

# MHDD Documentation

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DISCLAIMER: Use this software as is. MHDD is powerful, but very dangerous program and nobody is responsible for any damage or data loss made by MHDD.

## About the MHDD Project

MHDD is the small and powerful freeware tool to work with hard drives at the lowest possible level. First version was released in 2000 by me, Dmitry Postrigan. It was able to make surface scan of an IDE drive in CHS mode. My main objective was to develop well-known and trusted HDD diagnostic tool.

Now MHDD is much more than just diagnostic. You can do anything with MHDD: diagnose your drive, access raw sectors, manage S.M.A.R.T. (SMART) and other drive parameters such as acoustic management, security, Host Protected Area. You can even send your own commands to a drive using very simple linear scripting engine.

## Getting MHDD

When you need fresh copy of MHDD, please always use <http://mhdd.com> website. You can get MHDD as CD image, as self-extracting floppy image or as archive. Documentation is web-based to make it always up-to-date.

## What is Inside of MHDD Package

- mhdd.exe Main executable
- mhdd.hlp This file is used by MHDD to display help
- batch/sample.mba Sample batch script to run tests without an operator
- scripts/test Sample script for sending commands
- cfg/mhdd.cfg Here MHDD stores its configuration

After the first run log/mhdd.log file will be created automatically. This is the main log file, everything is logged there.

If you download and extract a boot floppy or CD image you will have DR-DOS system files too.

## How it Works

Let's imagine how MSDOS works when it needs to read a sector from a drive — it simply asks the BIOS to do that. Then BIOS looks into its tables to find where that drive is attached, checks ranges and then starts sending commands to the drive. After everything is done it returns result to MSDOS. Just look at this. This is a typical diagram how generic DOS program talks to the drive.

```
PROGRAM <----> MSDOS <----> BIOS <----> IDE/SATA controller <----> Hard disk
```

## And now how MHDD works:

```
MHDD <----> IDE/SATA controller <----> Hard disk
```

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The main difference: MHDD does not use BIOS functions and interrupts. So, you even do not need to detect your drive in BIOS. You can even turn on your drive after MSDOS boots. MHDD works directly with IDE or Serial ATA controller so it does not care about partitions, file systems, BIOS (motherboard) limitations, etc.

**WARNING:** Do not run MHDD from the hard drive which is on the same physical IDE channel (cable) which you are going to use to diagnose drives! MSDOS (SMARTDRV.EXE, for example) may decide to access any drive at the same moment when MHDD is using it, you will have some data loss on both devices on that channel! There is no way to block or trace MSDOS' or BIOS' read/write attempts. That is why, by default, MHDD does not work with Primary IDE as it usually used to boot MSDOS, to run MHDD, etc. To unblock Primary IDE please run MHDD once, then exit, and then modify MHDD.CFG or use /ENABLEPRIMARY switch.

For SCSI drives MHDD uses DOS ASPI driver. If you are not planning to use MHDD on SCSI drives then you do not need any drivers.

## Platform Requirements and Supported Hardware

Platform:

- Intel Pentium or higher CPU
- 4 megabytes of RAM
- DR-DOS, MSDOS version 6.22 and higher
- Any boot device (USB, CDROM, FDD, HDD)
- A keyboard

IDE/SATA Controllers:

Any integrated into motherboard north bridge (addresses: 0x1F<sub>x</sub> for primary channel, 0x17<sub>x</sub> for secondary channel)

PCI UDMA boards (detected automatically): HPT, Silicon Image, Promise, ITE, ATI and so on. Even some RAID boards are supported. In this case MHDD works with each physical drive separately

UDMA/RAID controllers integrated into motherboard as additional chip

Hard disk drives

- Any IDE or Serial-ATA drive with size bigger than 600Mbytes, in other words, LBA mode is supported in full. This is because I have removed whole CHS code since version 2.9
- Any IDE or Serial-ATA drive with size lower than 8388607 TBytes, in other words, LBA48 mode is supported in full
- Any SCSI drive with sector size 512—528 bytes
- IDE drive should operate in master mode, and no slave devices should be attached. Please configure all drives you are planning to work with as master devices.

Other devices

Any SCSI removable media such as tape, CDROM. Maximum sector size for such devices is 4096 bytes

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## Obtaining Installation Package

You have to decide which kind of installation you prefer: CD image, floppy image or just executable files. Please visit <http://mhdd.com>.

You can burn CD image with any CD burning software. Your CD will be bootable.

Floppy image can be written under Windows 2000/XP.

You may also decide to obtain just executables. You will have to extract MHDD files somewhere.

## First run. Some important information

Some people believe that MHDD is very difficult. This is because they suppose MHDD should be very simple and easy, «one-button» software, and when they run it for the first time they become disappointed. MHDD is not easy if you have no deep knowledge how disk drives work. If you want to get such knowledge you can use ATA/ATAPI standard: <http://t13.org>.

It is very important to understand that you have to spend several hours (minimum) before you will start understanding results made by MHDD. I strongly recommend trying a couple of good drives with MHDD before you start working with bad drives.

On the first run MHDD creates a new `./cfg/mhdd.cfg` file. Primary IDE channel is disabled by default. If you really want to enable it, please read this (look for warning message).

You will see drive selection menu. Please select any device you want. You can always call this menu by pressing SHIFT+F3.

Now you can press F1 and use whatever commands you want. Please be extremely careful when running MHDD first times.

Best commands to try first are EID, SCAN, STOP, CX and TOF. Some of them have shortcuts, for example F4 for SCAN.

Please also take a look at the registers. Any IDE/SATA drive should report DRIVE READY and DRIVE SEEK COMPLETE, so you will see DRDY and DRSC flags colored in blue. BUSY appears when drive has something to execute (read or write command, for example). Some flags such as WRITE FAULT and TRACK 0 NOT FOUND are obsolete, they never should appear. INDEX flag is obsolete too, but sometimes it can blink. DATA REQUEST (DREQ) flag is on when drive wants to receive or to send some data from/to the PC.

When you see ERROR flag (ERR) you can look at the error register where you can see what kind of error happened. See ATA/ATAPI standard for more information about registers and commands.

## Using MHDD Commands

### Scanning a Drive

Scanning of any device is possible only if it can be detected by ID/EID commands (or F2 key). To scan a drive type SCAN and press ENTER or use F4 key. You will see menu where you can adjust some settings. By default, start LBA is zero and end LBA is maximum possible value (last sector of the drive). All data-destructive functions (Remap, Erase Delays) are switched off by default.

Press F4 again to start the scan. MHDD scans drives by blocks. For IDE/SATA drives one block is 255 sectors (130560 bytes).

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## How MHDD scan works:

1. MHDD sends VERIFY SECTORS command with LBA number and number of sectors to verify as parameters
2. DRIVE raises BUSY flag
3. MHDD starts timer
4. After drive executes VERIFY command, it drops BUSY flag
5. MHDD counts the time and puts corresponding block on the screen. If error occurs MHDD prints corresponding letter which describes the error.

MHDD repeats steps 1—5 till the end sector. If you need the log of scan please check out log/mhdd.log file — everything is there.

If your drive has errors, first thing to do is to make full back up. Then you have to run ERASE command which erases every sector on your drive, and drive recalculates ECC fields of each sector. This helps to get rid of «software bad blocks». If that do not help, you have to run SCAN with REMAP option switched on.

If you see all blocks as errors, do not try to erase or remap sectors on your drive. You deal with service-area error which cannot be fixed by standard MHDD commands. If you need your data — the best option is to use a data recovery company.

## Getting SMART Attributes

You can type SMART ATT command or press F8 to get SMART attributes. What do they mean?

The most important thing is the raw value of «Reallocated Sectors Count» attribute, which says how many remaps are on the drive. Normally, you should always have zero there. If it is more than 50 — you have a problem. That means you have bad power supply, vibration, overheating or just broken hard disk drive.

Take a look at the temperature. The best values are between 20 and 40 degrees centigrade, but some drives do not report their temperature.

UDMA CRC error rate attribute means how many errors have happened during transferring data through IDE/SATA cable. You should normally have zero there. If it is not zero, you have to change your cable immediately. Also overclocking may result in increased error rate.

Other attributes usually are not so important. Please see ATA/ATAPI standard for more information about SMART attributes.

## Device Identify Commands

Try commands ID and EID to see some information about your drive.

Please see ATA/ATAPI standard for more information about HDD features and modes.

## Erasing Sectors or Whole Drive

You can use ERASE command to do this. If your drive is recognized by BIOS, MHDD will try to use BIOS functions to erase the drive. If you don't want MHDD to use BIOS to erase drives then use /DISABLEBIOS command line switch.

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## Cutting the Drive (size change)

Use HPA command to limit size of a drive. You will be asked about new MaxLBA number, just enter how many sectors you want to use. To uncut the drive, use NHPA command. Please repower the drive before using NHPA command. According to ATA/ATAPI standard, you can use HPA functions only once per drive's power cycle.

## Security Commands

Use PWD command to lock a drive with defined user password. According to ATA/ATAPI standard, you have to repower the drive to make password setting active.

There are two commands to unlock drives: UNLOCK and DISPWD. UNLOCK just unlocks a drive till the next power cycle. To disable password you have to UNLOCK drive first, then use DISPWD command to disable the password. You have to know the password to use unlock or disable password commands. UNLOCK and DISPWD will ask you which kind of password you will enter: master or user. For example, PWD command sets USER password.

Master password is set by manufacturer and can be used to unlock a drive.

## Reading Sectors to a File

You can read several sectors or whole drive to a file or to set of files. Just run TOF command, there is nothing difficult. MHDD skips bad sectors, if any. If you are planning to get more than 1 GB, it is better to use ATOF command (it just creates several files instead of one).

## Writing Sectors from File to the Drive

Use FF command to write sectors to the drive. It will ask you the number of the first LBA sector to write and how many sectors to write.

## Acoustic Management

Almost all modern drives support Acoustic Management. You can decrease noise produced by heads by increasing seek time. Use AAM command to adjust the noise.

## Device Configuration

You can view and change current drive configuration by using CONFIG command. It will allow you to view or set the maximum UDMA mode, Security support, SMART support, LBA48 mode support, AAM and HPA support etc. You can also cut or uncut the drive by using this command. Some manufacturers are using Device Configuration to reduce the size of a disk.

## Batches

You can write a simple batch file (see an example in BATCH directory) where you can describe «what to do». Press F5 to run a batch.

## Other MHDD Commands

Press F1 to find more MHDD commands to play with. Also it is a very good idea to use command MAN to get more detailed help on each command. Good luck!

## Command Line Switches

<code>/NOPINGPONG</code>	Disable some sounds
<code>/DISABLEBIOS</code>	Disable ERASE through BIOS
<code>/DISABLESCSI</code>	Disable SCSI engine
<code>/ENABLEPRIMARY</code>	Enable Primary IDE/SATA channel
<code>/RO</code>	Run MHDD on write-protected storage

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## Frequently Asked Questions

Q: Can MHDD see devices attached to additional PCI IDE/SATA adapters?

A: Yes.

Q: Where can I find all list of MHDD commands with descriptions?

A: Just run MHDD and try command "man".

Q: MHDD is very unstable (sometimes it crashes).

A1: You need to clear Read-Only attributes on MHDD.CFG, MHDD.EXE, MHDD.LOG, MHDD\*.\*. If this does not help, you can just delete all files except MHDD.exe and MHDD.hlp, and MHDD will create everything again.

A2: Check that you have enough free space on your media from which you are running MHDD.

A3: Check that you are NOT testing the same drive from which you are running MHDD (never do this!)

Q: What about MHDD under Windows?

A: I know that it is possible to run MHDD under any Windows with some limitations. For Win2k/XP you will need the USERPORT driver (google it). I do not recommend it though.

Q: I'm scanning a drive and seeing something like a chess board. Is this normal?

A: It is OK, you see delays when heads are moving to the next track.

Q: After I played with MHDD my drive became working very slow (about 3MB/S under Windows)

A: Check IDE pins on your HDD — you broke one of them when you played with IDE cables.

Q: Why MHDD cannot see my drive attached to Primary channel?

A: Check MHDD.CFG for something to enable primary channel (and also read the doc!). You can also use /ENABLEPRIMARY command line switch.

Q: What about MHDD and SATA?

A: There are no differences between IDE and SATA except the physical interface. MHDD works with SATA exactly as it works with IDE.

Q: MHDD does not see my drive.

A1: Check Q6 first

A2: If your drive is SLAVE, you have to switch it to MASTER first. I removed SLAVE-devices support from MHDD.

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A3: Actually, there is a way of accessing slave devices in MHDD. Press SHIFT+F3, and then look for master hard drive number on the same channel. For example, if the master hard drive number is "3", enter "4" to select slave drive on that cable.

Q: MHDD hangs while I am trying to detect my HDD.

A: It is a common problem with some third-party MHDD distributions. Please use original MHDD floppy and CD images.

Q: How can I fix delays on my HDD (red and brown blocks in MHDD)?

A: Use ERASE command in MHDD (it will erase the entire hard drive though), then run scan+erase delays ON, then scan+remap ON.

Q: Does MHDD Scan+remap kill my data?

A: Remapping with MHDD is safe to your data as long as you have not too much bad blocks (under 100).

Q: Does MHDD erase delays kill my data?

A: Yes, because it erases by 255-sectors blocks.

Q: Can I do sector-by-sector EraseWaits?

A: No, because it would be almost exactly the same as remap.

Q: Can I remap red or brown box?

A: No. But see Q10, that may help.

Q: I'm checking my disk with chkdsk or scandisk and they are reporting bads, but MHDD does not see any bad block. What happened?

A: Your drive had some bad blocks in the past and they were removed by MHDD or other software (or sometimes by the hard drive itself).

1. Use DiskEdit to remove bads from your file system

2. Try Partition Magic's "Bad sectors recheck"

3. Repartition your hard drive.

Q: MHDD does not see my HDD!

A: Try Shift+F3 (and please read the doc immediately!)

Q: MHDD does not see drives connected to my Promise SX4000 or 150TX2/TX4 board.

A: Sorry, MHDD will never see drives on such boards because they suck (they have a very different interface that does not allow MHDD to talk to the board).

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Q: I'm running MHDD from write-protected media (floppy/CD). Each time I exit MHDD i have error messages.

A: Use /RO command key when running MHDD.

Q: Why do I see my IDE/SATA controller twice when MHDD runs?

A: MHDD sees each IDE/SATA channel as different device (I made it this way for internal needs).

Q: What is the meaning of scan results?

A: Normally, you should not get brown and red blocks. If you have some, see Q above (about erase delays). If you have blocks marked as a letter ("A", "x", "S", "!" and so on) — those are bad blocks. If there is more than 20% of surface is covered with bad blocks, then it is a head crash. If your hard drive is 100% filled by bad blocks — then it is either a head crash, pcb damage or firmware issue. None of these failures are fixable with free software.

Q: While scanning a drive with MHDD I see letter W sometimes.

A: You are scanning with EraseDelays turned on, and W is appearing where MHDD erased a block of 255 sectors.

Q: While scanning a drive I see blue block.

A: You are scanning with Remap option turned ON and a remap attempt has just happened there.

Q: I have defects on my HDD, how do I remove them?

A: See Q "What is the meaning of scan results?" above.

Q: I have problems with installing/removing of HPA or DCO.

A1: Sometimes it happens when your drive is attached to PCI IDE/SATA controller. Please use chipset IDE/SATA controllers to play with HPA and DCO.

A2: Some modern motherboards use HPA feature to store some BIOS data on your drive in hidden place. They may block HPA commands to the hard drive.

Q: The size of my HDD is less than it should be. What can I do?

A: Check jumper settings. Check HPA setting with MHDD (try NHPA command). If that doesn't help, do the following:

Execute CONFIG command in MHDD, answer "y", then just press ENTER for each question.

There is a complete capacity restore guide available here: [http://blog.atola.com/restoring-factory ... -capacity/](http://blog.atola.com/restoring-factory-capacity/)

Q: How can I low level format (LLF) my drive with MHDD?

A: You can LLF your drive by using "erase" command.

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Q: Can I cut off the beginning of a drive?

A: Sorry, you can only cut the end of a hard drive surface (commands CONFIG and HPA).

Q: Can MHDD work with USB drives?

A: Theoretically yes. You have to find a driver which turns your USB device into SCSI (under DOS). Then MHDD can work with your device in SCSI mode. The driver is located here:  
[http://hddguru.com/content/en/software/... OS-Driver/](http://hddguru.com/content/en/software/...OS-Driver/)

There is also a very good boot floppy disk available here:

[http://hddguru.com/content/en/software/ ... Boot-Disk/](http://hddguru.com/content/en/software/...Boot-Disk/)

Q: I'm tired hearing these weird sounds in MHDD

A: Try command line switch /NOPINGPONG

Q: I'm running MHDD from a boot floppy/CD, where can I find logs/screenshots?

A: Bootable MHDD media creates a RAM disk and is runs from there. All logs are stored there too (on the RAM-disk).

Q: Can I somehow select a Slave device in MHDD? (I know that slave is not supported, but...)

A: You can. Press SHIFT+F3 to choose a drive. Slave-devices are not displayed, but you can choose them by entering even numbers. For example, to choose Primary Slave device, enter 2, to choose Secondary Slave device, enter 4. For drives which are attached to PCI host controllers, you have to select odd numbers.