# HDClone 4.2

## Copy | Backup | Migration | Rescue

## Manual

# HDClone 4.2

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: Offers general information about 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 media as well as information about which aspects to consider when using certain types of controllers or media.

4 Installation: For using HDClone, you can install it as a normal Windows program and/or create a bootable medium This chapter describes how this can be done within few minutes, using the installation package.

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 Operating principles: 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 Miray Virtual Disk: The HDClone software package includes the Miray Virtual Disk application. With this software you can mount file images as virtual drives.

9 Miscellaneous: In the last chapter you find miscellaneous information, particularly regarding our support and HDClone licensing 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 a corresponding symbol, e.g. **<↑>** for the 'up'-key. Visual controls on the screen, particularly buttons are represented by brackets ('[' and ']') and semi-bold type, e.g. [next], [back].

## 1.3    Features

HDClone lets you make physical and logical 1:1 copies (clones) as well as physical and logical file images of hard disks and partitions. Physical 1:1 copies ensure, that the copy is sector-by-sector 100% identical with the source. This allows HDClone to create copies or file images 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 (bit-wise) 1:1 copies and 1:1 images makes it suitable for many areas of application. HDClone's features make it a valuable tool, even in special and extraordinary scenarios.

## 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.

> **Note:** Within the table the following abbrevations are used to identify the different editions: **FE** = Free | **BE** = Basic | **SE** = Standard | **PE** = Professional | **EE** = Enterprise

|                                    | FE | BE | SE | PE | EE |
|------------------------------------|----|----|----|----|----|
| **Device support**                 |    |    |    |    |    |
| IDE/ATA/SATA hard disks [1)]       | ●  | ●  | ●  | ●  | ●  |
| AHCI (SATA II)                     | ●  | ●  | ●  | ●  | ●  |
| USB (UHCI, OHCI, EHCI)             | ●  | ●  | ●  | ●  | ●  |
| USB 3.0 (XHCI)                     | ○  | ○  | ●  | ●  | ●  |

| | FE | BE | SE | PE | EE |
|---|---|---|---|---|---|
| Hard disks > 2048 GB (2 TB) [2) | ○ | ○ | ○ | ● | ● |
| Firewire / IEEE1394 (OHCI) | ○ | ○ | ○ | ● | ● |
| SCSI hard disks [3) | ○ | ○ | ○ | ● | ● |
| **Copy modes** [4) | | | | | |
| Drive copy | ● | ● | ● | ● | ● |
| Partition copy | ○ | ● | ● | ● | ● |
| SmartCopy | ○ | ○ | ● | ● | ● |
| PartitionSelect | ○ | ○ | ● | ● | ● |
| MultiCopy (4x, 8x, 16x) | ○ | ○ | ○ | ○ | ● |
| **File images** | | | | | |
| Physical images | ● | ● | ● | ● | ● |
| Logical images (SmartImage) | ○ | ○ | ● | ● | ● |
| Compressed images | ○ | ○ | ● | ● | ● |
| Password protected images | ○ | ○ | ● | ● | ● |
| Securely encrypted images | ○ | ○ | ○ | ● | ● |
| RAW images | ○ | ○ | ○ | ● | ● |
| VMware file images (VMDK/VMX) | ○ | ○ | ○ | ● | ● |
| **Special modes** [5) | | | | | |
| HotCopy | ● | ● | ● | ● | ● |
| Upsizing (NTFS, FAT, ext2-ext4) | ● | ● | ● | ● | ● |
| Downsizing (NTFS, FAT) | ○ | ● | ● | ● | ● |
| LiveImage | ○ | ● | ● | ● | ● |
| SafeRescue mode | ○ | ● | ● | ● | ● |
| Defragmentation (NTFS, FAT) | ○ | ○ | ● | ● | ● |
| Verification mode | ○ | ○ | ● | ● | ● |
| Image compression | ○ | ○ | ○ | ● | ● |
| QuickCompress | ○ | ○ | ○ | ● | ● |
| Command line interface | ○ | ○ | ○ | ● | ● |
| FastCopy mode | ○ | ○ | ○ | ● | ● |
| **Copying speed** [6) | | | | | |
| Maximum speed in MB per sec. | 30 | 50 | 60 | 100+ | 1000+ |
| **Miray Virtual Disk** | | | | | |
| Virtual volumes | ○ | 1 | 1 | 7 | 7 |
| File image management | ○ | 1 | 1 | ● | ● |
| Persistent virtual disks | ○ | ○ | ○ | ● | ● |
| Writing data to virtual disks | ○ | ○ | ○ | ● | ● |

|                                      | FE | BE | SE | PE | EE |
|--------------------------------------|----|----|----|----|----|
| Virtual volumes @ TrueSpeed [7]      | ○  | ○  | ○  | ●  | ●  |
| **License scope** [8]                |    |    |    |    |    |
| Private use                          | ●  | ●  | ●  | ●  | ●  |
| Professionals/corporations           | ○  | ○  | ●  | ●  | ●  |
| Technician license                   | ○  | ○  | ○  | ●  | ●  |

[1] SATA hard disks: Have to be connected to a SATA controller supported by HDClone and the controller has to be configured correspondingly ( ▶ 3.3.2 SATA/SATA-II controllers).

[2] Hard disks > 2048 GB: HDClone supports hard disks above 2048 GB (2 Terabytes) from the Professional Edition on.

[3] SCSI hard disks: Have to be connected to one of the SCSI host adapters supported by HDClone ( ▶ 3.4 SCSI).

[4] Copying modes: You find further information regarding the different modes in chapter ▶ 6 Operating principles.
  • Drive copy: Allows to make a copy of entire drives.
  • Partition copy: Allows to make a copy of single partitions.
  • SmartCopy: Creates a logical 1:1 copy, usually faster by a multiple ( ▶ 6.6 SmartCopy).
  • MultiCopy: Mass-copying to up to 4/8/16 targets at a time, multiplying transfer ratio according to the Enterprise Edition used (4x/8x/16x) ( ▶ 6.5 Mass copy (MultiCopy mode)).

[5] Special modes: Increased copying speed (FastCopy), data integrity and safety (verification, SafeRescue), use within Windows at runtime (HotCopy, LiveImage). Further information to be found in chapter ▶ 5.8 Selecting the options.

[6] Copying speed: Due to technical differences between the individual editions, there is an upper limit for the actually achievable copy speed of each edition.
  > 100 MB/sec: Up to 133 MB/sec. using Ultra-DMA 6, up to 300 MB/sec. using SATA II.
  > 1000 MB/sec: Mass-copying to up to 16 targets at a time.

[7] Virtual volumes @ TrueSpeed: Use of RAW images at almost hardware speed.

[8] License scope: See also chapter ▶ 9.1 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.

> **Hint:** HDClone allows you to copy data arbitrarily between all types of media recognized, particularly between different types of drives.

## 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 target media 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, ▸ 6.1.4 Drive-to-drive as well as ▸ 6.1.5 Partition-to-partition. To select individual partitions of an installation for copying, HDClone offers PartitionSelect mode ( ▸ 6.7 PartitionSelect).

> **Note:** Please take care to have only one hard disk connected after completing the copy and before starting the operating system. It should be plugged to the same channel as the original. Hence, either remove the copy or connect it instead of the original medium.

### 2.1.1   Unused disk space

Additional free disk space on the target medium can be converted into a partition using the partitioning tool fdisk or the Windows Computer Management application (C:\WINDOWS\system32\compmgmt.msc). 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 target medium, but this requires special tools.

### 2.1.2   Smaller target medium

In general, you can also copy a complete installation from a larger to a smaller medium. For NTFS and FAT file systems, HDClone can perform downsizing automatically. For other file systems, you can first downsize the partitions on the source medium with the help of appropriate tools before copying.

## 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 cases 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 ( ▸ 5.8.5 Advanced 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 ( ▸ 6.1.5 Partition-to-partition). After having rescued the data from the defective hard disk, you can perform a recovery on the (functional) target 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 target medium of the same size or a larger target medium in either case ( ▸ 6.2 Size differences). For this reason, also **never** use the Smart-Copy mode ( ▸ 6.6 SmartCopy) for rescuing data.

> **Hint:** Alternatively, you may create a RAW image or a phisical image. You then can restore the image to another hard disk later or perform the recovery directly on the image by mounting it as a virtual drive using Miray Virtual Disk ( ▸ 8 Miray Virtual Disk).

## 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, create a file image in the backup partition using mode ▸ 6.1.9 Create partition image. If needed, restore the original system using ▸ 6.1.11 Restore partition image.

> **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

HDClone Enterprise Edition is specially designed for creating up to 16 copies at a time. This makes it 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 very suitable for distributing or duplicating master installations ( ▸ 2.4 Mass copying). Copy an entire master hard disk or master partition to the target 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 drive-to-partition ( ▸ 6.1.6 Drive-to-Partition) and partition-to-drive ( ▸ 6.1.7 Partition-to-drive) 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 drive-to-partition to make a copy of each master hard disk to one of the partitions on the container hard disk. Use the mode partition-to-drive to create a complete system installation from the desired 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 target medium of the same or larger size. A target 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-to-partition mode ( ▶ 6.1.5 Partition-to-partition) 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 drive-to-drive mode ( ▶ 6.1.4 Drive-to-drive) or a RAW image ( ▶ 6.1.8 Create drive image) before performing a detailed forensic analysis of secured media. This allows you to make changes to the copy during analysis without altering and thus endangering the original content of the medium.

> **Note:** When securing data it may be unclear, which areas of the medium are actually used. Especially regarding hidden or deleted data, it is recommended to create a copy of the entire medium to a target medium of the same or larger size. For the same reason the SmartCopy mode ( ▶ 6.6 SmartCopy) should **not** be used for this type of application.

## 2.8    Image files

In HDClone, working with physical and logical images follows the same basic logic as physical and logical copies, which are performed directly from medium to medium.

Image files often offer advantages over direct copies. Image files allow for:

○ Simple storing and managing in your file system

- ○ Archiving within any existing infrastructure

- ○ Exchanging media contents using arbitrary storage media

- ○ Distributing without physical media via networks and the Internet

- ○ Use with virtual machines ( ▶ 6.8.4 VMDK images)

> **Example:** A defective hard disk has to be rescued to another medium using HDClone. Afterwards the data has to be rescued from the copy without putting the original medium at risk. This objective may be achieved by either making a physical 1:1 copy ( ▶ 6.1.4 Drive-to-drive) or by creating a physical (!) image ( ▶ 6.1.8 Create drive image) of the defective original hard disk. The created image file may then be restored to another hard disk in a second step. The result will be the same in both cases. The target medium will always contain a bit-wise exact copy (apart from possibly occurred defects of the source hard disk) of the original hard disk.

## 2.9    HotCopy & LiveImage

HDClone supports creating copies or image files of a Windows drive during Windows is working - even of the Windows system partition itself. To use this feature, it is not necessary to take certain steps. When using HDClone/W, the appropriate mechanisms for using HotCopy and LiveImage will be activated automatically.

# 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.

> **Note:** The devices listed below represents the entire spectrum of hardware supported by HDClone. Which of them can be used with a certain edition is listed in ▶ 1.4 Edition overview.

### 3.1.1    Hardware requirements

- PC 80586 or higher, 500 MHz, 128 MB RAM, VGA (optimal: VESA support)
- Keyboard & mouse: PS/2 or USB
- Bootable floppy or CD drive or bootable USB medium

### 3.1.2    Supported media

- Under Windows (HDClone/W):
  any mass storage media supported by Windows
- DE/ATA hard disks, CompactFlash via IDE [1]
- SATA hard disks (internal & external)
- SCSI hard disks (internal & external)
- USB hard disks (internal & external)
- Firewire hard disks (internal & external)
- USB 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]

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[1] CompactFlash media with TrueIDE support
[2] Must support the USB-Mass-Storage-Class protocol
[3] Via an appropriate USB card reader

### 3.1.3   Supported controllers

○ Under Windows (HDClone/W): any controller supported by Windows

○ PCI-IDE controller

○ Bus master IDE controller

○ PCI-SCSI host adapter ( ▶ 3.4.2 Compatibility)

○ SATA controller with IDE interface ( ▶ 3.3.2 SATA/SATA-II controllers)

○ SATA-II controller with AHCI interface ( ▶ 3.3.2 SATA/SATA-II controllers)

○ USB UHCI & OHCI controller (USB 1.1)

○ USB EHCI controller (USB 2.0)

○ USB XHCI controller (USB 3.0)

○ IEEE1394 OHCI controller (Firewire)

## 3.2   Compatibility

HDClone has been developed for the hardware listed in ▶ 3.1 Overview and tested on a large number of devices. HDClone also works well with many other devices. Please use the HDClone Free Edition 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 drive-to-drive copy and click on [Next]. 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 Drive information).

> Note: Please ensure that you connect the needed USB devices before starting the program to ensure that they are recognized correctly ( ▶ 5.1 Preliminary 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 extensive 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 any hardware deficiencies. 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 ( ▸ 9.5 Support) will be there to assist you with solving the problem.

## 3.3   IDE/ATA/SATA

Generally, HDClone supports IDE/ATA/SATA hard disks. A necessary precondition is to have them connected to one of the IDE/ATA/SATA controllers supported by HDClone ( ▸ 3.3.1 IDE/ATA controllers and ▸ 3.3.2 SATA/SATA-II controllers).

### 3.3.1   IDE/ATA controllers

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..

HDClone supporting PCI IDE controllers 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 ⇔ Drive) it results in a double meaning. See ▸ 3.2.1 Compatibility test about how to check if your PCI controller complies with PCI IDE standard.

### 3.3.2    SATA/SATA-II controllers

Precondition for the support of SATA drives is an SATA controller with IDE inter-face 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. Regretta-bly, 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.

> **Hint:** With HDClone Free Edition you can easily check out if 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 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 nec-essary 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 or 1 and 3 available for SATA. Please connect the SATA hard disks cor-respondingly in this case.

### 3.3.3    Multiword DMA and Ultra-DMA

HDClone automatically recognizes and uses bus master IDE controllers, which al-low 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, wheth-er controller and hard disk support DMA and then automatically selects the fastest usable mode (Multiword DMA or Ultra-DMA 33/66/100/133).

> **Note:** Please take into account that both, hard disk and IDE control-ler have to support a certain DMA mode. If the actual speed does 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 trans-fer rate of about 90 MB/sec.

### 3.3.4  Bus master IDE controllers

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 problems with utilizing DMA, it is likely that certain BIOS settings have to be accommodated correspondingly ( ▸ **7.4.3 Problems with DMA**).

### 3.3.5  Speed

The speed DMA can achieve always depends on the physical abilities of a hard disk. The rough classification below shows the approximate speed to be expected from a certain drive type:

| Type | Age | Speed |
|------|-----|-------|
| Older drives | About 5-10 years | About 5-30 MB/sec |
| Newer drives | About 2-5 years | About 30-60 MB/sec. |
| Top models | About 0-2 years | About 60-120 MB/sec and more |
| SSDs | About 0-2 years | About 90-200 MB/sec and more |

## 3.4  SCSI

If your edition of HDClone supports SCSI hard disks, the following chapters provide important information on utilizing and compatibility of SCSI devices.

> **Note:** Since HDClone embeds original driver code of the hardware manufacturers, there no influence on actual compatibility. The following information is based on specifications of the manufacturer.

### 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 respective selection lists.

> Note: You can copy data from SCSI hard disks to other media types ( ▸ 2 Fields of application). This is important for the purpose of data rescue or if there is no SCSI target medium at hand, as any arbitrary medium can be used for (temporarily) storing the regarding data.

### 3.4.2   Compatibility

Generally, HDClone supports SCSI hard disk drives. As a precondition, they have to be connected to a SCSI controller HDClone supports. Currently, HDClone supports Narrow-, Wide-, Ultra- and Ultra-Wide-SCSI controllers from Adaptec.

> Hint: You can determine easily whether your SCSI controller is supported with any 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 recognized, 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 built-in as onboard chipset (AIC) or found on adapter cards (AHA, ASC). They can be recognized by their respective PCI vendor ID and PCI device ID, which are listed in the following table.

| Vendor | Model | Device | Vendor | Model | Device |
|--------|-------|--------|--------|-------|--------|
| 9004h | AHA-2930U | 3860h | " | AHA-4944UW | 8678h |
| " | AHA-2930CVAR | 3868h | " | AIC-7887 | 8778h |
| " | " | 3869h | " | AIC-7888 | 8878h |
| " | AHA-4944(U)W | 3B78h | " | AHA-4944(U)W | EC78h |
| " | AIC-755x | 5x75h | 9005h | AHA-2940/50U2W | 0010h |
| " | AIC-785x | 5x78h | " | AIC-789x | 001xh |
| " | AIC-7560 | 6075h | " | " | 002xh |

| Vendor | Model | Device | Vendor | Model | Device |
|--------|-------|--------|--------|-------|--------|
| " | AIC-786x | 6x78h | " | " | 003xh |
| " | AIC-7870 | 7078h | " | AHA-3940/50U2x | 0050h |
| " | AHA-2940(W) | 7178h | " | AHA-3950 U2x | 0051h |
| " | AHA-3940(W) | 7278h | " | AIC-7896/7 U2 | 005Fh |
| " | AHA-2944 | 7478h | " | AIC-789x | 006xh |
| " | AHA-3944(W) | 7578h | " | " | 007xh |
| " | AHA-4944(U)W | 7678h | " | AIC-7892(A|B)U160 | 008xh |
| " | AIC-7877 | 7778h | " | AIC-789x | 009xh |
| " | AIC-7860 | 7860h | " | " | 00Axh |
| " | AIC-7895 | 7895h | " | " | 00Bxh |
| " | AIC-7880 | 8078h | " | AIC-7899(A) U160 | 00Cxh |
| " | AHA-2940U(W) | 8178h | " | AIC-789x | 00Dxh |
| " | AHA-3940U(W)(D) | 8278h | " | " | 00Exh |
| " | AHA-2944UW | 8478h | " | " | 00Fxh |
| " | AHA-3944U(WD) | 8578h | " | AHA-2930U2 | 0180h |

The IDs of your respective controllers can be determined by means of the program PCISniffer. At http://www.miray.de/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 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 Preliminary steps) and if possible directly to the PC resp. to the USB controller ( ▶ 3.5.4 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 protocol. This is an official standard, which is supported by almost 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

In case of USB devices, it is crucial that HDClone supports the USB controller used. HDClone is capable of all three common USB standards, UHCI and OHCI

for USB 1.0/1.1, EHCI for USB 2.0 as well as XHCI for USB 3.0. 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, you can use HDClone Free Edition to check ( ▶ 3.2.1 Compatibility test).

### 3.5.3   XHCI

HDClone also supports the new XHCI standard. Therefore it is able to use fast, state-of-the-art USB 3.0 SuperSpeed technology mass storage media of the latest generation.

### 3.5.4   Hubs

USB devices are sometimes connected via a USB hub. For achieving the highest possible transfer rate, it is recommended to connect USB disks directly to the PC's USB port.

## 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 Preliminary steps) and if possible directly to the PC resp. to the Firewire controller.

# 4    Installation

## 4.1    Introduction

HDClone does not require an installation in the usual sense and can be invoked directly as a Windows application. Otherwise it can be started without the presence of an operating system as a self-booting application from CD, floppy disk or USB key( ▸ 4.1.1 Bootable medium). Additionally, there is a setup program, allowing you to easily install HDClone in Windows on your computer ( ▸ 4.2.1 HDClone Setup).

### 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 form of a bootable medium 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).

### 4.1.2    Software package

As far as you do not have HDClone on a bootable medium already, you can create one by yourself. The software package, which you 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).

### 4.1.3    Miray Virtual Disk

Some editions of HDClone also contain the software **Miray Virtual Disk** ( ▸ 8 Miray Virtual Disk) an application to mount file images as virtual Windows drives. **Miray Virtual Disk** will be installed automatically during HDClone setup. In case you do not want to have **Miray Virtual Disk** installed, please deselect it in the first installation screen ( ▸ fig. 1).

## 4.2    Installation in Windows

The HDClone software package contains a setup program (**setup.exe**), allowing you to install HDClone directly on Windows into a program folder. This will – by choice of the user – also create an Start menu folder as well as links on your desktop and in the Quickstart bar ( ▶ **4.2.1 HDClone Setup**).

The HDClone software package also contains an installation program for creating a bootable floppy disk or CD/DVD with only few mouse clicks



*fig. 1: HDClone setup start screen*

( ▶ **4.2.2 Boot-Setup & boot media**). To use the boot setup program, please run **setup.exe** first. Then start **[All Programs]** ▶ **[HDClone]** ▶ **[Create bootable medium]** in the Windows Start menu.

> **Note:** Alternatively, in case you have a software package in the ZIP file format, you may extract all files to an empty folder. Then execute the file **setup.exe** from there.

### 4.2.1    HDClone Setup

Start **setup.exe** ( ▶ **fig. 1**) and select the desired options on the first screen. Then follow the instructions displayed to install HDClone on your Windows PC. After setup has finished, you are asked in the final screen to choose whether to start HDClone directly.

> **Note:** HDClone Setup also will install the software **Miray Virtual Disk**, as far as you did not deselect it on the first screen. This will also include a software driver to be installed. For this reason, a Windows dialog window regarding driver installation ( ▶ **fig. 2**) may appear during setup. Confirm it with **[Continue Anyway]**. In case Windows will display the "Found New Hardware Wizard" ( ▶ **fig. 3**), close it with **[Cancel]**.

fig. 2: Windows dialog "Hardware Installation"
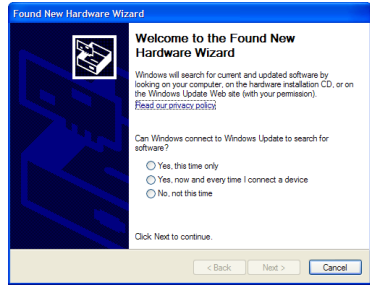


fig. 3: Windows dialog "Hardware Wizard"

---

**Note:** Depending on the kind of HDClone package you have, using the setup is not absolutely necessary. If you already have HDClone ready on a medium, you may additionally **setup.exe** to install HD-Clone on Windows. The same applies for a software package in the ZIP file format. When downloading HDClone via the Internet, the entire program package will be contained in the **setup.exe** file.

## 4.2.2    Boot-Setup & boot media

When starting the Boot-Setup program the main window appears ( ▶ fig. 4).

○ If you want to create a bootable floppy, choose the drive at 'Floppy drive' and click on [Create floppy].

○ To create a bootable CD/DVD, choose the drive at 'CD/DVD writer' and click on [Create CD/DVD].

○ To create a bootable USB key, choose the desired drive at 'USB medium' and click on [Make bootable].

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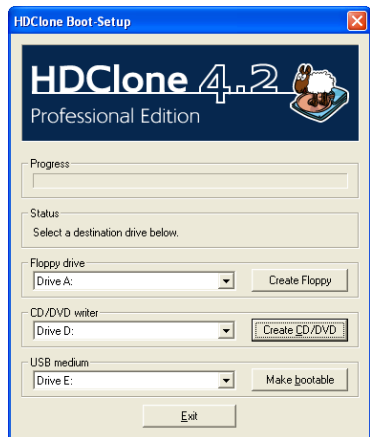


fig. 4: HDClone boot setup

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

#### 4.2.2.1   CD/DVD writer not selectable

In few cases, no drive is offered for selection at **CD/DVD writer** although a CD/DVD writer is available on the system. Usually, 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. Or 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**).

### 4.2.3   Bootable Windows XP CD

When using HDClone with storage devices or controllers, which require special Windows drivers, it has to be used directly on Windows. If there is no Windows installation available, you can create a bootable Windows XP CD which includes the drivers needed. It just requires PE Builder and a Windows XP installation CD.

Please download PE Builder from the Internet at http://www.nu2.nu/pebuilder/. The downloaded package allows you to create a specially configured Windows XP system, which can be started right off a CD. A plug-in is used to integrate HDClone into the PE system. A corresponding plug-in is to be found at http://www.miray.de/public/support/HDClone-BartPE-Plugin.en.zip. Please install PE Builder on your system and unpack the plug-in to the folder **pebuilder3110a\plugin**. This location then should contain the new folder



*fig. 5: PE Builder configuration dialog*

**HDClone**. Now copy **hdclone.exe** from the installation package to **pebuilder3110a\plugin\HDClone\files**. In case the mass storage devices and controller on your target system will require special drivers, please copy the driver files to **pebuilder3110a\drivers\SCSIAdapter**.

Then start **pebuilder.exe** from the folder **pebuilder3110a**. After few seconds, a dialog window appears ( ▶ **fig. 5**). Please enter the path to the Windows XP instal-

lation files in the input field on top. They are to be found on your Windows XP installation CD. Hence, this field usually contains the drive letter of your CD/DVD drive – except you have copied the installation files to another location. You can now choose a name and a location for the boot image by clicking on **Create ISO image** in the box **Media output**. If another CD/DVD writer is available, you can immediately create a CD by clicking on **Burn to CD/DVD**. Otherwise, please create an ISO image first.

After clicking on **Start** PE Builder creates the CD. Depending on your system, this may take a few minutes. If you did not select **Burn to CD/DVD** in the previous step, it is necessary to write the newly created ISO image to CD with your recording software. Please note that the file has to be written to CD directly as an image. Normal writing will not be sufficient in this case. Instead, please start your recording software and choose **Create from image file** (or similar description, depending on the recording software used).

Start your PC from the CD created. HDClone is to be found at **Go ▶ Programs**.

## 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. After having created a bootable floppy disk, you can start HDClone on any PC as described in chapter ▶ 5.2 **Starting the program**.

> **Hint:** 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.

### 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 sim-

ilar caption, according to the respective CD writing software)

○ Specify the file **hdclone.iso** as image file.

○ Insert a blank CD into the drive and write the CD.

> **Hint:** 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:** CD/DVD writing software may refuse writing an ISO image to a DVD. The HDClone installation program writes DVDs without any problem. Booting from a DVD created this way also works smoothly.

## 4.4 Booting from USB key

To start HDClone from a USB key, the PC has to be able to boot from USB media. Usually the easiest way is to enter the **BIOS-Boot-Selector (BBS)** and select the USB key to start from. The PC then boots directly from the USB key instead of the installed operating system. Depending on the regarding BIOS of the PC, the USB key is displayed in the BBS menu under its name (e.g. "Miray USB"), as "USB medium", "USB-HDD", "Removable Device", or a similar caption.

If the USB key is not listed in the BBS menu at all, it is required to activate support for USB boot media in the BIOS setup first. This setting is to be found under different captions and menu items, depending on the regarding BIOS. In most cases they are to be found under captions like **USB**, **Boot** and **Legacy**. In BIOS setup you can also preset booting from USB firmly, usually under the menu item **Boot**.

> **Hint:** You can enter the BBS menu directly when starting the PC with a certain key on the keyboard, depending on the BIOS. In most cases the startup screen shows which key to press. For the BBS menu it is **<F8>** or **<F12>** in most cases, rarely **<F11>**. BIOS setup usually is called with the **<F2>** or **<Del>** key.

# 5    Program instructions

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

> **Note:** Depending on the edition you use, there may be differences in the features described in this and the following chapters. Please check in ▶ 1.4 Edition overview which features your edition supports.

## 5.1    Preliminary steps

If you want to use USB devices for the following copying process, connect the 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:** HDClone can be started directly as a Windows application ( ▶ 5.2.2 Windows program) or as a self-booting application ( ▶ 5.2.1 Self-booting program). To start the self-booting HDClone, you need a bootable HDClone CD or floppy disk. If you don't have HDClone on a bootable medium, you can create it as described in chapter ▶ 4 Installation.

## 5.2    Starting the program

### 5.2.1    Self-booting program

Insert the bootable HDClone CD, floppy disk into the corresponding drive or plug the bootable USB key to your PC. Switch on the computer or reboot it. Make sure that the BIOS boots from the respective drive or USB key ( ▶ 4.4 Booting from USB key). HDClone will then start automatically from the bootable medium and the program screen appears.

> **Note:** In case your PC does not boot from the HDClone boot medium, press <F8>, <F11> or <F12> (BIOS dependent) immediately after turning on the PC to enter the boot menu. Select the HDClone boot device there. Or press <F2>, <F10> or <Del> (BIOS dependent) to enter BIOS setup and set the required boot device order there. For troubleshooting loading problems of HDClone please view chapter ▶ 7.1 Load errors.

## 5.2.2    Windows program

Start HDClone from the Windows start menu at [Programme] ▶ [HDClone] ▶ [Start HDClone] or by starting the executable file hdclone.exe from the genuine HDClone medium or directly from your software package.

## 5.2.3    Command line program

You may include HDClone in automated workflows like shell scripts or time-triggered tasks. For this kind of usage, there is a command line version of HDClone (hdclone-cl.exe), to be found in the program folder of HDClone. It is especially suitable for the following fields of application:

○ Calling it from shell scripts or batch files.

○ Creating a permanent link on the Desktop or in the Start menu.

○ Creating time triggered tasks by calling HDClone through the Task Scheduler.

This allows to integrate HDClone seamless into existing scripts or batch processes. You can also create Desktop links for frequently used cloning configurations to call them easy manually or automatically on demand. Usage of hdclone-cl.exe is described in detail in ▶ 6.10 Command line interface.

# 5.3    Program screen
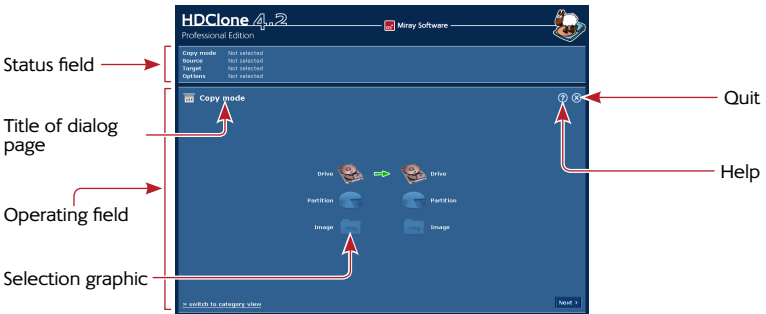


*fig. 6: Program screen*

The HDClone program screen ( ▶ fig. 6) 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.

### 5.3.1    Status field

The upper field is the status field ( ▸ fig. 6). It shows the parameters selected for the copying process (Copying mode, Source, Target and Options). Thus you 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. 6). 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 quit button [X] you can quit the program at any time ( ▸ 5.11 Closing the program). At the bottom of the operating field, you find the buttons [Next] and [Back], for navigating 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 control elements

To control the program, HDClone offers different graphical control elements ( ▸ fig. 7 and fig. 8). The names, used within this manual to designate the different elements, are listed and illustrated by examples in the following illustrations.
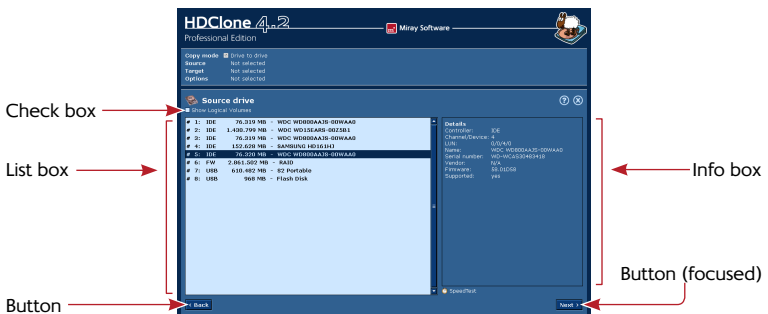


*fig. 7: Graphical control elements (1)*

*fig. 8: Graphical control elements (2)*

Labels on figure: Dialog window, Percentage, Button (inactive), Close dialog, Progress bar
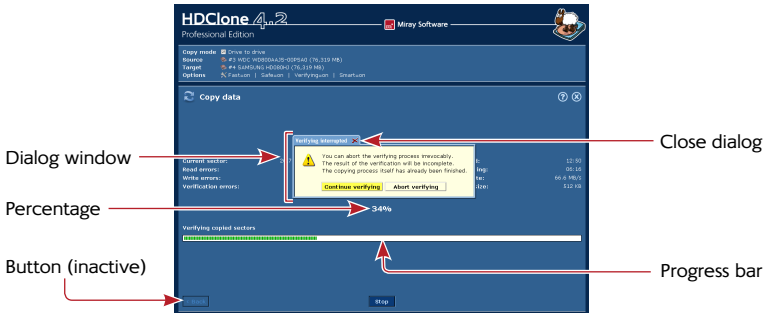
## 5.4.2   Operation with keyboard and mouse

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

Keyboard operation always refers to the currently 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 | Control element | Function |
|---|---|---|
| <Tab> | (All) | Switch to the next element |
| Arrow keys | List field | Select list element |
| (←/↑/→/↓) | Selection graphic | Highlight element |
| <Space> | Button | Press button |
| | Selection graphic | Select highlighted element |
| | Link | Show link target |
| <Return> | Button | Press button (in dialog windows only) |
| | Link | Show link target |
| <Esc> | Window | Close window (only windows with **✗** in the title bar) |
| | (Operating field) | Quit 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. 6). 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 user's manual especially, when you have problems or need more information on a topic.

## 5.6   Selecting a copy mode

Select the desired copying mode on the first dialog page ( ▶ fig. 9 and fig. 10). There are two views, basically offering the same options. They differ in how the copying modes are presented. The classic view is focused on functionality, while the category view displays the available copying modes task-oriented.

### 5.6.1   Category view

The category view ( ▶ fig. 9) allows you to choose a copying mode matching the desired area of use (backup, restore, and cloning). The upper row of symbols shows the copying modes referring to entire disks (e.g. hard disks). The lower row refers to copying modes for individual partitions. If you select a copying mode by clicking with your mouse, it will be displayed highlighted. If you want to use the selected copying mode, click on [next]. A detailed description of the copying



*fig. 9: Selecting copying mode (categories)*

modes, their operation and impact can be found in ▶ 6 Operating principles.

## 5.6.2    Classic view

The classic view ( ▶ fig. 10) offers you a more functional selection of the available copying modes. You have eight options altogether. This is two more than with the category view, since the classic view also allows for choosing ▶ 2.1.1 Unused disk space and ▶ 6.1.7 Partition-to-drive. According to your choice, a physical copy, a logical copy, or an image file will be created or restored. The following table provides a short overview on the available options. You find a detailed



fig. 10: Selecting copying mode (classic)

description of the copy modes and how they work in ▶ 6 Operating principles.



**Drive-to-drive**
Physical 1:1 copy of an entire drive
( ▶ 6.1.4 Drive-to-drive).



**Partition-to-partition**
Physical 1:1 copy of an individual partition
( ▶ 6.1.5 Partition-to-partition).



**Drive-to-partition**
Creates a backup of an entire drive
( ▶ 6.1.6 Drive-to-Partition).



**Partition-to-drive**
Restores the backup of an entire drive
( ▶ 6.1.7 Partition-to-drive).



**Create drive image**
Creating a file image of an entire drive
( ▶ 6.1.8 Create drive image).

**Create partition image**
Creating a file image of a single partition
( ▸ 6.1.9 Create partition image).

**Restore drive image**
Restoring an entire drive from a file image
( ▸ 6.1.10 Restore drive image).

**Restore partition image**
Restoring a single partition from a file image
( ▸ 6.1.11 Restore partition image).

> **Note**: The copy modes drive-to-partition and partition-to-drive are designed for mutual use. In general, it is not possible to copy a working hard disk installation onto a partition and to use it there. The installation rather has to be copied back to a hard drive first. The partition serves only as a container for the hard disk data. The same applies to copying a normal partition onto a hard disk. Nevertheless, there are some systems, which know to handle media with just one single partition and without any partition table, sometimes named SuperFloppy. For further information on these copying modes please see ▸ 6.1 Copying modes.

After selecting the copy mode, move to the next step by clicking [next] in the lower right corner of the operating field ( ▸ 5.7 Selecting data source and target).

When selecting the copy mode, HDClone starts its device and drive recognition. A small popup will be displayed before the next dialog page will be shown. This can take one minute or more. The time required depends on the number of drives connected. If it takes more than five minutes, there may be technical problem. In this case you find further information in ▸ 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 either an entire drive or a single partition. The following sub-chapters give you more detailed information. After having selected the data source in the first step, another dialog page ap-

pears 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 a drive

When selecting a source or target drive ( ▶ fig. 11) you see the devices recognized by HDClone in the selection list. The info box on the right side shows more details on the selected element ( ▶ 5.7.4 Drive information).

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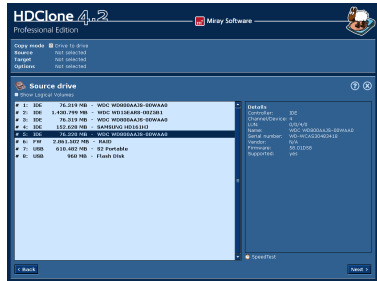


*fig. 11: Selecting a drive*

### 5.7.2   Selecting a partition

When selecting a source or target partition ( ▶ fig. 12), the recognized drives and partitions are shown in the selection list. The partitions belonging to a certain drive are listed below it in an indented form. The drives themselves cannot be selected. The frame with the details on the right side of the selection list shows details concerning the drive on which the currently selected partition is located.
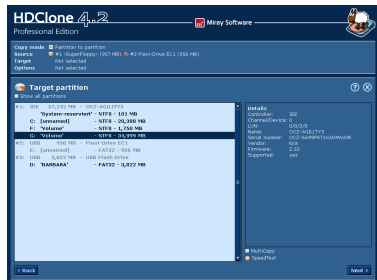


*fig. 12: Selecting a partition*

Select the desired partition and confirm your selection by pressing [Next] in the lower right corner of the operating field and move 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 drive or

the drive that contains the source partitions is deactivated when selecting a target drive.

○ When selecting a target partition, the already selected source partition or all partitions of the source drive are deactivated.

○ If HDClone recognizes drives, but the edition used does not support them, these drives and the partitions 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.com.

> **Hint:** 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   Drive information

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

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

> **Note:** Supported will show yes if the edition you use supports the selected drive. Otherwise HDClone indicates here from which edition on that drive is supported.

## 5.7.5   Selecting a file image

When selecting a file image ( ▶ fig. 14
and fig. 15) the selection list shows the
recognized drives and the partitions
found on them. All partitions of a cer-
tain drive are listed beneath the drive
in indented form. The drives them-
selves cannot be selected. The dialog
for selecting a file image is to be found
in the frame on the right of the list box.
The form of the dialog varies depend-
ing on whether the file image will be
the target ▶ 5.7.5.1 File image as a



fig. 13: File image browser

target or the source ▶ 5.7.5.2 File images as a source of the copying process. In
both cases you can use the button [Browser] below the frame to open the file
image browser ( ▶ fig. 13). It offers a more convenient layout for browsing larger
folder structures with many entries. With [Cancel] you can return to the file im-
age selection dialog page without any changes. Click on [OK] to use the file im-
age selected in the browser.
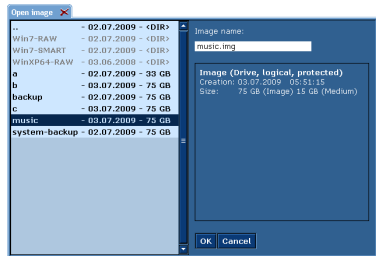
> Note: If you are running HDClone/W and mapped network drives
> are not displayed in the selection list, this may probably be solved as
> described in ▶ 7.7 Mapped network drives.

### 5.7.5.1   File image as a target

When creating an image ( ▶ fig. 14),
the target of the copying process is a
file image. You are prompted to enter
a file name into the input field in the
frame on the right of the list box. A file
image with that name will be created
on the selected partition ( ▶ 5.7.5 Se-
lecting a file image). Additionally, you
may specify whether a SmartImage or
a RAW image is to be created. More
information on the different image
types is to be found in ▶ 6.8 Imaging.
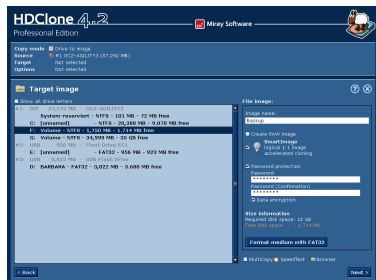


fig. 14: File image as a target

Select the desired partition from the list box and enter a name for the file image.
To protect the file image, activate Password protection ▶ 6.8.7 Password-Protec-

tion. Enter a password for the file image twice. As an option, you may choose **Encryption** to have the data in the image securely encrypted ( ▸ 6.8.8 Encryption). If desired, choose to create a **SmartImage** ( ▸ 6.8.1 Logical images) or a **RAW image** ( ▸ 6.8.3 RAW images, ▸ 6.8.4 VMDK images). Otherwise a physical image ( ▸ 6.8.2 Physical images) will be created automatically. To proceed to the next step, click on **[Next]** in the lower right corner of the operating field to confirm your choice.

### 5.7.5.2    File images as a source

When restoring an image ( ▸ fig. 15), the source of the copying process is a file image. In the frame on the right of the partition list, a second list box is to be found. It contains a list of file images found on the selected partition ( ▸ 5.7.5 Selecting a file image). When clicking on an image in the list, further details on the selected image will be displayed beneath the list: Creation time and date, size, and type of image. There are two information fields on the size. First, the storage size of the



*fig. 15: File image as a source*

file image. Second, the original size of the medium stored in the image. Regarding the type of image, HDClone distinguishes between an image of an entire drive and the image of a single partition or logical drive. There is also an information about which mode the image has been created with, i.e. as a physical, logical, or RAW image.

Select the desired file image. Confirm your selection with **[Next]** in the lower right corner of the operating field to proceed to the next step.

## 5.7.6    SpeedTest

On the lower right of the operating field you find the speed test icon, labeled **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 ( ▶ 5.7.7 MultiCopy mode) is select-
ed, the speed measurement is being performed for all selected me-
dia 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).

### 5.7.7     MultiCopy mode

When selecting the target medium you can use the check box MultiCopy to ac-
tivate 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 ( ▶ 5.7.6 SpeedTest) to
measure the data throughput of the selected drives or partitions in parallel op-
eration. 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 HD-
Clone, even in the Free Edition. This can be used to check in ad-
vance 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).

Hint: MultiCopy mode can also be used in combination with imag-
ing ( ▶ 5.6 Selecting a copy mode). In this case you can either re-
store the contents of an image file to up to 16 targets at a time
( ▶ 5.7.5.2 File images as a source) or create up to 16 image files at a time - to
different media, of course - from one single source ( ▶ 5.7.5.1 File image as a
target).

## 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. Only modify the options to troubleshoot problems ( ▸ 7 Troubleshooting) or when you are sure that this improves the performance of HDClone.

> Note: Improper modification of options may influencethe copying performance negatively.

After choosing the required options, 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 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
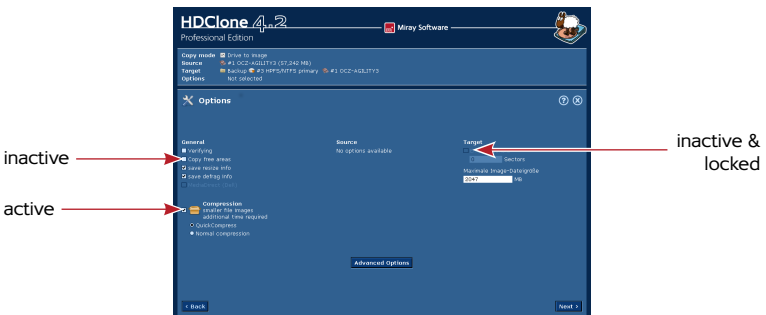


*fig. 16: Selecting the options (creating an image)*

The options have show different availability and selectability, depending on the copy mode selected. Locked options cannot be modified, but the displayed setting is valid. ▶ fig. 16 shows the different states.

### 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 |
| --- | --- |
| Verifying | Compares the data of source and target after copying. Not to be used for data rescue, as it yields unnecessary additional stress for a damaged drive ( ▶ 5.8.1 Verifying). |
| Copy free areas | Include unpartitioned areas in the copy. If the source is only partly partitioned, this will speed up copying significantly. Only special contents (e.g. backup areas, dynamic disks/volumes) require to copy the free areas, too. |
| MediaDirect (Dell) | Deactivate MediaDirect software on the target. |
| SmartCopy | Copying only: Logical 1:1 copy ( ▶ 6.6 SmartCopy). |
| Defragmentation | Copying only (NTFS+FAT): Reorganize file system during copying. |
| Store downsizing info | Creating images only (NTFS+FAT): Will store information needed to downsize NTFS partitions when restoring the file image in the future. Without this information, partitions can only be restored at their original size (or larger). |
| Store defrag info | Creating images only (NTFS+FAT): Store information needed to defragment NTFS partitions when restoring in the future. Without this information, partitions cannot be defragmented during restoring. |
| Compression | Creating images only: Will create a compressed file image to reduce the required free space for storing it ( ▶ 6.8.6 Compressed Images). |

### 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 |
| --- | --- |
| Sector area | Exactly definable copying area ( ▶ 6.4 Area copy). |

| Option | Meaning |
|--------|---------|
| Error threshold | When copying to several targets, the maximum number of defective sectors accepted per medium can be set here. If this limit is reached, the regarding medium will be exempted from the copying process. There will be no further attempts to write on that medium. This allows the remaining media to be copied at full speed. For example, a good value for practical use is 32,000. |
| 4k alignment | Target only: If this option is active, the copied partitions will be automatically aligned to 4 kilobyte boundaries on the target medium. If this option is disabled, the copied partitions will be aligned at the usual cylinder boundaries (CHS). When the source is already aligned, the option will be activated automatically. |
| Maximum image file size | Image only: Defines the maximum size of the file blocks stored within an image. To be compatible with different file systems, the default is 2,047 MB. For burning an image to CD, DVD or BD later, you may specify a different value (CD: 700 MB \| DVD: 4.700 MB \| BD: 25.000 MB). |

## 5.8.5   Advanced options

The dialog page Options contains the most frequently needed options. More detailed settings are accessible over the button [Advanced options]. It opens a dialog with more option ( ▸ fig. 17). The separation into different columns is the same as on the dialog page Options.
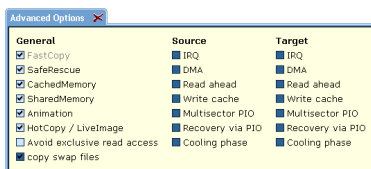


*fig. 17: Advanced options*

### 5.8.5.1   General

These options refer to the general features of a copying run.

| 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 also stay turned on for normal copies. |
| CachedMemory | Use fast intermediate memory. |

| Option | Meaning |
| --- | --- |
| SharedMemory | Use fast data transfers. |
| Animation | Switch off copy animation. |
| HotCopy LiveImage | HDClone/W only: Allows or denies HDClone access to the Windows shadow copy mechanism. If this option is deselected, HDClone is not able to create copies or file images of the system volume or of volumes, which are used by other programs at the same time. |
| Avoid exclusive read access | HDClone/W only: Usually, HDClone when running on Windows, at first tries to reserve the source drive for exclusive access. This is the most reliable way for creating an identical copy, but it may interfere with other programs running at the same time. If this option is selected, HDClone tries to create a HotCopy or a LiveImage first. |
| Copy swap files | Creating images only: Usually, it is not necessary to store the files pagefile.sys and hiberfil.sys in the file image. If this option is activated, both files will be stored in the file image. When creating a 1:1 copy – whether smart or physical – this option is always activated. |

### 5.8.5.2 Source and target

These options refer to the specific abilities of source and target drives.

> Note: These options are not available under Windows and will therefore not be displayed by HDClone/W.

| Option | Meaning |
| --- | --- |
| IRQ | In 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, when DMA is deactivated (see above). |
| Recovery via PIO | Optimal recovery of defective sectors. |
| Cooling phase | To fix data errors or interruptions during the USB data transfer ( ▶ 7.6.2 Other device problems). |

## 5.9    Copying data

The final dialog page is named Copy data ( ▶ fig. 18). Check the settings in the status field: copy mode, source, target, and the selected options. If needed, go back by clicking [Back] in the lower left corner and adjust the settings. Start the copying process, with [Start] on the bottom center. During the copying process, you can watch the process with the help of the displays described below.
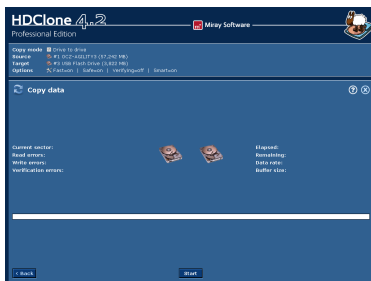


*fig. 18: Dialog page ‚Copy data'*

### 5.9.1    PartitionSelect

In case of using ▶ 6.1.4 Drive-to-drive, ▶ 6.1.8 Create drive image or ▶ 6.1.10 Restore drive image copy mode, a dialog ( ▶ fig. 19) prompts you to choose the partitions to copy and which to exclude from copying. Select the partitions of the source (a drive or a drive image) to be copied to the target and the ones to be ignored without copying them to the target.
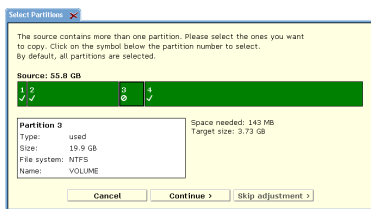


*fig. 19: Dialog ‚Select Partitions'*

If the total size of the partitions to be copied exceeds the total capacity of the target, the graphic bar will be marked in red. In this case, you can exclude any partitions you do not need on the target until the remaining partitions fit on the target. Alternatively, you can click on [Cancel] to choose a different combination of source and target for creating the copy.

The default setting is to have all partitions selected. If this meets your requirements, you can simply click on [Continue]. Otherwise select which partitions to exclude from copying by clicking on the check symbol (✓) beneath the partition number. The check symbol will then change to a lock symbol (🔒). It signals that the partition will be excluded from copying. When clicking on the lock symbol, you can activate the partition again so that it will be copied.

In this case, the check symbol appears again. When you have selected all partitions as desired, click on [Continue].

In case you want to copy all partitions and to skip the adjustment step ( ▶ 5.9.2 Adjusting partitions), you can use the button [Skip adjustment]. Any previous

selection of partitions will then be ignored and all partitions will be copied in their original size and original location as given on the source.

For further information on the PartitionSelect mode, see ▸ 6.7 PartitionSelect.

## 5.9.2    Adjusting partitions

In case partition sizes can be altered a dialog window appears, before the copying process will be started ( ▸ fig. 20). It allows you to adjust the size of several or all partitions to fit on the target medium as desired.

Positions and sizes of the partitions on the target medium are displayed graphically in a bar. Each partition has a cipher or – from the tenth partition on – a letter assigned to it. If you click



fig. 20: 'Adjust partitions' dialog

on a partition in the bar, the box on the lower left will display additional information on the selected partition. Below each partition number, there is either a double arrow ( , the default setting), showing that the partition size can be altered, or a lock-symbol ( ), indicating that the size of the partition is fixed. By clicking on these symbols, you can toggle between both modes arbitrarily. This allows to keep the original sizes of certain partitions, while changing others or have them adjusted automatically.

> **Example:** Given you have a system partition (C:) and two data partitions (D: and E:). When migrating to a new, larger hard disk, you may want to resize the data partitions while the system partition keeps its original size. First, click on the symbol below the system partition to have it change to the lock-symbol. This will keep the system partitions's size fixed. Then choose Automatic adjustment to have the data partitions resized proportional to the newly available space. Then click [Continue].

FAT, NTFS, and ext2/ext3/ext4 partitions can be increased, FAT and NTFS partitions can also be decreased in size. Each partition can be shrinked to the minimum amount of space required by the data stored on this partition. Enlarging or downsizing can be accomplished either automatically proportional to the size of the target medium or manually to an arbitrary size. The original size of the partition is displayed in light green, the minimal partition size achievable by downsizing in dark green. The additionally assigned space when enlarging a partition is displayed in striped light green. The size of partitions displayed in black cannot be altered. Free space not assigned to any partition is displayed in white. There

are three options for how to handle free space on the target medium ( ▶ 5.9.2.1 Keep original sizes, 5.9.2.2 Automatic adjustment, 5.9.2.3 Free adjustment).

Select the desired option. In case of Free adjustment, make the desired changes. Then click on [Apply adjustments] for having the selected adjustments become effective. If you click on [Continue without adjustment] , the following copying process will transfer the partitions of the source to the target medium without any changes. Clicking [Cancel] will bring you back to the dialog page Copy data, without making any changes and without starting the copying process.

> **Note:** In case you want to transfer the original partition layout to the target medium, click on [Continue without adjustment]. Although the option Keep original sizes will keep the original partition sizes, it may though alter their absolute positions on the medium by shifting them towards the beginning of the medium for a better utilization of free space.

### 5.9.2.1   Keep original sizes

The original sizes of partitions on the source will be kept on the target medium ( ▶ fig. 21). The partitions them-

*fig. 21: Option 'Keep original sizes'*

selves will be "shifted together" at the beginning of the target, if possible. This approach is useful since it closes gaps between partitions, gaining additional space, which is made available in one single block at the end of the medium.

### 5.9.2.2   Automatic adjustment

Free space on the target medium will be apportioned completely to the individual partitions, proportional to their respective size ( ▶ fig. 22). This increases the partitions' sizes according to their part of the full size of medium. Calculation of the size proportions is handled automatically by HDClone.
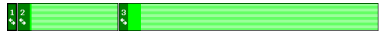
*fig. 22: Option 'Automatic adjustment'*

### 5.9.2.3   Free adjustment

You can adjust the apportioning of additional space on the target medium to the individual partitions by yourself

*fig. 23: Option 'Free adjustment'*

( ▶ fig. 23). You can change the size of a certain partition by clicking and dragging the corresponding area on the graphical representation.

### 5.9.3   Security query

Before the final start of the copying process, a security query ( ▸ fig. 24), appears where source and target of the copying process as well as corresponding security notes are displayed. Click [Start copying] to start the copying process and [Cancel] to return without starting the copying process.
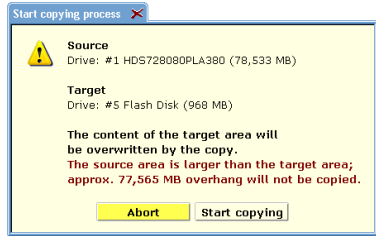


*fig. 24: Security query*

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

### 5.9.4   Copy animation

In the center of the operating field, there is the copy animation (if you have not deactivated it when selecting the options) after starting the copying process. The copy animation shows, that the copying process is running. Especially other indicators only change rarely, for example in case of read or write errors, the copy animation shows that HDClone is still running.

### 5.9.5   Status indication

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

| Status | Meaning |
| --- | --- |
| Sectors processed | Absolute number of sectors already copied. |
| Buffer size | Size of the internally used buffer. |
| Read errors | Number of the read errors occurred yet. This number may 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 yet. This number may 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. |

| Status | Meaning |
|--------|---------|
| Time remaining | Estimated (!) time remaining for the entire copying process (incl. the optional verification run) based on the current copying speed. 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 indicator is only used if the Verifying option is on. |

### 5.9.6   Percentage indication

The percentage indicator ( ▶ fig. 8) is located below the copy animation, showing the progress of the current run ( ▶ 5.9.8 Course of the process) in percent.

### 5.9.7   Progress bar

The progress bar ( ▶ fig. 8) below the percentage indication visualizes the progress of the current run. Which run ( ▶ 5.9.8 Course of the process) is currently processed is shown on the left above the progress bar.

### 5.9.8   Course 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..

### 5.9.9   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. 25 and fig. 26), where you have the choice to either continue the process (click on [Continue copying] or [Continue veri-



*fig. 25: Abort dialog copying process*

fying]) 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.

# 5.10  Termination of the copying process

## 5.10.1  User abort

If you interrupt a running copying pro-
cess or verification run by clicking
[Stop] (▸ 5.9.9 **Interrupting the run-
ning process**), you can definitively
abort the process in the dialog win-
dow which then appears (▸ **fig. 25**
and **fig. 26**) by clicking [**Abort copy-**


*fig. 26: Abort dialog verification run*

**ing**] or [**Abort verifying**]. You then obtain a final report (▸ 5.10.4 **Final report**)
upon the prematurely terminated process.

> **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 (▸ 5.9.8 **Course 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 (▸ 5.10.4 **Final report**).

## 5.10.3  Adjust media parameters

After finishing the copying process, a dialog
for adjusting media parameters appears
(▸ **fig. 27**). Since HDClone creates a 1:1 copy,
the data from the Master Boot Record (MBR)
and of the boot sector(s) are also copied to
the target medium. As this characteristic of a
1:1 copy sometimes causes problems in prac-
tice, HDClone offers to adjust the regarding
media parameters optimally for the target
medium.
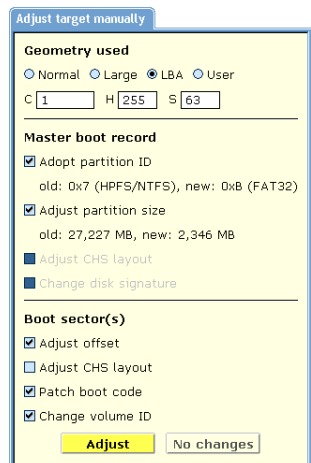

*fig. 27: Adjustment dialog*

> ⚠ **Important:** In case you adjust the target medium, it will no longer be an absolute 1:1 copy. Especially in case of forensic analysis, you might want to abstain any adjustment.

HDClone automatically sets parameter values, which are optimal for the respective medium in most cases. They usually just need to be confirmed. A manual change of the preset parameters is only needed in exceptional cases. The parameters refer to the Master Boot Record (MBR) and to any known boot sector(s) and are grouped correspondingly.

| Parameter | Meaning |
|---|---|
| Geometry used | To boot from the medium, the device geometry has to match the geometry set in BIOS. |
| Adopt partition ID | Use same partition type as on the source medium. |
| Adjust partition size | Set the space reserved for the target partition to the size needed for the partition copied. |
| Adjust CHS layout | Use the values set under Geometry used for adjusting the MBR or the boot sector(s). |
| Reset disk signature | Reset unique media signature. |
| Adjust offset | Adjust real partition start address in boot sector(s). |
| Patch boot code | Avoids boot problems on older hardware. |
| Change volume ID | Create a new ID for the partition. Necessary when source and target work in the same PC. |

When the parameters and options are set as desired, click on [Adjust] to modify the medium or click on [No changes] to leave the medium unchanged.

> ℹ **Note:** In case of a copy with several target media (Enterprise Edition only), the dialog appears only once. The selected adjustments are then carried out for all target media.

## 5.10.4  Final report

After termination ( ▶ fig. 28) or the abort ( ▶ fig. 29) of a copying process, you obtain a final report in a dialog window with the following information:
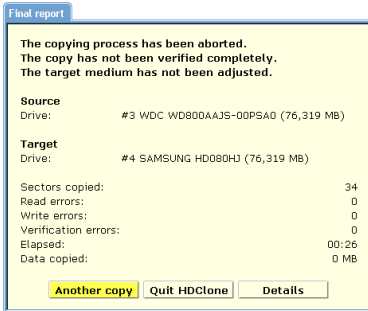
fig. 28: Final report after a successful copying and verification run
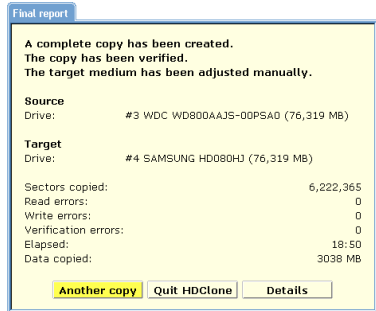


fig. 29: Final report after the abort of the copying run

- **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 aborted prematurely.

- **The copy has been verified:** In case the verification has been terminated without an abort.

Furthermore, the final report contains the following information:

| Field | Meaning |
|---|---|
| Source | Source drive/partition of the copying process. |
| Target | Target drive/partition of the copying process. |
| Copied sectors | Total number of copied sectors. |
| Read errors | Total number of 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 write errors occurred during the copying process. Write errors, which occur during the verification run, are exclusively counted as verification errors. |

| Field | Meaning |
|---|---|
| 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 comparison. This stays zero verification is not enabled. |
| Runtime | Time required for the whole process, i.e. copying process and verification run (if executed). |

You can start another copying process by clicking [Another copy] or end the program by clicking [Quit HDClone] ( ▶ 5.11.2 Good-bye screen).

## 5.11   Closing the program

### 5.11.1 End dialog

You can end HDClone at any time. Possibly open dialog windows have to be closed before. Click then the end symbol [X] in the upper right corner of the operating field ( ▶ fig. 6)or press <Esc>. The end dialog appears ( ▶ fig. 30) where you can quit HD-Clone by clicking [Yes] and return to



*fig. 30: End dialog*

the program by clicking [No]. Furthermore, you can cancel HDClone directly after a terminated copying process ( ▶ 5.10.4 Final report).
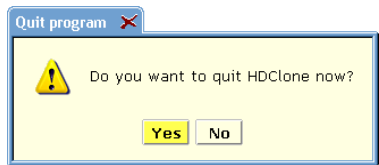
### 5.11.2 Good-bye screen

After the termination of HDClone, either via the end dialog ( ▶ 5.11.1 End dialog) or via the dialog window with the final report ( ▶ 5.10.4 Final report), a good-bye screen appears ( ▶ fig. 31). You can then shut down the computer or reboot it.
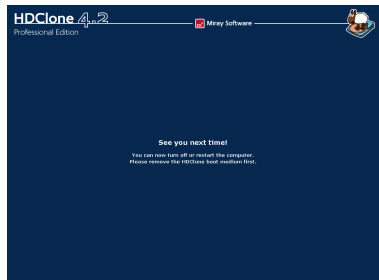
> **Note:** If you don't want to start HDClone when starting the computer the next time, remove the HDClone boot medium from the boot drive.



*fig. 31: Good-bye screen*

# 6   Operating principles

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

## 6.1   Copying modes

HDClone can handle entire hard disks as well as individual partitions. The program therefore offers different copy modes. Their meaning, effect and options 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 entire 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 1:1 copy as possible. Since many users have their own individual requirements and cases of application for the 1:1 copy, some of the offered possibilities only lead to an intermediate step (e.g. in case of a backup, ▸ 6.1.6 Drive-to-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 physical 1:1 copy or a physical 1:1 image 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 regarding the original data.

### 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 copy mode fits best for a certain

use case is described below as well as in ( ▶ **2 Fields of application**).

### 6.1.3   Logical Copy

A logical copy takes only those area of a storage medium into account for the data transfer, which are occupied by the operating system and data files ( ▶ **6.6 SmartCopy**). Any free areas – including unused space within a file system – will not be copied. Since in most cases only a fraction of the available storage capacity is actually occupied with data, a logical copy is usually notably faster than a physical copy, sometimes even a multiple.

> ⃠ **Important:** A logical copy evaluates file system information to find out which areas of the medium will be copied. Therefore it should never be used for defective media or corrupt file systems. Otherwise HDClone will behave unpredictable. Moreover, copies created under such circumstances are mostly faulty and useless since they are based on corrupted file system information. **Therefore, especially for rescuing data, please always use a physical copy in these cases** ( ▶ **6.1.2 Physical copy**).

### 6.1.4   Drive-to-drive

This copy mode creates a 'classical' 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. Differ-



*fig. 32: Drive-to-drive*

ent sizes of the hard disks result in a non-copied or non-overwritten area ( ▶ **6.2 Size differences**).
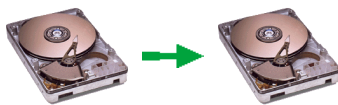
The drive-to-drive copy mode is especially useful for the following areas of use:

○ Migration of an existing operation system installation to a larger drive ( ▶ **2.1 Upgrading hard disks & migrating an OS**).

○ Rescue of entire hard disks ( ▶ **2.2 Data rescue**).

○ Backup and restore of entire drives 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 drive ( ▶ **2.6 Proprietary hard disk formats**).

○ Copy for forensic analysis and evaluation ( ▶ **2.7 Forensic data securing**).

### 6.1.5   Partition-to-partition

This copying mode functions similarly to
the above described mode ( ▸ 6.1.4 Drive-
to-drive). However, in this case, not the
whole hard disk is copied, but only the
content of an individual partition is copied.

fig. 33: Partition-to-partition

This copy is executed sector by sector, too. Relatively a the beginning of the re-
spective partition, the individual sectors are also moved to the same address.
However, due to the principle and in contrast to the drive-to-drive mode, the
individual sectors are not at the same absolute address in relation to the com-
plete 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 ( ▸ 5.10.3 Adjust media parameters).

The partition-to-partition copy mode is useful for the following areas of use:

○ Migration of an existing operation system partition to another drive ( ▸ 2.1 Up-
  grading hard disks & migrating an OS). Bootability cannot be guaranteed.

○ Rescue of individual partitions ( ▸ 2.2 Data rescue).

○ Backup and restore individual (system) partitions ( ▸ 2.3 Installation backup).

○ Multiple installations of individual (system) partitions ( ▸ 2.5.1 Duplicating sys-
  tem installations).

○ Copying of proprietary file systems and data formats onto another drive
  ( ▸ 2.6 Proprietary hard disk formats) - only with a valid partition table!

○ Backup of individual partitions for forensic analysis and further processing
  ( ▸ 2.7 Forensic data securing).

○ Temporary storage or intermediate storage of a partition, e.g. in case of a reor-
  ganization of a hard disk.

○ Relocating a partition within a medium or to another medium.

### 6.1.6   Drive-to-Partition

This copying mode stores a physical copy
of a complete hard disk in a partition on
an-other hard disk. Physical images of sev-
eral hard disks can be stored on a single
hard disk for example (in different parti-
tions) ( ▸ 2.5.2 Handling several master in-

fig. 34: Drive-to-partition

stallations). In most of the cases, such a partition cannot be used directly. This
copying mode mainly serves to create a backup of a hard disk. This is why it is
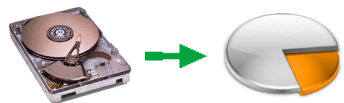
mostly used in context with the partition-to-drive copying mode ( ▸ 6.1.7 Partition-to-drive), which recovers the previously backed up data.

The drive-to-partition copy mode is useful for the following areas of use:

○ Rescue of several drives onto one single drive ( ▸ 2.2 Data rescue).

○ Backup of several drives ( ▸ 2.5.2 Handling several master installations).

○ Backup of the data from several drives to one single drive for a subsequent forensic analysis and further processing ( ▸ 2.7 Forensic data securing).

○ Temporary storage or intermediate storage of entire drives.

## 6.1.7    Partition-to-drive

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


*fig. 35: Partition-to-drive*

Handling several master installations). That is why it is normally used in combination with the drive-to-partition copying mode  ▸ 6.1.6 Drive-to-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.

The partition-to-drive copy mode is useful for the following areas of use:

○ Restore of a complete drive which has been previously backed up with the drive-to-partition copying mode ( ▸ 6.1.6 Drive-to-Partition).

○ Multiple installations ( ▸ 2.5.1 Duplicating system installations).

○ Decoupling of hard disk data that has previously been saved in individual partitions for a forensic evaluation ( ▸ 2.7 Forensic data securing).

## 6.1.8    Create drive image

This copying mode allows to copy the contents of an entire drive to an image file. The result is a file, containing an exact image of the source drive. Depending on the type of image used ( ▸ 6.8 Imaging), the image file contains a logical image


*fig. 36: Create drive image*

( ▸ 6.8.1 Logical images) or a physically exact 1:1 image ( ▸ 6.8.2 Physical images). A physical image can be processed by third party programs in certain cases ( ▸ 6.8.3 RAW images). In case of a logical image, the data stored in the image
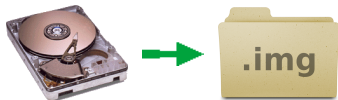
file is identical to a direct copy using SmartCopy mode ( ▶ 6.6 SmartCopy), i.e. only sectors in use on the drive are stored. In case of a physical image or RAW image, all sectors on the drive are stored bit by bit, similar to a physical 1:1 copy.

The copy mode **create drive image** is suitable for the following areas of application:

○ Backup of an entire drive to a file ( ▶ 2.3 Installation backup).

○ Creating master installations ( ▶ 2.5.1 Duplicating system installations).

○ Data rescue to an image ( ▶ 2.2 Data rescue) for further processing.

○ Forensic drive image for further evaluation ( ▶ 2.7 Forensic data securing).

## 6.1.9    Create partition image

This copy mode allows to copy the contents of a single partition to an image file. The result is a file, containing an exact image of the source partition. Depending on the type of image used ( ▶ 6.8 Imaging) , the image file contains a logical image



fig. 37: Create partition image

( ▶ 6.8.1 Logical images) or a physically exact 1:1 image ( ▶ 6.8.2 Physical images). A physical image can be processed by third party programs in certain cases ( ▶ 6.8.3 RAW images). In case of a logical image, the data stored in the image file is identical to a direct copy using SmartCopy mode ( ▶ 6.6 SmartCopy), i.e. only sectors in use of the partition are stored. In case of a physical image or RAW image, all sectors of the partition are stored bit by bit, similar to a physical 1:1 copy.

The copy mode **create partition image** is suitable for the following areas of use:

○ Backup of single (system-) partitions to a file ( ▶ 2.3 Installation backup).

○ Creating master installations ( ▶ 2.5.1 Duplicating system installations).

○ Data rescue to an image ( ▶ 2.2 Data rescue) for further processing.

○ Forensic partition image for further evaluation ( ▶ 2.7 Forensic data securing).

## 6.1.10  Restore drive image

This copy mode allows to restore the contents of an image file to a drive. It is used to restore backups, to roll out master installations, or to copy data previously saved to an image file back to a drive for data recovery or forensic evaluation. It is
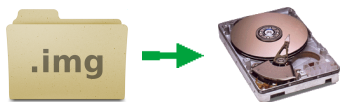


fig. 38: Restore drive image

recommended that a drive image is used as source. Copying a partition image to an entire drive may yield a result which usually cannot be accessed directly.

The copy mode **restore drive image** is suitable for the following areas of use:

○ Restore of an entire drive from a drive image ( ▶ **6.1.8 Create drive image**).

○ Rolling out master installations ( ▶ **2.5.1 Duplicating system installations**).

○ Copying back previously saved drive images for data recovery ( ▶ **2.7 Forensic data securing**) or forensic evaluation ( ▶ **2.2 Data rescue**).

### 6.1.11 Restore partition image

This copy mode allows to restore the contents of an image file to a partition. It is used to restore backups, to roll out master installations, or to copy data previously saved to an image file back to a partition for data recovery or forensic evaluation. It

*fig. 39: Restore partition image*

is recommended that a partition image is used as source. Copying a drive image to a single partition may yield a result which is not usable for direct access in most cases.

The copy mode **restore partition image** is suitable for the following areas of use:

○ Restore a single partition of a partition image ( ▶ **6.1.9 Create partition image**).

○ Rolling out master installations ( ▶ **2.5.1 Duplicating system installations**).

○ Copying back previously saved partition images for data recovery ( ▶ **2.7 Forensic data securing**) or forensic evaluation ( ▶ **2.2 Data rescue**).

## 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   Equal 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 drive-to-drive ( ▶ **6.1.4 Drive-to-drive**) 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   Automatic 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 handling defective sectors 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 trouble-shooting run ( ▶ 5.9.8 Course 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 ( ▶ 5.9.5 Status indication). The indicated read errors only refers to the errors occurred during the copying process (including 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 ( ▶ 5.9.8 Course of the process). During the troubleshooting run, the number of the indicated write errors can decrease according to the areas on the target medium, which could be recovered.

### 6.3.4   Verification errors

When the option Verifying ( ▶ 5.8.1 Verifying) is activated, HDClone executes a verification run ( ▶ 5.9.8 Course 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 user defined 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. 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 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 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 the defined partial area is used in the copying process, instead of copying the whole drive or partition.

> **Example:** The values **from** = 0, **to** = 31 define an area of 32 sectors. If the type of source (or target) is drive, the declaration refers to the first 32 sectors on the drive. If the type of source (or target) is partition, the value 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 multiple target media can be selected, instead of only one. It becomes available as soon as the option **MultiCopy** is selected in the target medium dialog page ( ▸ 5.7 Selecting data source and target). Then you can 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. 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.

## 6.6   SmartCopy

### 6.6.1   Mode of operation

SmartCopy mode creates logical 1:1 copies. It allows HDClone to save a huge amount of the time needed for creating a physical 1:1 copy – depending on how much data is stored on the medium. SmartCopy mode creates a bitwise copy as well, but in contrast to a physical 1:1 copy it only refers to the areas marked as used on the medium. For many cases, this mode is more suitable since it yields the same result in less time.

> **Note:** Since it is only a copy, you can always try SmartCopy mode first. If it turns out not to be sufficient for your individual case, you can still create a physical 1:1 copy.

> **Important:** Never use **SmartCopy** mode for ▸ **2.2 Data rescue**. Only use it in exceptional cases for ▸ **2.7 Forensic data securing**, i.e. only if you are definitely sure that it is sufficient for the use case.

## 6.6.2   Usage

For using SmartCopy, simply activate the option **SmartCopy** (▸ **fig. 40**) on the dialog page **Options** (▸ **5.8.3 General options**). This mode can be applied to entire hard disks or other media as well as single partitions. SmartCopy



*fig. 40: SmartCopy*

currently supports NTFS, FAT, ext2-4 file systems. In case of other file systems, a physical 1:1 copy will be created, even if the SmartCopy option is activated.
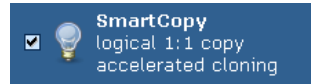
## 6.7   PartitionSelect

The source and its partitions are displayed graphically in a bar (▸ **fig. 41**). The partitions a numbered, using capital letters from the tenth partition on. Below the partition number, there is either a check symbol (✅, the default setting), showing that this partition will included in the copy, or a block-symbol (⊘), showing that this partition will be excluded from the copy. By clicking
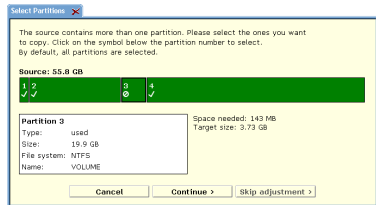


*fig. 41: PartitionSelect dialog*

on these symbols, you can in- or exclude any partition individually. The Partition-Select-Dialog will always show the total size of the partitions selected to inform you about the effect of each selecting or de-selection of a certain partition.

By selecting the partitions to be copied, you can either choose to transfer only certain parts of a drive, for example system partitions only or data partitions only. Or to exclude certain partitions not required to be copied, for example a recovery partition that needs not to be included in a backup. PartitionSelect can also be used to reduce the amount of free space required on the target.

## 6.8   Imaging

HDClone is also capable of creating file images of a medium. An image contains the same data as a copy. When an image has been restored to another medium, the result is the same as if it had been copied directly from the source medium.

Information: Images offer many advantages if the data of a certain medium has rather to be stored than copied directly. Since images are normal files, stored in folders, managing them is a lot easier. Images also can be transmitted or exchanged, e.g. on optical discs or via network and the Internet.

### 6.8.1   Logical images

Logical images store – exactly like logical 1:1 copies – only those areas of a medium that contain valid data. Therefore a logical image requires much less disk space than a physical image in most cases. This implies that creating logical images also requires much less time. This makes them the perfect choice for creating backups or for managing several system installations.

### 6.8.2   Physical images

Physical images store – exactly like physical 1:1 copies – all areas of the medium. In contrast to a pure copy, physical images store the data in a file, which can be archived (e.g. as a 1:1 emergency backup) or transmitted afterwards. The latter may be useful for restoring the medium at another location without having to transfer a physical medium. This makes it easier, faster, and more secure.

### 6.8.3   RAW images

RAW images are also a kind of physical images. They contain the same data as physical images. HDClone just uses a special file format for physical images, which supports HDClone's special modes (e.g. SafeRescue) optimally. In contrast, RAW images contain the data of a medium in the same linear order as they are stored on the medium. This makes it easier to process image files with third party programs.

Hint: RAW images are especially suitable for using them for data streaming or with virtual machines. A RAW image can be used like a normal (virtual) drive with many virtual machines. HDClone includes support of VMware virtual machines ( ▶ 6.8.4 VMDK images).

### 6.8.4   VMDK images

You can use file images created with HDClone to include them directly into a virtual machine of the VMware virtualization software. For this purpose, VMware requires a VMDK file. HDClone will add this file automatically when creating a RAW image ( ▶ 6.8.3 RAW images). When opening the regarding HDClone file

image with **VMware**, you will be displayed a VMDK file of the same name. You then can select and use it. The VMDK files HDClone creates comply with "HW-version=4" and are specified to be used with the following versions of **VMware**:

○ **VMware Player** starting from version 1.x

○ **VMware Workstation** starting from version 5.x

○ **VMware Server** starting from version 1.x

○ **VMware ESXi** starting from version 3

> **Hint:** Currently HDClone creates VMDK files only in combination with RAW images. If you have another type of image available and want to create a VMDK image out of it, you can use the **Miray Virtual Disk** software ( ▶ **8 Miray Virtual Disk**) to achieve this. Mount the existing image as a virtual drive and use HDClone to create a RAW image of this virtual drive. The RAW image then will contain the VMDK file to be used directly with **VMware** as described above.

## 6.8.5    Mode of operation

When choosing a copying mode ( ▶ **5.6 Selecting a copy mode**) you can specify **Image** as source (= restore image) or target (= create image). You can create physical images of any media supported by HDClone. For creating logical images, it is required (just as for logical copies) that the source medium is formatted with FAT, NTFS, ext2, or ext3. With HDClone/S you can use FAT32 or NTFS formatted media for reading and writing image files. HDClone/W also supports network drives.

## 6.8.6    Compressed Images

When creating a file image, the dialog page **Options** ( ▶ **5.8 Selecting the options**) offers you to create a compressed image. Please choose the option **Compression** to have HDClone compress the file image. You will then have the choice between **Normal compression** (default) and the **QuickCompress** Feature ( ▶ **fig. 42**). The latter offers a lower



*fig. 42: QuickCompress*

compression ratio than **Normal compression**, but in run it requires almost no additional runtime. To create backups quickly while saving some space, please choose **QuickCompress**. To maximize the amount of saved space, please choose **Normal compression**.
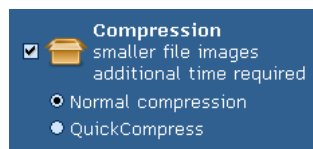
Regarding operating HDClone and the files where images are stored in, there is – apart from the file size – no difference between compressed and uncompressed file images from the user's point of view. Hereby, creating compressed file images will consume more time than decompressing file images at restore. Respectively, the transfer speed when restoring compressed file images is usually faster than creating compressed file images.

> **Note:** Activating **Normal compression** usually leads to a lower copying speed, since compressing data consumes extra time. But in special cases, creating compressed file image can lead to an even higher copying speed – as well when creating as when restoring file images. This may be possible especially when the medium containing the file image is relatively slow, for example slow USB keys, mass storage media connected via USB 1.1, or slow network drives.

## 6.8.7   Password-Protection

When creating file images, you can protect them with a password (Option **Password protection**, ▶ 5.7.5.1 File image as a target). HDClone will not restore a file image that is password protected unless the correct password is specified. It is also not possible to open or mount a password protected file image with Miray Virtual Disk ( ▶ 8 Miray Virtual Disk) without specifying the correct password first.

> **Important:** The password protection mechanism is a simple (but fast) access protection of the file image. HDClone and Miray Virtual Disk will deny any access to the image file without the correct password. For secure protection of the file image, you will have to select the **Data Encryption** option ( ▶ 5.7.5.1 File image as a target) in addition.

## 6.8.8   Encryption

If you select the **Data Encryption** option when creating a file image ( ▶ 5.7.5.1 File image as a target) , the data in the image will be encrypted. HDClone uses a 128 bit AES encryption for this purpose. The image data then cannot be read without the specified password, neither with HDClone or Miray Virtual Disk ( ▶ 8 Miray Virtual Disk) not with other software tools.

> **Important:** Since the data encryption used in HDClone is a secure method without a displacement password, image data created with encryption will be definitely irrecoverable if the password gets lost.

> **Note:** Currently, encrypted file images cannot be opened and mounted as virtual drives with Miray Virtual Disk.

> **Hint:** Since data encryption requires a certain amount of processing power, encryption will usually increase the duration for creating and restoring file images significantly. So please select Data Encryption only if it is required. Otherwise the password protection mechanism may also be sufficient. The latter will not increase the duration of the process.

### 6.8.9    Storing Images on CD/DVD

File images can also be archived on CD or DVD. HDClone can restore these file images directly. For this purpose, please insert the CD/DVD into the drive, at best before starting HDClone or when the first screen appears. Choose the copying mode **Image-to-Drive** or **Image-to-Partition** and click on [next]. When selecting the source image, the CD/DVD drive will appear in the list and you can choose an image from there as the source images.

> **Note:** When writing an HDClone image to CD or DVD it is required to use an ISO file system. Please consider the manual of your CD writing software in this case. The CD/DVD media has to contain the entire image. So called ‚spanning‘ of the file image is not yet supported by HDClone But you can choose a file block size, matching the capacity of the target medium optimally ( ▶ **5.8.4 Options for source and target**).

## 6.9    Defragmentation

For NTFS file systems, HDClone offers on the dialog page **Options** ( ▶ **5.8 Selecting the options**) to choose a defragmentation being performed during the copying process. For using this ability, please choose the option



*fig. 43: Defragmentation*

**Defragmentation** ( ▶ fig. 43). Apart from the general advantages of a defragmentation, in particular the acceleration of file accesses and the boot process, HDClone offers the special advantage of performing the defragmentation process without consuming significant extra time. Downsizing or defragmenting can also be selected when restoring from an image if it has been created using the options **Store downsizing info** or **Store defrag info** ( ▶ **5.8.3 General options**).

> **Important:** Use defragmentation on healthy file systems only, meaning only those file systems declared being flawless by programs like chkdsk.exe (Windows).

> **Note:** When downsizing NTFS partitions, HDClone may also perform a shifting of data blocks. This shifting aims to reduce the file system's size in as few steps as necessary. Therefore, to perform a defragmentation, please select the option Defragmentation explicitly even when downsizing a file system.

## 6.10   Command line interface

To integrate HDClone into automated processes or to enable it for time-triggered calls, there is the additional file **hdclone-cl.exe** for calling HDClone from the Windows command line. This program is destined for being called by batch and shell scripts or program links. It handles user input and output exclusively via the command line and calling parameters.

This allows to use the command line version for areas of application, for which the graphical version is not suitable, like the following examples:

○ **Time-triggered calling**
  Scheduled calls of HDClone by the Windows Task Manager to start frequent or periodic copying processes automatically, for example backups.

○ **Script integration**
  Calling HDClone from scripts for integrating it into automated processes, for example for data rescue, mass installation (deployment), or for forensic tasks.

○ **Programmed processes**
  For recurring copying processes, you can create links in the Start Menu, the Quick Launch bar, or on the Desktop to allow these programmed processes to be called quickly and easily at any time.

> **Hint:** When calling **hdclone-cl.exe -help** or without any parameters or with an insufficient number of parameters, a list of supported parameters in combination with a short description of their usage will be displayed.

The following sub-chapter lists and explains the supported parameters. When appending them to the call of **hdclone-cl.exe** , the order of the single parameters is arbitrary.

## 6.10.1 Program call

The command line version of HDClone expects the following calling syntax:

- Copying an entire drive
  hdclone-cl.exe -mode:d2d -srcdrv:[number] -dstdrv:[number]
- Copying a single partition
  hdclone-cl.exe -mode:p2p -srcvol:[drvletter] -dstvol:[drvletter]
- Creating a file image of an entire drive
  hdclone-cl.exe -mode:d2i -srcdrv:[number] -dstvol:[drvletter] -dstimg:[filename]
- Creating a file image of a single partition
  hdclone-cl.exe -mode:p2i -srcvol:[drvletter] -dstvol:[drvletter] -dstimg:[filename]
- Restoring a file image to an entire drive
  hdclone-cl.exe -mode:i2d -srcvol:[drvletter] -srcimg:[filename] -dstdrv:[number]
- Restoring a file image to a single partition
  hdclone-cl.exe -mode:i2p -srcvol:[drvletter] -srcimg:[filename] -dstvol:[drvletter]

> Note: When using Enterprise Edition with more than one target, the calling syntax is extended as follows: the parameter combinations -dstdrv:[number] (drive), -dstvol:[drvletter] (partition/volume) or -dstvol:[drvletter] -dstimg:[filename] (file image) have to be specified iteratively, one for each copying target.

Providing the parameters described above is mandatory when calling hdclone-cl.exe. If one of the parameters is not provided or an invalid value is assigned, the call will be canceled with an error message.

> Note: The copying modes Drive-to-Partition and Partition-to-Drive are not available in the command line version. Please use the functions for creating and restoring drive images instead.

## 6.10.2 Optional parameters

There is a number of further, optional parameters, allowing you to enable or disable certain features of HDClone for the copying process. They are provided in the from

-[option]:[on|off].

The following table lists the available options. The values printed in capital letters (ON or OFF) represents the default value for the respective parameter. This value will be used if you do not explicitly provide this parameter. The individual op-

tions correspond to the options of the graphical HDClone program.

| Option | Meaning |
|---|---|
| -verify:[on\|OFF] | Perform an additional verification ( ▸ 5.8.1 Verifying). |
| -smart:[ON\|off] | Faster copies and smaller images by having HDClone use logical file system information ( ▸ 6.6 SmartCopy). |
| -freespace:[on\|OFF] | Copy unused areas ( ▸ 5.8.3 General options). |
| -swapfiles:[on\|OFF] | Copy pagefile.sys and hiberfil.sys ( ▸ 5.8.5 Advanced options). |
| -timestamp:[ON\|off] | Automatically extend the names of image files by a time-stamp. For labeling periodic backups and to avoid identical naming of file images. Without this option, the command line version will cancel the process in case of identical names. |
| -compression: [on\|OFF\|quick] | Create a compressed file image, quick activates QuickCompress ▸ 6.8.6 Compressed Images. |
| -raw:[on\|OFF] | Create a RAW image ( ▸ 6.8.3 RAW images). |
| -defrag:[on\|OFF] | NTFS+FAT only: Also perform a defragmentation when copying or store defragmentation information when creating a file image ( ▸ 5.8.3 General options). |
| -resizeinfo:[ON\|off] | NTFS+FAT only: Store information for downsizing when creating file images ( ▸ 5.8.3 General options). |
| -resize<br>-resize:\<size><br>-resize:fixed<br>-resize:skip<br>-resize:AUTO<br>-resize:[p1]:[p2]:[p3]... | NTFS+FAT+ext with copy and image restore only: Resizing partitions automatically or manually when copying or restoring from a file image ( ▸ 5.9.2 Adjusting partitions), excluding individual partitions ( ▸ 6.7 PartitionSelect) |
| -skip:[pnr]:[pnr]... | Copy and create image only: Numbers of the partitions to be excluded from the copy or not stored if an image is created. Numbering starts with 1, the partition order equals the order listed by the command hdclone-cl.exe -list. |
| -list | Lists all drives and partitions recognized as well as their internal numbering. |

### 6.10.3 Return values

The command line version (CLI) of HDClone returns result values in the environment variable ERRORLEVEL. This allows to evaluate and to react to the copying result automatically, for example by using batch files. The return values are defined as follows:

| Option | Meaning |
|--------|---------|
| 0 | Copying process finished successfully with no errors of any kind or the program was called using parameters -help or -list. |
| 1 | Errors in call (missing/duplicate/invalid parameters). |
| 2 | Invalid license or license expired. |
| 3 | At least one 'resize' parameter ( ▸ 6.10.2 Optional parameters) is invalid, does not match the target size or contains invalid characters. |
| 4 | Could not access source or target properly, for example device not found, file image not found or exclusive access not allowed. |
| 5 | Password not specified or invalid password. |
| 6 | User abort (<Ctrl>+<C>). |
| 7 | Copying finished with verification errors. |
| 8 | Copying finished with read/write errors (overrides 7). |
| 9 | Some other error occurred. A specific error code, is displayed with the console output of HDClone. |

## 6.10.4  Resizing

In case of copying or restoring, you can use the resize option ( ▸ 6.10.2 Optional parameters) to specify how to adjust the sizes of individual partitions on the target medium. The resize option without any further parameters will cause all partitions to be resized proportionally to their original size. You can specify one or more additional parameters to specify the resizing for individual partitions in their natural order on the medium. These parameters are:

<size>: Increases or reduces the size of a partition to the size value specified. The values may be specified in sectors (S), bytes (B), kilobytes (K), megabytes (M), gigabytes (G), or terabytes (T). The desired numeric value has to be specified, immediately followed (without spaces) by one of the unit specifiers above (for example: 10G = 10 gigabytes or 500M = 500 megabytes).

fixed: Keeps the partition size without any changes

skip: Skips the partition, meaning it will not be copied ( ▸ 6.7 PartitionSelect).

auto: Adjusts the partition size automatically and proportionally to its share of the entire medium.

The parameters for resizing (<size>, fixed, skip, auto) may be specified repeatedly, separated by a colon. The parameters then will be applied to the partitions in the specified order. In case there are more partitions than parameters specified, the default parameter auto will be applied to the remaining partitions. If

there are more parameters specified than partitions available, the remaining parameters are ignored. This option works equivalent to ▶ 5.9.2 Adjusting partitions.

> ▷ **Example:** There are four partitions on the drive, but only two resize-parameters are specified. The first two partitions will be adjusted as specified. The two remaining partitions will be resized automatically, just as if the parameter **auto** was specified for them.

## 6.10.5  Examples of use

The following examples represent a selection of frequently used scenarios, but they do not cover all possible variations or areas of use.

- ○ Copying Disk 1 to Disk 2, physical 1:1 copy (hard disk copy)
  hdclone-cl.exe -mode:d2d -srcdrv:1 -dstdrv:2 -smart:off -freespace:on

- ○ Copying drive D: to drive E: with verification (individual partition copy)
  hdclone-cl.exe -mode:p2p -srcvol:D -dstvol:E -verify:on

- ○ Backup image: store Disk 1 to file on E: (hard disk backup)
  hdclone-cl.exe -mode:d2i -srcdrv:1 -dstvol:E -dstimg:backup

- ○ Backup image: store drive D: to file on E:, compression (partition backup)
  hdclone-cl.exe -mode:p2i -srcvol:D -dstvol:E -dstimg:backup -compression:on

- ○ Restoring a file image from drive E: to Disk 1
  hdclone-cl.exe -mode:i2d -srcvol:E -srcimg:backup -dstdrv:1

- ○ Restoring a file image from drive E: to partition D:, defragmentation
  hdclone-cl.exe -mode:i2p -srcvol:E -srcimg:backup -dstvol:D -defrag:on

- ○ Copying Disks, adjust partitions sizes automatically
  hdclone-cl.exe -mode:d2d -srcdrv:1 -dstdrv:2 -resize

- ○ Copying Disks, keep size of partition 1, resize others automatically
  hdclone-cl.exe -mode:d2d -srcdrv:1 -dstdrv:2 -resize:fixed

- ○ Copying Disks, partitions: 1. keep size, 2. resize to 100 GB, resize others
  hdclone-cl.exe -mode:d2d -srcdrv:1 -dstdrv:2 -resize:fixed:100G

- ○ Copying Disk, adjust partition 1 automatically, keep sizes of others
  hdclone-cl.exe -mode:d2d -srcdrv:1 -dstdrv:2 -resize:auto:fixed:fixed:fixed

> 💡 **Hint:** To find out which drive numbers are assigned to the physical drives, please execute hdclone-cl.exe -list. It will print a list on the screen where you can see the available physical drives together with their assigned drive number.

# 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 ( ▶ 9.5 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 ( ▶ 9.5 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 ( ▶ 9.5 Support).

## 7.2   Keyboard and mouse

HDClone supports keyboards and mice with PS/2 standard or USB connector ( ▶ 3 Supported hardware). This also includes many wireless mice, given they are connected as a true USB device. Input devices connected with Bluetooth are currently not supported. In this case, please connect a separate USB device. If keyboard or mouse (or both) do not function with HDClone, this is usually due to a wrong legacy emulation setting in BIOS setup. On most computers, you can fix this problem by changing (activating or deactivating, depending on the current setting) the emulation for PS/2 devices in BIOS setup. Please consult your computer manual on how to change this setting since it may be named differently 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).

> **Note:** In some of the cases, problems with PS/2 keyboards or mice occur with active emulation for PS/2 devices. If you don't use any USB devices, please switch off 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).

> **Note:** In case the working speed of a copy is significantly below the source medium and the technical performance data of the target medium imply a significantly higher performance, the target medium might be a drive with a deviant internal block size. In this case, try to use the automatic alignment option ( ▶ 5.8.4 Options for source and target).

### 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 controllers).

### 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 controllers. 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.

○ 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 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 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.

○ Check if the concerned drive really supports DMA. Some older drives and especially older 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 drive(s).

○ If two drives are connected via the same cable, the DMA mode of the slower drive 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 at the end) in case of a single connected drive to eliminate possible problems with damping (center connection) and reflection (connection at the end).

○ Switch the used UltraDMA mode to a lower value in the BIOS setup ( ▸ 7.4.4.1 Switch to a lower/higher UltraDMA mode) or deactivate UltraDMA ( ▸ 7.4.4.2 Activate/deactivate UltraDMA). Multiword DMA mode will be (automatically) still available, which offers about a twice to four times higher speed than PIO mode.

○ On the other hand, you can also try to activate UltraDMA or to switch to a higher UltraDMA mode if the corresponding default settings in your BIOS setup are too low.

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

### 7.4.4   BIOS settings

In case of problems when using DMA, please refer to the following notes

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 in the BIOS setup are manufacturer- and model-specific, these notes can only be given in a general form. Refer to your BIOS manual on how exactly to make these settings and which settings are available at all. You usually find the DMA settings under Integrated Peripherals or Chipset Setup in the BIOS setup.

> **Note:** Please perform automatic hard disk recognition in BIOS after each 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 BIOS setup.

#### 7.4.4.1   Switch to a lower/higher UltraDMA mode

In many BIOS setups the (highest) used UltraDMA 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 UltraDMA completely. The controller then mostly (automatically) uses multi-word DMA, which is at least faster than PIO. You can switch the UltraDMA mode step by step to a higher level, if you think you have not selected the best possible UltraDMA mode.

#### 7.4.4.2   Activate/deactivate UltraDMA

Some BIOS setups do not offer a free selection of the UltraDMA 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 UltraDMA mode and problems keep occurring, deactivate UltraDMA. 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 UltraDMA 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  Set 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 device recognition ( ▶ 5.6 Selecting a copy mode)

○ No SCSI hard disks are recognized

○ Not all SCSI hard disks are recognized

### 7.5.1  Restart

If HDClone stops during the startup or does not show the desired SCSI drives, try to restart with a warm boot (reset button). Only if this does not fix the problem, you should try a cold start (switch off the PC and switch it on again after 30 seconds). Both forms of restart may solve signal 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 drives

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 systems

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 solutions.

### 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 **Preliminary 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 there-fore 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 selecting 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 usually the data transfer works better.

> **Note:** The described problems are mostly due to deficient hardware and also occur under other operating systems. We recommend you to have the concerned device replaced by your vendor.

### 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 problem:

○ The USB controller does not meet 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 a 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.

## 7.7   Mapped network drives

When using mapped drives in Windows Vista and Windows 7, HDClone cannot find the mapped drives in some cases. The reason is, that HDClone is running in administrator mode. To make the established mapped drives visible anyway, a small change to the Windows Registry is required. HDClone Setup ( ▶ **4.2.1 HDClone Setup**) will handle this automatically, if desired. But you can also make the change manually, as described below:

○ Open the registry editor (**regedit.exe**)

○ Move to the following registry key in the tree structure
  HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\
  Policies\System

○ Create, if not existing, the DWORD value **EnableLinkedConnections**

○ Set its value data to 1 and restart your computer.

> **Note:** To undo the changes, simply delete the registry value.

# 8    Miray Virtual Disk

Some editions of HDClone contain the software **Miray Virtual Disk**. This software can be used to mount file images created with HDClone as Windows drives. This allows for directly accessing files and folders stored within a file image to be accessed directly without having to restor the image to a disk before. **Miray Virtual Disk** may be started on demand or automatically at system start-up time. This also allows for mounting file images either just on demand or persistently.

> **Note:** You can also open and mount file images directly, which are located on network shares with limited access, meaning they are only available to certain users.

## 8.1    Installation

**Miray Virtual Disk** is included with the HDClone setup ( ▸ 4.2.1 **HDClone Setup**). During setup, you can choose to install **Miray Virtual Disk** ( ▸ 4.1.3 **Miray Virtual Disk**). It will be installed to a separate location in the **Program Files** directory.

## 8.2    Program startup

You can start **Miray Virtual Disk** from the Windows Startmenu, right in the HDClone folder. As soon as you start it, the program window will pop up ( ▸ fig. 39). Since **Miray Virtual Disk** will mainly work in the background, the program icon will appear in the System Tray. You may close the program window at any time. Miray Virtual Disk will remain active in the background. You can return to the program window at any time using the program icon in the **System Tray**.

### 8.2.1    Program window

In the **Miray Virtual Disk** program window ( ▸ fig. 44), you can open file images and create virtual drives. There are three major elements, the menu bar, the image list ( ▸ 8.2.2 **Image list**) , and the control buttons at the bottom. You may also control **Miray Virtual Disk** using the Context Menu (right click on the image list) or keyboard shortcuts (hotkeys) ( ▸ 8.3 **Operation**).
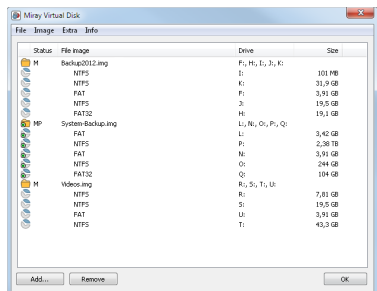


*fig. 44: Program window*

You can use the control buttons to add an Image ([Add...], see ▸ 8.3.1 Adding an image) to or to remove an Image ([Remove], see ▸ 8.3.2 Removing an image) from the image list. Press [OK] to close the program window. Miray Virtual Disk will though stay active in the background ( ▸ 8.2.3 Tray icon).

> **Note:** Adding an image to the image list does not automatically create a new virtual drive. In fact, the image list is intended to give you an overview of the partitions an image contains. This allows you to mount them specifically in a second step ( ▸ 8.3.4 Mounting an image).

> **Hint:** If you have several images in the list, you may want to resize the program window freely by clicking and dragging the lower right corner.

## 8.2.2   Image list

The image list serves to manage the images added before and offers an overview of the partitions they may contain. Partitions are always displayed right below the image they belong to. To make it easier to distinguish the kind of individual entries in the image list, there are different symbols listed below:

**File image**
Image is not mounted

**File image**
Image could not be found

**File image**
Image is mounted

**File image**
Image is mounted permanently

**SuperFloppy** (no MBR)
Volume is not mounted

**Partition**
Partition is not mounted

**SuperFloppy** (no MBR)
Volume is mounted

**Partition**
Partition is mounted

**SuperFloppy** (no MBR)
Volume is mounted permanently

**Partition**
Partition is mounted permanently

> **Note:** In addition to the symbols listed above, there is a column 'Status', where a mounted image or volume will be marked with letter 'M' or - if permanently mounted - with 'MP'.

### 8.2.3   Tray icon

You can see whether **Miray Virtual Disk** is active or not from the program icon appearing in the System Tray (Tray icon). You can open the program window by double-clicking the Tray icon. Right-clicking the Tray icon opens the context menu ( ▶ fig. 45) which gives you direct access to the following four functions:
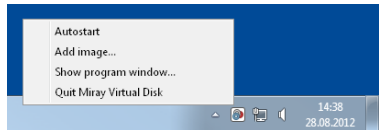
*fig. 45: Tray icon and context menu*

- ◦ [Autostart]: Same functions as ▶ 8.3.7 Autostart.
- ◦ [Add image]: Same functions as ▶ 8.3.1 Adding an image.
- ◦ [Open program window]: Opens the program window or brings it to the front.
- ◦ [Quit Miray Virtual Disk]: Same functions as ▶ 8.3.9 Quit program.

> **Hint:** If you want to open the program window, double-click the Tray icon.

> **Note:** If the Tray icon is not visible, Miray Virtual Disk is not active and there are no virtual drives available.

## 8.3   Operation

You can operate **Miray Virtual Disk** using the menu bar on the top of the window, the control buttons on the bottom of the window or the context menu ( ▶ 8.2.1 Program window).The context menu opens by right-clicking on entries or on the free area of the image list.

### 8.3.1   Adding an image

At first, you can add a file image to the image list of the program window. There are five ways to achieve this:

○ Control button [Add…]

○ Menu bar [File] ▶ [Add image…]

○ Context menu [Add image…] (right-click on the free area of the image list)

○ Tray context menu [Add image…] (right-click on the Tray icon)

○ Hotkey <F2>

○ Drag-and-drop from any Explorer window

The image list also displays information on the data areas (partitions) and file systems of each file image in the list ( ▶ fig. 39).

> **Note:** Depending on the version of the program, you will be allowed to add one or more images. When you quit the program, **Miray Virtual Disk** will memorize these images for the next program startup.

### 8.3.2   Removing an image

Select one or more file images, you want to remove from the image list. There are four ways to remove file images from the image list:

○ Control button [Remove]

○ Menu bar [File] ▶ [Remove image]

○ Context menu [Remove image] (right-click on the image in the image list)

○ Hotkey <Shift>+<F2>

> **Note:** If images you want to remove from the image list (or individual partitions) are still mounted as virtual drives, the file image cannot be removed. A corresponding message will appear.

### 8.3.3   Empty image list

You can also remove all images from the image list. There are three ways:

○ Menu bar [File] ▶ [Empty image list]

○ Context menu [Empty image list] (right-click on the free area of the image list)

○ Hotkey <Ctrl>+<Shift>+<F2>

> **Note:** When the file image or file images to be removed from the image list (or individual partitions thereof) are still mounted as virtual drives, the image list cannot be emptied. A corresponding message will appear.

### 8.3.4    Mounting an image

You can mount previously added file images or individual data areas (volumes) as Windows drives. When mounting an image, it will be made available as a Windows disk and will behave just like a physical disk. When mounting an entire file image which contains several partitions, you may obtain several drive letters, one for each partition containing a file system Windows is able to access. When mounting an individual partition, you may obtain one drive letter for this partition if Windows supports the file system it contains.

There are three ways to mount an entire file image or an individual partition. Select one or more images or partitions first:

○ Menu bar [Image] ▶ [Mount]

○ Context menu [Mount image] (right-click on the desired image or partition in the image list)

○ Hotkey <F8>

As soon as an image or a partition has been mounted successfully, this will be displayed in the image list as follows:

○ The icon of the image or partition mounted will be displayed colored.

○ The capital 'M' is displayed in the column next to the icon.

○ The drive letter(s) assigned to the virtual drives will be displayed in the row of the mounted image or partition.

> **Note:** The capital 'M' always appears in the row of the object which has actually been mounted. If you mount, i.e. an entire image containing two partitions, 'M' will appear in the row of the image. In contrast, if you mount both partitions individually, the capital 'M' appears in both partition rows, but not in the row of the image.

### 8.3.5    Persistent mounting

You can make mounted virtual drives persistent. This means that these virtual drivers will be mounted automatically with any start of Miray Virtual Disk. They will remain mounted as long as the program is active. In case this feature is used

in combination with the Autostart option ( ▶ 8.3.7 Autostart), the respective virtual drives will be available at any time while Windows is running.

> **Note:** Password protected images cannot be mounted permanently, since the password would have to be stored. This would compromise password security and therefor is not supported.

If you want to mount images or partitions thereof permanently, there are three ways to achieve this. Select one or more images or partitions first:

○ Menu bar [Image] ▶ [Mount permanently]

○ Context menu [Mount image permanently] / [Mount volume permanently] (right-click on the desired image or partition in the image list)

○ Hotkey <Ctrl>+<F8>

Persistent mounting can be applied to images or partitions already mounted as well as to images or partitions which are not yet mounted. As soon as an image or a partition has been successfully mounted persistently, this will be displayed in the image list as follows:

○ In the icon of the mounted image / partition appears a small green point (●).

○ The capitals 'MP' are displayed in the column next to the icon

> **Note:** To cancel persistent mounting, mount the regarding image or partition normally ( ▶ 8.3.4 Mounting an image) or unmount it completely ( ▶ 8.3.6 Drive unmounting).

### 8.3.6 Drive unmounting

There are three ways mounted images and partitions and the regarding virtual drives can be unmounted. Select one or more images or partitions first:

○ Menu bar [Image] ▶ [Unmount]

○ Context menu [Unmount image] / [Unmount volume] (right-click on the desired image or partition in the image list)

○ Hotkey <Shift>+<F8>

As soon as an image or an individual partition has been unmounted, the respective icon in the image list will be displayed in gray and the capitals 'M' or 'MP' in the column next to the icon as well as the related drive letters will disappear.

### 8.3.7   Autostart

You can select to start Miray Virtual Disk automatically at system startup (Autostart). Especially in case of persistently mounted drives, the benefit is to have them available at any time without having to start **Miray Virtual Disk** manually.

There are two ways to switch the Autostart function on or off:

○ Menu bar [Image] ▶ [Autostart]

○ Tray context menu [Autostart] (right-click on the Tray icon)

The menu item indicates whether the Autostart function is currently active. If the menu item [Autostart] is displayed with a leading check mark, the Autostart function is already activated. Without a check mark, the Autostart function is not active.

> **Note:** If **Miray Virtual Disk** starts automatically at system startup, only the Tray icon ( ▶ 8.2.3 Tray icon) in the System Tray will appear. Double-click the Tray icon to open the program window.

### 8.3.8   Close program window

You can close the program window of **Miray Virtual Disk** at any time. The application will though stay active in the background. There are two ways to close the window:

○ Menu bar [File] ▶ [Close window]

○ Hotkey <Ctrl>+<W>

### 8.3.9   Quit program

To quit **Miray Virtual Disk** completely, there are three ways:

○ Menu bar [File] ▶ [Quit Miray Virtual Disk]

○ Tray context menu [Quit Miray Virtual Disk] (right-click on the Tray icon)

○ Hotkey <Ctrl>+<Q>

> **Note:** When quitting Miray Virtual Disk, all active virtual drives will be unmounted, after a corresponding dialog has been confirmed. They will be unavailable until next program startup.

## 8.4    Drive not visible

If there are no drive letters or less drive letters than partitions displayed after mounting an image, there may be several reasons:

○ Windows drive recognition of one or more virtual drives has been delayed. In this case, they have a drive letter assigned, but Miray Virtual Disk does not display it yet. Press the <F5> key or select the menu item [Image] ▶ [Refresh list] from the main menu to update the drive letters displayed. Afterward, all drive letters assigned should be visible.

○ One or more partitions contain file systems Windows is unable to use (e.g. Linux file systems). In this case, the behavior is normal, since Windows is not able to use these file systems from a physical disk either.

○ There are no more Windows drive letters available. Windows recognizes the mounted partitions, but cannot assign drive letters to them. In this case, free one or more of the drive letters currently in use.

○ If there is a drive letter displayed, but the drive has no content or Windows prompts to format that drive, the file system might be damaged. This may happen when the image was created from an inconsistent file system.

## 8.5    Modes of operation

There are three different ways to mount file images in Miray Virtual Disk:

○ Write-protected: Menu item [Image] ▶ [Advanced] ▶ [Mount (R/O)]

○ Writeable with undo option: Menu bar [Image] ▶ [Mount]

○ Direct reading & writing: Menu bar [Image] ▶ [Advanced] ▶ [Mount (R/W)]

### 8.5.1    Write-protected access

In this mode, virtual drives can only be read. In previous versions of Miray Virtual Disk, this was the only mode available. In this mode, no changes are made to the mounted images. But this also means that no changes can be made to the file system on the virtual drive. For example, it is not possible to change file names or access rights in this mode.

### 8.5.2    Read/write access (default)

This mode is the default mode when mounting file images. It allows to read from and write to file images. The data written will be stored separately in this mode. This means that the data of the original file image remains unaltered, even when writing to the virtual drive.

> **Hint:** You can undo the changes caused by data written to an original image. Double-click the desired file image in Windows Explorer and delete all files with an .ovl extension in the folder. Afterward, the file image has its original state. Any changes made to the virtual drive are then made undone.

### 8.5.3    Direct read/write access

In this mode Miray Virtual Disk writes directly to or reads directly from a RAW image. It offers the fastest possible access – comparable to physical media access in average. This mode will immediately and irrevocably change the RAW image – in contrast to normal read/write access ( ▶ 8.5.2 Read/write access (default)). Therefore you may consider creating a copy of the original RAW image before using direct read/write access.

> **Note:** This mode can only be applied to RAW images.

### 8.5.4    Converting to RAW image

One main advantage of SmartImages is the strongly reduced size they require for storing. When using Miray Virtual Disk, RAW images offer a clearly higher access performance of the virtual drive. If required, you can convert a SmartImage to a RAW image via [Extra] ▶ [Create RAM image...].

# 9    Miscellaneous

## 9.1    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.

### 9.1.1    License model

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

| Edition | Private users | Companies/Institutions | Professionals |
|---|---|---|---|
| Free | Sufficient | Insufficient | Insufficient |
| Basic | 1 license | Insufficient | Insufficient |
| Standard | 1 license | 1 license per location [1] | Insufficient |
| | | 1 license per 5 PCs [2] | |
| Professional | 1 license | 1 license per location [1] | |
| | | 1 license per dedicated PC [4] | |
| | | 1 license per 25 PCs [2] | 1 license per technician [3] |
| Enterprise | 1 license | 1 license per location [1] | |
| | | 1 license per dedicated PC [4] | |
| | | 1 license per 100 PCs [2] | 1 license per technician [3] |

[1] License is taken into account for the respective other indicated criteria.
[2] Existing PC work stations, regardless of actual use of HDClone.
[3] Technicians are all employees who use HDClone simultaneously or for field service.
[4] PC which is exclusively used for HDClone, for example 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, for example 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.

### 9.1.2   Examples

The following examples refer to frequently occurring 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.

### 9.1.3   Scope

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.

### 9.1.4   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.

## 9.2   Certificate of authenticity

The following notes exclusively refer to the boxed versions of HDClone and not to the versions available as download or via email.

### 9.2.1    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.

### 9.2.2    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 within the program. 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.

## 9.3    Disclaimer

Parts of this product are based on works licensed under the GNU General Public License (GPL). The appropriate license is to be found at http://www.gnu.org/co-pyleft/gpl.html. On request to support@miray.de we will send you a copy of the source code.

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.

## 9.4    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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## 9.5    Support

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