PMM-100

2/4 MHz PATCH INSTALLATION INSTRUCTIONS

for

Magnolia Microsystems CP/M Version 2.424

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by
UltiMeth Corporation
and
KRES Engineering

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# TABLE OF CONTENTS

INTRODUCTION .................................................. 1

BRIEF INSTALLATION FOR THOSE FAMILIAR WITH CP/M .......... 2

DETAILED INSTALLATION FOR THOSE LESS FAMILIAR WITH CP/M ... 7

USING DDT .......................................................... 7

PART I - CREATING MOVCPM.COM ............................... 10

PART II - CHECKING MOVCPM.COM WITH DDT ................. 11

PART III - H17 CONTROLLER PATCH ............................. 13

PART IV - SAVING MOVCPM.COM AND RECONFIGURING ...... 14

PART V - PATCHING FORMAT.COM VER 2.242 .................... 15

PART VI - PATCHING DDFORMAT.COM VER 2.23 ............... 21

ADDITIONAL PATCHES FOR 8 INCH THIN LINE DRIVES ........... 24

ACKNOWLEDGMENTS .................................................. 25
INTRODUCTION

These instructions cover the modification of Magnolia Microsystems, Inc. CP/M Version 2.242, to allow use of their double density floppy disk controller board at system speeds of 2 or 4 MHz. This modification also allows a hard-sectored diskette to be accessed at 2 or 4 MHz using the Heath H-88-1 controller board.

When the patches are completely installed, any bootable disk created with the patched CP/M can be booted at either 2 MHz or 4 MHz. In addition, when using any diskettes other than 8 inch double density, you may toggle the system's speed between 2 MHz and 4 MHz after you boot. This may also be done if you have the 8 inch double density diskettes on line, so long as you do not access them.

When using the 8 inch double density diskettes, ANY access MUST be at the speed at which you booted, even if you did not boot from them. Thus to run these diskettes at 4 MHz you must boot at 4 MHz which requires a boot ROM capable of operation at the increased speed (Consult the DSM-240 manual section "Monitor ROM considerations").

The KRES/UltiMeth KMR-100 monitor ROM will run at 4 MHz, and will boot any of the popular drive types including the Magnolia Microsystems controller at either 2 MHz or 4 MHz. In addition, it contains commands to allow you to toggle the CPU and system speed from the monitor BEFORE you boot. This gives you an easy means of control of system speed for the 8 inch double density diskettes which must be run at the boot speed. This ROM is available for an additional charge from KRES Engineering.

Follow either the brief installation instructions beginning on page 2, OR the detailed installation instructions beginning on page 7, to modify your CP/M to run at either 2 or 4 MHz. Either set of instructions, if followed precisely, will "patch" your Magnolia CP/M to allow use with the DSM-240 2/4 MHz Board. If you are experienced with DDT.COM and Operating Systems, you may be able to omit some steps and do the patches directly. But for sure, safe results follow these instructions step by step. Even if you rarely use DDT, the steps included in the detailed section are explicit enough, IF YOU FOLLOW THEM PRECISELY, to lead you through the patches without error.
BRIEF INSTALLATION INSTRUCTIONS

USE THESE INSTRUCTIONS IF YOU ARE FAMILIAR WITH CP/M, DDT, AND 8080 ASSEMBLY LANGUAGE MNEMONICS

Perform the following steps:

1. Boot at 2 MHz the diskette containing the CP/M version 2.242 system to be modified. This diskette must contain the following programs (supplied by Magnolia):

   LINK.COM  MOVCPM.COM  DDT.COM  SYSGEN.COM
   and:      SETUP.COM  FORMAT.COM  (ver 2.242)
   or:       DDSETUP.COM  DDFORMAT.COM  (ver 2.23)

2. Insert the distribution diskette in another disk drive (say, "B"). Make sure that the mode of the disk drive is compatible with the diskette.

3. Enter the following command -

   for an 8" CP/M system diskette:
   LINK B:BTV4DD8Z

   for a 5" CP/M system diskette:
   LINK B:BTV4DD5Z

4. Use "DDT MOVCPM.COM" to examine the following locations in MOVCPM.COM (values in parentheses may be different; note the "NEXT" value given upon entry to DDT for step #6 below):

   097B MVI A,18
   097D STA 2024   (references 2A24)
   0980 STA 2049   (references 2A49)
   2A21 CALL (20ED)
   2A24 ??= 28     ***
   2A25 INX B
   2A26 LXI D,(2114)
   2A29 MVI B,88
   2A44 ??= 38
   2A45 PCHL
   2A46 CALL (20ED)
   2A49 ??= 28     ***
   2A50 INX B
   2A51 LXI D,(2137)
   2A54 MVI B,A8

The above assumes that the double-density floppy disk controller I/O module is the first module in the BIOS. The Magnolia modules LINK.COM, BASECPM.COM, and M316.HEX may be used to construct a MOVCPM.COM which has the double-density floppy disk controller I/O module as the first module in the BIOS. Refer to the Magnolia user's manual.
If the above values are not found in the corresponding locations, the above instruction sequences must be located, and the above references in the boot track area (locations 0900-09FF) must be patched to point to the proper locations (note the offset of 0A00).

5. Remain in DDT and patch the following location in MOVCPM.COM if you wish to access the Heath H-17 hard-sectored controller board at 4 MHz:

```
3286 MVI A,FD
3288 MVI D,50 ***
328A OUT 7E
328C IN 7E
328E IN 7F
```

change 3288 MVI D,50 to MVI D,A0 (3289 50 to A0)

The above assumes that the Heath H-17 mini-floppy disk controller I/O module is the second module in the BIOS. The Magnolia modules LINK.COM, BASECPM.COM, and Z17.HEX may be used to construct a MOVCPM.COM which has the Heath H-17 mini-floppy disk controller I/O module as the second module in the BIOS. Refer to the Magnolia user's manual.

If the above values are not found in the corresponding locations, the above instruction sequence must be located and patched as shown.

6. Save the resultant MOVCPM.COM as follows:

```
SAVE 60 MOVCPM.COM
```

Note that the value "60" may be different for your system. Compute the proper value from the "NEXT" value shown upon entry to DDT (as described on page 2 of the DDT user's guide).

7. Run SETUP (ver 2.242) or DDSETUP (ver 2.23) and enter the "SET LOGICAL/PHYSICAL DRIVE ASSIGNMENTS" menu. Depress the <BLUE> key to update MOVCPM; then exit to CP/M.

8. Run MOVCPM and SYSGEN to generate a new system.

9. Reboot and try the CP/M system diskette at both 2 4 MHz. Note that in order to boot an 8" CP/M diskette at 4 MHz, you will need a monitor/boot ROM from KRES Engineering.
10. If you have ver 2.242 utilities (FORMAT.COM is the only formatting program), perform steps 10A-12A. If you have ver 2.23 utilities (DDFORMAT.COM and FORMAT.COM are used for formatting), perform steps 10B-12B.

10A. Rename "FORMAT.COM" to "FORMAT2Z.COM" as follows:

```
REN FORMAT2Z.COM=FORMAT.COM
```

11A. Use "DDT FORMAT2Z.COM" to examine and patch the following locations in FORMAT2Z.COM, creating a NEW formatting program called FORMAT4Z.COM (values in parentheses may be different):

```
08E4  CALL (09F3)
08E7  MOV A,D
08E8  CPI 07   ***
08EA  JNC (08BC)
08ED  CPI 03   ***
08EF  JC (08E4)
08F2  CALL (09F3)
08F5  MOV A,D
08F6  CPI 03   ***
08F8  JNC (08F2)
08FB  XRA A

change 08E8 CPI 07 to CPI 0C
       08ED CPI 03 to CPI 06
       08F6 CPI 03 to CPI 06
       (08E9 07 to 0C)
       (08EE 03 to 06)
       (08F7 03 to 06)

0979  CALL (09F3)
097C  MOV A,D
097D  CPI 03   ***
097F  JC (0979)
0982  CALL (09D8)

change 097D CPI 03 to CPI 06
       (097E 03 to 06)

09DB  MVI A,FD   ***
09DD  MVI D,50
09DF  OUT 7E
09E1  IN 7E
09E3  IN 7F

change 09DD MVI D,50 to MVI D,A0
       (09DE 50 to A0)
```
0A78    PUSH PSW
0A79    LXI  B,00AB  ***
0A7C    DCX  B
0A7D    MOV  A,B
0A7E    ORA  C
0A7F    JNZ  (0A7C)

change 0A79 LXI B,00AB to LXI B,0155  
(0A7A AB to 55)                  
(0A7B 00 to 01)

0ABB    CALL  (0AD0)
0ABE    LXI  B,84D0  ***
0AC1    IN   3C
0AC3    RLC
0AC4    JNZ  (0ACD)
0AC7    DCX  B
0AC8    MOV  A,B
0AC9    ORA  C
0ACA    JNZ  (0AC1)

change 0ABE LXI B,84D0 to LXI B,0  
(0ABF D0 to 00)                  
(0AC0 84 to 00)

0AE5    MVI  C,3F
0AE7    ??=  CB
0AE8    MOV  M,B
0AE9    JNZ  (0AF1)  ***
0AEC    ??=  CB
0AED    MOV  D,B

change 0AE9 JNZ  ... to JMP  ...  
(0AE9 C2 to C3)

0B34    MVI  C,3F
0B36    ??=  CB
0B37    MOV  D,D
0B38    ??=  28  ***
0B39    INR  B

change 0B38 ??= 28 to ??= 18  
(0B38 28 to 18)

If the above values are not found in the corresponding locations, the
above instruction sequences must be located and patched as shown.

Save the result with "SAVE 35 FORMAT4Z.COM".

12A. Use "FORMAT2Z.COM" when formatting diskettes at 2 MHz; use
"FORMAT4Z.COM" when formatting diskettes at 4 MHz.
10B. Rename "DDFORMAT.COM" to "DDFMT2Z.COM" as follows:

```
REN DDFMT2Z.COM=DDFORMAT.COM
```

11B. Use "DDT DDFMT2Z.COM" to examine and patch the following locations in DDFMT2Z.COM, creating a NEW formatting program called DDFMT4Z.COM (values in parentheses may be different):

```
0284  MOV A,M
0285  ANI 41
0287  CPI 41
0289  MOV A,M
028A  LXI H,(0481)
028D  JNZ (0293)
0290  LXI H,(0492)  ***
0293  SHLD (04BC)
0296  XCHG

change 0290 LXI H,... to LXI B,...
       (0290 21 to 01)

02E0  LDA 000D
02E3  ANI FD
02E5  OUT F2
02E7  CALL (0464)
02EA  LXI B,84D0  ***
02ED  IN 3C
02EF  RLC

change 02EA LXI B,84D0 to LXI B,0
       (02EB D0 to 00)
       (02EC 84 to 00)

0338  OUT 38
033A  MVI A,92  ***
033C  DCR A
033D  JNZ (033C)
0340  IN 3C
0342  ORA A

change 033A MVI A,92 to MVI A,0
       (033B 92 to 00)
```

If the above values are not found in the corresponding locations, the above instruction sequences must be located and patched as shown.

Save the result with "SAVE 8 DDFMT4Z.COM".

12B. Use "DDFMT2Z.COM" when formatting diskettes at 2 MHz; use "DDFMT4Z.COM" when formatting diskettes at 4 MHz.
DETAILED INSTALLATION INSTRUCTIONS

USE THESE INSTRUCTIONS (WHICH BEGIN WITH A REVIEW OF DDT) IF YOU ARE NOT FAMILIAR WITH CP/M, DDT AND 8080 ASSEMBLY LANGUAGE MNEMONICS

USING DDT

The patches you will install require the use of a utility program on your original CP/M distribution disk called DDT.COM. DDT stands for Dynamic Debugging Tool. It will allow you to change portions of a CP/M file. We will use it to change some of your CP/M operating system and utility programs so they will run at 2 MHz or 4 MHz. Complete information on the use of DDT can be found in the CP/M manual. Although there are many commands available in DDT, we will only use two of them to make our changes, and they are detailed in this section. These commands allow you to:

1. Look at the values in memory (the List command)
2. Change the values in memory (the Substitute or Set command)

Since it is actually disk files that we want to change, rather than memory locations, we will first put a file into memory; then change memory locations; and finally save the values in memory back into a disk file.

THESE STEPS ARE EXAMPLES ONLY. ACTUAL PATCHES START ON PAGE 10

1.) First, DDT will automatically put any one disk file into memory when we first give the DDT command. It uses the file name you type after the DDT command at the CP/M "A>" prompt. For example, when you see the "A>" prompt you type:

DDT MOVCPM.COM <cr>

You will begin to run the DDT program, and DDT will find the disk file named MOVCPM.COM and load it into memory. When DDT signs on, after it tells you what it is and what version you are running, it also tells you the NEXT available memory location after the loaded program, and the Program Counter setting (100H) to run this COM file. This information should be written down, as you will use it to determine the length of the modified file to save. When DDT is ready for you to enter a command, it prompts you with a "-". Now that the file is in memory, we can use some DDT commands to look at memory locations, and change them if we wish.

2.) The List command will list the contents of the memory location specified as assembly language mnemonics. We will be using this command only to verify that what you have in the file at a particular location is what it should be. We will use the command by typing L followed by a memory address and DDT will respond by listing lines of assembly language code. All you need do is compare what you see on the screen with what is printed in this manual. For example, if we wanted to look at what is in our file at location 097B, at the "-" prompt we would type:

L097B <cr>
and your machine would respond with the memory location followed by the mnemonics it found at that location, for example:

```
097B  MVI   A,18
097D  STA  2024
0980  STA  2049
....
```

Note that every memory address is not listed. Some instructions take more than one memory location. In our example above, the instruction corresponding to "MVI A," is in location 097B, and the value 18 is in location 097C. Similarly, the location 097D contains the instruction corresponding to "STA", and memory locations 097E and 097F contain the value 2024. (The 24 is stored first, then the 20.)

3.) When you are told to change a memory location to another value, you will use the Substitute (or Set) command. This command will display the value stored in a memory location, and allow you to change the value if you wish. We will use the command by typing S followed by a memory location. DDT will return with the value in that location, and wait for your command. You may then either:
   a. Type in a new Hexadecimal value
   b. Press the Return key (<cr>) to go on to the next location and leave the data unchanged
   c. Press the period ("."), followed by the RETURN key to leave this command and return to the ":" prompt.

4.) When all of the changes have been made, you have software that can run at 2 MHz or 4 Mhz, but it is still in memory. You want it in a disk file so you can continue to reuse it. We will need to exit DDT and return to CP/M so the file can be saved. DDT is exited by typing GO ("G" ZERO) which returns control to CP/M.

5.) Finally we use the CP/M SAVE command to write the memory back to a disk file. **DOING ANYTHING ON YOUR COMPUTER BETWEEN THE GO AND THE SAVE COMMAND CAN BE DISASTROUS.** The values you wrote down in step one are now used to determine the length of the file. We need to make a conversion from Hexadecimal to Decimal for use with the SAVE command. The proper value can be found in TABLE I on the next page.

For example, let's say when DDT signed on the computer screen read:

```
DDT VER 2.2
NEXT PC
3D00 0100
```

Find the table entry that contains 3D00 in the given range. This is the line reading:

```
3C01-3D00 60
```

Then to SAVE our MOVCPM.COM example file, we would type at the CP/M prompt:

```
SAVE 60 MOVCPM60.COM
```

And we are done. Now that you understand enough about what you are about to be doing, let's proceed and make the actual patches.
### DECIMAL SAVE VALUE FROM DDT

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<th>NEXT RANGE</th>
<th>USE</th>
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<td>4201-4300</td>
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<td>4301-4400</td>
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</table>

Note in all cases the value under PC is assumed to be 0100.

**TABLE I**
PATCHING MAGNOLIA MICROSYSTEM'S CP/M

PART I - Creating MOVCPM.COM

During PART I you will make a new copy of MOVCPM.COM. This MOVCPM.COM will contain the modules in a specific order, so that when you later use DDT to examine the code, and alter some bytes, the code will be in a specific location.

With your system running at 2 MHz, use PIP to transfer the following files onto your present bootable disk. The PIP command is detailed in the DSM-240 manual under the Software Configuration for Heath/Zenith CP/M section. The following files are on your original Magnolia CP/M disks.

- BASECPM.COM
- M316.HEX
- Z17.HEX
- B8316.HEX (to boot from an eight inch drive)
  or
- B5316.HEX (to boot from a 5 1/4 inch drive)
- ICON.HEX (if you want the type-ahead keyboard)
- LINK.COM
- DDT.COM
- SYSGEN.COM
- SETUP.COM (Version 2.242 only)
- FORMAT.COM (Version 2.242 only)
  or
- DDSETUP.COM (Version 2.23 only)
- DDFORMAT.COM (Version 2.23 only)
- PIP.COM (for later use moving files, etc.)

Also PIP the following files onto the same disk. These are located on the disk that came with these patches:

- BTV4DD8Z.HEX
- BTV4DD5Z.HEX

Then make a fresh copy of MOVCPM.COM with the double density module as the first module and the H/Z-17 controller module as the second module by executing the following commands:

If MOVCPM.COM exists on your disk, either erase it or give it some other name

- REN MOVCPM.COM=BASECPM.COM
- LINK M316.HEX MOVCPM.COM
- LINK Z17.HEX MOVCPM.COM
- LINK ICON.HEX MOVCPM.COM (if desired)
- LINK BTV4DD8Z.HEX MOVCPM.COM (for an 8-inch diskette)
  or
- LINK BTV4DD5Z.HEX MOVCPM.COM (for a 5-inch diskette)
PART II - Checking MOVCPM.COM with DDT

Now, using DDT.COM, the MOVCPM.COM file just created will be examined and possibly patched. If prior procedures have been followed accurately, no changes should have to be made in this section--only verification is needed. If you have trouble using DDT, refer back to page 7 of this manual for the section on DDT, or refer to your Magnolia Microsystems CP/M manuals for complete documentation.

( ) Type the following command:

    DDT MOVCPM.COM <cr>

The computer will respond with:

    DDT VER 2.2
    NEXT PC
    3D00 0100

( ) Write down the values displayed on your screen under "NEXT" and "PC" for use in PART IV:

    Value from next: _ _ _ _
    Value from PC: _ _ _ _

( ) Use the DDT "L" for "LIST" command and look at the memory beginning at location 097B by typing:

    L097B <cr>

Your computer will respond with:

    097B  MVI A,18  <===
    097D  STA 2024  <===  Verify these three lines read correctly
    0980  STA 2049  <===

(The offset for this section of code is 0A00, so the STA 2024 actually references 2A24, and the STA 2049 actually references 2A49. Don't worry about this offset - its just a comment for those who are interested and want to follow what is happening, or those whose code doesn't match later on)
( ) Use DDT "L" command again to look at the memory beginning at location 2A21 by typing:

L2A21 <cr>

Your computer will respond with (Values in parentheses may vary.):

2A21 CALL (20ED)
2A24 ??= 28 <== Confirm the value printed here.
2A25 INX B
2A26 LXI D,(2114)
2A29 MVI B,88

( ) Next look at the memory locations beginning at 2A44 by typing:

L2A44 <cr>

Your computer will respond with (Again, values in parentheses may vary.):

2A44 ??= 38
2A45 PCHL
2A46 CALL (20ED)
2A49 ??= 28 <== Confirm the value printed here
2A50 INX B
2A51 LXI D,(2137)
2A54 MVI B,A8

ALL VALUES YOU HAVE EXAMINED WITH DDT SHOULD MATCH WHAT HAS BEEN PRINTED HERE IN THIS MANUAL. YOU SHOULD NOT HAVE MODIFIED ANY VALUES IN THESE FILES.

If something does not match, and you are sure you have version 2.242, then go back to PART I and relink the specified modules into MOVCPM.COM in the EXACT order they are specified. The double density floppy disk controller I/O module must be the first module in the BIOS. This should be the case if earlier steps to make a fresh copy of MOVCPM.COM were followed. If things still do not match, you must locate the second two sequences of code now while you are in DDT (the sections that start at memory locations 2A21 and 2A44 and note where the IDENTICAL code sections are in memory). Then you must:

A. Write down the address of the memory that contains the same value as SHOULD have been at location 2A24 and subtract 0A00 Hex from that value.

B. Write down the address of the memory that contains the same value as SHOULD have been at location 2A49 and subtract 0A00 Hex from that value.

C. Go back to the code you first examined at location 097B and use DDT to patch the STA instructions at 097D to read STA followed by the value you obtained from the subtraction in step 1 above.

D. Similarly, replace the address referenced by the STA instruction in 0980.

These patches were designed to work only with version 2.242 of MMS CP/M. If the proper code is not in place, you probably do not have this version. Updates have been available from MMS for a charge in the past; we suggest you obtain the proper version. If, however, you wish to try to patch some other version, the instructions here may work. YOU ARE ON YOUR OWN.
PART III - H17 Controller patch

This section is required only if you wish to access the H-17 10 hard sectored disk drives at 4 MHz as well as 2 MHz.

( ) Remain in DDT and patch the following location in MOVCPM.COM if you wish to access the Heath H-17 hard-sectored controller board while running at 4 MHz. To look at the code beginning at 3286, you type:

L3286 <cr>

And your computer responds with:

3286 MVI A,FD
3288 MVI D,50  <= Change below is for this line
328A OUT 7E
328C IN 7E
328E IN 7F

( ) Use the DDT "S" to substitute memory values to change line 3288 by substituting "A0" for the value at location 3289. (Part of the instruction at memory location 3288 is in location 3289. At the "-" prompt, you type:

S3289 <cr>

Your computer will display:

3289 50

And leave the cursor to the right of the typed line. You will change the 50 to A0 by typing:

A0 <cr>

Your computer will move on to the next memory location when you press RETURN:

3290 31

And again leave the cursor to the right of the typed line. We are done with DDT for the moment; you type a period (".")) followed by a RETURN to return to the DDT prompt "-".

( ) To verify the change, list the memory starting at 3286 by typing:

L3286 <cr>

And the first two lines should now read:

3286 MVI A,FD
3288 MVI D,A0

The H/Z-17 controller I/O module must be the second module in the BIOS. Again, if a new MOVCPM.COM was created per instructions, there should be no problem. If the above values are not found in the given locations, the above instruction sequence must be located and patched by replacing 50 with A0 as above.
PART IV - Saving MOVCPM.COM, reconfiguring and testing

Although any patches to CP/M itself are now complete, the MOVCPM in the previous parts is still in memory. We will save the contents of memory in a file on disk called MOVCPM.COM. Finally, your system must be reconfigured using SETUP to your particular hardware environment.

( ) Exit DDT and return back to CP/M by typing:

GO <cr>

After some disk accesses, you will return to the CP/M prompt. The file you changed is still in memory, and you must save it to disk by using the CP/M SAVE command.

( ) Next you will save the resulting MOVCPM.COM still in memory to disk. If the values you wrote down at the beginning of section 4 matched the printed value in that section, you may type:

SAVE 60 MOVCPM.COM <cr>

And your patched MOVCPM.COM file will be on disk. If, however the value for NEXT was something different, you must use the technique for determining file length outlined in the notes on DDT section on page 7 of this manual. Then type:

SAVE nn MOVCPM.COM <cr>

where nn corresponds to the value you determined from the TABLE I.

( ) Run SETUP (Vers. 2.242) or DDSETUP (Vers. 2.23) and set up your operating parameters to fit your system. You will need to "SET LOGICAL/PHYSICAL DRIVE ASSIGNMENTS", set default and disk parameters for the controllers, set any need serial port parameters, etc. just as you have done before in setting up your system. Remember to use the "Blue" function key in each stage of "SETUP" to update your image of MOVCPM. Then exit to CP/M and the prompt.

( ) Run MOVCPM and SYSGEN to generate a new system on any diskette you won't mind losing should something have gone wrong.

( ) Shift/Reset your system, move the 4 MHz diskette you have been creating to the drive you normally boot from and verify that it will boot properly at 2 and 4 MHz. Again, note that with the double density card you will be booting 8-inch drives at either 2 or 4 MHz and cannot software switch. You will have to set Jumpers JJ2 and JJ3 on your DSM-240 card to "A" for 4 MHz or "B" for 2 MHz, or if you have the Kres/Ultimeth ROM use the "KRES System" command to set the desired speed. The ROM Manual and DSM-240 Manual should be consulted for details on commands and jumper options.
PART V - Patching FORMAT.COM

USE THIS SECTION IF YOU HAVE VERSION 2.242

FORMAT.COM which you have been using to FORMAT disks at 2 MHz must now be patched, and two FORMAT files will result. The original FORMAT file will be renamed FORMAT2Z.COM and will be used for formatting disks when you are running at 2 MHz. DDT.COM will be used again to patch FORMAT2Z.COM, with the resulting patched version to be saved as FORMAT4Z.COM and used to format when running at 4 MHz.

If you have Version 2.242, you will be patching FORMAT.COM and should perform the steps in this part (PART V). If you have Version 2.23, which uses DDFORMAT.COM and FORMAT.COM, go to PART VI.

( ) Rename "FORMAT.COM" TO "FORMAT2Z.COM" at the CP/M prompt by typing:

    REN FORMAT2Z.COM=FORMAT.COM <cr>

( ) Use DDT.COM to make necessary patches as follows:

    DDT FORMAT2Z.COM <cr>

The computer responds with:

    DDT VER. 2.2
    NEXT PC
    2300 0100

( ) List the memory locations beginning at 08E4 by typing:

    L08E4 <cr>

Your computer will display (note that values in the parentheses may vary):

    08E4 CALL (09F3)
    08E7 MOV A,D
    08E8 CPI 07 <===Value to be changed
    08EA JNC (08BC)
    08ED CPI 03 <===Value to be changed
    08EF JC (08E4)
    08F2 CALL (09F3)
    08F5 MOV A,D
    08F6 CPI 03 <===Value to be changed
    08F8 JNC (08F2)
    08FB XRA A
Use the "S" command under DDT as you did previously to change the areas indicated above. Enter the S command at the "-" prompt at memory 08E9 by typing:

S08E9 <cr>

Your computer will display:

08E9 07

As the address and value appear each time, you may type a new value in, which the DDT program will place out beside the present value. Or, you may hit RETURN to leave the value unchanged. Or you may enter a period, "." followed by RETURN to return to the DDT "-" prompt.

Change the value at this memory location 08E9 to 0C by typing:

0C <cr>

Your computer will now display:

08E9 07 0C
08EA D2

Continue to press the RETURN key until the next memory location to be changed is displayed (08EE), then change this to the indicated value (06). The last location to be changed is 08F7, also changed to 06. When this change has been made, you may press the period ("." ) followed by RETURN to leave the substitute command. The entire sequence would proceed as follows:

08EA D2 <cr>
08EB BC <cr>
08EC 08 <cr>
08ED FE <cr>
08EE 03 06 <cr>
08EF DA <cr>
08F0 E4 <cr>
08F1 08 <cr>
08F2 CD <cr>
08F3 F3 <cr>
08F4 09 <cr>
08F5 7A <cr>
08F6 FE <cr>
08F7 03 06 <cr>
08F8 D2 . <cr>
Then use the "L" list command of DDT to verify the changes marked above have been done, and no other locations were inadvertently changed, by typing:

L08E4 <cr>

Your computer will respond with:

```
08E4 CALL (09F3)
08E7 MOV A,D
08E8 CPI 0C
08EA JNC (08BC)
08ED CPI 06
08EF JC (08E4)
08F2 CALL (09F3)
08F5 MOV A,D
08F6 CPI 06
08F8 JNC (08F2)
08FB XRA A
```

Since you should be familiar with DDT by now, we will simply instruct that an area of code be examined, and some of the code changed. Use the following steps, just as we have done before, to make the changes:

1. Use the L command to verify the code is as printed in the manual
2. Use the S command to change the required bytes. We will abbreviate this by showing the computer output, and your input, all in one block. As usual, your input will be differentiated from computer output by bold face.
3. Use the L command again to verify only the desired bytes have been changed to the proper values.

Examine the memory locations beginning at 0979 by typing L0979 verifying what you see on the screen with the listing printed under the FROM heading below. Make the changes with the S command sequence printed below, then verify the proper changes have been and the code looks the same as what you see printed under the TO heading below by using L0979 again:

<table>
<thead>
<tr>
<th>CHANGE:</th>
<th>FROM</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>FROM 0979</td>
<td>CALL (09F3)</td>
<td>CALL (09F3)</td>
</tr>
<tr>
<td>097C MOV A,D</td>
<td>097D CPI 03</td>
<td></td>
</tr>
<tr>
<td>097F JC (0979)</td>
<td>097F JC (0979)</td>
<td></td>
</tr>
<tr>
<td>0982 CALL (09D8)</td>
<td></td>
<td>CALL (09D8)</td>
</tr>
</tbody>
</table>

By typing:

S097E <cr>

097E 03 06 <cr> (Value changed from 03 to 06)
097F DA . <cr> ("." returns you to the "-") prompt)
( ) Examine the memory locations beginning at 09DB by typing L09DB. Make the changes with the S command then verify the proper changes have been made by using L09DB again:

**CHANGE:**

<table>
<thead>
<tr>
<th>FROM</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>09DB</td>
<td>MVI A,FD</td>
</tr>
<tr>
<td>09DD</td>
<td>MVI D,50</td>
</tr>
<tr>
<td>09DF</td>
<td>OUT 7E</td>
</tr>
<tr>
<td>09E1</td>
<td>IN 7E</td>
</tr>
<tr>
<td>09E3</td>
<td>IN 7F</td>
</tr>
<tr>
<td>09DB</td>
<td>MVI A,FD</td>
</tr>
<tr>
<td>09DD</td>
<td>MVI D,A0 &lt;= NOTE CHANGE</td>
</tr>
<tr>
<td>09DF</td>
<td>OUT 7E</td>
</tr>
<tr>
<td>09E1</td>
<td>IN 7E</td>
</tr>
<tr>
<td>09E3</td>
<td>IN 7F</td>
</tr>
</tbody>
</table>

**BY TYPING:**

`S09DE <cr>`

09DE 50 A0 <cr> (Value changed from 50 to A0)
09DF D3 . <cr> ("." returns you to the "-" prompt)

( ) Examine the memory locations beginning at 0A78 by typing L0A78. Make the changes with the S command then verify the proper changes have been made by using L0A78 again:

**CHANGE:**

<table>
<thead>
<tr>
<th>FROM</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>0A78</td>
<td>PUSH PSW</td>
</tr>
<tr>
<td>0A79</td>
<td>LXI B,00AB</td>
</tr>
<tr>
<td>0A7C</td>
<td>DCX B</td>
</tr>
<tr>
<td>0A7D</td>
<td>MOV A,B</td>
</tr>
<tr>
<td>0A7E</td>
<td>ORA C</td>
</tr>
<tr>
<td>0A7F</td>
<td>JNZ (0A7C)</td>
</tr>
<tr>
<td>0A78</td>
<td>PUSH PSW</td>
</tr>
<tr>
<td>0A79</td>
<td>LXI B,0155 &lt;= NOTE CHANGE</td>
</tr>
<tr>
<td>0A7C</td>
<td>DCX B</td>
</tr>
<tr>
<td>0A7D</td>
<td>MOV A,B</td>
</tr>
<tr>
<td>0A7E</td>
<td>ORA C</td>
</tr>
<tr>
<td>0A7F</td>
<td>JNZ (0A7C)</td>
</tr>
</tbody>
</table>

**BY TYPING:**

`S0A7A <cr>`

0A7A AB 55 <cr> (Changes value AB to 55)
0A7B 00 01 <cr> (Changes value 00 to 01)
0A7C 0B . <cr> ("." returns you to the "-" prompt)
Examine the memory locations beginning at $0ABB$ by typing $L0ABB$. Make the changes with the $S$ command then verify the proper changes have been made by using $L0ABB$ again:

**CHANGE:**

<table>
<thead>
<tr>
<th>FROM</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0ABB$ CALL (0AD0)</td>
<td>$0ABB$ CALL (0AD0)</td>
</tr>
<tr>
<td>$0ABE$ LXI B,84D0</td>
<td>$0ABE$ LXI B,0000</td>
</tr>
<tr>
<td>$0AC1$ IN 3C</td>
<td>$0AC1$ IN 3C</td>
</tr>
<tr>
<td>$0AC3$ RLC</td>
<td>$0AC3$ RLC</td>
</tr>
<tr>
<td>$0AC4$ JNZ (0ACD)</td>
<td>$0AC4$ JNZ (0ACD)</td>
</tr>
<tr>
<td>$0AC7$ DCX B</td>
<td>$0AC7$ DCX B</td>
</tr>
<tr>
<td>$0AC8$ MOV A,B</td>
<td>$0AC8$ MOV A,B</td>
</tr>
<tr>
<td>$0AC9$ ORA C</td>
<td>$0AC9$ ORA C</td>
</tr>
<tr>
<td>$0ACA$ JNZ (0AC1)</td>
<td>$0ACA$ JNZ (0AC1)</td>
</tr>
</tbody>
</table>

**BY TYPING:**

```
S0ABF <cr>
```

$0ABF$ D0 00 <cr>  (Value changed from D0 to 00)
$0AC0$ 84 00 <cr>  (Value changed from 84 to 00)
$0AC1$ DB . <cr>  ('.' returns you to the "-" prompt)

Examine the memory locations beginning at $0AE5$ by typing $L0AE5$. Make the changes with the $S$ command then verify the proper changes have been made by using $L0AE5$ again:

**CHANGE:**

<table>
<thead>
<tr>
<th>FROM</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0AE5$ MVI C,3F</td>
<td>$0AE5$ MVI C,3F</td>
</tr>
<tr>
<td>$0AE7$ ??= CB</td>
<td>$0AE7$ ??= CB</td>
</tr>
<tr>
<td>$0AE8$ MOV M,B</td>
<td>$0AE8$ MOV M,B</td>
</tr>
<tr>
<td>$0AE9$ JNZ (0AF1)</td>
<td>$0AE9$ JMP (0AF1)</td>
</tr>
<tr>
<td>$0AEC$ ??= CB</td>
<td>$0AEC$ ??= CB</td>
</tr>
<tr>
<td>$0AED$ MOV D,B</td>
<td>$0AED$ MOV D,B</td>
</tr>
</tbody>
</table>

**BY TYPING:**

```
S0AE9 <cr>
```

$0AE9$ C2 C3 <cr>  (Value changed from JNZ to JMP)
$0AEA$ F1 . <cr>  ('.' returns you to the "-" prompt)
( ) Examine the memory locations beginning at O834 by typing L0B34. Make the change with the S command then verify the proper changes have been made by using L0B34 again:

CHANGE:

<table>
<thead>
<tr>
<th>FROM</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>0B34</td>
<td>MVI C, 3F</td>
</tr>
<tr>
<td>0B36</td>
<td>??= CB</td>
</tr>
<tr>
<td>0B37</td>
<td>MOV D, D</td>
</tr>
<tr>
<td>0B38</td>
<td>??= 28</td>
</tr>
<tr>
<td>0B39</td>
<td>INR B</td>
</tr>
</tbody>
</table>

BY TYPING:

S0B38 <cr>

0B38 28 18 <cr>  (Value changed from 28 to 18)
0B39 04 . <cr>  ("." returns you to the ":" prompt)

If the above values are not found in the corresponding locations, the above instruction sequences must be located and patched as to the values shown.

( ) Exit DDT by typing:

G0 <cr>  (note that this is "G" zero)

which will return you to the CP/M prompt

( ) Save the file as FORMAT4Z.COM by typing:

SAVE 35 FORMAT4Z.COM <cr>

( ) At this point, your 4MHz software patches are complete. You now may want to take the diskette you sysgened and tested in PART IV and copy over all the files using PIP. It may also be wise to format and sysgen a second disk with your new 2 and 4 MHz CP/M, and copy over the rest of your system files from your original disk. Name the two new disks something like "2/4MHz MMS SYSTEM MASTER" and "2/4MHz MMS WORKING MASTER". The "System Master" disk then should be filed away in a safe place along with the disks you received with your DSM-240 Board and 4MHZ Patches.
PART VI - Patching DDFORMAT.COM
USE THIS SECTION IF YOU HAVE VERSION 2.23

FORMAT.COM which you have been using to FORMAT disks at 2 MHz must now be patched, and two FORMAT files will result. The original FORMAT file will be renamed DDFMT2Z.COM and will be used for formatting disks when you are running at 2 MHz. DDT.COM will be used again to patch DDFMT2Z.COM, with the resulting patched version to be saved as DDFMT4Z.COM and used to format when running at 4 MHz. If you have Version 2.242, you will be patching FORMAT.COM and should perform the steps in PART V. If you have Version 2.23, which uses DDFORMAT.COM and FORMAT.COM, perform the steps in this part (PART VI).

( ) Rename DDFORMAT.COM to DDFMT2Z.COM by typing:

```
REN DDFMT2Z.COM=DDFORMAT.COM <cr>
```

( ) Use DDT.COM to examine DDFMT2Z.COM and make changes which will be saved as DDFMT4Z.COM, with DDFMT2Z.COM to be used for formatting while running at 2 MHz and DDFMT4Z.COM to be used for formatting while running at 4 MHz.

Since you should be familiar with DDT by now, we will simply instruct that an area of code be examined, and some of the code changed. Use the following steps, just as we have done before, to make the changes:

1. Use the L command to verify the code is as printed in the manual
2. Use the S command to change the required bytes. We will abbreviate this by showing the computer output, and your input, all in one block. As usual, your input will be differentiated by computer output by bold face.
3. Use the L command again to verify only the desired bytes have been changed to the proper values.

( ) Examine the memory locations beginning at 0284 by typing L0284 verifying what you see on the screen with the listing printed under the FROM heading below. Make the changes with the S command sequence printed below, then verify the proper changes have been and the code looks the same as what you see printed under the TO heading below by using L0284 again:

```
CHANGE:

FROM          TO
0284 MOV A,M  0284 MOV A,M
0285 ANI 41   0285 ANI 41
0287 CPI 41   0287 CPI 41
0289 MOV A,M  0289 MOV A,M
028A LXI H,(0481) 028A LXI H,(0481)
028D JNZ (0293) 028D JNZ (0293)
0290 LXI H,(0492) 0290 LXI B,(0492) <== NOTE CHANGE
0293 SHLD (04BC) 0293 SHLD (04BC)
0296 XCHG 0296 XCHG
```

BY TYPING:

```
S0290 <cr>
0290 21 01 <cr> (Value changed from LXI H to LXI B)
0291 92 . <cr> ('.' returns you to the "-" prompt)
Examine the memory locations beginning at 02E0 by typing L02E0. Make the changes with the S command then verify the proper changes have been made by using L02E0 again:

<table>
<thead>
<tr>
<th>FROM</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>02E0</td>
<td>02E0</td>
</tr>
<tr>
<td>ANI FD</td>
<td>ANI FD</td>
</tr>
<tr>
<td>OUT F2</td>
<td>OUT F2</td>
</tr>
<tr>
<td>CALL (0464)</td>
<td>CALL (0464)</td>
</tr>
<tr>
<td>LXI B,84D0</td>
<td>LXI B,0000 (=== NOTE CHANGE)</td>
</tr>
<tr>
<td>IN 3C</td>
<td>IN 3C</td>
</tr>
<tr>
<td>RLC</td>
<td>RLC</td>
</tr>
</tbody>
</table>

BY TYPING:

S02EB <cr>

02EB D0 00 <cr>  (Value changed from D0 to 00)
02EC 84 00 <cr>  (Value changed from 84 to 00)
02ED DB . <cr>  ("." returns you to the "-" prompt)

Examine the memory locations beginning at 0338 by typing L0338. Make the changes with the S command then verify the proper changes have been made by using L0338 again:

<table>
<thead>
<tr>
<th>FROM</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>0338</td>
<td>0338</td>
</tr>
<tr>
<td>OUT 38</td>
<td>OUT 38</td>
</tr>
<tr>
<td>MVI A,92</td>
<td>MVI A,00 (=== NOTE CHANGE)</td>
</tr>
<tr>
<td>DCR A</td>
<td>DCR A</td>
</tr>
<tr>
<td>JNZ (033C)</td>
<td>JNZ (033C)</td>
</tr>
<tr>
<td>IN 3C</td>
<td>IN 3C</td>
</tr>
<tr>
<td>ORA A</td>
<td>ORA A</td>
</tr>
</tbody>
</table>

BY TYPING:

S033B <cr>

033B 92 00 <cr>  (Value changed from 92 to 00)
033C 3D . <cr>  ("." returns you to the "-" prompt)
If the above values are not found in the corresponding locations, the above instruction sequences must be located and patched as shown.

( ) Exit DDT by typing:

GO <cr>

and you will return to the CP/M prompt.

( ) Save the result by typing:

SAVE 8 DDPMT4Z.COM <cr>

( ) At this point, your 4MHz software patches are complete. You now may want to take the diskette you sysgened and tested in PART IV and copy over all the files using PIP. It may also be wise to format and sysgen a second disk with your new 2 and 4 MHz CP/M, and copy over the rest of your system files from your original disk. Name the two new disks something like "2/4MHz MMS SYSTEM MASTER" and "2/4MHz MMS WORKING MASTER". The "System Master" disk then should be filed away in a safe place along with the disks you received with your DSM-240 Board and 4MHZ Patches.
ADDITIONAL PATCHES FOR MMS AND 8-INCH THIN LINE DRIVES

The patches you have just completed were written assuming a standard height eight inch drive on line. These drives, for the most part, use AC motors which are always on. Most of the new thinline drives use DC motors, which come on as the disk is accessed, and shut off again when not needed, just as the 5 1/4 inch drives. Some of the thinline drives require a greater time to come up to speed than the operating system software allows at 4 MHz. The result is frequent BDOS errors when the drive is accessed after the motor has shut off. The following patches provided by Henry Fale, of Quikdata Computer Services, Inc., 2618 Penn Circle, Sheboygan, WI 53081, (414) 452-4172 will help alleviate this problem. The patch is installed using DDT, just as the previous patches were installed. It should be noted that the delay provided in this patch represents the maximum available, and should this not work for you, contact your disk drive dealer for further information on how operation of your drive might be improved.

( ) Go into DDT to modify MOVCPM.COM again by entering:

DDT MOVCPM.COM <cr>

DDT will respond with the usual signon and values. Remember to note the "NEXT" and "PC" values as always with DDT for the purpose of saving the modified MOVCPM.COM after patching.

( ) Enter the following to enter the substitute command to change the required memory locations:

S2CC1 <cr>

Your computer will respond by displaying the contents of 2CC1, and giving you the option of changing it. Be certain the contents of each memory location is as in the table below. If the value is correct, simply type a RETURN to leave the value unchanged. If something is different in a particular location, change it to correspond to the value given in this table. Exit the sequence by typing a period (".") which will return you to the "-" prompt. Change contents of the following memory locations as required:

2CC1 11
2CC2 00
2CC3 00
2CC4 1B
2CC5 7A
2CC6 B3
2CC7 DB
2CC8 3C
2CC9 07
2CCA D0
2CBB E3
2CCC E3
2CCD 00
2CCE 20
2CCF F4

(After the next address enter " . " to return to the "-" prompt.)
( ) Use the "L" command to verify the patches by typing:

L2CC1 <cr>

Your computer will respond with:

2CC1 LXI D,0
2CC4 DCX D
2CC5 MOV A,D
2CC6 ORA E
2CC7 IN 3C (You will have to use the "L" command twice to obtain a full listing of these values.)
2CC9 RLC
2CCA RNC
2CCB XTHL
2CCC XTHL
2CCD NOP
2CCE ??= 20
2CCF CP (7EC9)

( ) Exit DDT by typing:

GO <cr>

and you will return to the CP/M prompt.

( ) Save the MOVCPM.COM image from memory back to disk using the SAVE command as in PART IV of the previous patches. Use either the value for the length of file you used in PART IV, or calculate the length of the file from the NEXT and PC values you recorded at the beginning of this section. This completes the additional patches to the Magnolia CP/M for the 8 inch thin line drives.

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