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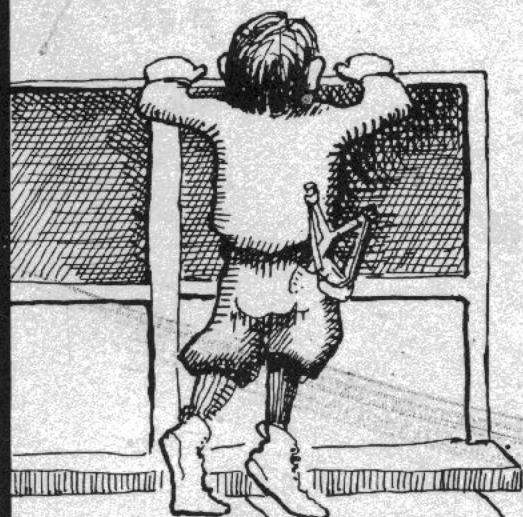


July 1981

No. 1

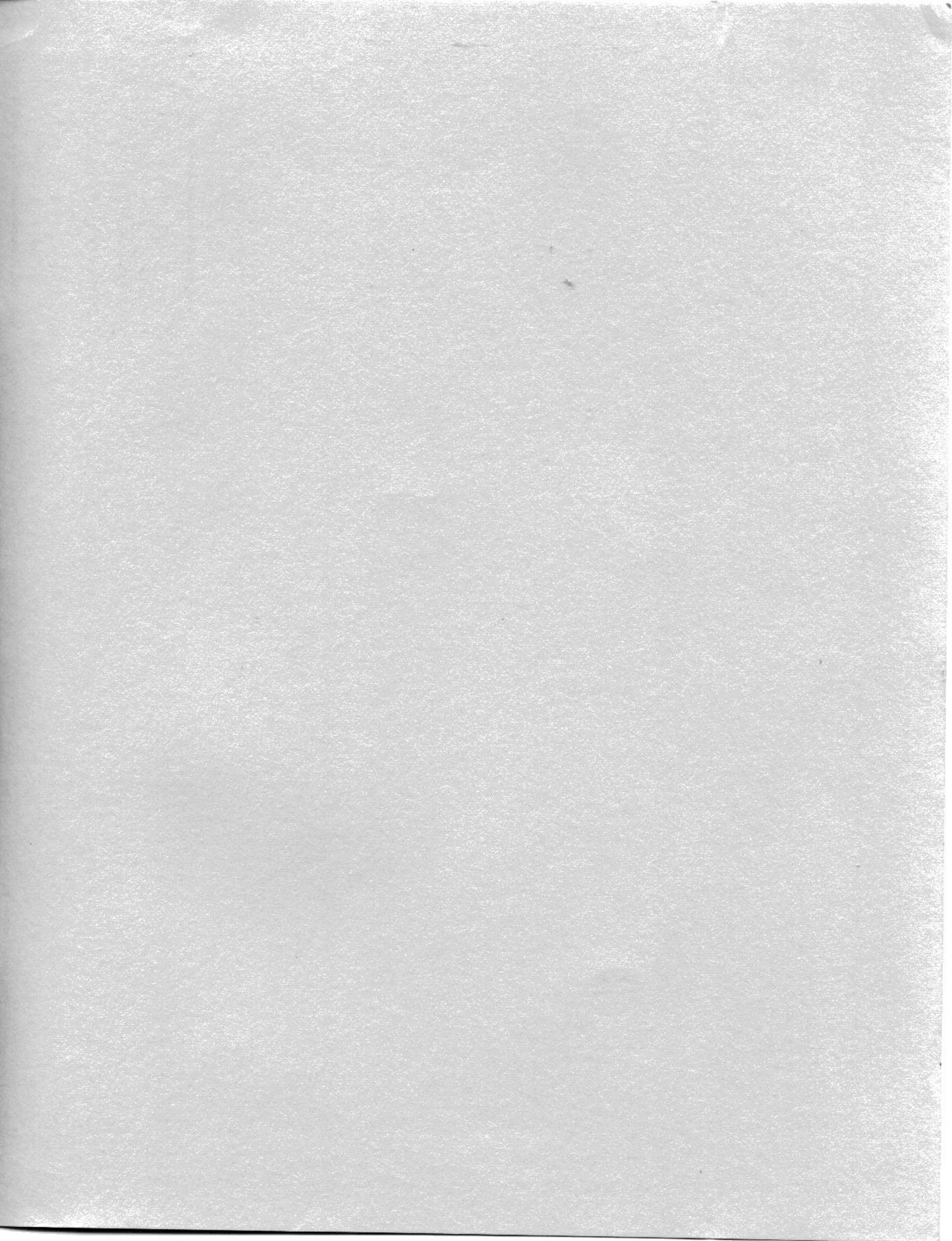
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MICRO CORNUCOPIA

July 1981

The Journal of the Big Board Users

No. 1



Hi, Y'all!

Welcome to the Premier Issue!

It was hard to imagine what this magazine would even look like on March 15th when we decided to start a publication supporting the Big Board. And now it's really exciting to see it take form.

Starting a new magazine is kind of a scary thing. You need interesting things to put in magazine so people will want to read it. You need people willing to take a chance and subscribe to a new publication, sight unseen. You need lots and lots of hours alone, staring at a video monitor, trying to generate ideas and direction. You need people who are willing to donate time and ideas to a dream. And you need a wife who is not only understanding but who does graphic design, accounting, paste-up, technical illustrating and schematic drafting. So thanks to all you folks, I get to say "Welcome."

Our typesetters, Patty Morris and Martin White are super people to work with (they are getting a Big Board to use for text editing). And Ruth, our technical editor is probably as excited as anyone about Micro C.

Then there are the people who have already submitted material for publication. I talked to Don Retzlaff while I was still deciding whether or not to jump in. His excitement about a user's group and his offer to write some very interesting things really made a publication look feasible. Don's first article appears in this issue. Thanks Don.

John Jones wrote such interesting things on his subscription form that I had to call him. He has a number of useful utilities, including the disk formatting program in this issue. More from John in future issues.

Plus, I have just received a really incredible disk from AB computers including a complete hardware and software interface for minifloppies, a reverse video cursor, and more. Stay tuned, because these super people, and you, are doing some great things with the Big Board.

David Thompson
Editor & Publisher

Dear Editor,

I am thinking of using one parallel port as an address bus to tell peripherals when to access the other parallel port. One bit would set the direction and then seven bits would remain to address up to 128 peripherals. These could include A/D's, D/A's, plotters, CRT vector graphics, and so on. I would like to see a standard scheme so we can trade designs within the group.

Frank Gentges
9251 Wood Glade Dr
Great Falls, VA 22066

Editor's Note:

I think Frank has an excellent idea. In fact, how does everyone feel about using port A for data and port B for address and control? Bit 7 (PB7) on port B could be the control bit. What say?

What would be super now, would be for someone to write a simple little general purpose parallel port driver that would reside up with the PFM monitor and could be called via the CP/M punch or directly. If someone did such a thing, it would run in the September issue, guaranteed.

And, if someone came up with a latch for translating 8 bits of port A into 16 bits of address and 8 bits of data why there'd be the start of a PROM burner or an S-100 bus interface etc.

Dear Folks,

I would like to locate Jim Rea, designer of PolyVue/80 or Micro Concepts the outfit that marketed Poly Vue. Has anyone done a modem interface for SIO port A? Or, has anyone configured Modem7 from the CPMug for the Big Board?

The Editor.

Dear Editor,

Why doesn't "clear to end of screen" work on the three boards I've seen?

Cole Chevalier
17862 Fitch
Irvine, CA 92714

Dear Editor,

I need: (1) modem driver for BB, (2) parallel printer driver, (3) to contact other users in my local area.

Daryl Coulhart
532 Lake Bayview Ct
Shoreview, MN 55112

VEDIT—Text editor.

I have Vedit up and running on my Big Board and once you figure out a couple of idiosyncrasies it is easy to customize and install. Get the CRT version rather than the memory mapped and just follow the directions for the ADM-3A.

However: Do not enter "Carriage Return" for the "COMMON 2ND CHARACTER IN THE ESCAPE SEQUENCE." The only character I've found that works is ESC (again). After this you have to use ESC W or something rather than ESC ESC to leave visual mode, and for some reason you have to use the default for the "command iteration brackets." These brackets are < and > rather than [and] by the way.

Once you have it up and running, however, it is a small (10K), but very powerful text editor. (I am using it now to do my text editing).

SMALL C and SMALL C+

If you want to get your feet wet in C and still generate source code that will run on PDP-11s running Bell Labs' C, then these two packages are worth considering. I purchased Small C from the Code Works, Box 550 Boleta, CA 93017. I mean, \$15 for a CP/M disk—how could I go wrong? It is neat, kind of like starting out using integer basic. Plus, it is public domain! Several of the fellows at Tektronix are working on it now, doing some optimizing, etc. The printed document is pretty minimal but when combined with the book, "The C Programming Language" by Kernighan and Ritchie, it is sufficient. The source for Small C, also written in Small C (it compiles itself) is also on the disk. Small C generates assembly code which can be assembled by ASM.

I picked up Small C+ at the Computer Faire from Alpha Omega Computer Systems. P.O. Box U, Corvallis, OR 97330. They say they have fixed numerous bugs in Small C and have added for-loops, do-while, and case statements, among other things. Small C+ requires M80 and L80 to compile the assembly code it generates.

Since small C+ is also public domain, I plan to make it available as part of a group exchange disk. Small C+ also compiles itself and can be compiled by the original Small C. The source and the documentation are on the disk. Two programmers at Alpha Omega did the extension pretty much as a personal project and I hope to talk to them about Small C+ in the near future.

PASCAL/MT+

I learned Pascal on a big system, I mean a BIG system (60 bits/word), and after using some of the small subset languages commonly available for micros (Small C, ALGOL/M, ...) I didn't really expect much more than a usable subset of Pascal. I was wrong. Pascal/MT+ is playing with a full deck.

I have tried it on some small "gee I wonder if it will" type programs, and it did. Hopefully I will have a chance to look at it more thoroughly in the near future. Manual and all, it is an impressive package. MT Microsystems has also put out an editor and debugger package to use with Pascal/MT+ (I've heard). If it is anything like the language package, the combination should be hard to beat for someone doing serious application programming. Contact MT Microsystems, 1562 Kings Cross Dr., Cardiff-by-the-sea, CA 92007.

Crowe Z80 Assembler

Byte's Nybbles made available a Z80 assembler by Patrick Crowe. The assembler uses standard Zilog Z80 mnemonics as defined in the "Zilog Z-80 Assembly Language Programming Manual." Byte originally made this program available for \$4.00 as a printed listing. I'm checking now to see if it is still available or if we can make it available, this time on disk instead of as a 60-page listing.

What makes this piece of software particularly interesting is that John Jones did the I/O linking for the Big Board and has supplied the source of that. And it works very well. More about all this as I get information from Byte. (All kinds of exciting things! Thanks, John.) ■ ■ ■

Now for the news you have all been waiting for, the latest, greatest from Digital Research Computers.

New ROMs for old.

Jim Tanner is now shipping the Big Board with character ROMs created by yours truly. And, he will reburn (for free) any of the old style upper case and smaller upper case ROMs you send him. If you can't part with your old character ROM for a few days then send him \$10.00 and he will send you a new ROM.

New video rocks for free.

For those of you who haven't appreciated the wiggle you get on the video display, here's relief. (No, you don't have to give up drinking.) Any registered owner who sends in his serial number and date of purchase to Jim will receive, free, a 13.9776 MHZ crystal. Take out the old 14.318 video crystal and replace it with the new one and the wiggle will be gone. Not even a genie could do better than that.

4 MHz the easiest way of all.

- Step 1. Remove U96
- Step 2. Jumper what was pin 4 of U96 to pin 4 of U97.
- Step 3. DON'T replace U96.

That's it, no crystals to buy and no board runs to cut. However, it won't work on all boards because of the precharge requirements on the RAM.

First of all, you probably need 200ns RAM chips. Big Boards have been shipped with 300ns, 250ns, and 200ns chips. About 40% were 300ns, 40% 250ns, and the other 20% were 200ns. This mod generates a clock that is more like 60/40 rather than 50/50 High/Low so even the 200ns RAM is just barely making it.

Out of three boards that they have modified at Digital Research two worked and one didn't, though they all had 200ns RAM. On most of the boards it is pretty easy to tell how fast the RAM is. The number on the chip will be 4116-X where X is probably 20, 25 or 30. 20 stands for 200ns, 25 stands for 250ns and 30 stands for 300ns. The National chips have a -4

(continued next column)

How do you contribute to Micro C? What are we interested in? What should you send, disk, printer output, post card, papaya leaf? What if you can't write? What if the thing you are doing is pretty basic or maybe too advanced? Well, here is the information.

Form: Send articles on paper, (double-spaced) or, even better, on disk. If you send a disk, we will copy the contents of the latest Big Board user's group disk onto your disk before we return it.

It's easier on us if you don't include any formatting characters in the text. These characters may help your text formatter but they have to be removed before Patti and Martin can typeset the article.

Programs: Here a disk is a super way to go. Please include at least a few paragraphs of introduction. If the program requires compiling or

Notes from Garland continued

for 250ns and a -3 for 200ns. Any others you should look up in a parts book.

If you are among the folks who have done a successful mod to speed up the Big Board, please send it in and I'll publish it (for those of us who don't have 200ns RAM or can't get this mod to work). In fact, if I get 20 different mods for speeding up the Big Board, I'll publish them all. Why not?

Double double density density.

Jim has someone working on a three-chip board which will plug into the 1771 socket. It will do single and double density on 8 inch and mini floppies (according to Tanner). I would guess that they are aiming for availability sometime late summer or early fall but no one's making any promises.

The chips will be Western Digital and the main controller will be the 1795. (Hooray, it's NOT the 1791.) Perhaps those of you struggling with the idiosyncrasies of the 1791 should write to Western Digital for a new data book.

■ ■ ■

assembling please include a COM file along with the source. And if the compiler or assembler is public domain please include it and anything else needed to do the compilation. Most of the software contributed will be placed in a group disk and made available to everyone in the group.

Personal information: Please include some information about yourself (like raising bees and running your big board off wind power) and about how you are using the Big Board.

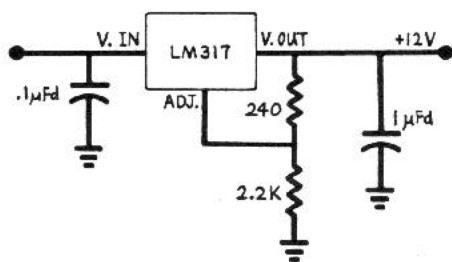
What to write about: We're looking for anything on the following list, along with just about anything not on the following list.

- **Hardware interfacing**, complete with schematics (we can redraw them if it's needed) and comments about what the circuit does and how it does it.
- **Software drivers** or other mods to the operating system. This time include a listing, etc. (See "Programs" above.)
- **Reviews of software** take a critical look at how easy it is to learn, how powerful it is, and how easy it is to use once you've learned it. Note: part of the user interface is determined by the quality of the documentation and part by the structure of the software.
- **Reviews of languages** take a critical look at the language for particular applications, systems, etc. What are its weaknesses (size, speed) and it's strengths (floating point, string manipulation, documentation, for instance). The primary languages I'm looking for are, C, Pascal, assembly, Fortran, Forth, Lisp, APL, ADA.
- **Inside scoops** on the latest, greatest rumors from the industry. It sometimes takes a little yellow journalism to keep the industry on its toes. If you would like to use a pen name like ZOSO does, let me know and presto, the Micro Cornucopia shadow can strike fear into the hearts of those wearing their three-piece-vested-interests.
- **And anything else** (which covers a lot of things).

■ ■ ■

Power to the Big Board

By David Thompson



Schematic of +12V Regulator

Picking a power supply these days can be a problem. Everyone and his kid brother are building them in variations that read like the marquee at an ice cream parlor. So the following may be a little help, both in the selection of a supply and in understanding the consequences of a poor choice.

A group of us in Portland are using the Power One model CP 384. This is a simple linear supply with three outputs, +5V at 9 amp, -12V at about an amp, and +24V at .7 amp average or 5 amp peak. The price for this unit is about \$120 in single unit quantities. It includes over-voltage and over-current protection.

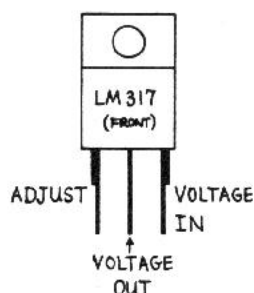
This supply is made to power 8-inch disk drives but if you add a simple 3-terminal regulator for +12V, it will also supply all the power for the Big Board.

To add +12V, tie the input of the regulator to the + lead of either of the two 60V electrolytics. The connecting post marked 24V return is ground (in fact, I just tied all the return posts together and ran them to the aluminum frame on the supply). The + lead on the electrolytics is at about 38V above ground which is higher than a standard 12V regulator (7812) is rated for. One member of our group is using a 7812 anyway and it is working fine. The LM317, however, is supposed to handle 38 volts just fine and it has a variable output to boot. Its output is designed to be 1.2V above the adj. lead, so by having approximately 1/10 of the drop between the output and the reference and 9/10 between the reference and ground you should get 12V. It comes out pretty close.

Mount the regulator against the frame with a mica insulator. Be sure to use silicon grease because it has to dissipate up to 13 watts.

Double check yourself.

It's a good idea to put a resistor load on the supply and then use a digital voltmeter to double check the outputs before connecting it up to your system. I have heard some pretty gruesome stories about folks accidentally putting outrageous voltages on their systems. Sometimes the systems have gone down permanently, other times they have gone temporarily insane, while a few have miraculously survived. It's best, obviously, to check the supply thoroughly.



LM 317 Regulator

Also, check to see that the supply will deliver 24V at 5 amps. The Power One's current limit is set at 1 amp at the factory. It will work in the circuit that way until you try to write something on the disk. The drive can then get very strange, generating random CRC errors and in some cases rendering a disk unusable.

If you a having drive problems, check the 24V line during a write operation. It shouldn't drop below 22V. (If the 24V line drops below 15V, you will probably get a buzz as the relay tries to load the head.)

To adjust the 24V current limit on the Power One Supply, locate the small screwdriver pot marked "24V I.LIMIT" and turn the control fully clockwise. It should now give you 5 amps at a rock solid 24V.

If you have had experience with other power supplies, let me know and I'll pass the word along here in Micro C. ■ ■ ■

Notes on Book Reviews

A good book or manual is a conversation with the author. At first it is a story, the reader sharing experiences with the author through the transparency of the written word. Later when the reader has questions about the material covered, the conversation turns to question and answer and the book becomes a reference volume.

Conversation: The tone of the conversation is very important. No one would freely choose to sit through hour upon hour of impersonal lecture if there were any easier way to get the same information. And yet some authors get mired in pages of third person passive.

Transparency: When the words move you smoothly and easily from idea to idea, then what you see are the ideas, not the words. The words have become transparent. If the sentences are too long and confusing or are short. Choppy. Broken up. Or if the ideas don't fit well together, then the conversation is reduced to one word at a time.

Asking questions: Technical books are generally used for two primary purposes. First, they are learning tools (the original conversation) and second, they are references as questions arise. Many technical books are arranged as training manuals only or as reference manuals only (sometimes for very good reason).

For instance, Microsoft's Basic 80 manual is primarily an alphabetical list of commands, which is fine if you know what commands you need to use and just need syntax examples. Kernighan and Ritchie's C book, on the other hand, is a well written introduction to the language, but if you want to look up a command you will have to start at the index and then refer to three or more places scattered through the book. At least they did an index.

And finally all the things you normally notice when reading a book:

- Content. Is the information appropriate to this group. Is the book a bargain in terms of information content.

(continued next page)

Three Books on CP/M

David Thompson Reviews

**Using CP/M,
A Self-Teaching Guide**
by Fernandez and Ashley
John Wiley & Sons
ISBN 0 471 08011-X

"Using CP/M" is the book that introduced me to CP/M. I purchased this text immediately after ordering the Big Board and by the time I had my system running I was pretty comfortable with the simpler portions of its operating system. But then I had already read the book cover to cover at least three times in anticipation.

The authors use an informal, conversational, writing style that's clear and easy to read. The text comes in short chunks. Each half-page or so, is followed by approximately a half-page of questions about the material just covered. I just skipped the questions, which meant that I skipped about half the total book. If you're really into questions you can use mine.

The book starts at a beginning level and stays there. It goes over and

over the basics; spending 9 pages, for instance, on how to enter generalized filenames (*.*) . And then it covers DDT in 10 lines.

Graphically speaking, "Using CP/M" doesn't make it. The writers organized the material pretty well but that organization disappears into a forest of sameness. Even the question sections are not visually separated well from the text, so it is sometimes hard for your eye to skip to the next piece of text. And skimming through the text to find a particular command is nearly impossible.

The only prayer this book has as a reference is the index. But if something didn't make the index you're in real trouble. Try to find the CP/M line editing commands (not ED). I gave up trying.

All in all, this text is reasonable for someone who is just starting out and wants to do a lot of light reading.



The CP/M Handbook with MP/M
by Rodnay Zaks
Sybex
ISBN 0 89588 048 2

I got "The CP/M Handbook" after trying to use "Using CP/M" for a reference, so most of my experience with this text is for reference work. It's a real improvement. This book is full of tables, charts, reference guides and appendices. The chapters are organized in logical manner. The design and many illustrations (and index) help the reader locate specific information.

All of Zak's books that I've seen have been easy to read. The book starts at a beginning level and then progresses to such things as reconfiguring CP/M for different system sizes. Advanced topics such as DDT and ASM, however, are covered just enough for the reader to access the programs. DDT gets about 2½ pages and ASM gets about 3. The reader is then referred to the user's guide from Digital Research.

This is a good text for someone using CP/M for running applications

programs. PIP is pretty thoroughly covered in its own chapter and ED gets the detailed look it needs to keep the reader from losing his cursor entirely. So, for those not digging heavily into CP/M itself, this book is a definite option.



Osborne CP/M User Guide
By Thom Hogan
Osborne McGraw-Hill
ISBN 0 931988-44-6

The "Osborne CP/M User Guide" is the latest book to jump on the CP/M bandwagon and is the most technical of the three books. The introduction for beginners is relatively brief; and PIP, for instance, is presented in 21 pages of formatted text rather than a chapter in standard paragraph form.

This book contains a complete chapter on assembly language utilities, a subject skimmed over by the other texts. In fact, DDT and ASM each get 12 pages of remarkably thorough coverage. Like the Sybex book, Hogan makes extensive use of appendices for command summaries, etc. but he also adds some extra goodies like an annotated bibliography and addresses of companies supplying CP/M based products. (Hooray!)

Hogan's writing style is variable. Generally it is friendly but there are places where it is more formal than Zaks or Fernandez/Ashley. And he uses very few illustrations. However, the graphic layout of the material is very well done. In fact, you probably won't notice the dearth of illustrations because of the excellent use of type and layout to make the organization obvious. The combination of graphic design and index make this a first class reference work for CP/M.

This book is definitely the best book I've seen for someone using CP/M on a day-to-day basis. A beginner, however, might seriously consider starting with Zaks' book and then moving up to this one as he gains experience.



Notes on Book Reviews continued

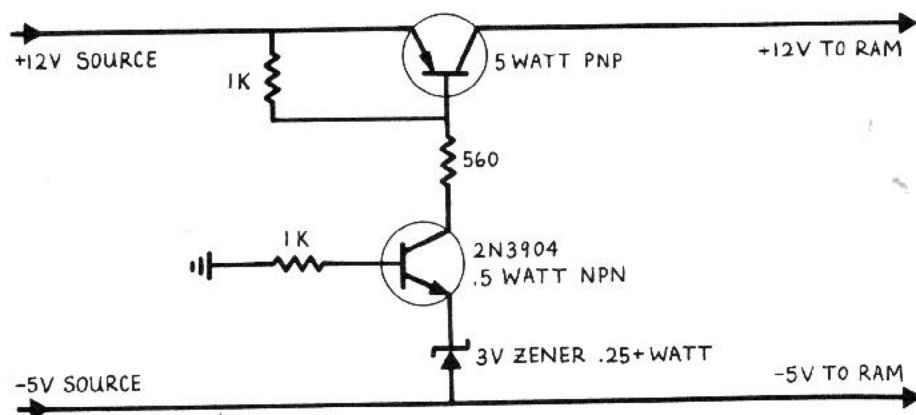
- Organization. Is the way the author progresses into the subject obvious? Is it easy to go back and find the information you need?
- Graphic design. Is the book visually appealing? Can you skim through glancing at the headlines and the illustrations and follow the book's progression through the subject?
- Illustrations. Are the illustrations well thought out and technically accurate or just afterthoughts to pretty up the page?
- Author's command of the subject. It's fun to catch a mistake in print. It's sort of like Moses messed up when chipping the rock, but too many errors cast doubt on the validity of the whole book.

So if you have books that are interesting to you and might be interesting to others in the group then by all means put the information down on a disk or paper or post card or whatever and let us know.



RAM Protection Circuit

By David Thompson



Schematic of RAM Protection Circuit

The RAM chips used on the Big Board (4116s) require three voltages for operation, +5V, +12V and -5V.

The +5V and +12V are used for device operation while the -5V provides an internal protective bias to keep the +12V from breaking down the chip. Isolation between some regions is provided by reverse biased diode junctions and the -5V provides the reverse bias.

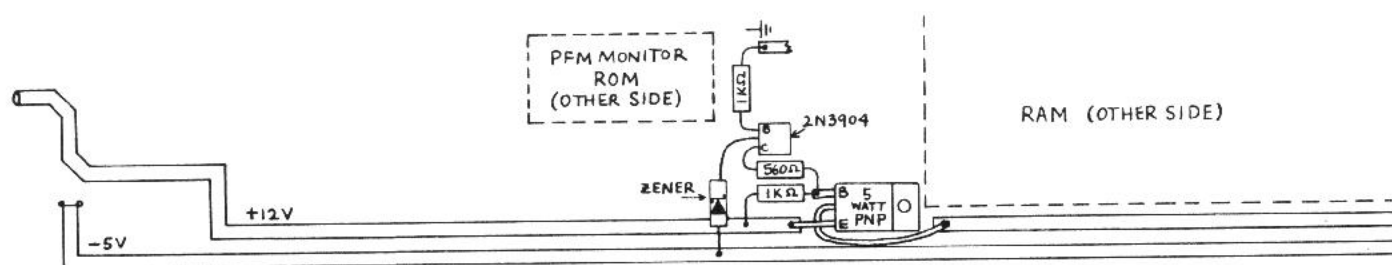
So, the device manufacturers strongly recommend that the -5V be available before the +12V. And they recommend that the -5V be available after the 12V goes away.

Most personal computers (TRS-80 etc.) have gotten around the problem by providing a slightly longer time constant for the +12V on power-up and a shorter time constant on power-down. But if the -5V supply ever shuts down momentarily or doesn't come up for some reason then the owner gets to buy new RAM. The Big Board, on the other hand is at the mercy of the supply.

The documentation recommends that you use a quality supply but there are many other reasons why -5V might not be available.

The following circuit takes care of the problem and has already saved our group a couple of sets of 4116s. The parts are mounted on the underside of the board and only one run (the +12V) has to be cut. Nothing is critical. The NPN is just a small, plastic, half-watt transistor with a DC gain of about 100. The PNP is a larger tab-style package and has a DC gain of 10 or more. Since the PNP is either saturated or off, it doesn't dissipate enough to require heat-sinking.

It is easy enough to check the whole thing out on the bench before installing it on the Big Board. When the -5V line drops down to about -3.5V the NPN should stop pulling current out of the base circuit of the PNP. As the PNP base rises, the PNP shuts off, removing the +12V from the RAM. ■ ■ ■



Example Installation of RAM Protection Circuit

Video Wiggle

The Cause and Cure

Quite a number of folks have noted on their subscription forms that they are bothered by wiggle on their video displays.

Well, the wiggle is caused by a frequency difference between your power line and the vertical output in the video generator. The video generator is 1 Hertz off (It's 61 Hz) and when it beats against power supply ripple in a Leedex monitor (for instance) you get wiggle. Many monitors also have trouble maintaining vertical sync because the frequency is outside their normal operating range.

To completely cure the problem, change the frequency of the CRT display generator crystal. Jim Tanner now has new crystals available free for Big Board owners. See "Notes From Garland, Texas" for more information.

A partial cure requires adding additional power supply filtering to the monitor. One additional 6000 ufd capacitor on the 12V DC line makes quite an improvement.

On the other hand, if your monitor accepts separate vertical, horizontal, and sync signals then you probably won't have any trouble. I've tried it both ways and my ancient Tektronix monitor with its separate inputs is as solid as a rock (it's also about that heavy).

■ ■ ■

Disk Formatter Listing

5826 Southwest Ave.
St. Louis, MO 63139

Editor's note: This program really works! If you don't have something like M80 to assemble this with then hang on. The COM version will be on the group disk plus I'm trying to make the Crowe Z80 assembler available.

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New Character ROM

Sometime after the first of this year, Jim Tanner began shipping the Big Board with a new character ROM. The ROM has true lower case characters rather than the smaller upper case/larger upper case ROM shipped in the early boards.

- The ROM uses a 5 by 8 dot matrix so it has one-dot descend-ers.
- It contains the standard character set for 00(hex) through 7F(hex). (Even though the Big Board only displays 20—7F.)
- And I like it because I designed it and gave it to Jim.
- However, It isn't perfect.

So, for a week or so I worked on the g, y, t, f, and q characters until ... well, if it isn't perfect now, I give up because I'm absolutely tickled.

If your board has true upper/lower case but you would like to have the absolute latest greatest, then send me a ROM and \$5.00.

If you have one of the old upper case/smaller upper case ROMs you have a choice. Send a ROM to Jim Tanner at Digital Research Computers of Texas and he will burn a copy of my first character ROM (the one he's using in the new boards) for you, free. Or you can send me the ROM and \$5.00 and get the deluxe version.

Price

- \$5.00 if you send a 350ns 2716 and a self-addressed, stamped package I can ship it back in.
- Or instead of \$5.00 you can submit something to the magazine, a program, a book or software review, a schematic and comments, a page or two about what you are doing with the Big Board, etc., along with your ROM and SASE and presto, you get fame AND a new character set, free! (And those who contributed to this issue also qualify for a free burn.)

Make checks payable to Micro Cornucopia. If you don't agree that it's a \$5.00 improvement, I'll send you the \$5.00 back.

PFM-80 Monitor

By Don Retzlaff

6435 Northwood
Dallas, Texas 75225

The PFM-80 Monitor is the primary control program for your Big Board computer. It was burned into the EPROM that is installed in the first ROM socket (U67).

PFM and CBIOS were written by Russell Smith, who is an exceptional young programmer who operates his own software house in Denton, Texas. He has helped me immeasurably in understanding PFM and implementing my programs on the Big Board. As time goes on I will pass along some of this expertise to you, through this column.

If your curiosity is like mine you want to know what PFM stands for. I was informed that PFM is the abbreviation of the profound literal description of what the monitor is: "PRETTY F——KIN' MAGIC."

When the computer is turned on or the reset button is pressed, the Big Board automatically starts executing the COLD START BOOT program in the monitor ROM. The first five instructions in the ROM (starting at location 0000H) copy the PFM monitor program from the ROM into upper memory starting at location F000H and continuing through F7E6H. The RAM locations starting at location FF00H through FFA8H are used as monitor data storage locations.

After PFM has been booted into RAM the monitor starts executing and goes through the cold start initialization routine that does the following:

1. Initializes data storage pointers.
2. Clears the scratch RAM with zeros.
3. Fills CRT storage with blanks.
4. Initializes values in memory.
5. Initializes programmable I/O devices.
6. Waits for input from keyboard or terminal.
7. Sets baud rate for SIO input if input from there.
8. Displays sign-on message on the appropriate device.
9. Displays monitor prompt *
10. Waits for input.

At this point PFM is up and operating.

I think that it is important to note that whenever an RS-232 serial terminal is connected to SIO PORT B, PFM automatically determines the BAUD rate of the terminal by analyzing the input from the single carriage return. It then sets up the baud rate generator to the correct frequency.

In future articles we will get deeper into the monitor.

Now let's discuss the monitor entry point table. Starting at location F000H you will find a series of jump instructions. These provide a fixed address that can be used as entry points to the various monitor routines. These will be useful in software routines that you write. This table will provide a constant jump location for these routines even if updates are made to the monitor. Thus, changes in addresses of the internal routines will not affect your software.

I plan to cover the various features of PFM and CBIOS which work together to control your Big Board. In succeeding articles I will lead you through the assembly language listings of both PFM and CBIOS, pointing out the features of each and how you can make the most from each.

In the next issue we will discuss the mechanics of modifying the monitor.

■ ■ ■



Editor's Note: The first installment of the PFM monitor listing begins on the following page. We will continue the listing in the September issue.

PFM Monitor Listing

```

0001 :*****
0002 :*
0003 :* BIGBOARD MONITOR ROM, NON-RELOCATABLE VERSION
0004 :* Russell Smith
0005 :*
0006 :*****
0007 :
0008 :
0009 :
0010 :>F000 PSECT ABS
0011 :>F000 EQU 0F000H
0012 :>3000 EQU OFF00H
0013 : CRTMEM EQU 3000H
0014 :
0015 :
0016 : DRG ROM
0017 : INCLUDE INIT.ASM
0018 :*****
0019 :*
0020 :* COLD START INITIALIZATION ROUTINE FOR
0021 :* CONFIGURING THE SYSTEM AFTER A POWER-ON
0022 :* OR PUSHBUTTON RESET.
0023 :*
0024 :*****
0025 :
0026 :
0027 :-- MONITOR ENTRY POINT TABLE --
0028 :
0029 : C32AF0 JP INIT
0030 : C32BF1 JP PROMPT
0031 : C331F4 CONST: JP KBDST
0032 : C339F4 CONIN: JP KBDIN
0033 : C320F5 CONOUT: JP CRTOUT
0034 : C320F5 JP CRTOUT
0035 : C32BF4 JP SI0ST
0036 : C3F0F4 JP SI0IN
0037 : C3FEF4 JP SI0OUT
0038 : C3B1F6 JP SELECT
0039 : C3E9F6 JP HOME
0040 : C3BFF6 JP SEEK
0041 : C32AF7 JP READ
0042 : C32AF7 JP WRITE
0043 :
0044 :
0045 :
0046 : DO A SHORT POST-RESET TIME DELAY. ALSO INITIALIZES THE
0047 : STACK POINTER AND FILLS THE MONITOR SCRATCH RAM WITH ZERO
0048 :
0049 : INIT: D1
0050 : F3 LD HL,RAM
0051 : 2100FF LD (HL),0
0052 : 3600 LD SP,HL
0053 : F9 INC L
0054 : 20FA JR NZ,INIT1-$
0055 :
0056 : INITIALIZES THE Z-80 FOR INTERRUPT MODE #2
0057 :
0058 : LD A,H
0059 :
0060 :
0061 :
0062 :
0063 :
0064 :
0065 :
0066 :
0067 :
0068 :
0069 :
0070 :
0071 :
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0095 :
0096 :
0097 :
0098 :
0099 :
0100 :

```


UNIT	DEFB	0181	65FF	F0E5	0187	INITIALIZE THE CRT DISPLAY CURSOR
255	DEFB	0182	FF	F0E6	0188	
255,255,255	DEFB	0183	FFFFFF	F0E7	0189	
00000000B	DEFB	0184	00	F0E8	0190	
128	DEFB	0185	80	F0E9	0191	
30	DEFB	0186	1E	F0EA	0192	
	DEFB	0187		F0EB	0193	
				F0EC	0194	
				F0ED	0195	
				F0EE	0196	
				F0EF	0197	
				F0F0	0198	
				F0F1	0199	
				F0F2	0200	
				F0F3	0201	
				F0F4	0202	
				F0F5	0203	
				F0F6	0204	
				F0F7	0205	
				F0F8	0206	
				F0F9	0207	
				F0FA	0208	
				F0FB	0209	
				F0FC	0210	
				F0FD	0211	
				F0FE	0212	
				F0FF	0213	
				F100	0214	
				F101	0215	
				F102	0216	
				F103	0217	
				F104	0218	
				F105	0219	
				F106	0220	
				F107	0221	
				F108	0222	
				F109	0223	
				F10A	0224	
				F10B	0225	
				F10C	0226	
				F10D	0227	
				F10E	0228	
				F10F	0229	
				F110	0230	
				F111	0231	
				F112	0232	
				F113	0233	
				F114	0234	
				F115	0235	
				F116	0236	
				F117	0237	
				F118	0238	
				F119	0239	
				F11A	0240	
				F11B	0241	
				F11C	0242	
				F11D	0243	
				F11E	0244	
				F11F	0245	
				F120	0246	
				F121	0247	
				F122	0248	
				F123	0249	
				F124	0250	
				F125	0251	
				F126	0252	
				F127	0253	
				F128	0254	
				F129	0255	
				F12A	0256	
				F12B	0257	
				F12C	0258	
				F12D	0259	
				F12E	0260	
				F12F	0261	
				F130	0262	
				F131	0263	
				F132	0264	
				F133	0265	
				F134	0266	
				F135	0267	
				F136	0268	
				F137	0269	
				F138	0270	
				F139	0271	
				F13A	0272	
				F13B	0273	
				F13C	0274	
				F13D	0275	
				F13E	0276	
				F13F	0277	
				F140	0278	

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(continued next page)

PFM Monitor Listing (continued)

```

0244 ; INITIALIZE CHANNELS 2 AND 3 OF THE CTC
0245 ; TO GENERATE ONE SECOND INTERRUPTS FROM CTC3
0246 ;
0247 CTC0 EQU CTC+0 ; CTC CHANNEL 0 PORT#
0248 CTC1 EQU CTC+1 ; CTC CHANNEL 1
0249 CTC2 EQU CTC+2 ; CTC CHANNEL 2
0250 CTC3 EQU CTC+3 ; CTC CHANNEL 3
0251
0252 DEFN 1,CTC0
0253 DEFN CTCVEC
0254 ;
0255 DEFN 2,CTC2
0256 DEFN 001000111B ;PUT CTC2 IN TIMER MODE
0257 DEFN 105 ;CTC2 PERIOD=105*256*400 NS
0258 ;
0259 DEFN 2,CTC3
0260 DEFN 110000111B ;PUT CTC3 IN COUNTER MODE
0261 DEFN 93 ;CTC3 PERIOD=999936 uS
0262 ;
0263 ;
0264 ; INITIALIZE SID CHANNEL B FOR ASYNCHRONOUS SERIAL
0265 ; INTERFACE TO PRINTER OR TERMINAL
0266 ;
0267 SID0PA EQU SID+0 ;SID DATA PORT A
0268 SID0PB EQU SID+1 ;SID DATA PORT B
0269 SID0CA EQU SID+2 ;SID CONTROL/STATUS PORT A
0270 SID0CB EQU SID+3 ;SID CONTROL/STATUS PORT B
0271
0272 DEFN 1,BAUDB
0273 DEFN 0101B
0274 ;
0275 DEFN 11,SID0CB
0276 DEFN 4
0277 DEFN 01000101B ;16X CLK,1 STOP BIT,ODD PARITY
0278 DEFN 1 ;SELECT REGISTER #1
0279 DEFN 000000100B ;STATUS AFFECTS VECTOR,
; NO INTERRUPTS
0280 DEFN 3 ;SELECT REGISTER #3
0281 DEFN 010000001B ;7 BITS/RX CHAR
0282 DEFN 5 ;SELECT REGISTER #5
0283 DEFN 10101010B ;7 BITS/TX CHAR, ASSERT DTR
0284 DEFN 2 ;SELECT REGISTER #2
0285 DEFN SID0VEC
0286 DEFN 2 ;LOAD INTERRUPT VECTOR BASE
0287
0288 DEFN -1 ;END-OF-TABLE
0289 ;
0290 ; INIT DONE
0291 ;
0292 ;
0293 ; ***** INCLUDE MONITOR.ASM *****
0294 ; *****
0295 ;
0296 ; BASIC HEX MONITOR FOR Z-80 PROCESSORS
0297 ; 3-Aug-80
0298 ; *****
0299 ; *****
0300 ;
0301 ;
0302 ;
0303 ;

```

```

F19F 20F3
F1A1 B0F1
>0021
0366
0367
0368
0369 C0DS1Z EQU $-C0D1TAB
0370 ;
0371 ; *****
0372 ; *****
0373 ; *****
0374 ; *****
0375 ; *****
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F12B CDECF3 0304 PROMPT: CALL
F12E 000A 0305 DEFB
F130 2A20 0306 DEFB
F132 04 0307 DEFB
F133 2186FF 0308 LD
F136 0E20 0309 LD
F138 C03BF3 0310 CALL
F13B 3035 0311 JR
      0312
F13D AF 0313 XOR
F13E 3284FF 0314 LD
F141 CDFCF3 0315 CALL
F144 3A88FF 0316 LD
F147 FE0D 0317 CP
F149 28E0 0318 JR
F14B 2182F1 0319 LD
F14E 010B00 0320 LD
F151 CD60F3 0321 CALL
F154 201C 0322 JR
F156 C5 0323 PUSH
F157 FD2189FF 0324 LD
F15B CD6AF3 0325 CALL
F15E DDE1 0326 POP
F160 3810 0327 JR
F162 2A70FF 0328 LD
F165 ED5B7EFF 0329 LD
F169 ED4B80FF 0330 LD
F16D CD80F1 0331 CALL
F170 30B9 0332 JR
      0333
F172 CDECF3 0334 WHAT:
F175 20776861 0335
      74203F
F17C 07 0336 DEFB
F17D 04 0337 DEFB
F17E 18AB 0338 JR
      0339
F180 DDE9 0340 CALLX: JP
      0341
      0342
      0343
      0344
F182 52 0345 CMDTAB: DEFB
F183 4F 0346 DEFB
F184 49 0347 DEFB
F185 47 0348 DEFB
F186 54 0349 DEFB
F187 46 0350 DEFB
F188 4D 0351 DEFB
F189 43 0352 DEFB
F18A 42 0353 DEFB
F18B 44 0354 DEFB
F18C 53 0355 DEFB
      0356
F18D 29F3 0357 DEFW
F18F 05F2 0358 DEFW
F191 A3F1 0359 DEFW
F193 E6F2 0360 DEFW
F195 57F2 0361 DEFW
F197 DBF2 0362 DEFW
F199 BCF2 0363 DEFW
F19B 81F2 0364 DEFW
F19D FEF2 0365 INCMD

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```

0432 :
0433 :
0434 :
0435 : -- MEMORY DUMP COMMAND --
0436 :
0437 MEMDMP: DEC A :CHECK PARAMETER COUNT
0438 JR Z,MDMP2-$
0439 DEC A
0440 JR Z,MDMP3-$
0441 LD HL,(LAST)
0442 LD DE,16
0443 JR MDMP3B-$
0444
0445 MDMP3: EX DE,HL
0446 SBC HL,DE
0447 LD B,4
0448 SRL H
0449 RR L
0450 DJNZ MDMP3A-$
0451 INC HL
0452 EX DE,HL
0453 CALL DUMP
0454 LD (LAST),HL
0455 RET
0456 :
0457 :
0458 DUMP:
0459 CALL PUT4HS
0460 CALL SPACE
0461 LD B,16
0462 LD A,(HL)
0463 INC HL
0464 CALL PUT2HS
0465 DJNZ DUMP2-$
0466 POP HL
0467 LD B,16
0468 LD A,(HL)
0469 INC HL
0470 RES 7,A
0471 CP 20H
0472 JR C,DUMP4-$
0473 CP 7FH
0474 JR C,DUMP5-$
0475 LD A, '.'
0476 CALL OUTPUT
0477 DJNZ DUMP3-$
0478 CALL CRLF$
0479 NZ
0480 RET
0481 DEC DE
0482 LD A,D
0483 OR E
0484 JR NZ,DUMP-$
0485 :
0486 :
0487 :
0488 :
0489 : -- MEMORY EXAMINE COMMAND --
0490 :
0491 VIEW:
0492 CALL MDATA
0493 CALL ECHO
0494 CP CR
0495 JR Z,VIEW4-$
0496 CP '-'
0497 JR Z,VIEW5-$
0498 CALL ASCHX

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(continued next page)

PFM Monitor Listing (continued)

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F268 3F      DCF
F269 D0      RET NC
F270 00      RLCA
F271 07      RLCA
F272 07      RLCA
F273 07      RLCA
F274 4F      LD C,A
F275 0504    CALL ECHO
F276 0506    CALL ASCHEX
F277 3F      CCF
F278 D0      RET NC
F279 B1      OR C
F280 0509    VIEW3: LD (HL),A
F281 0510    CHECK
F282 0511    CALL
F283 0512    INC HL
F284 0513    VIEW4: INC HL
F285 0514    VIEW5: DEC HL
F286 0515    JR VIEW-$
F287 0516    ;
F288 0517    ;
F289 0518    ;
F290 0519    ;-- JUMP TO MEMORY LOCATION COMMAND --
F291 0520    ;
F292 0521    GOTO: DEC A ;CHECK PARAMETER COUNT
F293 0522    SCF
F294 0523    RET NZ
F295 0524    PUSH HL
F296 0525    POP IX
F297 0526    CALL CALLX
F298 0527    OR A
F299 0528    RET
F300 0529    ;
F301 0530    ;
F302 0531    ;-- MEMORY READ/WRITE DIAGNOSTIC COMMAND --
F303 0532    ;
F304 0533    ;
F305 0534    TEST: CP 2 ;CHECK PARAMETER COUNT
F306 0535    SCF
F307 0536    RET NZ
F308 0537    INC DE
F309 0538    LD E,D
F310 0539    LD D,H
F311 0540    LD E,0
F312 0541    TEST1: LD H,D
F313 0542    LD L,0
F314 0543    TEST2: LD A,L
F315 0544    XOR H
F316 0545    XOR B
F317 0546    LD (HL),A
F318 0547    INC HL
F319 0548    LD A,H
F320 0549    CP E
F321 0550    JR NZ,TEST2-$
F322 0551    ;NOW READ BACK EACH BYTE & COMPARE
F323 0552    LD H,D
F324 0553    LD L,0
F325 0554    TEST3: LD A,L
F326 0555    XOR H
F327 0556    XOR B
F328 0557    CALL CHECK
F329 0558    RET NZ
F330 0559    ;
F331 0560    ;
F332 0561    ;
F333 0562    ;
F334 0563    ;
F335 0564    ;
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F398 0627    ;
F399 0628    ;
F400 0629    ;
F401 0630    ;
F402 0631    ;
F403 0632    ;
F404 0633    ;
F405 0634    ;-- READ FROM INPUT PORT COMMAND --
F406 0635    ;
F407 0636    INCMD: DEC A ;CHECK IF PARAMETER COUNT=1
F408 0637    SCF
F409 0638    RET NZ
F410 0639    LD C,L
F411 0640    CALL CRLFS
F412 0641    LD A,C
F413 0642    PUT2HS
F414 0643    IN A,(C)
F415 0644    CALL PUT2HS
F416 0645    CALL ECHO
F417 0646    CP CR
F418 0647    JR Z,IN2-$
F419 0648    CP CR
F420 0649    JR Z,IN3-$
F421 0650    LD A
F422 0651    RET
F423 0652    ;
F424 0653    IN2: INC C
F425 0654    INC C
F426 0655    IN3: DEC C
F427 0656    JR IN1-$
F428 0657    ;
F429 0658    ;
F430 0659    ;
F431 0660    ;-- WRITE TO OUTPUT PORT COMMAND --
F432 0661    ;
F433 0662    OUTCMD: CP 2 ;CHECK IF PARAMETER COUNT=2
F434 0663    SCF
F435 0664    RET NZ
F436 0665    LD C,L
F437 0666    OUT (C),E
F438 0667    OR A
F439 0668    RET
F440 0669    ;
F441 0670    ;
F442 0671    ;-- SWITCH CONSOLE OUTPUT DEVICE COMMAND --
F443 0672    ;
F444 0673    SWITCH: LD HL,COFLAG
F445 0674    INC (HL)
F446 0675    BIT 0,(HL)
F447 0676    LD'
F448 0677    JR Z,SWIT2-$
F449 0678    LD HL,CR'OUT
F450 0679    LD (CONOUT+1),HL ;STORE NEW CONSL OUT ADDR
F451 0680    SWIT2: LD
F452 0681    RET
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F2F9 C5
F2FA D1
F2FB C1
F2FC 03
F2FD C9
F2FE 3D
F2FF 37
F300 C0
F301 4D
F302 CDFCF3
F303 79
F304 CD02F3
F305 ED78
F306 CD02F3
F307 CD02F3
F308 CD02F4
F309 FE0D
F310 2806
F311 FE2D
F312 2804
F313 B7
F314 C9
F315 0C
F316 0C
F317 0D
F318 18E2
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F500 2120F5
F501 220DF0
F502 C9
F503 21B5FF
F504 34
F505 CB46
F506 21FEF4
F507 2803
F508 2120F5
F509 220DF0
F510 C9
F511 21B5FF
F512 34
F513 CB46
F514 21FEF4
F515 2803
F516 2120F5
F517 220DF0
F518 C9
F519 21B5FF
F520 34
F521 CB46
F522 21FEF4
F523 2803
F524 2120F5
F525 220DF0
F526 C9
F527 21B5FF
F528 34
F529 CB46
F530 21FEF4
F531 2803
F532 2120F5
F533 220DF0
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F535 21B5FF
F536 34
F537 CB46
F538 21FEF4
F539 2803
F540 2120F5
F541 220DF0
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F602 21FEF4
F603 2803
F604 2120F5
F605 220DF0
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F607 21B5FF
F608 34
F609 CB46
F610 21FEF4
F611 2803
F612 2120F5
F613 220DF0
F614 C9
F615 21B5FF
F616 34
F617 CB46
F618 21FEF4
F619 2803
F620 212
```

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F2AB 23      0559      HL      INC      ;ELSE GO ON TO NEXT BYTE
F2AC 7C      0560      A,H      ;CHECK FOR END OF BLOCK
F2AD BB      0561      E        ;BUMP PASS COUNT
F2AE 20F4    0562      NZ,TEST3-$ ;PRINT '+' AND ALLOW FOR EXIT
F2B0 04      0563      B        ;DO ANOTHER PASS IF NO ESCAPE
F2B1 3E2B    0564      LD      OUTPUT
F2B3 CD15F4  0565      CALL    Z,TEST1-$
F2B6 2BDD    0566      JR      RET
F2B8 C9      0567      ;
0568      0568      ;
0569      0569      ;
0570      0570      ;
F2B9 BE      0571      CHECK:   (HL)
F2BA C8      0572      RET      Z
F2BB F5      0573      PUSH    AF
F2BC CDEF2   0574      CALL    MDATA
F2BF CDEF3   0575      CALL    PNEXT
F2C2 7368F75 0576      DEFM    'should='
6C643D      0577      EOT
F2C9 04      0577      DEFEB  POP
F2CA F1      0578      POP     JP
F2CB C3D2F3  0579      PUT2HS
0580      0580      ;
0581      0581      ;
F2CE CDFCF3  0582      MDATA:   CRLFS
F2D1 CDDCF3  0583      CALL    PUT4HS
F2D4 7E      0584      LD      A,(HL)
F2D5 C3D2F3  0585      JP      PUT2HS
0586      0586      ;
0587      0587      ;
0588      0588      ;
0589      0589      ;-- FILL MEMORY WITH CONSTANT COMMAND --
0590      0590      ;
F2D8 FE03    0591      FILL:   CP      3
F2DA 37      0592      SCF      ;CHECK IF PARAMETER COUNT=3
F2DB C0      0593      RET      NZ
F2DC 71      0594      FILL1:  LD      (HL),C
F2DD E5      0595      PUSH    HL
F2DE B7      0596      DR      A
F2DF ED52    0597      SRC     HL,DE
F2E1 E1      0598      POP     HL
F2E2 23      0599      INC     HL
F2E3 3BF7    0600      JR      C,FILL1-$
F2E5 C9      0601      RET
0602      0602      ;
0603      0603      ;
0604      0604      ;
0605      0605      ;
0606      0606      ;-- MEMORY BLOCK MOVE COMMAND --
0607      0607      ;
F2E6 FE03    0608      BLOCK:  CP      3
F2E8 37      0609      SCF      ;CHECK IF PARAMETER COUNT=3
F2E9 C0      0610      RET      NZ
F2EA CDF3F2  0611      CALL    BLOCAD
F2ED 79      0612      LD      A,C
F2EE B0      0613      OR      B
F2EF C8      0614      RET      Z
F2F0 ED80    0615      LDIR
F2F2 C9      0616      RET
0617      0617      ;
0618      0618      ;
0619      0619      ;
F2F3 EB      0620      BLOCAD: EX     DE,HL
F2F4 B7      0621      OR      A
F2F5 ED52    0622      SBC     HL,DE
;CLEAR CARRY
;GET DIFFERENCE BETWEEN

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(continued on top of page 14)

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0690      0690      ;
0691      0691      ;SAVE MAX LINE LGTH PARAM IN B
0692      0692      ;GET A CHAR FROM THE CONSOLE
0693      0693      ;CHECK FOR CARRIAGE RETURN
0694      0694      ;CHECK FOR CTL-H BACKSPACE
0695      0695      ;OTHER CONT CHARACTERS ILLEGAL
0696      0696      ;STORE CHARACTER IN BUFFER
0697      0697      ;GET ANOTHER IF MORE ROOM
0698      0698      ;RETURN WITH CARRY=1 IF TOO
0699      0699      ;MANY CHARACTERS ARE ENTERED
0700      0700      ;PUT <CR> ON END OF LINE
0701      0701      ;RETURN WITH CARRY BIT=0
0702      0702      ;DELETE LAST CHAR FROM BUFFER
0703      0703      ;PRINT A SPACE TO OVERWRITE THE
0704      0704      ;LAST CHAR, THEN DO A BACKSPACE
0705      0705      ;MAKE SURE YOU'RE NOT TRYING TO
0706      0706      ;<ES> FAST START OF THE LINE
0707      0707      ;
0708      0708      ;
0709      0709      ;
0710      0710      ;
0711      0711      ;
0712      0712      ;
0713      0713      ;
0714      0714      ;
0715      0715      ;
0716      0716      ;
0717      0717      ;
0718      0718      ;
0719      0719      ;
0720      0720      ;
0721      0721      ;
0722      0722      ;
0723      0723      ;
0724      0724      ;
0725      0725      ;
0726      0726      ;
0727      0727      ;
0728      0728      ;
0729      0729      ;
0730      0730      ;
0731      0731      ;
0732      0732      ;
0733      0733      ;
0734      0734      ;
0735      0735      ;
0736      0736      ;
0737      0737      ;
0738      0738      ;
0739      0739      ;
0740      0740      ;
0741      0741      ;
0742      0742      ;
0743      0743      ;
0744      0744      ;

```

(continued next issue)

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Software Applications

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Languages 1. _____

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2. _____

☐

3. _____

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Hardware

☐

INTEREST

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What are your hardware/software needs now?

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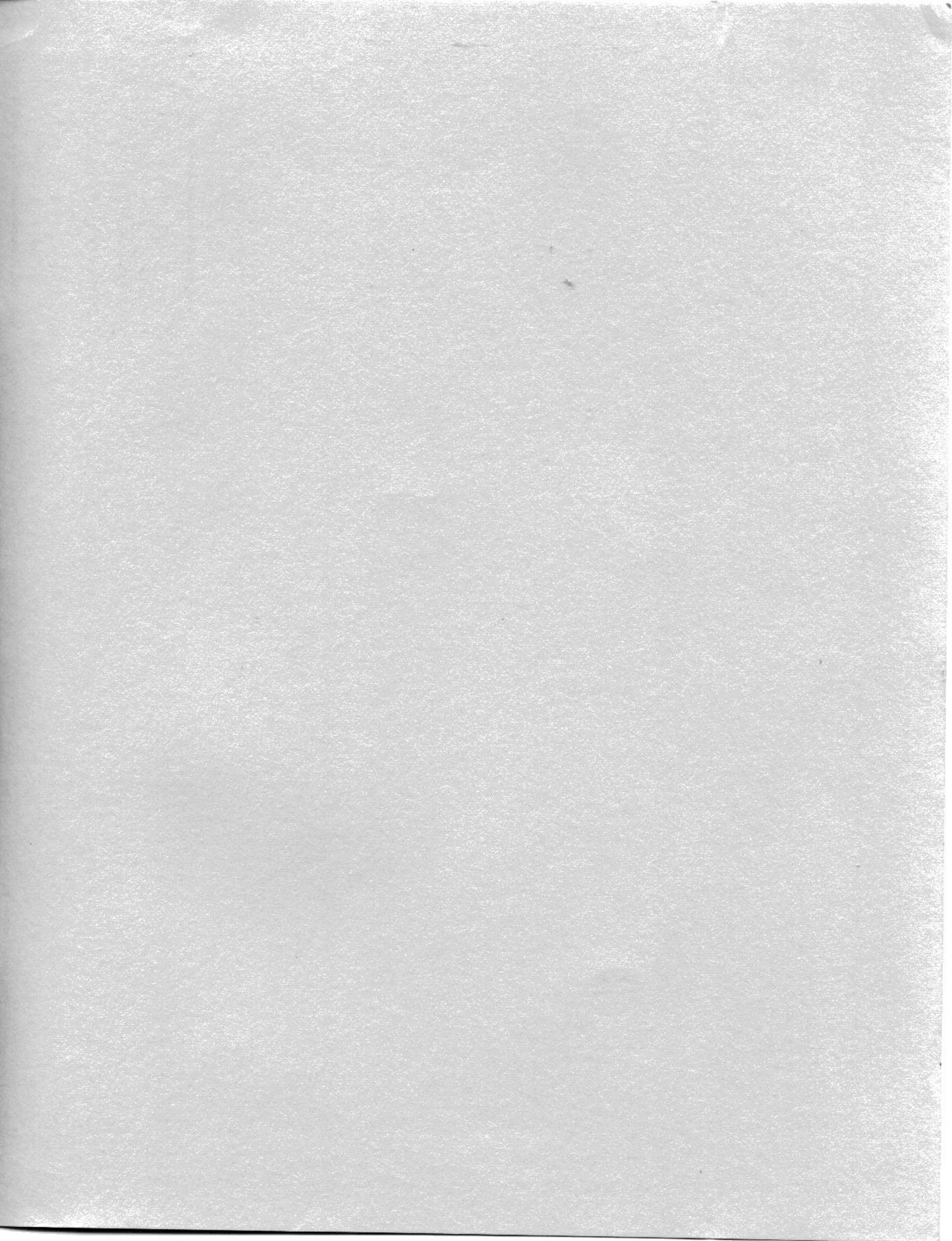
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