Reference Manual

EPM-NET-100

10BaseT/100BaseTX Module
for the PC/104-*Plus* Bus

VERSA**L**OGIC
C O R P O R A T I O N

EPM-NET-100

10BaseT/100BaseTX Module
for the PC/104-*Plus* Bus

EPM-NET-100
10BaseT/100BaseTX Module
for the PC/104-*Plus* Bus

REFERENCE MANUAL

VERSALOGIC
C O R P O R A T I O N

Doc. Rev. 4/25/2003

VERSALOGIC CORPORATION
WWW.VERSALOGIC.COM

3888 Stewart Road
Eugene, OR 97402
(541) 485-8575
Fax (541) 485-5712

Contents Copyright ©1999
All Rights Reserved

Table of Contents

Introduction **1**

Description

The EPM-NET-100 module combines a high-performance 10/100 Megabit per second (Mbps) Ethernet interface for PC/104-*Plus* systems with an on-board DiskOnChip site for non-volatile system storage. It is fully compatible with wide selection of popular operating systems such as QNX, Windows CE, NT, Win95/98, VxWorks, and PSOS.

The module 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. The EPM-NET-100 is a PC/104-*Plus* compliant interface module utilizing the 33MHz PCI bus for high-bandwidth network data traffic.

ETHERNET

The Ethernet section, based on an AMD 79C973 controller, provides a standard 10baseT and 100baseTX network interface. Software drivers are available for a wide variety of operating systems to provide a complete high-performance networking solution. The Ethernet controller features Auto-Negotiation for twisted-pair (10T/100TX) operation by using a modified 10Base-T link integrity test pulse sequence. The controller automatically configures the circuitry to operate at the maximum performance level supported by the network cabling without the need for jumper or software configuration. An optional Ethernet boot-ROM site allows remote embedded systems to be automatically booted from a server, making hard or floppy disks unnecessary.

DISKONCHIP

The EPM-NET-100 module also provides a socketed DiskOnChip site for Flash File System (FFS) storage in sizes up to 144 MB. Combining both Ethernet and Flash expansion on a single module provides cost and space savings for systems that do not have adequate Flash capacity. Under most operating systems, the DOC operates as a standard disk drive and supports normal file reads and writes. Most operating systems also support the DiskOnChip as a bootable device, allowing 100% solid state program storage. The DOC occupies an 8K memory block at one of seven jumper-selectable start addresses, or it can be disabled altogether.

FEATURES

- High Speed PC/104-*Plus* PCI Interface
- 12K Ethernet Transmit / Receive Data Buffer
- 10BaseT/100 Base TX high speed Ethernet
- Remote boot Ethernet option
- DiskOnChip® Bootable in most Systems

Technical Specifications

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

Size:
> 3.55" x 3.775" (PC/104-*Plus* standard)

Storage Temperature:
> –40°C to +85°C

Free Air Operating Temperature:
> –20°C to +85°C

Power Requirements:
> +5V ±5% @ 300 ma typical(without DiskOnChip module)

Ethernet Controller:
> AMD 79C973

Ethernet Buffer RAM:
> 12 KB

Ethernet Compatibility Modes:
> 10BASE-T
> 100BASE-TX
> Complies with IEEE/ANSI 802.3 and Blue Book standards

Ethernet Boot ROM Socket:
> Site available for 29F040 Flash ROM

DiskOnChip Site:
> 32-pin DIP socket accepts DiskOnChip Modules
> Occupies 8K memory space
> 7 jumper selectable addresses or socket disable

External Connectors:
> Ethernet: RJ-45 jack

Bus Compatibility:
> PC/104-*Plus* (+5V or +3.3V signaling)

Specifications are subject to change without notice.

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 VersaLogic by e-mail at support@versalogic.com, or visit our website at www.versalogic.com.

REPAIR SERVICE

If your product requires service, you must obtain a Returned Material Authorization (RMA) number by calling (541)485-8575.

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.

This chapter describes how to configure the on-board jumper options on the EPM-NET-100 module.

Hardware Jumper Summary

Hardware option configuration is accomplished by installing or removing jumper plugs. In this chapter, the term "in" is used to indicate an installed jumper and "out" is used to indicate a removed jumper.

Jumper Block Locations

Note   Jumpers shown in as-shipped configuration.
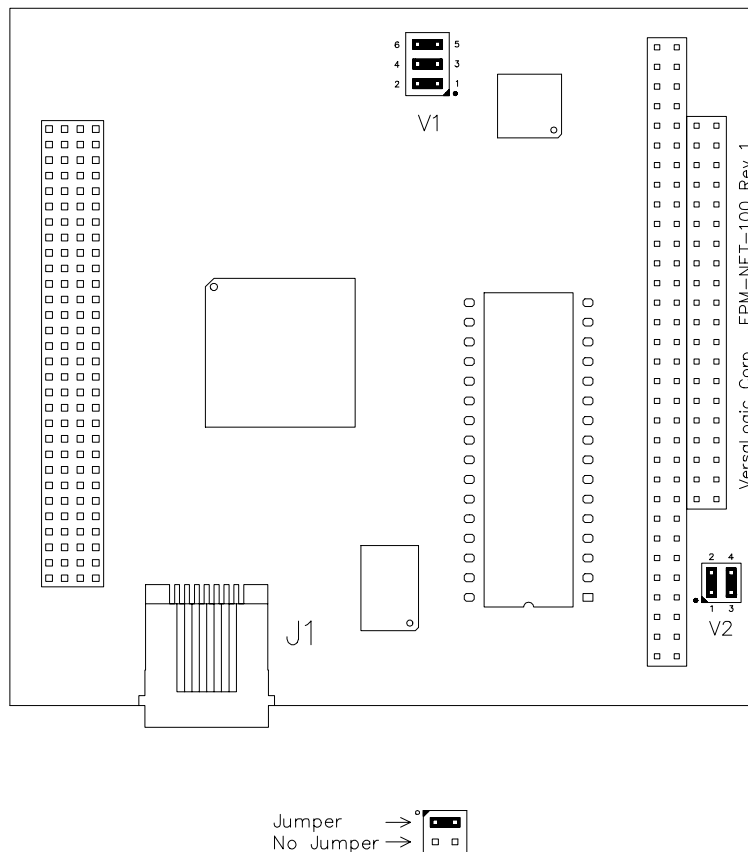
Figure 1. Jumper Block Locations

Jumper Summary

Table 1: Jumper Summary
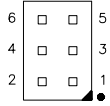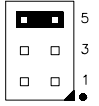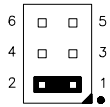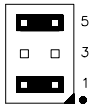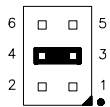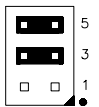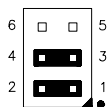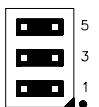
Jumper Block	Description				As Shipped	Page
V1	**DiskOnChip Address Selector**				Disabled	6
	V1[5-6]	**V1[3-4]**	**V1[1-2]**	**Address**		
	In	In	In	Disabled		
	Out	Out	Out	CC000h		
	Out	Out	In	D0000h		
	Out	In	Out	D4000h		
	Out	In	In	D8000h		
	In	Out	Out	DC000h		
	In	Out	In	E0000h		
	In	In	Out	E4000h		
V2	**PC/104-Plus Slot Position Selector**				Position 0	7
	V2[3-4]	**V2[1-2]**	**Slot Position**			
	In	In	0 (closest to CPU board)			
	In	Out	1			
	Out	In	2			
	Out	Out	3			

DiskOnChip Configuration

The EPM-NET-100 DiskOnChip site accommodates a plug-in, 32 pin flash module. Note that the DOC is a paged device and occupies only an 8K block of memory regardless of the DOC device storage size.

Jumper block V1 selects between 7 different 8K block start addresses and DOC disable. Any of the addresses shown may be used by the DOC chip. The system BIOS will search each of these addresses at start-up time in order to determine whether any DOC devices are present in the system. However, the DOC chip address must be selected so that it does not conflict with any other device in the system that is using that memory area. Select any address that does not conflict with existing system hardware.

Table 2: DiskOnChip Start Address Selector

Jumper Block V1	Address	Jumper Block V1	Address
	CC000h		DC000h
	D0000h		E0000h
	D4000h		E4000h
	D8000h		Disabled (as shipped)

PC/104-*Plus* Bus Configuration
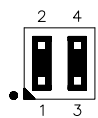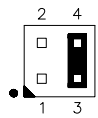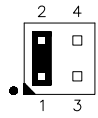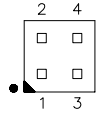
PC/104-*Plus* is limited to the same 4-slot configuration as desktop PCI. While the technology allows stacks of up to 4 PC/104-*Plus* modules and theoretically up to 10 regular PC/104 modules, rarely will systems consist of this many boards.

If a stack consists of a mixture of PC/104-*Plus* and regular PC/104 modules, the PC/104-*Plus* modules must occupy positions 0, 1, 2, or 3 (0 being closest to the SBC/CPU board).

The EPM-NET-100 module is a PC/104-*Plus* product, therefore it must occupy one of the first four positions in the stack, usually position 0. Jumper block V2 must be configured to match the position of the module within the stack.

The function of V2 is to choose a distinct pair of slot-specific signals (Clock and ID Select) from the PCI feed-through connector. Each PC/104-*Plus* module must be jumpered differently to utilize a unique set of slot-specific signals.

Table 3: Module Position Jumper.

Jumper Block V2	Module Position
2 4 1 3	0 (As Shipped)
2 4 1 3	1
2 4 1 3	2
2 4 1 3	3

Introduction

This chapter describes EPM-NET-100 module installation procedures and describes the external connections.

Warning!   Electrostatic discharge (ESD) can damage boards, disk drives, and other components. Do the installation procedures described in this chapter only at an ESD workstation. If such a station is not available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to a metal part on the card cage.

Circuit boards can be extremely sensitive to ESD and always require careful handling. After removing the board from its protective wrapper or from the stack, place the board on a grounded, static-free surface, component side up. Do not slide the card over any surface. During storage or shipment, protect the card with anti-static foam or bubble wrap.

Arranging the PC/104-*Plus* Stack

1. Turn the system power **off**.

2. Install the EPM-NET-100 module in stack position 0, 1, 2, or 3.

3. Make sure that jumper V2 matches the chosen stack position. See page 5 for details.

4. Additional stack-through modules can be stacked on top of the EPM-NET-100. Up to three more PC/104-*Plus* modules and/or six regular PC/104 modules can be added.

Warning!   Installing or removing modules from the PC/104-*Plus* stack while the power is on may damage the system.

Note   The EPM-NET-100 module is designed to work with PC/104-*Plus* systems. It cannot be plugged onto a regular PC/104 stack (without the PCI connector).

External Connectors
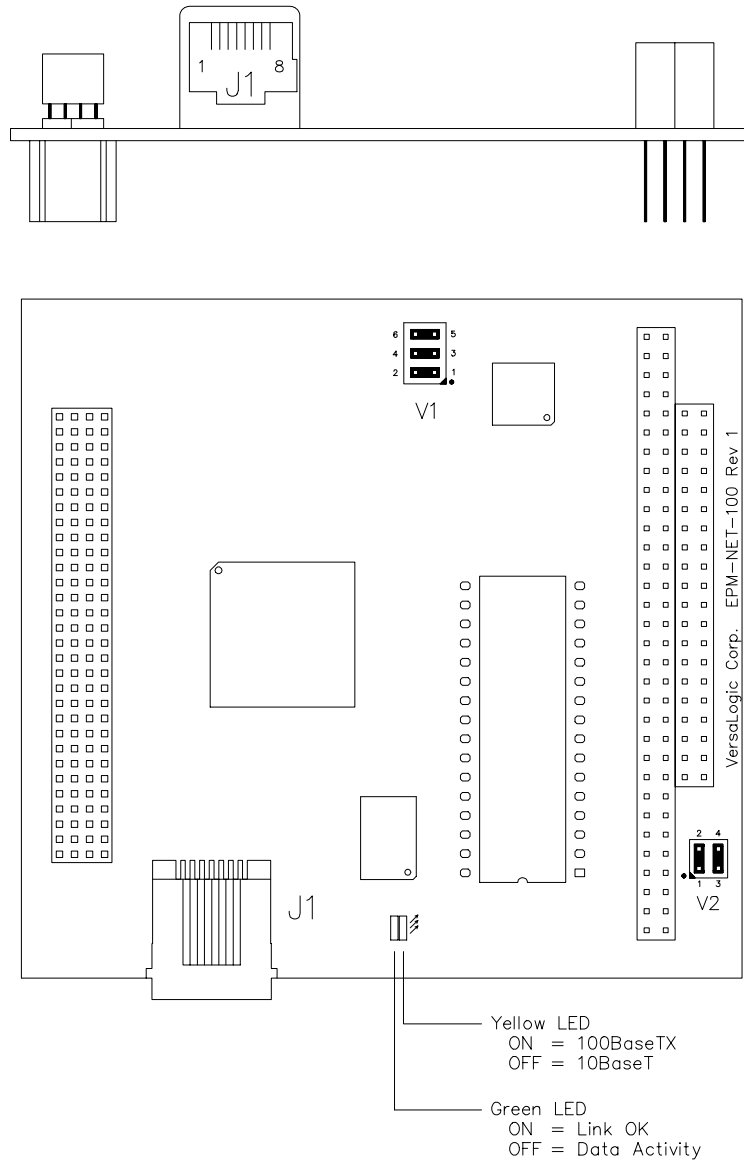
Figure 2. Connector Locations

Ethernet Pinout

Warning!   Do **not** connect or disconnect cabling while the module power is on.

Table 4: Ethernet Pinout.

J1 Pin	Signal Name	Function
1	TD+	Transmit Data Plus
2	TD–	Transmit Data Minus
3	RD+	Receive Data Plus
4	N/C	No connect
5	N/C	No connect
6	RD–	Receive Data Minus
7	N/C	No Connect
8	N/C	No Connect

ETHERNET DRIVERS

PCNet Family Software Drivers are available from the AMD website (www.amd.com). Drivers can be found in the Connectivity solutions/networking/**PCNETFastIII/Utilities, drivers & updates/PCNETFamily/Drivers** section of the website.

Cables and Plugs

CABLE REQUIREMENTS

Due to the high bandwidth requirements of 100baseTX, cable connections to the EPM-NET-100 module must meet or exceed TIA/EIA 568-A category 5 specifications. High performance 4 pair UTP (unshielded twisted pair), 24 AWG solid bare copper cabling such as Belden *DataTwist Five* 1583A or equivalent must be used to achieve satisfactory data rates.

Note   The complete TIA/EIA 568-A *Commercial Building Telecommunications Wiring Standard* is available for purchase. Contact *Global Engineering Documents* at (800) 854-7179, or visit http://global.ihs.com for further information.

MATING PLUG

The Ethernet Jack, J1, will accept a standard crimp or molded style RJ-45 plug.
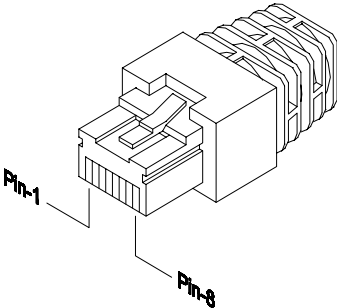
Figure 3. RJ-45 Mating Plug

DOC Configuration

DISKONCHIP INSTALLATION

1. Make sure the system is powered OFF.

2. Plug the DiskOnChip device into socket U6. Verify the direction is correct (pin 1 of the DiskOnChip is aligned with pin 1 of the socket).

3. Power up the system.
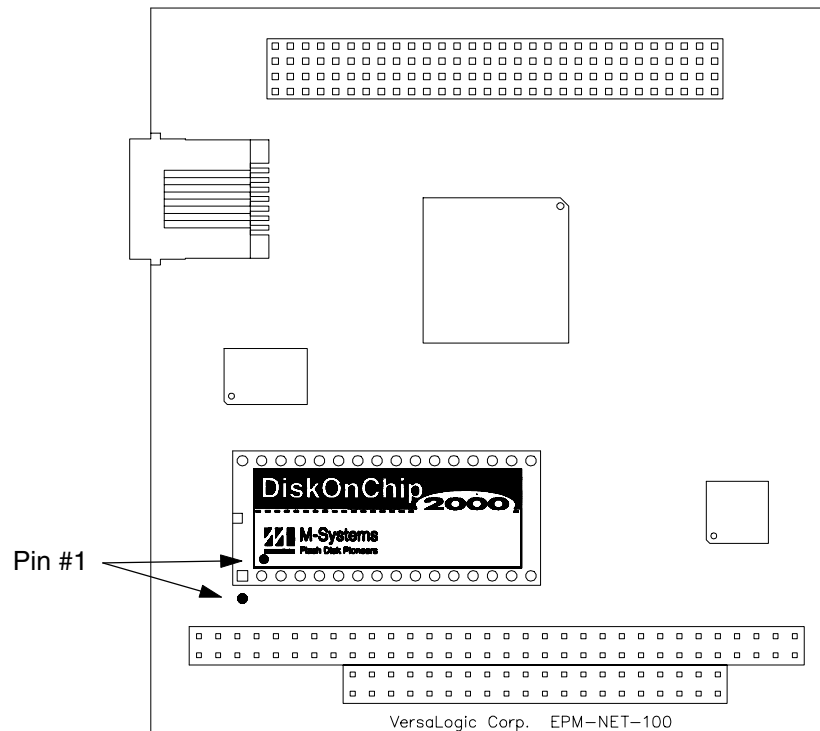
Figure 4. DiskOnChip Orientation

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

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

If the DiskOnChip 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, the DiskOnChip 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 15 for further information.

Example

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

```
SYS C:
```

Common Questions and Answers about the Disk On Chip

- What modifications will I have to make to the AUTOEXEC.BAT and the CONFIG.SYS files in order to use the DiskOnChip?

    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 DiskOnChip 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 DiskOnChip 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 16 for more information on the DUPDATE utility.

- Is the DiskOnChip 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

Software Utilities for the DiskOnChip

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   "Technical Support" page.
- www.VersaLogic.com   "Downloads" page, Flash File section.

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 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, 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

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.