HDClone 5

Copy | Backup | Migration | Rescue

Manual

HDClone 5

Manual

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1   Introduction

Thank you very much for choosing HDClone. It is our expressed goal to offer a product, that fully meets your requirements and expectations. In case of having suggestions for improvement or not being satisfied with the software, we kindly ask you to send your suggestions and criticism to feedback@miray.de.

1.1   Brief description

HDClone is a universal tool for cloning storage media on hardware sector level. HDClone manages many cases of application, for example hard disk migration, backups, creating file images and sector-by-sector copies. This allows HDClone to create copies or file images of storage media regardless of the respective partitioning scheme, the used file system and the installed operating system. HDClone is especially suitable for the tasks described in ▸ 2 Fields of application.

1.2   Chapter summary

1 Introduction: General information about this manual and HDClone. Summary of the available editions and features.

2 Fields of application: Descriptions of the most common use cases.

3 Supported hardware: Minimal requirements and supported devices.

4 Quickstart: Short description for installation and program startup.

5 Installation: Installing HDClone in few minutes under Windows and/or creating a HDClone bootable medium (USB key or CD/DVD).

6 Program startup: Starting HDClone - under Windows and self-booting.

7 Program functions: The functions HDClone offers.

8 Controls: Description of the program screens and popup windows.

9 Mode of operation: Mode of operation of particular functions.

10 Command line (CLI): Instructions on the command line version of HDClone.

11 Troubleshooting: If you encounter any problems when using HDClone, this chapter provides information and proposals for solution.

12 Miray Virtual Disk: The HDClone software package includes the Miray Virtual Disk application. You can use it to mount file images as virtual drives.

13 Miscellaneous: Legal disclaimer and feedback.

1.3   Character conventions

In this manual, keys on the keyboard are printed with an inverted background, for example **Esc** for the escape key or **Return** for the return key. Some keys are represented by a corresponding symbol, for example ⬆ for the 'up'-key. Visual controls on the screen, particularly buttons are represented over- and underlined with italic font, for example *next*, *back*.

1.4   Edition summary

There are different editions of HDClone. They differ from each other by the amount of features they offer, supported device types, performance and special options. The following table offers you a comparative summary of the editions and their features.

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

	FE	BE	SE	AE	PE	EE
Copying Speed						
Maximum speed in MB per sec.	30	50	60	∞[1)]	∞[1)]	∞[1)]
Device Support						
IDE/ATA/SATA hard disks	●	●	●	●	●	●
AHCI (SATA II)	●	●	●	●	●	●
USB 1.1 and 2.0	●	●	●	●	●	●
Hard disks > 2048 GB (2 TB)	○	●	●	●	●	●
USB 3.0 (XHCI)	○	○	●	●	●	●
Firewire / IEEE1394 (OHCI)	○	○	○	○	●	●
Intel Software RAID 0/1/10/5	○	○	○	○	●	●
ATA-Password unlock	○	○	○	●	●	●
TRIM command for faster SSDs	○	○	○	●	●	●
SCSI hard disks	○	○	○	○	●	●
SATA-Hotplug & Port-Multiplier	○	○	○	○	○	●
Copy Modes						
Drive copy	●	●	●	●	●	●
Partition copy	○	●	●	●	●	●
SmartCopy	○	○	●	●	●	●

	FE	BE	SE	AE	PE	EE
PartitionSelect	○	○	●	●	●	●
MultiCopy (4x, 8x, 16x)	○	○	○	○	○	●
File Images						
Physical images	●	●	●	●	●	●
Logical images (SmartImage)	○	○	●	●	●	●
Compressed images	○	○	●	●	●	●
Password protected images	○	○	●	●	●	●
QuickCompress	○	○	○	●	●	●
StrongCompress	○	○	○	○	●	●
Securely encrypted images	○	○	○	○	●	●
RAW images	○	○	○	○	●	●
Dynamic VMDK/VHD(X)/VDI images	○	○	○	○	●	●
Special Modes						
HotCopy	●	●	●	●	●	●
AutoExpand (NTFS, FAT, ext2-ext4)	●	●	●	●	●	●
AutoReduce (NTFS, FAT)	○	●	●	●	●	●
LiveImage	○	●	●	●	●	●
SafeRescue mode	○	●	●	●	●	●
Advanced Format / 4K conversion	○	●	●	●	●	●
Defragmentation (NTFS, FAT)	○	○	●	●	●	●
Verification mode	○	○	●	●	●	●
FastCopy mode	○	○	○	●	●	●
Command line interface	○	○	○	○	●	●
Storing a clone report	○	○	○	○	●	●
Miray Virtual Disk						
Virtual volumes	○	1	1	7	7	7
File image management	○	1	1	●	●	●
Persistent virtual disks	○	○	○	○	●	●
Virtual volumes @ TrueSpeed [2]	○	○	○	○	●	●
Mounting VMDK/VHD(X)/VDI images	○	○	○	○	●	●

[1] No software speed limit.
[2] Use of RAW images at nearly hardware speed.

1.5   New in HDClone 5

Besides new technical features, HDClone 5 also offers some changes of the user interface and in operating. They are described in the following subchapters.

1.5.1   Main screen

HDClone 5 offers a newly designed main screen (▶ fig. 24). It shows the program functions, grouped by area of use. The individual functions are described in ▶ 7 Program functions. Furthermore, the new title bar (▶ fig. 21) now contains some basic functions that are available at any time (▶ 8.1.1 Title bar).

1.5.2   Program screens

User guidance within the program functions has been maintained for the most part, but it has been improved for the favor of usability:

○ HotPlug & LiveScan: HDClone scans for newly connected or disconnected drives and storage media automatically (▶ 8.3.1 Selecting a disk). The drive selection list will then be updated dynamically.

○ When ▶ 8.3.3 Selecting an image (source or target), path names can also be entered manually now. In Windows you can use copy-and-paste to insert path names in the HDClone input field.

○ Images on hidden network shares: By entering the pathname manually, hidden network shares can now also be specified and used.

○ Size and speed details are displayed in the suitable magnitude level (KB, MB, GB). Memory sizes are now also displayed in SI units (KB, MB, GB, TB) instead of the binary based IEC units (KiB, MiB, GiB and TiB) like in previous versions.

> **Note:** The selection screens for source and target no longer contain buttons for SpeedTest and DiskView. They are now to be found on the Tools section of the main screen (▶ 7.5.1 SpeedTest, ▶ 7.5.2 DiskView).

1.5.3   Boot Setup

For better support of the new UEFI BIOSes, there is an UEFI option in the Boot Setup (▶ 5.2 Boot-Setup).

Boot Setup no longer contains support for creating bootable floppy disks. In case you still require a bootable floppy disk, please contact our ▶ 13.3 Support.

2   Fields of application

HDClone is specialized on creating physical copies. Therefore HDClone offers particular advantages for copying and respectively rescuing defective media (▶ 2.2 Data rescue). In addition, HDClone can work independently from partitioning scheme, file system and operating system. This allows you 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 text you will find descriptions of the most common areas of the application of HDClone. The individual chapters offer instructions as well as further tips regarding the execution of the 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

Because HDClone works independently of file system formats and operating systems, you can use it to migrate entire installations, including 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 again. For this type of application, the ▶ 7.1.1 Cloning disks mode is most suitable. Use the PartitionSelect feature (▶ 9.7 PartitionSelect) to choose individual partitions to be cloned.

> **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

Free disk space on the target medium can be converted into a partition and used as an additional drive from within Windows by using the **fdisk** tool or the Windows Computer Management (C:\WINDOWS\system32\compmgmt.msc).

2.1.2   Smaller target medium

In general, you can also copy from a larger to a smaller medium. HDClone can decrease your NTFS and FAT partition size automatically on the fly during copying. For other file systems, you may downsize the partitions on the source medium before cloning, using appropriate third-party tools before cloning.

2.2   Data rescue

In case of hard disks with defective areas it is especially important that they are being rescued to an intact medium before starting any recovery attempts. Otherwise, depending on the kind of defect, the recovery procedure may cause further defects resulting from the inherent exposure of this procedure. Of course, using HDClone also causes exposure to the hard disk. But the physical copying causes much less exposure than any other usage due to its linear operation, i.e. only linear movement of the disk's heads. Furthermore, the option SafeRescue (▸ 8.3.4.1 General options) is able to reduce exposure to an absolute minimum. In very critical cases, you can also just copy single partitions to reduce exposure for the medium even more (▸ 7.1.2 Cloning Partitions). After having rescued the data from the defective hard disk, you can then perform a recovery on the (functional) target medium without having to fear any further damages.

Important: For the purpose of data rescue, create a ▸ 9.1.1 FullCopy or ▸ 9.1.3 BitCopy of the entire hard disk at first (or a ▸ 9.8.1 FullImage or ▸ 9.8.3 RAW images respectively). This clone then can be used to conduct recovery attempts without any risk for the original data.

Note: Only a physical copy allows you to rescue all of the data (except irrecoverable areas), even if there are logical errors resulting from defective areas. For this reason, **never** use SmartCopy mode (▸ 9.1.2 SmartCopy) for rescuing data.

Hint: Alternatively, you may create a RAW image, or a physical image. You can then restore the image to another hard disk later, or perform the recovery directly on the image by mounting it as a virtual drive using ▸ 12 Miray Virtual Disk.

2.3   Installation backup

HDClone can also 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 the previous affliction of 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. Then cre-

ate a file image and restore the original system from that image when needed.

> **Note:** Before restoring from the backup partition, save your work files and other data from the system partition or store them somewhere else, since they otherwise will be overwritten.

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

HDClone is also suitable for duplicating (deployment) system installations (▶ 2.4 Mass copying). Copying an entire master directly or from a file image to the target medium to use it directly from there.

> **Note:** For duplicating Windows installations, we recommend to run the Microsoft tool sysprep before cloning. Further information is to be found at http://www.microsoft.com, search for 'sysprep'.

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 and transfer 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. You should only use the mode ▶ 7.1.2 Cloning Partitions if you know for sure that the partitions are reported correctly.

2.7   Forensic examination

HDClone is also suitable for securing data for forensic purposes, as all data from a disk is copied completely, including data that has possibly been hidden or deleted. This data cannot be reached any more via the usual file system mecha-

nisms. Therefore it will be useful to create a copy in BitCopy mode (▶ 7.1.1 Cloning disks) or a RAW image (▶ 9.8.3 RAW images) before performing a detailed forensic examination of secured disks. This allows you to make changes to the copy during analysis without altering and thus endangering the original content of the medium.

> **Note:** When backing up data for forensic examination, hidden and deleted files can be located anywhere on the medium, it is always required to create a copy of the entire medium to a target medium of the same or larger size. **Never** use SmartCopy mode (▶ 9.1.2 SmartCopy) 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 storage medium to storage medium. File images offer the following advantages:

○ Simple storing and managing in your file system

○ Optional compression for minimum space required

○ Password protection and AES encryption to protect data

○ Use arbitrary storage media for exchange

○ Distributing without physical media via networks and the Internet

○ Accessing individual files via virtual drives (▶ 12 Miray Virtual Disk)

○ Virtual machines (▶ 9.8.4 VM-Images (VMDK, VHD/VHDX, VDI))

> **Example:** To rescue a defective hard disk, you may create a physical ▶ 9.1.1 FullCopy instead of a physical ▶ 9.8.1 FullImage. Both cases will result in a bit-wise identical clone of the master hard disk.

2.9   HotCopy & LiveImage

HDClone supports creating clones or images of a Windows drive while 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 information on the hardware supported when using HDClone/W (Windows) and HDClone/S (self-booting).

3.1   HDClone/W

Under Windows, HDClone can use all devices that are supported by Windows natively or that have a specific Windows driver installed.

3.1.1   Supported systems

HDClone/W runs on PCs (x86 + x64) with the following versions of Windows:

Workstation

- Windows XP (32+64 Bit)
- Windows Vista (32+64 Bit)
- Windows 7 (32+64 Bit)
- Windows 8 (32+64 Bit)
- Windows 8.1 (32+64 Bit)

Server

- Windows Server 2003 (32+64 Bit)
- Windows Server 2008 (32+64 Bit)
- Windows Server 2008 R2 (64 Bit)
- Windows Server 2012 (64 Bit)
- Windows Server 2012 R2 (64 Bit)

3.1.2   Supported controllers and adapter cards

All controllers and adapter cards supported by Windows.

3.1.3   Supported devices and media

All devices and mass storage media supported by Windows.

3.2   HDClone/S

The self-booting version of HDClone runs on PCs (x86) and supports a wide range of hardware. Details about the supported systems, controllers and devices are listed in the following subchapters.

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

3.2.1   **Supported Systems**

○ PC 80586 or higher, 500 MHz, 128 MB RAM, VGA (optimal: VESA support)

○ Keyboard & mouse: PS/2 or USB

○ Bootable CD drive or USB bootable medium

3.2.2   **Supported controllers**

○ PCI-IDE controller and Bus Master IDE controller

○ Adaptec PCI-SCSI host adapter (▶ 3.3 Compatibility)

○ SATA controller with IDE interface

○ SATA-II controller with AHCI interface

○ USB 1.1 (UHCI & OHCI controller)

○ USB 2.0 (EHCI controller)

○ USB 3.0 (XHCI controller)

○ Firewire (IEEE1394 OHCI controller)

○ Intel Onboard RAID Controller (SATA-RAID)

3.2.3   **Supported media**

○ IDE/ATA hard disks, CompactFlash via IDE [1]

○ SATA hard disks (internal & external)

○ Intel Software RAID (0, 1, 10, 5)

○ SCSI hard disks (internal & external)

○ USB hard disks (internal & external)

○ Firewire hard disks (internal & external)

○ USB keys [2]

○ SD [3], microSD [3], SDHC [3] and MMC [3]

○ CompactFlash I [3], CompactFlash II [3]

○ MicroDrive [3], xD-Picture Card [3]

○ Memory Stick [3], Memory Stick PRO [3], Memory Stick DUO [3]

[1] CompactFlash media with TrueIDE support
[2] must support the USB-Mass-Storage-Class protocol
[3] connected over a USB card reader or an equivalent adaptor

3.3   Compatibility

HDClone is developed to support general hardware standards. It has been tested on a large number of devices. (▶ 3.2 **HDClone/S** , ▶ 3.3.1 **Compatibility check**)

3.3.1   Compatibility check

You can use HDClone Free Edition to check in advance and for free if your devices are supported. Start HDClone Free Edition on the particular PC, select ▶ 7.5.1 **SpeedTest** function from the **Tools** group. Select the desired drive list entry. The edition required for the listed disks will be shown in the info box right of the list field (▶ **fig. 20**) at the caption **Supported**.

3.3.2   Standards

To support a wide spectrum of devices, HDClone/S implements the official interface standards for the particular device types. In addition, we perform extensive tests with each device type. If you experience an issue, though, it can be solved in most cases by setting the options appropriately (▶ 8.3.4 **Options** and ▶ 11 **Troubleshooting**). In case of even this does not work, our Support Team (▶ 13.3 **Support**) will be glad to help you.

3.3.3   Speed

The achievable speed always depends on the physical abilities of your drive hardware. The following rough classification can be made:

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 and SAS

Professional Edition or more advanced required

Under Windows, HDClone/W supports available SCSI and SAS drives, if a suitable driver has been installed. HDClone/S currently only supports the following Narrow-, Wide-, Ultra- and Ultra-Wide-SCSI controllers from Adaptec:

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

> **Hint:** Use the Free Edition to determine whether your SCSI/SAS control-ler is supported (▶ 3.3.1 Compatibility check). If HDClone recognizes the connected drive, the SCSI/SAS controller is supported.

3.5   USB

HDClone can be used with USB devices of the USB versions 1.1 (UHCI, OHCI), 2.0 (EHCI) and 3.0 (XHCI). HDClone supports USB mass storage media (USB Mass Storage Class), USB keyboards and mice (HID) and USB hubs.

3.6   Firewire (IEEE1394)

Professional Edition or more advanced required

HDClone works with any Firewire drive or Firewire card reader that supports the Serial-Bus-Protocol (SBP).

> **Note:** Please take care to connect Firewire devices prior to starting HDClone and if possible directly to the PC or to the Firewire controller.

4   Quickstart

You can use HDClone in two variants: HDClone/W as a Windows application and HDClone/S as a self-booting program.

> **Note:** Further information on launching the program is to be found at ▶ 5 Installation and ▶ 6 Program startup. Information on how to use the HDClone is to be found in ▶ 7 Program functions and ▶ 38 Controls.

4.1   Windows – HDClone/W

Please take the following steps to start HDClone in Windows:

1. Start the setup for Windows (setup.exe) and follow the instructions. Accept the default settings.

2. When setup is finished, HDClone will be started automatically. Otherwise you can start HDClone from the Desktop or the Windows Start Menu.

3. After starting HDClone, select the desired function and follow the course of the program. For further information, please refer to ▶ 7 Program functions and ▶ 8 Controls.

4.2   Self-booting – HDClone/S

To start (=boot) HDClone without Windows, the following steps are required:

1. If you already have a bootable medium (CD/DVD or USB key) with HDClone, please proceed with step 4.

2. Plug a USB key to your PC or insert an empty CD/DVD into your CD/DVD writing drive. Start the Boot-Setup under:
   Programs ▶ *HDClone 5...* ▶ *Boot-Setup*

3. Select the desired CD/DVD drive or the desired USB key and create a bootable medium.

4. Boot the desired PC from this medium.

5. After starting HDClone, select the desired function and follow the course of the program. For further information, please refer to ▶ 7 Program functions and ▶ 8 Controls.

5   Installation

HDClone has two variants, HDClone/W (Windows program) and HDClone/S (self-booting program). Use ▶ 5.1 Setup for Windows to install HDClone/W in Windows and/or create a bootable medium (HDClone/S) with ▶ 5.2 Boot-Setup or as described in ▶ 5.4 ISO image.

> Note: In case you have obtained HDClone on a medium (CD/DVD or USB key), you can start HDClone/W and/or HDClone/S directly from there in many cases (▶ 6 Program startup).

5.1   Setup for Windows

Setup will install HDClone on your Windows PC. Start setup.exe and select the desired option on the first screen (▶ fig. 1). Then click <u>Next</u> and follow the course of the Setup. After finishing, you can start HDClone/W immediately.

fig. 1: HDClone Setup start screen

5.1.1   Miray Virtual Disk

Some editions of HDClone also contain the software ▶ 12 Miray Virtual Disk. To have it not installed, please deselect it in the first installation screen (▶ fig. 1).

Miray Virtual Disk also includes a device driver (Miray Storage Controller), enabling Windows to present virtual drives as real drives. For this reason the Windows Security popup (▶ fig. 2) opens at the end of the installation process. Click on <u>Install</u> in order to confirm device driver installation.

fig. 2: HDClone Setup start screen

In Windows XP, confirm the Hardware Installation popup (▶ fig. 3) with <u>Continue Anyway</u>. If Windows opens the Found New Hardware Wizard (▶ fig. 4), close it with <u>Cancel</u>.
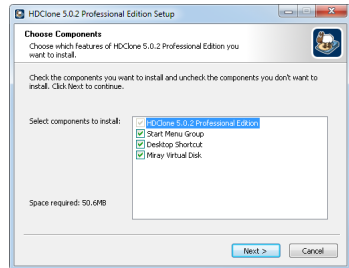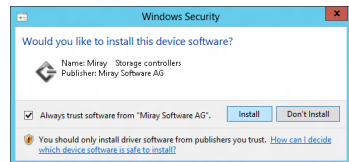
fig. 3: Windows Hardware Installation
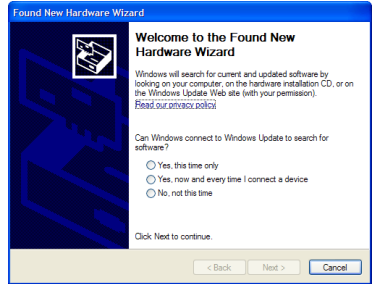
fig. 4: Windows Hardware Wizard

5.2   Boot-Setup

Boot-Setup (▸ fig. 5) creates a bootable medium for starting (booting) HDClone/S on a PC without Windows.

Note: To create a bootable USB medium, connect it to the PC before starting Boot-Setup.

fig. 5: Boot-Setup

You can start Boot-Setup in three ways:

○ After HDClone has been installed (▸ **5.1 Setup for Windows**) you find the Boot-Setup under *Programs* ▸ *HDClone 5…* ▸ *Boot-Setup*.

○ Start HDClone/W, klick on the Toolbox symbol (▸ 8.1.1.2 **Toolbox**) or press `Ctrl` + `F6` and select **Boot-Setup**.

○ Start **hdclone.exe** from the program package. Then click on the *Create Bootable Medium* button.

The Boot-Setup program window contains the following control elements:

○ **UEFI bootcode**: To ensure the bootable medium can be used with a modern UEFI-BIOS, it additionally contains special UEFI bootcode. This allows the bootable medium to be used with both, old and new BIOSes. In case you encounter any problems when starting from the bootable medium, deactivate this option to create a bootable medium without UEFI bootcode.

○ **Add startup script** (special editions only): If your edition supports using an INI file to automate HDClone/S, you can specify the desired INI file here to have it included in the bootable medium. Otherwise, this option will be deactivated.

○ **Create bootable USB key**: Connect the desired USB medium to the PC before starting Boot-Setup. Then select the medium from the list and click on *Make bootable*.

○ **Create bootable CD/DVD**: Select the desired CD/DVD drive from the list, insert an empty medium and click on *Create CD/DVD*.

Follow the instructions and wait for the program reporting successful completion. Then click on *Exit*. Continue at ▸ 6 Program startup or ▸ 4 Quickstart.

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

5.3   Bootable Windows 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, the options you to create a bootable Windows CD which includes the required drivers are described in the following paragraphs.

5.3.1   BartPE (Windows XP)

BartPE creates a specially configured Windows XP system, that can be started from CD. Download PE Builder at http://www.nu2.nu/pebuilder/. A plug-in used to integrate HDClone into the PE system is to be found at http://www.miray-software.com/public/support/HDClone-BartPE-Plugin.en.zip. Install PE Builder on your system and unpack the plug-in to **pebuilder3110a\plugin**. Create the new folder **HDClone** there. Copy **hdclone.exe** to **pebuilder3110a\plugin\HD-Clone\files**. If the mass storage devices and controller on your target system will require special drivers, copy the driver files to **pebuilder3110a\drivers\SCSI-Adapter**.
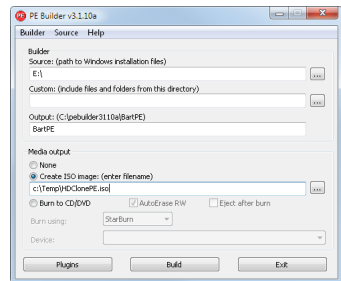
fig. 6: PE Builder configuration dialog

Then start **pebuilder.exe** from the folder **pebuilder3110a**. After few seconds, a popup window appears (▸ fig. 6). Please enter the path to the Windows XP installation 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 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.

5.3.2   Windows PE

You may also create a bootable CD version of Windows Vista, Windows 7, or Windows 8/8.1. For this purpose, we recommend the freely available projects of CWCodes under http://www.cwcodes.net/.

You will find the projects for Windows Vista PE, Windows 7 PE and Windows 8 PE and Windows 8.1 at the following URLs:

○ Windows Vista PE (VistaPE): http://vistape-capi.cwcodes.net/

○ Windows 7 PE (Win7PE SE): http://w7pese.cwcodes.net/

○ Windows 8 PE (Win8PE SE): http://w8pese.cwcodes.net/

○ Windows 8.1 PE (Win8.1 SE): http://win81se.cwcodes.net/

Along with HDClone, you may then also integrate additional device drivers; for example for RAIDs into the ISO image. After booting the Windows PE CD, these drivers will be available for HDClone as well.

5.3.3   Windows HotCopy

There is a practical alternative to creating a ▶ 5.3.1 BartPE (Windows XP) or ▶ 5.3.2 Windows PE to obtain a independently bootable Windows, for example to use special Windows drivers for RAIDs or SCSI/SAS. Simply create a temporary clone of an existing Windows Installation. Install additionally required drivers before or after creating the clone. This clone then offers you a Windows that can be booted independent from the installed operating system and start HDClone/W there, similar to a BartPE or Windows PE.

5.4   ISO image

The HDClone software package contains an ISO image (hdclone.iso):

- After installing with ▸ 5.1 Setup for Windows in the Start menu:
  Programs ▸ *HDClone 5...* ▸ *Boot-Setup*.

- In a program package in ZIP format as hdclone.iso.

- On the genuine medium (CD/DVD or USB key) as hdclone.iso.

It can be used to create a bootable HDClone-CD in any operating system and with any software supporting creation of CDs/DVDs from ISO images. Further information can be found in the manual of your CD/DVD authoring software.

1. Extract the file hdclone.iso from the HDClone software package.

2. Start your CD writing software and choose Create CD from image file (or similar caption, according to the respective CD writing software).

3. Specify the file hdclone.iso as an image file.

4. 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 ▸ 6 Program startup.

> **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.

6   Program startup

6.1   Windows – HDClone/W

After installing (▸ **5.1 Setup for Windows**), you may start HDClone from the Windows start menu under *Program* ▸ *HDClone 5…* ▸ *Start HDClone*. Alternatively HDClone can be started by invoking the file **hdclone.exe** from the genuine HDClone medium or directly from the software package (ZIP archive).

6.2   Self-booting – HDClone/S

Connect the bootable USB key or insert the bootable CD/DVD (▸ **5.2 Boot-Setup**). Start the PC and ensure that BIOS will boot from the desired medium. HDClone will then be launched from the bootable medium.

> **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 and select the bootmedium.

6.3   Quit program

In the lower right of the Main Screen (▸ **8.2 Main screen**) you find a symbol for closing the application (HDClone/W, ▸ **fig. 24**) or for powering off the PC (HDClone/S, ▸ **fig. 20**). Click on this symbol or press the **Esc** key to quit HDClone.

If there is still a program function open, you can return to the main screen by clicking on the Close-symbol $\overline{X}$ in the upper right corner of the Control panel (▸ **fig. 20**) or pressing the **Esc** key. A process still running has to be finished or cancelled at first.

> **Note:** (HDClone/S only) If you do not want to start HDClone when starting the computer for the next time, remember to remove the HDClone boot medium from the boot drive first.

7   Program functions

The ▸ 8.2 Main screen contains several function groups, where the symbols for the individual program functions. The following chapters contain a description of these functions and the steps required. There is also a detailed description of the individual steps in ▸ 8 Controls.

7.1   Cloning

This function group contains functions to create an identical copy (clone) of a disk or selected partitions.

7.1.1   Cloning disks

FullCopy requires Free Edition
SmartCopy requires Standard Edition

This function clones disks. You can choose be-tween transferring selected partitions or all parti-tions to the target. The sizes the partitions will have on the target can also be adjusted. Smart-

fig. 7: FullCopy & SmartCopy

Copy only transfers the sectors which are marked as used by the file system. This will increase cloning speed considerably in most cases.

> **Note:** For cloning one single partition into an existing target partition while keeping the remaining partitions on the target, please use the function ▸ 7.1.2 Cloning Partitions.

> **Important:** Activate ▸ 9.1.2 SmartCopy only in case of sound media and sound file systems. Otherwise creating a ▸ 9.1.1 FullCopy or ▸ 9.1.3 BitCopy instead is strongly recommended. Check the disk integrity before cloning as described in ▸ 11.5.1 Clone not booting .

Operating steps

1. Select source disk (▸ 8.3.1 Selecting a disk)

2. Select target disk (▸ 8.3.1 Selecting a disk)

3. Select copying options (▸ 8.3.4 Options)

4. Optional: ▸ 8.4.2 PartitionSelect

5. Optional: Adjust partition sizes (▸ 8.4.3 Adjusting partitions)

6. ▸ 8.3.5 Copying data

7. Optional: ▸ 8.4.5 Adjust boot data

8. Final report/Finish (▸ 8.4.6 Final report)

7.1.2   Cloning Partitions

FullCopy (Partition) requires Free Edition
SmartCopy (Partition) requires Standard Edition

Clones the contents of a single partition into an-
other, already existing or newly created parti-
tion. When transferring a system partition, the
target has to be a bootable system partition, too,
since this copying function will transfer the parti-

*fig. 8: FullCopy (Partition) &
SmartCopy (Partition)*

tion contents only, but will not create a bootable entry. SmartCopy only transfers
the sectors which are marked as used by the file system. This will increase clon-
ing speed considerably in most cases.

> **Note:** For any other area of use, for example cloning several partitions
> of a disk or a whole disk, please use ▸ 7.1.1 Cloning disks.

Operating steps

1. Select source partition (▸ 8.3.2 Selecting a partition)

2. Select target partition (▸ 8.3.2 Selecting a partition)

3. Select copying options (▸ 8.3.4 Options)

4. Optional: Adjust partition size (▸ 8.4.3 Adjusting partitions)

5. ▸ 8.3.5 Copying data

6. Optional: ▸ 8.4.5 Adjust boot data

7. Final report/Finish (▸ 8.4.6 Final report)

7.1.3   BitCopy

Professional Edition or more advanced

This function, also known as "Bare-Metal-Copy", will clone all
sectors of a disk without a difference whether they are
marked as occupied or not by the file system table or partition
table. This will result in a bitwise identical clone of the whole
medium or the selected areas.

fig. 9: BitCopy

Note: BitCopy creates an exact clone of the whole disk. Usually, this is only required in case of creating clones for data rescue or forensic examination. The SmartCopy function (▸ 7.1.1 Cloning disks) will also clone all data, but skips disk areas marked as free or unused. It is therefore much faster in many cases.

Operating steps

1. Select source disk (▸ 8.3.1 Selecting a disk)

2. Select target disk (▸ 8.3.1 Selecting a disk)

3. Select copying options (▸ 8.3.4 Options)

4. Optional: ▸ 8.4.2 PartitionSelect

5. ▸ 8.3.5 Copying data

6. Optional: ▸ 8.4.5 Adjust boot data

7. Final report/Finish (▸ 8.4.6 Final report)

7.2   Data backup

This function group is available in all editions. It offers the most simple way to create a backup or to restore your system from a previous backup. Basically this function also uses file images. In contrast to the dedicated imaging functions (▸ 7.3 File images), operating is focused on backups and therefore more streamlined for this use case. This function automatically uses the most suitable options. The file sizes of backups and the time required depend on the edition used, since the function automatically uses the available features (for example SmartImage or data compression).

7.2.1   Backup

all editions

Creates a backup of a whole hard disk, SSD, or other storage media to a file image. It also allows to select only particular partitions of the medium to be stored.

fig. 10: Store

Operating steps

1. Select disk to be backed up (▸ 8.3.1 Selecting a disk)

2. Specify file to store the backup in (▸ 8.3.3 Selecting an image)

3. Select backup options (▸ 8.3.4 Options)

4. Optional: ▸ 8.4.2 PartitionSelect

5. Start backup (▸ 8.3.5 Copying data)

6. Final report/Finish (▸ 8.4.6 Final report)

7.2.2   Recovery

all editions

This function restores a disk from a data backup, previously created with ▸ 7.2.1 Backup or copies data from an image created with FullImage, SmartImage, or BitImage back to a disk. It is also possible to adjust the sizes the partitions contained will have on the target medium.

fig. 11: Recover

> **Note:** Only FullImage, SmartImage (▸ 7.3.1 Disk Image) and ▸ 7.3.2 BitImage can be restored to a disk. A ▸ 7.3.3 VM-Image can be mounted by ▸ 12 Miray Virtual Disk or a virtual machine.

Operating steps

1. Select a backup or other file image (▸ 8.3.3 Selecting an image)

2. Select target disk to recover (▸ 8.3.1 Selecting a disk)

3. Optional: ▸ 8.4.2 PartitionSelect

4. Optional: Adjust partition size (▸ 8.4.3 Adjusting partitions)

5. Select recovery options (▸ 8.3.4 Options)

6. Start recovery (▸ 8.3.5 Copying data)

7. Final report/Finish (▸ 8.4.6 Final report)

7.3   File images

HDClone can store the content of a disk or other mass storage media to a file image. Depending on the edition used, there are different image types and options available. FullImage, SmartImage and BitImage can be restored to a disk (▸ 7.2.2 Recovery) or be mounted as a virtual disk under Windows for accessing individual files and folders, using ▸ 12 Miray Virtual Disk. VM-Images can be used as virtual disks with Miray Virtual Disk or by adding them to a virtual machine.

> **Important:** The use of SmartImage and VM-Image is recommended with sound disks and file systems only. In other cases, create a FullImage or BitImage. Check file system integrity with chkdsk /f (as described in ▸ 11.5.1 Clone not booting) prior to creating an image.

Operating steps

1. Select source disk (▶ 8.3.1 Selecting a disk)

2. Specify file image to store the data in (▶ 8.3.3 Selecting an image)

3. Optional: ▶ 8.4.2 PartitionSelect

4. Select file image options (▶ 8.3.4 Options)

5. Start file image creation (▶ 8.3.5 Copying data)

6. Final report/Finish (▶ 8.4.6 Final report)

7.3.1   Disk Image

FullImage requires Free Edition
SmartImage requires Standard Edition

This function allows you to store the contents
of a disk to a file image. You can either store
selected   partitions or all partitions of the
source. SmartImage only transfers the sectors

fig. 12: FullImage & SmartImage

which are marked as used by the file system. This will reduce the time required
to create the image and the image size considerably in most cases, compared to
FullImage (▶ 7.3.1 Disk Image) and ▶ 7.3.2 BitImage.

Operating steps see ▶ 7.3 File images

7.3.2   BitImage

Professional Edition or more advanced

This function creates an image containing all sectors of a disk
without a difference whether they are marked as occupied or
not by the file system table or partition table, similar to ▶ 7.1.3
BitCopy. This will result in a bitwise identical image of the
whole medium.

fig. 13: BitImage

> **Note:** BitImage creates an exact image of all data areas. Usually, this is
> only required for data rescue or forensic images. The SmartImage function
> (▶ 7.3.1 Disk Image) will also store all data, but omits disk areas marked
as free or unused. It is therefore much faster and creates smaller images in many
cases.

Operating steps see ▶ 7.3 File images

7.3.3   VM-Image

Professional Edition or more advanced

This function creates images for virtual machines in one of the available formats (▸ 9.8.4 VM-Images (VMDK, VHD/VHDX, VDI)). They can then be mounted as a virtual drive with ▸ 12 Miray Virtual Disk or be added to a virtual machine. A VM-Image only stores the sectors marked as used in the file sys-

fig. 14: VM-Image

tem, similar to a SmartImage. In most cases this results in a clearly higher speed when creating an image and a clearly smaller image size compared to a FullImage and a BitImage.

> Note: VM-Images can be used with ▸ 12 Miray Virtual Disk or a virtual machine. Restoring them to a disk using the ▸ 7.2.2 Recovery function is not supported.

Operating steps see ▸ 7.3 File images

7.4   MultiCopy

This function group combines functions that allow to copy to several disks at once.

7.4.1   Multi-SmartCopy

Enterprise Edition or more advanced

Creates several clones onto the selected target disks. Only transfers areas marked as used by the file system, similar to the SmartCopy function (▸ 7.1.1 Cloning disks).

fig. 15: Multi-SmartCopy

Operating steps

1. Select source disk (▸ 8.3.1 Selecting a disk)

2. Select target disks (▸ 8.3.1 Selecting a disk)

3. Optional: ▸ 8.4.2 PartitionSelect

4. Optional: Adjust partition size (▸ 8.4.3 Adjusting partitions)

5. Select copying options (▸ 8.3.4 Options)

6. Start copying process (▸ 8.3.5 Copying data)

7. Final report/Finish (▸ 8.4.6 Final report)

7.4.2   Multi-BitCopy

Enterprise Edition or more advanced

Creates several bitwise 1:1 clones („Bare-Metal-Copy") to the selected target drives by copying all sectors of the source disk, similar to the ▸ 7.1.3 BitCopy function.

fig. 16: Multi-BitCopy

Operating steps

1. Select source disk (▸ 8.3.1 Selecting a disk)

2. Select target disks (▸ 8.3.1 Selecting a disk)

3. Optional: ▸ 8.4.2 PartitionSelect

4. Select cloning options (▸ 8.3.4 Options)

5. Start copying process (▸ 8.3.5 Copying data)

6. Final report/Finish (▸ 8.4.6 Final report)

7.4.3   Multi-Deploy

Enterprise Edition or more advanced

Creates several disks at once form a FullImage, SmartImage or BitImage, similar to the ▸ 7.2.2 Recovery function.

fig. 17: Multi-Deploy

Operating steps

1. Select (▸ 8.3.3 Selecting an image)

2. Select target disks for (▸ 8.3.1 Selecting a disk)

3. Optional: ▸ 8.4.2 PartitionSelect

4. Optional: Adjust partition size (▸ 8.4.3 Adjusting partitions)

5. Select deployment options (▸ 8.3.4 Options)

6. Start deployment (▸ 8.3.5 Copying data)

7. Final report/Finish (▸ 8.4.6 Final report)

7.5   Tools

This function group contains useful additional functions.

7.5.1   SpeedTest

all editions

fig. 18: SpeedTest

Use this function to check the reading speed of the connected drives. You can select individual disks or several disks at once. In case of individual disks, this function will determine their maximum speed. In case of several disks at once, it will determine the combined reading speed of the selected disks.

Operating steps

1. Select one or more disks (▸ 8.3.1 **Selecting a disk**)

2. Start klicking the **SpeedTest** button

3. View result (▸ 8.4.7 **SpeedTest result**)

7.5.2   DiskView

all editions

This program function displays the sector data of the selected disk. It allows to view all sectors of a disk directly.

fig. 19: DiskView

Operating steps

1. Select disks or partitions (▸ 8.3.1 **Selecting a disk** or ▸ 8.3.2 **Selecting a partition**)

2. Start klicking the **DiskView** button

3. Browse the desired sectors (▸ 8.4.8 **DiskView sector data**)

8   Controls

This chapter describes the controls, for example program screens or popup windows, used within the ▸ 7 Program functions. Depending on the edition used, there may be differences in the available features (▸ 1.4 Edition summary).

8.1   General operation

This chapter describes general controls and operating options, which are available across the different program functions.
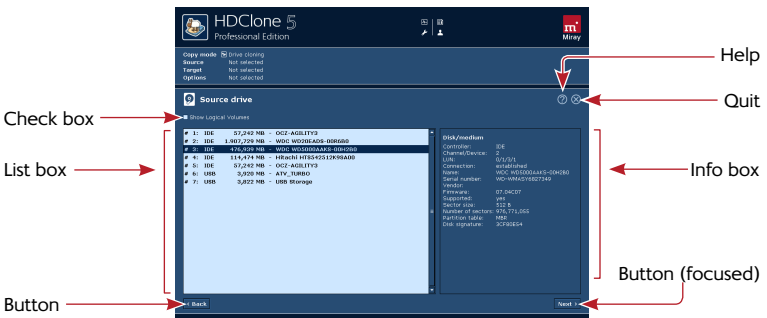
fig. 20: Graphical controls (1)
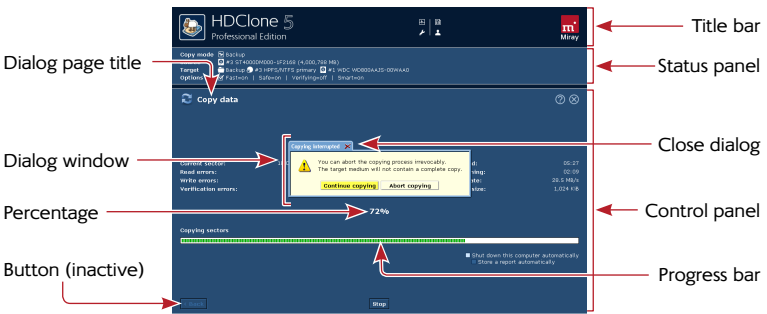
fig. 21: Graphical controls (2)

8.1.1   Title bar

The title bar on top of the screen (▸ fig. 21) is visible at any time during program execution. It contains additional functions and information as described below.

8.1.1.1   System status

A click on the 🔲 symbol or the **F5** key open the system status menu (▸ fig. 22). It contains the following entries:

○ System information: Information on the Symobi system platform.
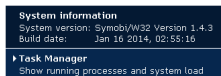
fig. 22: System status menu

○ Task Manager: opens the Windows task manager (HDClone/W) or the Symobi task manager (HDClone/S).

8.1.1.2   Toolbox

A click on the 🔧 symbol or the **F6** key open the toolbox menu (▸ fig. 23). It contains the following entries:
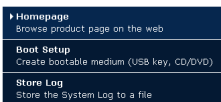
○ Homepage (HDClone/W only): opens the HD-Clone product page in your web browser.

fig. 23: Toolbox menu

○ Boot Setup (HDClone/W only): starts the ▸ 5.2 Boot-Setup used to create a bootable medium (USB stick or CD/DVD).

○ System Log: stores the system log to a file (▸ 11.1.2 System-Log).

8.1.1.3   License information

A click on the 📑 symbol or the **F7** key opens a window showing information about the program license.

8.1.2   Control panel

After starting a program function the associated program screen opens (▸ fig. 21, ▸ 8.3 Program screens). The title of the currently opened dialog page appears on the upper left. The buttons *Next* and *Back* are located at the bottom of the operating field. Use them, if available, to navigate to the next or previous dialog page.

8.1.3 Status panel

Some program functions offer a status panel above the control panel (▶ fig. 21), showing information on the current state of the program function.

8.1.4 Graphical controls

HDClone offers several controls to operate the program. They are listed and described in ▶ fig. 20 and ▶ fig. 21.

8.1.5 Mouse operation

The most convenient way to operate the program is by mouse. Some elements show additional information in a small tooltip window when being hovered.

8.1.6 Keyboard operation

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

Key	Context	Function
→| (Tab)	(any)	Switch to the next element
Arrow keys ↑ ↓ ...	List field Main screen	Select list element Select program function
Space	Button Main screen Link	Press button Invoke highlighted program function Show link target
↵ (Return)	Button Link	Press button (in popup windows only) Show link target
Esc	Popup Control panel	Close popup (only with ✗ in the title bar) Close program function
Ctrl + F4	Control panel Main screen	Close program function Quit HDClone
Ctrl + F5	(any)	open ▶ 8.1.1.1 System status
Ctrl + F6	(any)	open ▶ 8.1.1.2 Toolbox
Ctrl + F7	(any)	show ▶ 8.1.1.3 License information
Print	(any)	Create and store a screenshot
⇧ + Ins	Input field	Insert into input field from clipboard

8.1.7   Help & closing

At the upper right of the control panel there are two controls (▶ fig. 20): the help-symbol $\overline{?}$ or `F1` open help. It offers information on the current program screen. Using the text links in the help window, displayed underlined, you can switch to other help topics. The close-button $\overline{X}$ or `Ctrl` + `F4` close the current program function or quit the program (▶ 8.2.2 Quitting & powering off).

> **Note:** Program help is designed to give you useful hints when using the program. Please use this user's manual when encountering problems or requiring more information on a topic.

8.2   Main screen

The main screen (▶ fig. 24) opens after ▶ 6 Program startup.

Program function

Quit
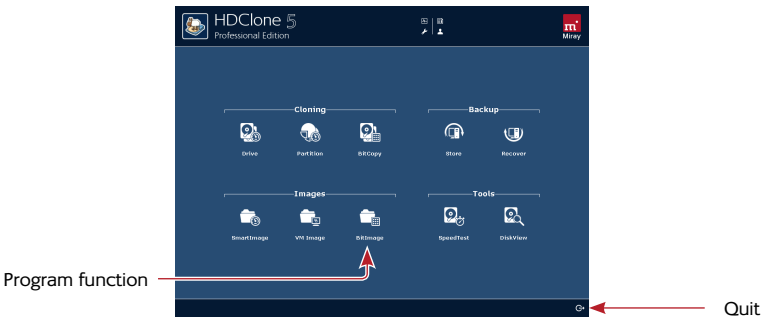
fig. 24: Main screen

8.2.1   Program functions

The brighter middle area of the main screen contains icons to invoke the different program functions (▶ fig. 24). They are organized in groups. The available program functions and groups may differ in different editions of HDClone. A description of the individual functions is to be found in ▶ 7 Program functions.

8.2.2   Quitting & powering off

The control for quitting the program is located on the right below the program functions (▶ fig. 20). Click on this icon to exit the program (HDClone/W) or to power off the computer (HDClone/S).

8.3   Program screens

8.3.1   Selecting a disk

Recognized disks are displayed in a list (▸ fig. 25). The list is being updated automatically if disks or other mass storage media are connected or disconnected.

Each disk has a correlating number (left), which is unique and is assigned only once within a program function.

Click on the desired list entry to select a disk. Some program functions allow

fig. 25: Selecting a disk

to select several entries. Klick on an already selected entry to deselect it. The info-box right of the selection list shows further information on the selected disk.

> **Hint:** Activate Show logical drives to display the associated Windows drive letters for each disk in the list. They make it easier to identify the different disks, but are not selectable themselves.

Select the desired disk or disks and click *Next* to proceed.

8.3.2   Selecting a partition

Recognized partitions are displayed in a list (▸ fig. 26). The list is being updated automatically if disks or other mass storage media are connected or disconnected.

Each disk has a correlating number (left), which is unique and is assigned only once within a program function.

Click on the desired list entry to select a partition. The info-box right of the

fig. 26: Selecting a partition

selection list shows further information on the selected partition and the associated disk.

> **Hint:** Activate Show all partitions to also display partitions in the list that have not been assigned a Windows drive letter to, for example if they contain no valid file system.

Select the desired disk or disks and click <u>Next</u> to proceed.

8.3.3   Selecting an image

When selecting an image, first specify the storage location in the list on the left (▸ fig. 27). Under Windows it also displays network drives as well as network shares, provided the option **Show network shares** is activated.

fig. 27: List of storage locations

Subsequently, enter an image name and an optional folder path in the input field on the right (▸ fig. 29). In HDClone/W you can use **copy-and-paste** (⇧ + Ins). Alternatively, klick <u>Browse...</u> to open the ▸ 8.4.1 Image browser for navigating through the folder structures. If there is no folder path provided, the **HDClone Images** folder path will be used by default.

If an image is being restored, there is a small image browser in the box right of the list (▸ fig. 28). Below, you find information on the selected image. When creating an image, the image type selection is located there instead (▸ fig. 29, ▸ 9.8 File images).

fig. 28: Restore image

> 💡 **Hint:** If a network share cannot be found or you want to use a hidden share, enter the full path in the input field **Name** in the box on the right (▸ fig. 29) and press ↵ (Return). If the share is valid, it will appear in the list on the left. The share will then persist and be available during program runtime and in other program functions as well.

Select or specify the desired file image and click <u>Next</u> to proceed.

fig. 29: Create image

8.3.4   Options

On this screen you can set the options for the selected program function. Locked options can not be altered, but the visible setting will be applied. ▸ fig. 30 illustrates the different states.

Select the desired options and click $\overline{Next}$ to proceed.

active —→

inactive & locked —→

←— inactive
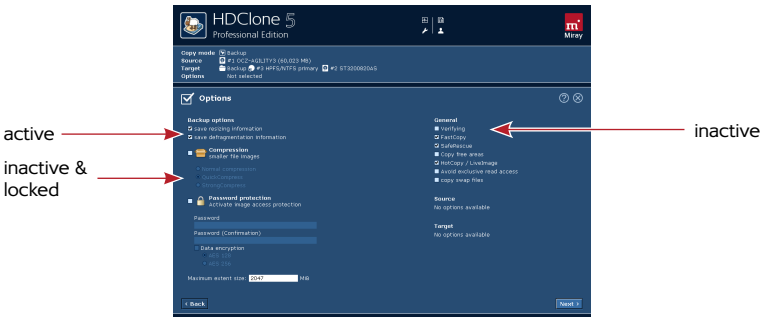
fig. 30: Selecting the options (creating an image)

8.3.4.1   General options

These options are generally available in all copying and imaging functions.

Option	Description
Verifying	Compares the data of source and target after copying. Not to be used for data rescue, as it yields unnecessary additional stress on a damaged disk (▶ 9.3 Verification).
FastCopy	Special copy algorithm. May increase the regular copy speed up to twice as fast.
SafeRescue	Special algorithm for data recovery. Tries to recover large areas first. Can also stay turned on for normal copies.
Copy free areas	FullCopy/SmartCopy only: On a partly partitioned source, HDClone works faster if free areas are not included. In case of special media (for example dynamic disks, RAID) it may be required to include free areas though.
HotCopy LiveImage	HDClone/W only: This option allows for clones or file images of the system drive or of disks, which are currently also in use by other programs.
Avoid exclusive read access	HDClone/W only: In Windows, HDClone usually tries to reserve the source drive for exclusive access at first. If this option is selected, HDClone will try to use HotCopy mode or LiveImage mode 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. For cloning, this option is always activated.

8.3.4.2 Cloning options

These options are only available when cloning disks directly.

Option	Description
SmartCopy	Create a ▸ 9.1.2 SmartCopy.
Defragmentation	NTFS+FAT only: Reorganize file system during cloning.

8.3.4.3 Backup options

These options are only available when creating images or backups.

Option	Description
Store resize-info	Store information needed to reduce NTFS and FAT partitions when restoring, otherwise partitions can only be restored to their original size or larger.
Store defrag-info	Store information needed to defragment NTFS and FAT partitions when restoring, otherwise partitions cannot be defragmented during restoring.
Compression	Creates a file image with the selected compression (Normal/Quick/Strong) (▸ 9.8.6 Compressed Images).
Password protection	Use a password to protect your file image (▸ 9.8.7 Password-Protection) and choose to use file image encryption (▸ 9.8.8 Encryption).
Maximum extent size	Limit the size of extents in the image to a defined maximum. 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).
Set image size manually	RAW image only: Set a virtual target size when creating an image. Allows to reduce the size of RAW images.

8.3.4.4 Restore options

These options are only available when restoring from images.

Option	Description
Defragmentation	NTFS+FAT only: Reorganize file system during restore.

8.3.4.5 Options for source and target

These settings refer to the drives selected as source and target.

Option	Description
Sector area	Exactly definable copying area (▶ 9.5 Area copy).
4k alignment	Target only: Aligns the copied partitions to 4 KB borders automatically on the target medium.
Driver adjustment	Target only: Activate inactive AHCI and IDE drivers.
Trim	Target only: Deallocation of unused data blocks. Revives full writing speed for SSDs when cloning and afterwards.
MediaDirect (Dell)	Target only: Deactivate MediaDirect software.
Error threshold	Target only (MultiCopy): Sector error limit leading to exclusion of the disk from the copying process. The remaining disks then can to be copied at maximum speed. For example, a good value for practical use is 32,000.

8.3.5   Copying data

The **Copy data** dialog page (▶ fig. 31) appears before starting the data transfer. Check in the status panel if program function, source, target, and options are selected correctly. If needed, go back with *Back* in the lower left corner and adjust the settings. Click *Start* to start the copying process. In some program functions, it will be followed by a ▶ 8.4.4 Security query.

fig. 31: Dialog page 'Copy data'

8.3.5.1   Status indication

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

Status	Description
Sectors processed	Absolute number of sectors already copied.
Buffer size	Size of the internally used buffer.
Read errors	Number of read errors encountered. May decrease if errors can be fixed.
Write errors	Number of write errors encountered. May decrease if errors can be fixed.
Running time	Time passed since the start of the copying process.
Time remaining	Estimated time remaining for the entire copying process.

Status	Description
Data rate	Average data rate attained up to this point.
Verification errors	This indicator is only used if the **Verifying** option is on.

8.3.5.2   Percentage indication

The percentage indicator (▶ fig. 21) is located below the copy animation, show-ing the progress of the current run (▶ 8.3.5.4 **Copying sequence**) in percent.

8.3.5.3   Progress bar

The progress bar (▶ fig. 21) below the percentage indicator visualizes the prog-ress of the current run. Which run (▶ 8.3.5.4 **Copying sequence**) is currently be-ing processed is shown on the left above the progress bar.

8.3.5.4   Copying sequence

The entire process consists of up to three runs:

1. Copying run: The actual data transfer. Depending on the program function and settings, this run starts with a file system analysis.

2. Error recovery run: In case of errors occurring during copying, the affected areas will be copied again (**SafeRescue** option, ▶ 8.3.4.1 **General options**).

3. Verification run: The optional verification is conducted in a separate run (**Ver-ifying** option, ▶ 8.3.4.1 **General options**).

8.3.5.5   Cancellation

You can use $\overline{Stop}$ to interrupt the process (▶ fig. 32). You may then continue the pro-cess or ultimately cancel it. You will then ob-tain a final report (▶ 8.4.6 **Final report**).
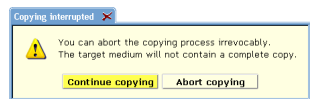
fig. 32: Cancel copying process?

Note: Unlike a cancelled copying run, a cancelled verification run has no influence on the copied data. The copy itself is already finished completely after the copying run.

8.3.5.6   Regular termination

After up to three runs (▶ 8.3.5.4 **Copying sequence**) without a ▶ 8.3.5.5 **Can-cellation**, the copying process is terminated normally. A final report for the com-

plete copying process is shown in a popup window (▸ 8.4.6 Final report).

8.4   Popup windows

8.4.1   Image browser

This popup is used to browse folders for file images. The list on the left side shows folders and file images. Folders are trailed by a <DIR> identifier, images by their size value. Other files are not displayed. The box on the right contains more information on the selected image.
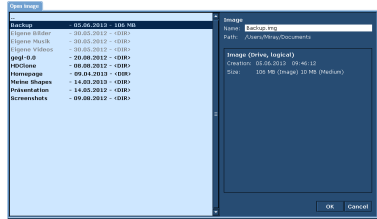
fig. 33: File image browser

Confirm the selection with $\overline{OK}$ or go back with $\overline{Cancel}$.

8.4.2   PartitionSelect

The PartitionSelect popup (▸ fig. 34) will prompt you to choose the partitions to copy and which to exclude from copying. If the total size of the partitions to be copied exceeds the total capacity of the target, the graphical bar will be marked in red. In this case, exclude partitions you do not re-

fig. 34: Select Partitions

quire on the target until the remaining partitions fit on the target. Alternatively, you can click on $\overline{Cancel}$ to choose a different combination of source and target for creating the copy.
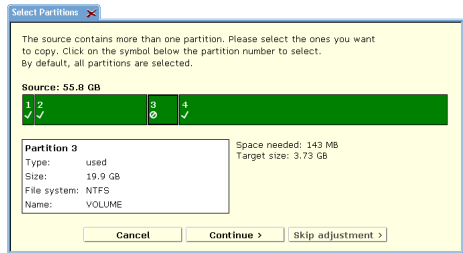
The default setting is to have all partitions selected, so you may accept that by just clicking $\overline{Continue}$. Otherwise select which partitions to exclude from copying by clicking on the check symbol ($\checkmark$) beneath the partition number. The check symbol will then change to a lock symbol ($\oslash$). It signals that the partition will be excluded from copying. When clicking on the lock symbol, you can activate the partition again and the check symbol appears again. When you have selected all partitions as desired, click on $\overline{Continue}$.

In case you want to copy all partitions and to skip the adjustment step (▸ 8.4.3 Adjusting partitions), use *Skip adjustment*. Any previous partitions selection will then be ignored and all partitions will be copied in their original size and original location as given on the source. For more information, see ▸ 9.7 PartitionSelect.

8.4.3   Adjusting partitions

In case partition sizes can be altered, a popup window appears before starting the copying process (▸ fig. 35). 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
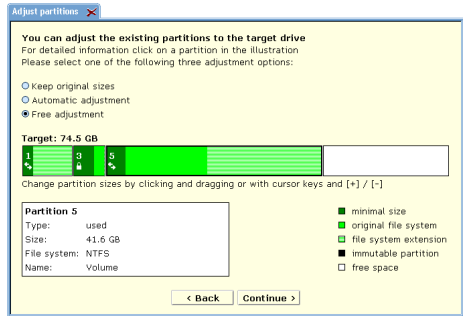
fig. 35: Adjust partitions

partition on – a letter assigned to it. If you click 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 (⟷, default setting), showing that the partition size can be altered, or a lock-symbol (🔒), indicating that the partition size is fixed. By clicking on these symbols, you can toggle between both modes. This allows to keep the original sizes of certain partitions, while changing others or have them adjusted automatically.

> **Example:** Given are system partition (C:) and two data partitions (D: and E:). When migrating to a larger hard disk, the latter two partitions are able to be AutoExpanded but not the system partition. First, click on the symbol below the system partition to have it change to the lock-symbol. This will keep the system partition a fixed size. Then choose **Automatic adjustment** to have the data partitions resized proportionally 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 reduced to the minimum amount of space required by the data stored on this partition. Expanding or reducing partition size 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 enlarg-

ing 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 (▶ 8.4.3.1 Keep original sizes, 8.4.3.2 Automatic adjustment, 8.4.3.3 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 Copy data dialog page and will cancel any changes made.

> Note: To transfer the original partition layout to the target medium, click on *Continue without adjustment*. The option Keep original sizes will keep the original partition sizes, but may alter their absolute positions on the medium by shifting them towards the beginning of the medium for a better utilization of free space.

8.4.3.1   Keep original sizes

The original sizes of partitions on the source will be kept on the target medium (▶ fig. 36). The partitions them-

fig. 36: 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.

8.4.3.2   Automatic adjustment

Free space on the target medium will be apportioned completely to the individual partitions, proportional to

fig. 37: Option 'Automatic adjustment'

their respective size (▶ fig. 37). 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.

8.4.3.3   Free adjustment

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

fig. 38: Option 'Free adjustment'

(▶ fig. 38). You can change the size of a certain partition by clicking and dragging the corresponding area on the graphical representation.

8.4.4   Security query

This security query (▶ fig. 39) pops up before finally starting a cloning process or a restore from an image. Click <u>Start copying</u> to start the copying process or <u>Cancel</u> to return without starting the copying process.
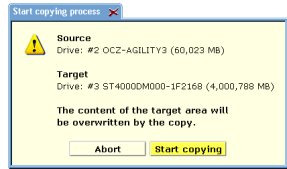
fig. 39: Security query

Warning: Any data in the target area will be irretrievably deleted by starting the copying process and even data recovery software will not be able to retrieve the overwritten data.

8.4.5   Adjust boot data

This popup (▶ fig. 40) appears after a copying process has finished. Usually the boot data, copied 1:1 from the source has to be adjusted in order to have the target booting smoothly and to avoid interference with the source. Select <u>Automatic</u> to have HDClone make the modifications automatically.
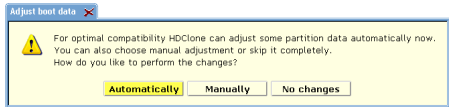
fig. 40: Adjust boot data

Hint: Using the automatic boot data adjustment is expressly recommended. Except when a certain use case expressly requires a different adjustment or no adjustment at all.

Select No changes for absolutely identical clones without any changes to the boot data (for example data rescue or forensic examination).

Important: With <u>No changes</u>, usually only copies to the same disk model are bootable. Never boot windows with such a copy connected at the same time as the source.

In special cases it may be necessary or desired to change only specific boot data. Klick <u>Manual</u> to open the popup for manual adjustment of the boot data (▶ fig. 41). The values are preset automatically by HDClone. Some refer to the partition sector (MBR/GPT), others to the boot sectors. They are grouped accordingly.
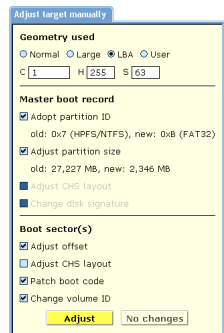
fig. 41: Adjustment popup

Parameter	Description
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. Required when source and target work in the same PC.

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

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

8.4.6   Final report
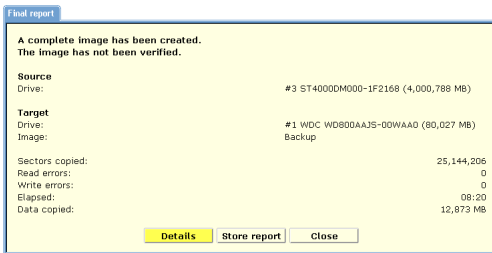
fig. 42: Final report

After termination, the final report (▶ fig. 42) opens, containing a summary of the copying process and additional information.

Field	Description
Source	Source drive/partition of the copying process.
Target	Target drive/partition of the copying process.

Field	Description
Copied sectors	Total number of copied sectors.
Read errors	Total number of read errors occurred (w/o verification).
Write errors	Total number of write errors occurred.
Verification errors	Total number of errors occurred during verification.
Runtime	Time required for the entire process..

You can start another copying process by clicking Another copy or end the program by clicking Quit HDClone. The Details button will open another popup with more details on each drive.

Use Store report to create a detailed cloning report and store it as a text file (▶ 10.2 Store final report). Select the drive you want the report being stored on (▶ fig. 43). Clicking Create will store the report to the selected drive in the file hdclone.<x>.txt (<x> = consecutive number), located in the root directory (for example X:\hdclone.1.txt).
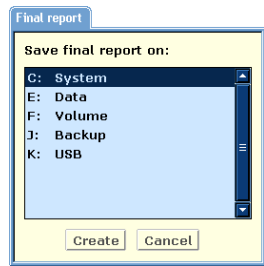
fig. 43: Store report

8.4.7   SpeedTest result

After the speed of the selected disk or disks has been determined (▶ 7.5.1 SpeedTest), the results are presented in a popup window (▶ fig. 44).

Note: If there are several disks selected, speed measurement is conducted over all disks at once. The result then contains the combined speed as achievable with the Enterprise Edition. It also depends on how the disks are connected to the system (▶ 9.6.2 Speed).

fig. 44: SpeedTest result

8.4.8 DiskView sector data

This popup (▸fig. 45) displays the sectors data of the selected disk (▸7.5.2 DiskView). Klicking Go will display the sector with the number specified in the input field (Sector). The bar below allows to quickly navigate through all sectors of the disk. Close the popup with $\overline{X}$ in the title bar or with the Esc key.

fig. 45: DiskView sector data
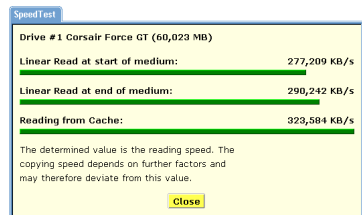
9   Mode of operation

HDClone can handle entire disks as well as individual partitions. Copies can be created directly to target disks or into file images. HDClone offers different modes and options for different use cases.

> **Important:** For data rescue, create a full ▶ 9.1.3 BitCopy or a RAW image (▶ 9.8.3 RAW images) of the entire disk first. You can then try different recovery attempts without putting the original data at risk.

9.1   Copy modes

HDClone offers several copy modes to directly transfer the data of one disk to another.

9.1.1   FullCopy

FullCopy (physical copy) is a universal copy mode offered by all editions of HDClone.it creates an exact clone of all partitions of a disk and optionally also the sectors in between (**Copy free areas**, ▶ 8.3.4.1 General options). Partitions are cloned as a whole, regardless of the actual utilization of their sectors. This allows to clone arbitrary file systems.

> **Note:** FullCopy is available in all editions of HDClone. In order to use the FullCopy mode with editions, which also offer the ▶ 9.1.2 SmartCopy mode, deactivate the **SmartCopy** option (▶ 8.3.4.2 Cloning options).

9.1.2   SmartCopy

With SmartCopy (logical copy) HDClone only takes those areas of a storage medium that are occupied by the operating system and other files. Any unused areas will not be copied. Since in most cases only a part of the total capacity of storage media is occupied, SmartCopy saves – depending on the amount of data stored – some of the time needed for a FullCopy. For this reason, SmartCopy usually is by a multiple faster than FullCopy.

For cloning disks with **SmartCopy** (▶ fig. 46), activate the **SmartCopy** option (▶ 8.3.4.2 Cloning options). SmartCopy mode can be applied to entire disks or other media as well as to single partitions. SmartCopy currently supports NTFS, FAT, ext2 and ext3 file systems. Partitions with other file systems,

fig. 46: Smart-Copy

will be copied in FullCopy mode, even if the SmartCopy option is activated.

> **Note:** SmartCopy evaluates the file system and depends on file system data being consistent and free of errors. Otherwise the copy may contain errors as well. In case you are not sure, you may check the source with **chkdsk /f** before cloning.

SmartCopy also creates an exact clone, but in contrast to ▸ **9.1.1 FullCopy**, only copying the used areas of the medium. For many cases of use, this mode is preferable, since it delivers the same result in less time.

> **Hint:** Since it is only a clone, you can always try SmartCopy mode first. If it turns out not to be sufficient for your individual case of use, you can still create a FullCopy.

> **Warning:** Never use **SmartCopy** mode for ▸ **2.2 Data rescue**, for copying defective or inconsistent file systems, or for ▸ **2.7 Forensic examination**. Rather create a FullCopy or ▸ **9.1.3 BitCopy** in these cases.

9.1.3   BitCopy

BitCopy (bitwise physical copy) creates a complete or partial (▸ **9.5 Area copy**) clone of a storage medium. This clone is bit by bit identical with the source, since each sector of the source will be copied exactly to the same sector on the target. This is the main difference between BitCopy and ▸ **9.1.1 FullCopy**.

> **Important:** For a complete BitCopy of all areas of the source, also select the **Copy free areas** option. This is especially required when performing data rescue or forensic examination.

9.2   Size differences

To create a **real** BitCopy, source and target must have exactly the same size. HDClone is also capable to create physical copies if the size of source and target differs. But the result will not be an absolutely identical clone.

> **Hint:** The following subchapters refer to the usage of ▸ **9.1.3 BitCopy**. With ▸ **9.1.2 SmartCopy** the contents of the source can usually be adjusted automatically to the size of the target.

9.2.1   Equal size

If source and target have exactly the same size and ▸ **7.1.3 BitCopy** mode is selected, HDClone creates an identical copy. On this clone – provided there were no errors – all sectors on the target are 100% identical with the source.

9.2.2   Small to large

If the source is smaller than the target, HDClone clones all source data, from the beginning of the source, onto the target medium. The area at the end of the target medium, which is larger than the source, remains unaffected. 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 ▶ **9.2.3 Large to small**).

9.2.3   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 is unusable or only very restrictedly usable 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 (▶ **9.2.2 Small to large**) and if you copy back the (unchanged) data onto the original medium or onto a target of the corresponding size.

9.3   Verification

The **Verifying** option (▶ **8.3.4.1 General options**) allows to compare source and target after the copying process. The entire process including copying and verification requires about twice the time. Select this option according to your requirements and the available time.

Warning: When copying defective disks (data rescue), do **not activate verification**. The additional exposure may increase existing defects. And a verification has virtually no significance in case of defective disks.

9.4   Automatic troubleshooting

HDClone tries to troubleshoot occurring sector errors automatically in the best possible way. If this is not possible, the errors will be counted in a corresponding error statistic.

9.4.1   Intensive reading/writing

In case of read errors, HDClone uses different strategies in order to recover these sectors. The time used for this depends on the type and size of medium

used. For each sector, several seconds up to minutes can be needed for the recovery attempts. Therefore, it is recommended to always activate the option SafeRescue (▸ 8.3.4.1 General options) since handling of defective sectors will then be done after the copying of all intact areas has been finished. The process can then be cancelled if it takes too long without losing the data of the intact areas.

9.4.2   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 (option SafeRescue, ▸ 8.3.4.1 General options) within a separate error recovery run (▸ 8.3.5.4 Copying sequence). During the error recovery run, the number of the indicated read errors can reduce depending on the areas on the source which could be recovered.

> **Note:** Read errors occurring during verification are counted as verification errors (▸ 8.3.5.1 Status indication). Since at verification time cloning has been finished already, there will be no further error recovery.

9.4.3   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, ▸ 8.3.4.1 General options) with the help of special data recovery strategies within a separate error recovery run (▸ 8.3.5.4 Copying sequence). During the error recovery run, the number of the indicated write errors can decrease depending on the recoverable areas on the target.

9.4.4   Verification errors

When the option Verifying (▸ 9.3 Verification) is activated, HDClone executes a verification run (▸ 8.3.5.4 Copying sequence) 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. The number of verification errors gives you absolute information on how exact source and target correspond to each other after cloning.

> **Note:** Verification will only be performed on sectors that have been copied previously. Since SmartCopy only will copy data from used sectors, verification will only compare these sectors.

9.5 Area copy

In case of an area copy, not the entire storage medium (drive/partition) of source or target (or both) will be used, but only a partial area.

9.5.1 Usage

The dialog page **Options** provides the possibility to specify an exactly definable sector area for source and target (▸ 8.3.4.2 Cloning options). 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:** Counting starts with '0' (= 1st sector of the medium), so all further sector numbers have to be decreased by 1 (e.g. from = 0, to = 99999 defines the first 100000 sectors on the medium as an area).

> **Warning:** Only use area copy if you are completely aware of its functioning. A sector area, which has not been defined properly, may lead to data loss or render the result unusable.

9.5.2 Mode of operation

Sector area means a contiguous area of sectors on a storage medium. In the case of partitions, it is specified relative to their starting positions. HDClone will then copy the first sector of the source, to the first sector of the target area and so on. Compared to a normal BitCopy, the main difference is that the defined partial area is cloned instead of the entire drive or partition.

> **Example:** Sector area **from** = 0, **to** = 31. For drives, this defines the (absolute) first 32 sectors. The absolute position of the first 32 sectors of a partition depends on its (absolute) start on the drive.

9.6 MultiCopy

In case of a MultiCopy (mass copy) the contents of the source are copied on multiple targets 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 targets at the same time.

9.6.1 Mode of operation

When selecting a program function from the **MultiCopy** group (▸ 7.4 MultiCopy), the target selection dialog page (▸ 8.3.1 Selecting a disk) allows to select

multiple targets from the list. The rest of the process works just like copying to a single disk.

> **Note:** When creating a MultiCopy, the result on a single medium is identical with the result of a single copy. Even the values for automatic resizing will be calculated separately for each target.

9.6.2   Speed

Using MultiCopy yields strong advantage in speed compared to single copies. In case of optimal connected media (▸ 9.6.3 Different media) , speed increases directly proportional with the number of target media. For example, a fourfold copy yields about four times the data throughput of a single copy.

> **Note:** Please note that the achievable speed depends on the hardware used (optimally SATA, USB3, IDE, or SAS/SCSI) and on the maximum speed of the individual disks.

9.6.3   Different media

MultiCopy can be used with an arbitrary combination of drive types. Differences in performance of different media types may have an impact on the total performance. It is recommended to use IDE drives configured as master only.

9.7   PartitionSelect

Partitions on the source are displayed in a graphical bar (▸ fig. 47) and numbered (with letters after the ninth partition). Beneath the partition number, there is a check symbol ($\checkmark$, default setting), if the partition will be included in, or a blocking-symbol ($\oslash$), if this partition will be excluded from

fig. 47: PartitionSelect dialog

the clone. Click on these symbols, to include or exclude any partition individually. Changes to the total size by selecting and de-selecting partitions will be displayed.

PartitionSelect provides a way to transfer only certain partitions and to leave others out. Hence, you can use PartitionSelect to reduce the storage size required for the target.

9.8   File images

Besides direct clones, HDClone is also capable of storing images of a medium into a file. An image contains the same data as a clone. When an image has been restored to another medium, the result is the same as if it had been copied directly from the original source.

9.8.1   FullImage

A FullImage (physical Image) stores – similar to a ▸ 9.1.1 FullCopy – all sectors of the disk or selected partitions and optionally all sectors in between (Copy free areas, ▸ 8.3.4.1 General options) in a file image.

> **Note:** FullImage is available in all editions. In editions, which also support other image types, explicitly select FullImage if desired when creating an image (▸ 8.3.3 Selecting an image).

9.8.2   SmartImage

A SmartImage (logical Image) stores – analog to a ▸ 9.1.2 SmartCopy – only the areas of a medium that are occupied with file system data. A SmartImage usually requires much less disk space and time for creation than a ▸ 9.8.1 FullImage.

9.8.3   RAW images

RAW images are also physical images. They contain the same data like FullImages (including Copy free areas, ▸ 8.3.4.1 General options). HDClone just uses a special file format for FullImages, which optimally supports HDClone specific features (e.g. SafeRescue). RAW images contain data in the same linear order as it is stored on a medium. This makes it faster and easier to process image files with third party programs, especially when mounting them in ▸ 12 Miray Virtual Disk.

> **Hint:** RAW images created by HDClone automatically contain a VMDK file required to mount them directly as virtual drives in VMware or other virtual machines (▸ 9.8.4 VM-Images (VMDK, VHD/VHDX, VDI)).

9.8.4   VM-Images (VMDK, VHD/VHDX, VDI)

In addition to its native image formats, HDClone is also able to create dynamic VM-Images to be used in virtual machines. It offers the following formats: VMDK (VMware), VHD/VHDX (Virtual PC) and VDI (VirtualBox). They only contain actually used areas of the source and therefore are usually much smaller than ▸ 9.8.3 RAW images – similar to a ▸ 9.8.2 SmartImage. Due to their technical characteristics, VM-Images are slightly larger than SmartImages. And it is not pos-

sible to exactly calculate their final size in advance. During creation, this may lead to a deviation from the predicted size.

> **Note:** Compression and encryption are not available for VM-Images. In this case, select a SmartImage and the appropriate options instead (▶ 8.3.4.3 Backup options).

VM-Images created with HDClone can be used as virtual drives in virtual machines. For further information, please refer to the manual of your version of VMware, VirtualPC, or VirtualBox. From Windows 7 and Windows Server 2008 on, you can also mount VHD/VHDX images as virtual drives using the Windows Disk Management tool (diskmgmt.msc).

▶ 12 Miray Virtual Disk can mount both formats under Windows as virtual drives. This allows you to access the files and folders stored in them without opening the image in a virtual machine.

> **Note:** A virtual VM-Image drive mounted with Miray Virtual Disk can be read AND written, but changes are not stored directly in the image. But you can use the virtual drive to create a new image including all changes made (▶ 12.7 Copy to other Image formats).

When creating ▶ 9.8.3 RAW images, a VMDK file will be created automatically. Opening the HDClone file image with **VMware**, you will be displayed a VMDK file of the same name. You then can select and use the file. The VMDK files HDClone creates comply with **HWversion=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

9.8.5   Usage

When ▶ 8.3.3 Selecting an image you can specify the type of the image to be created. FullImages can be created from any supported disk type. For creating SmartImages, the source disk has to be formatted with FAT, NTFS, ext2/ext3. With HDClone/S you can use FAT32 or NTFS formatted disks for reading and writing image files. HDClone/W also supports network dives and network shares.

9.8.6   Compressed Images

When creating a file image, the **Options** dialog page (▸ 8.3.4 **Options**) offers you to create a compressed image. Please choose the option **Compression** to have HDClone compress the file image. You will then be able to choose between **normal compression** (default), QuickCompress and Strong-Compress (▸ **fig. 48**). **QuickCompress** offers a lower com-

fig. 48: Strong-Compress

pression ratio than **Normal compression**, but to run it requires almost no additional runtime. To create backups quickly while saving some space, please choose **QuickCompress**. To maximize the amount of space saved, please choose **StrongCompress**, which needs more time for achieving maximum compression.

When using file images in HDClone, there is – except file sizes – no difference between compressed and uncompressed file images from the user's point of view. Creating compressed file images will consume more time than decompressing file images when restoring. Therefore, transfer speed when restoring compressed file images is usually faster than creating compressed file images.

Note: Activating compression usually leads to a lower copying speed, since compressing data consumes extra time. But in some cases, creating compressed file images may even lead to a higher copying speed. 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 and when using **QuickCompress**.

9.8.7   Password-Protection

When creating file images, you can protect them with a password (option **Password protection**, ▸ 8.3.4 **Options**). 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 ▸ 12 **Miray Virtual Disk** without specifying the correct password first.

Important: Password protection is a simple access protection for file image. HDClone and Miray Virtual Disk will deny any access without the correct password. For secure protection of the file image data, choose the **Data Encryption** option (▸ 9.8.8 **Encryption**).

9.8.8   Encryption

If you select the **Data Encryption** option when creating a file image (▸ 8.3.4 **Options**) , the data in the image will be encrypted. HDClone uses a 128/256 bit AES encryption for this purpose. The image data then cannot be read without the

specified password, neither with HDClone or ▶ 12 Miray Virtual Disk and not with other software tools.

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

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

> **Hint:** Encryption will usually increase the time required for creating and restoring file images significantly. Select Data Encryption only if it is required. Otherwise the password protection mechanism may also be sufficient and it will not increase the duration of the process.

9.8.9   Images from CD/DVD/BD

HDClone cannot store file images directly on CD/DVD/BD, but can read file images from there for restoring. Insert the CD/DVD/BD into the drive before starting HDClone or when the main screen opens. Select ▶ 7.2.2 Recovery mode. When selecting the source image, the CD/DVD drive will appear in the list and you can choose a source image from there.

> **Note:** When writing an HDClone image to CD/DVD/BD it is required to use an ISO file system. Please consider the manual of your disc writing software in this case. The CD/DVD/BD media has to contain the entire image. So called 'spanning' of the file image is not supported by HDClone But you can choose a file block size, matching the capacity of the target medium optimally (▶ 8.3.4.3 Backup options).

9.9   Defragmentation

HDClone can perform a defragmentation for NTFS and FAT file systems during copying. On the ▶ 8.3.4 Options dialog page, select Defragmentation (▶ fig. 49). Apart from the general advantages of a defragmentation, in particular the acceleration of file accesses and the boot

fig. 49: Defragmentation

process, HDClone offers the special advantage of performing the defragmentation process with only a little additional time required. Downsizing or defragmenting can also be selected when restoring from file images if it has been created using the options Store downsizing info or Store defrag info (▶ 8.3.4.1 General options).

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

Note: When downsizing partitions, HDClone may also shift data blocks. This shifting aims to reduce the file system's size in as few steps as possible. For a real defragmentation select the option **Defragmentation** explicitly, even when downsizing a file system.

10 Command line (CLI)

You can 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.bat), 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 easily call them manually or automatically on demand. Usage of hdclone-cl. exe is described in detail in ▶ 10.1 Command line interface.

10.1 Command line interface

To use HDClone for automated processes or time-triggered calls, there is the additional file hdclone-cl.bat for calling HDClone from the Windows command line. This program is destined to be called by 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 copying processes automatically, for example backups.
- ○ Script integration: Calling HDClone from scripts for integrating it into automated processes, for example for mass installation (deployment).
- ○ 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 -help or without any parameters, a list of supported parameters in combination with a short description of their usage will be displayed.

The following chapters list and explain the supported parameters. The order of individual parameters when calling hdclone-cl is arbitrary.

10.1.1 Start Menu

To facilitate the use of the command line version, it has its own Start Menu entry. Under the HDClone entry, you find the sub-folder CLI. It contains two subitems:

- ○ HDClone CLI: Opens a privileged Windows Shell in the program folder, so you can directly start the command line version from here.

- ○ Scripting templates: Opens a folder with templates for batch scripts in the Windows Explorer. You may customize them according to your needs.

> Important: Along with the scripting templates there is an hdclone-cl.bat file. Use it instead of calling hdclone.exe cl, especially in complex scripts to ensure you obtain the correct result values (▶ 10.1.7 Return values).
Replace the call of hdclone-cl.exe from earlier versions with hdclone-cl.bat.

10.1.2 Program call

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

- ○ D2D – Copying an entire drive
  hdclone-cl -mode:d2d -srcdrv:[source] -dstdrv:[target]

- ○ P2P – Copying a single partition
  hdclone-cl -mode:p2p -srcvol:[source] -dstvol:[target]

- ○ D2I – Creating a file image of an entire drive
  hdclone-cl -mode:d2i -srcdrv:[source] -dstvol:[target] -dstimg:[image]

- ○ P2I – Creating a file image of a single partition
  hdclone-cl -mode:p2i -srcvol:[source] -dstvol:[target] -dstimg:[image]

- ○ I2D – Restoring a file image to an entire drive
  hdclone-cl -mode:i2d -srcvol:[source] -srcimg:[image] -dstdrv:[target]

- ○ I2P – Restoring a file image to a single partition
  hdclone-cl -mode:i2p -srcvol:[source] -srcimg:[image] -dstvol:[target]

> Note: When using Enterprise Edition with more than one target, the calling syntax is extended as follows: the parameter combinations -dstdrv:[target], -dstvol:[target] or -dstvol:[target] -dstimg:[filename] have to be specified iteratively, one for each copying target.

Providing the parameters described above is mandatory. If one of the parameters is missing or has an invalid value, the call will be canceled with an error.

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

10.1.3 Drive identification

To allow more areas of use for physical drives (-srcdrv:[source]/-dstdrv:[target]), there are different ways to specify a drive:

○ **Drive by Windows ID:** Physical drives are usually specified by their respective ID, assigned by Windows at run-time. This ID is to be found in the Disk Management of Windows (diskmgmt.msc).

○ **Drive by port:** You can also specify the port that is used to connect the drive (not for USB and Firewire). If you specify the 2nd SATA port for the source, the drive connected to it will be used, regardless of the Windows ID assigned to it.

○ **Drive by name / serial number:** Alternatively, a drive can be selected by its type name and /or serial number, regardless of the Windows ID assigned to it or over which port it is connected. But it has to be unique in the context of the copy to be created (and the Edition used).

> **Hint:** You can use hdclone-cl -list to display a list of the available physical drives and their respective indications: Windows ID, port number, and name/serial number.

In case there are several targets available under the identification provided, HDClone Enterprise Edition will take this specification as unambiguous if the number of drives is smaller than or equal to the maximal number of targets.

> **Example:** If you specify a drive name as a target which matches five drives in the system, HDClone Enterprise Edition 8x will use all five drives as targets, while the Enterprise Edition 4x will refuse cloning due to the ambiguity.

> **Note:** If HDClone cannot make an unambiguous selection for the port or identification specified, HDClone will cancel the process with an error.

10.1.4 File image paths

File images are specified as source or target using the full file path (drive letter or network share, folder path and image name).

10.1.5 Network shares

File images can also be created directly on network shares or be recovered from there. Just use -srcimg:[source]/-dstimg:[target] to specify a path for the network share instead of a drive letter. The network path must have the form:

\\[domain|computer]\[share]\[folderpath]\[imagename]

For example '\\MyComputer\sharedfolder\backup\latest\mypc.img'.

10.1.6 Optional parameters

There are 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 form

-[option]:[on|off] or -[option]:[<choice1>|<choice2>|...]

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 options correspond to the options of the graphical HDClone program.

Option	Description
-verify:[on|OFF]	Perform an additional verification (▸ 9.3 Verification).
-smart:[ON|off]	Faster copies by using logical file system information (▸ 9.1.2 SmartCopy).
-freespace:[on|OFF]	Copy unused areas (▸ 8.3.4.1 General options).
-swapfiles:[on|OFF]	Copy pagefile.sys and hiberfil.sys (▸ 8.3.4.1 General options).
-defrag:[on|OFF]	NTFS+FAT only: Also perform a defragmentation when copying or storing defragmentation information when creating a file image (▸ 8.3.4.3 Backup options).
-imagetype: [full|SMART|raw| vmdk|vhd]	Image type to be created, according to the available image formats (▸ 9.8 File images).
-timestamp:[ON|off]	Automatically extends the names of file images 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|strong]	Create a compressed image, 'on' for standard compression, 'quick' for QuickCompress, and 'strong' for StrongCompress (▸ 9.8.6 Compressed Images).
-resizeinfo:[ON|off]	NTFS+FAT only: Store information for reducing partition size when creating file images (▸ 8.3.4.3 Backup options).
-password:<password>	Specify a password to protect the file image.
-encrypt: [AES128|aes256]	Encrypt image (only in combination with -password).

Option	Description
-extentsize:<size>	Limit the size extents in the image folder to a maximum. Value for size plus K/M/G/T for magnitude, for example 650M, 4G, default is 2G.
-targetsize:<size>	Virtual target size when creating images. Value for size plus K/M/G/T for magnitude, for example 20G, 1T.
-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 -list.
-resize -resize:<size> -resize:fixed -resize:skip -resize:AUTO -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 (▶ 10.1.8 Resizing), excluding individual partitions (▶ 9.7 PartitionSelect). <size> = value for size plus K/M/G/T for magnitude, for example 650M, 4G, default is 2G.
-adjust:[ON|off]	Automatic adjustment of disk parameters.
-preferlock	Reserve source for exclusive access, otherwise VSS (▶ 2.9 HotCopy & LiveImage) will be used.
-allowlock	Only use exclusive source access if VSS (▶ 2.9 HotCopy & LiveImage) is not available.
-allowlazy	Use unsecured drive access, if exclusive access or VSS are both not available.
-report:[drvletter]	Generate a report and store it to the specified drive (▶ 10.2 Store final report).
-shutdown	Shut down the PC after successful completion.
-timeout:<sec>	HDClone will cancel drive recognition after this period in seconds has passed, default = 10.
-list	Lists all drives and partitions recognized as well as their internal numbering, port number, name, and serial number (▶ 10.1.3 Drive identification).

10.1.7 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.

Option	Description
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 (▶ 10.1.6 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 or file image not found/access denied.
5	Password not specified or invalid password.
6	Cancelled by user (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.
10	Another instance of HDClone is already running.

10.1.8 Resizing

In the case of copying or restoring, you can use the resize option (▶ 10.1.6 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 (▶ 9.7 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 will be applied to the partitions in the specified order. In the case where 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 similar to ▶ 8.4.3 Adjusting partitions.

▷ **Example:** There are four partitions on the drive, but only two size values 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 used for them.

10.1.9 Examples of use

Examples for different use cases are to be found in the CLI subfolder of the program path after installing HDClone, or via *Start* ▶ *Programs* ▶ *HDClone...* ▶ *CLI* ▶ *Sample scripts*

◉ **Hint:** Call hdclone-cl -**list** to find out, which drive numbers are assigned to which physical drives. You will be displayed a list of the available physical drives in the system.

10.2   Store final report

After the process has been finished, you can generate and store a detailed final report in a text file to document and analyze the cloning processes. The report contains the following Information:

○ Program and license

○ Device data (CPU, memory, etc.)

○ Copying mode

○ Source and target(s) including device details

○ Option settings

○ Duration and result including errors

11 Troubleshooting

This paragraph describes possible problems when using HDClone and offers proposals for a solution. If there not a proposal given for a solution to a problem, you can gladly contact our ▸ 13.3 Support.

11.1 General

11.1.1 Retry

In case that something does not run as expected or desired at the first attempt, a trivial but often effective solution is to give it a second try. Especially in case of hardware issues this saves time, as many problems will be gone when connecting hardware a second time or using a different port.

11.1.2 System-Log

In case of any problems, even if they can be solved with the instructions following, but especially when contacting our ▸ 13.3 Support, please create a System Log first and send it to us. Just like a flight recorder, it contains information about program internal activities, which will lead us to a solution much faster – and you as well. Store the System Log when HDClone is running as follows:

1. **HDClone/S:** If you have not booted HDClone from a USB key, please connect one to store the System Log to.

2. Klick on the Toolbox symbol (▸ 8.1.1.2 Toolbox).

3. Select the "Store System Log" option.
   HDClone/S: If you have booted HDClone from a USB key, the System Log will be stored to it automatically. Otherwise, a popup will open and prompt you to select a storage medium.
   HDClone/W: The System Log will be stored on the Public Desktop. If it is not visible on your desktop, press `F5` or open the path C:\Users\Public\Desktop (hidden folder) in Windows Explorer.

4. A popup window appears, showing the storing progress as well as the storage location and the file name.

If an older System Log is found at the storage location, the number contained in the file name will be increased automatically. The latest System Log is always the one with the highest number.

11.2   Create a bootable HDClone medium

This chapter describes potential issues when creating a bootable medium for the self-booting version of HDClone.

11.2.1 USB key not working

If creating a bootable USB key or booting from this USB key fails, the USB key may lack a partition table. In this case, use a different USB key instead or format the USB key using the HP USB Disk Storage Format Tool (freeware). Download it at   http://www.miray-software.com/public/tools/HPUSBFW_v2.2.3.exe.   Afterwards, start ▸ 5.2 Boot-Setup again with this USB key.

11.2.2 CD/DVD writer not selectable

In no drive is offered for selection at CD/DVD writer although a CD/DVD writer is available on the system, the installed CD/DVD writing software may be the reason. It may reserve the drive exclusively, so that Boot-Setup cannot access it. Deactivate or uninstall the CD/DVD writer software in this case or create a bootable CD/DVD with your CD/DVD writing software the ▸ 5.4 ISO image contained in the software package.

11.3   Booting HDClone

If there are issues when booting HDClone from USB key or CD/DVD (for example black screen or startup screen freezes), the following chapters provide suitable solutions.

11.3.2.1 BIOS-USB-Boot

If the HDClone bootable medium (USB key or USB CD/DVD drive) is not listed in the BBS menu (▸ 6.2 Self-booting – HDClone/S), activate USB boot support in the BIOS setup first. Press **F2**, **Del**, or **F10** (depending on BIOS) to enter BIOS setup. The setting is to be found under different names and menu items, depending on the BIOS version. In most cases it is to be found under labels like USB, Boot and Legacy. In BIOS setup you can also select to boot from USB permanently, usually under the menu item Boot.

11.3.2.2 UEFI-Boot and SecureBoot

Current PC models often have a modern UEFI-BIOS. HDClone supports booting with UEFI. Some of these BIOSes also offer the SecureBoot function, which is not yet supported by HDClone/S for booting. Deactivate SecureBoot while using

HDClone/S. You can activate SecureBoot again afterwards. In case there is an is-sue when booting with UEFI or SecureBoot, please create the HDClone bootable medium again (▸ 5.2 Boot-Setup). with the "Include UEFI boot support" option disabled. Start HDClone/S again from this bootable medium.

11.4 Input devices

If there is no reaction on mouse or keyboard input after starting HDClone/S, the following subchapters render further information and a solution.

11.4.1 General

A solution that is generally very successful when having issues with input devices is to connect an alternative USB input device of the same type.

11.4.2 Bluetooth devices

HDClone/S support USB mice and keyboards (▸ 3 Supported hardware). This also covers many cordless devices, if they are connected as USB devices. Blue-tooth input devices are currently not supported. In this case, please connect an alternative USB device of the same type.

11.4.3 Problem devices

Few USB mice and keyboards contain a flawed implementation of the USB stan-dard. Those devices may though work with Windows, since vendors usually test against Windows, but will not work with other operating systems. In this case, please use a different USB device temporarily. Create a ▸ 11.1.2 System-Log and send it, together with information about vendor and device type of the non-working device to our ▸ 13.3 Support.

11.5 Copied disk

11.5.1 Clone not booting

If the clone (or restored image) of a bootable disk does not boot as expected, please consider the following notes:

○ Does the source boot correctly? If not, the problem is located here,

○ Ensure that the automatic boot data adjustment (▸ 8.4.5 Adjust boot data) is applied to the target after the copying process has been finished.

○ Is the file system of the source defective? Check this before creating a copy by running chkdsk /f on the source. Errors on the source file system may yield

problems on the target, even if the source seems to boot and work correctly. Otherwise use FullyCopy (▶ 7.1.1 Cloning disks) or ▶ 7.1.3 BitCopy.

○ Is the disk connected to the target system in the same way as the source in the original system? In case of an SATA port, a frequent mistake is to have it configured as AHCI in the BIOS of the first system and as IDE in the other system. Some versions of Windows refuse booting then. Change the BIOS setting as required in this case.

○ Usually, Windows is not able to boot from USB disks. If you have created a copy of a Windows system to USB, connect the disk as an internal drive before attempting to boot Windows from it.

11.5.2 Decelerated system

If the performance of the target disk is clearly decreased after cloning or restoring from an image, the drive may use 4K sectors internally. Create another copy or restore the disk again and ensure that the 4K alignment option (▶ 8.3.4.5 Options for source and target) is selected for the target disk.

11.6   Copying process

11.6.1 Read, write and verification errors

When HDClone reports errors, this usually results from defective areas on the corresponding disk. General hardware problems can also cause read and write errors, usually indicated by a very high number of errors. In this case, cancel the copying process, connect the affected disk to another port or check if it may be defective. Restart the copying process then.

> Note: In case of disks connected over USB, use a different USB port and ensure the power supply is sufficient. When using USB cases for SATA or IDE hard disks, please check if the case is working properly first.

11.6.2 Copying performance

If the copying performance of HDClone does not achieve the expected value, please consider the following notes:

○ Does the disk work without an issue? Please use the ▶ 7.5.1 SpeedTest function to check if source and target achieve the expected speed or which of them probably shows a lack of transfer speed.

○ When using USB cases for SATA and IDE hard disks, please consider that the maximum transfer speed is much lower for USB 2 than for SATA or IDE.

- When using USB3 devices, ensure that they are connected to a USB 3 con-
  nector (blue). In fact USB3 devices are downward-compatible, but only run at
  USB2 speed when plugged to a USB2 connector (black).

- Also consider that creating a SmartCopy or images will usually not achieve the
  nominal transfer speed of a FullCopy or BitCopy. This has technical reasons
  and therefore is normal.

11.7   Mass storage

Please ensure that the disks are working properly and connected correctly. Also
take care that the power supply is sufficient. The following subchapters contain
information about certain types of storage media.

11.7.1 SCSI

When using SCSI devices, please ensure that they are configured correctly and
connected to one of the supported SCSI controllers. A list of supported SCSI
controllers is to be found at ▶ 3.3 Compatibility.

HDClone supports even more controllers, either as onboard chipset (AIC) or as
addon card (AHA, ASC). They are determinable by their respective vendor and
device IDs 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
"	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

11.8   USB

11.8.1 Hubs

USB devices can either be connected directly or over a USB hub. In order to achieve as high transfer rates as possible, it is recommended to connect them directly to the PC or the USB controller.

11.8.2 USB 3

Always ensure that you connect USB3 devices to a proper USB3 connector (blue) in order to utilize the full performance of USB3.

11.9   Mapped network drives

When using mapped drives in Windows, HDClone may not find the mapped drives in some cases, since HDClone is running in administrator mode. To use the established mapped drives, a small change to the Windows Registry is required. Usually, ▶ 5.2 Boot-Setup will handle this automatically. 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 the DWORD value EnableLinkedConnections

○ Set its value data to 1 and restart your computer

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

12 Miray Virtual Disk

HDClone contains the **Miray Virtual Disk** software, which allows to mount file images created with HDClone – even VMDK, VHD/VHDX, VDI images – as virtual Windows drives. You can then access files and folders stored within a file image directly. **Miray Virtual Disk** can be started on demand or automatically at system start-up. File images may be mounted either just on demand or persistently.

> **Note:** You can also open and mount file images as virtual drives directly, from the network, using network drives or network shares.

12.1   Installation

Miray Virtual Disk is included with the ▶ **5.2 Boot-Setup**. During setup (▶ **5.1 Setup for Windows**), you can choose to install **Miray Virtual Disk**. It will be installed to a separate location in the **Program Files** directory.

12.2   Program startup

You will find **Miray Virtual Disk** in the Windows Start menu in the HDClone folder. At startup, the program window will appear (▶ **fig. 50**). Since **Miray Virtual Disk** works in the background, the program icon will appear in the System Tray. **Miray Virtual Disk** will remain active in the background, even if you close the program window. You can open the program window again using the **System Tray** icon.

12.2.1 Program window

Use the program window (▶ fig. 50), to open file images and create virtual drives. It contains three major elements: menu bar, ▶ **12.2.2 Image list**, and 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) (▶ **12.3 Operation**).
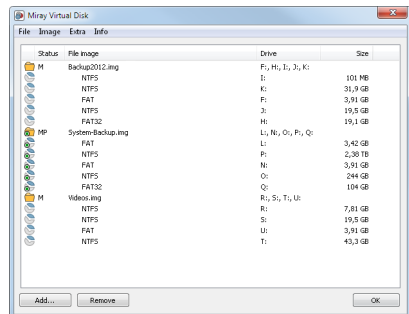

fig. 50: Program window

You can use the control buttons to add an Image (_Add..._, see ▶ 12.3.1 Adding an image) to or to remove an Image (_Remove_, see ▶ 12.3.2 Removing an image) from the image list. Press _OK_ to close the program window. Miray Virtual Disk will continue to stay active in the background (▶ 12.2.3 Tray icon).

> **Note:** Adding an image to the image list does not automatically create a virtual drive. The image list shows the partitions an image contains, so you can mount them separately (▶ 12.3.4 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.

12.2.2 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 distinguish the individual entries in the image list, there are different symbols as 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**.

Hint: You can directly open mounted partitions in Windows Explorer by double-clicking in the **File image** column. This may be especially useful, if there is no drive letter available to be assigned to the partition.

12.2.3 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. 51) which gives you direct access to the following four functions:
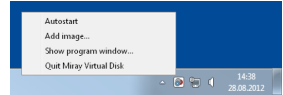

fig. 51: Tray icon and context menu

- ○ _Autostart_: Same functions as ▸ **12.3.7 Autostart**.
- ○ _Add image_: Same functions as ▸ **12.3.1 Adding an image**.
- ○ _Open program window_: Opens the program window or brings it to the front.
- ○ _Quit Miray Virtual Disk_: Same functions as ▸ **12.3.9 Quit program**.

Hint: If you want to open the program window, double-click the Tray icon. If the Tray icon is not visible, Miray Virtual Disk is not active and there are no virtual drives available.

12.3   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 (▸ **12.2.1 Program window**).The context menu opens by right-clicking on entries or on the free area of the image list. You open the tray context menu by a right-click on the program icon in the System Tray.

12.3.1 Adding an image

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

- ○ Control button _Add..._
- ○ Menu bar _File_ ▸ _Add image..._

○ Context menu *Add image...*

○ Tray context menu *Add image...*

○ Hotkey **F2**

○ Drag-and-drop from any Explorer window

The image list also displays information on the partitions and file systems of each file image in the list (▸ fig. 50).

> **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.

12.3.2 Removing an image

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

○ Control button *Remove*

○ Menu bar *File* ▸ *Remove image*

○ Context menu *Remove image*

○ Hotkey **Shift** + **F2**

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

12.3.3 Empty image list

There are three ways to remove all images from the image list:

○ Menu bar *File* ▸ *Empty image list*

○ Context menu *Empty image list*

○ Hotkey **Ctrl** + **Shift** + **F2**

> **Note:** If one or more 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.

12.3.4 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 Win-

dows disk and will behave just like a physical disk. When mounting an entire file image which contains several partitions, you 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*

○ 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 in color.

○ 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. For example, mounting an image containing two partitions, **M** will appear in the row of the image. If mounting both partitions individually, the capital **M** appears in both partition rows.

12.3.5 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 option ▶ 12.3.7 **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 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 mounted *and* unmounted images or partitions. As soon as an image or a partition has been successfully mounted persistently, this will be displayed in the image list as follows:

○ A small green point 🟢 appears in the icon of the mounted image/partition.

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

> **Note:** To cancel persistent mounting, mount the regarding image or partition normally (▸ 12.3.4 Mounting an image) or unmount it completely (▸ 12.3.6 Drive unmounting).

12.3.6 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*

○ Hotkey `Shift` + `F8`

As soon as an image or an individual partition have 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.

12.3.7 Autostart

You can select to start Miray Virtual Disk automatically at system startup (Autostart). This allows you to have persistently mounted drives permanently available 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*

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** is started automatically at system startup, only the ▸ 12.2.3 Tray icon will appear. Double-click it to open the program window.

12.3.8 Close program window

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

○ Menu bar *File* ▸ *Close window*

○ Hotkey **Ctrl** + **W**

12.3.9 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*

○ Hotkey **Ctrl** + **Q**

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

12.4   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 *Image* ▸ *Refresh list* from the main menu to update the image list.

○ 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.

○ 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 is damaged. The image may have been created from an inconsistent or damaged file system.

12.5   Modes of operation

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

○ Write-protected: Menu bar *Image* ► *Advanced* ► *Mount (R/O)*

○ Writeable with undo option: Menu bar *Image* ► *Mount*

○ Direct reading & writing: Menu bar *Image* ► *Advanced* ► *Mount (R/W)*

12.5.1 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 and 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.

12.5.2 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. To make changes available in the original image, some Editions of HDClone allow to create a new image of the desired type from the virtual drive (▸ 12.7 Copy to other Image formats)

> **Note:** This mode works with any kind of file image. For high performance access, it is recommended to use RAW images (▸ 12.6 Converting to RAW image) in R/W mode (▸ 12.5.3 Direct read/write access).

To undo changes to an original image, resulting from write access to it, select the image in the list and unmount it. Then click on *Extras* ► *Delete overlay data*. The file image then has been reverted to its original state. Any changes made to the virtual drive are then made undone.

> **Hint:** To delete overlay data created with Miray Virtual Disk 3.x and earlier, double-click the file image in Windows Explorer and delete any files with the .ovl extension there.

12.5.3 Direct read/write access

In this mode **Miray Virtual Disk** writes or reads directly from a RAW image. It offers the fastest possible access – comparable to physical media access. This mode will immediately and irrevocably change the RAW image – in contrast to normal read/write access (▸ 12.5.2 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. If required, you can convert other image types into RAW images (▶ 12.6 Converting to RAW image).

12.6   Converting to RAW image

One main advantage of SmartImages is the greatly 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...*.

12.7   Copy to other Image formats

Use HDClone to create a copy of a virtual drive into a new image of any format required (Full, Smart, RAW, VMDK, VHD), independent of the original image format the virtual drive is based on.

Especially in cases where an image has been mounted with ▶ 12.5.2 Read/write access (default), the changes made on the virtual drive are not stored in the original image. In this case, you can use such a copy to create a new image of the desired type, which will then contain all changes made to the virtual drive.

13 Miscellaneous

13.1 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/copyleft/gpl.html. On request to support@miray.de we will send you a copy of the source code.

Although HDClone was programmed and tested with the largest possible caution, please 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.

13.2 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 would look forward to receiving such information from you.

Internet	miray-software.com
Email	feedback@miray.de
Fax	+49 (0)89 72013-647
Postal address	Miray Software AG
	Gaissacher Str. 18
	81371 Munich
	Germany

13.3 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 miray-software.com/support or email us at support@miray.de.