



**M-Systems**

Flash Disk Pioneers

## **User Manual**

# **DiskOnChip GANG Programmer Rev. B2-1.23**

**MAR-2000**

91-SR-004-03-7L REV. 4.0

# Contents

<b>1</b>	<b>Introduction</b> .....	<b>3</b>
1.1	DiskOnChip GANG Programmer Overview.....	3
1.2	DiskOnChip Family of Products Overview .....	3
1.3	Package Contents.....	3
<b>2</b>	<b>Quick Installation Guide</b> .....	<b>4</b>
<b>3</b>	<b>DiskOnChip GANG Programmer – Description</b> .....	<b>4</b>
3.1	Push Buttons Description .....	5
3.2	Rules of Operation .....	6
<b>4</b>	<b>Duplicating DiskOnChip Devices</b> .....	<b>6</b>
4.1	DiskOnChip Family Products Support.....	6
4.2	Required Stages .....	7
4.3	Step by Step.....	7
<b>5</b>	<b>Maintenance</b> .....	<b>9</b>
5.1	Internal Maintenance .....	9
5.2	Software Upgrade .....	9
<b>6</b>	<b>Error Codes</b> .....	<b>10</b>
6.1	Source DiskOnChip Device Errors.....	10
6.2	“Read Source DiskOnChip” Errors.....	10
6.3	Errors Generated During “Copy to Target DiskOnChip Devices” or Verify .....	10
<b>7</b>	<b>Troubleshooting</b> .....	<b>11</b>
<b>8</b>	<b>Q&amp;A</b> .....	<b>12</b>
	<b>How to Contact Us</b> .....	<b>13</b>

# 1 Introduction

## 1.1 DiskOnChip GANG Programmer Overview

DiskOnChip GANG programmer is a stand-alone GANG programmer, which can duplicate DiskOnChip devices very quickly. It is intended for mass production quantities of DiskOnChip-based products. The DiskOnChip GANG programmer includes 9 ZIF sockets for DiskOnChip devices, one for the “source” DiskOnChip device, and 8 for the “target” DiskOnChip devices. The DiskOnChip GANG can duplicate up to 8 DiskOnChip devices at a high speed.

The “source” DiskOnChip is copied into an internal “image file”, which then can be used as a source, for duplication, without the need for the “source” DiskOnChip device to be in the source socket. The duplication can be repeated as many times as required.

The Stand-alone DiskOnChip GANG is shipped as a ready to work system, simply plug in the power cable and start working.

## 1.2 DiskOnChip Family of Products Overview

M-Systems’ DiskOnChip is a family of high performance single-chip flash disk. The DiskOnChip family includes:

- **DiskOnChip 2000:** 32 pins DIP flash disks, with capacities ranging from 16MB to 288MB
- **DiskOnChip Millennium:** Single die flash disks, available in an 8MB capacity with a 32-pin DIP or TSOP-II packages

These unique data storage solutions offer a faster, and more cost-effective flash disk for applications with limited space and modest disk capacity requirements.

The DiskOnChip has become the standard flash disk module for Embedded Single Board Computers. It is the optimal solution for mother boards used to control a variety of applications, such as Set-top boxes, diskless Network Computers, Internet appliances, DVD and CD-Video players and recorders. It can also provide a hard disk O/S back up for Network Servers.

## 1.3 Package Contents

Please check that you have received all of the package contents as described in the attached release letter. In case something is missing or damaged, please contact your M-Systems representative.

## 2 Quick Installation Guide

The GANG is very easy to install:

1. Connect Power Cord to power outlet.
2. Select DiskOnChip voltage (3.3V or 5V - on left-hand bottom side of the operating panel).
3. Turn power ON.
4. Wait for “OK” on the LCD display.

The GANG is ready to work.

## 3 DiskOnChip GANG Programmer – Description

The GANG programmer is composed of a Host PC and an operating panel. The host PC is a Pentium class CPU based PC. The operating panel includes:

- 1+8 Sockets for the DiskOnChip DIP products
- DiskOnChip Voltage select switch (3.3V or 5V)
- Push Buttons to control the GANG operation
- LCD display
- LED's display

The Operating panel, as shown in Figure 1 is composed of one source socket (labeled as “source”, in the upper left corner, and 8 target sockets (labeled as 1 to 8), on the right hand side of the source socket. Each socket has an indication led. The led can be inactive (nothing to signal), blinking (active now), red (last operation failed) or green (last operation pass).

An LCD display resides below target sockets 6-8 and is used to display status messages and error codes. Seven push buttons are used to activate the GANG programmer. Two are used during standard operation (S1 is labeled “Read” and S7 is labeled “Duplicate”), the other are used for technical support or reserved for future use.

Three LEDs are located on the right hand side of the LCD, labeled as L1, L2 & L3.

L1 indicates 5V operation, L2 is reserved and L3 indicates 3.3V operation.

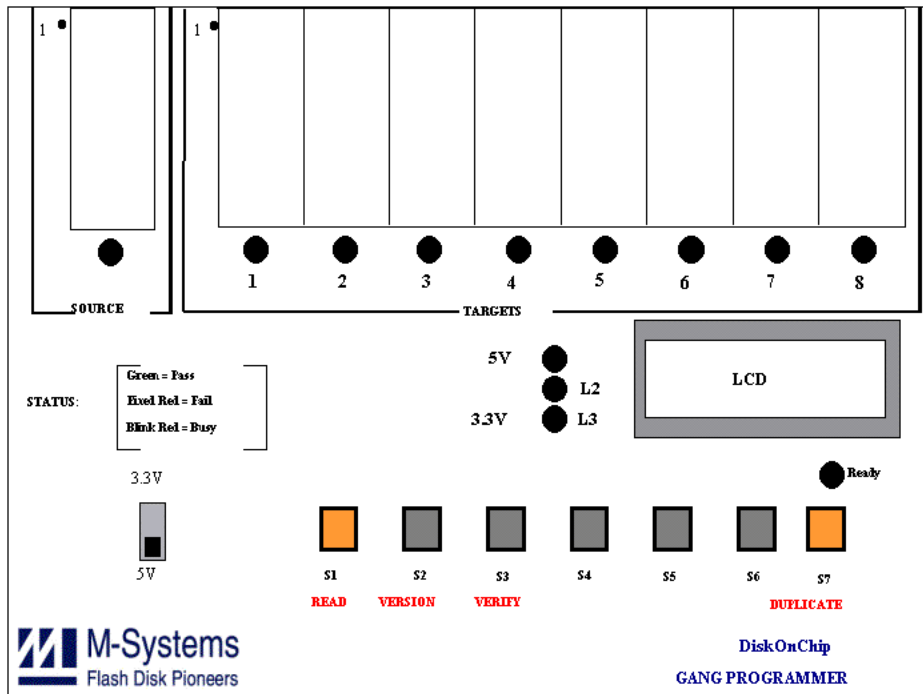


Figure 1: GANG Programmer Operating Panel

### 3.1 Push Buttons Description

The GANG has 7 push buttons, numbered from S1 to S7. The following guidelines define the buttons behavior:

- The software samples the buttons only when the GANG is not busy with previous command.
- If a button is pressed during the execution of a command, there will be no affect on the operation.

The following table defines the buttons behaviors:

GANG Buttons	Description
S1	READ. Press this button to copy the source DiskOnChip placed in the MASTER socket into an IMAGE file on the internal hard disk.
S2	Pressing S2 will cause the software and hardware version to be displayed on the LCD display (for example: "GANG version B-1.21", "HW version 1 ESR").
S3	Pressing S3 will start a verification process between the image file on the disk and all DiskOnChip devices plugged in the Target sockets.
S4	Pressing this button will show the image file description on the LCD display. If there is no image file available, a "Disk Image file does not exist" message will appear on the LCD display. If the image file exists, the LCD will display "Disk Image File xxxMB", in which the xxx represents the size of the image file.
S5	Reserved for future use.
S6	Reserved for future use.
S7	DUPLICATE – press this button to copy the image file from the hard disk to all the DiskOnChip devices plugged in the Target sockets.

## 3.2 Rules of Operation

The following rules will guarantee a faultless operation of the GANG programmer product:

1. Place the GANG programmer in a stable location, room environment, not in direct sunlight.
2. Make sure that no DiskOnChip devices are placed in the GANG's sockets when power is turned ON or OFF.
3. Don't touch the DiskOnChip devices while the Ready LED is not green (indicating the GANG is busy).
4. Visit M-Systems' web site ([www.m-sys.com](http://www.m-sys.com)) once in a while – and look for new features or upgrades.

## 4 Duplicating DiskOnChip Devices

### 4.1 DiskOnChip Family Products Support

The DiskOnChip GANG programmer is equipped with 9 ZIF sockets for DIP 32 pins DiskOnChip devices. As such it supports:

- DiskOnChip 2000 products (MD2200-Dxx, MD2201-Dxx, MD2202-Dxx, MD2203-Dxx)
- DiskOnChip Millennium DIP (MD2800-D08)

For the DiskOnChip Millennium TSOP-II, an adapter will be required:

- DiskOnChip Millennium TSOP-II ZIF adapter

Each TSOP adapter should be placed in a DIP socket. The GANG can be used with 4 target TSOP adapters at the same time.

## 4.2 Required Stages

The DiskOnChip GANG programmer is a tool used mainly to duplicate DiskOnChip devices. It takes one pre-prepared DiskOnChip device (“Master Device”) and copies the image (“Source Image”) to the internal hard disk. Then, it duplicates this “Source Image” into a maximum of 8 DiskOnChip target devices. The target devices must be of the same type as the master DiskOnChip (same product, voltage operating, capacity etc) resulting in target DiskOnChip devices identical to the source DiskOnChip device. Below is a summary of the required stages (these apply to all DiskOnChip family of products):

1. The customer receives a new DiskOnChip from M-Systems.

The DiskOnChip is a DOS formatted, empty disk.

2. The DiskOnChip device is placed in a target platform, and all application files are copied into the device. Usually it will be made as a bootable disk (remember to re-boot after the SYS or the FORMAT /S commands in DOS).

3. The DiskOnChip is tested in the target platform to make sure the integration into the platform is working well.

This DiskOnChip device will be used as the "Master" device.

4. In the mass production stage, the GANG programmer enables the duplication of many units in a short time. In order to program many similar systems, all that is needed is one source DiskOnChip device (“Master Device”) containing the data which all the systems require. Instead of repeating the copying equal to the number of systems, the GANG programmer duplicates 8 target DiskOnChip devices, with one command, in a very short time.

5. Plug the target DiskOnChip devices into a target system and power up.

The operation of each of those systems should be the same as the source system.

6. For control purposes, DiskOnChip devices can be verified, by placing them in any target socket, and pressing button S3.

## 4.3 Step by Step

Let's go step-by-step through DiskOnChip duplicating stages:

1. Make sure power is OFF, and no DiskOnChip devices are in the GANG's sockets.
2. Power up the GANG programmer. You should get the following message on the LCD:

```
DiskOnChip
GANG Ready
```

The GANG is now ready to accept commands via the press buttons.

3. Take the pre-prepared source DiskOnChip device and place it in the "source" socket, on the top left-hand side of the GANG. Verify the polarity is correct.
4. Press the "Read" button.

The LED under the source socket should be blinking red, which means that the GANG is busy. During this activity, the following message should appear on the LCD display:

```
Reading source
W A I T
```

5. The "source" DiskOnChip device can be taken out of the source socket and kept for future use (usually for verification).  
**Note:** The image of the source DiskOnChip is kept on the hard disk of the GANG programmer until a new source DiskOnChip is read.
6. Place up to 8 target DiskOnChip devices with the same capacity as the source in the target sockets. Verify that the polarity is correct.
7. Press the "Duplicate" button. The GANG will start copying the "Source Image" into each DiskOnChip device. During operation, the LED of each socket will indicate the status by blinking red (at work), steady green (finished successfully), or steady red (operation failed).

The LCD displays the following message:

```
Copy to targets
W A I T
```

8. When the duplicate operation is finished, the ready LED will become a steady green, each socket displays its own status (steady green for OK, steady red for failed), and the following message appears on the LCD:

```
1 2 3 4 5 6 7 8
X X X X X X X X
```

The numbers 1 to 8 represent the relevant target socket. The "x" under each socket represent the return code (0: OK, other: error code). The codes are described in section 6.3.



9. All the DiskOnChip devices that were successfully duplicated (LED is green) have now the exact same disk contents as the source DiskOnChip device.
10. All the DiskOnChip devices that had a red LED signal should be checked. Refer to Chapter 6.

## 5 Maintenance

### 5.1 Internal Maintenance

The DiskOnChip GANG programmer is testing the internal disk integrity on every boot, to make sure the files are not damaged.

### 5.2 Software Upgrade

**Warning:** The GANG will not retain any stored images, present on the GANG, before installing the new software version. Therefore, before performing the installation make sure that you have the original source DiskOnChip. Upon completing the installation, make sure to read the source DiskOnChip (using the S1 button) at least once before performing a duplication.

From time to time M-Systems releases new software versions. You can download the software from the web at <http://www.m-sys.com> or you can receive a floppy diskette, which contains the software needed to update your GANG programmer.

Please perform the following steps to update your software:

1. Power off the GANG programmer.
2. Insert the upgrade diskette into the floppy drive.
3. Power on the GANG programmer.

The GANG will boot from the floppy and start to update the new software automatically. The following message will be seen on the LCD display:

GANG Update VX.XX Starts
-----------------------------

When the updating process is finished, the following message is displayed:

GANG Update VX.XX Finished
-------------------------------

4. Power off the GANG
5. Take the floppy diskette out of the floppy drive and keep it in a safe place
6. Power on the GANG
7. Place the source DiskOnChip into the master socket

8. Press the S1 button to read the source DiskOnChip
9. The GANG is ready to work

## 6 Error Codes

Several error codes can appear on the LCD display. The codes are described in this chapter, according to the operation that was performed when the message appeared.

### 6.1 Source DiskOnChip Device Errors

The following error messages can appear while executing the “Read from Master” operation, because of a fault device.

Error	Description
“DiskOnChip Not found in Socket”	No DiskOnChip device is available in the socket, the DiskOnChip device is damaged, or inserted incorrectly in the socket.
“DiskOnChip error in Master socket”	The DiskOnChip device placed in the Master socket was recognized, but is a faulty device.
“General failure”	General system failure occurred.

### 6.2 “Read Source DiskOnChip” Errors

The following error messages can appear while executing the “Read from Master” operation, because of bad format of the DiskOnChip device.

Error	Description
“DiskOnChip has bad Format”	The file format of the source DiskOnChip device is bad.
“Error writing DiskOnChip image”	The system failed writing the DiskOnChip image onto the hard disk.

### 6.3 Errors Generated During “Copy to Target DiskOnChip Devices” or Verify

The following error messages can appear while executing the “Copy to targets” operation. Each error is displayed on the LCD display as an error code.

Code	Description
0	OK
1	General failure
2	No DiskOnChip in socket or illegal insertion.
3	Bad DiskOnChip device.
4	Capacity of target DiskOnChip doesn't mach the source.
5	Error reading image file from hard disk.
6	DiskOnChip format failed, or Verify failed.
7	DiskOnChip have the wrong voltage supply ( 3v or 5v)

## 7 Troubleshooting

In case of a problem, please try to solve it according to the following guide lines. In case the problem is not solved, please contact the nearest M-Systems' representative for technical support.

**Problem:** I pressed the power button, but nothing happened.

**Solution:** Make sure the power cord is connected to the outlet.

**Problem:** The GANG boots up, but no message is seen on the LCD display, and the buttons do not respond.

**Solution:** Make sure no floppy diskette was left in the floppy drive.

**Problem:** One target DiskOnChip device failed. All others passed.

**Solution:** First, try the last operation again. If it fails again, look at the DiskOnChip device leads. Are they clean? Are any pins broken? Try another device in the same socket, and try this device in another socket.

**Problem:** One target DiskOnChip device failed. All others passed. I put it in a different target socket and it kept failing.

**Solution:** If other DiskOnChip devices pass in the same activity, you might have a faulty device. Contact the nearest dealer.

**Problem:** When I turn the GANG on, it "hangs-up" while looking for the keyboard.

**Solution:** Change the BIOS set-up to ignore the keyboard. This is set in the first screen: "Halt on all error but keyboard."

## 8 Q&A

Following is a list of questions that M-Systems' technical support team is often asked. We recommend reading this chapter before contacting technical support.

**Q:** Should I leave the "Master DiskOnChip" in the Master Socket after it was successfully read to image file?

**A:** You don't have to. After the file was read, it is kept on the internal hard disk, until a new source is being copied. However, it is recommended to take out the master DiskOnChip and keep it in safe place for backup.

**Q:** I accidentally pushed the READ button, while no DiskOnChip was in the Master socket. Was the image file that was in the hard disk destroyed? (the one that was copied last)

**A:** No. The image file will be erased/replaced only when the READ button is pressed and there is a DiskOnChip in the Master socket.

**Q:** Will the GANG support future DiskOnChip products?

**A:** Yes. M-Systems will release a new firmware version for the GANG any time new products from the DiskOnChip product family are released.

**Q:** Must I put 8 DiskOnChip devices in the Target sockets every time I duplicate?

**A:** No. You can duplicate up to 8 devices at a time. The software will automatically detect the sockets in which a DiskOnChip device was placed. All empty sockets will be ignored.

**Q:** I accidentally programmed the same 8 DiskOnChip devices twice. Did I cause any damage?

**A:** No. You can re-program the same devices as many times as you want. You can not cause any damage this way.

**Q:** Can I duplicate the DiskOnChip using a file from a floppy disk or device, other than the Master?

**A:** No. You must use a Master for duplication.

**Q:** Can I use an 8MB DiskOnChip as a Master and a 16MB DiskOnChip as the Target?

**A:** No. The Master and the Target DiskOnChip's must be the same capacity.

**Q:** Can I have an old 32MB high profile (MD2201-D32) as the master, and new 32MB low profile (MD2202-D32) as the target?

**A:** No. The source and the target must be the same format, since they are made of different flash devices.

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