundabout way although the `verify´ code may complain rather!)

In general the ESCape key acts as an abort key to return you to the main menu. However this feature does not work during programming, and there is no visual echo of the progress of the programming operation. I assume this is to reduce the display/polling overhead that would otherwise occur and cause an increase in the overall programming time, but it is a pity that it has been omitted. Perhaps this will be changed in a later release of the software.

General comments
It is nice to see the programmer as a separate unit rather than an 80-BUS card. If anyone has ever used a system where the programmer was on a plug-in card they will know the frustrations of that approach. (You have to work with the lid off the computer and have to juggle the cards around to get the EPROM card into a position where you can actually get EPROMs into and out of the socket - The socket is more often than not vertical, and when you flick the lever to release the EPROM it often falls out into the guts of the computer!)

If you do not have a disk-based system, or want some unusual feature in your control software, the file PROGINIT.MAC contains the low level drivers that form part of PROG. If you are writing software to be `PROM´ed then it is likely that you should be able to add your own control routine to PROGINIT although you will have to do a certain amount of detective work to work out exactly what to do. PROGINIT.MAC - I think it should actually be PROGINIT.C judging by the comments at the start - starts off with a section of comments that tells you what bits where control what. (e.g. Bit X of the control latch selects a Vcc of 5v or 6v, set bit Y for 21v programming voltage, etc.) What it leaves you to work out for yourself are the bit combinations required for the various EPROM types.

Conclusions
The Gemini EPROM programmer is fairly obviously targeted on Gemini Galaxy and Quantum users, but any Multiboard/Gemini/Nascom owner running CP/M should be able to use the package without any difficulty. (N.B. The screen display of PROG.COM is obviously orientated towards the Gemini IVC/SVC.) Those without disk systems will have to write some of the support software themselves.

The price of £150 (+VAT) seems a little on the high side to me, but it is neatly packaged (unlike the earlier Bits & PC´s programmer which came as a bare board) and it definitely does work.

REVIEW OF NASCOM ENHANCED BASIC (CRYSTAL BASIC 3) By Roger Dowling

GENERAL

The following review of Enhanced BASIC for the Nascom computer is based upon the version to run under the Nas-Dos disk operating system, although presumably the CP/M version is similar and the tape version is lacking the disk commands, most of which will be obvious.

The Nas-Dos version supplied on disk contains two Crystal BASIC interpreters. XBASD is the standard disk version and one other which has additional commands for use with the Nascom AVC (GXBASD). The former is approxiamately 14k in length and the graphics version is some 22k long. XBASD returns 34044 bytes free and GXBASD returns 26304 bytes free when run under a 48k RAM system. It will run under either Nas-Sys 1 or 3.

Also on the disk are some demonstration XBASIC programs, some of which are also examples of disk (or tape!) file handling given in the manual. The manual contains around 90 pages including appendices and is well documented although a bit hap-hazard in layout. Nothing like the early Nascom manuals though for anyone who goes that far back! The only faults with the manual that I could fairly say is that some of the default values in the workspace area are incorrectly shown and the examples given for adding extra commands seem to assume tape XBASIC and thus the locations for the pointers to the extra tables and commands are different for the disk version. No great hardship after half an hours work though.

Also present on the disk are various pictures and demo programs to be run with the AVC under GXBASD. These are virtually the same as those which come with the AVC board although I did manage to find one or two extra things in there.

One other nice program on the disk is a ROM BASIC to XBASIC conversion utility which, when run, sets up the command table to accept two extra commands namely DLOAD and TLOAD to load and convert a ROM BASIC program from disk or tape and then to convert to XBASIC format.

XBASIC supports up to four disk drives and one tape drive and occupies RAM from 1000H to approximately 4660H. Its workspace is from 1006H to 1180H and a complete useful listing of the workspace area is given in the manual.

Additional commands may be incorporated into the interpreter in two ways -permanent extensions to the command set extend the interpreters length by adding the routines and extra word tables onto the end of the XBASIC code. The complete interpreter is then re-writtem to disk to include the extra commands. Temporary additions such as toolkit type commands which have no use during the running of a program are added at the top of RAM and can be removed by a cold start. An interesting point is that the Auxiliary Reserved word table (the table that contains any extra commands) is scanned before the Standard Reserved word table and this means that it is possible to use complete words from the existing table as part or whole Auxiliary words.

There are a total of 115 commands (including operators), 44 (I think!) that are in addition to those available with ROM BASIC. There are 14 commands that are similar to those of ROM BASIC but which have a changed format or are enhanced. XBASIC is an interpreter in its own right but where commands are the same as in ROM BASIC then their action is similar too. In XBASIC, there is no unscrolled top line. Thus all 16 lines scroll. It took a long time to get used to the fact that it is the cursor down key rather than the Enter key that scrolls the screen. The Enter key merely places the cursor (if it is not already there) at the first free line on the VDU. The Editor uses an internal "VDU" high up in RAM and a line length of up to 127 characters is achieved using this technique coupled with an input buffer located at 0C80H. By moving

this location, with the use of the pointer comand, longer line lengths may be achieved.

Variables may be named to any length but only the first five letters are distinguished. Integer variables are defined by the use of a % suffix i.e. A%, B% etc. Any numerical variable followed by % will be truncated to its integer form. Hex numbers are catered for by preceeding any hex number with an ampersand sign (&).

EDITOR

The XBASIC editor takes two forms, namely screen editor and line editor. Normally under command mode, the Editor is in screen edit mode and during a program run is in line edit mode, although this can be altered for special purposes (see IOM command).

SCREEN EDITOR

As under ROM BASIC with the additional facilities of:

CTRL A - Home cursor to top left corner of screen. CTRL W - Erase whole line that cursor is sitting upon irrespective of where it is in that line. CTRL X -Erase to end of line from the current cursor position. CTRL O - Erase to end of screen from current cursor position. CTRL P - Print screen contents to printer. ESC - Abandon a line. This does not delete the line as it does in ROM BASIC. The Ok prompt is printed. This took a while to get used to.

LINE EDITOR

As for ROM BASIC in input mode within a program except that CTRL P will dump screen contents to printer. Cursor left wil delete previous input during input mode.

OUTPUT DEVICES

As supplied, three devices are assigned under XBASIC. Device 0 is the default value and assigns the Nascom output to the VDU and input from the keyboard. Device 0 is the only one that uses the screen editor. Device 1 is output to a printer (may be serial or parallel) and is the device utilised when CTRL P is used. Input is not assigned and is as for device 0. Device 2 is output to serial port and input from the serial port.

The output device is changed by use of the PRINT# command followed by the device number. e.g. PRINT#1:LIST would list the current XBASIC program to the printer. A number of devices may easily be added to cater for a modem or other such periphiral attached to a UART on the Nascom I/O board for example. A total of 255 (0 to 254) output and 255 input devices may be assigned! All disk and tape file handling is passed via device 255 and is therefore not assignable.

COMMANDS

First the commands that have the same name as those within ROM BASIC that we all know and love but which are enhanced or act differently.

CLEAR - As for ROM BASIC except when followed by up to two values sets up the top most location available to BASIC and the size of the stack in addition to clearing the variables.

e.g. CLEAR&C000,300 increases the size of the stack from its default and minimum value of 256 to 300 bytes and the highest location available to XBASIC as BFFF hex. Any OBJ file loaded after this command will be loaded from C000H irrespective of its resident address when it was saved.

POKE - Easiest shown as an example: POKE&C000,252,253,254,255 etc. This places the hex code for 252d into location C000H,253d into C001H,254d into C002 etc.

DOKE - As for POKE above only, of course, in double byte form.

LIST - Followed by up to three values. The first value is the line to list from, the second is the number of lines to list at a time before pausing and the third is the line number to list up to. The default value of lines to list at a time, as supplied is 65535 but this can be altered to suit your taste. e.g. LIST 300,10,1000 will list lines 300 to 1000 pausing every 10 lines until a key is hit to display the next ten. The value of ten lines at a time will remain until set otherwise by a command such as LIST,5 when the whole program will start to be listed pausing every 5 lines displayed. A nice feature of XBASIC is that it is not necessary to press ESC to abort a listing. During a pause, any of the cursor keys will abandon the listing while at the same time moving the cursor in the desired direction in order to make an edit. Listings are made obvious that they are XBASIC format by the fact that the start of each line is indented by two spaces on the VDU. Another interesting point is that graphic characters are listed as their true representation rather than their reserved word counterpart.

MON - Abreviated form of the MONITOR command available in ROM BASIC.

POS - POS(J) where J is an expression which must evaluate to an integer in the range 0 to 255 is used to obtain the current output column or row position according to the value of J.

POS(0) returns the print column count up to a maximum of 255 when it is zeroed. It is independent of screen size. It is a command mainly used in conjunction with printers.

POS(1) returns the current column position of the cursor on the VDU.

POS(2) returns the current row position of the cursor on the VDU. The latter two are designed to be used alongside the PRINT@ facility.

PRINT@ - Allows printing of expressions at specified points on the screen. Similar in use to the ROM BASIC SCREEN command except that the coordinates 0,0 are from the top left of screen. The coordinates may be up to 255 and in this case wrap-around will occur.

PRINT# - When data files are open PRINT# followed by strings or numerical variables will allow writing to the file.

INPUT# - As above but in the reverse direction! Superbly easy to use.

SET - As for ROM BASIC except as with the PRINT@ command above the coordinates 0,0 are at top left. Incidentally, the SET command is not followed by the coordinates within brackets as it must be within ROM BASIC. Similar rules apply to the RESET command.

RND - RND(1), as for ROM BASIC, returns a random number in the range 0 to 1 although it is a true random number, the routine making several uses of access to the refresh register of the Z80 CPU.

RND(0) returns the last random number produced.

RND(I) where I is in the range 2 to 65535 will return an integer random number ranging from 0 to I-1. e.g. RND(9) produces an integer random number in the range 0 to 8.

RUN - Programs may be run direct from disk by just entering RUN followed by the name of the program as stored in the disk directory. e.g. RUN"TEST" will load the program TEST from disk and proceed to run it.

TAB - As for ROM BASIC except that when additionally followed by two values will print characters specified by the second value until the print head reaches the column specified by the first value. e.g. PRINT TAB(20,46) assuming the cursor is placed on the first column of a line, will print twenty full stops.

WIDTH - Sets the width of the current output device when an automatic CRLF is generated. Set by default to 0 when no automatic CRLF is generated.

LOG - Followed by a suitable number returns the base 10 logarithm. The ROM BASIC LOG command returns the natural (base e) logarithm.

LN - Followed by a suitable number returns the natural logarithm!

And now the exclusive command set:

AUTO - Followed by up to two values. An automatic line numbering whilst entering programs facility. e.g. AUTO 100,5 will start auto numbering from line 100 in steps of 5. Default values are from line 10 in steps of 10. Unfortunately you can fool this command by editing another line whilst in the auto mode and then entering this new line. Although this line will be entered correctly the next line number automatically printed will have increased by the increment even though there has not been a line entered with the previously printed auto line number. The only way to revert to normality is to abort the auto mode by ESC and then issuing a new AUTO command. Absolutely essential to program writing though!

CALL - Followed by a suitable expression will call a machine code routine at the address specified. The routine should normally end with a RET instruction. e.g. CALL &C800 will call the machine code routine located at C800H.

DEL - Followed by two values will delete the XBASIC program lines between the lines specified. e.g. DEL100,200 will delete all lines from 100 to 200 inclusive.

DRIVE - The default drive in the disk version is the disk drive A (logical drive 0) and this may be altered with the DRIVE command. Any read or write commands after this will default to the drive specified unless specified otherwise in the command (see later disk commands). e.g. DRIVEB will now default to the second disk drive. DRIVET will now read and write data to and from tape when required.

ELSE IF ..... THEN ..... : ELSE - need anymore be said?

EVAL - I'm afraid the usefulness of this command escapes me. The command will evaluate text in a string expression. e.g. A$="1+X-EXP(X/3)":Y=EVAL(A$).

FMT - Requires a lot of words to explain its detailed use but suffice to say it is a PRINTUSING type of command which can specify the number of figures to

be printed in front of and behind a decimal point.

HOLD - A real beaut. this one - especially when used with the CHAIN command. HOLD followed by up to two line numbers will hold a range of lines for view in a program so that another program may be appended to it or so that this range only may be renumbered and thus moved to another part of the program. The effect is that the rest of the program seems to have disappeared. In fact it is still resident in memory but cannot be found with a LIST command nor executed with a RUN command. The listable area can be modified however and even RUN without affecting the hidden areas. LOADING another program removes the listable area and also the upper hidden area if there is one but does not destroy the lower hidden area. e.g. HOLD100,199 leaves lines 100 to 199 in view and a command such as a renumbering command will only renumber that which is in view.

MGE - Restores sanity to a held program.

HEX$ - Followed by up to two values returns the hexadecimal string corresponding to the first value as a string of characters whose length is dependant upon the second value (4 assumed if not specified). e.g. HEX$(1234) returns the string 04D2. HEX$(100,2) returns the string 64.

INCH - Returns the ASCII value of the next input character which it waits for. e.g A=INCH places the ASCII code of the next key pressed into the variable A.

INCH$ - Returns the next key pressed as for INCH above but as a one character string. e.g A$=INCH$. Also useful in conjunction with tape or disk files when certain characters may cause undesired effects under an input condition. See later commands on file handling.

KBD - Similar to INCH but scans keyboard and does not wait for a character.

KBD$ - As for INCH$ but does not wait for input.

RENUM - Renumbers a held program or the whole of it if a HOLD has not been previously issued. Used in conjunction with HOLD and MGE it is a very versatile command.

IOM - Followed by two values. This command alters the bits in the IOMOD word in the workspace which consists of sixteen one bit flags of which seven are used at present in XBASIC. By setting the bits to 0 or 1 the operation of certain areas can be modified. These require more explanation than is possible here but it is with this command that one prevents the switch from Screen Edit mode to Line Edit mode during a program run or disable the use of the break key etc.

MOD - An operator which is the remainder from a division. It can be defined as follows: A MOD B = A - B * INT(A/B). e.g 5 MOD 3 returns 2.

MUL$ - Followed by a string and a number returns the string repeated a number of times dependant upon the number. e.g. MUL$("*",5) returns the string *****.

PI - Returns the value 3.14159. Very useful with the AVC and is faster than using a variable to hold the number for pi. This function actually uses 3.141593 but is only printed to five decimal places.

POP - Removes one address off the stack of GOSUB addresses so the next RETURN ill branch one statement beyond the second most recently executed GOSUB.

PTR - Followed by two values allows the setting of selected scratch pad locations without using POKE or DOKE. The advantage of this is that the XBASIC workspace area is different for various implementations. For example the worksp-ace locations in the Nas-Dos version starts at 1006H but in the CP/M implementation, it is at 0100H. Thus some compatability is achieved. There are 24 selected locations. e.g. A=PTR(14) places the address (in decimal!) of the end of the XBASIC program currently in memory into variable A.

SCRN$ - Followed by a number which must be less than the number of rows on the screen (16 on a standard Nascom), returns the string of characters from this row number, the length of which will always be equal to the number of columns on the screen (48 on a standard Nascom).

SEP - Followed by an ASCII value alters the seperator found in input statements - normally a comma. e.g. SEP 47 makes / the seperator. SEP 0 allows any characters to be input in INPUT statements including commas - although in this case, only one input at a time would be allowed.

SIZE - Returns the current space available for program use. As for FRE(0) in ROM BASIC.

SPEED - Followed by a number from 0 to 255 sets a delay in the character output to the current output device. 0 is very slow whilst 255 is normal speed.

SWAP - Followed by two variables swaps the contents of the variables which may be numeric or string types. Saves a lot of space in sort routines.

ZONE - Followed by two numbers sets the print zone (tab) width and the largest column for which printing to the next zone will stay on the same line. Default values for a standard Nascom are 14 and 36 respectively.

ON ERR - Errors can be trapped and dealt with as you desire. It is possible to deal with certain errors only and then continue in the program whilst unexpected errors will still break out of the program. The function ERL returns the line number where the error occurred, ERR returns the number of the type of error -there is a list in the manual, ERR$ returns the error string message without the word "error".

OFF ERR - Turns off the ON ERR command. An ON ERR command will turn off anyway after an error has occurred in case the error routine has an error in it(!) but the error dealing routine can always turn it back on again at the end of the routine.

ON EOF - As for ON ERR except that this deals specifically with the encounter of an end of file when reading disk or tape data files and which would normally cause an End of Text Error. If ON ERR and ON EOF are both in force then the latter takes precedence if an end of file condition is sensed. The main difference between the two error handling statements is that the ON EOF routine does not turn off after an EOF error.

OFF EOF - As for OFF ERR, turns off above command. The OFF commands are not required if the program ends normally as both modes are automatically turned off.

DIR - Displays the directory of the currently logged disk drive. This is shown in a different format to when displayed under Nas-Dos. Each file name is shown with the type of file (XBS for XBASIC, OBJ for object code, ASC for ASCII type files or how you wish to suffix them!). Nas-Dos object code files and ROM BASIC files are shown with strange file types. Locked files are indicated with an asterisk in front of the filename and the size of each file is given after the name to the nearest 1k above its actual size.

LOAD - Followed by a filename loads a file from tape or disk. e.g. LOAD"TEST" will load the XBASIC program called TEST from the current logged drive, disk or tape. Any program in memory is lost but variables are not destroyed. LOAD"B:TEST.OBJ" will load the object code file called TEST from disk drive B (irrespective of the current logged drive) into memory starting at the location reserved for it by the CLEAR command.

SAVE - Similar in operation to LOAD command above only, of course, saves the file to disk or tape. Three types of file may be saved with this direct command -XBASIC programs, object code and a program as an ASCII file. If the filename is already present on disk then the file with that name will be erased before saving the current program!

ERA - Followed by a filename will erase the disk file of that name from the directory.

LOCK - Followed by a filename will lock the file so any attempt to erase or save a file of the same name will produce an error message. UNLOCK removes the facility.

REN - Followed by two filenames will rename one file for the other.

VERIFY - Followed by a filename will verify the file, reporting any checksum error as a Bad Data Error.

CHAIN - Followed by a filename will load and execute a program whilst preserving variables. Particularly useful when used in conjunction with the HOLD command such that common subroutines at the beginning of a program may be "held" and then another program CHAINed from disk, an automatic MGE being performed, the resulting program then being able to make use of the previously "held" subroutines. Thus any number of programs may be "chained" which make use of a common set of routines. I find this command most useful.

CREATE - Followed by a valid filename will create a file for subsequent data torage using the PRINT# command. Random or sequential access are both catered for.

OPEN - Followed by a filename will open a previously created file for subsequent writing (PRINT#) or reading (INPUT#).

APPEND - Followed by a filename will open the file for subsequent writing (PRINT#) or reading (INPUT#).

APPEND - Followed by a filename will open the file for subsequent writing onto the end of the current data in the file.

CLOSE - Followed by the appropriate string handler for a file will close the file. Unlike the ROM BASIC routine handler within Nas-Dos, XBASIC allows any number of files to be open at one time subject to memory limitations. Close by itself will close all files that are open at that time.

The file handling within XBASIC is very easy to use. File handling in ROM BASIC is, in my view, cumbersome, although it was reasonably straight forward to store strings but numeric data was more of a pain. In XBASIC, file storage and retrieval of strings and numeric data is made as simple as I think it can be whilst still retaining versatility.

Apart from the previously mentioned bug in the AUTO command, there are at the time of writing (July 1983) several known bugs in the Nas-Dos version of XBASIC which I am told is being looked into by Nascom. The two most drastic ones are:-1) ASC files cannot be saved to disk although they can be saved to tape and 2) attempts to retrieve programs or data from tape proves fruitless. Hopefully these will be corrected shortly.

CONCLUSIONS

I find that I now no longer use ROM BASIC because XBASIC does all that ROM BASIC does and more. Certain commands are lacking which need to be added as debugging aids;namely TRACE and FIND routines etc. No doubt these will appear as XBASIC becomes more widely used. Failing that I will have to write the routines myself! My first attempt at writing an OLD command to retrieve NEWed programs resulted in disaster as I could only recover the first line!

All in all I find XBASIC to be a useful interpreter and one that any Nas-Dos user should not be without if only for the added disk commands that make file handling so much easier than in ROM BASIC.

SMALLADS (continued)

For Sale

RAM-A board, 32k RAM, 2716 conversion (no EPROMs). With INMC mods, but still won't work at 4MHz without waits (dunno why...) #45 ono. HS1N twin-drive digital cassette system. As reviewed 80-BUS News Vol 1 iss. 4. With original ROMs (2708s, assembled for #D000 and ports #F8 to #FF) or my enhanced OS (2716 - assembled for #D000, and ports #78 to #7F); 4118s, connecting leads and some tapes. #170 ono Adrian Perkins Tel. Bracknell (0344) 485816.

Gemini Galaxy 2 Computer System, as new. Complete with WordStar and MailMerge. #1300 ono. Tel. Peter Forsyth, Chesham (0494) 782449.

Colour/Sound/RTC, etc, card (Holmes - R&EW) as advertised in Vol 3, Iss 1. Also HENELEC GM805 Disk Controller card. Any reasonable offers considered. Chris Bowden (0209) 860480 for details.

An Insight into the Gemini IVC and SVC

By D. W. Parkinson

Over the years I have waited for a review of the Gemini IVC to appear in the pages of 80-BUS News. As nothing has appeared to date, I have decided to put pen to paper to rectify the situation. What follows is not a review, but an insight into the IVC (GM812) and the SVC (GM832). Why an insight? Well I had some influence on the specifications for the boards, and I am the author of the IVC and SVC monitors. As such I am unlikely to be an un-biased reviewer, but hopefully this article will give you a deeper understanding of the whys and wherefores of the software, and the capabilities of the boards.

Background

Back in the dark ages, when there were only Nascoms, and the Nascom 2 was stuck in that black hole of Receivership from which only a trickle emerged, the Gemini system was born. (The demand was there, and the dealers needed something to sell.) After much discussion Gemini decided that in their system the video section should be separate from the CPU card, and that it should have its own dedicated processor. Although this was a more costly approach than that of the Nascom 2 it had various advantages:

(1) Those requiring a CPU card for dedicated control applications need only buy a CPU card (GM811).
(2) Flexibility.
(3) Increased performance.

Item (3) needs some further explanation as, on first examination, one would think that nothing could be faster than a memory-mapped display. After all, with a memory-mapped approach, the CPU is putting the characters directly into the display, so why take any other approach? The reasons for doing this are many, and I'll try and give the pros and cons.

Loss of CPU memory space I. A memory mapped display eats up CPU address space, (c.f. the 32k BBC. Put it into hi-res graphics and you are only left with 12k), although this could be got round by switching the display memory into the normal address space only when it is required (as done by the Nascom AVC).

Loss of CPU memory space II. A memory mapped display requires software to drive it, and the more sophisticated the software the more space it takes up. Once again the software could be contained in ROM on the video card, being paged in along with the display memory (Not done by the Nascom AVC).

Speed. Unless the video driver is incorporated within the applications programs (which would ensure they were non-portable), there is the overhead of the driving software to consider, and the case of `transparent access'. The screen memory is usually shared between the CPU and the display controller. If the CPU updates the screen memory whenever it wants to without regard to what the display controller is doing, the result is visible interference on the display. This can be very irritating and most systems aim to provide an interference free display by synchronising the CPU and display controller. In general this is most easily achieved by only allowing the CPU access to the shared memory during the intervals when the display is blanked, and the resultant `waiting' wastes a certain amount of the CPUs time. Similarly scrolling a full screen takes an appreciable amount of time, although this could be reduced with specialised hardware. Anyway, by the time you have a paged display card including on-board software in EPROM, it is only a small incremental cost to give it its own processor, and to talk to it via a few I/O

ports. This now gives you parallel processing. The main CPU can pass a character over to the slave CPU saying `deal with this please', and can then get on immediately with its job of running your program.

I have recently heard of a problem somebody has been having with the Nascom AVC that nicely illustrates the point. He is (was?) writing a communications package to run on his Nascom, and had run into trouble because he couldn't get incoming characters into the display fast enough. The IVC can suffer from a similar problem, (scrolling takes an appreciable time), but this can be circumvented very easily by implementing a small circular buffer and alternately polling the UART and the IVC [1]. Here one processor is handling the display and keyboard while the other is acting as a postman between it and the UART, and the postman can temporarily hold onto things if the display is busy. However with the AVC the problem is more fundamental as the postman and display driver programs can only run sequentially, not concurrently. Having given the output routine a character to display the AVC driver was sometimes taking so long to return that several incoming characters were lost. This could be circumvented in two ways:

i) duplicate the screen driving code, and add `poll UART & buffer' calls to it in the middle of all routines that take an appreciable length of time to execute. (i.e. Combine the `postman' and `display driver' in a single program, interleaving the two like a `riffle shuffle' with a pack of cards.)
ii) Run the UART under interrupts.

The latter approach needs careful thought if the screen driver is busy paging various parts of the memory in and out! Also it may interfere with any software approach to transparent screen access.

The IVC hardware

The IVC is basically a small SBC (single board computer) containing the following: A Z80A, 6845 display controller, 2K of shared screen memory, 4k of character generator that may be a mixture of RAM and EPROM (the standard is 2k of EPROM, 2k of RAM), 2k of workspace memory, EPROM program memory (2716 or 2732), and a few I/O ports. To the host 80-BUS system it appears as three I/O ports. One port is a read/write port through which data and commands are passed to/from the IVC, one port is a read-only status byte that holds the full/empty flags for the data port. The final port is a write-only port that resets the IVC's processor.

Within that hardware context the features of the IVC are provided in software by the on-board monitor IVC-MON. There have been several versions of the monitor, and in the following sections I will cover various aspects of the monitor, finishing off with a description of the differences between each version.

IVC-MON

I don't intend to regurgitate the software manual here - those that are interested should be able to obtain a copy through their friendly Gemini dealer - but table 1 is a copy of the command summary from the manual for those that are not familiar with it.

Command Summary

NOTE:
1. These are the control codes that the IVC responds to. They are normally sent to the IVC by a User program or the Host's operating system. (See section 4 - PUTVID).
2. Programs that request information from the IVC will have to read the information back from the IVC. (See section 4 - GETVID).
3. It may not be possible to issue commands to the IVC direct from the keyboard attached to a system, as the operating system may modify the characters typed. (eg the standard CP/M line input routine would echo "^[" to the IVC if the ESCAPE key were pressed, rather than the ESCAPE code. - However note that this problem can be solved in Gemini CP/M systems by selecting "EDIT mode", where all characters are echoed to the IVC exactly as typed).
   (Also see section 6.2 - Nested Escape sequences).

General

07	^G	Bell
08	^H	Backspace
0A	^J	Linefeed
0D	^M	Carriage return

Cursor movement

1C	^\	Cursor left
1D	^]	Cursor right
1E	^^	Cursor up
1F	^_	Cursor down
1B 3D...	<ESC> "=" RR CC	Cursor addressing

Additional cursor operations

1B 3F	<ESC> "?"	Return cursor coordinates and character
1B 44	<ESC> "D"	Delete cursor
1B 45	<ESC> "E"	Enable cursor
1B 59..	<ESC> "Y"..	Define cursor type

Screen editing

0B	^K	Delete line and scroll up
0E	^N	Insert line
16	^V	Delete character in line
17	^W	Insert character in line
1A	^Z	Clear screen

1B 16	<ESC> ^V	Delete character in screen
1B 17	<ESC> ^W	Insert character in screen
1B 25	<ESC> "%"	Delete to end-of-screen
1B 2A	<ESC> "*"	Delete to end-of-line
1B 5A	<ESC> "Z"	Return contents of current line

Screen format

1B 31	<ESC> "1"	Select 80 wide format
1B 32	<ESC> "2"	Select 48 wide format
1B 33	<ESC> "3"	Select user-defined format
1B 46..	<ESC> "F"..	Define user format
1B 42	<ESC> "B"	Blank screen
1B 56	<ESC> "V"	Video on (unblank screen)
1B 49	<ESC> "I"	Video Invert screen
1B 4A	<ESC> "J"	Video normal screen
1B 41	<ESC> "A"	Alternate character generator is the default
1B 4E	<ESC> "N"	Normal character generator is the default
1B 4D	<ESC> "M"	Memory lock on
1B 4F	<ESC> "O"	Memory lock off

Character set

1B 43..	<ESC> "C"..	Define character
1B 63..	<ESC> "c"..	Define character set
1B 47	<ESC> "G"	Construct block graphics character set
1B 48	<ESC> "H"	Duplicate lower character set in upper but invert
1B 68	<ESC> "h"	Duplicate lower character set in upper c/gen

Block graphics

1B 47	<ESC> "G"	Construct block graphics character set
1B 52..	<ESC> "R" X Y	Reset point X,Y
1B 53..	<ESC> "S"..	Set point X,Y
1B 54..	<ESC> "T"..	Test point X,Y

Keyboard

1B 66..	<ESC> "f"	Define Function Key(s)
1B 6B	<ESC> "k"	Test Keyboard status
1B 4B	<ESC> "K"	Get Keyboard character
1B 58	<ESC> "X"	Get one line of input

Miscellaneous

1B 57..	<ESC> "W"..	High speed Write to display
1B 4C..	<ESC> "L"..	Load user program
1B 55	<ESC> "U"	Execute user program
1B 50	<ESC> "P"	Return light pen coordinates
1B 76	<ESC> "v"	Return version number

Odd features of the IVC stem from the Nascom background. e.g. the alternative screen format being 48 characters per line. The block graphics are those of the Nascom 2, rather than the teletext standard. (Same symbols, just controlled by different bits within the byte.)

The IVC accepts 8-bit characters from the host system. All the standard printable ASCII characters (whose codes are in the range 20-7F), and all characters for the alternate character generator (whose codes are in the range 80H-FFH), are placed directly into the display at the current cursor position. Characters in the range 00-1FH are interpreted as control characters, and are used to control the extensive features of the IVC.

One reason why I have been looking for a review of the IVC is to see if anbody feels that important features are lacking from the escape sequences. (Do you all want protected fields? Do you want a "page" mode as well as a "Scroll" mode?) My feeling, echoed recently in these pages by David Hunt, is that 97% of users do not use anything other than the few basic functions like `cursor addressing´ that are used by programs such as Wordstar and dBase II.

Attributes
The IVC supports a single flexible attribute. This is the programmable character generator (pcg), sometimes refered to in the IVC documentation as the alternate or upper character generator. On power-up the contents of the standard character generator (an EPROM) are copied to the alternate character generator and are inverted on the way. This means that by using the alternate character generator, (either by setting the msb of a character before it is sent to the IVC, or using the sequence <ESC> A to make the IVC do it for you), video-inverse characters can be displayed. (e.g. to highlight headings and menus within Wordstar and other such programs.) Note that inverse video is the default setting, there is nothing to stop you programming other bit combinations into the character boxes. For example you could set up a Greek alphabet or a series of specialist mathematical symbols for use by a custom wordprocessing package. The Henry´s package HI-RES uses the pcg to offer a pseudo high resolution graphics mode on the IVC.

Transparent access
As I mentioned earlier, the absence of visual interference on the screen when the on-board processor accesses the screen memory is essential. There are various ways that this can be achieved, but this to some extent depends upon the choice of controlling microprocessor. If a Motorola 6800 had been used for the IVC processor, then a very neat arrangement could have been implemented where the processor and display accesses could have been interleaved, leaving each controller in total ignorance of the other. However history dictated that a Z80 was used. The Z80 has asynchronous memory cycles, (asynchronous to the extent that its memory cycles are not all the same length), and so it can not easily be arranged to access the display memory between each displayed character. With the IVC design the easy way out was taken, and the Z80 was given priority access to the display memory. (i.e. it can barge in when ever it likes.) However the horizontal and vertical sync pulses and the display blanking signal from the display controller are routed to a port so that the Z80 can monitor their state. Thus, by monitoring this port, it knows when it can safely `barge in´ and update the screen memory without causing any interference on the display.

In general, there is a suprisingly small impact on performance in taking this approach. This can be seen by considering the usual practical overheads in displaying a line of text on the screen. To do this an application program loads a byte from memory into a register, updates and saves the pointer into the character string, and then calls the operating system to output that character. The operating system then determines where to send the character, (e.g. checking the IOBYTE in CP/M), and finally sends it on its way. A simple assumption that can be made in this scenario is that the IVC can put characters into the screen display at a maximum rate of one per displayed line, i.e. one every 64uS during the line blanking interval. (A remote terminal would have to work at a line rate of 156k baud to match this!) This display rate of one byte per 64uS is likely to be of the order of the Host system's overhead, if not a bit faster, and so the display rate is actually limited by something other than the internal display technique of the IVC. (Note that once the IVC has accepted the character for display the Host system is free to go off and collect the next character. Thus the IVC's `average' waiting time of 32uS to get that character into the display is not wasted time, as the Host is not held up by it.)

The one time that the display technique does have an impact on the performance of the IVC is in the scrolling rate. Don't get me wrong - the IVC doesn't scroll exceptionally slowly - it's just that it could go faster! I did briefly experiment with using a hardware feature of the display controller that resulted in a scroll rate of over 1000 lines/sec but dropped it for various reasons:

i) It was far too fast and would require another escape sequence to let users define the scroll rate they wanted.
ii) It complicated the monitor software in various places.
iii) It made the implementation of the `non-scrolling' lines more complicated, and if a significant number of lines were `locked' on the screen the situation returned to the original problem. (Either `locked' lines are left alone and the rest of the screen memory contents moved, or the main screen stays in place in the display memory and the `locked' lines have to be moved to the new display start address!)

Keyboards

The IVC includes a port to which a keyboard can be attached. This makes sense as it effectively turns the IVC into a terminal which is then connected to the Host 80-BUS system. (The connection is via the 80-BUS backplane rather than a conventional RS232 link.) The IVC continually monitors the keyboard port and passes all characters from the keyboard to the Host via an internal 64-character buffer. Thus, whenever a key on the keyboard is pressed, the character is read and stored in the buffer from whence it is extracted when and if the Host system asks for it. Thus a fast typist can hammer away secure in the knowledge that nothing will be missed. In fact it is quite useful to be able to `type ahead' with some programs, although this should be done with caution until you are sure that the program will accept it. (Some programs poll the keyboard often, and `swallow' characters they don't recognise. Others stop polling as soon as they receive a single character that is not immediately applicable, but they hold onto it for later.)

The point I'm trying to make is that once you are familiar with certain programs you can improve your throughput by typing in responses before the next prompt appears. For example you can speed up the time taken to load a Wordstar file and to get to a certain position within it. Having typed WS to

invoke Wordstar wait until Wordstar has loaded and has started on its first screen display. (It seems to `swallow' the odd character if you start too soon.) You can than type (without any pauses) a command like **DARTICLE.DOC<RETURN>^QFKeyboards<RETURN>2<RETURN>**. This magic invocation (for those unfamiliar with Wordstar) would open a document file ARTICLE.DOC, start to load it into the memory buffer, search through the file and put the cursor at the second occurrence of the word "Keyboards". WORDSTAR would do this without all the normal in-built delays, and also without bothering to display the first page of the document.

One very useful feature came in with release 2.0 of IVC-MON. At this time Gemini introduced a new keyboard, GM827, which included a row of extra function keys along the top, together with a numeric pad on the right-hand side. IVC-MON 2.0 catered for this keyboard, and while providing default settings for these extra keys, it allowed users to define alternative character strings for them (including the numeric pad). Note the use of the word "strings". If required, pressing one of these keys can result in an entire sentence (or paragraph!) being returned by the IVC. I find them useful in a variety of contexts: During program development they can be used as an instantaneous SUBMIT feature (e.g. define a key as **<M80 =PROG^M L80 PROG,PROGLIB,PROG/N/E^M>** - which runs the assembler followed by the linking loader). For standard programs they can be set up to suit the program's command codes. (e.g. Keys for INSERT, DELETE etc in editors). Oft used words or phrases can be put a single key (e.g. Please send the money).

The keyboard port on the IVC is an 8-bit port that is sub-divided into 7 data bits and a strobe pulse. This meant that some way had to be found for the IVC to distinguish the special function keys from the 128 standard ASCII characters that are generated by the other keys on the keyboard. This was done by having the GM827 keyboard return double-byte codes for the special keys, and, as the ESCAPE code (0Bh) was chosen as the lead-in code, the ESCAPE key is in fact one of the special keys. (The IVC-MON software however does not allow it to be reprogrammed to an alternative code or character string.)

Every time one of these special double-byte codes is received, the IVC converts it to a single byte code in the range 80H-BDH and stores the byte in the keyboard buffer. (Note that the normal keys can only produce codes in the range 00-7FH.) When the IVC passes bytes from the keyboard buffer to the host system it checks the msb of each byte. If the msb is found to be set it then looks for that keycode in an internal table it has its workspace RAM. The code in the table marks the start of the string that is to be sent in place of the function key. IVC-MON then sets a flag to say "get characters from this string rather than the keyboard buffer", which remains set until the string is exhausted. One point to notice from this is that a function key only uses up one byte of the `type ahead' buffer. So, if you're somebody who often goes charging ahead of PIP or your assembler, and occasionally `bust' the buffer, the answer is to put some of your typing under function keys (if this is possible). The programmable function keys I find a powerful feature, and this the IVC provides at zero overhead to the Host system thanks to it having its own processor on-board.

IVC-MON Release history.

Vers.

1.0 The original release.

1.1 Various small items were changed. (The unlikely sequence ESC ESC % % used to crash the system). `Delete line and scroll up´ now cleared the bottom line of the display if the cursor was there. (Previously nothing happened.) Cursor addressing, Set, Reset, and Test now accepted nested escape sequences during the coordinate string.

1.2 A few small internal changes made. The input buffer (used to hold incoming characters while the screen is being scrolled) was reduced to 64 bytes from 128 bytes, (128 bytes was a bit of a waste), and the internal stack area was increased.

2.0 Support for the Rotec keyboard and programmable function keys added, hence the jump to 2.0. The monitor size now exceeded 2k and required a 2732 rather than the 2716 of the earlier releases.

2.1 The current release of IVC-MON. Sections of the monitor code were restructured to give a faster response to keyboard poll requests. This has a noticable effect on the screen update rate for operating systems such as CP/M where the BDOS polls the keyboard everytime it outputs a character. Another Escape sequence was added to allow lines to be `locked´ at the bottom of the screen.

(3.0?) Although the IVC has now been discontinued one further update of the software is envisaged. (When time permits - don´t expect it tomorow!) This will include SOME of the features that have appeared in the SVC monitor (see below).

The SVC

With a new design on the drawing board Gemini was faced with the usual decision - Do they use a `state-of-the-art´ device and design a system around that and accept the attendant constraints? (e.g. the in-built character set and screen formats offered by some graphics controllers.) Or should they remain as far as possible compatible with the IVC? They - wisely in my view - opted for the latter case.

So following the IVC came the SVC. Why SVC? well they had to call it something and it does bear some relationship to the IVC. In fact it is upwards compatible with the IVC. (i.e. You can replace an IVC by an SVC and 99.9% of programs will continue to run as before.) So what do you get by moving from an "I" to an "S"? Well the Z80A changes to a Z80B (6MHz operation), the screen memory goes up in size from 2k to 8k (although some of it doubles as the character generator), a 256x256 pixel graphics mode appears, a 40 x 25 display option is provided (the 0.01% incompatibility), a UART can be added on a piggy-back board to make the SVC a stand-alone terminal, a range of attributes appears, a buzzer is added, a Gemini serial keyboard can be used and finally you get ESP.

I think that is about enough for now, and so I´m afraid you will have to wait until the next issue for part II to find out about the ESP.

REFERENCES.

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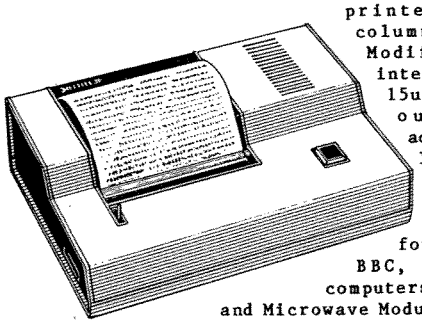

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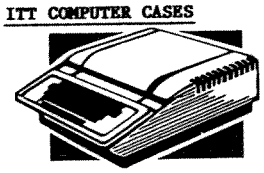

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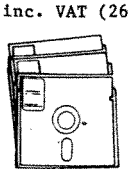

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