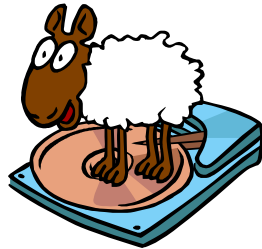


Miray Stand-Alone-Tool-Series



HDClone

Version 3.2

User's Manual



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1. INTRODUCTION

Thank you very much for choosing HDClone. We are always striving for offering you a software product, which meets your requirements as well as our own high ambitions. In case of having suggestions for improvement or not being satisfied with the software in certain aspects, we therefore kindly ask you to communicate the regarding criticism and suggestions to us at feedback@miray.de.

1.1. Chapter overview

1. Introduction: In this chapter, you find general information regarding this manual and the program. Particularly, it contains an overview of the available editions and their abilities.

2. Fields of application: By supporting physical copies, HDClone is suitable for many different areas of application. Here you find descriptions and hints for the most common areas of application of the program.

3. Supported hardware: In this chapter, you find a list of supported controllers and hard disks resp. media as well as information about which aspects to consider when using certain types of controllers or media.

4. Installation: For starting HDClone you need a bootable HDClone CD or floppy disk at first. This chapter describes how you create a bootable HDClone medium within few minutes by means of the installation package in case you have not already received the program on a bootable medium.

5. Program instructions: This chapter contains the actual manual for operating HDClone. It is a step-by-step description of how to operate the program for creating a copy with HDClone.

6. Working mode: Here you find useful descriptions and hints for gaining optimal performance when using HDClone with different types of media as each media type can have its very own characteristics.

7. Troubleshooting: In case you encounter any problems when using HDClone, you find detailed descriptions and support here. By means of these information you will be able to solve or bypass occurring problems in most cases.

8. Miscellaneous: In the last chapter you find miscellaneous information, particularly regarding our support and our license terms.

1.2. Character conventions

In this manual, angle brackets ('<' and '>') and italic type are used to depict a **key on the keyboard**, e.g. <Esc> for the escape key or <Return> for the return key. Some keys are represented by an according symbol, e.g. '↑' for the 'up'-key. Visual controls on the screen, particularly buttons are represented by brackets ('[' and ']') and italic type, e.g. [next], [back].

1.3. Features

HDClone lets you make physical 1:1 copies (clones) of hard disks and partitions. This ensures that the sector-by-sector copy is 100% identical to the original. This allows HDClone to make copies of hard disks regardless of the respective partitioning scheme, the used file system and the installed operating system(s). Thus HDClone is especially suitable for the tasks described in → 2. *Fields of application* as well as for many other tasks.

Note: The physical copying process of HDClone for exact 1:1 copies opens a lot of possible areas of application. Not all of them are always obvious, as some of HDClone's features are there to allow HDClone being a valuable tool even in special and extraordinary scenarios. They have already made HDClone a tool of unique value to many users in situations where no other program offered the necessary features.

1.4. Edition overview

There are different Editions of HDClone. They differ from each other by the amount of features they offer, particularly supported device types, performance and special options. The following table offers you a comparative overview of the editions and their features. Subsequent, there are short explanations referring to some of the topics listed in the table.

	Free	Basic	Standard	Professional	Enterprise
device support					
IDE/ATA/SATA hard disks ¹⁾	✓	✓	✓	✓	✓
hard disks > 128/137 GB ²⁾	✓	✓	✓	✓	✓
AHCI (SATA II)	✓	✓	✓	✓	✓
USB 1.1 (UHCI, OHCI)	✗	✓	✓	✓	✓
USB 2.0 (EHCI)	✗	✗	✓	✓	✓
CompactFlash on IDE ³⁾	✗	✗	✓	✓	✓
Firewire / IEEE1394 (OHCI)	✗	✗	✗	✓	✓
SCSI hard disks ⁴⁾	✗	✗	✗	✓	✓
copy modes ⁵⁾					
1:n copy	✓	✓	✓	✓	✓
n:m copy	✗	✓	✓	✓	✓
partition copy	✗	✓	✓	✓	✓
disk-to-partition backup	✗	✓	✓	✓	✓
MultiCopy (4x, 8x, 16x)	✗	✗	✗	✗	✓
DMA support ⁶⁾					
Multiword DMA	✗	✓	✓	✓	✓
Ultra-DMA 33	✗	✗	✓	✓	✓
Ultra-DMA 66/100/133	✗	✗	✗	✓	✓
special modes ⁷⁾					
SafeRescue mode	✗	✓	✓	✓	✓
verification mode	✗	✗	✓	✓	✓
FastCopy mode	✗	✗	✗	✓	✓
copy speed ⁸⁾					
up to 5 MB/sec	✓	✓	✓	✓	✓
up to 10 MB/sec	✗	✓	✓	✓	✓
up to 20 MB/sec	✗	✗	✓	✓	✓
up to 90 MB/sec and more	✗	✗	✗	✓	✓
up to 1000 MB/sec and more	✗	✗	✗	✗	✓
license scope ⁹⁾					
private use	✓	✓	✓	✓	✓
professionals/corporations	✗	✗	✓	✓	✓
technician license	✗	✗	✗	✓	✓

- 1) **SATA hard disks:** A necessary precondition is that they are connected to one of the SATA controllers supported by HDClone and that the controller is configured accordingly (→ 3.3.2. *SATA/SATA II controller*).
- 2) **hard disks > 128/137 GB:** For IDE/ATA/SATA hard disks with a capacity of more than 128 resp. 137 GB, HDClone supports the special 48-bit addressing scheme and thus can handle hard disks of up to 2048 GB.
- 3) **CompactFlash on IDE:** HDClone supports CF-media via TruIDE mode.
- 4) **SCSI hard disks:** A necessary precondition is that they are connected to one of the SCSI host adapters supported by HDClone (→ 3.4. *SCSI*).
- 5) **copy modes:** Detailed information about the different modes are to be found in chapter → 6. *Working mode*.
 - **1:n copy ('small-to-large' copy):** This mode is particularly interesting for migrating an entire operating system installation to another hard disk.
 - **n:m copy:** In addition to the 'small-to-large' copy, this mode also allows a 'large-to-small' copy and a 1:1 copy between hard disks of the same size.
 - **partition copy:** Allows to make a physical copy of single partitions.
 - **disk-to-partition backup:** Backing up an entire hard disk into a partition resp. restoring it from there.
 - **MultiCopy:** Mass-copying to up to 4, 8 or 16 target drives at a time, according to the stage of the Edition used: Enterprise Edition 4x, Enterprise Edition 8x, Enterprise Edition 16x (→ 6.5. *Mass copy (MultiCopy mode)*).
- 6) **DMA support:** Using DMA, data transfers will be accelerated (up to factor 40), in case of Multiword DMA with up to 16,7 MB/sec, in case of Ultra-DMA even with up to 133 MB/sec (→ 3.3.3. *Multiword-DMA and Ultra-DMA*).
- 7) **special modes:** HDClone knows special working modes to increase copy speed (*FastCopy*) and data security (verification, *SafeRescue*). Further information about this is to be found in chapter → 5.8. *Selecting the options*.
- 8) **copy speed:** Due to technical differences between the individual editions, there is an upper limit for the actually achievable copy speed of each edition:
 - ~ **5 MB/sec:** corresponding to PIO mode 2.
 - ~ **10 MB/sec:** corresponding to Multiword DMA mode 2.
 - ~ **20 MB/sec:** corresponding to Ultra-DMA mode 2.
 - > **90 MB/sec:** up to 133 MB/sec with Ultra-DMA mode 6, up to 300 MB/sec with SATA II.
 - > **1000 MB/sec:** Mass-copy via IDE with UltraDMA or SATA / SATA II to 16 target drives at a time.
- 9) **license scope:** see also chapter → 8.1. *Terms of license*.

2. FIELDS OF APPLICATION

HDClone is specialized on creating physical copies. Therefore HDClone offers particular advantages for copying resp. rescuing defective media (→ 2.2. *Data rescue*). In addition, HDClone is able to work independent from partitioning scheme, file system and operating system. This allows to copy entire operating system installations (→ 2.1. *Upgrading hard disks & migrating an OS*) or to be able to create an exact copy in case of unknown/proprietary file systems (→ 2.6. *Proprietary hard disk formats*). Altogether, HDClone covers a wide spectrum of possible applications by its universal copying technology. In the following you find descriptions of the most common areas of application of HDClone. The individual chapters contain instructions as well as further advice regarding accomplishment of the respective application.

Tip: HDClone allows you to copy data arbitrarily between all recognized types of media, particularly between different types of drives etc.

2.1. Upgrading hard disks & migrating an OS

Since HDClone works independent of file system formats and operating systems, you can use it to migrate entire installations, incl. the installed operating system, to another hard disk. This is especially useful if you want to migrate an existing installation to a new hard disk without having to install the operating system and applications once again. The media used as destination should be of the same size as the source media or larger to ensure that all data will be copied. For this type of application you can utilize both modes, → 6.1.3. *Hard disk on hard disk* as well as → 6.1.4. *Partition on partition*.

Note: Please take absolute care to have only one of the two hard disks connected after completion of the copying process and before starting the operating system. It should be connected to the same channel as the original hard disk, i.e. either remove the medium with the copy on it or connect it instead of the original medium.

2.1.1. Unused disk space

Additional disk space on the medium used as destination can be converted into a partition using the partitioning program *fdisk* or the *Computer Management* program (`C:\WINDOWS\system32\compmgmt.msc`) of Windows XP. It can then be used as an

additional virtual drive. You can also resize the copied partition so that it also uses the extra disk space of the destination medium, but this requires special tools.

2.1.2. Smaller destination media

In general, you can also copy a complete installation from a larger to a smaller medium. But then you should first downsize the partitions on the source medium with the help of according tools in such a way that they fit completely into the destination medium and are located at the beginning of the source medium. It possibly works also if you defragment the source media in such a way that all used data is situated at the beginning of the source medium and that the area containing the used data does not use more disk space than is available on the destination medium. This method is not absolutely reliable, but as the data on the source medium stays unchanged, it maybe worth an attempt.

2.2. Data rescue

In case of hard disks with defective areas it is especially important that they are being rescued to an intact medium before starting any recovery attempts. Otherwise, depending on the kind of defect, the recovery procedure may cause further defects resulting from the inherent exposure of this procedure. Of course, using HDClone also causes exposure for the hard disk. But the physical copying causes much less exposure than any other usage due to its linear operation, i.e. only continuous movement of the disk's heads. Furthermore, the option *SafeRescue* (→ 5.8.3. *General options*) is able to reduce exposure to an absolute minimum. In very critical cases, you can also just copy single partitions to reduce exposure for the medium even more (→ 6.1.4. *Partition on partition*). After having rescued the data from the defective hard disk, you can perform a recovery on the (functional) destination medium without having to fear any further damages.

Note: Only a physical copy allows to rescue all of the data, except the irrecoverable areas, even if there are logical errors resulting from defective areas. The logical errors can be corrected in most cases by the recovery, but missing data could not be restored. Hence, the data should be copied to a destination medium of the same size or a larger destination medium in either case (→ 6.2. *Size differences*).

Tip: If you do not have an appropriate unused hard disk at hand for an urgent rescue, you can temporarily save the damaged hard disk to a partition of the according size

on the destination disk. (→ 6.1.5. *Hard disk on partition*) or only save certain partitions from the damaged hard disk (→ 6.1.4. *Partition on partition*).

2.3. Installation backup

HDClone also provides the possibility to create a local backup of an entire system installation. If required, a simple restore from the backup partition brings the system installation back into its original state – without any ballast, faulty program installations, viruses etc. For this purpose, create an unused partition in addition to the system partition of at least the same size to serve as a backup partition. After having finished system installation, copy the system partition to the backup partition using the *partition on partition* mode (→ 6.1.4. *Partition on partition*). Then you can restore the original system partition at any time by making a copy in the opposite direction.

Note: Before restoring from the backup partition, save your work files and other data from the system partition or store them on a third partition from the outset.

2.4. Mass copying

The Enterprise Edition of HDClone is specially designed for creating up to 16 copies at a time. Therefore the Enterprise Editions especially suitable for industrial duplication of pre-installed software (e.g. on hard disks or on CompactFlash media etc.) or for creating several identical operating system installations (→ 2.5. *Master installations*).

2.5. Master installations

2.5.1. Duplicating system installations

HDClone is also optimally suitable for distributing resp. duplicating master installations (→ 2.4. *Mass copying*). Copy a complete master hard disk or master partition to the destination medium to create a complete installation there and to have it ready for action.

Note: When duplicating Windows XP installation, we recommend to run the tool *sysprep* (contained in Windows) before cloning. Further information on this is to be found at Microsoft at <http://www.microsoft.com>, search for *'sysprep'*.

2.5.2. Handling several master installations

Especially if you want to handle several different master installations, the copy modes *hard disk on partition* (→ 6.1.5. *Hard disk on partition*) and *partition on hard disk* (→ 6.1.6. *Partition on hard disk*) are very useful. For this purpose, use a hard disk as container and create one partition for each master installation on it. Afterwards, use the mode *hard disk on partition* to make a copy of each master hard disk to one of the partitions on the container hard disk. Now you can use the mode *partition on hard disk* to create a complete system installation from the according partition on any system.

2.6. Proprietary hard disk formats

HDClone is capable of copying arbitrary hard disk formats. Especially for hard disks installed in proprietary systems (e.g. studio technology, medical technology etc.) there are often no programs besides system software, which can read the data on these media. HDClone can rescue this data or moving it to a new medium without any problem. The best way is to copy the original medium to a destination medium of the same or larger size. A destination medium smaller than the original medium should not be used as it cannot be assured that all relevant user data will be transferred in this case.

Note: In case of unknown or proprietary (non-standardized) formats, always copy the entire original medium. Even if HDClone reports partitions, it cannot be assured that this information is correct due to the proprietary hard disk format. You should only use the *partition on partition* mode if you know for sure that the partitions are reported correctly.

2.7. Forensic data securing

HDClone is also very suitable for securing data for forensic purposes as really all data from a hard disk is copied, including data that has possibly been hidden or deleted. This data cannot be reached any more via the usual file system mechanisms. Therefore it will be useful to create a copy in *hard disk on hard disk* mode (→ 6.1.3. *Hard disk on hard disk*) before performing a detailed forensic analysis of secured media. This allows you to make changes to the copy during analysis without endangering the original medium by altering its content.

Note: As in case of securing data it may be unclear which areas of the medium are actually used, especially concerning hidden or deleted data, it is always recommend-

able to create a copy of the entire medium to a destination medium of the same or larger size.

3. SUPPORTED HARDWARE

This section contains detailed information about the hardware and hardware standards supported by HDClone. Furthermore, there are special references to be found regarding the usage of certain device types.

3.1. Overview

Subsequent, you find a listing of the hardware requirements concerning the hardware used to run HDClone as well as additionally supported devices. Please note that support for a certain hardware may depend on the edition used (→ 1.4. *Edition overview*)

Hardware Requirements

- PC 80586 or higher, 90 MHz, 32 MB RAM, VGA (optimal: VESA support)
- keyboard: standard, PS/2 or USB
- mouse: serial, PS/2 or USB (optionally, can be operated with keyboard only)
- bootable floppy or CD drive

Supported Media

- IDE/ATA hard disks (also > 128/137 GB), CompactFlash via IDE ¹⁾
- SATA hard disks
- SCSI hard disks
- USB hard disks (internal & external)
- Firewire hard disks (internal & external)
- USB sticks/keys ²⁾, CompactFlash I ³⁾, CompactFlash II ³⁾, MicroDrive ³⁾, SD/MMC ³⁾
- xD-Picture Card ³⁾, Memory Stick ³⁾, Memory Stick PRO ³⁾, Memory Stick DUO ³⁾

¹⁾ CompactFlash media with TrueIDE support

²⁾ must support the USB-Mass-Storage-Class protocol

³⁾ via an appropriate USB card reader

Supported Controllers

- PCI IDE controller
- Bus master IDE controller
- PCI SCSI adapter (→ 3.4.2. *Compatibility*)

- SATA controller with IDE interface (→ 3.3.2. SATA/SATA II controller)
- SATA II controller with AHCI interface (→ 3.3.2. SATA/SATA II controller)
- USB UHCI & OHCI controller (USB 1.1)
- USB EHCI controller (USB 2.0)
- IEEE1394 OHCI controller (Firewire)

Advice: The devices listed above represent the whole spectrum of hardware supported by HDClone. Detailed information about which devices are supported by your edition of HDClone is to be found in chapter → 1.4. *Edition overview*.

3.2. Compatibility

HDClone has been developed for the hardware listed in → 3.1. *Overview* and has been tested on a multiplicity of according devices. HDClone also works well with many other devices. You may use the Free Edition of HDClone to easily check out in advance and for free whether the device in question is supported (→ 3.2.1. *Compatibility test*).

3.2.1. Compatibility test

You can use the Free Edition of HDClone to find out easily if your hard disks, other media as well as the associated controllers are supported properly, even if a higher edition is required to use them with HDClone. For this purpose, simply start HDClone Free Edition on the respective PC, chose a *hard disk on hard disk copy* and move on to the source drive selection (→ 5.6. *Selecting the copying mode*). All drives displayed there as well as the associated controllers have been recognized by HDClone and are supported by one of the available editions. Which edition will be necessary to utilize a certain device type can be seen from the info box at the right side of the list box when you select the regarding drive (→ 5.7.4. *Information on the drive*).

Note: Please ensure that you connect the needed USB devices before starting the program to ensure that they are recognized correctly (→ 5.1. *Preparing steps*).

3.2.2. Standards

To be able to support as many devices as possible, HDClone implements the effective standards for the appropriate device types. Device support in HDClone primarily refers to the standards applicable to the appropriate device type. In addition, we perform ex-

tensive tests with each device type. Those test also reveal that there is a number of devices, which themselves implement their respective standard only insufficiently or even inaccurately. Furthermore, it is possible that some problems occur in certain hardware configurations, usually in certain combinations of controller and device. If possible, HDClone tries to support even such devices and to bypass the according deficiencies of the hardware. However, these kinds of problems can not always be bypassed. Hence even extensive tests cannot completely prevent that a problem appears in your special hardware configuration. In most cases this can be solved by setting the options appropriately (→ 5.8. *Selecting the options* and → 7. *Troubleshooting*). In case of even this does not work, our support team (→ 8.5. *Support*) will be there to assist you with solving the problem.

3.3. IDE/ATA/SATA

In principle, HDClone supports all IDE/ATA/SATA hard disks. A necessary precondition is, that they are connected to one of the IDE/ATA/SATA controllers supported by HDClone (→ 3.3.1. *IDE/ATA controller* and → 3.3.2. *SATA/SATA II controller*).

3.3.1. IDE/ATA controller

HDClone supports standard IDE controller (ISA) and PCI IDE controller. These may be (internal) onboard controllers as well as (external) PCI/ISA adapter cards. In case of ISA/Standard IDE controllers, the first two channels are scanned for hard disks. HDClone recognizes available PCI IDE controllers automatically and scans them for connected hard disks.

Note: If there are one or more PCI IDE controllers available in the system, ISA controllers that are possibly present, too, will not be taken into account.

Regarding the *PCI IDE controllers* supported by HDClone, this refers to a standardized programming interface, which is supported by a large majority of IDE controllers. Nevertheless, there are also others, especially external PCI hard disk controllers, which implement a different, usually proprietary interface. They are often also called “IDE controllers”, as they allow IDE hard disks to be connected. Since ‘IDE’ stands for a programming interface (program↔controller) as well as for a hardware interface (controller↔hard disk), it results in a double meaning. Refer to → 3.2.1. *Compatibility test* to determine whether your PCI controller is compliant with the PCI IDE standard).

3.3.2. SATA/SATA II controller

Precondition for the support of SATA drives is an SATA controller with IDE interface or an SATA II controller with AHCI interface. All popular chipsets from Intel with ICH-5/-6/-7 incorporate such an IDE-compatible SATA controller. Regrettably, many other SATA controllers only offer a proprietary programming interface. Nevertheless, it may be possible in case of onboard SATA controllers to activate a compatibility mode in BIOS setup, which would allow HDClone to access the SATA controller. As for SATA II controllers, many models already implement the AHCI interface supported by HDClone.

Tip: With the Free Edition of HDClone you can easily check out whether your SATA or SATA II controller is supported (→ 3.2.1. *Compatibility test*). Connect at least one SATA drive and start HDClone. If the SATA drive is recognized, HDClone also supports the associated SATA/SATA II controller.

Note: It might possibly be necessary to adjust the SATA settings in BIOS. As mode of operation, “*IDE*”, “*ATA*”, “*compatible*” or “*AHCI*” should be chosen, but in no case “*RAID*” or “*SATA*”. Additionally it may be necessary to set the controller configuration to *combined*, especially for allowing simultaneous use of IDE and SATA hard disks. In this case there are only ports 0 and 2 resp. 1 and 3 available for SATA. Please connect the SATA hard disks accordingly in this case.

3.3.3. Multiword-DMA and Ultra-DMA

HDClone automatically recognizes and uses bus master IDE controllers, which allow data rates up to 133 MB/sec resp. 7.8 GB/min. Hereby, Multiword DMA (up to 16.7 MB/sec) as well as Ultra-DMA (UDMA) are supported. This can increase achievable data transmission rates by a multiple higher of the rates that can be achieved without DMA (in PIO mode). HDClone recognizes automatically, whether controller and hard disk support DMA and then automatically selects the fastest usable mode (Multiword DMA or Ultra-DMA 33/66/100/133).

Note: Take into account that both, hard disk *and* IDE controller have to support a certain DMA mode. If the actually achieved speed values do not match the technical data of a hard disk, the reason may be that the IDE controller only supports lower modes. Furthermore, the achievable values also depend on the physical abilities of the hard disk, i.e. a hard disk with UDMA-6 (theoretically 133 MB/sec) currently achieves an actual transfer rate of about 60 MB/sec.

3.3.4. Bus master IDE controller

Precondition for using DMA mode is that the attached PCI IDE controller also supports the Bus master IDE standard. This is the case for most of the established internal and external IDE controllers. Whether your PCI IDE controller supports Bus master IDE can be determined by means of the program **PCISniffer**, if necessary, which can be downloaded for free at <http://www.miray.de/download/sat.pcisniffer.html>. The field *Classcode* in PCISniffer has to contain the value *01018x* (x = arbitrary) for the respective PCI IDE controller.

Note: For using Bus master IDE, the settings and initializations made in and by the PC's system BIOS play a major role. In case of HDClone having problems with utilizing DMA, it is likely that certain BIOS settings have to be accommodated accordingly. (→ 7.4.3. *Problems with DMA*).

3.3.5. Speed

The speed that can be achieved with DMA always depends on the physical abilities of the regarding hard disk. The following rough classification shows the approximate speed that can be expected by a certain drive type:

Type	Age	Speed
older drives	about 5-10 years	about 1-10 MB/sec
newer drives	about 2-5 years	about 10-30 MB/sec
top model	about 0-2 years	about 30-80 MB/sec and more

3.4. SCSI

In case you have an edition of HDClone which also supports SCSI hard disks, the following chapter provide important information regarding utilization and compatibility of SCSI drives and controllers.

Note: As HDClone embeds original driver code of the hardware manufacturers, Miray Software has no influence on actual compatibility. Hence, the following statements are of informative nature only, are based on specifications of the manufacturer and are not legally binding (→ 8.3. *Disclaimer*).

3.4.1. Utilization

You can use HDClone with SCSI hard disk in the same way as with any other media. HDClone automatically recognizes supported SCSI controllers and connected SCSI hard disks at program start and displays them, along with other recognized media, in the according selective lists.

Note: You can also copy data from SCSI hard disks to any other kinds of media (→ 2. *Fields of application*). This is especially important for the purpose of data rescue or if there is no adequate SCSI destination medium at hand, as any arbitrary medium can be used for (temporarily) storing the regarding data.

3.4.2. Compatibility

In principle, HDClone supports all SCSI hard disk drives. Precondition is that they are connected to a SCSI controller supported by HDClone. Currently, HDClone supports the popular Narrow-, Wide-, Ultra- und Ultra-Wide-SCSI controllers from Adaptec.

Tip: Whether your SCSI controller is supported can be determined easily with the Free Edition of HDClone (→ 3.2.1. *Compatibility test*). Connect at least one SCSI drive to the SCSI bus and start HDClone. If the SCSI drive is being recognized then HDClone also supports the SCSI controller.

3.4.3. Manufacturer information

According to information from the manufacturer, the drivers used in HDClone currently support the following SCSI controllers:

- Adaptec **AHA-2930U**
- Adaptec **AHA-2940 Ultra**
- Adaptec **AHA-2940UW**
- Adaptec **AHA-2940AU**
- Adaptec **AHA-2944UW**
- Adaptec **ASC-19160**
- Adaptec **ASC-29160**
- Adaptec **ASC-29160LP**
- Adaptec **ASC-29160N**
- Adaptec **ASC-39160**

3.4.4. Driver information

According to information directly from the drivers, they support a number of other SCSI controllers, too, which are partly constructed as onboard chipset (AIC) and partly as

adapter cards (AHA, ASC). They can be recognized definitely by their respective PCI vendor ID and PCI device ID, which are listed in the following table.

Vendor	Model	Device	Vendor	Model	Device	Vendor	Model	Device
9004h	AHA-2930U	3860h	9004h	AIC-7860	7860h	9005h	AHA-3940/3950U2x	0050h
"	AHA-2930CVAR	3868h	"	AIC-7895	7895h	"	AHA-3950 U2x	0051h
"	"	3869h	"	AIC-7880	8078h	"	AIC-7896/7 U2	005Fh
"	AHA-4944(U)W	3B78h	"	AHA-2940U(W)	8178h	"	AIC-789x	006xh
"	AIC-755x	5x75h	"	AHA-3940U(W)(D)	8278h	"	"	007xh
"	AIC-785x	5x78h	"	AHA-2944UW	8478h	"	AIC-7892(A/B) U160	008xh
"	AIC-7560	6075h	"	AHA-3944U(WD)	8578h	"	AIC-789x	009xh
"	AIC-786x	6x78h	"	AHA-4944UW	8678h	"	"	00Axh
"	AIC-7870	7078h	"	AIC-7887	8778h	"	"	00Bxh
"	AHA-2940(W)	7178h	"	AIC-7888	8878h	"	AIC-7899(A) U160	00Cxh
"	AHA-3940(W)	7278h	"	AHA-4944(U)W	EC78h	"	AIC-789x	00Dxh
"	AHA-2944	7478h	9005h	AHA-2940/2950U2W	0010h	"	"	00Exh
"	AHA-3944(W)	7578h	"	AIC-789x	001xh	"	"	00Fhx
"	AHA-4944(U)W	7678h	"	"	002xh	"	AHA-2930U2	0180h
"	AIC-7877	7778h	"	"	003xh			

The IDs of your respective controllers can be determined by means of the program **PCISniffer**. At <http://www.miray.de/download/sat.pcisniffer.html> you can download it for free from the Miray homepage. For the regarding PCI SCSI controller, the values displayed by PCISniffer for the fields *Vendor ID* and *Device ID* have to match the values specified above for your SCSI controller.

3.5. USB

If your edition of HDClone also supports USB storage media, the following chapters contain important information regarding utilization and compatibility of USB storage media and controllers.

Note: Please take care to connect USB devices already before starting HDClone (→ 5.1. *Preparing steps*) and if possible directly to the PC resp. to the USB controller (→ 3.5.3. *Hubs*).

3.5.1. Mass-Storage-Class

USB storage media that is intended to be used with HDClone has to support the *USB-Mass-Storage-Class-Protokoll*. This is an official standard, which is supported by al-

most all current USB sticks, USB card readers, USB hard disks etc. If you are not sure if a certain USB storage medium is supported by HDClone, you can check this out easily and for free in advance by means of the Free Edition (→ 3.2.1. *Compatibility test*).

3.5.2. UHCI, OHCI and EHCI

Regarding USB devices, it is crucial that HDClone supports the respective USB controller. HDClone is capable of all three common USB standards, UHCI and OHCI for USB 1.0/1.1 as well as EHCI for USB 2.0. In the area of standard PCs, all current USB controllers, onboard controllers as well as adapter cards, offer one of these three interface standards. In case you are not sure though whether your USB controller is supported by HDClone, you can check this out easily and for free in advance by means of the Free Edition (→ 3.2.1. *Compatibility test*)

3.5.3. Hubs

USB devices usually may also be connected via a USB hub. Nevertheless, for achieving the highest possible transfer rate, it is recommended to rather connect them directly to the PC resp. to the USB controller.

3.6. Firewire (IEEE1394)

If your edition of HDClone supports Firewire, you can connect arbitrary Firewire drives or card readers. Connected devices must support the “Serial Bus Protocol” (SBP) in order to be recognized and operated correctly by HDClone.

Note: Please take care to connect Firewire devices already before starting HDClone (→ 5.1. *Preparing steps*) and if possible directly to the PC resp. to the Firewire controller.

4. INSTALLATION

4.1. Introduction

HDClone does not need an installation in the usual sense. In case you do not already have HDClone available on a bootable medium (→ 4.1.1. *Bootable medium*), it is necessary to create a bootable HDClone medium before using HDClone for the first time (→ 4.1.2. *Software package*).

4.1.1. Bootable medium

In case you have HDClone already available on a bootable medium, you can start and use the program immediately on any PC and without any preceding installation, as described in chapter → 5.2. *Starting the program*.

Note: It is possible that, although you have HDClone on a physical medium, it may not be in a bootable form but rather as an installation package. In this case it is also necessary to create a *bootable* medium at first, according to the subsequently provided descriptions.

4.1.2. Software package

As far as you do not have HDClone on a bootable medium already, you have to create one before using HDClone for the first time. The software package, which you should have obtained in this case, contains the files needed for this purpose. The following chapters describe how to create a bootable medium. The required procedure can be different according to the media type or operating system used. The bootable medium created in this way then can be used to start HDClone on any PC without any further installation (→ 5.2. *Starting the program*).

4.2. Installation with Windows

The HDClone software package contains an installation program for creating a bootable floppy disk or CD/DVD with only few mouse clicks. To use the installation program, please extract all files of the installation package into an empty folder. Then execute the file **install.exe** from this folder.

4.2.1. Installation interface

When starting the installation program the main window appears (→ *fig. 1*).

- If you want to create a **bootable floppy disk**, choose the desired drive at 'Floppy drive' and click on [*Create Floppy*].
- To create a **bootable CD/DVD**, choose the desired drive at 'CD/DVD writer' and click on [*Create CD/DVD*].

Follow the instructions and wait until the installation program announces successful creation of the bootable medium. Then click on [*Exit*]. Afterwards, please proceed with chapter → 5. *Program instructions*.



Fig. 1: Main window of the installation program

Note: When creating a CD/DVD, please *always* use a new, empty blank CD/DVD. Otherwise there may be problems when starting HDClone.

4.2.2. CD/DVD writer not selectable

It is possible that there is no drive offered for selection at 'CD/DVD writer' although a CD/DVD writer is available on the system. In most cases this results from already installed software for the CD/DVD writer (e.g. drivers for direct access to the CD/DVD writer with Windows Explorer). It "reserves" the drive in a way that the installation program cannot access it. If possible, deactivate or uninstall the CD/DVD writer software. As an alternative, please create a bootable CD/DVD from that ISO image which is also contained in the software package (→ 4.3.2. *Creating a bootable CD/DVD*).

4.3. Installation with other operating systems

4.3.1. Creating a bootable floppy disk

You can also create a bootable HDClone floppy disk without the installation program with any operating system. For this purpose, the HDClone software package contains a

floppy disk image in the file **hdclone.img**. You can create a bootable 3.5"/1.44MB floppy disk from this image with any appropriate disk imaging program.

Tip: Under UNIX and Linux you may use the tool *dd*, which is available on these systems, with the following syntax: *dd if=hdclone.img of=/dev/fd0*.

After having created a bootable floppy disk, you can start HDClone on any PC as described in chapter → 5. *Program instructions*.

4.3.2. Creating a bootable CD/DVD

The HDClone software package contains a so called *ISO image* in the file **hdclone.iso**. It can be used to create a bootable HDClone CD with any operating system using a CD writing software of your choice as far as it supports creating CDs from an ISO image. Further information can be found in the manual of your CD writing software.

- Extract the file **hdclone.iso** from the HDClone software package.
- Start your CD writing software and choose 'Create CD from image file' (or similar, according to the respective CD writing software)
- Specify the file **hdclone.iso** as image file.
- Insert a blank CD into the according drive.
- Write the CD.

Tip: The easiest way of creating a bootable HDClone CD under Linux is using the software tool *cdrecord* with the following syntax: *cdrecord hdclone.iso*.

After having accomplished these steps you have created a bootable HDClone CD. From this CD you can start HDClone directly on any PC with a bootable CD/DVD drive as described in → 5.2. *Starting the program*.

Note: Generally the instructions provided above for creating a bootable CD using the ISO image can also be adopted to DVDs. However, some CD/DVD writing software refuses writing an ISO image to a DVD. The HDClone installation program (→ 4.2. *Installation with Windows*) for example also writes DVDs without any problem. Booting from a DVD created this way also works smoothly.

5. PROGRAM INSTRUCTIONS

The following chapters give a detailed description on how to operate HDClone, from the start to the end.

Note: According to the edition you use, there can be deviations between the capacities described or illustrated herein and the capacities supported by your edition. If one or several of the capacities of the program described below cannot be used in your edition, you can check in → *1.4. Edition overview* whether your edition supports the respective feature.

5.1. Preparing steps

If you want to use USB devices for the following copying process and your edition of HDClone supports USB, connect these devices before starting HDClone and leave them connected until the copying process is finished. Otherwise it is not guaranteed that HDClone recognizes them correctly. Do not use a USB hub to connect USB storage devices, always connect the USB storage devices directly to the USB controller or the PC case.

Note: To start HDClone, you need a bootable HDClone CD or floppy disk. If you don't have HDClone on a bootable storage device, you can create such a device as described in chapter → *4. Installation*.

5.2. Starting the program

Insert the bootable HDClone CD or floppy disk into the corresponding drive. Switch on the computer or reboot it. Make sure that the BIOS boots from the respective floppy disk or CD drive. HDClone is then started automatically from the CD or floppy disk and the program screen appears.

Hint: For troubleshooting loading problems of HDClone please view chapter → *7.1. Load errors*.

5.3. Program screen

The HDClone program screen (→ *fig. 5*) contains two fields in a lighter blue. They are the 'active' area of the program where all information is shown and all operation steps are executed.

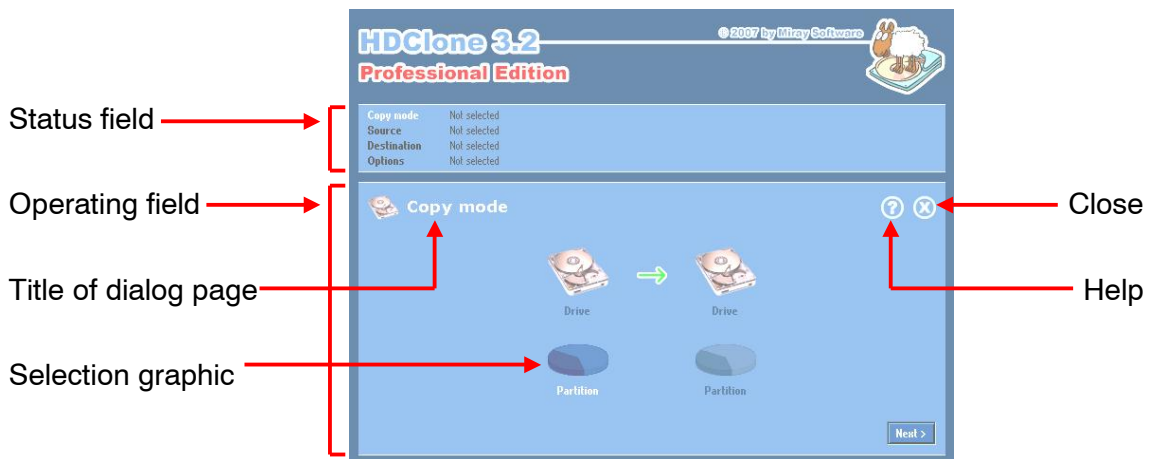


Fig. 5: Program screen

5.3.1. Status field

The upper field is the status field (→ *fig. 5*). It shows the parameters selected for the copying process (*copying mode, source, target and options*). Thus you see at any point of the program which parameters you have already selected. Furthermore, the right side of the status field also shows license information.

5.3.2. Operating field

The lower field is the *operating field* (→ *fig. 5*). In the upper left of the operating field is the title of the currently shown dialog page together with a corresponding symbol. In the upper right are two general operating elements: with the Help button [?] you can call up the interactive help at any point of the program (→ 5.5. *Help*). With the Close button [X] you can end the program at any time (→ 5.11. *Ending the program*). At the bottom of the operating field, you find the buttons [Next] and [Back], with which you can go to the next or previous dialog page.

5.4. Operation

To create a copy, you are led through five consecutive dialog pages where you can select the individual parameters for the copy and start and control the copying process. These five dialog pages are shown in the *operating field*.

5.4.1. Graphical operating elements

To control the program, HDClone knows different operating elements (→ fig. 6). The names which are used within this manual to designate the different elements are listed and illustrated by examples in the following illustration.

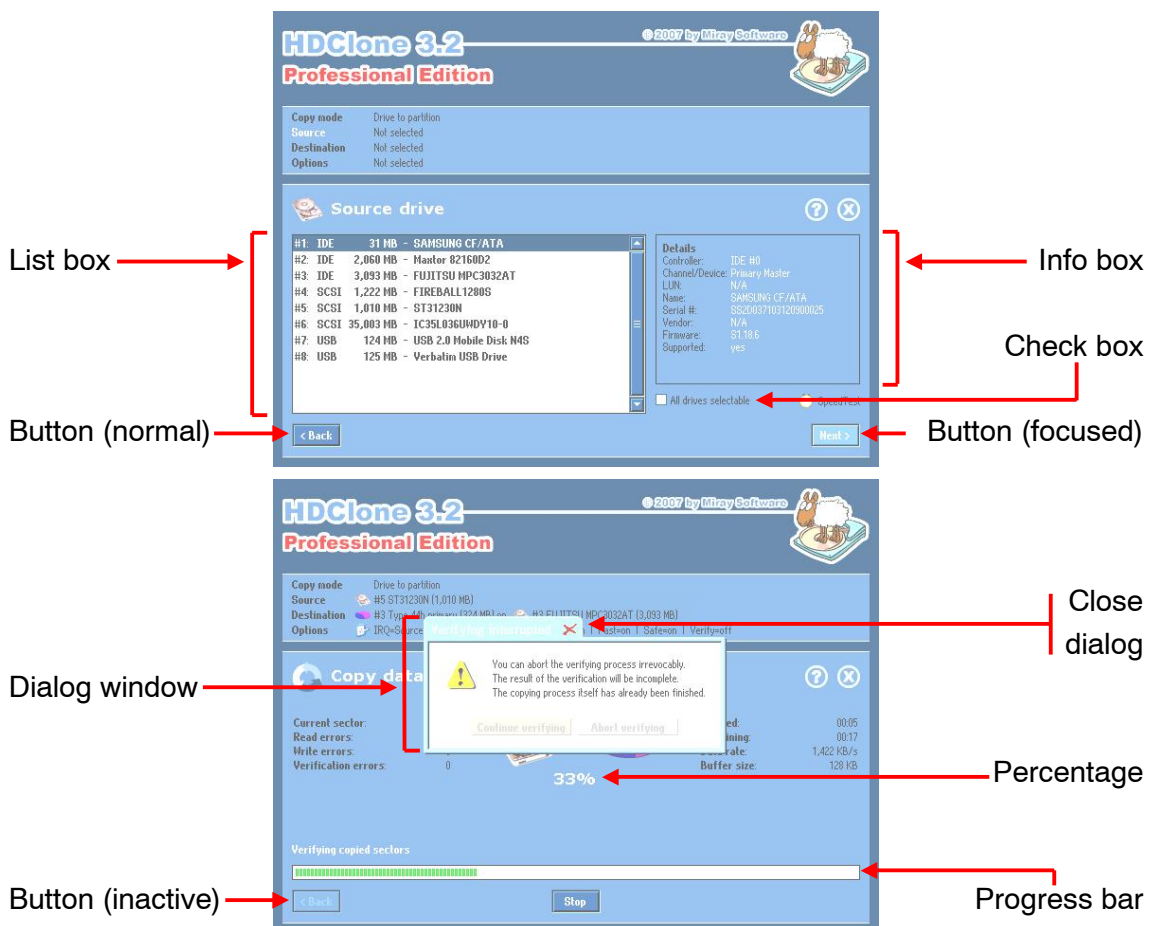


Fig. 6: Graphical operating elements

5.4.2. Operation with keyboard and mouse

HDClone is operated by keyboard and mouse. It is also possible to operate the program exclusively by keyboard or exclusively by mouse.

5.4.2.1. Keyboard operation

The operation with the keyboard always refers to the respectively focused graphical element. This element is highlighted by color, brightness, or an additional frame. With the tabulator key you can switch the focus in turn to the other operating elements. The following control keys have a function when operating the keyboard:

Key	Operating element	Function
<Tab>	(all)	Switch to the next element
Arrow keys (←/→/↑/↓)	List field Selection graphic	Select list element Highlight element
<Space key>	Button Selection graphic Link	Press button Select highlighted element Show link target
<Return>	Knopf Link	Press button (in dialog windows only) Show link target
<Esc>	Window (in operating field)	Close windows (only windows with x in the title) Close HDClone

5.4.2.2. Mouse operation

Operating HDClone with the help of a mouse is done according to the 'point and click' principle. The right mouse key has no special function. HDClone does not use drag-and-drop.

5.5. Help

You can open a context-related help window at any point of the program by pressing the key <F1> or the [?] symbol in the upper right corner of the operating field (→ fig. 5). The help gives you useful hints on the current program screen. The underlined text links in the help window enable you to jump to other help topics at any time.

Note: The program help is designed to give you useful hints when using the program. The help is no complete program instruction. That is why you should use this instruction especially when you have problems or need extensive information on a topic.

5.6. Selecting the copying mode

You can select the desired copying mode on the first dialog page (→ *fig. 6*). You have four options altogether. In all cases, a physical 1:1 copy of the selected source is created. The following table provides a short overview on the available options. You find a detailed description of the copying modes, their working mode and effect in chapter → *6. Working mode*.



Fig. 7: Selecting the copying mode



Hard disk on hard disk

Creates the classical physical 1:1 copy of a hard disk (→ *6.1.3. Hard disk on hard disk*).



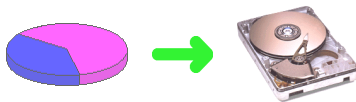
Partition on partition

Creates a physical 1:1 copy of an individual partition (→ *6.1.4. Partition on partition*).



Hard disk on partition

Backup of a complete hard disk (→ *6.1.5. Hard disk on partition*).



Partition on hard disk

Restore of a complete hard disk (→ *6.1.6. Partition on hard disk*).

Note: The copying modes *hard disk on partition* and *partition on hard disk* work physically, too. For this reason, it is not possible to copy a functioning hard disk installation onto a partition and to use it there. The installation has rather to be copied back onto a hard drive to be able to be used. The partition serves only as a container for the hard disk data. The same applies for copying a functioning partition onto a hard disk. For

further information on these copying modes please consult chapter → 6.1. *Copying modes*.

After having selected the copying mode, you go to the next step by pressing [next] in the lower right corner of the operating field (→ 5.7. *Selecting data source and target*).

Already when selecting the copying mode, HDClone starts the recognition of connected devices and drives. If the recognition is not finished yet, a corresponding note is faded in before the next dialog page will be shown. This can take up to one minute or more. The time needed also depends on the number of drives connected. If it takes more than five minutes, you can assume that there is a technical problem. In this case you find further information in chapter → 7. *Troubleshooting*.

5.7. Selecting data source and target

In the two following steps, you select the data source and the target for the copying process. The left half of the operating field shows a selection list. On the right side is an info box containing details on the currently selected element. According to the selected copying mode, you can select a whole hard disk or a partition. The following two sub-chapters give you more detailed information. After having selected the data source in the first step, a similar looking dialog page appears for the selection of the target. After these two steps, you come to the selection of the options (→ 5.8. *Selecting the options*).

5.7.1. Selecting hard disk

When selecting a source or target *hard disk*, you see the devices recognized by HDClone in the selection list. The info box beside the selection list shows more details on the selected element (→ 5.7.4. *Information on the drive*).

Select the desired hard disk. You confirm your selection by pressing [Next] in the lower right corner of the operating field and go to the next step.



Fig. 8: Selecting a source hard disk

5.7.2. Selecting partition

When selecting a source or target *partition*, the recognized hard disks and the partitions found on them are shown in the selection list. The partitions belonging to a hard disk are listed below it in an indented form. The hard disks themselves cannot be selected. The frame with the details on the right side of the selection list shows details concerning the disk on which is the currently selected partition.



Fig. 9: Selecting a target partition

Select the desired partition. You confirm your selection by pressing *[Next]* in the lower right corner of the operating field and go to the next step.

5.7.3. Deactivated list entries

There are four cases in which entries in the selection list for source or target are deactivated and therefore cannot be selected:

- In the selection dialog for a source or target *partition*, the list entries for the corresponding hard disks are always deactivated because a partition but not a hard disk is to be selected.
- Since source and target must not overlap, the already selected source *hard disk* resp. the hard disk that contains the source *partitions* is deactivated when selecting a target *hard disk*.
- When selecting a target *partition*, the already selected source partition resp. all partitions of the source hard disk are deactivated.
- If HDClone recognizes drives, but the edition used does not support them, these drives resp. the partitions created on them are also deactivated. In order to use HDClone for these drives, you need a higher edition. For further information on the supported drives and the capacities of the different editions of HDClone, please consult chapter → 1.4. *Edition overview* or the HDClone website at <http://www.hdclone.de>.

Tip: To see the details of drives which are recognized by HDClone but not supported by your edition (→ 1.4. *Edition overview*), activate the checkbox 'All drives selectable' below the details. Then you can also select these drives to show the corresponding

details. You can see under the point 'Supported' from which edition on the respective drive is supported.

5.7.4. Information on the drive

On the right side of the selection list for the source hard disk/source partition resp. the target hard disk/target partition, you find a frame containing details on the currently selected hard disk. When selecting a partition, the data of the corresponding hard disk is shown here. The following information is available:

Controller	Type (<i>IDE/SCSI</i>) and number (0-15) of the controller
Channel/Device	Channel used by the drive (<i>primary/secondary</i>) and Connection of the drive (<i>master/slave</i> resp. 0-15)
LUN	Logical number of the drive (0-255)
Name	Name of the device (according to the internal drive data)
Serial number	Device number (according to the internal drive data)
Manufacturer	Name of the manufacturer (according to the internal drive data)
Firmware	Version of the firmware (according to the internal drive data)
Supported	Drive type supported by the edition used

Note: 'Yes' appears under the point 'Supported', if the edition you use supports the selected drive. Otherwise HDClone indicates here from which edition on that drive is supported.

5.7.5. SpeedTest

On the lower right of the operating field you can find the trigger for a speed test, labeled as 'SpeedTest'. Here you can start a speed test for the currently selected medium. Since it is only a pure reading test, all data on the drive stays unchanged. The test shows you the speed which can be achieved with the currently selected medium. In the first line it serves as an orientation guide for examining whether it would be reasonable to use a higher edition on the tested system or not. The result reports the maximum achievable speed for linear reading on the selected medium and therefore is also a real performance value of the hardware.

Note: If the option 'MultiCopy' (→ 5.7.6. MultiCopy mode) is selected, the speed measurement is being performed for all selected media at the same time. Hence, it

determines the maximum possible concurrent total data throughput of these media. This is especially relevant for potential use of the Enterprise Edition, but also represents a performance test of the entire system. The speed that can be achieved strongly depends on how the tested media are connected to the system. (→ 6.5.2. *Speed*).

5.7.6. MultiCopy mode

When selecting the target medium you can use the checkbox '*MultiCopy*' to activate the MultiCopy mode (→ 6.5. *Mass copy (MultiCopy mode)*). In this mode it is possible to select up to 16 drives or partitions at the same time. For doing so, click on all desired list entries. The selected entries then will be marked with a dark blue background. To remove a marked list entry from the selection, it simply has to be clicked again. You can then use the SpeedTest (→ 5.7.5. *SpeedTest*) to measure the data throughput of the selected drives or partitions in parallel operation. Copying to multiple drives in parallel is only possible with the Enterprise Edition. It allows to copy to up to 4, 8 or 16 targets at a time, depending on the stage used (Enterprise Edition 4x, Enterprise Edition 8x or Enterprise Edition 16x).

Note: The '*MultiCopy*' option can be activated in all editions of HDClone, even in the Free Edition. This can be used to check in advance which speed can be achieved on a certain system by using the Enterprise Edition. Please keep in mind that the achievable speed in this case strongly depends on the interfaces used (most suitable: IDE, SATA, and SCSI) and the drive combinations (only use master drives with IDE).

5.8. Selecting the options

On the dialog page *Options*, you can set the options with which you want the following copying process to be executed. Principally, HDClone automatically sets the optimal options for the selected drives and the type of the copy. Modify the options only in order to troubleshoot problems (→ 7. *Troubleshooting*) or when you are sure that this improves the performance of HDClone.

Note: An improper modification of options can possibly lead to a deterioration of the copying performance.

If the settings of the individual options comply with your demands, click [Next]. You then come to the next dialog page where you can start the copying process (→ 5.9. Copying data).

5.8.1. Verifying

The option *Verifying* is an exception to the options described in this chapter (→ 5.8.3. General options). This option has no influence on the copying performance itself, but offers the possibility to synchronize the data of the source and target after the copying process. However, the whole process of copying and verifying then normally takes approximately the double amount of time. Choose this option according to your needs of copying and your time available.

Warning: You should **not activate the verification** when you copy hard disks containing defects, that means in particular when you use HDClone for a data recovery. Physical damages on the drive could spread essentially faster because of the additional stress. Furthermore, the result of a verification of hard disks with defects has no real expressiveness for logical reasons.

5.8.2. Locked options

The options have different possibilities of availability and selectability. Locked options cannot be modified, but the displayed setting is valid. → Fig. 10 shows the different possibilities.



Fig. 10: Selecting options

5.8.3. General options

In the column 'General', you find options, which relate to the operating method of HDClone and the copying process in general.

Option	Meaning
FastCopy	Special copy algorithm. Can increase the regular copy speed up to the double.
SafeRescue	Special algorithm for data recovery. Tries to recover as large areas on the drive as possible. Can be left switched on for normal copies as well.
Verifying	Executes a verification run after the end of the copying process. Compares once again the data of source and target. Should not be used for data recovery because this is an unnecessary additional stress for a damaged drive (→ 5.8.1. Verifying).
CachedMemory	Use fast intermediate memory.
SharedMemory	Use fast data transmission.
Animation	Switch off copy animation, possibly a slight speed increase.

5.8.4. Options for source and target

In the columns 'Source' and 'Target', you find setting possibilities, which relate especially to the drives selected for the copying process.

Option	Meaning
IRQ	In the IRQ mode, source and target are optimally synchronized. Only this leads to a maximum copy transfer rate.
DMA	For highest transfer rate and the shortest copying time.
Read Cache	Use fast read buffer.
Write Cache	Use fast write buffer.
Multi-sector PIO	Increases speed by about 10% compared to the standard mode in a deactivated DMA mode (see above).
Recovery via PIO	Optimal recovery of defective sectors.
Cooling break	To fix data errors or interruptions during the USB data transfer

	(→ 7.6.2. Other device problems).
Sector area	Exactly definable copying area (→ 6.4. Area copy).

5.9. Copying data

On the dialog page 'Copying data' (→ fig. 11) , you can start the copying process. Check beforehand in the status field whether the settings for copying mode, source, target, and the selected options are right. If no, go back to the corresponding dialog page by clicking (repeatedly) [Back] in the lower left corner of the operating field and adjust the settings. As soon as you want to start the copying process, click [Start] in the bottom margin of the operating field. During the copying process, you can follow the process with the help of the displays described in the following subchapters

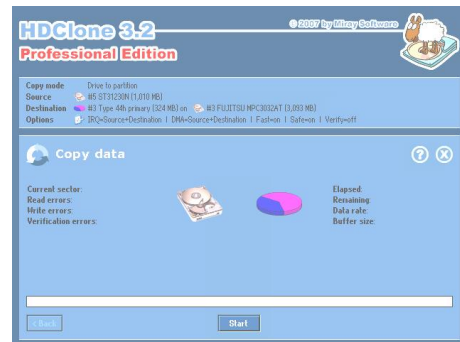


Fig. 11: Dialog page 'Copying data'

5.9.1. Security query

Before the final start of the copying process, a security query (→ fig. 12) appears where source and target of the copying process as well as corresponding security notes are once again indicated. Click [Start copying] to start the copying process and [Cancel] to return without starting the copying process.

Warning: All data in the target area will be irretrievably deleted by starting the copying process.

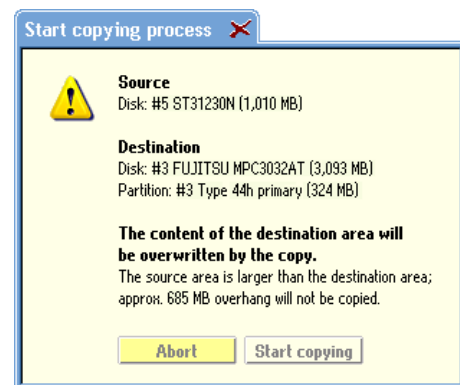


Fig. 12: Security query

5.9.2. Copy animation

In the center of the operating field, you see the copy animation (if you have not deactivated it when selecting the options) after the start of the copying process. The copy animation shows that the copying process is running. Especially in case the other indi-

cations hardly change or do not change at all for a time, e.g. in case of read or write errors, the copy animation shows that HDClone is still running.

5.9.3. Status indication

On the left and right side of the operating field, you see the fields of the status indication. They contain information on the current status of the copying process.

Status	Meaning
Sectors processed	Absolute number of the sectors already copied.
Buffer size	Size of the internally used buffer.
Read errors	Number of the read errors occurred up to this point. This number can also decrease if errors can be fixed. When starting the optional verification run, this value is set back to zero.
Write errors	Number of the write errors occurred up to this point. This number can also decrease if errors can be fixed. When starting the optional verification run, this value is set back to zero.
Running time	Time passed since the start of the copying process.
Rest time	Estimated (!) rest time of the whole copying process (incl. the optional verification run) on the basis of the copy speed attained up to here. Note: The rest time can strongly increase in case of occurring read or write errors.
Data rate	Average data rate which has been attained up to this point of time. The indicated value refers to the amount of copied data. The actual throughput is twice as high (x MB copying = x MB reading + x MB writing).
Verification errors	This indication is only used if you have selected <i>Verifying</i> as an option.

5.9.4. Percentage indication

The percentage indication (→ *fig. 6*) is below the copy animation. It shows how many percent of the current run (→ 5.9.6. *Flow of the process*) are already finished.

5.9.5. Progress bar

The progress bar (→ *fig. 6*) below the percentage indication visualizes the progress of the current run. Which run (→ *5.9.6. Flow of the process*) is currently processed is shown on the left above the progress bar.

5.9.6. Flow of the process

The whole process consists of up to three runs: the copying process itself, an optional debug run (option *SafeRescue* active, → *5.8.3. General options*), and an optional verification run (option *Verifying* active, → *5.8.3. General options*). In this manual, the designation *copying process* includes the optional debug run because it belongs to the copying process, even if it is executed afterwards.

5.9.7. Interrupting the running process

You can interrupt the running copying process or the verification run at any time by clicking *[Stop]*. A dialog window then appears (→ *fig. 13+14*) where you have the choice to either continue the process (click on *[Continue copying]* or *[Continue verifying]*) or to abort it completely (click on *[Abort copying]* or *[Abort verifying]*), → *5.10.1. User abort*). As long as you select neither option, the current copying process remains interrupted.

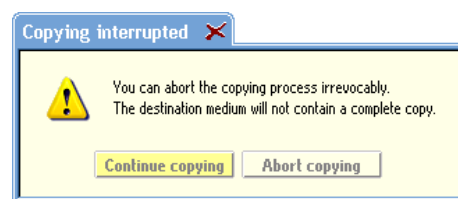


Fig. 13: Abort dialog copying process

5.10. Termination of the copying process

5.10.1. User abort

If you interrupt a running copying process or verification run by clicking *[Stop]* (→ *5.9.7. Interrupting the running process*), you can definitively abort the process in the dialog window which then appears (→ *fig. 13+14*) by clicking *[Abort copying]* or *[Abort verifying]*. You then obtain a final report (→ *5.10.3. Final report*) upon the prematurely ended process.



Fig. 14: Abort dialog verification run

Note: Unlike an aborted copying run, an aborted verification run has no influence on the copied data. The copy itself is already finished at that point of time.

5.10.2. Regular termination

After up to three runs (→ 5.9.6. *Flow of the process*) without a premature abort, the copying process is regularly ended. You then obtain a final report upon the complete copying process in a dialog window (→ 5.10.3. *Final report*).

5.10.3. Final report

After the termination (→ fig. 15) or the abort (→ fig. 16) of a copying process, you obtain a final report in a dialog window with the following information.

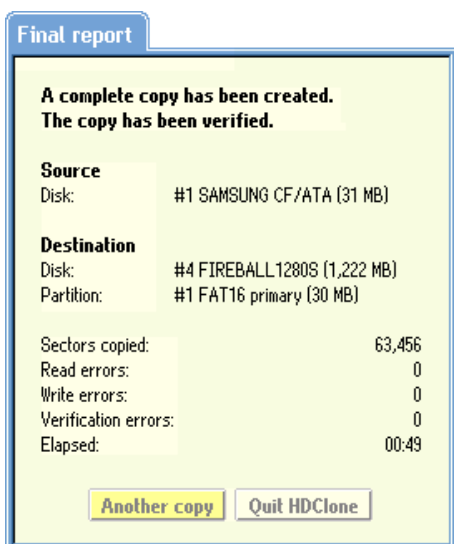


Fig. 15: Final report after a successful copying and verification run

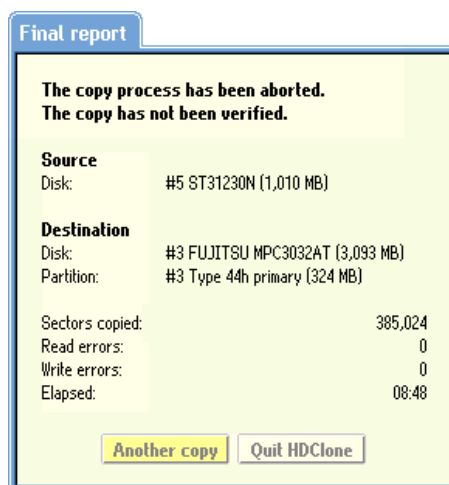


Fig. 16: Final report after the abort of the copying run

- **A complete copy has been created:** in case the copying process has been finished without an abort (even if the verification run has been aborted).
- **The copying process has been aborted:** in case the copying run has been aborted before its regular termination.
- **The copy has not been verified:** in case no verification run has been executed after the copying process or in case the copying process has been prematurely aborted.

- **The copy has been only partly verified:** in case the verification run has been prematurely aborted.
- **The copy has been verified:** in case the verification has been terminated without an abort.

Furthermore, the final report contains the following information:

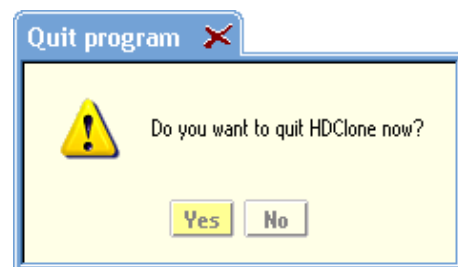
Information field	Meaning
Source	Source drive/partition of the copying process.
Target	Target drive/partition of the copying process.
Copied sectors	Total number of the copied sectors.
Read errors	Total number of the read errors occurred during the copying process. Read errors, which occur during the verification run, are exclusively counted as verification errors.
Write errors	Total number of the write errors occurred during the copying process. Write errors, which occur during the verification run, are exclusively counted as verification errors.
Verification errors	Total number of the errors occurred during the verification run. This includes write and read errors as well as non-identical data during the synchronization. This field is not shown, if no verification run was started. If the verification run has been aborted, maybe not all verification errors have been discovered due to the premature abort.
Runtime	Time required for the whole process, i.e. copying process and verification run (if executed).

You can start another copying process by clicking [*Further copy*] or end the program by clicking [*Cancel HDClone*] (→ 5.11.2. *Good-bye screen*).

5.11. Ending the program

5.11.1. End dialog

You can end HDClone at any time. Possibly open dialog windows must be closed before. Click then the end symbol (→ 5.3.2. *Operating field*) in the upper right corner of the operating field (→ fig. 5) or press <ESC>. The end dialog



appears (→ *fig. 17*) where you can cancel HDClone by clicking *[Yes]* and return to the program by clicking *[No]*. Furthermore, you can cancel HDClone directly after a terminated copying process (→ *5.10.3. Final report*).

5.11.2. Good-bye screen

After the termination of HDClone, either via the end dialog (→ *5.11.1. End dialog*) or via the dialog window with the final report (→ *5.10.3. Final report*), a good-bye screen appears (→ *fig. 18*). You can then shut down the computer or reboot it.

Note: If you do not want to start HDClone when you start the computer the next time, remove the HDClone data carrier from the boot drive.

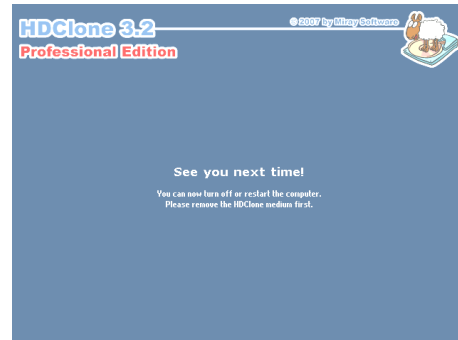


Fig. 18: Good-bye screen

6. WORKING MODE

In this paragraph, you find detailed descriptions upon the working mode of the copying modes and upon the operating procedure of HDClone in case of defective media.

6.1. Copying modes

HDClone can handle whole hard disks as well as individual partitions. The program therefore offers different copying modes, whose meaning, effect and possibilities of use are explained in the following subchapters. However, the different copying modes only represent the technical possibilities offered by HDClone. Each copying mode has, according to the system environment, numerous practical possibilities of application, which cover the data recovery over the backup to the migration of complete operating system installations (→ 2. *Fields of application*).

6.1.1. Preliminary remark

The copying modes offered by HDClone aim to cover as many possibilities of application of the physical copy as possible. Since many users have their own individual requirements and cases of application for the physical copy, some of the offered possibilities reveal to be useful only at second glance. Therefore, not each of the offered copying modes leads to a directly applicable result in any case, but possibly only to an intermediate step (e.g. in case of a backup, → 6.1.5. *Hard disk on partition*). As long as you do not overwrite any areas containing data which is still needed, you can try every copying mode without problems because the original remains unchanged.

Important: In case of a data recovery from a defective hard disk, you should first of all make a copy of the whole hard disk onto an identically big or a bigger hard disk (→ 6.2. *Size differences*). With that copy, you can then try different copying modes or recovery trials without any risk.

6.1.2. Physical copy

A physical copy copies a cohesive area of a hard disk onto another area on the same hard disk or onto another hard disk. It is capital for the usability of the copy and its integrity which area is copied and onto which area on the target disk the data is copied. To keep the process easily manageable for the user and to allow you to create a copy

according to your wishes and needs in the easiest way possible (see also → 6.1.1. *Preliminary remark*), HDClone offers the copying modes described in the following subchapters. Which copying mode is the best for what purpose, is described in the respective subchapter as well as in (→ 2. *Fields of application*).

6.1.3. Hard disk on hard disk

This copying mode creates a 'classical' physical 1:1 copy. Each sector of the source hard disk is copied to the same address on the target hard disk. After the successful termination of the copying process, hard disks of an identical size match in every sector. Different sizes of the hard disks result in a non-copied resp. non-overwritten area (→ 6.2. *Size differences*).

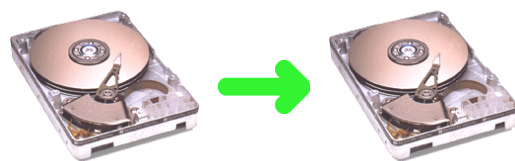


Fig. 19: Hard disk on hard disk

The *hard disk on hard disk* copying mode is especially useful for the following areas of use:

- Migration of an existing operation system installation to a bigger hard disk (→ 2.1. *Upgrading hard disks & migrating an OS*).
- Rescue of complete hard disks (→ 2.2. *Data rescue*).
- Backup and restore of complete hard disks or operating system installations (→ 2.3. *Installation backup*).
- Multiple installations (→ 2.5.1. *Duplicating system installations*).
- Copying proprietary file systems and data formats onto another hard disk (→ 2.6. *Proprietary hard disk formats*).
- Backup of hard disk data for a forensic evaluation and further processing (→ 2.7. *Forensic data securing*).

6.1.4. Partition on partition

This copying mode functions similarly to the above described mode (→ 6.1.3. *Hard disk on hard disk*). However, in this case, not the whole hard disk is copied, but only the content of an individual partition is physically



Fig. 20: Partition on partition

copied. This copy is executed sector by sector, too. Relatively at the beginning of the respective partition, the individual sectors are also moved to the same address. However, due to the principle and in contrast to the *hard disk on hard disk* mode, the individual sectors are not at the same absolute address in relation to the complete hard disk. Perhaps such a copy is therefore not directly usable, but only after it has been copied back (→ 2.3. *Installation backup*) or adapted to the changed absolute position on the hard disk with the help of other tools.

The *partition on partition* copying mode is especially useful for the following areas of use:

- Migration of an existing operation system partition to another hard disk (→ 2.1. *Upgrading hard disks & migrating an OS*).
- Rescue of individual partitions (→ 2.2. *Data rescue*).
- Backup and restore of individual (operating system) partitions (→ 2.3. *Installation backup*).
- Multiple installations of individual (system) partitions (→ 2.5.1. *Duplicating system installations*).
- Copying of proprietary file systems and data formats onto another hard disk (→ 2.6. *Proprietary hard disk formats*) - only with valid partition table!
- Backup of individual partitions for a forensic evaluation and further processing (→ 2.7. *Forensic data securing*).
- Temporary storage or intermediate storage of a partition, e.g. in case of a reorganization of a hard disk.
- Relocating a partition within a hard disk or onto another hard disk (requires possibly an additional adaptation with special tools).

6.1.5. Hard disk on partition

This copying mode stores a physical copy of a complete hard disk in a partition on another hard disk. Physical images of several hard disks can be stored on a single hard disk for example (in different partitions) (→ 2.5.2. *Handling several master installations*). In most of the cases, such a partition

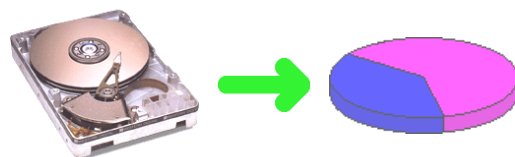


Fig. 21: Hard disk on partition

cannot be used directly. This copying mode mainly serves to create a backup of a hard disk. This is why it is mostly used in context with the *partition on hard disk* copying mode (→ 6.1.6. *Partition on hard disk*), which recovers the previously backed up data.

The *hard disk on partition* copying mode is especially useful for the following areas of use:

- Migration of an existing operating system installation to a bigger hard disk (→ 2.1. *Upgrading hard disks & migrating an OS*).
- Rescue of several complete hard disks onto one single hard disk (→ 2.2. *Data rescue*).
- Backup of several hard disks (→ 2.5.2. *Handling several master installations*).
- Backup of the data from several hard disks onto one single (correspondingly big) hard disk for a subsequent forensic evaluation and further processing (→ 2.7. *Forensic data securing*).
- Temporary storage or intermediate storage of complete hard disks.

6.1.6. Partition on hard disk

This copying mode copies the content of individual partitions onto a single hard disk. This copying mode mainly serves to restore a previously created backup of a hard disk or to bring in one of several previously stored master installations (→ 2.5.2. *Handling several master installations*). That is why it is normally used in the context of the *hard disk on partition* copying mode (→ 6.1.5. *Hard disk on partition*) for a data recovery. If an arbitrary partition is copied onto a hard disk on the contrary, the hard disk is in most of the cases not directly usable.

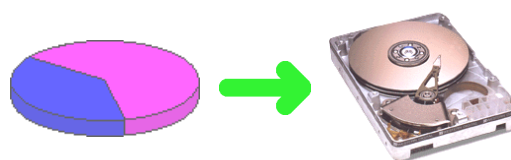


Fig. 22: Partition on hard disk

The *partition on hard disk* copying mode is especially useful for the following areas of use:

- Restore of a complete hard disk which has been previously backed up with the *hard disk on partition* copying mode (→ 6.1.5. *Hard disk on partition*).
- Multiple installations (→ 2.5.1. *Duplicating system installations*).

- Copying of proprietary file systems and data formats onto another hard disk (→ 2.6. *Proprietary hard disk formats*).
- Decoupling of hard disk data that has previously been saved in individual partitions for a forensic evaluation (→ 2.7. *Forensic data securing*).

6.2. Size differences

To create a 'real' 1:1 copy, source and target must have the same size. HDClone is also capable to create physical copies if the size of source and target differs. The following subchapters describe according to what rules HDClone processes and what are the results.

6.2.1. Identical size

If source and target are of the same size, HDClone creates an absolutely identical copy (clone). On this clone, all sectors on source and target, from the first to the last sector, are 100% identical, provided that the process was error-free. Principally, HDClone can create such a clone in all available copying modes. However, only the mode *hard disk on hard disk* (→ 6.1.3. *Hard disk on hard disk*) guarantees that the individual sectors of source and target also have the same absolute position on the hard disk.

6.2.2. Small-to-large

If the source is smaller than the target, HDClone copies only the data that is available on the source. This data is copied from the beginning of the source onto the beginning of the target medium. The area at the end of the target medium, which is larger than the source, remains unaffected. Apart from that the unaffected area remains possibly unused during a later usage, such a copy is usually comparable to a real clone as far as the capacity of use is concerned because the target contains entirely all data of the source (in contrast to → 6.2.3. *Large-to-small*).

6.2.3. Large-to-small

If the source is bigger than the target, HDClone copies only the data which also fits onto the target. This data is copied from the beginning of the source to the beginning of the target medium. The data which is larger than the target is not copied and is missing on the target. Generally, such a copy can only restrictedly be used because possibly

necessary data can be missing. However, if you make sure before copying (e.g. by defragmentation) that all valid or necessary data is in the front part of the source medium and that this area is not larger than the target medium, a copy onto a smaller target medium can also be successfully used. This also applies if you have copied a smaller source onto a larger target (→ 6.2.2. *Small-to-large*) and if you copy back the (unchanged) data onto the original medium or onto a target of the corresponding size.

6.3. Troubleshooting

In case of occurring errors, HDClone tries to troubleshoot them the best possible. If this is not possible, the errors will be mentioned in a corresponding error statistic. The following chapters give you more detailed information on the troubleshooting and error statistic in HDClone.

6.3.1. Intensive reading/writing

In case of read or write errors, HDClone uses different strategies in order to still be able to read or write this data, if possible. The time used for defective areas depends to a large extent on the respective medium. According to the medium and its state, several seconds up to minutes can be needed for the recovery trials. Therefore, it is recommended to always activate the option *SafeRescue* (→ 5.8.3. *General options*) because then the troubleshooting takes place after the copying of all intact areas has been finished. The process can then be aborted if it takes too long without losing the data of the intact areas.

6.3.2. Read errors

During the copying process, read errors can only occur on the source medium. HDClone then tries to read the defective areas immediately after the termination of the copying process (with the option *SafeRescue*, → 5.8.3. *General options*) with the help of special data recovery strategies within a single troubleshooting run (→ 5.9.6. *Flow of the process*). During the troubleshooting run, the number of the indicated read errors can reduce according to the areas on the source medium, which could be recovered.

Note: Read errors, that occur during the verification run, are not counted as read errors but as verification errors (→ 5.9.3. *Status indication*). The indicated read errors only refers to the errors occurred during the copying process (incl. the debug run).

6.3.3. Write errors

Write errors can only occur during the copying process and only on the target medium. HDClone then tries to read the defective areas immediately after the termination of the copying process (with the option *SafeRescue*, → 5.8.3. *General options*) with the help of special data recovery strategies within a proper troubleshooting run (→ 5.9.6. *Flow of the process*). During the troubleshooting run, the number of the indicated write errors can reduce according to the areas on the target medium, which could be recovered.

6.3.4. Verification errors

If the option *Verifying* (→ 5.8.1. *Verifying*) is activated, HDClone executes a verification run (→ 5.9.6. *Flow of the process*) after the copying process. A verification error is counted if the data of two sectors on source and target do not correspond. Furthermore, read errors, which occur during the verification run in one or both of the areas to be compared, are also counted as verification errors. Therefore, the number of verification errors gives you absolute information on how exactly source and target correspond to each other after the copying process. In case of an error-free copying process, HDClone should not report any verification errors and signalize a 100% conformity of source and target.

6.4. Area copy

In case of an area copy, the source or target medium (or both) is not used as a whole. Only a partial area of the selected medium(drive or partition) is used for the copy.

6.4.1. Usage

The dialog page *Options* provides the possibility to specify an exactly definable sector area for source and target (→ 5.8.4. *Options for source and target*). To specify a sector area, activate the check box *Sector area* and enter the starting (*from*) and the ending (*to*) sector of the area to define. These sectors are interpreted as the first and the last sector of the area, i.e. they are included with the area.

Note: The sector counting starts with ,0' (= 1st sector of the medium). Accordingly, all further sector numbers have to be decreased by 1, too (e.g. *from* = 0, *to* = 99999 defines the first 100000 sectors on the medium as an area).

Warning: You should not conduct an area copy unless you are completely aware of its functioning and possible consequences. A sector area, which has not been defined with expertise may lead to data loss.

6.4.2. Functioning

The sector area is always subordinated to the selected medium (drive or partition) and is interpreted relatively to the starting position of the medium. Instead of using the whole medium for the subsequent copying process, only the defined sector area will be used as source or target. During copying, the data from the first sector of the source area will be copied to the first sector of the target area and so on. Compared to a normal copy, the only difference is that instead of copying the whole drive or partition only the defined partial area is used in the copying process.

Example: The values *from* = 0, *to* = 31 define an area of 32 sectors. In case of the type of source (or target) is *drive*, the declaration refers to the first 32 sectors on the drive. In case the type of source (or target) is *partition*, the declaration refers to the first 32 sectors of the partition and may be located at an arbitrary position of the drive (depending on the partition table).

6.5. Mass copy (MultiCopy mode)

In case of a mass copy the contents of the source medium are copied on multiple target media at the same time. As a result there is a huge benefit regarding time and performance, since the source data only has to be read once and the data can be written on multiple target media at the same time.

6.5.1. Mode of operation

With HDClone, creating a multi or mass copy works exactly the same (simple) way as creating a single 1:1 copy. The only difference is that instead of only one multiple target media can be selected. This becomes possible as soon as the option '*MultiCopy*' is being selected in the target medium dialog (→ 5.7. *Selecting data source and target*). Then it is possible to select multiple target media from the list. The further procedure then is the same as when creating a single 1:1 copy.

Note: When creating a mass copy, the result on a single medium is identical with the result of a single copy. If the target medium is smaller than the source, it is not possible to copy all data. If the target medium is larger, the region which exceeds the size of the source medium will remain unchanged. This is also valid when using one of the different copying modes (→ 6.1. *Copying modes*): regarding the result, there is no difference in comparison to a single copy.

6.5.2. Speed

Mass copying yields an enormous advantage in speed compared to single copies. In case of optimal connected media (→ 6.5.3. *Different media*), speed increases straight proportional with the number of target media. For example, a fourfold copy yields about four times the data throughput of a single copy.

6.5.3. Different media

Regarding mass copying HDClone offers the possibility to connect all types of supported drives in arbitrary combinations. But there may be huge differences in performance according to which drives are used and how they are connected. For maximum speed, only IDE, SATA, and SCSI drives ought to be used. And IDE drives should always be configured as master.

7. TROUBLESHOOTING

This paragraph describes possible problems when using HDClone and offers proposals for solution. If there should be no proposal for solution for a problem, you can gladly contact our Support (→ 8.5. *Support*).

7.1. Load errors

During the start of the program, before HDClone is loaded itself, a message and a progress bar will appear on the boot screen. In case of an error, one of the following error codes will be indicated here.

7.1.1. Error #5002 and 'Disk error'

This error will be displayed if the boot medium is not readable when booting the program. The error is reported by the BIOS of the computer and points to a defective data carrier or a problem with the used boot drive. In many cases, in particular when booting from a floppy disk, an incompatibility between drive and data carrier is the cause. Principally this problem can be fixed. Please try the following steps, at best in the indicated order:

- Try again to boot the program, perhaps with/without cold start.
- Create once again a bootable disk (→ 4. *Installation*).
- **Floppy disk:** format the floppy disk (*no* quick format) before creating a new one.
- **Floppy disk:** use another floppy disk.
- Use (if possible) another boot drive.

Note: If you didn't receive HDClone as an installation package but on a bootable disk and if a disk shows this problems also after multiple trials on different devices, please contact our Support (→ 8.5. *Support*) and indicate your license number.

7.1.2. Other errors

If other errors in the form of #(number) should occur when loading the program, please contact our Support (→ 8.5. *Support*).

7.2. Keyboard and mouse

HDClone supports DIN and PS/2 keyboards as well as serial and PS/2 mice (→ 3. *Supported hardware*). If keyboard or mouse (or both) do not function with HDClone, this is usually because the concerned computer has only a USB keyboard or USB mouse. On most of the computers, you can fix this problem by activating the emulation for PS/2 devices in the BIOS setup. Please consult your computer manual on how to change this setting because modifying this option is different according to the respective BIOS. In most of the cases, you can find it under the name '*USB Legacy Support*' or '*USB Keyboard Support*' (often under '*Integrated Peripherals*' or '*Advanced Options*'). As an alternative, you can temporarily connect a PS/2 keyboard or mouse for running HDClone.

Note: In some of the cases, problems with the PS/2 keyboard and/or mouse occurred with an activated emulation for PS/2 devices. If you do not use any USB input devices, please switch off the PS/2 emulation in the BIOS setup.

7.3. General problems

7.3.1. Slowed down system

If you think the speed of the total system or the copying speed – also with IDE and SCSI devices – is too slow, a USB controller can be the cause, even if it is not used (→ 7.6.4. *Speed loss*).

7.3.2. Read, write and verification errors

If HDClone reports errors, these are usually defective areas on the respective medium. However, general problems with the hardware can possibly also cause (putative) read and write errors. This is mostly noticeable by a very high number of displayed errors. First of all, try to fix the problem via the help instructions for the respective hardware types (IDE, SCSI, USB) because the causes are usually found there. If the problems cannot be fixed this way either, deactivate step by step the following options, at best in the indicated order:

- *CachedMemory*
- *Read cache* and *write cache*

- *FastCopy*
- *DMA*
- *SharedMemory*

If the problem does not occur any more after having deactivated a certain option, the previously deactivated options can be reactivated as a test.

7.4. IDE/ATA/SATA

7.4.1. Hard disk not recognized

If HDClone does not recognize a hard disk, there can be several reasons. Perhaps the controller which the disk is connected to has not been found (→ 7.4.2. *IDE controller not found*). A further possible reason can be a non-standardly connected hard disk. This is for example the case if a hard disk is configured as slave and if a CD/DVD drive or no drive at all is connected at the same IDE channel as master. Normally, HDClone can handle that, too.

Note: If an SATA hard disk is not recognized, this can also be due to the used SATA controller (→ 3.3.2. *SATA/SATA II controller*).

7.4.2. IDE controller not found

There are the following three reasons why HDClone has not automatically recognized an IDE controller:

- The IDE controller/channel is deactivated, e.g. on an onboard IDE controller. Activate the IDE controller/channel via the BIOS setup.
- Standard IDE controllers (ISA) are not taken into account if PCI IDE controllers are available. Connect the respective hard disk to a PCI IDE controller in this case or deactivate the PCI IDE controller or controllers.
- The used controller does not correspond to the PCI IDE standard. Although most controllers support this standardized programming interface, there are some controllers which have only a proprietary programming interface. More detailed information can be found in → 3.3.1. *IDE/ATA controller*. Connect the corresponding drives to another controller (PCI IDE controller).

7.4.3. Problems with DMA

The following principal problems can occur with (Ultra) DMA:

- The achieved speed is too slow despite DMA. Please consider that the achievable speed (→ 3.3.5. *Speed*) depends on many factors and that this is not absolutely due to a problem with DMA.
- The DMA mode is not available. When selecting the options (→ 5.8.4. *Options for source and target*), the option DMA is deactivated and locked in this case.
- Read, write or verification errors occur when using DMA.

In all cases, the problems can be due to the same reasons. When having problems with DMA, you can principally use the PIO mode at any time. Deactivate the option *DMA* of the concerned drive when selecting the options (→ 5.8.4. *Options for source and target*). Since the PIO mode is usually much slower than DMA, we recommend to try first of all the following hints and help instructions to possibly be able to use the DMA mode. Please consider the notes in the subchapter → 7.4.4. *BIOS settings* as well.

- Check if the concerned drive really supports DMA. Some older hard disks and especially CompactFlash media do not support DMA.
- Make sure that from *Ultra DMA Mode 3* on an 80-wire data cable is used to connect the hard disk(s).
- Please note that when two hard disks are connected via the same cable, the DMA mode of the slower hard disk is also used for the faster drive. Remove the slower drive temporarily, if possible, or connect the drives via separate channels or cables.
- Try both connections of the data cable (center connection and connection to ground) in case of a single connected hard disk to eliminate possible problems with damping (center connection) and reflection (connection to ground).
- Switch the used UDMA mode to a lower value in the BIOS setup (→ 7.4.4.1. *Switch to a lower/higher UDMA mode*) or deactivate UDMA (→ 7.4.4.2. *Activate/deactivate UDMA*). The multi-word DMA mode will be (automatically) still available, which offers about a twice to four times higher speed than the PIO mode.
- On the other hand, you can also try to activate UDMA or to switch to a higher UDMA mode if the corresponding default settings in your BIOS setup are too low.

Note: Our tests showed that some chipsets and hard disks do not collaborate optimally. This can lead to the fact that the UDMA mode (putatively correctly) recognized and set in the BIOS is too high.

7.4.4. BIOS settings

The following notes refer to settings which you should possibly make in the BIOS setup of your computer if problems occur during the use of DMA. Since the settings offered by the BIOS setup are manufacturer- and model-specific, these notes can only be given in a general form. Consult your BIOS manual on how exactly to make these settings in your BIOS setup and which settings are available. You normally find the DMA settings under *'Integrated Peripherals'* or *'Chipset Setup'* in the BIOS setup.

Note: Please execute the automatic hard disk recognition in the BIOS after every modification of the DMA and hard disk settings so that the modifications for the corresponding drives become effective. Make sure to save the modifications via *'Save and Exit'* when leaving the BIOS setup.

7.4.4.1. Switch to a lower/higher UDMA mode

In many BIOS setups the (highest) used UDMA mode can be selected manually. If you have problems with DMA, try to switch the used mode step by step to a lower level at the corresponding IDE channel. Only if this does not solve the problem, deactivate UDMA completely. The controller then mostly (automatically) uses multi-word DMA, which is at least faster than PIO. You can switch the UDMA mode step by step to a higher level of course, if you think that you have not selected the best possible UDMA mode.

7.4.4.2. Activate/deactivate UDMA

Some BIOS setups do not offer a free selection of the UDMA mode but only an automatic recognition or deactivation. If this is the case with your BIOS or if you have already switched to the lowest UDMA mode and problems keep occurring, deactivate UDMA. Usually, multi-word DMA is (automatically) available then, which is often faster than PIO. Only if this doesn't function either, you should completely switch off the DMA mode in HDClone (→ 5.8.4. *Options for source and target*). If UDMA is deactivated in your BIOS setup, you can activate it as a test, of course, in order to attain a higher speed, if possible.

7.4.4.3. Deactivate IO caching

If there are problems in the PIO mode as well, you should deactivate IO caches and buffers. In particular the setting *'Dataport Postwrite'*, if available, should be switched to *'Disable'* if there are problems.

7.4.4.4. Setting BIOS defaults

If HDClone should not work as desired despite all the above mentioned instructions, you can try to set standard values via the option *'Load BIOS/Setup Defaults'*. This setting tries to avoid possible hardware conflicts.

7.5. SCSI

When using SCSI devices, please make sure that they are correctly configured and connected to the SCSI controller. In particular SCSI controllers with SCSI BIOS must show a hard disk during the system start, so that HDClone can then address this hard disk. Furthermore, HDClone must support the controller you use. You find a list of the supported SCSI controllers in chapter → 3.4.2. *Compatibility*.

Note: Even if an SCSI controller shows the desired drives during the system start, this is no guarantee that they are correctly configured or connected. In principle, the BIOS of the SCSI controller works on a lower level than the SCSI drivers used by HDClone and can thus possibly recognize hard disk drives which are not recognized by HDClone itself.

HDClone has been tested on a range of SCSI controllers. Sporadically encountered problems are bypassed by the software as far as possible. The following subchapters contain useful hints on how to solve further random or sporadic problems. These hints should be applied in the described order to minimize the effort, if possible. The following problems occurred during the tests and could be bypassed with the hints from the following subchapters:

- HDClone stops during the device recognition (→ 5.6. *Selecting the copying mode*)
- no SCSI hard disks are recognized
- not all SCSI hard disks are recognized

7.5.1. Restart

If HDClone stops during the start procedure or does not show the desired SCSI drives, try a restart in form of a warm boot (reset button). Only if this does not fix the problem, you should try a cold start (switch off the PC and leave it switched off for about 30 seconds). Both forms of the restart can counter signal and status problems of SCSI controllers.

7.5.2. Deactivate unused controllers

If a restart does not lead to the desired result, you should, if your system disposes of several SCSI controllers, deactivate unused controllers. This is also recommended if a controller is principally used, but the hard disks connected to it are not needed for using HDClone.

7.5.3. Deactivate unused hard disks

In some cases, SCSI hard disks, which are connected to the same controller, can interfere with each other or even with the controller itself. Deactivate individual hard disks as a test or connect them step by step after one another to find out which hard disk possibly causes an interference. Make sure that the last SCSI device is always terminated also during the tests.

7.5.4. Minimum configuration of the controller

The configuration of the SCSI controller over its BIOS setup or the BIOS setup of the PC in case of onboard controllers can also solve the problem. Set the lowest resp. the securest values for the SCSI bus (e.g. transmission in the narrow mode of a wide controller).

7.5.5. Minimum configuration of the system

Try to connect the SCSI hard disks used in the system in a different way, especially if you use several SCSI controllers. Proceed as follows, if possible: deactivate all SCSI controllers except one. This controller should have one SCSI channel only, if possible, and be part of the controllers listed in → 3.4.3. *Manufacturer information*. Connect then the needed drive or drives only. Apart from defective drives, this strategy mostly allowed us to find a functioning configuration during our tests to execute the planned job.

7.6. USB

Despite the vast support of USB controllers and storage devices (→ 3.5. *USB*), there are some cases where these controllers and devices do not function as expected. The following subchapters provide you with hints and solution possibilities.

Note: Please check first of all in chapter → 1.4. *Edition overview* whether your HDClone edition supports USB. Otherwise, you need a higher edition of HDClone to use USB.

7.6.1. Storage device not recognized

Mostly, there are four possible reasons why a USB storage device supported by HDClone (→ 3.1. *Overview*) is not recognized:

- The USB storage device has been connected too late or exchanged afterwards. USB storage devices should be connected to the computer before starting HDClone (→ 5.1. *Preparing steps*).
- The USB storage device is not directly connected to the USB controller but via a hub (e.g. at the monitor). Always connect the USB devices, you wish to use with HDClone, directly to the USB controller or to the computer.
- The used device is no standard-conform *USB mass storage device* and does therefore not belong to the supported devices (→ 3.5.1. *Mass-Storage-Class*).
- The USB storage device is defective or works faultily. You should then test its functionality by using it with another PC or another operating system.

Note: If no USB storage device is recognized and if the above mentioned possibilities are excluded, the corresponding USB controller has probably not been recognized (→ 7.6.3. *Controller not found*).

7.6.2. Other device problems

Some devices, especially USB sticks, can show malfunctions in case of temperature rise or continuous operation, i.e. in case of continuous reading or writing big amounts of data. With HDClone, these problems manifest in read or write errors on the respective USB storage device, which do not always occur at the same location but after a certain operating time. Sometimes these hardware problems also lead to very long breaks during the copying process, which can be up to several minutes. When select-

ing the options (→ 5.8.3. *General options*), try to deactivate the option *FastCopy* in this case. Only if the problem persists, activate additionally the option *Cooling off break* for the concerned device. Thus, the copying process takes a bit longer, but in most of the cases the data transfer functions better.

Note: The described problems are mostly due to deficient hardware and also occur under other operating systems. We recommend you to exchange the concerned device at your manufacturer.

7.6.3. Controller not found

HDClone should recognize all current USB controllers which offer one of the USB standard interfaces (→ 3.5.2. *UHCI, OHCI and EHCI*). If HDClone recognizes USB devices on one PC but not on another PC or on another controller, the USB controller can have one of the following problems:

- The USB controller does not correspond to the UHCI, OHCI or EHCI standard. In this case, use another compatible (→ 3.5.2. *UHCI, OHCI and EHCI*) USB controller.
- The USB controller is deactivated, e.g. in case of an onboard USB controller. Activate the USB controller via the BIOS setup.
- The USB controller does not function correctly or is defective. Use another USB controller or another PC for the copying process.

7.6.4. Speed loss

USB controllers can have a negative effect on the speed of the whole system. This particularly affects the copying speed of *all* device types (also IDE and SCSI), even if no USB storage device is connected. Remove the corresponding USB controller if it is not needed during the use of HDClone. Otherwise, there are no negative effects apart from the speed loss.

Note: In our tests, this problem showed up with only one USB controller (*VIA VT6212*) and also persisted on other computers and operating systems with this controller. The measured speed loss on the PCI bus was at about 40% (!).

7.6.5. Other controller problems

Another problem is an incompatibility with certain USB storage devices caused by the USB controller. Especially older USB devices do not function flawlessly in such USB controllers. Use another USB controller, if possible.

Note: In our tests, this problem showed up with only one USB controller (*Acer ALi M5273*) and was also reproducible on other computers and operating systems.

8. MISCELLANEOUS

8.1. Terms of license

HDClone is designed to offer you the highest possible technical flexibility, and also the HDClone license conditions are designed not to limit your flexibility when using HDClone. Since you usually don't know at the beginning on how many computers and how often you will use the software, we offer you a very simple and cost-effective license model, which restricts you the least possible.

8.1.1. License model

The following table shows you the minimum number of licenses necessary for the respective area of use.

Edition	Private users	Companies/Institutions	Service providers
Free	sufficient	insufficient	insufficient
Basic	1 license	insufficient	insufficient
Standard	1 license	1 license per branch office ¹⁾ 1 license per 5 PCs ²⁾	insufficient
Professional	1 license	1 license per branch office ¹⁾ 1 license per dedicated PC ⁴⁾ 1 license per 25 PCs ²⁾	1 license per technician ³⁾
Enterprise	1 license	1 license per branch office ¹⁾ 1 license per dedicated PC ⁴⁾ 1 license per 100 PCs ²⁾	1 license per technician ³⁾

¹⁾ License is given for the respective other indicated criteria.

²⁾ The existing PC work stations, regardless of a use with HDClone.

³⁾ Technicians are all employees who use HDClone simultaneously or in the field service.

⁴⁾ PC which is exclusively used for HDClone, e.g. as copy server.

In practice, the use of HDClone can involve a different number of PCs according to the area of use, despite a similar use. Either the program is permanently used on one single or several few computers, which the media to be copied is connected to when needed. Or HDClone is always used directly on the respective computers, which the

media to be copied is connected to; mostly with only one usage per computer. To find a fair regulation for all use cases, you can choose between a license per dedicated PC and a license for a lump number of work station PCs where HDClone could be used. Furthermore, you need additional licenses if you use HDClone (potentially) in parallel on several PCs, e.g. if several service employees use HDClone independently from each other. That is why you need at least one license per branch office because this also represents a (potentially) parallel use.

8.1.2. Examples

The following examples refer to more frequent license situations.

- A company with 50 PC work stations needs two licenses of the Professional Edition, whereof each covers 25 PC work stations.
- A company with 100 PC work stations needs four licenses of the Professional Edition, one for 25 PCs each.
- A service provider with two PCs that serve as HDClone copy station needs two licenses of the Professional Edition, one for each copy station.
- A service provider with two field service employees who use HDClone needs two licenses of the Professional Edition, one for each independently working technician.

8.1.3. Validity

A license is unlimited concerning the number of usages and the period of validity. It can be used as often as desired and without a time limit. However, the license is limited with regard to the (also potentially) parallel use on several computers and the size of the company or the institution concerning the number of existing PC work stations.

8.1.4. Consultancy

If you have questions concerning the license situation in your specific case, please contact us at products@miray.de. Miray Software gladly consults you on multiple licenses or more complex cases and offers you, according to the individual case, attractive discounts. We are pleased to make you an individual offer.

8.2. Certificate of authenticity

The following notes exclusively refer to the boxed versions of HDClone, that means *not* to the versions available as download or via email.

8.2.1. Security hologram

For the protection against bootleg copies, our software is equipped with a security hologram, among others. Each of the original data carriers you received bears a security hologram. Please keep the data carriers with the security hologram in any case because this is your license proof.

8.2.2. Valid product license

The condition to have a valid product license is that the number printed on the security hologram corresponds to the number shown when the program starts. If this should not be the case for your software package, please email us at products@miray.de. Please indicate the number displayed by the program, the number on the security hologram and where you acquired the software package. If there is no security hologram on the data carriers or if the security hologram is damaged, please contact us as well and indicate the above mentioned data. We will try to find a simple solution so that you obtain a valid license.

Note: Make sure that each data carrier you received bears its own security hologram with its own registration number and that this number has to correspond to the number of the program which has been started from this data carrier. That means if you start the program from a floppy disk, the displayed number has to correspond to the number of the security hologram on the floppy disk and not to the number of the security hologram on the CD.

8.3. Disclaimer

Although HDClone was programmed with the largest possible caution and was tested on a large scale of different systems, we hope you understand that we cannot assume any liability for the proper functionality of the program and that we are not liable for damages resulting from its usage, subject to gross negligence and intention.

8.4. Feedback

We are highly interested in your feedback. If you encounter any program errors or if you have any improvement ideas, we will always try to fix the errors and implement or integrate your ideas. If you only want to tell us your opinions on this software, we are looking forward to receive such information from you.

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8.5. Support

If you should have any problems with one of our products, our support team is gladly at your disposal. Please send us your inquiry at the HDClone homepage at <http://www.hdclone.de/support/> or email us at support@miray.de. Please note that inquiries sent directly per email and not over the HDClone homepage take a bit longer to be answered due to the system.