

DKFMDV3.DVD

12-82 Release

An HDOS 2.0 device driver for the Magnolia Microsystems' double-density, soft-sector floppy disk controller.

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ABSTRACT:

DVFMDV3.DVD is a NEW version of our DKDDFLP disk device driver for Magnolia Microsystems, Inc.' single-board, double-density, soft-sector floppy disk controller, which allows that board to be used under HDOS 2.0 with the following disk drives:

Four 8-inch floppy disk drives, each drive holding up to 1 million bytes.

Four 5-inch floppy disk drives, each drive holding up to .66 million bytes.

Full operation under HDOS 2.0 is supported, including diskette INITialization, SYSGEN, and booting. DKFMDV3.DVD offers the following NEW features over our DKDDFLP driver:

Support for CPUs that have software-switchable CPU speeds.

A faster media check during INITialization.

The following features from our original DKDDFLP driver are also provided:

Compatibility with Heath soft-sector 5-inch (H-37) and 8-inch (H-47) diskette formats.

Automatic detection of both diskette type and disk drive type when booting or mounting a diskette, including:

Support for single and double density recording formats.

Support for double-sided drives, including the ability to read, boot, and write a single-sided diskette in a double-sided disk drive.

Support for "double-track" disk drives (80 tracks on 5-inch, 154 tracks on 8-inch), including the ability to read, boot, but not write, a "single-track" diskette in a "double-track" disk drive.

Each disk drive is individually configurable as to number of sides, "single"- or "double"-track, and seek step time.

The device driver will run on a CPU running at 2 MHz or higher

(booting 8-inch double-density diskettes at CPU speeds greater than 2 MHz requires a monitor ROM from UltiMeth Corp.)

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PLANNING:

While this device driver is very easy to use, poor planning in configuring the device driver may require re-INITializing and SYSGENing all of your bootable soft-sectored diskettes. Also, you must thoroughly understand how HDOS assigns disk device driver names to a newly SYSGENed diskette (see page 1-87 of the HDOS 2.0 reference manual), and how HDOS assigns logical disk drive numbers during boot (see pages 2-60,61 of the HDOS 2.0 reference manual). These topics will be discussed below. In order for you to properly plan for the installation of the device driver, you should read through the entirety of this document before attempting to make any decisions about how to configure the device driver, or before attempting to install the device driver. We even suggest sleeping on your decisions before implementing them.

The most important decision that you will make in configuring the device driver is whether or not the device driver will support 8-inch disk drives. To make that decision, you will have to know how the device driver assigns disk unit numbers:

Unit number:	Driver w/ 8-inch:	Driver w/o 8-inch:
0	First 8-inch (DS0)	First 5-inch (DS0)
1	Second 8-inch (DS1)	Second 5-inch (DS1)
2	Third 8-inch (DS2)	Third 5-inch (DS2)
3	Fourth 8-inch (DS3)	Fourth 5-inch (DS3)
4	First 5-inch (DS0)	
5	Second 5-inch (DS1)	
6	Third 5-inch (DS2)	
7	Fourth 5-inch (DS3)	

(Note that Heath's mini-floppy controller assigns disk unit numbers backward from the industry norm; their unit "0" is "DS2", unit "1" is "DS1", and unit "2" is "DS0".) If you decide to use a disk drive with this device driver that was previously attached to the Heath mini-floppy controller board, you may want to change the "shunt" programming; see your Heath or disk drive manual.

For example, if you have (or plan to have) ANY 8-inch disk drives, and you plan to use two 5-inch disk drives, the maximum unit number will be "5". If you plan to use NO 8-inch disk drives, and two 5-inch disk drives, the maximum unit number will be "1". The maximum unit number is placed into the device driver by the "DVDDKGEN" program during installation. Since HDOS allocates 256 bytes of RAM memory for each possible disk drive, up to the maximum specified in the device driver, users who never plan to have 8-inch disk drives can save 1024 bytes of RAM memory space. However, if you later decide to add 8-inch disk drives, you will have to re-install the device driver and re-INITIALIZE and SYSGEN all of your bootable diskettes.

There is another option for you to consider. You may want to have two copies of the device driver; one for 5-inch only, and one for 8-inch only. Although this will not save any RAM space for those of you with both 5-inch and 8-inch disk drives (because each copy of the device driver, when it is being used, occupies approximately 900 bytes of RAM), it will allow you to add 8-inch disk drives later without having to pay the penalty of the additional RAM space now, and you will not have to reconfigure the first device driver when you later add the 8-inch disk drives. Also, because of the way HDOS assigns logical disk drive numbers, those of you with both 5-inch and 8-inch disk drives may want separate device drivers. The disadvantage of having two device drivers is that HDOS has a limit of seven device drivers on a bootable system diskette, and you may exceed that limit now (or later).

When you pick a name for the new device driver, you may pick any two-letter name except "SY". Say you pick the name "XX", and install the device driver as "XX.DVD" on one of your hard-sectored Heath mini-floppy bootable HDOS diskettes. When you have booted from that mini-floppy, you may reference disk drives attached to the Magnolia soft-sectored double-density controller board as "XX0:", "XX1:", etc. However, when you then SYSGEN onto a diskette in (say) "XX0:", both the current "SY.DVD" device driver and the new "XX.DVD" device driver are copied onto the new SYSGENed diskette, BUT THE NAMES ARE CHANGED (see page 1-87 of the HDOS 2.0 reference manual); the previous "XX.DVD" becomes "SY.DVD", and the previous "SY.DVD" becomes "XX.DVD". This is because a bootable diskette must ALWAYS have the device driver used to reference that diskette called "SY.DVD".

In making your decision as to whether to use one or two device drivers, you should know by what names you will be referencing the various disk drives on your system. For example, if you decide to use only one device driver (named "DK.DVD"), and if you have two 8-inch disk drives and two 5-inch disk drives, the maximum unit number for the device driver will be "5" (see above), and HDOS will allocate 1536 bytes for the six possible disk drives, plus 900 bytes for the device driver (total 2400). FOR THIS EXAMPLE, the following table shows how HDOS assigns logical disk drive numbers:

Hardware	Logical disk drive number when booted from
----------	--

unit #:	unit 0:	unit 1:	unit 4:	unit 5:	Heath floppy:
0	SY0:	SY5:	SY2:	SY1:	DK0:
1	SY1:	SY0:	SY3:	SY2:	DK1:
2	SY2:	SY1:	SY4:	SY3:	DK2:
3	SY3:	SY2:	SY5:	SY4:	DK3:
4	SY4:	SY3:	SY0:	SY5:	DK4:
5	SY5:	SY4:	SY1:	SY0:	DK5:
6	---	---	---	---	---
7	---	---	---	---	---

Using the same example, if you decide to have two device drivers (named "DK.DVD" and "FD.DVD"), the maximum unit number for each device driver will be "1", and HDOS will allocate 1024 bytes for the four possible disk drives, plus 1800 bytes for the two copies of the device driver (total 2800). FOR THIS EXAMPLE, the following table shows how HDOS assigns logical disk drive numbers in this case:

Hardware unit #:	Logical disk drive number when booted from unit 0:	unit 1:	unit 4:	unit 5:	Heath floppy:
0	SY0:	SY1:	DK0:	DK0:	DK0:
1	SY1:	SY0:	DK1:	DK1:	DK1:
2	---	---	---	---	---
3	---	---	---	---	---
4	FD0:	FD0:	SY0:	SY1:	FD0:
5	FD1:	FD1:	SY1:	SY0:	FD1:
6	---	---	---	---	---
7	---	---	---	---	---

Considering the above assignment of logical disk names and numbers, there is a question as to whether it is simpler to have one or two device drivers for the Magnolia controller; the answer will depend on how you plan to use the disk drives. We normally suggest using only one copy of the device driver. Regardless of whether you install one or two device drivers, we suggest that you normally boot from the same drive.

If you decide to install two copies of the device driver, pick two different two-letter names for the two separate device drivers, and follow the "INSTALLATION" and "SETUP AND USE" instructions separately for each device driver.

We also suggest that you leave one 40-track mini-floppy disk drive attached to the Heath H-17 hard-sectored mini-floppy disk controller board for compatibility with other Heath users. If you have our original version of DKH17.DVD (our disk device driver for the Heath H-17 controller), and you boot from the Magnolia controller board, you must LOAD the device driver for the Heath board (e.g., "LOAD DK:") before using it.

I assume since this is a revised version, this is not necessary.

If you received an UltiMeth monitor ROM prior to November, 1981, you MUST exchange it (no charge) for a new one prior to booting

HDOS from a soft-sectored diskette; you may use the Magnolia ROM in the interim.

This device driver will support disk drives jumpered for "radial head load", as Magnolia recommends, or jumpered for "head load on select" (jumpers on Qume 8-inch: open X, HL; plug A, B, C, DS).

INSTALLATION:

The best way to install the new device driver is to first carefully read and understand in their entirety both this section and the SET command section, and then carefully follow the steps below in the order given.

1. Copy the new device driver from the distribution diskette onto one of your bootable diskettes that has SET, INIT, and SYSGEN on it:

```
>MOUNT SYn:  
>COPY xx.DVD=SYn:DKFMDV3.DVD
```

where "xx" is the name you have chosen for the new device driver. You will probably also want to copy over the program "STATDDF.ABS", a program which reports the status of the device driver and each disk drive (see below).

2. Run the program "DVDDKGEN" (provided on the distribution diskette), specifying the maximum floppy disk drive hardware unit number (0 through 7) that you wish to be able to refer to with this device driver (see above under "PLANNING"), as follows:

```
>SYn:DVDDKGEN xxy:
```

where "y" is the maximum floppy disk drive hardware unit number. You may specify a maximum hardware unit number greater than any drive actually installed on your computer system, but that value must not exceed seven (e.g., "SYn:DVDDKGEN xx7:").

3. Use the SET option "8INCH" or "NO8INCH" described below to configure the device driver for 8-inch and 5-inch disk drive operation, or only 5-inch disk drive operation:

```
>SET xx: 8INCH
```

or:

```
>SET xx: NO8INCH
```

4. Use the SET command options "MHZBIT", "TRKS1X", "TRKS2X", "SIDES1", "SIDES2", and "STEP nn" described below to configure the device driver for each disk drive that it will reference.

5. Reboot your system disk which contains the new device driver.

6. Use the INIT program to initialize any desired diskettes on the disk drives attached to the Magnolia controller board:

```
>INIT xxz:
```

where "z" is the desired disk drive to be used for initial-

ization.

7. Use the SYSGEN program to generate any desired bootable system diskettes for the disk drives attached to the Magnolia controller board. Note (as discussed above) that the names of the disk device drivers change when copied to the new SYSGENed diskette. Don't forget that you must "type spaces" to establish the terminal BAUD rate the first time you boot any newly SYSGENed diskette.

If you decide to change the "8INCH"/"NO8INCH" SET option, or if you replace a disk drive with another one that has a slower seek step time, you must boot a system disk and copy onto it (with a new name) a NEW copy of the device driver and proceed with steps #1-7 above to generate a NEW set of bootable system diskettes. Any other changes may be made by simply SETting new values for the SET options and rebooting.

SETUP AND USE:

The SET command:

The SET command provides three options which may be specified for the device driver as a whole (any unit number specified on the SET command is ignored). One or more of these options are SET with a command of the form:

```
SET DK: <option> <option> ...
```

Options:

HELP	prints a list of the valid SET options.
8INCH or NO8INCH	specifies whether or not this device driver supports 8-inch floppy disk drives. SPECIFYING THIS OPTION INVALIDATES ALL PREVIOUSLY "SET" OPTIONS (except for "MHZBIT") FOR THIS DEVICE DRIVER.
MHZBIT n	where "n" is the number of the bit used in port 362 (octal) or F2 (hexadecimal) to select a higher CPU speed on CPUs with software-switchable CPU speeds (0-7). Specifying a valid bit number (values 0, 1, and 5 are ignored) causes the device driver to switch the CPU speed to 2 MHz during disk operations; this option is only required on CPUs that switch the CPU speed while any 8-inch double-density diskettes are mounted.

The SET command for the device driver also provides three options which must be SET for EACH drive on the system. One or more of these options are SET with a command of the form:

SET DKn: <option> <option> ...

where "n" is the HARDWARE unit number (0 through 7). The hardware unit number is the number used to reference the disk drive when you have booted from drive "0". See pages 2-60, 61 of the HDOS 2.0 reference manual. IF YOU DO NOT PROVIDE A HARDWARE UNIT NUMBER, THE SET COMMAND ASSUMES A VALUE OF ZERO. Note that one or more options may be specified at a time.

Options:

- STEP nn where "nn" is the seek step time in milliseconds (0-255). Because of the characteristics of the disk controller board, the value entered is rounded up to the closest value in the following list (if the highest value in the list is exceeded, the highest value in the list is used):
- | | |
|---------|---------------|
| 5-inch: | 6, 12, 20, 30 |
| 8-inch: | 3, 6, 10, 15 |
- SIDES1 or SIDES2 specifies the number of sides supported by the installed disk unit. This information is used only by INIT when INITIALizing a diskette.
- TRKS1X or TRKS2X specifies whether or not the disk drive has twice the standard number of tracks per side. For a 5-inch drive the standard number of tracks is 40; for an 8-inch drive the standard number is 77. This information is used only by INIT when INITIALizing a diskette.

The INIT command:

Before running INIT, the seek step time of each disk drive on the system must be specified with the SET command. This is because the INIT program writes an abbreviated device driver onto the boot track for use during the boot sequence; this abbreviated device driver will contain a copy of the seek step time for each disk drive. The seek step times are taken from the currently SET values in the device driver at the time that INIT is run. The ONLY way to change the seek step times on the boot track is to reINITialize the diskette.

When INIT initializes a disk, it divides the space on the disk into clusters. Because of the design of HDOS, a disk cannot have more than 256 clusters. Therefore, the larger the space available on a disk, the larger the size of a cluster is. The following table shows the number of sectors per cluster for various format diskettes:

5-inch, 40-track, 1-sided, single-density:	2
5-inch, 40-track, 2-sided, single-density:	4
5-inch, 80-track, 2-sided, single-density:	8

5-inch, 40-track, 1-sided, double-density: 4
5-inch, 40-track, 2-sided, double-density: 6
5-inch, 80-track, 2-sided, double-density: 10

8-inch, 77-track, 1-sided, single-density: 4
8-inch, 77-track, 2-sided, single-density: 8

8-inch, 77-track, 1-sided, double-density: 8
8-inch, 77-track, 2-sided, double-density: 16

When a file is created, it is always allocated an integral number of clusters. This means that a file may occupy more space on a larger capacity diskette than on a smaller capacity one. In particular, a small (2 sectors or less) file occupies the same percentage of total disk space regardless of the capacity of the diskette, because it always occupies one cluster.

When running INIT, the following messages, some requiring a response, may be issued:

Double density ~~<YES>~~? A "YES" response initializes the diskette in double density format, a "NO" initializes the diskette in single density format.

Double sided ~~<YES>~~? This message is issued if the drive you are attempting to initialize on has been configured by SET as double sided. A "YES" response initializes both sides of the diskette; a "NO" only initializes one side. DO NOT attempt to initialize both sides of an 8-inch diskette that is certified as single-sided. A single-sided 8-inch diskette has the index hole in the diskette jacket in a different place than for a double-sided 8-inch diskette; some disk drives detect the type of diskette and refuse to write on the second side.

Reformat ~~<YES>~~? This message is only issued if the diskette in the disk drive was previously initialized in a compatible format (sides, tracks per side, and density). A "YES" response reinitializes the sector headers on the diskette; a "NO" skips header initialization. NOTE THAT THE PREVIOUS CONTENTS OF THE DISKETTE WILL STILL BE "LOST", as INIT always creates an empty directory and writes a new boot track and label.

Media check ~~<NO>~~? This message is only issued if reformatting was not skipped. A "YES" response performs a sector validity check on each sector; a "NO" skips the validity

check.

Error in sector nnnn This message is printed during a media check to identify each bad sector. The sector numbers can be entered in response to the normal INIT prompt "Sector?".

The STATDDF command:

This program reports the status of the device driver and each disk drive. The device driver must be in memory in order for the status to be reported. The "STATDDF.ABS" program is invoked as follows:

STATDDF xx:

where "xx" is the name of the device driver for which reporting is desired. If the device driver name is "SY", the program may also be invoked as follows:

STATDDF *

or:

STATDDF

The configuration status information reported reflects the status AT THE TIME the device driver was last brought into memory; the other status information reported reflects the status detected AFTER the device driver was last brought into memory.

Heath compatibility:

The diskette formats generated by this device driver are the same formats as those generated by the Heath device drivers for soft-sector 5-inch (H-37) and 8-inch (H-47) diskettes. Both the 8-inch (H-47) Heath device driver and this device driver record the single/double-sided status of an 8-inch diskette in the label record during initialization, but the 8-inch Heath device driver detects double-sided diskettes during mounting by the type of diskette in the disk drive, whereas this device driver detects double-sided diskettes during mounting from the information recorded in the label record. What information we have about the 5-inch (H-37) Heath device driver indicates that it will support reading a 40-track single-sided diskette in an 80-track double-sided disk drive, and that it will support processing of 40-track double-sided and 80-track single-sided diskettes in compatible disk drives. This means that only the following incompatibility exists:

1. An 8-inch double-sided diskette initialized as single-sided by this device driver may not be processed by the Heath H-47 device driver.

Of course, a diskette initialized using one type of controller can only be booted using the same type of controller, because the boot track code created by INIT only knows about the type of controller that created it.

TECHNICAL INFORMATION:

HDOS interface:

HDOS 2.0 now provides a device independent interface for disk drives as well as serial devices. This means that disk device drivers may easily be written for new disk devices. A disk device driver file (e.g., DK.DVD) actually consists of two parts. The first part is the normal device driver that is loaded by the system when needed to reference the appropriate disk drive. The second part is only loaded when INIT is run; all additional device dependent code needed by INIT is contained in this second part. Each time a diskette is mounted, the device driver reads the label record and determines how to handle the mounted media. An error message is issued if the media is incompatible with the disk drive. The device driver does not allow writing on a "TRKS1X" diskette in a "TRKS2X" disk drive, because such a diskette would then not be readable in a "TRKS1X" drive.

The Magnolia board requires that any disk I/O be performed with all interrupts disabled except for those issued by the Magnolia controller. This device driver disables clock interrupts and saves and then disables the enable mask of each of the four 8250 serial I/O ports; the clock and serial port enable masks are restored at the completion of each I/O operation. This has several consequences during disk I/O: first, interrupts are effectively disabled for periods up to one second in some cases; second, the clock in memory ("TICCNT") will lose time; third, the normal HDOS "type-ahead" is disabled, causing typed characters to be lost; fourth, any other interrupts will cause disk errors and may cause the system to "crash".

The time periods that the disk drive head stays loaded and that the 5-inch disk drive motor stays on after an I/O operation are set by the Magnolia disk controller board, and thus may not be altered.

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