



CP/M-68K™

**Technical Manual and
Installation Procedures**

SINGLE USER 16-BIT OPERATING SYSTEM

CP/M 68K™ Technical Manual & Installation Procedures

Single User 16-Bit Operating System

CP/M-68K
Technical and Installation Manual
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RELEASE NOTES

FOR THE COMPUPRO

REVISION "A" IMPLEMENTATION CP/M-68K

Thank you for purchasing the COMPUPRO CP/M-68K 1.1A operating system. The software on these disks is proprietary to Digital Research and CompuPro. The Digital Research Software License Agreement defines the terms and conditions covering the use of CP/M-68K. Please take time to carefully read this agreement.

The documentation for CP/M-68K as purchased from CompuPro consists of the following manuals:

CP/M-68K Operating System User's Guide

CP/M-68K Operating System Programmer's Guide

CP/M-68K Operating System System Guide

CP/M-68K The C Language Programming Guide

CP/M-68K Technical Manual

Three diskettes are also included. These are not the same disks that are referenced in the Digital Research documentation. The first disk contains a system that is configured for the CompuPro System 816/E. It uses the System Support 1 for console I/O, requires 256K of memory, and uses a 3 msec floppy disk step rate. Disk #1 also contains all of the relocated utilities for CP/M-68K and all of the files needed for the CP/M-68K C compiler. Disk #2 contains a system that will use the Interfacer 3, user 7, or an Interfacer 1 addressed at 10h for console I/O, requires 128K of memory, and uses an 8 msec floppy disk step rate. Also contained on disk #2 are the source, library and submit files needed to modify the bios, and all of the ".REL" (relocatable) utility files. The printer is set for an Interfacer 3-port 10h, user 4 in both configurations. Disk #3 contains necessary files for the F83 FORTH package for the 816/E system.

The following programs are included with your CP/M-68K and are not mentioned in the Digital Research documentation:

FORMAT.68K	Floppy disk format utility.
MFORM.68K	Memory disk format utility.
DISK2.68K	Hard disk format utility.
DISK3.68K	Hard disk format utility.
COMPUPRO.A	Library of special extensions for the C language

CP/M-68K TECHNICAL MANUAL

INTRODUCTION

Your CP/M-68K system includes three diskettes. Diskette number 1 contains a bootable CP/M-68K system for use with the DISK 1 floppy disk controller, the CPU 68K, and the SYSTEM SUPPORT 1 board and 256K of memory. Diskette 2 contains a bootable CP/M-68K system for use with the DISK 1, the CPU 68K, and an INTERFACER 3 or 4 board and 128K of memory. Diskette #3 contains the necessary files for the F83 FORTH package for the 816/E system.

The enclosed version of CP/M-68K requires the following hardware for proper operation:

HARDWARE REQUIREMENTS:

- (1) An operational S-100 mainframe, such as a CompuPro COMPUTER ENCLOSURE.
- (2) A CompuPro CPU 68K.
- (3) A CompuPro SYSTEM SUPPORT 1 with the I/O address set to 50H.

An INTERFACER 3 or 4 addressed at 10H can be substituted for the System Support console, but a different boot disk is required. Consult the CP/M-68K Release Notes for more information.

- (4) A CompuPro DISK 1 with J17 connected between pins B and C or DISK 1A floppy disk controller addressed at 0COH.
- (5) At least 128K of IEEE-696 compatible 24 bit address RAM addressed at 000000H.
- (6) At least one operational floppy disk drive connected to the DISK 1 or DISK 1A.
- (7) A terminal set for 9600 baud, 8 bit word length, no parity and 2 stop bits.

OPTIONAL HARDWARE

- (8) A CompuPro MDRIVE®/H memory disk system.
- (9) A CompuPro DISK 2 hard disk subsystem.

- (10) A CompuPro DISK 3 hard disk subsystem.
- (11) A serial line printer.
- (12) A parallel or Centronics type line printer.

MAKING A BACKUP SYSTEM

The first thing that must be done when trying to bring up and configure your CP/M-68K system is to make two backup copies for alteration. This will require six single sided diskettes formatted in double density format with 1024 byte sectors.

To format the six blank diskettes, boot up the appropriate CP/M-68K diskette (check the CP/M-68K Release Notes to determine what blank diskette you should be using) and type the following.

NOTE: Type only the underlined word immediately following the prompt A> and then press the return key, indicated by <cr>.

A>FORMAT <cr>

Insert a blank diskette into the B drive. Select the B drive for formatting, and density 3. When the format is done, repeat for the rest of the blank diskettes.

To copy the system diskette onto the newly formatted diskettes, type:

A>COPY <cr>

Insert a blank diskette into the B drive. Select drive A for the source, and drive B for the destination. The COPY utility will then copy the master disk track-for-track. It is recommended that all tracks in the master be copied, as the non-file tracks are very important. Repeat the copy procedure with a second blank diskette. Before leaving COPY (with "END"), insert the second master diskette and copy it onto the two remaining blank diskettes. Don't forget to copy the third diskette that came with your system.

USING CP/M-68K WITH DIFFERENT MEMORY SIZES

CP/M-68K is distributed with a minimum memory size of 128K. To configure CP/M-68K for use with a different memory size it is necessary to alter two files on the appropriate disk with the ED character editor (**NEVER ALTER THE MASTER DISK**). For information on using ED see the CP/M-68K User Guide.

The first file to alter is the one called RC.SUB. This is a text file of commands to relocate the CP/M-68K resident part to some other address than 35000H, which is the default. For instance, to use a 512K memory space the value for the command is 75000H. This is actually somewhat less than the full 512K but that extra memory is for CP/M-68K's private temporary and stack data.

The second file to alter is BIOS.S. This is a fairly large file containing the low-level I/O routines for CP/M-68K to use. The line to alter is the definition line for a variable called "himem". This should also reflect the new value in RC.SUB.

To make CP/M-68K reflect the new memory size, type:

```
A>>MAKESYS <cr>
```

This creates a new file called CPM.REL which is a relocatable form of the CCP, BDOS, and BIOS. To make the changes usable type:

```
A>>RC d (d is the drive containing the diskette  
where the new CP/M-68K will reside)
```

This relocates and makes absolute the CPM.REL file and creates a CPM.SYS file.

The CPM.SYS file should be made read-only to prevent accidental disaster occurring to your CP/M-68K diskette (see the CP/M 68K User Guide for how to use the STAT command).

USING THE COMPUPRO MDRIVE/H MEMORY DISK

The CP/M-68K BIOS includes drivers for up to eight MDRIVE/H memory disk boards to provide up to 4 megabytes of fast memory disk on drive "M".

The CompuPro CP/M-68K BIOS will automatically determine how many MDRIVE/H boards are present, if any, and set the disk parameter blocks accordingly. The sizing routine will not destroy data already in the MDRIVE/H.

The first time power is applied to the system, the memory drive is automatically formatted with the MFORM command. Subsequent resets will not reformat the memory drive.

Then use drive "M" to quickly do slow tasks like using the CP/M-68K C compiler.

SOFTWARE SECTION

INTRODUCTION

The purpose of this section is to describe the software supplied with CP/M-68K and the CompuPro DISK 1 floppy disk controller for the standard IEEE 696 (S-100) bus.

This document is designed for users who are familiar with the CP/M-68K BIOS customizing techniques. If CP/M-68K was purchased with the DISK 1 controller then modifications should not be necessary. However if the CP/M-68K was purchased for use on a different controller then be sure to obtain and install CP/M-68K corrective patches.

The information contained within this document is divided as follows:

- a. Software User Guide
- b. Software Features
- c. Software Internal Design
- d. CBIOS Customization Guide

The Software User Guide describes how to use these software packages:

- | | | |
|----|-------------|-------------------------------------|
| a. | FORMAT.68K | floppy disk formatter |
| b. | COPY.68K | floppy disk copy utility |
| c. | PUTBOOT.68K | system track initialization utility |
| d. | DISK2.68K | hard disk formatter |
| e. | DISK3.68K | hard disk formatter |
| f. | MFORM.68K | memory disk formatter |

The next section describes the external features of the supplied software. This section describes the enhancements and assumptions made by the CompuPro CBIOS routines and utility routines.

The Software Internal Design section describes the design of the supplied software. This section should help the user understand how the software components work, thus enabling the purchaser to modify the software for his hardware configuration.

APPLICABLE DOCUMENTS

The reader should be familiar with the following documents:

- a. NEC uPD765 Floppy Disk Controller Application Note
- b. INS2651 Programmable Communications Interface Note
- c. CompuPro DISK 1 Floppy Disk Controller Description
- d. An Introduction to CP/M-68K Features and Facilities
- e. CP/M-68K Operating System User Guide
- f. CP/M-68K Operating System System Guide
- g. CP/M-68K Operating System Programmer Guide
- h. CP/M-68K Release Notes document

SOFTWARE USER GUIDE

The following sections describe the operating features of the supplied utility programs.

FORMAT.68K - Floppy Disk Format Utility

The FORMAT.68K utility program is supplied so that purchasers of the DISK 1 board can change the density of their disk. The FORMAT.68K utility formats floppy disks in IBM 3740 compatible formats, although not all disk controllers are IBM compatible. The data on the disk is destroyed so be careful when using FORMAT on a previously used disk.

The FORMAT utility contains the DISK 1 board interface routines which allows you to run under a current IEEE 696 CP/M-68K system.

The FORMAT utility has simple operating instructions. You are prompted for input as needed to control the utility flow. You initiate the FORMAT utility by typing the following:

FORMAT

or

FORMAT drivename (where drivename is a letter, A-D)

If the drive is not specified on the command line, then the FORMAT utility prompts you with the following line:

Specify drive (A-D):

You may now enter the drive (A through D) and the FORMAT utility proceeds. Be careful here since the drive names might not be the same as the normal CP/M-68K drive names if a hard disk subsystem is installed; the first floppy disk drive is always drive A for FORMAT and COPY.

After you have specified the drive to be formatted, FORMAT prompts you for a new density:

Select density (0-3):

The density is entered according to the following table:

Density	Sector Length
0	128 (Standard single density format)
1	256 (IBM system 34 format)
2	512
3	1024 (CompuPro standard format)

Now enter the disk formatting selection and the FORMAT utility begins formatting the disk. As each track is formatted an "F" appears on the terminal (a total of 77). After formatting all the tracks the FORMAT utility begins a verify operation. This verification informs the user of possible bad spots on the floppy disk. These displays and a description of the output follows:

Confirm ready for format on disk drive B (y) y

```
FFFFFFFFFFFFFF . . . FFFFFFFFFFFF
VVVVVVVVVSSVVV . . . VVVVSVVEVV
```

Symbol	Description
F	Successful format
V	Track format verified
S	Verify failed but retry succeeded
E	Verify and retries failed - hard error

NOTE: It is recommended that disks that show any errors here not be used.

After the verification the FORMAT utility asks you if another disk is to be formatted. If not, the FORMAT utility returns to CP/M-68K.

COPY.68K - Disk Copy Utility

The COPY.68K utility performs disk copy functions.

This program is intended to be used to copy an entire diskette to another diskette. It performs this by reading an entire cylinder of data, writing it out, and reading it back in and comparing for verification.

You must tell this program the following information:

1. Area of diskette to be copied.
2. Source drive.
3. Destination drive.

The prompts for this information are as follows:

COPY utility Version X.X.

Disk copy functions:

BOOT	System tracks only
FILES	Data tracks only
ALL	All tracks
END	Exit to CP/M-68K

Select function:

Type the word to select the proper function.

The COPY utility then prompts for a source and destination drive (with the same caution as with the FORMAT utility), and a prompt for you to place the proper disks in the drives.

The COPY utility will not permit copies to a disk with a different density as the source disk. The COPY utility also will not permit a copy to a differently sided disk as the source, even though the densities may be the same.

PUTBOOT.68K - Initialize System Tracks

The PUTBOOT program is used to place the BOOT and LOADER routines in the system tracks (0 and 1) of a disk formatted in any of the double density (MFM) modes.

The PUTBOOT program must be given a source file and a destination drive as part of the command line as shown below:

```
PUTBOOT CPMLDR.SYS B
```

The program then places the source file into the system tracks of the destination drive and returns to CP/M-68K.

It is recommended that the PIP utility be used to place a copy of the CPM.SYS file on a disk immediately after formatting and using the PUTBOOT program, to minimize the time required to boot the system on this disk.

DISK2.68K - Hard Disk Format/Test Utility

Before using your hard disk, you must format it with the DISK2 utility provided with your CP/M-68K system disk. The DISK2 program will format, verify, and test your hard disk drives, provided they are connected to a DISK2/SELECTOR CHANNEL hard disk controller board set. The options that are available are listed below.

Usage: DISK2 [option] [option]...

At least one option must be specified. The options can be specified in any order.

Options consist of:

m10	Set drive type to Fujitsu 10M
m20	Set drive type to Fujitsu 20M (default)
m20be	Set drive type to Fujitsu 20 Mb BE
m40be	Set drive type to Fujitsu 40 Mb BE
drive n	Select drive n (default 0)
format	Format the sector headers
data	Fill the data fields with ESH
test	Test the data fields
seek	Test the r/w head stepper motors

all Perform a format, data test, and a seek test
skew n Set the skew factor to n (default 2)
 This option is hardware dependent.

Any errors that show up will remap the bad sector to the known good region (cylinder 0). **Do not** reformat your hard drive after the "ALL" test as the bad sector map will be rendered inaccurate.

DISK3.68K - 5 1/4" Hard Disk Format/Test Utility

Before using your hard disk, you must format it with the DISK3 utility. The DISK3 program will format, verify, and test nearly any type of hard disk with an ST 506 or ST 412 interface.

Usage: DISK3 [option] [option]...

At least one option must be specified. The options can be specified in any order.

Options consist of:

st506 Set drive type to Seagate ST506
st412 Set drive type to Seagate ST412
q540 Set drive type to Quantum Q540 (default)
format Format the headers and fill sectors with ESH
verify Verify headers and CRC bytes
data Test data retention with 38 patterns and all sectors
seek Test the stepper motors
all Perform a format, data test, and a seek test
 (this takes about 17 hours to run)
help Display the other options available

The program will query for acceptance of the drive parameters. If the parameters are not accepted, a menu of parameters is presented. Typing a new value for an entry will replace that entry. Pressing the return key will accept the default entry. **Do not** reformat your hard drive after the "ALL" test as the bad sector map will be rendered inaccurate.

After the hard disk has been formatted and verified, you rename the current CPM.SYS to FCPM.SYS, edit the BIOS.S source file on your working COPIES of the master diskettes. The flags to set are either D3M5 or D3M40 for the ST506 and Q540 hard disk drives, respectively. The file may now be reassembled with the .SUB file MAKESYS. It is not necessary to alter the loader file LBIOS.S. The disk should now boot up and know about the hard disk. Move the contents of both floppies to drive E: (the hard disk is drives E-I with the CompuPro Hard Disk Subsystem).

MFORM.68K - Memory Disk Format Utility

The MFORM program will format any size CompuPro M DRIVE/H memory disk.

The CompuPro BIOS as distributed, uses auto vector feature of CP/M-68K to invoke MFORM at cold boot. If the MFORM program sees that a memory drive has already been formatted, it will not reformat the memory disk. Thus data on the memory disk is not destroyed when the computer is reset.

A reformat of the memory disk is enforceable by typing:

```
MFORM M
```

If the memory drive was already formatted, the program will prompt you and ask if you really want to proceed and destroy all the data in the memory disk.

Once the memory disk is formatted, you can use it just like any other disk drive. The drive name is always "M".

To override the confirmation prompt, type:

```
MFORM M Y
```

The memory disk will be erased without mercy, so be careful when using MFORM this way.

SOFTWARE INTERNAL DESIGN

This section describes the general flow and philosophy of the supplied components.

CompuPro DISK 1 ROM/BOOT

The DISK 1 ROM and BOOT routines are very straightforward. They are both straight line code routines with few loops. The important item to remember when reviewing the listing is the following system disk standard layout:

Cylinder	Head	Sectors	Density	Description
0	0	3-26	128 FM	DISK 1 LOADER
0	1	1-8	1024 MFM	unused
1	0	1-8	1024 MFM	CP/M-68K LOADER
1	1	1-8	1024 MFM	unused

CompuPro DISK 1 LOADER

The CompuPro DISK 1 LOADER's basic function is to initialize any hardware that requires it, to load in CP/M-68K and the CBIOS (contained in the file CPM.SYS) and transfer execution to the CCP.

The loader is composed of three parts, LCPM, LBDOS, and LBIOS. LCPM and LBDOS are part of CP/M-68K and should never have to be changed. They are included in the file LDRLIB.

The third part is LBIOS. This part is very hardware dependent and unique to CompuPro. LBIOS.S is assembled separately from the CBIOS and linked with the LDRLIB and not the CPMLIB, which is the case with the CBIOS.

CompuPro DISK 1 CBIOS

The CompuPro DISK 1 CBIOS quite literally makes CP/M-68K tick. The CBIOS uses a modified version of the CP/M DEBLOCK routines. The modification stems from the fact that multiple and hard disk sector formats are supported. All CP/M-68K disk transfers are 128 bytes in length, and a method for combining the 128 byte transfers into a single larger transfer is required.

The description of tables and variables, used in the CBIOS are the key to its understanding, therefore the following paragraphs describe the key tables and variables.

The DPHO table contains a CP/M-68K Disk Parameter Header (DPH) for each logical disk drive. The DPH is described in the CP/M-68K Operating System System Guide, but a few comments here are appropriate. The DPH is used mostly by CP/M-68K, but four entries are of particular interest to the CBIOS - the Translation Table Address, the Disk Parameter Block (DPB) Address, the Check Vector Address, and the Allocation Vector Address. The Check Vector Address and Allocation Vector Address are mentioned here because storage within the CBIOS must be reserved for these CP/M-68K tables.

The Translation Table Address is used to translate CP/M 68K consecutive sectors into software interlaced external sectors. In order to maintain compatibility between single density disks, a six sector interlace table is used, but for other sector formats different tables are used.

The most important entry within the DPH is the Disk Parameter Block. This address points to a table (one table for each disk type) which describes the storage characteristics of each associated disk type. The CP/M-68K Operating System System Guide describes the entries within the DPB, but the Guide does not describe why the CBIOS has defined the DPB values. The format of the CBIOS DPB's are as follows:

Bytes	Description
2	Sectors per track
1	Block shift
1	BS mask
1	Extent mask
1	Not used
2	Directory size
2	Allocation for directory
2	Check area size
2	Offset to first data track

The sector translation tables contain values which are CP/M compatible or compatible with other popular CP/M implementations.

Now that the description of the tables is complete, the key variables need to be described. The following variables contain information about various stages of a disk transfer:

CPMDRV - Disk Selection Value
 CPMTRK - Track Number
 CPMSEC - Sector in Track

The information about the data contained within the host disk deblocking buffer is contained in a corresponding set of variables called BUFDRV, BUFTRK, and BUFSEC. The variables might result in an actual physical transfer, or the data requested could be contained in the host disk deblocking buffer. The way CP/M-68K uses these variables reduces the number of unnecessary pre-reads.

The following paragraphs describe the differences between the CBIOS described in the CP/M-68K Operating System System Guide, and the CompuPro DISK 1 CBIOS implementation.

The SECTRAN differs from the Alteration Guide by testing register D2. If register D2 is zero, no sector translation is performed. Otherwise D2 contains the translation table address.

Since the CBIOS attempts to detect the density and number of sides of a floppy disk, the SELDSK routine diverges significantly from the Alteration Guide. When SELDSK is invoked by CP/M-68K, the disk selection value is saved and the DPH address is calculated. The NEWS tables contains a flag byte for each floppy disk. If an entry is non-zero, the density is extracted from the DENS table and the appropriate DPH address is returned in D0.

The more complicated process begins when the flag is zero. The SELDSK routine calls SETDENSE to try to determine the floppy disk type. SETDENSE computes the appropriate DPB address and initializes the translation table and DPB address in the DPH.

The READ routine is almost exactly like WRITE, mostly due to the modularization of the code.

This concludes the description of the CompuPro DISK 1 CBIOS. If you want more detailed information, refer to the listings and source of the supplied CompuPro DISK 1 CBIOS.

HARDWARE SECTION

TROUBLESHOOTING

The following table has been designed to help you in the event your system does not operate correctly:

Problem	Probable Cause	Remedy
---------	----------------	--------

	ENCLOSURE	
Fan off, power indicator not lit:	Power cord not plugged in.	Plug in cord.
	Power cord not plugged into rear panel of system.	Plug in cord.
	Wall outlet not live.	Check outlet. Check circuit breaker.
	Main circuit breaker has tripped.	Check system for shorts; turn breaker OFF, then back ON.

Fan on, power Indicator not lit	Indicator light bad.	Contact dealer.
	Internal connection loose.	Contact dealer.
	Power supply connection loose.	Contact dealer.

	FLOPPY DISK	
--	-------------	--

Power on, but disk drive indicator light does not blink:	Disk drive 50 pin cable not plugged in.	Plug it in.
	Power cord not plugged in.	Plug it in. (Check both ends)
	Floppy disk drive breaker switch not ON.	Turn it ON.

Problem	Probable Cause	Remedy
FLOPPY DISK (cont.)		
	Circuit breaker on disk drive rear panel tripped.	Check connections for shorts; turn breaker OFF, then back ON.
Disk drive indicator light does not blink	Cable improperly connected.	Connect properly/reverse connector.
	System not initialized.	Push RESET on Computer Enclosure front panel.
Drive head loads, seeks, but system does not boot up:	Incorrect diskette inserted.	Insert CP/M boot diskette.
	Cables and plugs incorrectly connected	Refer to board manuals.
HARD DISK		
Drive does not initialize	Data or control cable connected incorrectly.	Methodically change cable connections.
	Power supply connection loose.	Contact dealer.
	Drive head not unlocked.	Unlock head.
	CPU switch settings incorrect.	Reset switches.
	External drive cable unplugged.	Check cable connections.
	Internal drive cable disconnected.	Undo cover of drive cabinet and re-connect.
	Error in tracks tracks 0 and 1.	Contact dealer.

Problem	Probable Cause	Remedy
	TERMINAL I/O	
System sounds like it booted up but no message on the terminal	Cable incorrectly connected.	Check cable connections.
	Terminal incorrectly set.	Check baud rate and word size settings.
	Terminal not powered up.	Plug in terminal and turn on.
	I/O board switches not set properly.	Reset switches.
	I/O board headers not wired correctly.	Recheck connections on headers.
	Bad RS232 cable.	Try another cable.
	Wrong disk booted	Try the other disk.

HARDWARE SETTINGS FOR CP/M-68K

CPU 68K Switch and Jumper Settings:

All positions on all switches OFF.

Jumper J1 - B-C connected	
Jumper J2 - NOT INSTALLED for A&T INSTALLED for CSC	
Jumper J3 - NOT INSTALLED	Jumper J11 - don't care
Jumper J4 - NOT INSTALLED	Jumper J12 - don't care
Jumper J5 - INSTALLED	Jumper J13 - C-D connected
Jumper J6 - INSTALLED	Jumper J14 - ON
Jumper J7 - INSTALLED	Jumper J15 - OFF
Jumper J8 - INSTALLED	Jumper J16 - B-C connected
Jumper J9 - A to J10 installed	Jumper J17 - don't care
Jumper J10 - A to J9 installed	Jumper J18 - don't care

SYSTEM SUPPORT 1 - Switch Settings:

S1		S2		S3	
OFF	ON	OFF	ON	OFF	ON
==	1	==	1	==	1
==	2	==	2	==	2
==	3	==	3	==	3
	4	==	4	==	4
	5	==	5		5
==	6	==	6	==	6
	7	==	7		7
==	8	==	8	==	8

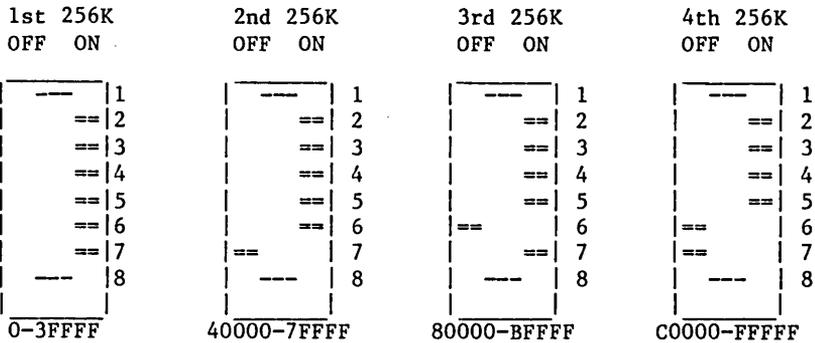
Jumpered Settings:

- J1 -- Serial port connection.
- J2 -- Insert an eight pin dip shunt, shunting all 8 lines.
- J3 -- Plug an auxiliary battery cable into this connector, red wire toward the left.
- J13 -- Insert a shorting plug onto prongs 8 and C.

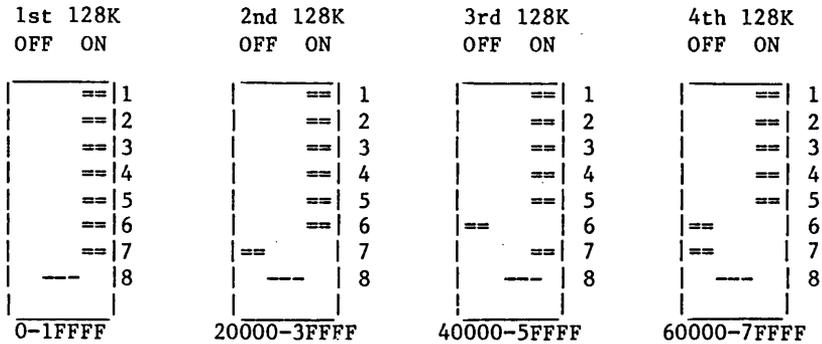
Remaining jumpers are left unconnected.

EPR0M Sockets: Not Used

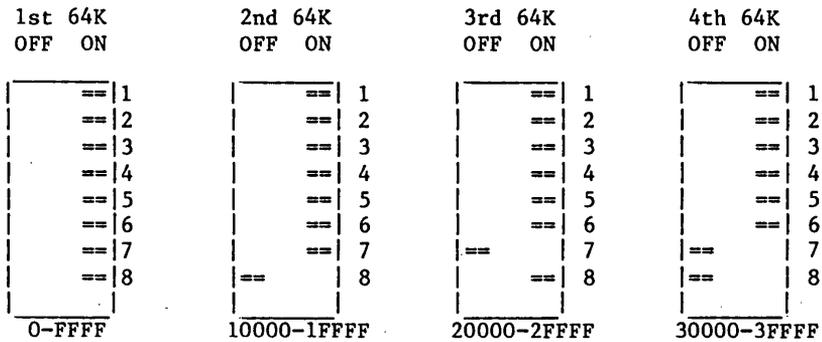
RAM 22 MEMORY BOARD - Switch setting for S1:



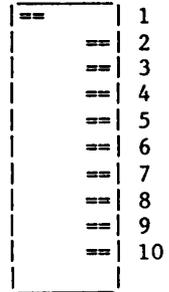
RAM 21 MEMORY BOARD - Switch Settings for S1:



RAM 16 MEMORY BOARD - Switch Setting for S1:

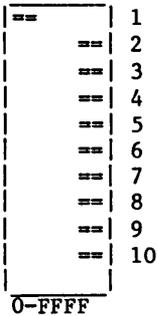


RAM 17 MEMORY BOARD - Switch Settings for S1: OFF ON

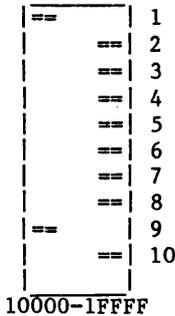


Switch Settings for S2:

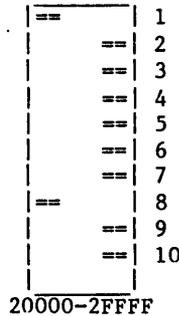
1st 64k
OFF ON



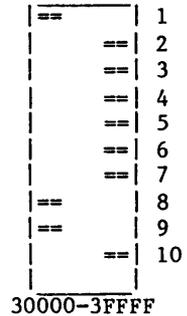
2nd 64k
OFF ON



3rd 64k
OFF ON

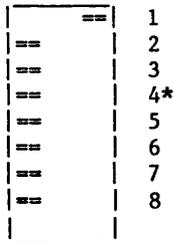


4th 64k
OFF ON



DISK 1 FLOPPY DISK CONTROLLER - Switch Settings:

S1
OFF ON



S2
OFF ON

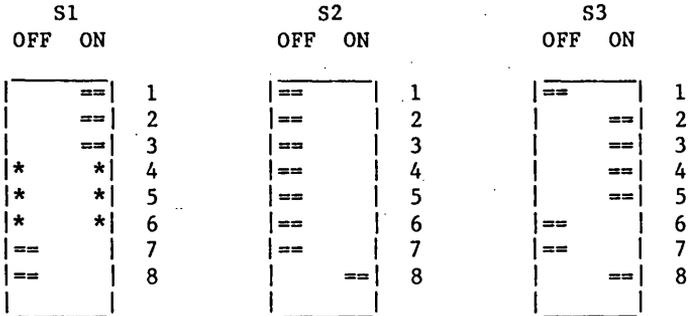


* OFF to BOOT from a Floppy Disk, ON to BOOT from a Hard Disk.

- Jumpered Settings: J16 -- Install a jumper on B-C
J17 -- Jumper B-C

Must have ROM labeled: "Boot F"
"68/85/88"

DISK 1A - The standard switch settings for running 8" floppies as drives "A" and "B", and 5.25" floppies as drives "C" and "D" are as follows:



*S1 positions 4-6 must be set as shown below depending on the type of CPU being used and the I/O device being used as the console.

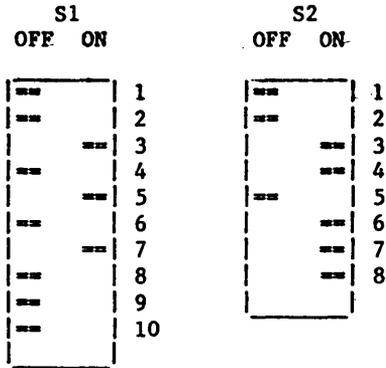
S1 POSITION			CPU TYPE	CONSOLE I/O DEVICE
4	5	6		
ON	ON	ON	CPU 86/87	INTERFACER 1/2
ON	ON	OFF	CPU 68K	SYS.SUP./INTERF. 3/4
ON	OFF	ON	CPU 86/87	SYSTEM SUPPORT
ON	OFF	OFF	CPU 86/87	INTERFACER 3/4
OFF	ON	ON	CPU 85/88 - Z	INTERFACER 1/2
OFF	ON	OFF	NOT SUPPORTED	
OFF	OFF	ON	CPU 85/88 - Z	SYSTEM SUPPORT
OFF	OFF	OFF	CPU 85/88 - Z	INTERFACER 3/4

- J1 - POSITION "5"
- J2 - POSITION "5"
- J3 - POSITION "8"
- J4 - POSITION "8"
- J5 - REMOVED
- J6 - A-C FOR MINIFLOPPIES GENERATING READY, OTHERWISE B-C.
- J7 - B-C (TWO WAIT STATES)
- J8 - LEAVE AS SHIPPED
- J9 - LEAVE AS SHIPPED
- J10- SHUNT ON "4"
- J11- SHUNT INSTALLED

These settings select DMA arbiter priority 15, port COH-C3H, wait states enabled, and the BOOT routine as selected.

DISK 2/SELECTOR CHANNEL HARD DISK CONTROLLER

DISK 2 Switch settings:



J6 Jumper \bar{C} for Fujitsu 2300, Memorex 101
J8 Not connected

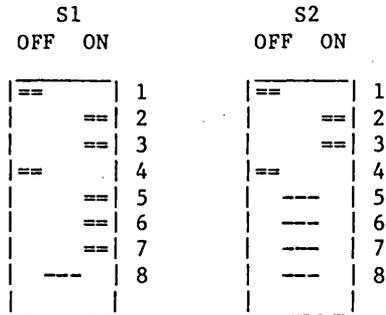
SELECTOR CHANNEL Switch settings:



* OFF to BOOT from Floppy Disk; On to BOOT from Hard Disk

Jumper settings: J8 (+)
J9 (G)
J10 (+)

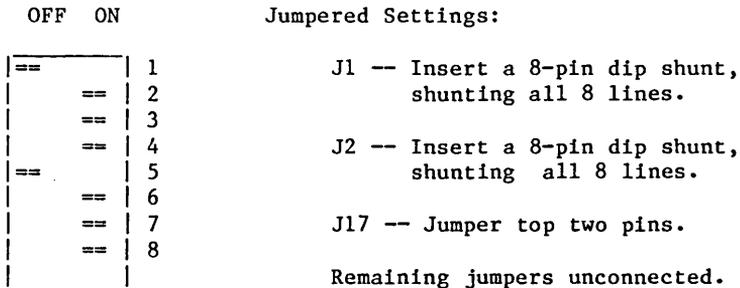
DISK 3 Switch Settings:



Jumper Settings:

- J1 Connector for drive 1 radial cable.
- J2 Connector for drive 2 radial cable.
- J3 Connector for drive 3 radial cable.
- J4 Connector for drive 4 radial cable.
- J5 Connector for daisy chained cable cable for all drives.
- J6 (Not currently used.)
- J7 B-C
- J8 A-C
- J9 Jumper position 1.
- J10 Jumper top position.

INTERFACER 3 - Switch Settings for S1:



INTERFACER 4: - Switch Settings:

S1		S2		S3	
OFF	ON	OFF	ON	OFF	ON
==	1	==	1	==	
==	2	==	2	==	
==	3	==	3	==	
==	4	==	4	==	4
==	5	==	5	==	5
==	6	==	6	==	6
==	7	==	7	==	7
==	8	==	8	==	8
==	9	==	9		
==	10	==	10		

- Jumpered Settings

- J1 -- No Shunt need be installed
- J2 -- Bottom installed with Epson printer / No shunt otherwise
- J3 -- Top installed with Epson / No shunt otherwise
- J4 -- Bottom installed with both Epson and Centronics
- J5-J25 -- Removed
- J26 -- Jumper A-B and C-D for the CENTRONICS CHANNEL as user 4.
Jumper A-C and B-D for the CENTRONICS CHANNEL as user 6.
- JS1,JS2,JS3 -- Install shunt, shorting all 8 lines.
- JS4-JS6 -- No connections.

MDRIVE/H - Switch settings

S1		Board Number	Switch Number*		
OFF	ON		8	9	10
==	1	1st	ON	ON	ON
==	2	2nd	ON	ON	OFF
	== 3	3rd	ON	OFF	ON
	== 4	4th	ON	OFF	OFF
	== 5	5th	OFF	ON	ON
==	6	6th	OFF	ON	OFF
==	7	7th	OFF	OFF	ON
	# 8	8th	OFF	OFF	OFF
	# 9				
	# 10				

*Switches 1 thru 7 are the set the same on all boards.

consult table on right

CP/M 68K

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