

# Reference Manual

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## VCM-DOC-1

Bootable DiskOnChip®  
Module for the PC/104 Bus



MVCMDOC1



**VERSA**LOGIC  
CORPORATION



**VCM-DOC-1**  
Bootable DiskOnChip  
Module for the PC/104 Bus  
**REFERENCE MANUAL**



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## Description

The VCM-DOC-1 module provides a socketed DiskOnChip 2000 site for Flash File System (FFS) storage. It allows painless integration of non-volatile, non-mechanical storage into PC/104 compatible systems. The VCM-DOC-1 module is compatible with most popular operating systems such as QNX, Windows CE, NT, Windows 95/98 and VxWorks.

The VCM-DOC-1 site allows the use of plug-in solid state Flash storage in sizes up to 144 MB. Flash expansion provides cost and space savings for systems that do not have non-volatile storage or have inadequate FFS capacity. Under most operating systems, the VCM-DOC-1 operates as a standard disk drive and supports normal file reads and writes. Most operating systems also support the VCM-DOC-1 as a bootable device. This allows easy creation of systems with 100% solid state program storage. The VCM-DOC-1 is both economical and flexible. Larger DiskOnChip sizes can be purchased and plugged in if expansion becomes necessary. The plug-in chip is significantly easier to handle than soldered-in Flash chips.

The VCM-DOC-1 features high reliability design and construction, along with 48-hour burn-in and 100% functional testing. It is backed by a two-year limited warranty and VersaLogic's outstanding service and support.

### FEATURES

- 2 to 144 MB DiskOnChip Flash support
- Easily expandable to larger capacity
- Bootable in most systems

## Common Questions and Answers

- What modifications will I have to make to the AUTOEXEC.BAT and the CONFIG.SYS files in order to use the DiskOnChip2000?  
None. The flash file driver is contained in a hidden partition of the flash chip. The driver is loaded automatically during start-up by most operating systems. The loading and execution of this driver is transparent to the user.
- Will I need to place any special files on the DiskOnChip2000 in order for it to work?  
No. The DiskOnChip driver is kept on the flash media, in a safe place, protected from and invisible to the user.

- How will I upgrade the DiskOnChip firmware when M-Systems releases new software versions? Will the DiskOnChip2000 have to be removed from its socket?

The DiskOnChip does not need to be removed from the socket. Running a simple utility program on the target system can perform the upgrade quickly and easily. See page 10 for more information on the DUPDATE utility.

- Is the DiskOnChip2000 compatible with Microsoft CE?

DiskOnChip is fully compatible with Windows CE. Because DiskOnChip is an ultra small, high capacity drive, it is ideal for storing large databases or applications, which will make it an attractive solution to many OEM's and vertical integrators.

- Does M-Systems have a website where I can get further technical information?

Yes. <http://www.m-sys.com>

## Technical Specifications

Specifications are typical at 25° C with 5.0V supply unless otherwise noted.

**Board Size:**

3.55" x 3.775" (PC/104 standard)

**Storage Temperature:**

- 40° C to +85° C

**Free Air Operating Temperature:**

0° C to +60° C

**Power Requirements: (with 8 MB DiskOnChip)**

5V ±5% @ 40 ma typ.

**DiskOnChip Site:**

32-pin DIP socket

**Memory Map:**

Occupies 8K memory space

7 jumper selectable base addresses or socket disable

**Compatibility:**

PC/104

*Specifications are subject to change without notice. PC/104 and the PC/104 logo are trademarks of the PC/104 Consortium. DiskOnChip is a trademark of M-Systems Inc.*

## Technical Support

If you have problems that this manual can't help you solve, contact VersaLogic for technical support at **(541) 485-8575**. You can also reach our technical support engineers via e-mail at [support@versalogic.com](mailto:support@versalogic.com), or visit our website at [www.versalogic.com](http://www.versalogic.com).

### REPAIR SERVICE

If your product requires service, you must obtain a Returned Material Authorization (RMA) number by calling (541) 485-8575. Our standard turn-around time for repairs is five working days after we receive the product.

Please provide the following information:

- Your name, the name of your company, and your phone number
- The name of a technician or engineer who we can contact if we have questions
- Quantity of items being returned
- The model and serial number (bar code) of each item
- A description of the problem
- Steps you have taken to resolve or repeat the problem
- The return shipping address

**Warranty Repair** All parts and labor charges are covered, including return shipping charges for UPS 3rd Day Select delivery to United States addresses.

**Non-warranty Repair** All non-warranty repairs are subject to diagnosis and labor charges, parts charges, and return shipping fees. We will need to know what shipping method you prefer for return back to your facility, and we will need to secure a purchase order number for invoicing the repair.

**Note!** Please mark the RMA number clearly on the outside of the box before returning. Failure to do so can delay the processing of your return.



### Overview

#### ELECTROSTATIC DISCHARGE

**Warning!** Electrostatic discharge (ESD) can damage boards, disk drives, and other components. The circuit board must be only be handled at an ESD workstation. If an approved station is not available, some measure of protection can be provided by wearing a grounded antistatic wrist strap. Keep all plastic away from the board, and do not slide the board over any surface.

After removing the board from its protective wrapper, place the board on a grounded, static-free surface, component side up. Use an anti-static foam pad if available.

The board should also be protected during shipment or storage by keeping inside a closed metallic anti-static envelope.

# Jumper Block Locations

**Note!** Jumpers shown in as-shipped configuration.

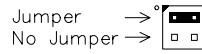
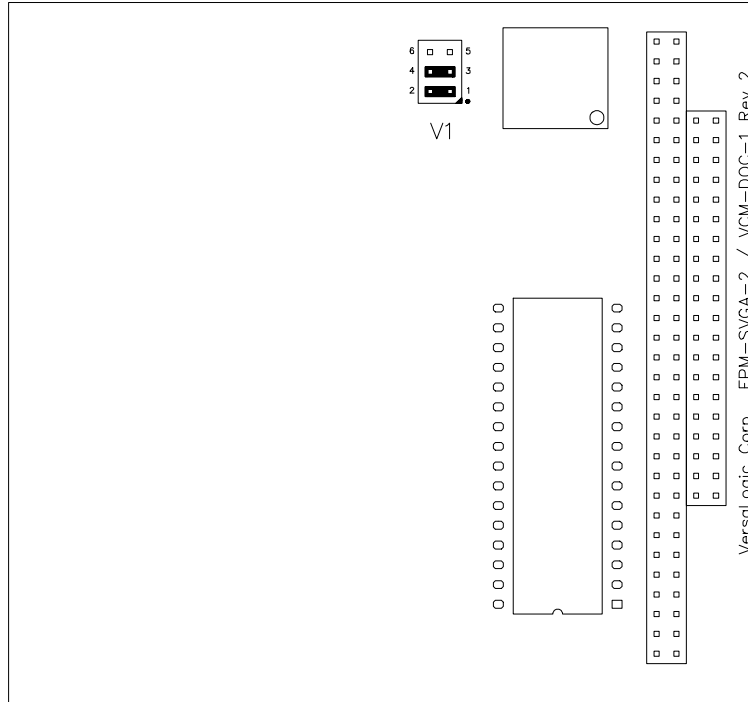


Figure 1. Jumper Block Locations

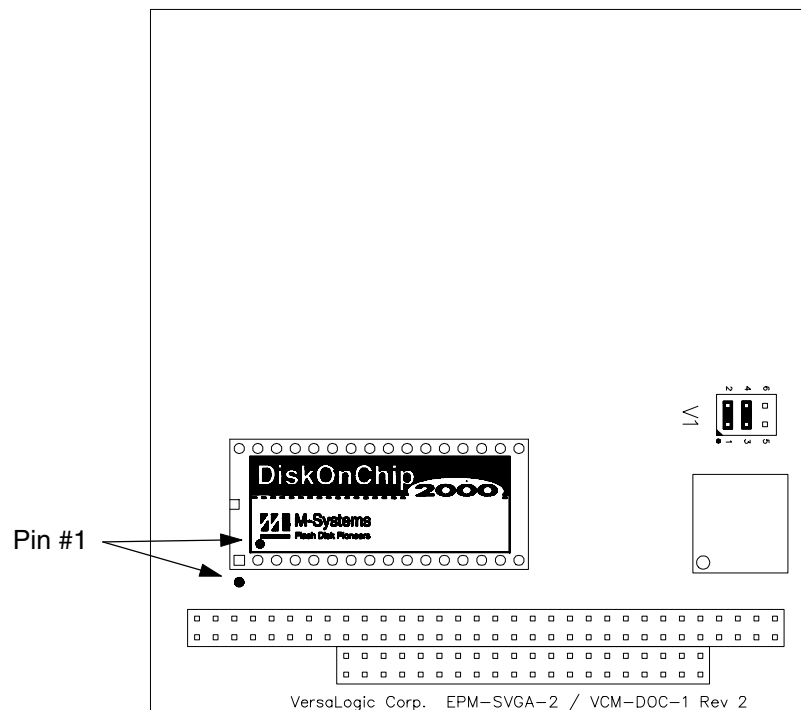
## JUMPER SUMMARY

Jumper Block	Description	As Shipped
V1	<b>DiskOnChip Address Selector</b>	D8000h
	<b>V1[5-6]    V1[3-4]    V1[1-2]    Address</b>	
	Out    Out    Out    CC000h	
	Out    Out    In    D0000h	
	Out    In    Out    D4000h	
	Out    In    In    D8000h	
	In    Out    Out    DC000h	
	In    Out    In    E0000h	
	In    In    Out    E4000h	
	In    In    In    Disabled	

## Quick Start

### DISKONCHIP 2000 INSTALLATION

1. Make sure the system is powered OFF.
2. Plug the DiskOnChip 2000 device into socket U6. Verify the direction is correct (pin 1 of the DiskOnChip 2000 is aligned with pin 1 of the socket).
3. Power up the system.



**Figure 2. Chip Orientation**

**Note** During power up you may observe the messages displayed by the DiskOnChip 2000 when its drivers are automatically loaded into system's memory.

After power-up the DiskOnChip 2000 can be accessed as any disk in the system.

If the DiskOnChip 2000 is the only disk in the system, it will appear as the first disk (drive C: in DOS).

If there are more disks besides the DiskOnChip 2000, the DiskOnChip 2000 will appear by default as the last drive.

### **MAKING THE DISKONCHIP BOOTABLE**

The DiskOnChip can serve as a boot device just like any floppy or hard disk. In order for the DiskOnChip to be bootable, it must have boot information written to it.

1. Copy the boot track data into the DiskOnChip by using the standard DOS command (for example: sys d:)
2. The DiskOnChip should be the only disk in the system or should be configured as the first disk in the system (c:) using the DUPDATE utility. See page 9 for further information.

#### ***Example***

The following command makes drive C: bootable and copies COMMAND.COM to the root directory.

```
SYS C:
```

## Software Utilities for the DiskOnChip 2000

### OBTAINING THE UTILITIES

The following DiskOnChip utilities are not required for normal operation of the product. If your situation requires the use of these routines, they may be downloaded from either of the following web pages:

- [www.m-sys.com](http://www.m-sys.com) "Technical Support" page.
- [www.VersaLogic.com](http://www.VersaLogic.com) "Downloads" page, Flash File section.

These routines can also be obtained on diskette from the VersaLogic Technical Support department. Please call (541) 485-8575 for assistance.

### DFORMAT -- FORMAT UTILITY

Before the DiskOnChip can be accessed it must be formatted, just as a floppy disk must be formatted. Formatting initializes the media and writes to it a new and empty DOS file system. When formatting is complete, the media contains only a root directory.

The DiskOnChip is fully tested and formatted before the product is shipped, but it can be reformatted by the user as needed.

The DFORMAT command differs from the DOS format command. DFORMAT performs a low-level format of the DiskOnChip including partitioning and FAT reconstruction. The DOS format command can be used if the DOC appears as a drive letter, however, it only performs a high level format. In general it is recommended to use DFORMAT.

The DFORMAT syntax is:

```
DFORMAT {drive-letter | /WIN:segment} [/SIZE:size] [/USE:nnn] [LABEL:label]
[/DOSVER:n] [/Y]
```

The DFORMAT options are:

drive-letter	DOS drive letter of the TrueFFS drive.
/WIN:Segment	Memory address in which the DiskOnChip is located. Use either this flag or the drive-letter flag.
/LABEL:label	A string to be used as the DOS label of the formatted media.
/SIZE:size	The size of the flash media to be formatted (including the install partition). By default the entire media is formatted by DFORMAT. This option limits the formatted size.
/USE:nnn	Percentage of available space on the flash media to be used for file storage. nnn can be any number from 1 to 100. Default is 99%.

The value of this option may affect the write performance of TrueFFS.

`/DOSVER:DOS-major-version` Format for a target system running the specified DOS version. The default is the current DOS version (the one on which DFORMAT is executed). For example, `/DOSVER:3` formats for DOS 3.x. Valid values are 1 to 6.

`/Y` Do not pause for confirmation before beginning to format.

**Note** All sizes specified in DFORMAT options are in bytes if specified as simple numbers, in KBytes if specified with the suffix K, or in megabytes if specified with the suffix M.

### ***Example 1***

The following command formats the DiskOnChip (assuming the DiskOnChip is drive C:)

```
DFORMAT C:
```

### ***Example 2***

The following command formats the DiskOnChip located at memory address D0000h. If any other hard disk is present in the system, the DiskOnChip will be identified as drive D:

```
DFORMAT /WIN:D000
```

## **DUPDATE -- UPDATING DISKONCHIP 2000 FIRMWARE**

The DUPDATE utility is used to write updated firmware into a reserved portion of the DiskOnChip. The firmware is distributed in special ".EXB" files provided by M-Systems.

**Note** DUPDATE requires a fully functioning DiskOnChip with pre-existing (older revision) firmware.

The DUPDATE syntax is:

```
DUPDATE [drive-letter | /WIN:Segment] /S:BootImage /FIRST drive-letter DOS drive  
letter of the TrueFFS drive.
```

`/WIN:Segment` Memory address in which the DiskOnChip is located. Use either this parameter or the drive-letter. The segment should be specified in Hex (e.g. `/win:d000`)

`/S:BootImage` The boot image file of the new firmware to be written to the DiskOnChip. Usually the file type is .EXB

**/FIRST**

Use this flag to program the DiskOnChip to be the first disk if more disks are installed in the system. This flag has no effect if the DiskOnChip is the only disk in the system. The /S parameter must be supplied when /FIRST flag is used.

***Example 1***

The following command programs the firmware which is supplied in DOC2000.EXB file into the DiskOnChip located as drive C:

```
DUPDATE C: /S:DOCXXX.EXB (Note: XXX = version number)
```

### ***Example 2***

The following command programs the firmware which is supplied in DOC2000.EXB file into the DiskOnChip which is located at memory address hex D000.

```
DUPDATE /WIN:D000 /S:DOCXXX.EXB (Note: XXX = version number)
```

### ***Example 3***

The following command programs the firmware which is supplied in DOC2000.EXB file into the DiskOnChip which is located at memory address hex D000. The DiskOnChip will be the first drive (C: ) in case a hard disk is available in the system.

```
DUPDATE /WIN:D000 /S:DOCXXX.EXB /FIRST (Note: XXX = version number)
```

### ***Example 4***

The following command programs the firmware which is supplied in DOC2000.EXB file into the DiskOnChip which is located at memory address hex D000. The DiskOnChip will be the last drive in the system (e.g. D: if one standard hard drive is already configured).

```
DUPDATE /WIN:D000 /S:DOCXXX.EXB (Note: XXX = version number)
```

## **DINFO -- INFORMATION UTILITY**

The DINFO Information utility provides background information regarding the DiskOnChip 2000, and the environment in which it is working. DINFO reports:

- TrueFFS drive letters
- Installed software and its version compliance.
- The size of the Flash media.

The DINFO syntax is:

```
DINFO
```

### ***Example***

The following command searches the system for a DiskOnChip.

```
DINFO
```

Following is the report that was generated in a specific system:

```
A 2MB DiskOnChip
Programmed with firmware version 3.3.03
It was assigned a drive letter D:
The disk size after format is 1,992 KB
Space allocated for Boot is 44KB
The Flash media is composed of one Flash device, manufactured by Toshiba
The Flash media is composed of 512 units
494 units are free.
Each unit is 4.096 bytes
```

```
DINFO Version 3.3.3 for DiskOnChip 2000 (V1.00) Copyright (C) M-Systems, 1992-1997
DiskOnChip 2000(R) found at D000:0000
```

-----  
**Disk statistics:**

```
Software version: 3.3.03
Drive letter : D
Disk size : 1,992 Kbytes
Boot size : 44 Kbytes
Flash media statistics :
Chip size : 2,048 Kbytes
No Of Chips : 1
Chip type : Toshiba TC5816FT
Total units : 512
Free units : 494
Unit size : 4,096 bytes
Interleaving : 1
```

## Duplicating the DiskOnChip 2000

Copying DiskOnChip device is the procedure of copying a “source” DiskOnChip contents into an “image file”, then copying the “image file” contents into as many target DiskOnChip devices as required. All target DiskOnChip devices will have exactly the same contents as the source DiskOnChip, which means they will have exactly the same functionality when plugged into target platform. The only limitation for this process is that all target DiskOnChip devices must have the same capacity of the “source” DiskOnChip. For example: if the “source” DiskOnChip has a 12MB capacity then the “target” DiskOnChip should have 12MB capacity as well.

**Note** This process copies the DiskOnChip firmware (from the source device) as well as the data it contains, into the target device.

The duplicating process includes 3 stages:

1. Prepare “source” DiskOnChip.
2. Copy “source” DiskOnChip into an image file.
3. Copy the image file into as many as required “target” DiskOnChip devices.

#### **STEP 1: CREATING THE “SOURCE” DISKONCHIP**

The source DiskOnChip includes all target application files. The following commands are usually used in order to prepare the “source” DiskOnChip:

1. Format DiskOnChip with DFORMAT utility in target platform, using version 1.04 or above.
2. Copy all target application files onto the DiskOnChip.
3. If required, make the DiskOnChip bootable

#### **STEP 2: COPY THE “SOURCE” DISKONCHIP INTO IMAGE FILE**

Use GETMIMG utility to copy the “source” DiskOnChip contents into an image file on disk, to be used later as source file for duplications.

1. Run GETMIMG image\_file\_name. (for example: GETMIMG MYDOC.SRC)

#### **STEP 3: COPY THE IMAGE FILE ONTO “TARGET” DISKONCHIP DEVICES**

Copying this image file into the target DiskOnChip will result in an identical copy of the “source”. Use the PUTMIMG utility to perform this task:

1. Power off the system.
2. Insert a target DiskOnChip with the same capacity as the source DiskOnChip into it’s socket.
3. Power on the system
4. Run: PUTMIMG image\_file\_name. (for example: PUTMIMG MYDOC.SRC)
5. The target DiskOnChip will have the exact contents and functionality as the source DiskOnChip when this operation is done. Repeat steps 1 to 3 for each additional target DiskOnChip.