KillDisk Industrial System

USER MANUAL

ver. 7.0

Updated: 17 Dec 2024

Contents

Introduction

As a relatively new technology an overwhelming majority of people, businesses and organizations do not understand the importance of security in digital data storage. The average hard drive stores thousands of files written on it and many of them contain sensitive information. Over the course of a hard drives lifetime the likelihood for recoverable remnants of sensitive information left on a hard drive at its end of life is very high. To see this just try out **KillDisk**'s File Browser on your system drive. You'll be surprised to see what you find!

The modern storage environment is rapidly evolving. Data may pass through multiple organizations, systems, and storage media in its lifetime. The pervasive nature of data propagation is only increasing as the Internet and data storage systems move towards a distributed cloud-based architecture. As a result, more parties than ever are responsible for effectively sanitizing media and the potential is substantial for sensitive data to be collected and retained on the media. This responsibility is not limited to those organizations that are the originators or final resting places of sensitive data, but also intermediaries who transiently store or process the information along the way. The efficient and effective management of information from inception through disposition is the responsibility of all those who have handled the data.

The application of sophisticated access controls and encryption help reduce the likelihood that an attacker can gain direct access to sensitive information. As a result, parties attempting to obtain sensitive information may seek to focus their efforts on alternative access means such as retrieving residual data on media that has left an organization without sufficient sanitization effort having been applied. Consequently, the application of effective sanitization techniques and tracking of storage media are critical aspects of ensuring that sensitive data is effectively protected by an organization against unauthorized disclosure. Protection of information is paramount. That information may be on paper, optical, electronic or magnetic media.

An organization may choose to dispose of media by charitable donation, internal or external transfer, or by recycling it in accordance with applicable laws and regulations if the media is obsolete or no longer usable. Even internal transfers require increased scrutiny, as legal and ethical obligations make it more important than ever to protect data such as Personally Identifiable Information (PII). No matter what the final intended destination of the media is, it is important that the organization ensure that no easily recoverable residual representation of the data is stored on the media after it has left the control of the organization or is no longer going to be protected at the confidentiality categorization of the data stored on the media.

Sanitization refers to a process that renders access to target data on the media infeasible for a given level of effort.

Note:

Additionally, try formatting a USB drive with files on it and browse it with **KillDisk**'s File Browser as well. Data leakages are not limited to hard drives!

Sanitization Types

Sanitization Types

NIST 800-88 international security standard (Guidelines for Media Sanitization) defines different types of sanitization.

Regarding sanitization, the principal concern is ensuring that data is not unintentionally released. Data is stored on media, which is connected to a system. Simply data sanitization applied to a representation of the data as stored on a specific media type.

When media is re-purposed or reaches end of life, the organization executes the system life cycle sanitization decision for the information on the media. For example, a mass-produced commercial software program contained on a DVD in an unopened package is unlikely to contain confidential data. Therefore, the decision may be made to simply dispose of the media without applying any sanitization technique. Alternatively, an organization is substantially more likely to decide that a hard drive from a system that processed Personally Identifiable Information (PII) needs sanitization prior to Disposal.

Disposal without sanitization should be considered only if information disclosure would have no impact on organizational mission, would not result in damage to organizational assets, and would not result in financial loss or harm to any individuals. The security categorization of the information, along with internal environmental factors, should drive the decisions on how to deal with the media. The key is to first think in terms of information confidentiality, then apply considerations based on media type. In organizations, information exists that is not associated with any categorized system. Sanitization is a process to render access to target data (the data subject to the sanitization technique) on the media infeasible for a given level of recovery effort. The level of effort applied when attempting to retrieve data may range widely. NIST SP 800-88 Rev. 1 Guidelines for Media Sanitization Clear, Purge, and Destroy are actions that can be taken to sanitize media. The categories of sanitization are defined as follows:

Clear

Clear applies logical techniques to sanitize data in all user-addressable storage locations for protection against simple non-invasive data recovery techniques; typically applied through the standard Read and Write commands to the storage device, such as by rewriting with a new value or using a menu option to reset the device to the factory state (where rewriting is not supported).
For HDD/SSD/SCSI/USB media this means overwrite media by using organizationally approved and validated overwriting technologies/methods/tools. The Clear pattern should be at least a single write pass with a fixed data value, such as all zeros. Multiple write passes or more complex values may optionally be used.

KillDisk supports Clear sanitization type through the **Disk Erase** command for all R/W magnetic types of media, more than 20 international sanitation methods including custom patterns implemented and can be used.

Purge

Purge applies physical or logical techniques that render Target Data recovery infeasible using state of the art laboratory techniques.
For HDD/SSD/SCSI/USB media this means ATA SECURE ERASE UNIT, ATA CRYPTO SCRAMBLE EXT, ATA EXT OVERWRITE, ATA/SCSI SANITIZE and other low-level direct controller commands.

KillDisk supports Purge sanitization type through the **Secure Erase** command only for media types supporting ATA extensions.

Destroy

Destroy renders Target Data recovery infeasible using state of the art laboratory techniques and results in the subsequent inability to use the media for storage of data due to physical damages.
For HDD/SSD/SCSI media this means Shred, Disintegrate, Pulverize, or Incinerate by burning the device in a licensed incinerator.

It is suggested that the user categorize the information, assess the nature of the medium on which it is recorded, assess the risk to confidentiality, and determine the future plans for the media. Then, the organization can choose the appropriate type(s) of sanitization. The selected type(s) should be assessed as to cost, environmental impact, etc., and a decision should be made that best mitigates the risk to confidentiality and best satisfies other constraints imposed on the process.

International Standards in Data Destruction

KillDisk works with dozens of international sanitizing standards for clearing and sanitizing data including the US DoD 5220.22-M and NIST 800-88 standards. You can be sure that once you erase a disk with **KillDisk** all the sensitive information is destroyed forever.

KillDisk is a professional security application that destroys data permanently from any computer that can be started using a boot USB or CD/DVD. Access to the drive's data is made on the physical level via the BIOS (Basic Input-Output Subsystem) bypassing the operating system's logical drive structure organization. Regardless of the operating system, file systems or machine types, this utility can destroy all data on all storage devices. It does not matter which operating systems or file systems are located on the machine which disks being sanitized.

Supported Sanitizing Standards:

- US DoD 5220.22-M
- US DoE M205.1-2
- Canadian CSEC ITSG-06
- Canadian OPS-II
- British HMG IS5 Baseline
- British HMG IS5 Enhanced
- Russian GOST p50739-95
- US Army AR380-19
- US Air Force 5020
- NAVSO P-5329-26 RL
- NCSC-TG-025
- NSA 130-2
- NIST 800-88
- NIST 800-88 rev.1
- German VSITR
- Bruce Schneier
- Peter Gutmann
- Australian ISM-6.2.93
- IEEE Std 2883-2022

User Defined Erase Method

KillDisk offers User Defined erase method where user indicates the number of times the write head passes over each sector. Each overwriting pass is performed with a buffer containing user-defined or random characters. User Defined method allows to define any kind of new erase algorithms based on user requirements.

Secure Erase for SSD

KillDisk offers low-level ATA Secure Erase method for Solid State Drives (SSD). According to National Institute of Standards and Technology (NIST) Special Publication 800-88: Guidelines for Media Sanitation, *Secure Erase* is "*An overwrite technology using firmware based process to overwrite a hard drive. Is a drive command defined in the ANSI ATA and SCSI disk drive interface specifications, which runs inside drive hardware. It completes in about 1/8 the time of 5220 block erasure.*" The guidelines also state that "*degaussing and executing the firmware Secure Erase command (for ATA drives only) are acceptable methods for purging.*" ATA Secure Erase (SE) is designed for SSD controllers. The SSD controller resets all memory cells making them empty. In fact, this method restores the SSD to the factory state, not only deleting data but also returning the original performance. When implemented correctly, this standard processes all memory, including service areas and protected sectors.

Related information

Erase Methods on page 120

Erase Confidential Data

Modern methods of data encryption are deterring network attackers from extracting sensitive data from stored database files.

Attackers (who want to retrieve confidential data) become more resourceful and look for places where data might be stored temporarily. For example, the Windows **DELETE** command merely changes the files attributes and location so that the operating system will not look for the file located on FAT/exFAT volumes. The situation with NTFS file system is similar.

One avenue of attack is the recovery of data from residual data on a discarded hard drive. When deleting confidential data from hard drives, removable disks or USB devices, it is important to extract all traces of the data so that recovery is not possible.

Most official guidelines regarding the disposal of confidential magnetic data do not take into account the depth of today's recording densities nor the methods used by the OS when removing data.

Removal of confidential personal information or company trade secrets in the past might have been performed using the **FORMAT** command or the **FDISK** command. Using these procedures gives users a sense of confidence that the data has been completely removed.

When using the **FORMAT** command Windows displays a message like this: `Formatting a disk removes all information from the disk.`

Actually the **FORMAT** utility creates new empty directories at the root area, leaving all previous data on the disk untouched. Moreover, an image of the replaced FAT tables is stored so that the **UNFORMAT** command can be used to restore them.

FDISK merely cleans the Partition Table (located in the drive's first sector) and does not touch anything else.

Moreover, most of hard disks contain hidden zones (disk areas that cannot be accessed and addressed on a logical access level). **KillDisk** is able to detect and reset these zones, cleaning up the information inside.

Related information

Disk Erase on page 82
Erase Disk Concepts on page 111
Disk Hidden Zones on page 125

Wipe Confidential Data

You may have some confidential data on your hard drive in spaces where the data is stored temporarily. You may also have deleted files by using the Windows **Recycle Bin** and then emptying it. While you are still using your local hard drive there may be confidential information available in these unoccupied spaces.

Wiping the logical drive's deleted data does not delete existing files and folders. It processes all unoccupied drive space so that recovery of previously deleted files becomes impossible. Installed applications and existing data are not touched by this process.

When you wipe unoccupied drive space on the system disk, the process must be run under operating system booted from CD/DVD/USB disk. As a result the wipe or erase process uses an operating system that is outside the local hard drive and is not impeded by Windows system caching. This means that deleted Windows system records can be wiped clean.

KillDisk wipes unused data residue from file slack space, unused sectors and unused space in system records or directory records.

Wiping drive space can take a long time, so do this when the system is not being actively used. For example, this can be done overnight.

Data Recovery

Advances in data recovery have been made such that data can be reclaimed in many cases from hard drives that have been wiped and disassembled. Security agencies use advanced applications to find cybercrime related evidence. Also there are established industrial spy agencies using sophisticated channel coding techniques such as PRML (Partial Response Maximum Likelihood), a technique used to reconstruct the data on magnetic disks. Other methods include the use of magnetic force microscopy and recovery of data based on patterns in erase bands.

Although there are very sophisticated data recovery systems available at a high price. Almost all the data can also be easily restored with an off-the-shelf data recovery utility like Active@ File Recovery, making your erased confidential data quite accessible.

Using **KillDisk** all data on your hard drive or removable device can be destroyed without the possibility of future recovery. After using **KillDisk** the process of disposal, recycling, selling or donating your storage device can be done with peace of mind.

Related information

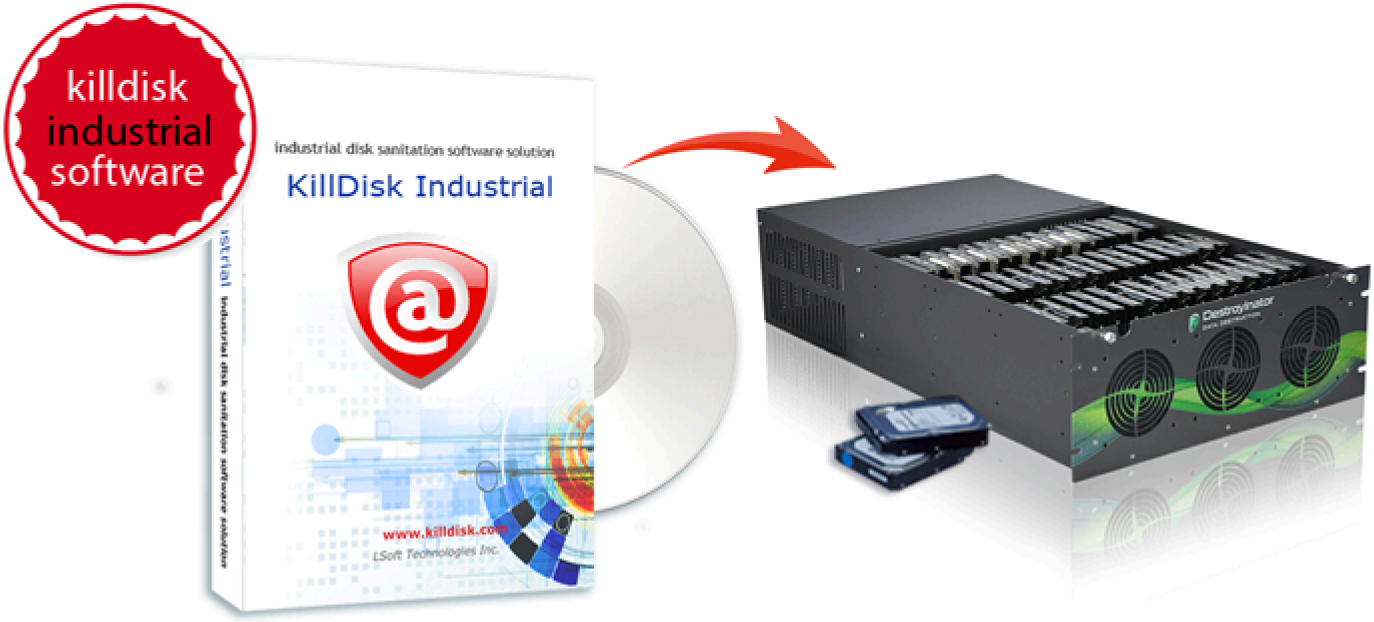
Getting Started on page 10

Usage Scenarios on page 25

Erase Disk Concepts on page 111

Overview

KillDisk for Industrial Systems



This edition of **KillDisk** is designed to provide a software solution for industrial workstations, configured to service disks in high volumes. **KillDisk for Industrial Systems** is distributed as a software package that may be installed on a disk erase workstation and used to examine, erase and even write images to individual or batches of disks. Highly customizable, the software is able to conform to any company standards - erasure standards, examination type, reporting, error handling are only a subset of the configurable settings **KillDisk** supports. All elements of **KillDisk**'s operations may be documented in XML reports, PDF certificates, or even printable labels for erased hard drives. Versatile, easy to navigate and rich in features, **KillDisk for Industrial Systems** is the ideal **KillDisk** solution for recyclers and corporations to securely erase hard drives - easily and efficiently.

KillDisk is a powerful software that delivers the following main features:

- Fast erase data on the entire hard disk drive surface, supports parallel erasing of large numbers of disks (hardware-limited)

- Destroy data permanently with a choice of dozens of international disk sanitizing standards including US DoD 5220.22-M
- Sanitize external disks (USB Flash, external HDD/SSD) connected via USB ports
- Examine disk integrity and overall stability, disk verification and detect bad sectors
- Auto-erase mode sanitizes disks and prints certificates without of any user interaction
- Hot-swap operations are fully supported, erase could be auto-initiated upon HDD plug-in
- Browse file systems on disk volumes and inspect particular sectors Hex Viewer on a low level
- Issue customizable certificates and detailed reports for disk erase and examination
- Print different types of labels including bar codes to be attached to hard disks after erase completion
- Provides enhanced information about disks including S.M.A.R.T. monitoring
- Export local erase history to the external SQL databases or CSV-file
- Wipe out unused clusters and meta-data on live volumes, leaving existing data intact
- Provides fast low-level Secure Erase feature for your SSD drives
- Resume interrupted erase from the point it stopped for different reasons
- Write a Disk Image or copy a Master Disk to erased disks
- and more...

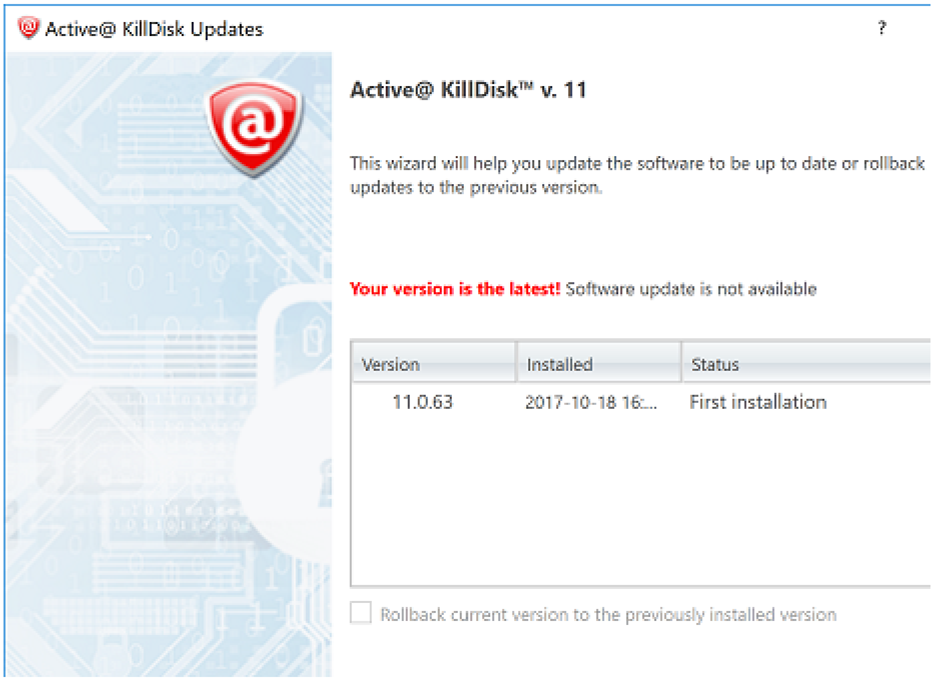
Related information

Disk Batches on page 62

Erase Methods on page 120

Software Updates

KillDisk has a built-in update feature to ensure you always have an access to the latest version of the application. To check for updates, use the file menu bar to navigate to **Help** > **Check for Updates**



Active@ KillDisk™ v. 11

This wizard will help you update the software to be up to date or rollback updates to the previous version.

Your version is the latest! Software update is not available

Version	Installed	Status
11.0.63	2017-10-18 16:...	First installation

☐ Rollback current version to the previously installed version

Figure 1: Check for Updates

Update dialog contains history of previously installed versions and updates.

If a new version or update is detected it can be downloaded and installed on the next wizard steps.

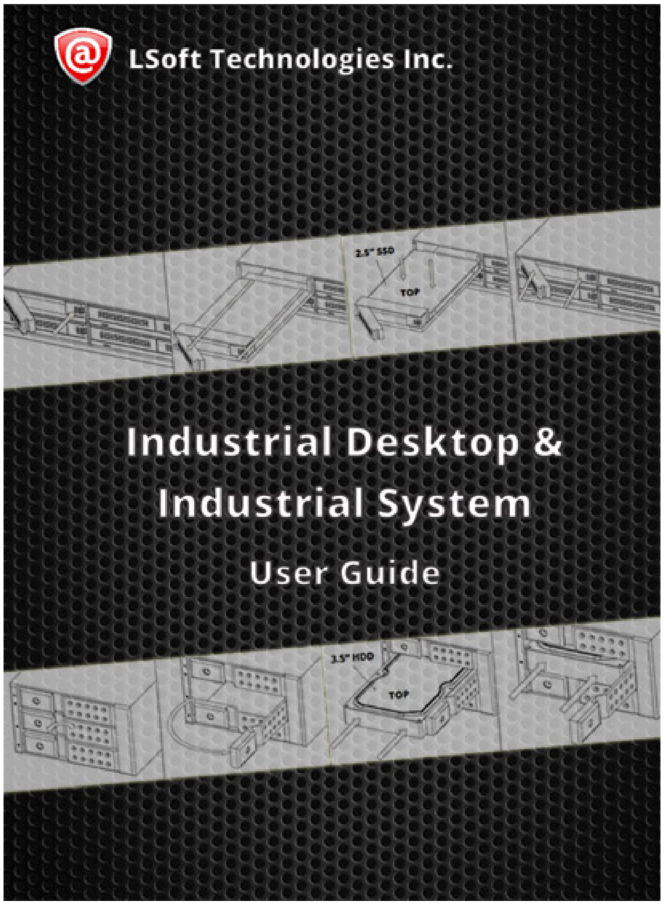
Click **Next** button to proceed with an update, if exists. Software download and installation will start automatically.

Note:

KillDisk stores your previously installed versions so you may roll back to any of your older versions at any time. To rollback to previous version, just select target version, mark **Rollback to previously installed version** check box and click **Next** button.

Hardware User Guide

In order to operate **KillDisk Industrial** hardware properly, please read a paper copy of the Hardware User Guide supplied with the kit or download it from https://www.killdisk-industrial.com/guides . This User Guide provides references and demonstrations on how to get started with your hardware system.



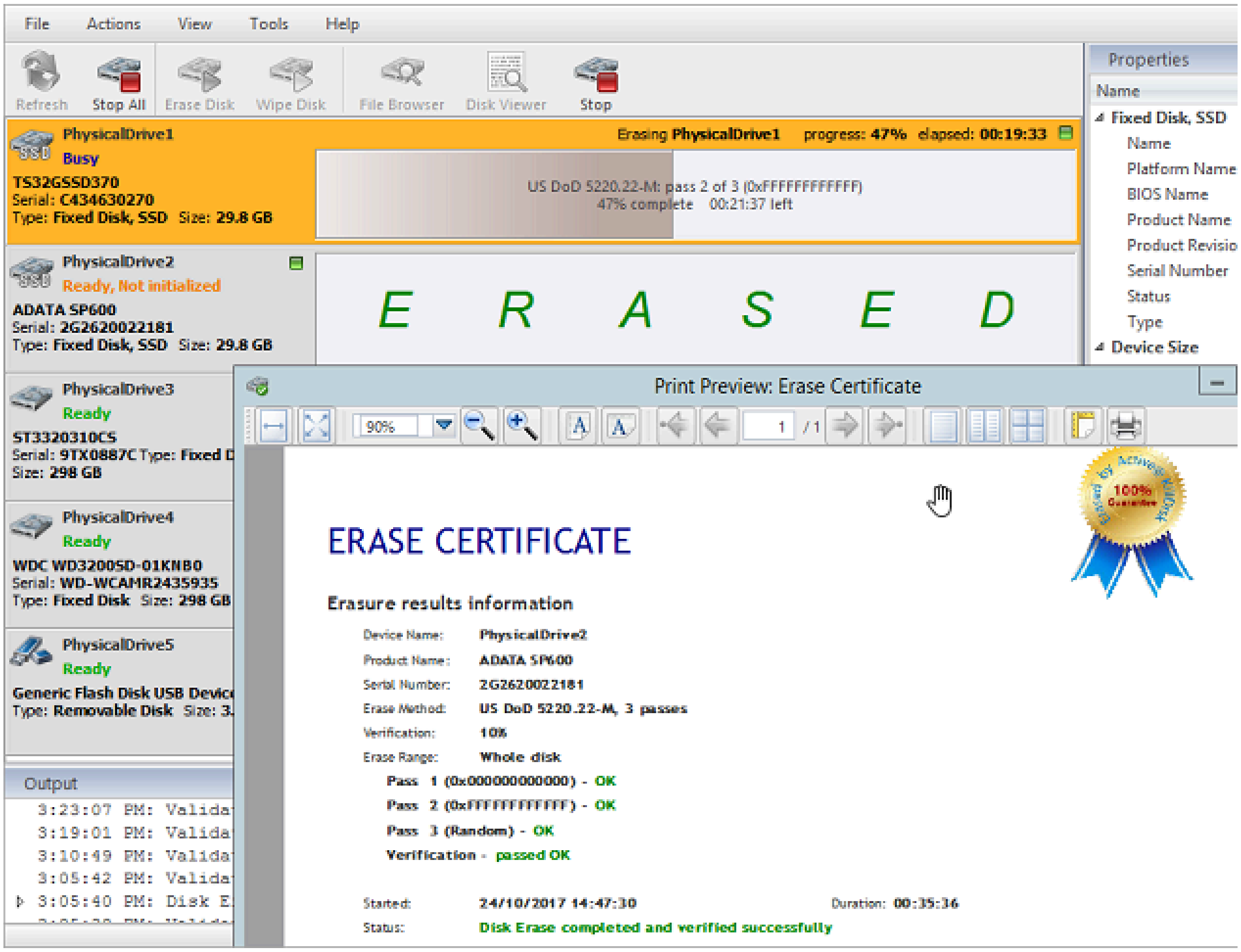
LSoft Technologies Inc.

Industrial Desktop &
Industrial System
User Guide

Figure 2: Hardware User Guide

Getting Started

This section describes key features of **KillDisk Industrial** and explains its basic functionality.



PhysicalDrive1
Busy
TS32GSSD370
Serial: C434630270
Type: Fixed Disk, SSD Size: 29.8 GB

Erasing PhysicalDrive1 progress: 47% elapsed: 00:19:33

US DoD 5220.22-M: pass 2 of 3 (0xFFFFFFFFFFFF)
47% complete 00:21:37 left

PhysicalDrive2
Ready, Not initialized
ADATA SP600
Serial: 2G2620022181
Type: Fixed Disk, SSD Size: 29.8 GB

E R A S E D

PhysicalDrive3
Ready
ST3320310CS
Serial: 9TX0887C Type: Fixed D
Size: 298 GB

PhysicalDrive4
Ready
WDC WD3200SD-01KNB0
Serial: WD-WCAMR2435935
Type: Fixed Disk Size: 298 GB

PhysicalDrive5
Ready
Generic Flash Disk USB Devic
Type: Removable Disk Size: 3.

```
3:23:07 PM: Valida
3:19:01 PM: Valida
3:10:49 PM: Valida
3:05:42 PM: Valida
3:05:40 PM: Disk E
```

ERASE CERTIFICATE

Erasure results information

Device Name: PhysicalDrive2
Product Name: ADATA SP600
Serial Number: 2G2620022181
Erase Method: US DoD 5220.22-M, 3 passes
Verification: 10%
Erase Range: Whole disk
Pass 1 (0x000000000000) - OK
Pass 2 (0xFFFFFFFFFFFF) - OK
Pass 3 (Random) - OK
Verification - passed OK

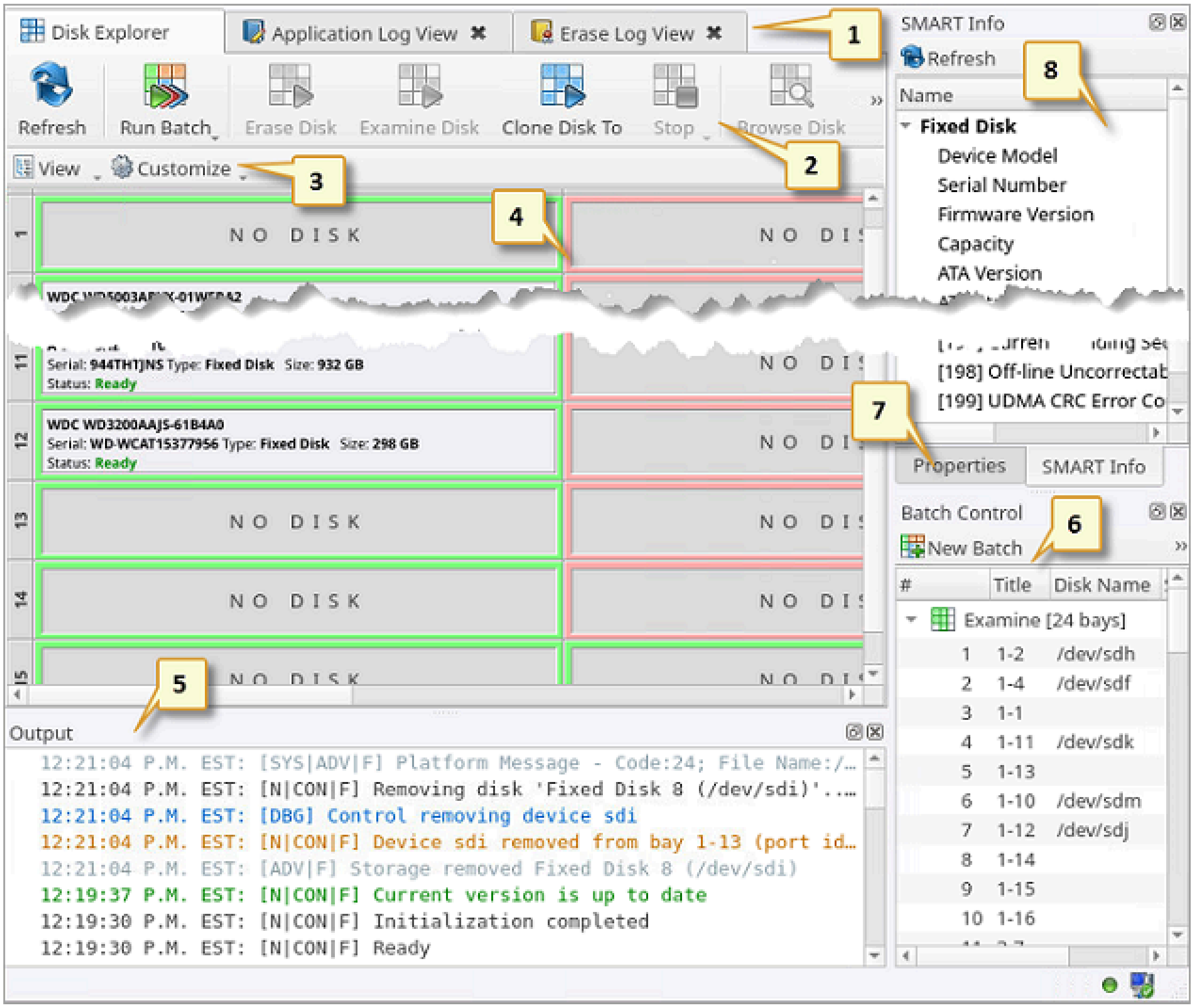
Started: 24/10/2017 14:47:30 Duration: 00:35:36
Status: Disk Erase completed and verified successfully

Related tasks

Disk Erase on page 25

Navigation

Once the **KillDisk** application is launched the main application's dashboard appears. From here you can use any of **KillDisk**'s tools. This section describes main components of the application and navigation. The full functionality and features of these components are discussed in corresponding sections later.



WDC WD5003AZEX-01WFRA2

Serial: 944THTJNS Type: Fixed Disk Size: 932 GB
Status: Ready

WDC WD3200AAJS-61B4A0
Serial: WD-WCAT15377956 Type: Fixed Disk Size: 298 GB
Status: Ready

```
12:21:04 P.M. EST: [SYS|ADV|F] Platform Message - Code:24; File Name:/…
12:21:04 P.M. EST: [N|CON|F] Removing disk 'Fixed Disk 8 (/dev/sdi)'.…
12:21:04 P.M. EST: [DBG] Control removing device sdi
12:21:04 P.M. EST: [N|CON|F] Device sdi removed from bay 1-13 (port id…
12:21:04 P.M. EST: [ADV|F] Storage removed Fixed Disk 8 (/dev/sdi)
12:19:37 P.M. EST: [N|CON|F] Current version is up to date
12:19:30 P.M. EST: [N|CON|F] Initialization completed
12:19:30 P.M. EST: [N|CON|F] Ready
```

#	Title	Disk Name
	Examine [24 bays]	
1	1-2	/dev/sdh
2	1-4	/dev/sdf
3	1-1	
4	1-11	/dev/sdk
5	1-13	
6	1-10	/dev/sdm
7	1-12	/dev/sdj
8	1-14	
9	1-15	
10	1-16	

Figure 3: KillDisk Industrial Dashboard

Where:

1 - Tabbed Windows
Here you can navigate between **KillDisk** tabbed windows such as Disk Explorer, Application Log etc..

2 - Command Toolbar
The command toolbar is a dynamic toolbar that allows the user to perform Tabbed Window-specific actions (depending on the context).

3 - View Selection
View Customization only available in Disk Explorer view and allows you to manipulate how the Bays are displayed in the Windowed View as well as manipulating with type of objects used to show in Disk Bays View. 4 - Windowed View
Contains the window that is currently active. By default you can see here all HDD/SSD/USB disks attached to the workstation.

5 - Output Window
Contains the log of actions **KillDisk** has performed.

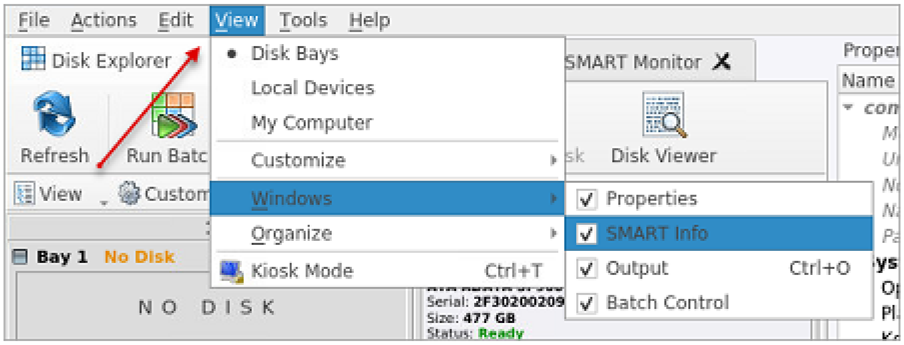
6 - Batch Control Window
Batch Control window is an easily accessible interface to create and manipulate disk batches.

7 - Advanced Tools Tabs
These tabs allow to navigate between the different Advanced Tools.

8 - Advanced Tool Window

This window shows the data for the Advanced Tool selected. The window can be moved, popped out and re-sized.

To browse through each of these Views click on the appropriate tab. You may also open a View from the **View** menu:



Bay 1 No Disk

NO DISK

Serial: 2F30200209
Size: 477 GB
Status: Ready

Figure 4: Access to Views via Menu

To open any View being closed, just select it from the **View** menu.

The status bar at the bottom of the workspace shows the current status of the application or status of the activity in progress.

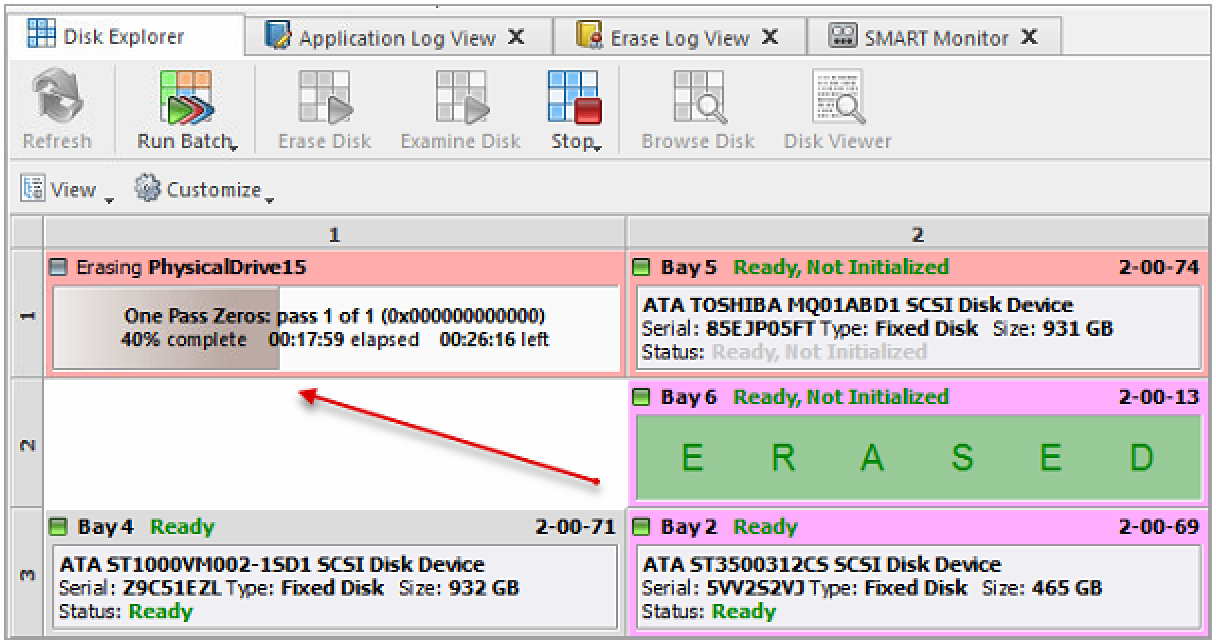
Related information

Property Views on page 59

Disk Explorer

Disk Explorer is a default workspace for the **KillDisk** application. All attached HDD/SSD/USB disks are visualized here and can be selected for different actions. Commands like **Disk Erase** can be initiated from here as well as progress displayed for actions performed with disks.

There are three main Views displayed in Disk Explorer: Disk Bays View on page 14, Local Devices View on page 15 and My Computer View on page 16



Erasing PhysicalDrive15
One Pass Zeros: pass 1 of 1 (0x000000000000)
40% complete 00:17:59 elapsed 00:26:16 left

Bay 5 Ready, Not Initialized 2-00-74
ATA TOSHIBA MQ01ABD1 SCSI Disk Device
Serial: 85EJP05FT Type: Fixed Disk Size: 931 GB
Status: Ready, Not Initialized

Bay 6 Ready, Not Initialized 2-00-13
ERASED

Bay 4 Ready 2-00-71
ATA ST1000VM002-1SD1 SCSI Disk Device
Serial: Z9C51EZL Type: Fixed Disk Size: 932 GB
Status: Ready

Bay 2 Ready 2-00-69
ATA ST3500312CS SCSI Disk Device
Serial: 5VV2S2VJ Type: Fixed Disk Size: 465 GB
Status: Ready

Figure 5: Disk Explorer View

An additional toolbar helps to execute frequently performed tasks. It contains the following buttons with drop-down menus:

View

The disk explorer supports a range of different Views to use when performing **KillDisk** actions, each with their own customizable settings for different use cases.

Customize

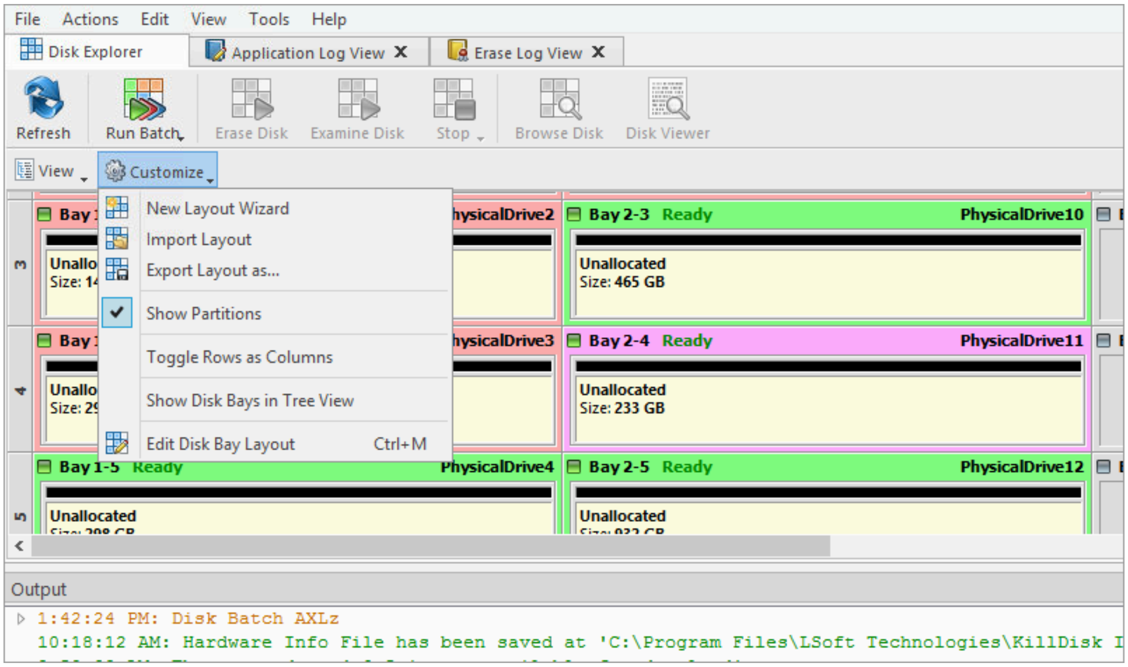
These settings (different for each View) let you customize appearance for better experience with each View.

Related information

Preferences on page 79
Disk Bays View on page 14
Local Devices View on page 15
My Computer View on page 16

Disk Bays View

Disk Bays view displays disks attached to bays and configured in the Disk Layout Editor. Bays are grouped by their row, colored by the batch color, and show disk information. During operations with a disk, the operation status and progress displayed on Disk Bay.



```
1:42:24 PM: Disk Batch AXLz
10:18:12 AM: Hardware Info File has been saved at 'C:\Program Files\LSoft Technologies\KillDisk I
```

Figure 6: Disk Bays View

Customize menu

New Layout Wizard

Launches the Disk Bay Layout Wizard

Import Layout

Imports saved (previously exported) layout form file having .dbl extension

Export Layout as..

Exports custom layout to file having .dbl extension

Show Partitions

Show or hide additional layout for partitions and volumes

Toggle Rows as Columns

This setting can be toggled on/off to display the rows (defined by the Disk Bay Layout) as columns in the **Disk Bays** view

Show Disk Bays in Tree View

Switches **Disk Bays** view to tree view for user convenience and customization related to the one configured in Disk Layout Editor

Edit Disk Bay Layout

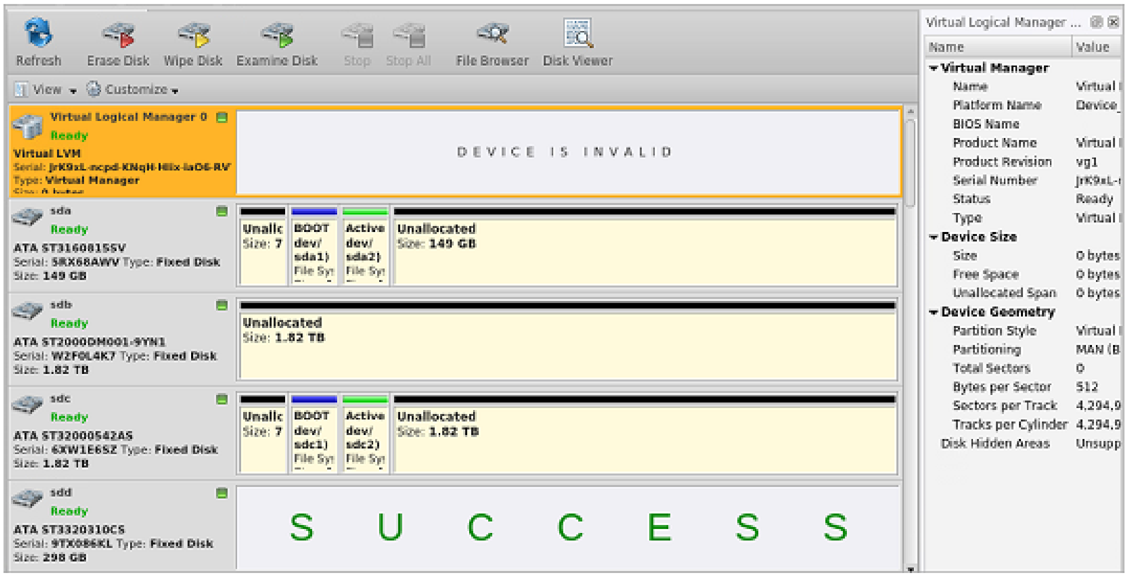
Opens Disk Layout Editor for current layout customization or creating a new layout

Related information

Disk Explorer on page 13
Local Devices View on page 15
My Computer View on page 16
Disk Layout Overview on page 17

Local Devices View

Local Devices view shows all disks recognized by the Operating System as a flat list:



Virtual Logical Manager 0
Ready
Virtual LVM
Serial: JrK9xL-ncpd-KNqH-Hlix-laO6-RV
Type: Virtual Manager

DEVICE IS INVALID

sda
Ready
ATA ST3160815SV
Serial: 5RX68AWV Type: Fixed Disk
Size: 149 GB

Unallc Size: 7 | BOOT dev/ sda1) File Sy | Active dev/ sda2) File Sy | Unallocated Size: 149 GB

sdb
Ready
ATA ST2000DM001-9YN1
Serial: W2F0L4K7 Type: Fixed Disk
Size: 1.82 TB

Unallocated Size: 1.82 TB

sdc
Ready
ATA ST32000542AS
Serial: 6XW1E6SZ Type: Fixed Disk
Size: 1.82 TB

Unallc Size: 7 | BOOT dev/ sdc1) File Sy | Active dev/ sdc2) File Sy | Unallocated Size: 1.82 TB

sdd
Ready
ATA ST3320310CS
Serial: 9TX086KL Type: Fixed Disk
Size: 298 GB

SUCCESS

Name	Value
Virtual Manager	
Name	Virtual I
Platform Name	Device_
BIOS Name	
Product Name	Virtual I
Product Revision	vg1
Serial Number	JrK9xL-(
Status	Ready
Type	Virtual I
Device Size	
Size	0 bytes
Free Space	0 bytes
Unallocated Span	0 bytes
Device Geometry	
Partition Style	Virtual I
Partitioning	MAN (B
Total Sectors	0
Bytes per Sector	512
Sectors per Track	4,294,9
Tracks per Cylinder	4,294,9
Disk Hidden Areas	Unsupp

Figure 7: Local Devices View

Customize menu

Show System Devices

Displays the disk where Operating System is installed. This is off by default to prevent accidental erasure of the system

Show Not Ready Devices

Displays devices not yet initialized and used by Operating System

Show Removable Devices

Displays all removable and externally connected disks (such as USB Flash Drives and External USB Disks)

Compact View

Changes the layout of the Disk View from display block to inline block orientation

Related information

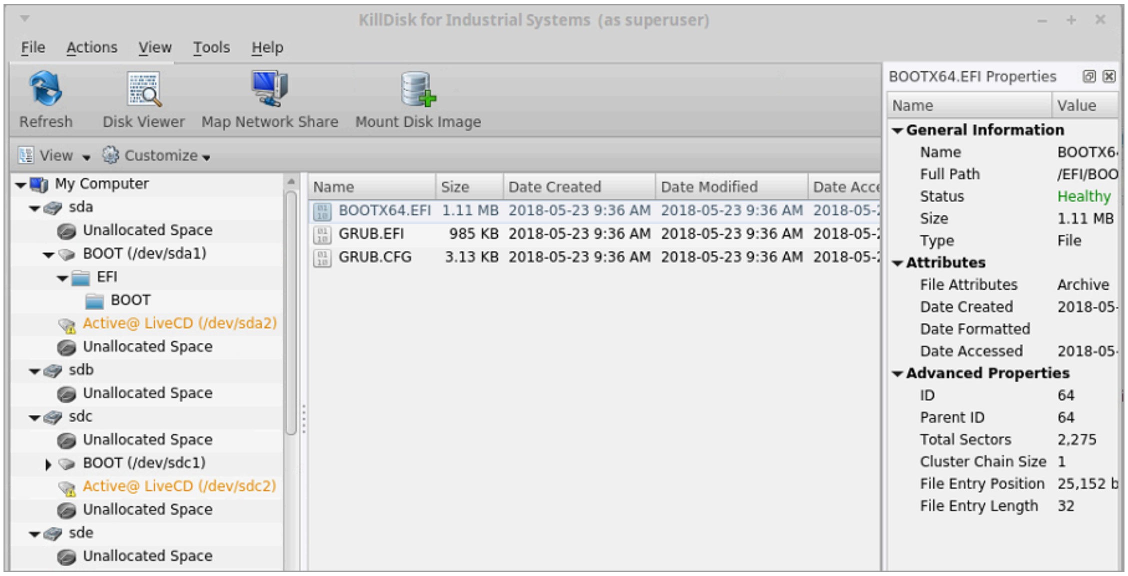
Disk Explorer on page 13

Disk Bays View on page 14

My Computer View on page 16

My Computer View

My Computer view presents a layout in a standard tree-view form, much like the disks in Windows Explorer. Information for the currently selected object such as disk status, serial number, partitioning displayed in Properties window at the right side.



Name	Size	Date Created	Date Modified	Date Acce
BOOTX64.EFI	1.11 MB	2018-05-23 9:36 AM	2018-05-23 9:36 AM	2018-05-2
GRUB.EFI	985 KB	2018-05-23 9:36 AM	2018-05-23 9:36 AM	2018-05-2
GRUB.CFG	3.13 KB	2018-05-23 9:36 AM	2018-05-23 9:36 AM	2018-05-2

BOOTX64.EFI Properties

Name	Value
General Information	
Name	BOOTX6
Full Path	/EFI/BOO
Status	Healthy
Size	1.11 MB
Type	File
Attributes	
File Attributes	Archive
Date Created	2018-05-
Date Formatted	
Date Accessed	2018-05-
Advanced Properties	
ID	64
Parent ID	64
Total Sectors	2,275
Cluster Chain Size	1
File Entry Position	25,152 b
File Entry Length	32

Figure 8: My Computer View

Related information

Disk Explorer on page 13

Disk Bays View on page 14

Local Devices View on page 15

Disk Layout Overview

The purpose of **Disk Bay Layout** is to match **KillDisk** 's graphical disks' representation to your actual hardware configuration making it easy to manage disks for erasure, examination, cloning and more. To illustrate this let's look at the example, using the hardware below:

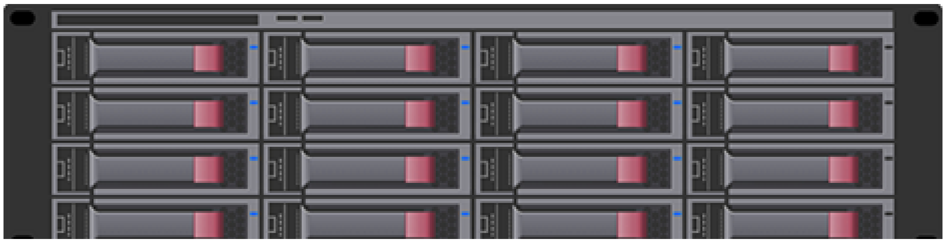
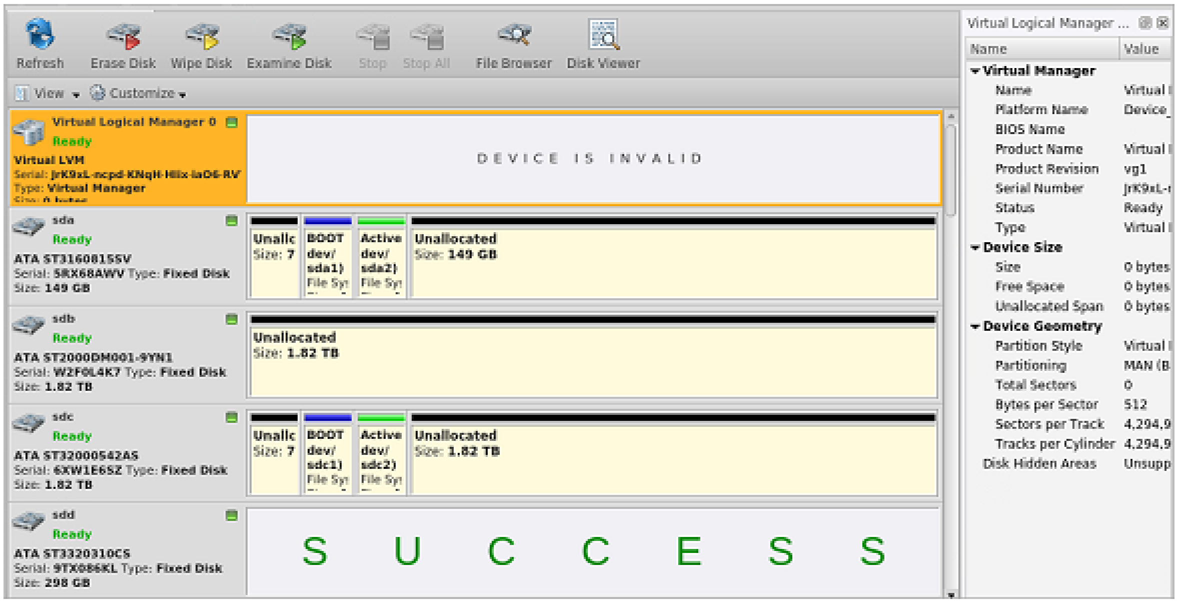


Figure 9: Example of Disk Array

In the example above we have a generic disk array consisting of 16 disks arranged in a 4x4 grid. The machine using these disks would see the disks similarly to **KillDisk**'s **Local Devices** view:



Virtual Logical Manager 0
Ready
Virtual LVM
Serial: JrK9xL-ncpd-KNqH-Hilx-laO6-RV
Type: Virtual Manager

sda
Ready
ATA ST3160815SV
Serial: 5RX68AWV Type: Fixed Disk
Size: 149 GB

sdb
Ready
ATA ST2000DM001-9YN1
Serial: W2F0L4K7 Type: Fixed Disk
Size: 1.82 TB

sdc
Ready
ATA ST32000542AS
Serial: 6XW1E6SZ Type: Fixed Disk
Size: 1.82 TB

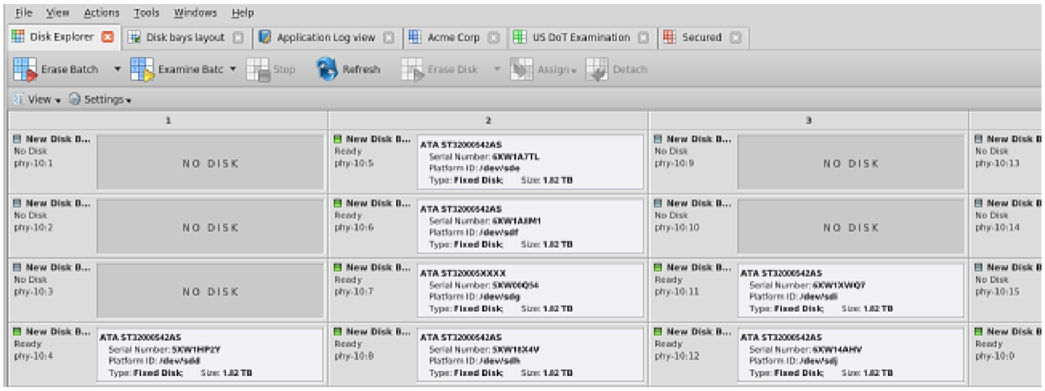
sdd
Ready
ATA ST3320310CS
Serial: 9TX086KL Type: Fixed Disk
Size: 298 GB

Virtual Logical Manager ...

Name	Value
Virtual Manager	
Name	Virtual
Platform Name	Device_
BIOS Name	
Product Name	Virtual
Product Revision	vg1
Serial Number	JrK9xL-
Status	Ready
Type	Virtual
Device Size	
Size	0 bytes
Free Space	0 bytes
Unallocated Span	0 bytes
Device Geometry	
Partition Style	Virtual
Partitioning	MAN (B
Total Sectors	0
Bytes per Sector	512
Sectors per Track	4,294,9
Tracks per Cylinder	4,294,9
Disk Hidden Areas	Unsupp

Figure 10: Local Devices View

Now imagine inserting a HDD into the bottom-leftmost Bay of the disk array. Even finding the device in a list of 15 other disks would be tedious and not very intuitive. This is when creating a **Disk Bay Layout** is extremely useful. By creating a 4x4 **Disk Bay Layout** we can map the physical ports to their corresponding Bay in **KillDisk** and visually see our disk array like this:



1		2		3		
New Disk B... No Disk phy-10:1	NO DISK	New Disk B... Ready phy-10:5	ATA ST32000542AS Serial Number: 6XW1A7TL Platform ID: /dev/sde Type: Fixed Disk; Size: 1.82 TB	New Disk B... No Disk phy-10:9	NO DISK	New Disk B No Disk phy-10:13
New Disk B... No Disk phy-10:2	NO DISK	New Disk B... Ready phy-10:6	ATA ST32000542AS Serial Number: 6XW1A8M1 Platform ID: /dev/sdf Type: Fixed Disk; Size: 1.82 TB	New Disk B... No Disk phy-10:10	NO DISK	New Disk B No Disk phy-10:14
New Disk B... No Disk phy-10:3	NO DISK	New Disk B... Ready phy-10:7	ATA ST32000SXXXX Serial Number: 5XW00Q54 Platform ID: /dev/sdg Type: Fixed Disk; Size: 1.82 TB	New Disk B... Ready phy-10:11	ATA ST32000542AS Serial Number: 6XW1XWQ7 Platform ID: /dev/sdi Type: Fixed Disk; Size: 1.82 TB	New Disk B No Disk phy-10:15
New Disk B... Ready phy-10:4	ATA ST32000542AS Serial Number: 5XW1HP2Y Platform ID: /dev/sdd Type: Fixed Disk; Size: 1.82 TB	New Disk B... Ready phy-10:8	ATA ST32000542AS Serial Number: 5XW18X4V Platform ID: /dev/sdh Type: Fixed Disk; Size: 1.82 TB	New Disk B... Ready phy-10:12	ATA ST32000542AS Serial Number: 6XW14AHV Platform ID: /dev/sdj Type: Fixed Disk; Size: 1.82 TB	New Disk B Ready phy-10:0

Figure 11: Disk Bays View

Assuming that the Bays were mapped correctly finding the correct disk to manipulate with is now much easier in the **Disk Bays** view than it would have been Local Devices View. You can now select the bottom-leftmost disk in the **Disk Bays** view and perform any necessary actions on it.

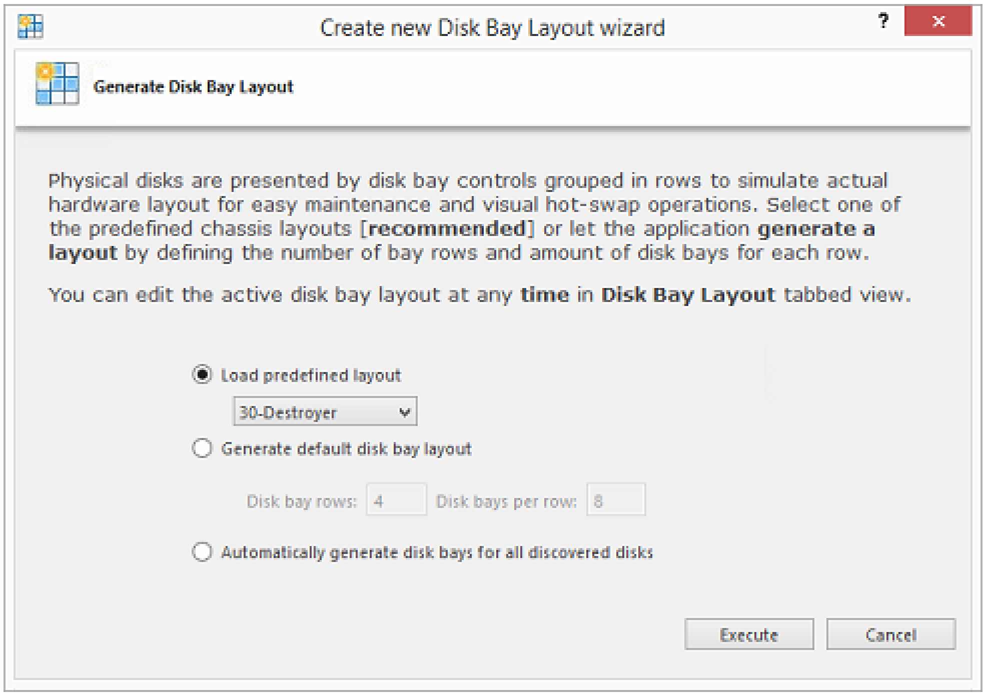
Related information

Edit Disk Bay Layout on page 18
Layouts Export and Import on page 23
Layouts Advanced Features on page 24

Edit Disk Bay Layout

To create a new layout using the wizard click **Customize** > **New Layout Wizard**. This will launch the **Layout Wizard**.

New Layout Wizard



Physical disks are presented by disk bay controls grouped in rows to simulate actual hardware layout for easy maintenance and visual hot-swap operations. Select one of the predefined chassis layouts [**recommended**] or let the application **generate a layout** by defining the number of bay rows and amount of disk bays for each row.

You can edit the active disk bay layout at any **time** in **Disk Bay Layout** tabbed view.

● Load predefined layout

30-Destroyer

○ Generate default disk bay layout

Disk bay rows: 4 Disk bays per row: 8

○ Automatically generate disk bays for all discovered disks

Figure 12: New Layout Wizard

This configuration of a new layout can be done in one of three ways:

Load predefined layout

Here you can find one of our predefined layouts that may fit your system. If an appropriate layout is not listed you may try the next option.

Generate default Disk Bay layout

Define your hardware in terms of a disk array arranged in a X (columns) by Y (rows) grid of disks. You may make adjustments to this later so this may just be a template to start from. Table-style layout will be created. The result for 2 columns and 5 rows could be looking as the following:

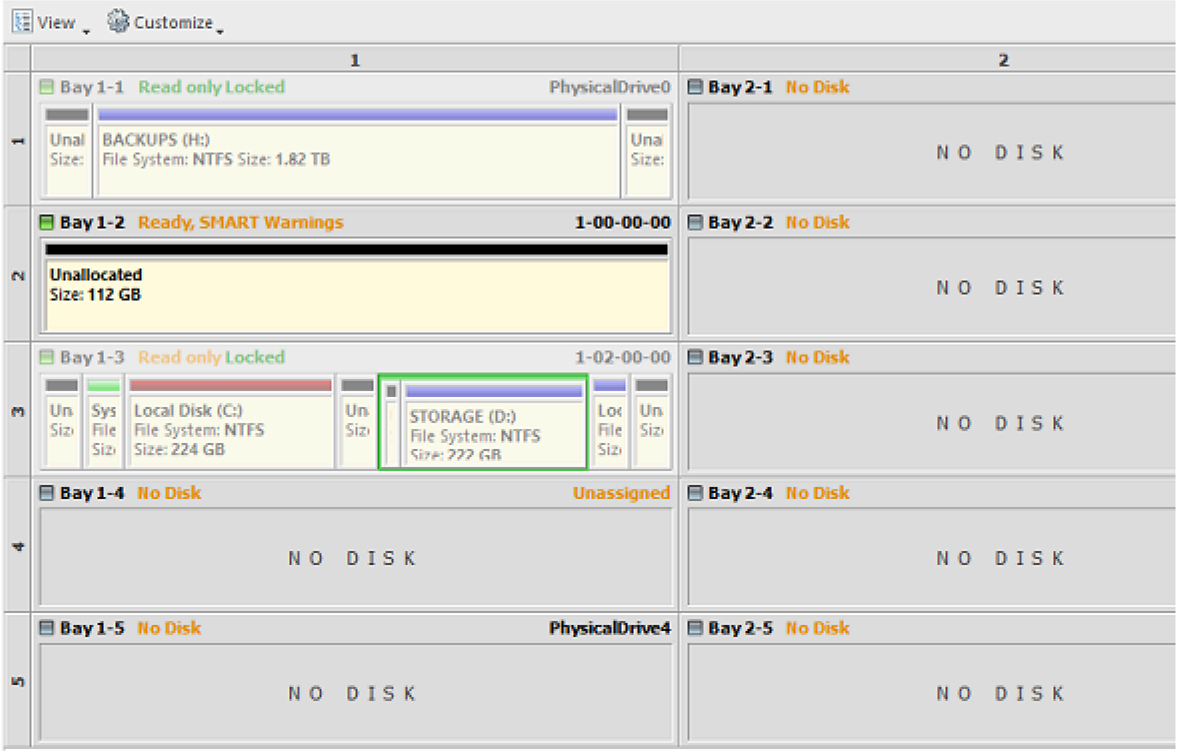

View
Customize
1
2
Bay 1-1 Read only Locked PhysicalDrive0
Unal Size:
BACKUPS (H:) File System: NTFS Size: 1.82 TB
Una Size:
Bay 2-1 No Disk
NO DISK
Bay 1-2 Ready, SMART Warnings 1-00-00-00
Unallocated Size: 112 GB
Bay 2-2 No Disk
NO DISK
Bay 1-3 Read only Locked 1-02-00-00
Un Siz
Sys File Siz
Local Disk (C:) File System: NTFS Size: 224 GB
Un Siz
STORAGE (D:) File System: NTFS Size: 222 GB
Loc File Siz
Un Siz
Bay 2-3 No Disk
NO DISK
Bay 1-4 No Disk Unassigned
NO DISK
Bay 2-4 No Disk
NO DISK
Bay 1-5 No Disk PhysicalDrive4
NO DISK
Bay 2-5 No Disk
NO DISK
1
2
3
4
5

Figure 13: Grid Layout in Disk Bays View

Automatically generate Disk Bays for all available physical ports

Defines your Disk Bay Layout based on the disks recognized by your system's Device Manager. The disks will be placed in their own individual row when the layout is generated. The result could be looking as the following:

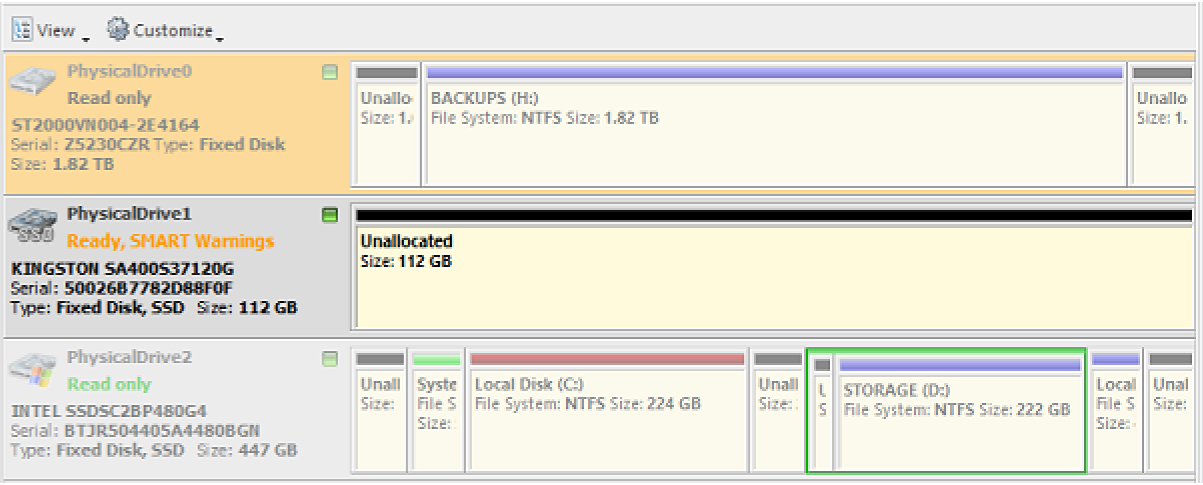


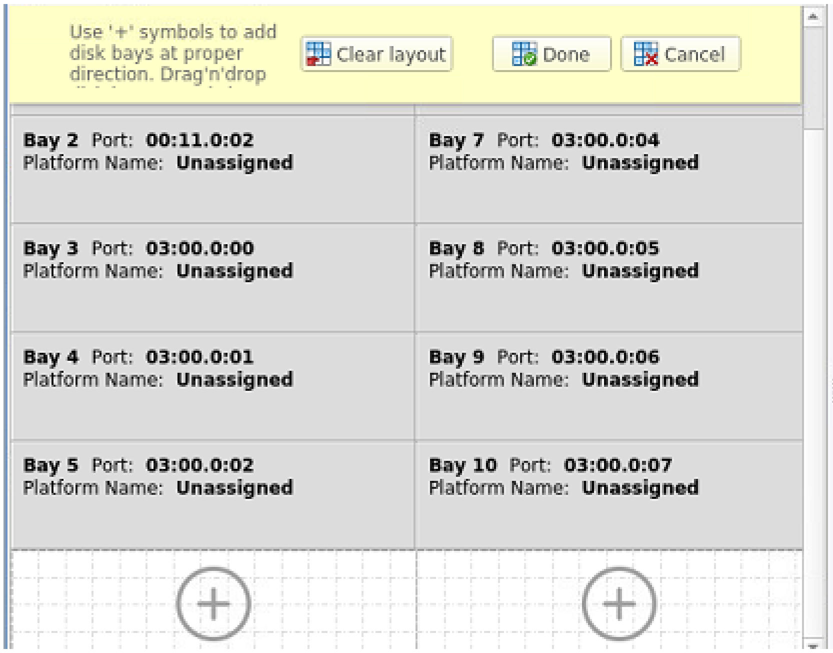
Figure 14: Auto-generated Layout

Select desired option and click **Create** button to create a default **Disk Bay Layout**.

Edit Existing Layout

To edit existing **Disk Bay Layout** select **Edit** > **Edit Disk Layout** in the menu or use a shortcut **CTRL + M**.

This will bring you to the **Disk Bays Layout** View where you can manipulate, save, import and create Disk Bay Layouts.



Use '+' symbols to add disk bays at proper direction. Drag'n'drop

Bay 2 Port: **00:11.0:02**
Platform Name: **Unassigned**

Bay 7 Port: **03:00.0:04**
Platform Name: **Unassigned**

Bay 3 Port: **03:00.0:00**
Platform Name: **Unassigned**

Bay 8 Port: **03:00.0:05**
Platform Name: **Unassigned**

Bay 4 Port: **03:00.0:01**
Platform Name: **Unassigned**

Bay 9 Port: **03:00.0:06**
Platform Name: **Unassigned**

Bay 5 Port: **03:00.0:02**
Platform Name: **Unassigned**

Bay 10 Port: **03:00.0:07**
Platform Name: **Unassigned**

Figure 15: Layout Editor

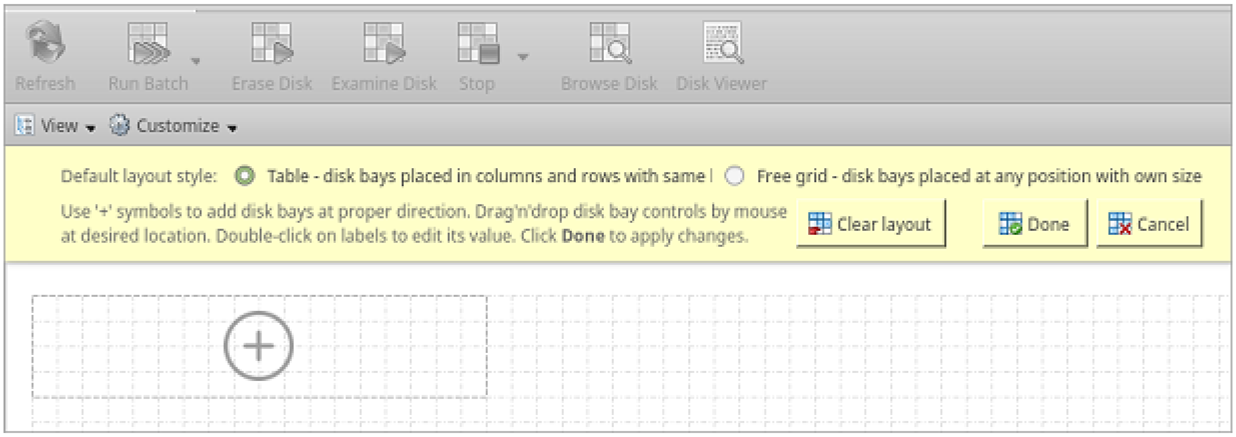
There are two types of layouts:

- **Free Grid Layout** allows user to place Disk Bay widget at any position, change Bay widget size and its alignment (vertically or horizontally) individually for each Bay. Hence, user can create relatively accurate mocking layout of actual (physical) disk Bay slots located on hardware chassis.
- **Table Layout** is similar to Disk Bay Layout from previous versions. However, now user can re-size or select Disk Bay widgets by using row and column headers.

Create a New Layout

To create a new **Disk Bay Layout** select either **Free Grid** or **Table** layout option and start adding Disk Bays using circled **(+)** symbols.

If predefined layout already exists click **Clear Layout** to remove it and create a new one.



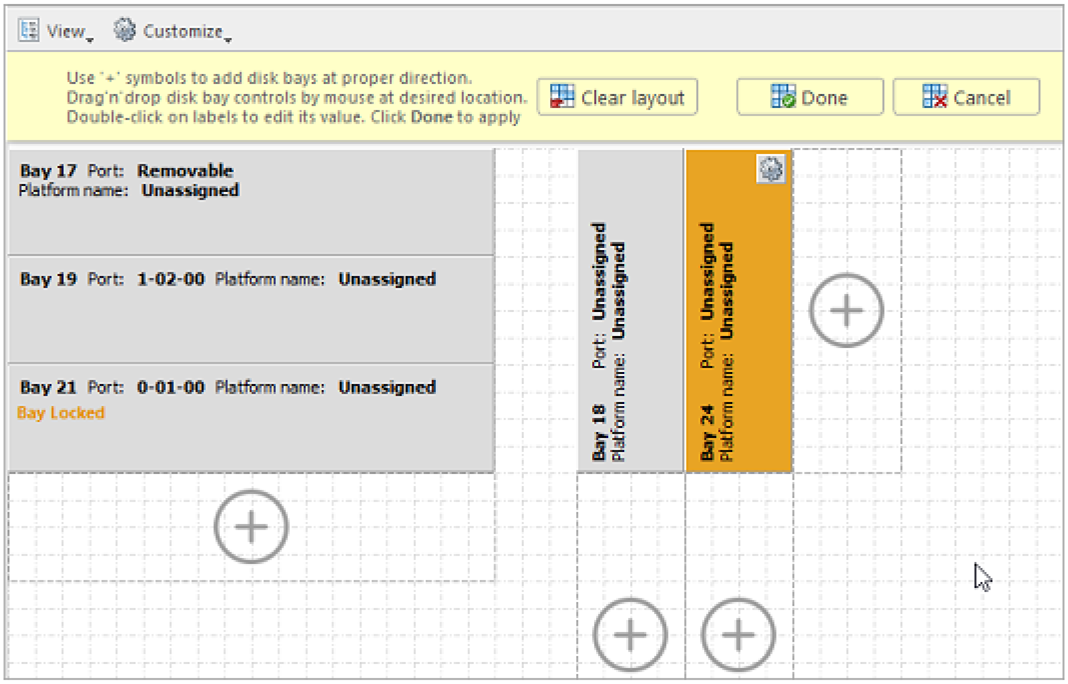
Default layout style: ● Table - disk bays placed in columns and rows with same l ○ Free grid - disk bays placed at any position with own size

Use '+' symbols to add disk bays at proper direction. Drag'n'drop disk bay controls by mouse at desired location. Double-click on labels to edit its value. Click **Done** to apply changes.

Figure 16: New Layout Created

Layout Editing Tips

- Click on circled (+) signs to add new Disk Bay widget on a side of existing one. New Disk Bay widget size will be corresponded to adjusted Disk Bay.
- To re-size Disk Bay use mouse to drag it's right side or bottom.
- To set Disk Bay vertically-oriented use mouse to drag it's right side to shrink it until it changes to vertical state.
- To delete Disk Bay select it and press **Delete** keyboard key or use service menu by clicking “gear” sign on left upper corner.
- Use mouse to drag-n-drop selected Disk Bay widgets to new location. If hovered location is invalid Disk Bay widgets will be highlighted with crossed sign.
- To change disk label or port, click on corresponded labels on disk widget to start editing.
- To change Disk Bay attributes use menu by clicking on “gear” sign on selected Bay.



Use '+' symbols to add disk bays at proper direction.
Drag'n'drop disk bay controls by mouse at desired location.
Double-click on labels to edit its value. Click **Done** to apply

Bay 17 Port: **Removable**
Platform name: **Unassigned**

Bay 19 Port: **1-02-00** Platform name: **Unassigned**

Bay 21 Port: **0-01-00** Platform name: **Unassigned**
Bay Locked

Bay 18 Port: **Unassigned**
Platform name: **Unassigned**

Bay 24 Port: **Unassigned**
Platform name: **Unassigned**

Figure 17: Layout Editing

Important:

Due to different hard disk controller manufacture standards and platform limitations physical disk port address format may vary.

Note:

If both platform name and disk port are assigned to Disk Bay widget then platform name is used for Disk Bay mapping.

Mapping Ports to Bays

After configuring your disk bay layout to match how the physical bays look on your hardware, you need to map the bays to the proper controller ports. Doing this will let disks start appearing in the application and appearing in the proper bay on the disk bay layout. The steps to easily do this is as follows:

1. Choose one of the disk bays you want to map
2. Take a physical HDD/SSD and plug it into that bay
3. Right-click on the corresponding bay in KillDisk Industrial
4. Select the proper controller, then click on the port from the drop-down that shows a drive connected to it (look for a new name like "/sda")
5. Repeat for all the rest of the bays, plugging disks and mapping one at a time.

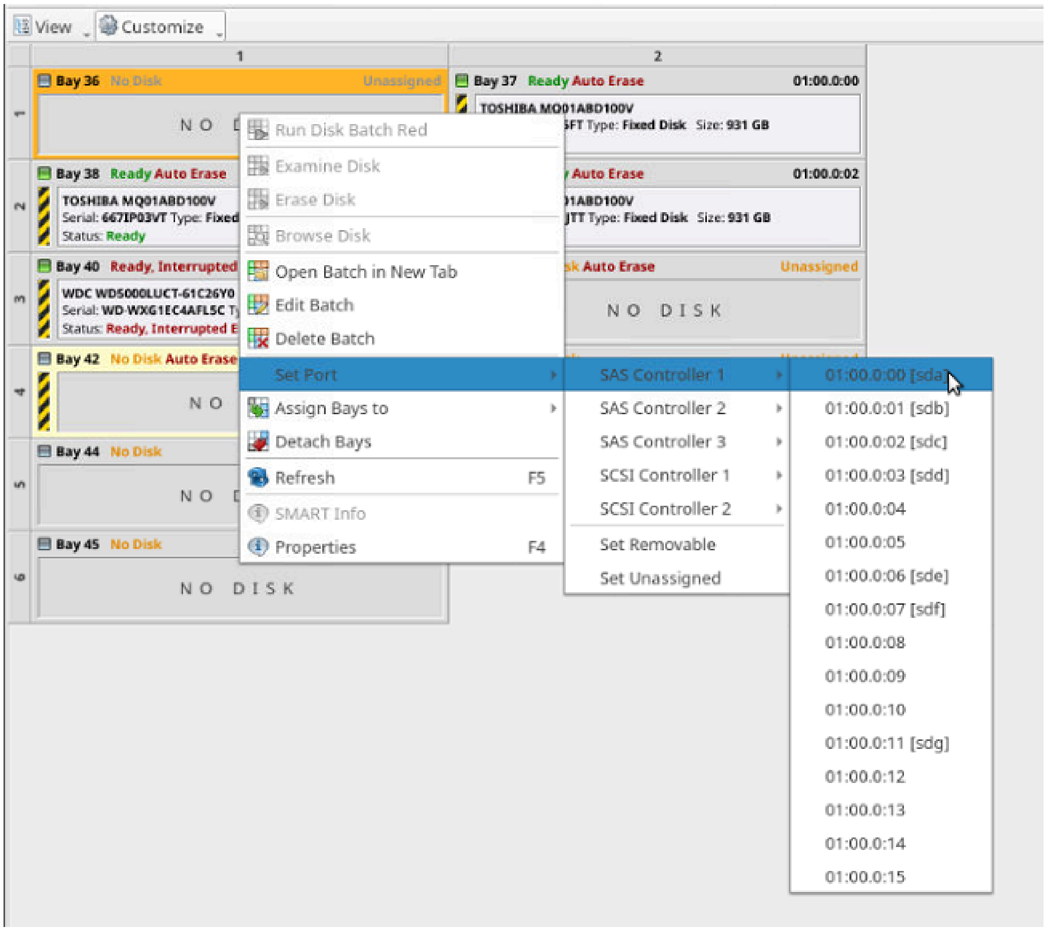


Figure 18: Mapping Ports to Bays

Important:

For some type of controllers static ports cannot be determined when new device appears, thus these disks cannot be statically linked to particular bays, for example, this happens for removable USB Disks which may have the same port number when inserted in different physical USB slots.

If you want to map a particular bay on the layout to be linked with a newly inserted disk which port is dynamically determined, from disk bay's context menu click **Set Port** > **Dynamic Ports** then click type of disk you want to appear: **Removable** or **Fixed**.

Saving and Reverting Changes

Click **Done** button to commit any changes to the application Disk Bays view layout.

Note:

Done will apply current change to the application session so the changes will be seen in the *Disk Bays* view and even be loaded in future application launch. These changes will not affect the .dbl file.

Click **Cancel** to revert any changes you made to the layout.

Important:

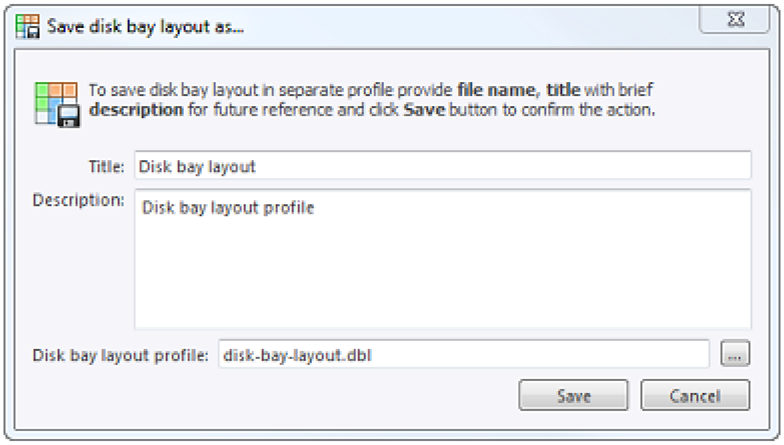
Make sure to save the layout by clicking **Done** otherwise your layout will be lost.

Layouts Export and Import

Once a **Disk Bay Layout** is configured it can be saved and later used with other **KillDisk** configurations. This is done with the **Export** and **Import** features.

Exporting a Layout

Layouts are saved using the Disk Bay Layout command tool bar's commands. Select **Customize** then **Export Layout as...** in the drop down list of commands. This will open a dialog where the layout can be configured by setting the Title, Description, File Name and Path to save the layout to. Once these settings are configured click **Save** and the layout will be saved as a .dbl file in the specified location.


Save disk bay layout as...

To save disk bay layout in separate profile provide **file name**, **title** with brief **description** for future reference and click **Save** button to confirm the action.

Title: Disk bay layout

Description: Disk bay layout profile

Disk bay layout profile: disk-bay-layout.dbl

Figure 19: Layout Export Dialog

Title

Enter any label to distinguish newly created Disk Bay Layout to differentiate it among other Disk Bay Layouts.

Description

Describe all the specs and features of the new Disk Bay Layout.

Layout profile name

Select the name of the file that the Disk Bay Layout will be saved as. File extension should remain as **.dbl**.

Importing a Layout

Saved Disk Bay Layouts are imported into separate application sessions using the **Import** feature. In the command tool bar select **Customize** and **Import Layout**. Select the desired Disk Bay Layout (**.dbl** file) in the file explorer window and click **Open**.

This will import the Disk Bay Layout into the current application session. Finally, click **Done** to update the disks in the Disk Explorer and the import should be complete.

Layouts Advanced Features

Once a **Disk Bay Layout** is created there are a number of actions that can be performed to format or manipulate the layout and appearance of the disks in the **KillDisk** application.

Disk Lock

In order to prevent accidental erasing of important disks **KillDisk** supports locking of disks. Once a disk is locked, no write operations are allowed to be performed on the drive. To do this simply find the disk that needs to be locked and execute **Bay Locked** menu command from the **Change disk bay attributes** drop down menu:

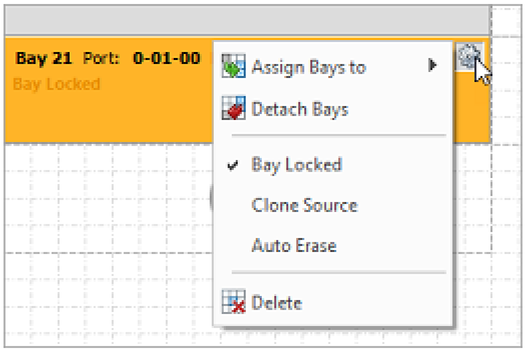


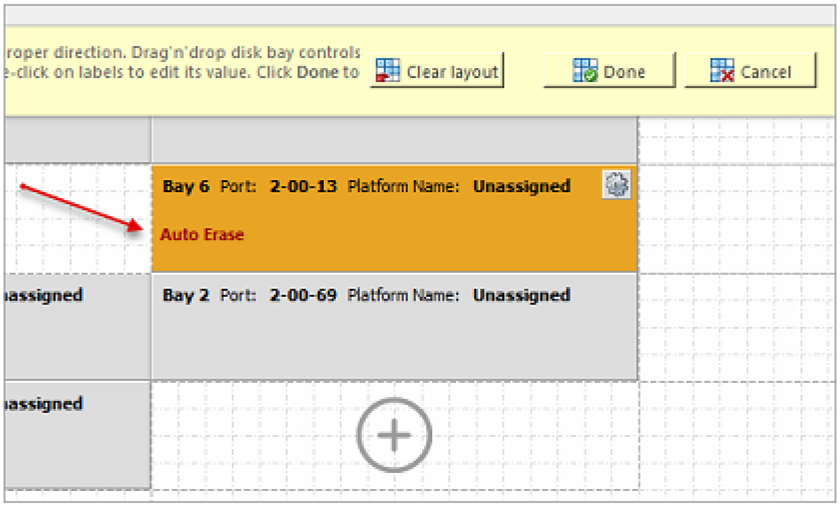
Figure 20: Locking a Disk

Clone Source Lock

Disks that are planned to be used as master copy for Disk Clone could be marked in Disk Bay Layout by selecting Disk Bay and clicking **Clone Source** from the **Change disk bay attributes** drop down menu. Hence, disks marked this way will be protected from accidental destruction and also will be available in devices' list as source for disk cloning.

Auto Erase

Auto Erase feature is designed to speed up disk wiping process in scenario when many disks must be erased with the same erase attributes with minimum user interaction. When disk is inserted in a Bay marked as **Auto Erase** then disk erase procedure will start without any introduction or confirmation dialogs. However, you will see 30 seconds countdown started on Disk Bay and may cancel this action by selecting Disk Bay widget and clicking **Stop** button in View's toolbar or in context menu.



roper direction. Drag'n'drop disk bay controls
e-click on labels to edit its value. Click Done to

Bay 6 Port: 2-00-13 Platform Name: Unassigned

Auto Erase

iassigned

Bay 2 Port: 2-00-69 Platform Name: Unassigned

iassigned

Figure 21: Auto Erase Enabled

CAUTION:

Use this feature with extreme caution - make sure the inserted disk is intended to be erased and appeared in a right Bay. You will have 30 seconds to abort disk erasure.

Saving and Reverting Changes

Click **Done** button to commit any changes to the application View layout.

Note:

Done will apply current change to the application session so the changes will be seen in the Disk Bays view and even be loaded in future application launch. These changes will not affect the *.dbl* file.

Click **Cancel** to revert any changes you made to the layout.

Usage Scenarios

KillDisk Industrial is a powerful industrial tool to provide disk erasure solutions for large workstations being able to erase large volumes of disks. The features in the **KillDisk Industrial** software are built with this goal in mind. This section describes the key features of the software and how they are used to erase single disks to large batches. The software is highly customizable and this guide will help get you started with configuring **KillDisk Industrial** for your system and using it to the full potential.

Usage scenarios include: Disk Erase, Disk Examination, Disk Wipe, Disk Clone, Secure Erase, Certificates, Labels, Reports, Processing Summary, Compact Operating Mode.

Disk Erase

KillDisk is a powerful tool for disk sanitation. Individual disks or group of disks (Batches) can be erased with just few clicks using many international sanitizing standards.

Disk Erase complete process is described below.

1. Select disks

Use mouse in Disk Explorer to select one or more physical disks. Selected disks displayed with orange borders.

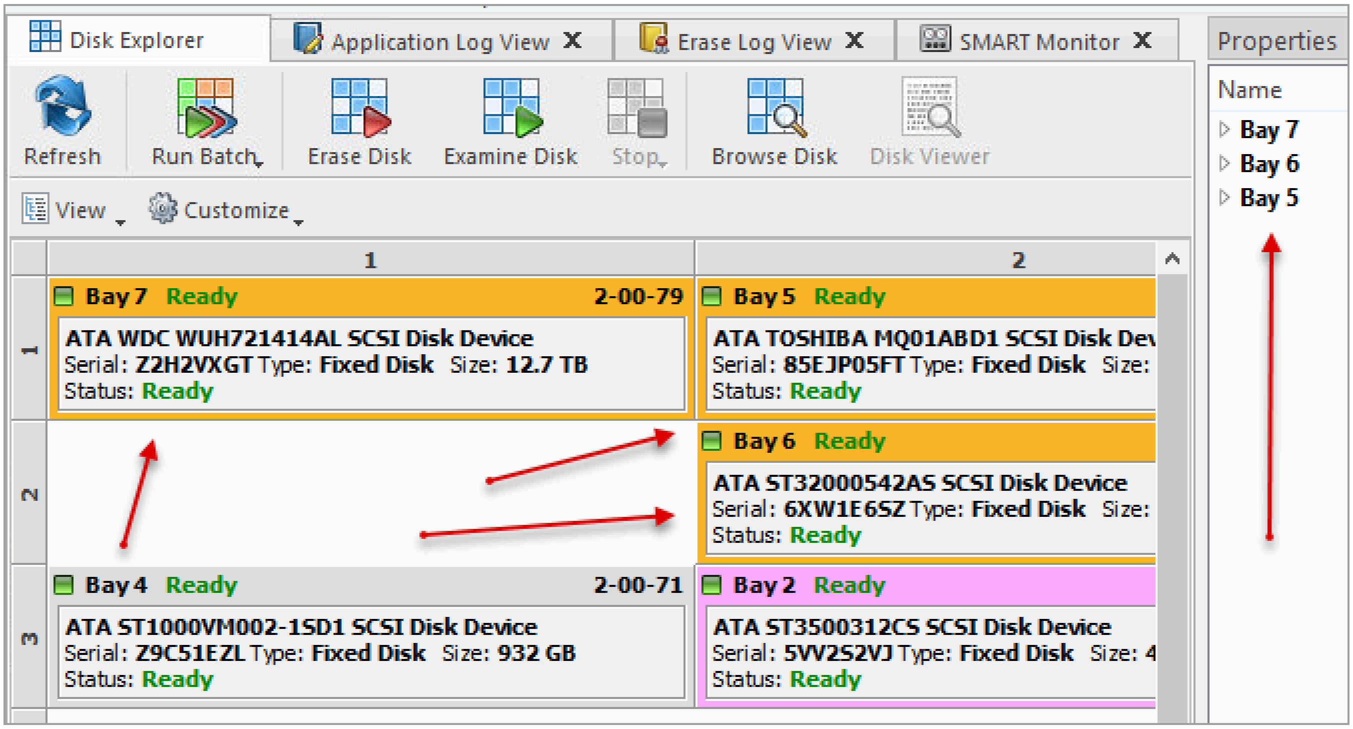
For multiple selection use **Ctrl+Left Mouse** click.

To select all disks in a row, click particular numbered row header.

To select all disks in a column, click particular numbered column header.

To select all attached disks, press **Ctrl+A**.

Another way to select all disks is to click a rectangle at the top-left corner of the Disk Bays view.



Bay 7 Ready 2-00-79
ATA WDC WUH721414AL SCSI Disk Device
Serial: Z2H2VXGT Type: Fixed Disk Size: 12.7 TB
Status: Ready

Bay 5 Ready
ATA TOSHIBA MQ01ABD1 SCSI Disk Dev
Serial: 85EJP05FT Type: Fixed Disk Size:
Status: Ready

Bay 6 Ready
ATA ST32000542AS SCSI Disk Device
Serial: 6XW1E6SZ Type: Fixed Disk Size:
Status: Ready

Bay 4 Ready 2-00-71
ATA ST1000VM002-1SD1 SCSI Disk Device
Serial: Z9C51EZL Type: Fixed Disk Size: 932 GB
Status: Ready

Bay 2 Ready
ATA ST3500312CS SCSI Disk Device
Serial: 5VV2S2VJ Type: Fixed Disk Size: 4
Status: Ready

Figure 22: Multiple Disk Selection

To select a particular partition or volume, click the object in the Local Devices view.

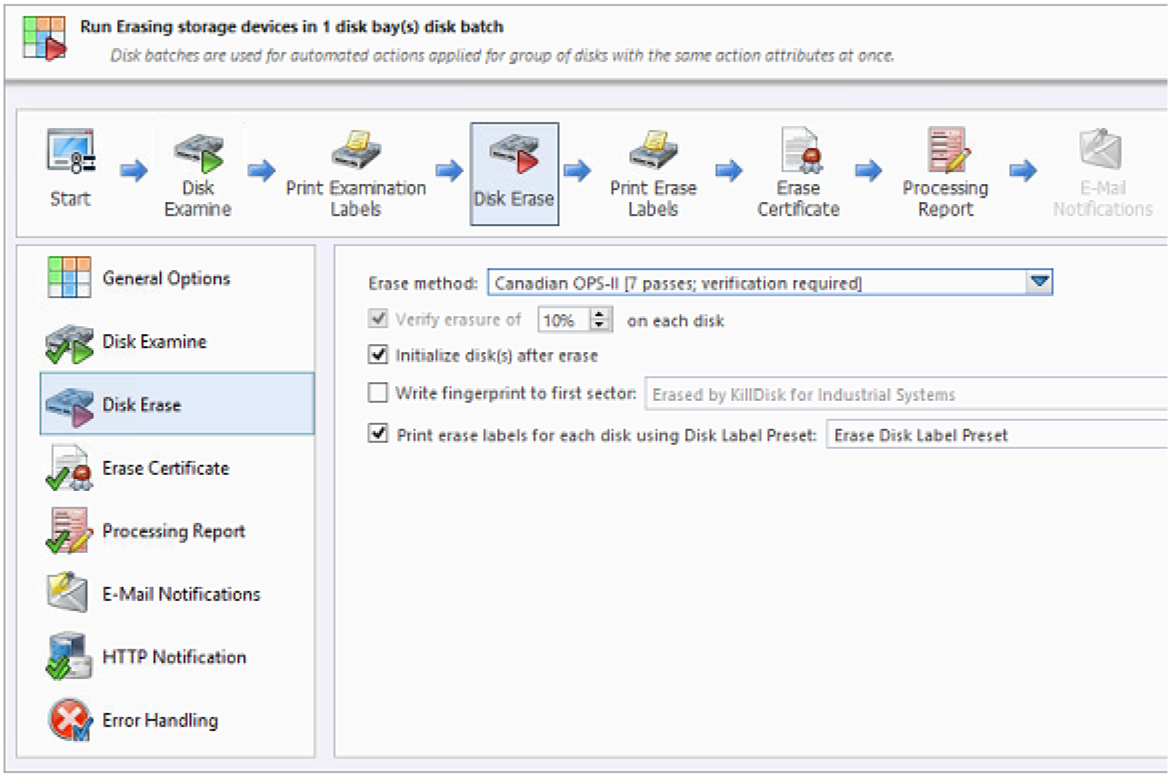
2. Start erase

Open Disk Erase dialog using one of the following methods:

- Click **Erase Disk** command on the action toolbar
- Click **Actions** > **Erase Disk** command from main menu
- Click **Erase Disk** command from disk's context menu

3. Confirm erase options

Confirm sanitation options after Disk Erase dialog pops up:


Run Erasing storage devices in 1 disk bay(s) disk batch

Disk batches are used for automated actions applied for group of disks with the same action attributes at once.

Erase method: Canadian OPS-II [7 passes; verification required]

☑ Verify erasure of 10% on each disk

☑ Initialize disk(s) after erase

☐ Write fingerprint to first sector: Erased by KillDisk for Industrial Systems

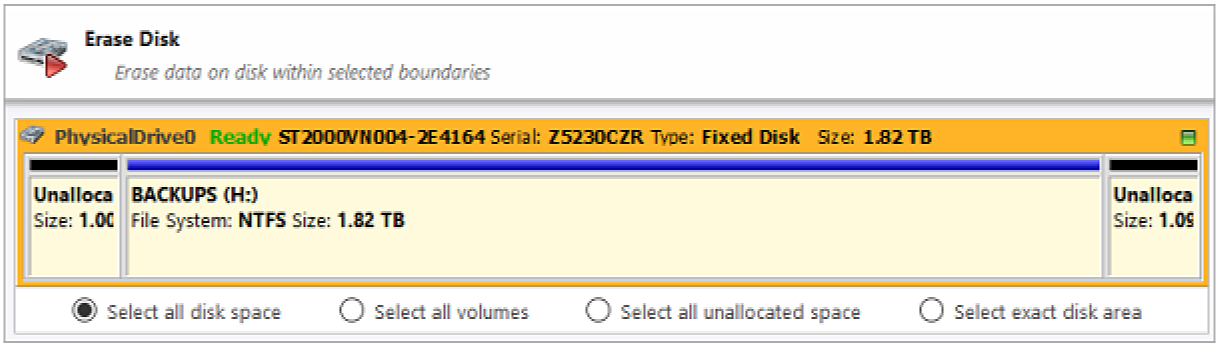
☑ Print erase labels for each disk using Disk Label Preset: Erase Disk Label Preset

Figure 23: Erase Options

Use tabbed views to adjust disk erasure options if necessary. Available options are:

- Disk Erase on page 82
- Erase Certificate on page 88
- Processing Report on page 93

If single disk is selected from Local Devices view, then exact area for the erase can be optionally specified:


Erase Disk

Erase data on disk within selected boundaries

PhysicalDrive0 Ready ST2000VN004-2E4164 Serial: Z5230CZR Type: Fixed Disk Size: 1.82 TB

Unalloca Size: 1.00

BACKUPS (H:) File System: NTFS Size: 1.82 TB

Unalloca Size: 1.09

● Select all disk space ○ Select all volumes ○ Select all unallocated space ○ Select exact disk area

Figure 24: Area selection for Disk Erase

Select all disk space

Entire surface of the disk will be erased

Select all volumes

Select for erase the only disk space where the live volumes located

Select all unallocated space

Select for erase the only disk unallocated area (the space where no live volumes exist)

Select exact disk area

Allows you to use sliders on the visualization of your disk to select a particular range of sectors for erasure.

4. Start erase

   Click **Start** button to go to the final Confirm Action dialog (depending on erase settings this dialog can be skipped). This is an additional precaution measure. If you proceed with confirmation - all data on the selected disk(s) or on selected disk area will be destroyed permanently - without any possibility to be recovered.

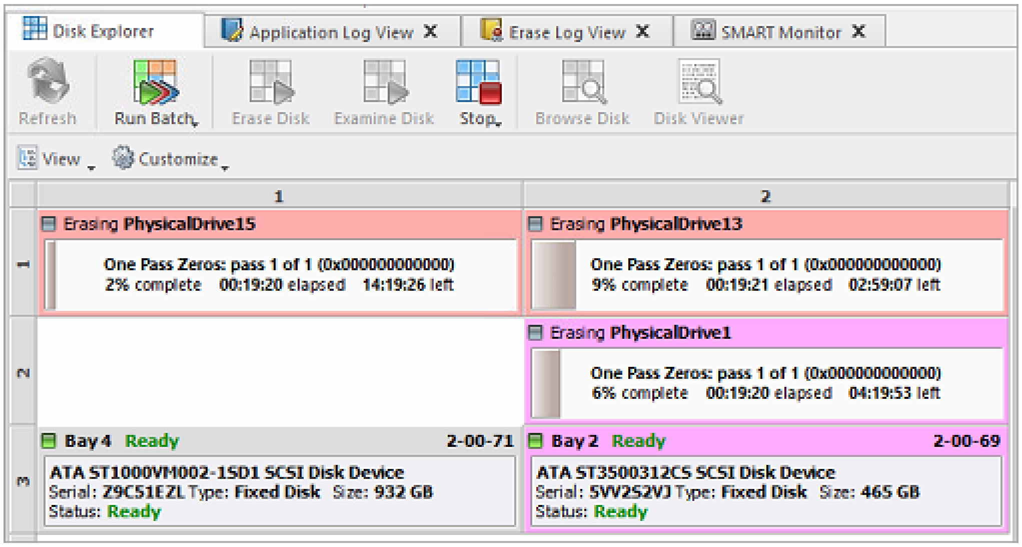
   Click **OK** button to confirm erase and start erase process.

5. Observe progress

   If Examine option is selected then disk examination starts first. Depending on examination results, disk erase runs as the second stage.

   After starting erase a progress bar is displayed at the disk area. The progress bar represents the percentage of disk space being sanitized. As the procedure progresses the percentage increases and time left recalculates.

   To stop erase process, click **Stop** at any time (via action toolbar, main menu or context menu).



Erasing **PhysicalDrive15**
One Pass Zeros: pass 1 of 1 (0x000000000000)
2% complete 00:19:20 elapsed 14:19:26 left

Erasing **PhysicalDrive13**
One Pass Zeros: pass 1 of 1 (0x000000000000)
9% complete 00:19:21 elapsed 02:59:07 left

Erasing **PhysicalDrive1**
One Pass Zeros: pass 1 of 1 (0x000000000000)
6% complete 00:19:20 elapsed 04:19:53 left

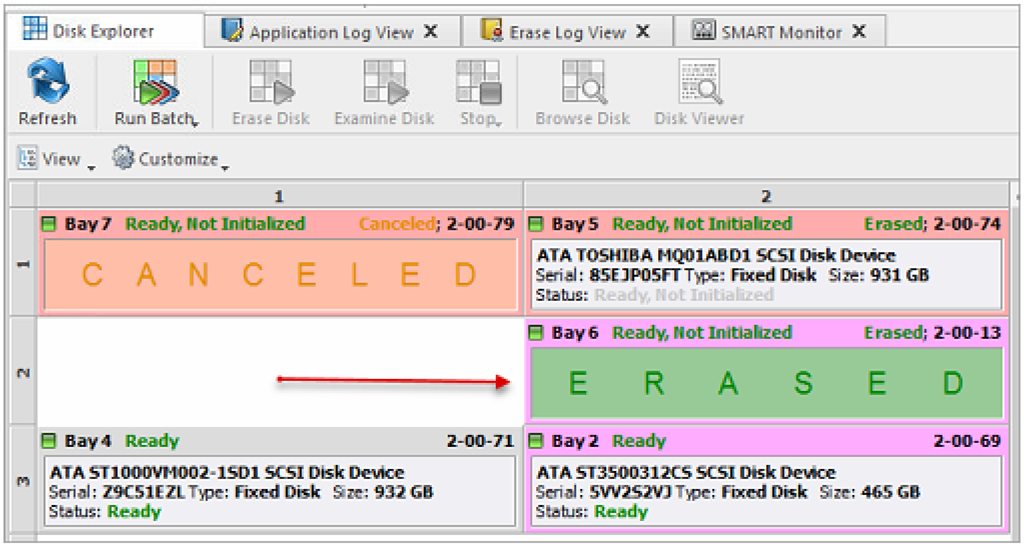
Bay 4 Ready **2-00-71**
ATA ST1000VM002-1SD1 SCSI Disk Device
Serial: **Z9C51EZL** Type: **Fixed Disk** Size: **932 GB**
Status: **Ready**

Bay 2 Ready **2-00-69**
ATA ST3500312CS SCSI Disk Device
Serial: **5VV2S2VJ** Type: **Fixed Disk** Size: **465 GB**
Status: **Ready**

Figure 25: Disk Erase Progress

6. Verify erase completion

After erase is complete, the results (**Success, Failed, Canceled**) are displayed on top of the disks in different colors.



Bay 7 Ready, Not Initialized Canceled; 2-00-79

C A N C E L E D

Bay 5 Ready, Not Initialized Erased; 2-00-74

ATA TOSHIBA MQ01ABD1 SCSI Disk Device
Serial: 85EJP05FT Type: Fixed Disk Size: 931 GB
Status: Ready, Not Initialized

Bay 6 Ready, Not Initialized Erased; 2-00-13

E R A S E D

Bay 4 Ready 2-00-71

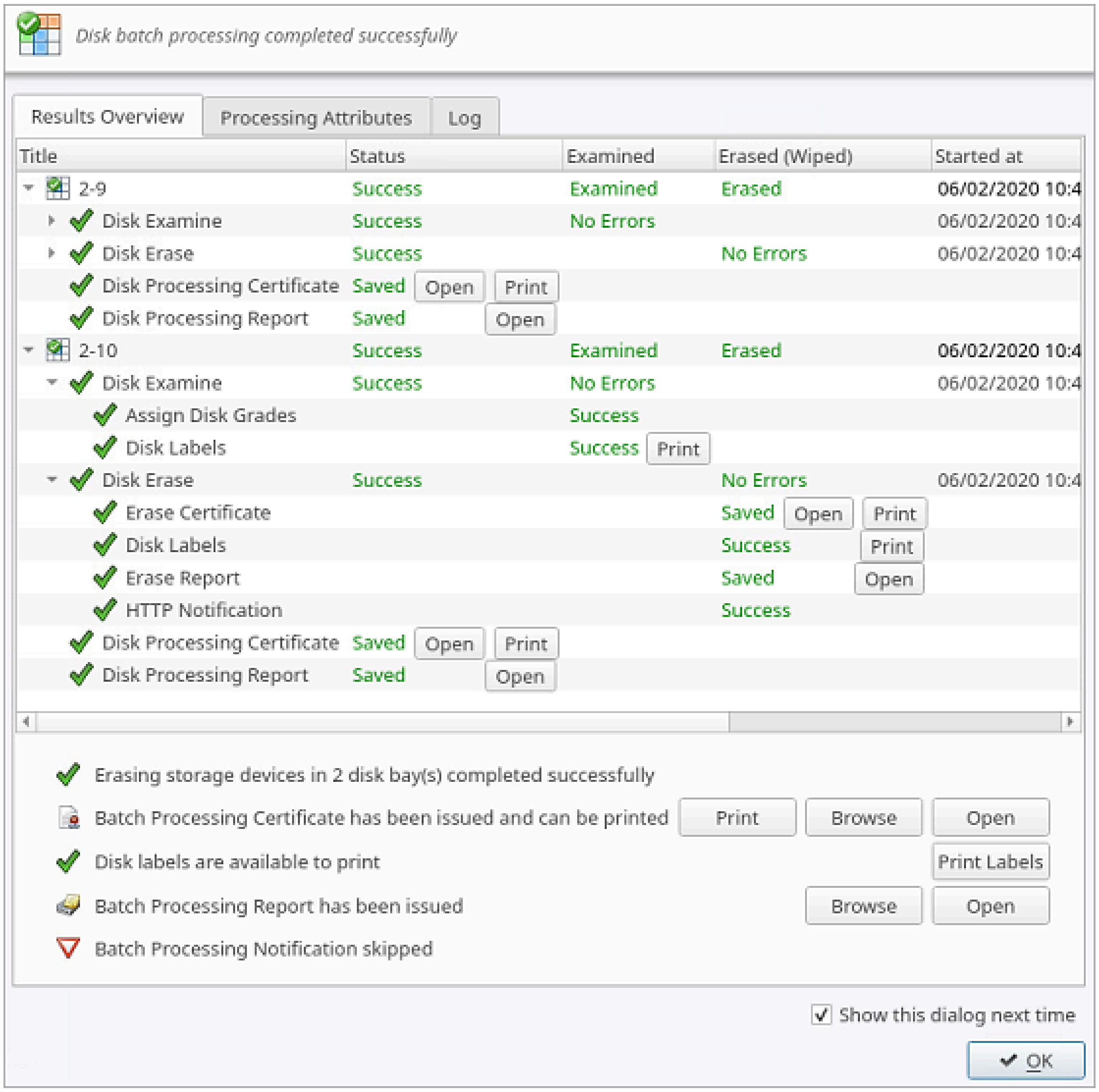
ATA ST1000VM002-1SD1 SCSI Disk Device
Serial: Z9C51EZL Type: Fixed Disk Size: 932 GB
Status: Ready

Bay 2 Ready 2-00-69

ATA ST3500312CS SCSI Disk Device
Serial: 5VV2S2VJ Type: Fixed Disk Size: 465 GB
Status: Ready

Figure 26: Erase Completed

After erase completion there are options for reviewing results (logs, processing reports and attributes), printing Erase Certificates and Disk Labels for processed disks.



Disk batch processing completed successfully

Title	Status	Examined	Erased (Wiped)	Started at
2-9	Success	Examined	Erased	06/02/2020 10:4
Disk Examine	Success	No Errors		06/02/2020 10:4
Disk Erase	Success		No Errors	06/02/2020 10:4
Disk Processing Certificate	Saved Open Print			
Disk Processing Report	Saved Open			
2-10	Success	Examined	Erased	06/02/2020 10:4
Disk Examine	Success	No Errors		06/02/2020 10:4
Assign Disk Grades		Success		
Disk Labels		Success Print		
Disk Erase	Success		No Errors	06/02/2020 10:4
Erase Certificate			Saved Open Print	
Disk Labels			Success Print	
Erase Report			Saved Open	
HTTP Notification			Success	
Disk Processing Certificate	Saved Open Print			
Disk Processing Report	Saved Open			

✓ Erasing storage devices in 2 disk bay(s) completed successfully

Batch Processing Certificate has been issued and can be printed [Print] [Browse] [Open]

✓ Disk labels are available to print [Print Labels]

Batch Processing Report has been issued [Browse] [Open]

▽ Batch Processing Notification skipped

☑ Show this dialog next time

Figure 27: Erase Summary

All erase events as well as erase results (Event Journal) stored to the internal database and can be exported to the external database or to the CSV format.

Related information

Disk Batches on page 62
Erase Methods on page 120
Processing Summary on page 40
Certificates, Labels and Reports on page 43
Journal Export on page 78

Disk Wipe

When you select a physical device the **Wipe** command processes all logical drives consecutively erasing data in unoccupied areas (free clusters and system areas) and leaving existing data intact. Unallocated space, where no partitions exists has been erased as well.

Note:

If you want to erase ALL data (both existing and deleted files) from the device permanently, use Disk Erase.

If **KillDisk** detects that a partition has been damaged, it does not wipe data in that area, because partition might contain an important data. There are some cases where partitions on a device cannot be wiped. Examples: an unknown or unsupported file system, a system volume or an application start up disk. In these cases **Wipe** command is disabled. If you select a device and **Wipe** button is disabled, select individual partitions (volumes) and wipe them separately.

Disk Wipe complete process is described below.

1. Select disks

Switch to **Local Devices** view.

Use mouse in Disk Explorer to select one or more physical disks. Selected disks displayed with orange borders.

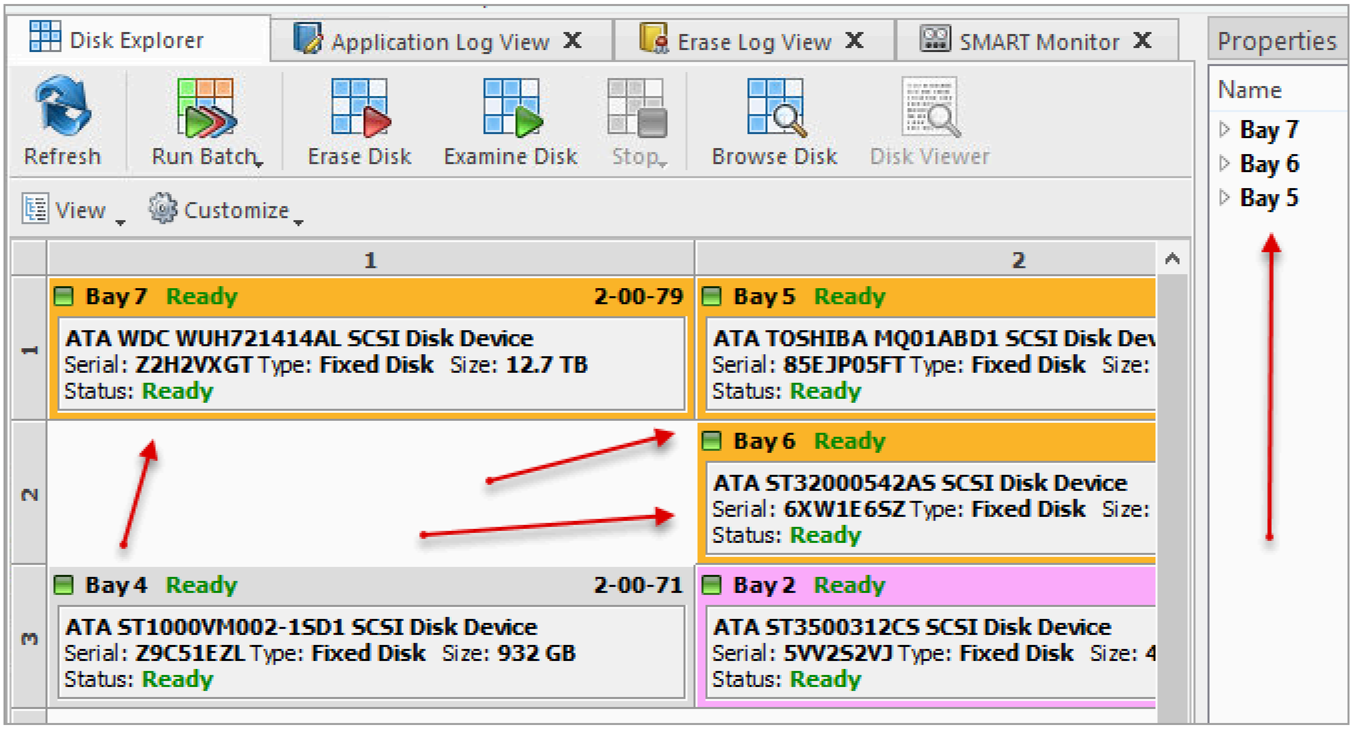
For multiple selection use **Ctrl+Left Mouse** click.

To select all disks in a row, click particular numbered row header.

To select all disks in a column, click particular numbered column header.

To select all attached disks, press **Ctrl+A** .

Another way to select all disks is to click a rectangle at the top-left corner of the Disk Bays view.



Bay 7 Ready 2-00-79
ATA WDC WUH721414AL SCSI Disk Device
Serial: Z2H2VXGT Type: Fixed Disk Size: 12.7 TB
Status: Ready

Bay 5 Ready
ATA TOSHIBA MQ01ABD1 SCSI Disk Dev
Serial: 85EJP05FT Type: Fixed Disk Size:
Status: Ready

Bay 6 Ready
ATA ST32000542AS SCSI Disk Device
Serial: 6XW1E6SZ Type: Fixed Disk Size:
Status: Ready

Bay 4 Ready 2-00-71
ATA ST1000VM002-1SD1 SCSI Disk Device
Serial: Z9C51EZL Type: Fixed Disk Size: 932 GB
Status: Ready

Bay 2 Ready
ATA ST3500312CS SCSI Disk Device
Serial: 5VV2S2VJ Type: Fixed Disk Size: 4
Status: Ready

Figure 28: Multiple Disk Selection

To select a particular partition or volume, click the object in the Local Devices view.

2. Start wipe

Open Disk Wipe dialog using one of the following methods:

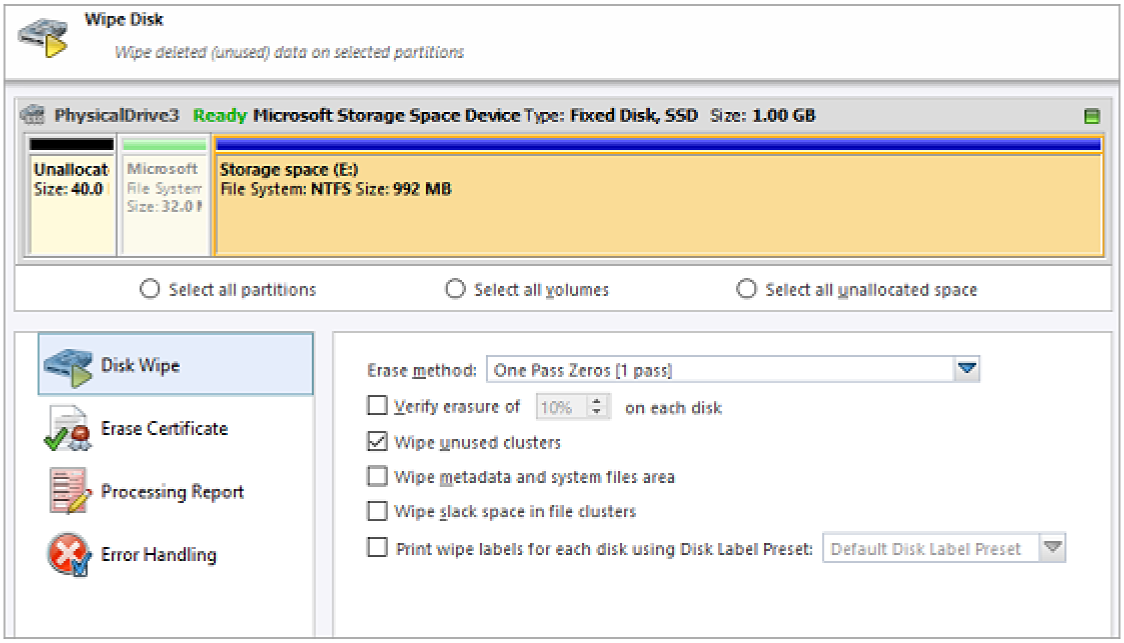
- Click **Actions** > **Wipe Disk** command from main menu
- Click **Wipe Disk** command from the context menu for disk or volume

3. Confirm wipe options

Use tabbed views to adjust Wipe options if necessary.

Available options are:

- Disk Wipe on page 84
- Erase Certificate on page 88
- Processing Report on page 93
- Error Handling on page 102



Wipe Disk

Wipe deleted (unused) data on selected partitions

PhysicalDrive3 Ready Microsoft Storage Space Device Type: Fixed Disk, SSD Size: 1.00 GB

Unallocat Size: 40.0

Microsoft File Systerr Size: 32.0

Storage space (E:) File System: NTFS Size: 992 MB

○ Select all partitions ○ Select all volumes ○ Select all unallocated space

Erase method: One Pass Zeros (1 pass)

□ Verify erasure of 10% on each disk

☑ Wipe unused clusters

□ Wipe metadata and system files area

□ Wipe slack space in file clusters

□ Print wipe labels for each disk using Disk Label Preset: Default Disk Label Preset

Figure 29: Wipe Options

If single disk is selected from Local Devices view, then exact area for the wipe can be optionally specified:

Select all partitions

Select for wipe the only disk space where partitions located

Select all volumes

Select for wipe the only disk space where live volumes located

Select all unallocated space

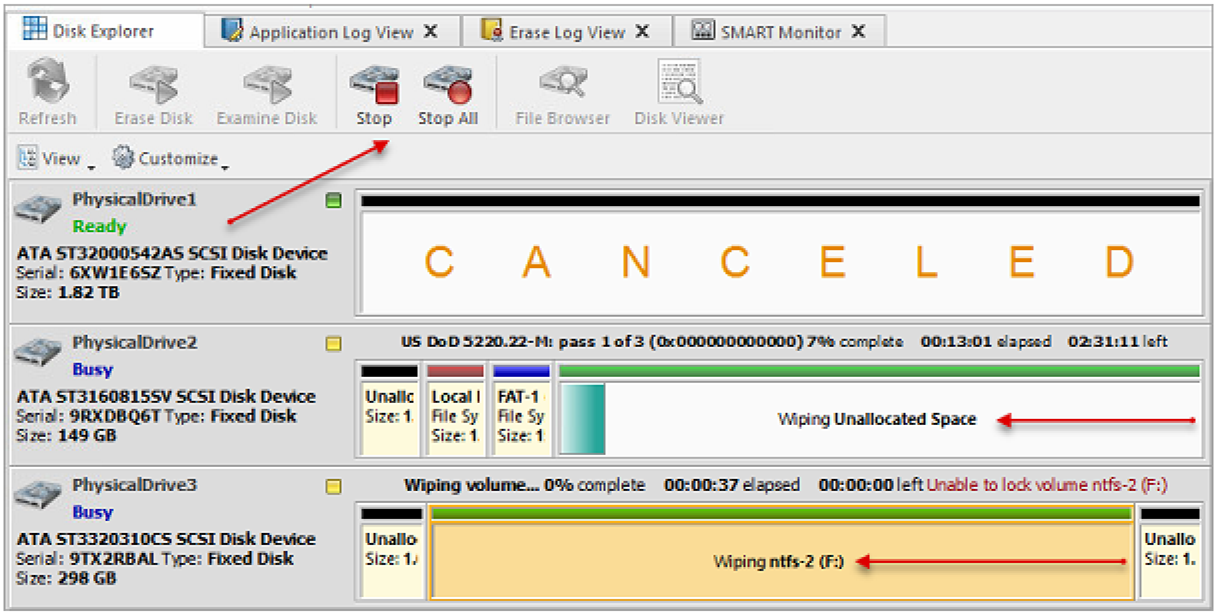
Select for wipe the only disk unallocated area (the space where no live volumes exist).

4. Start wipe

Click **Start** button to reach the final step before wiping out deleted data. Click **Yes** to confirm **Wipe** action and process starts.

5. Monitor progress

The progress of the wiping procedure will be displayed on the disk or volume. To stop the process at any time click the **Stop** button for the particular disk or volume. Click the **Stop All** button to cancel wipe for all disks.



PhysicalDrive1
Ready
ATA ST32000542AS SCSI Disk Device
Serial: 6XW1E6SZ Type: Fixed Disk
Size: 1.82 TB

C A N C E L E D

PhysicalDrive2
Busy
ATA ST3160815SV SCSI Disk Device
Serial: 9RXDBQ6T Type: Fixed Disk
Size: 149 GB

US DoD 5220.22-M: pass 1 of 3 (0x000000000000) 7% complete 00:13:01 elapsed 02:31:11 left

Wiping Unallocated Space

PhysicalDrive3
Busy
ATA ST3320310CS SCSI Disk Device
Serial: 9TX2RBAL Type: Fixed Disk
Size: 298 GB

Wiping volume... 0% complete 00:00:37 elapsed 00:00:00 left Unable to lock volume ntfs-2 (F:)

Wiping ntfs-2 (F:)

Figure 30: Disk Wipe Progress

6. Verify results

This is an optional step. Select the wiped volume and click **Open in File Browser** toolbar button to inspect the work that has been done. **KillDisk** scans system records of the partition. The **Browser** tab appears. Existing file/folder names appear with a multicolor icon and deleted file/folder names appear with a gray-colored icon. If the wiping process completed correctly the data residue in these deleted file clusters and the place these files hold in the directory/system records has been removed. You should not see any gray-colored file names or folder names within the volume being wiped out.

You will see a confirmation dialog when the process is complete. Here you can check the Processing Summary, print Labels and Certificates.

All deleted files and system records on wiped volumes became unrecoverable.

Note:

If there are any errors, for example due to bad sectors, these errors will be reported and placed to the log file. If such a message appears you may cancel the operation or continue wiping out disks.

Related information

Disk Wipe on page 84
Processing Summary on page 40
Certificates, Labels and Reports on page 43

Examine Disk Physical Integrity

Disk examination feature is designed to scan disk's surface and determine physical integrity of the disk. **Examine Disk** step can be the preliminary step to **Disk Erase**, **Disk Wipe** or **Disk Clone** commands.

Examine Disk complete process is described below.

1. Select disks

   Use mouse in Disk Explorer to select one or more physical disks. Selected disks displayed with orange borders.

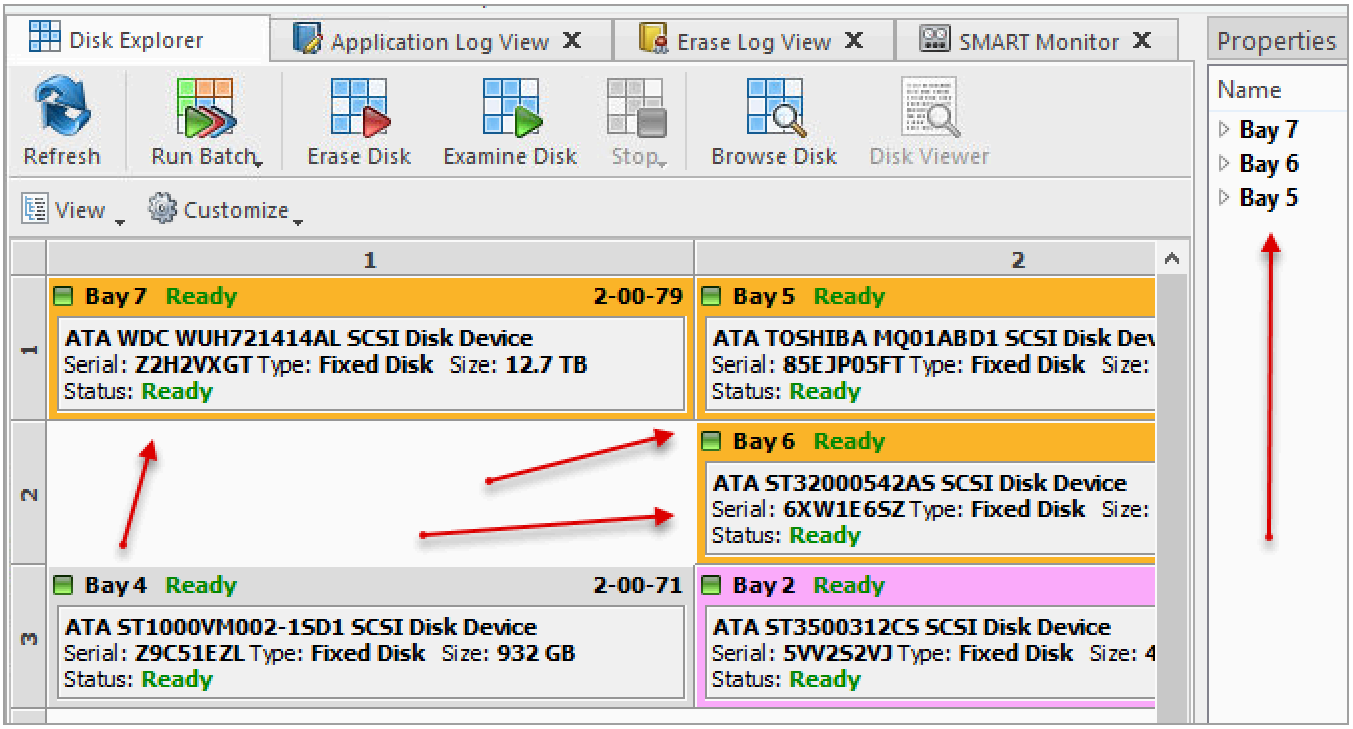
   For multiple selection use **Ctrl+Left Mouse** click.

   To select all disks in a row, click particular numbered row header.

   To select all disks in a column, click particular numbered column header.

   To select all attached disks, press **Ctrl+A**.

   Another way to select all disks is to click a rectangle at the top-left corner of the Disk Bays view.



Bay 7 Ready 2-00-79
ATA WDC WUH721414AL SCSI Disk Device
Serial: **Z2H2VXGT** Type: **Fixed Disk** Size: **12.7 TB**
Status: **Ready**

Bay 5 Ready
ATA TOSHIBA MQ01ABD1 SCSI Disk Dev
Serial: **85EJP05FT** Type: **Fixed Disk** Size:
Status: **Ready**

Bay 6 Ready
ATA ST32000542AS SCSI Disk Device
Serial: **6XW1E6SZ** Type: **Fixed Disk** Size:
Status: **Ready**

Bay 4 Ready 2-00-71
ATA ST1000VM002-1SD1 SCSI Disk Device
Serial: **Z9C51EZL** Type: **Fixed Disk** Size: **932 GB**
Status: **Ready**

Bay 2 Ready
ATA ST3500312CS SCSI Disk Device
Serial: **5VV2S2VJ** Type: **Fixed Disk** Size: 4
Status: **Ready**

Figure 31: Multiple Disk Selection

   To select a particular partition or volume, click the object in the Local Devices view.

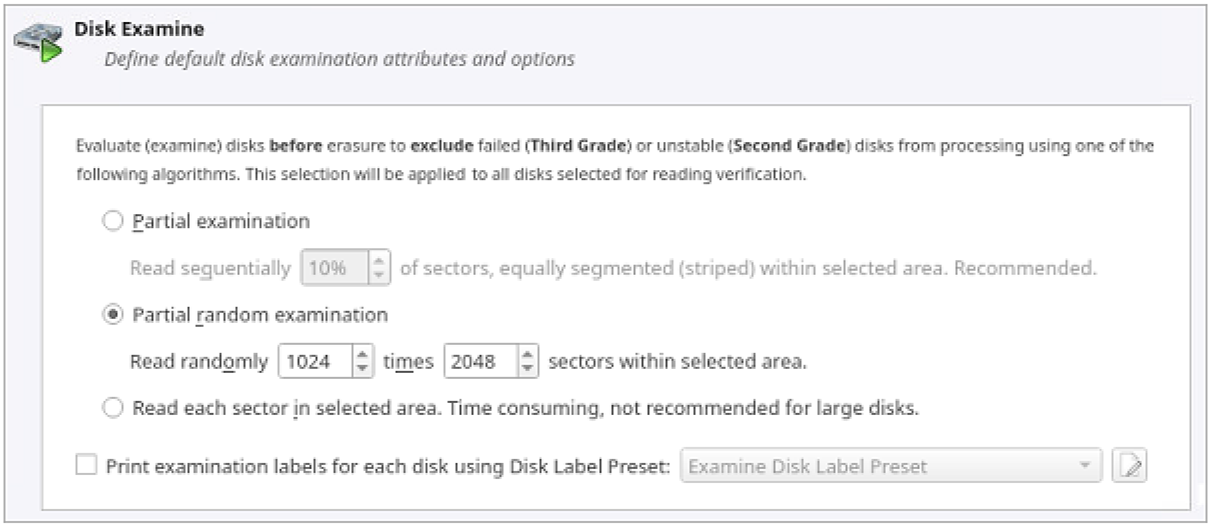
2. Start examination

   Open Disk Examine configuration dialog using one of the following methods:

   - Click the **Examine Disk** command on the action toolbar
   - Click **Actions** > **Examine Disk** command from main menu
   - Click **Examine Disk** command from context menu

3. Confirm examination options

Confirm examination options after Disk Examine dialog pops up:



Disk Examine

Define default disk examination attributes and options

Evaluate (examine) disks **before** erasure to **exclude** failed (**Third Grade**) or unstable (**Second Grade**) disks from processing using one of the following algorithms. This selection will be applied to all disks selected for reading verification.

○ Partial examination

Read sequentially 10% of sectors, equally segmented (striped) within selected area. Recommended.

● Partial random examination

Read randomly 1024 times 2048 sectors within selected area.

○ Read each sector in selected area. Time consuming, not recommended for large disks.

□ Print examination labels for each disk using Disk Label Preset: Examine Disk Label Preset

Figure 32: Disk Examine Options

Use tabbed views to adjust examination options if necessary. Available options are:

- Disk Examine on page 85
- Processing Report on page 93
- Error Handling on page 102

Use Examine Grades tab in global preferences to specify disk grading attributes if necessary.

Note:

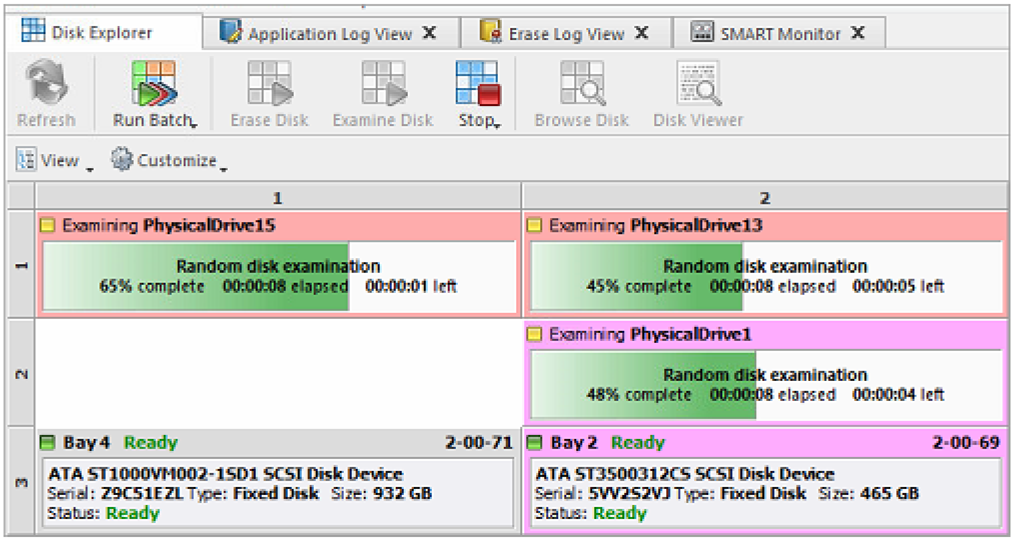
If only one disk was selected for examination than you can specify boundaries of examined area for selected disk.

4. Click Start

Click **Start** button to begin examination process.

5. Observe progress

In the Disk Explorer you will see the progress of the examination in the slot of the drive being operated on. The process will be shown as a progress bar:



Examining PhysicalDrive15
Random disk examination
65% complete 00:00:08 elapsed 00:00:01 left

Examining PhysicalDrive13
Random disk examination
45% complete 00:00:08 elapsed 00:00:05 left

Examining PhysicalDrive1
Random disk examination
48% complete 00:00:08 elapsed 00:00:04 left

Bay 4 Ready 2-00-71
ATA ST1000VM002-1SD1 SCSI Disk Device
Serial: Z9C51EZL Type: Fixed Disk Size: 932 GB
Status: Ready

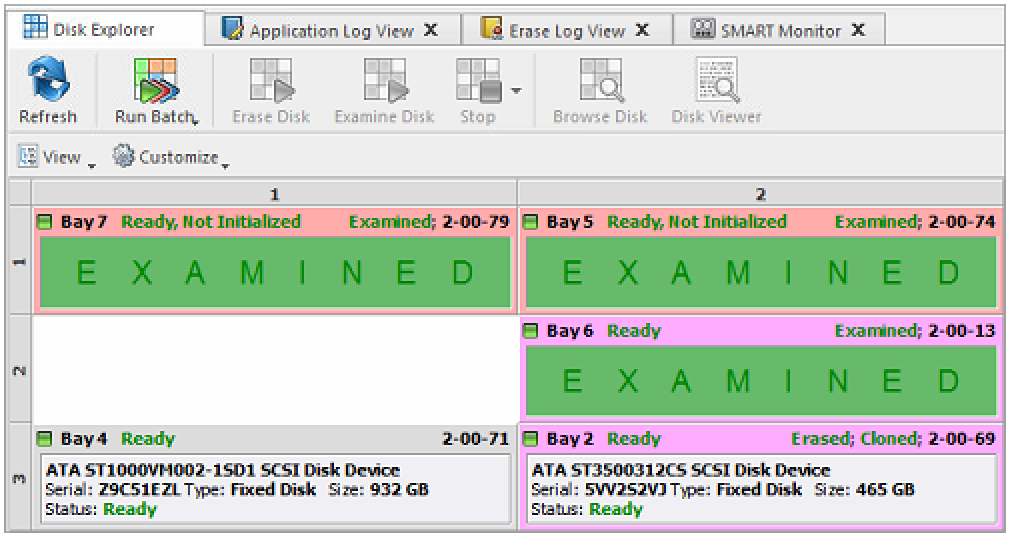
Bay 2 Ready 2-00-69
ATA ST3500312CS SCSI Disk Device
Serial: 5VV2S2VJ Type: Fixed Disk Size: 465 GB
Status: Ready

Figure 33: Examination Progress

To cancel Disk Examination click **Stop** or **Stop All** toolbar buttons at any time.

As you see the green progress bar fills the virtual drive slot. The percentage of the examination completed and the estimated completion time will also be shown on top of the slot. Once the process is complete the phrase **EXAMINED** will flash on top of the slot.

When examination is completed user is able to review results (logs, processing reports and attributes) for processed disks and print Disk Labels.



Bay 7 Ready, Not Initialized Examined; 2-00-79
EXAMINED

Bay 5 Ready, Not Initialized Examined; 2-00-74
EXAMINED

Bay 6 Ready Examined; 2-00-13
EXAMINED

Bay 4 Ready 2-00-71
ATA ST1000VM002-1SD1 SCSI Disk Device
Serial: Z9C51EZL Type: Fixed Disk Size: 932 GB
Status: Ready

Bay 2 Ready Erased; Cloned; 2-00-69
ATA ST3500312CS SCSI Disk Device
Serial: 5VV2S2VJ Type: Fixed Disk Size: 465 GB
Status: Ready

Figure 34: Examination Completed

Related information

Disk Examine on page 85

Certificates, Labels and Reports on page 43

Resume Stopped or Interrupted Erase

Disk erase can be a time consuming task. Erasing larger disks (10TB+) with sanitizing standards including several overwrite passes could last for hours. If something happens in a middle of erase (user stopped an action, failing disk just turned off, computer re-booted, etc.) user has options:

- Start Erase for the disk all over again
- Resume Erase from the point it stopped on a disk (time saving option)

When application starts all detected disks being analyzed for any erases interrupted previously, and if such erases detected for one or more disks, **Resume Erase** button become active for these disks. Disks with stopped or interrupted erase are marked with a red label **Interrupted Erase**.

Note:

If disks with interrupted erase being detected after program start, pop up dialog appears automatically suggesting you to Resume Erase. You can run Resume Erase from here, or select the particular disks later on.

Resume Erase complete process is described below:

1. Select disks

   Select a particular disk or group of disks to launch Resume Erase for.

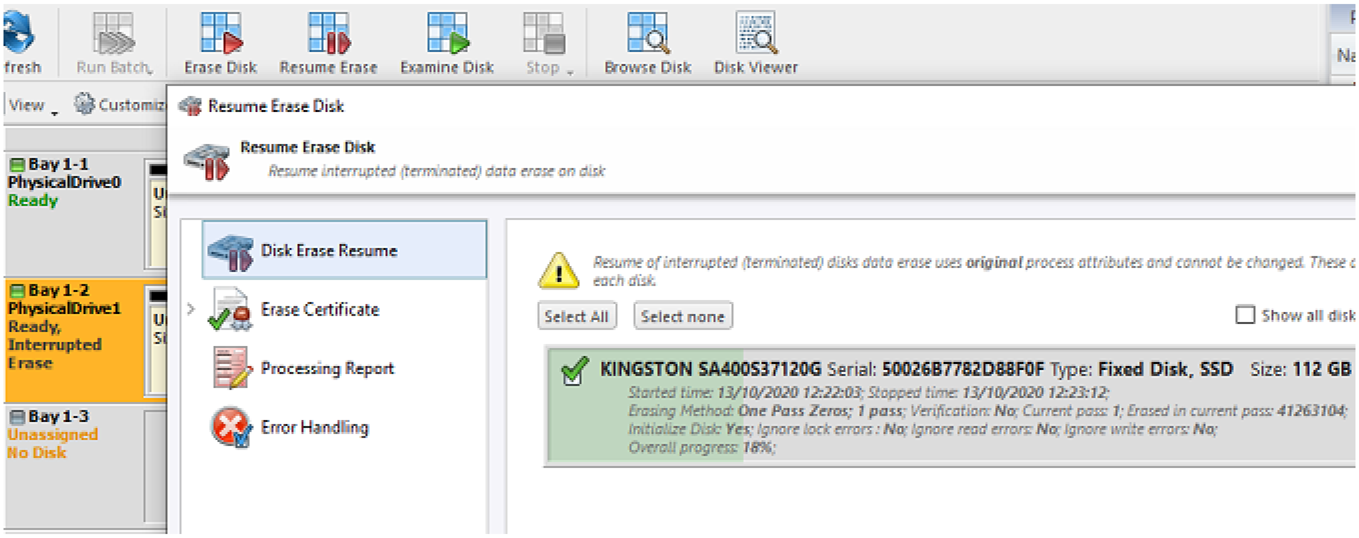
2. Resume erase

   Open Resume Erase Disk dialog using one of the following methods:

   - Click **Resume Erase** command on the action toolbar
   - Click **Actions** > **Resume Erase** command from main menu
   - Click **Resume Erase** command from disk's context menu

3. Confirm options

   After Resume Erase Disk dialog appears, all disks where **Resume Erase** option is available will be displayed. You can select more disks for resume erase (if available) or deselect some selected disks.



Resume Erase Disk

Resume Erase Disk

Resume interrupted (terminated) data erase on disk

Resume of interrupted (terminated) disks data erase uses ***original*** *process attributes and cannot be changed. These c each disk.*

☑ **KINGSTON SA400S37120G** Serial: **50026B7782D88F0F** Type: **Fixed Disk, SSD** Size: **112 GB**
Started time: 13/10/2020 12:22:03; Stopped time: 13/10/2020 12:23:12;
Erasing Method: ***One Pass Zeros; 1 pass****; Verification:* ***No****; Current pass:* ***1****; Erased in current pass:* ***41263104****;*
Initialize Disk: ***Yes****; Ignore lock errors :* ***No****; Ignore read errors:* ***No****; Ignore write errors:* ***No****;*
Overall progress: ***18%****;*

Figure 35: Resume Erase Options

Verify selected disks, certificate and report options and click **Start** button to resume interrupted erase. Wait until erase is complete.

After erase completion there are options for reviewing results (logs, processing reports and attributes), printing Erase Certificates and Disk Labels for processed disks.

Related tasks

Disk Erase on page 25

Related information

Processing Summary on page 40

Certificates, Labels and Reports on page 43

Secure Erase

Most of Solid State Drives (SSD) support Secure Erase for the low-level purging of all memory blocks on the media. **KillDisk** is able use **SATA Secure Erase** feature and perform fast unrecoverable erasure. By doing this, you can increase the performance of SSDs for future use. All of the data will be lost without recovery options. Before using this feature make sure user fully understands the concepts.

Warning:

100% FATAL DAMAGE GUARANTEED TO MEDIA IF THE PROCESS INTERRUPTED (POWER OUTAGE, UNAUTHORIZED SSD EXTRACTION, ETC.)

Make sure your hardware setup is safe from sudden lost of power.

Do not interrupt the process of *Secure Erase* in any manner!

Note:

If there is a need to erase ALL data (existing and deleted) from the hard drive device permanently with sanitation standards (US DoD 5220.22-M, Canadian OPS-II, NSA 130-2, etc.) use Disk Erase feature.

Important:

Secure Erase is available for Linux-based packages only (**KillDisk Industrial**, **Active@ KillDisk Linux**, **KillDisk Console** and KillDisk LiveCD in **Active@ KillDisk Ultimate**).

Secure Erase is not available in Windows-based packages, including applications running under Active@ Boot Disk (which is based on WinPE). For security reasons Microsoft intentionally blocked IOCTL_ATA_PASS_THROUGH function in all the latest Windows editions starting from Windows 8.

Secure Erase complete process is described below.

1. Select SSD disks

   Select disks marked as SSD in **Local Devices** view. You may select multiple disks to be erased simultaneously.
2. Start secure erase

   Open **Secure Erase** dialog using one of the following methods:

   - Click **Actions** > **Secure Erase** command from main menu
   - Click **Secure Erase** command from disk's context menu

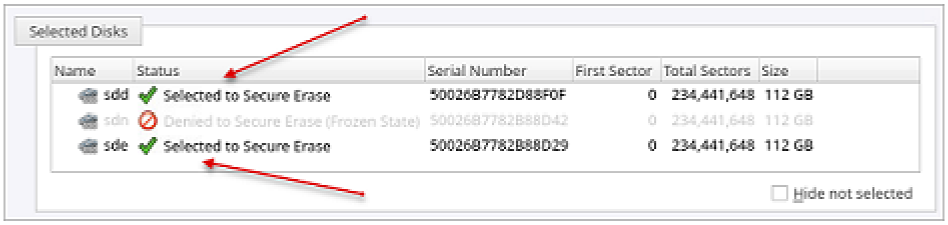
3. Confirm options

Use tabbed views to adjust secure erase preferences if necessary.

Available preferences are:

- Secure Erase on page 83
- Erase Certificate on page 88
- Processing Report on page 93
- Error Handling on page 102

Important: Only disks which state is NOT frozen SSDs can be selected for Secure Erase

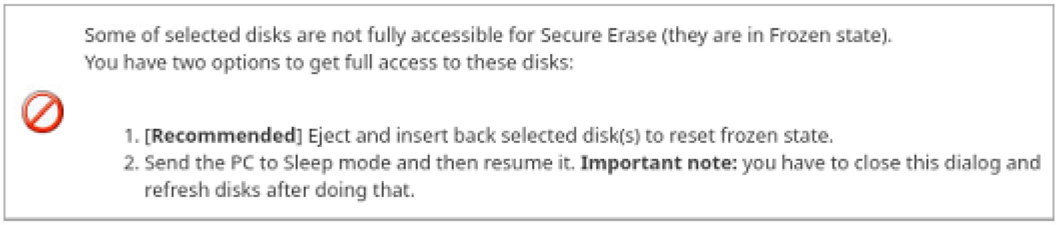


Name	Status	Serial Number	First Sector	Total Sectors	Size
sdd	✓ Selected to Secure Erase	50026B7782D88F0F	0	234,441,648	112 GB
sdn	Denied to Secure Erase (Frozen State)	50026B7782B88D42	0	234,441,648	112 GB
sde	✓ Selected to Secure Erase	50026B7782B88D29	0	234,441,648	112 GB

☐ Hide not selected

Warning:

In case if SSD which state is Frozen has been selected for Secure Erase the following message appears:



Some of selected disks are not fully accessible for Secure Erase (they are in Frozen state).
You have two options to get full access to these disks:

1. [**Recommended**] Eject and insert back selected disk(s) to reset frozen state.
2. Send the PC to Sleep mode and then resume it. **Important note:** you have to close this dialog and refresh disks after doing that.

Figure 36: Frozen SSD Warning

You have options either to eject and insert back the SSD, or send PC to Sleep mode and resume it back to get full access to the disk and proceed with a Secure Erase.

4. Start secure erase

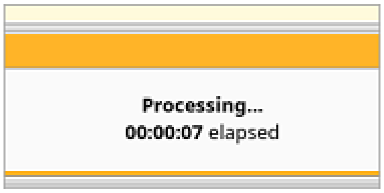
Click **Start** button to reach the final step before erasing disk data completely without any possibility to be recovered. Confirm Secure Erase action by typing a predefined keyphrase.

Click **OK** button to confirm erase and start erase process.

5. Observe progress

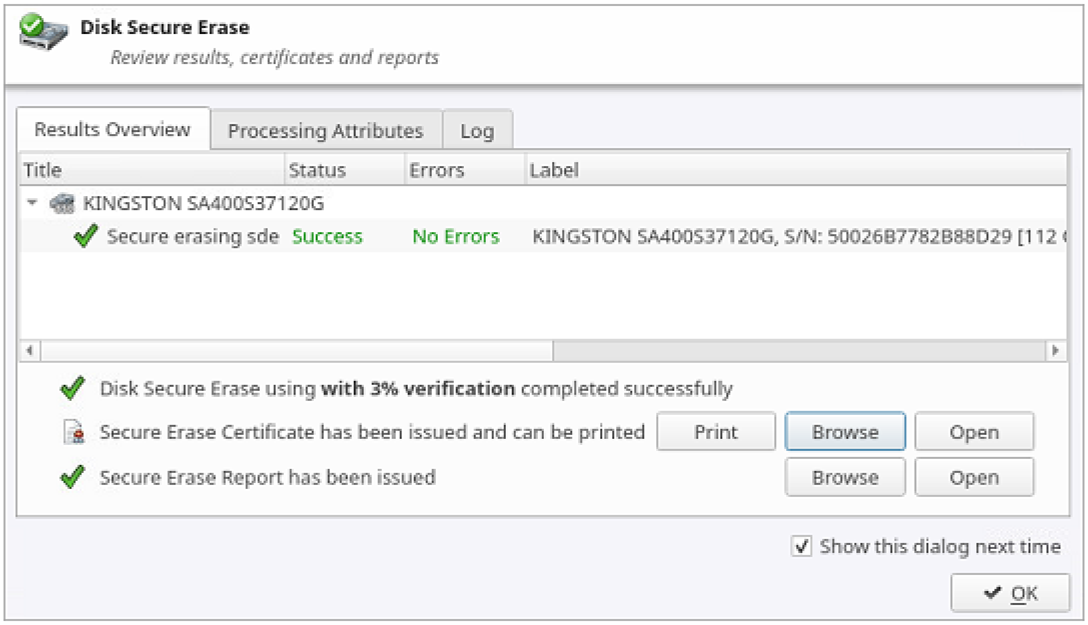
There is no progress indicator and Stop action available for the Secure Erase. The feature is implemented inside SSD controller.

The only time elapsed is available and can be displayed.



Processing...
00:00:07 elapsed

After Secure Erase process is completed the Processing Summary dialog appears:



Disk Secure Erase

Review results, certificates and reports

Title	Status	Errors	Label
KINGSTON SA400S37120G			
✓ Secure erasing sde	Success	No Errors	KINGSTON SA400S37120G, S/N: 50026B7782B88D29 [112

✓ Disk Secure Erase using **with 3% verification** completed successfully

Secure Erase Certificate has been issued and can be printed

✓ Secure Erase Report has been issued

☑ Show this dialog next time

Figure 37: Secure Erase Processing Summary

Now you may **Print** and **Open** Erase Certificate and work with XML Reports.

If there are any errors they will be reported.

Related information

Secure Erase on page 83

Processing Summary on page 40

Certificates, Labels and Reports on page 43

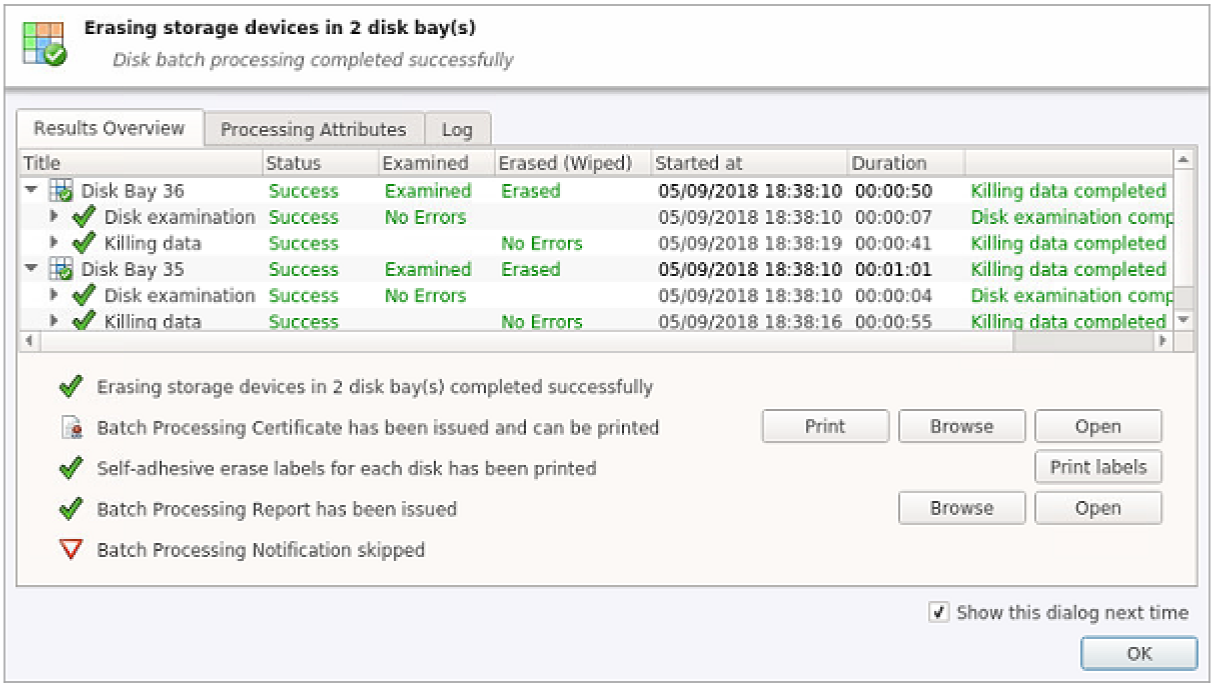
Secure Erase (SSD) on page 133

Secure Erase Concepts on page 113

Secure Erase (ANSI ATA, SE) on page 122

Processing Summary

Once **KillDisk** finishes processing tasks such as Disk Erase, Secure Erase or Disk Wipe, a Processing Summary dialog appears. It contains all of the information regarding to the operation(s). For example, information which disks were erased, status of erasure, logs and associated certificates and reports.



Erasing storage devices in 2 disk bay(s)

Disk batch processing completed successfully

Title	Status	Examined	Erased (Wiped)	Started at	Duration	
Disk Bay 36	Success	Examined	Erased	05/09/2018 18:38:10	00:00:50	Killing data completed
Disk examination	Success	No Errors		05/09/2018 18:38:10	00:00:07	Disk examination comp
Killing data	Success		No Errors	05/09/2018 18:38:19	00:00:41	Killing data completed
Disk Bay 35	Success	Examined	Erased	05/09/2018 18:38:10	00:01:01	Killing data completed
Disk examination	Success	No Errors		05/09/2018 18:38:10	00:00:04	Disk examination comp
Killing data	Success		No Errors	05/09/2018 18:38:16	00:00:55	Killing data completed

✓ Erasing storage devices in 2 disk bay(s) completed successfully

Batch Processing Certificate has been issued and can be printed

✓ Self-adhesive erase labels for each disk has been printed

✓ Batch Processing Report has been issued

▽ Batch Processing Notification skipped

☑ Show this dialog next time

Figure 38: Example of Processing Summary

Results Overview

Tab contains the following information:

Title
All the devices processed are displayed with their erase status

Status
An actual erase status (success/fail)

Errors
Displayed number of errors detected (if any)

Label
Volume or partition description

Method
Erase/Wipe sanitizing method being used

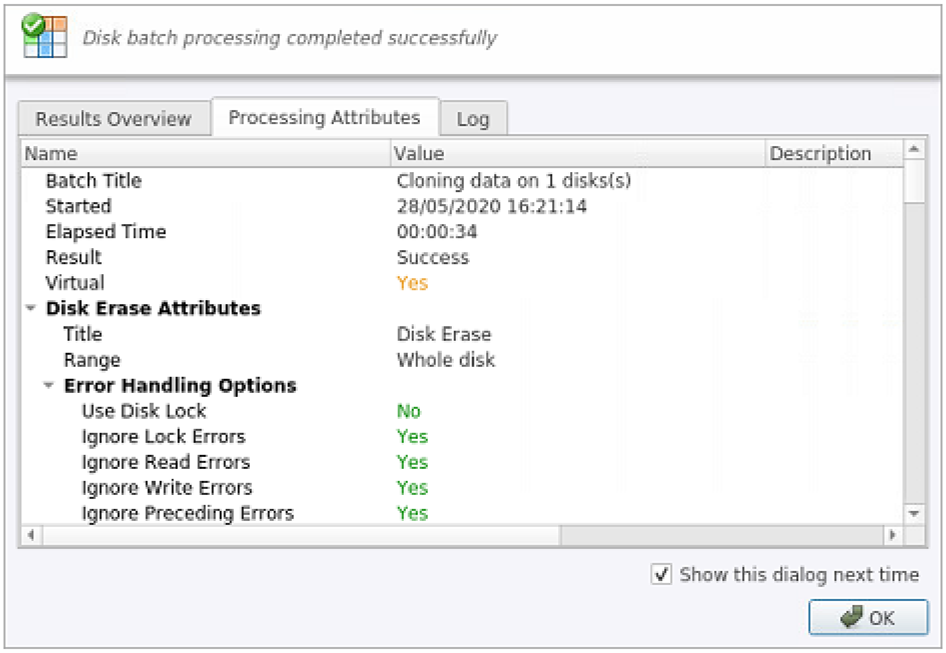
Erase Passes
Number of overwriting passes performed

Started at
Time & date of operation's start

Duration
Duration of the operation.

Processing Attributes

Tab contains detailed information about operation status and processing attributes:



Disk batch processing completed successfully

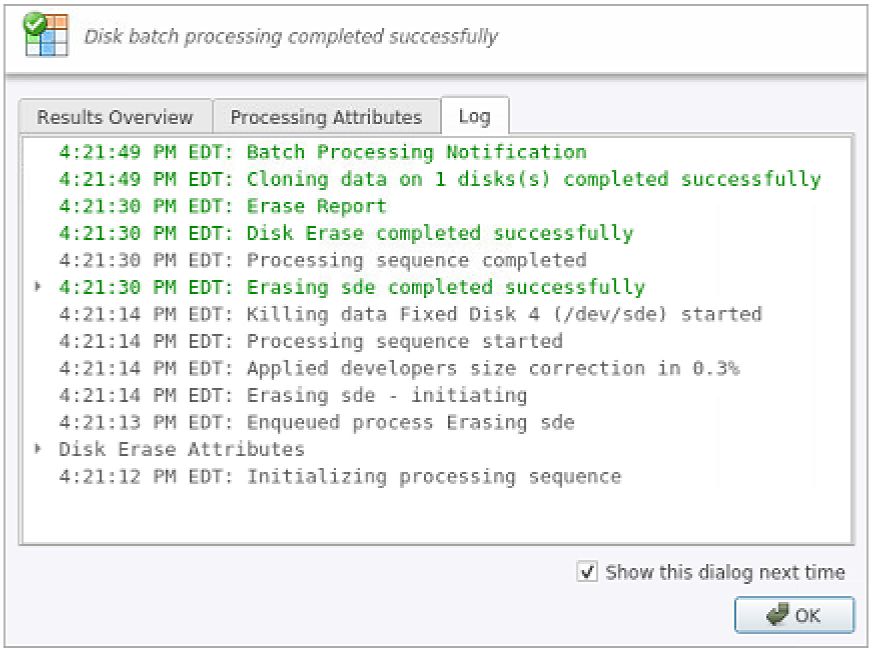
Name	Value	Description
Batch Title	Cloning data on 1 disks(s)	
Started	28/05/2020 16:21:14	
Elapsed Time	00:00:34	
Result	Success	
Virtual	Yes	
Disk Erase Attributes		
Title	Disk Erase	
Range	Whole disk	
Error Handling Options		
Use Disk Lock	No	
Ignore Lock Errors	Yes	
Ignore Read Errors	Yes	
Ignore Write Errors	Yes	
Ignore Preceding Errors	Yes	

☑ Show this dialog next time

Figure 39: Processing Attributes Sample

Log

Tab shows actual processing log:



Disk batch processing completed successfully

```
  4:21:49 PM EDT: Batch Processing Notification
  4:21:49 PM EDT: Cloning data on 1 disks(s) completed successfully
  4:21:30 PM EDT: Erase Report
  4:21:30 PM EDT: Disk Erase completed successfully
  4:21:30 PM EDT: Processing sequence completed
▸ 4:21:30 PM EDT: Erasing sde completed successfully
  4:21:14 PM EDT: Killing data Fixed Disk 4 (/dev/sde) started
  4:21:14 PM EDT: Processing sequence started
  4:21:14 PM EDT: Applied developers size correction in 0.3%
  4:21:14 PM EDT: Erasing sde - initiating
  4:21:13 PM EDT: Enqueued process Erasing sde
▸ Disk Erase Attributes
  4:21:12 PM EDT: Initializing processing sequence
```

☑ Show this dialog next time

Figure 40: Log Sample

Note:

The Wipe operation will produce a similar processing summary for the Disk Wipe.

Additional actions

Additional processing options and actions are:

Disk Certificate

Status of the saved PDF certificate. Allows user to print certificate (**Print** button), browse certificate directory with a file browser (**Browse** button) or examine certificate (**Open** button).

Print Labels

Examine, customize, change options and print Labels by clicking the **Print Labels** button.

Disk Processing Report

Status of the saved Disk Processing Report. Examine the disk processing report *.xml* file (click **Browse** button to navigate to the containing folder) or preview the report (**Open** button).

Related information

Certificates, Labels and Reports on page 43

Certificates, Labels and Reports

KillDisk maintains highest standards of disk erasure implementing most modern sanitation methods and provides extensive options for its operations with Certificates, Reports and Disk Labels with various Barcodes.

Erase Certificates

KillDisk provides PDF certificates upon the completion of Disk Erase, Secure Erase or Disk Wipe. These certificates can be customized to include company-specific information and hardware/procedure description. Configuring custom settings is described in the Certificate Preferences section of this guide.

Certificate Elements

Company logo

Company logo can be placed to the certificate instead of the default **KillDisk**'s logo at the top right corner.

Barcode

A barcode in selected format with encoded tags and attributes for scanning using a barcode scanner.

Company information

Displays all company information provided in the preferences. The user in the sample above only provided a business name. But other company information may also be included in the certificate.

Technician information

Displays the technician information provided in the preferences. This section is for the name of the operator and any notes they may want to include in the certificate report.

Erasure results information

Displays information pertaining to the erasure procedure conducted on the hard drive(s). Type of erasure algorithm, custom settings, date and time started and duration of the erasure are all listed here.

Disk information

Uniquely identifies the disk being erased. Includes information like Name, Serial Number, Size and Partitioning Scheme.

System information

Provides details on the system used to run **KillDisk** such as Operating System and Architecture type.

Hardware information

Provides details on the hardware used to run **KillDisk** such as Manufacturer, Number of Processors, etc.

Note:

The system information here only applies to the system running **KillDisk**, not the system that was erased by the application!

Storing Certificate to PDF

There are options for storing a certificate to file in PDF format as well as encrypting with passwords and digitally signing output PDFs. You can re-print stored to PDF certificates later on, as well as you can validate their integrity and validity.

Certificate location

Save erase certificate as a file in PDF format to the specific location.

File name template

Specify the template for the certificate file name. See the tags available in Appendix tags section.

Encrypt with password

If password field is not empty, output certificate (PDF file) will be encrypted and protected with specified password. This password needs to be typed in any PDF viewer the next time user opens a certificate for reviewing or printing.

Sign certificate with digital signature

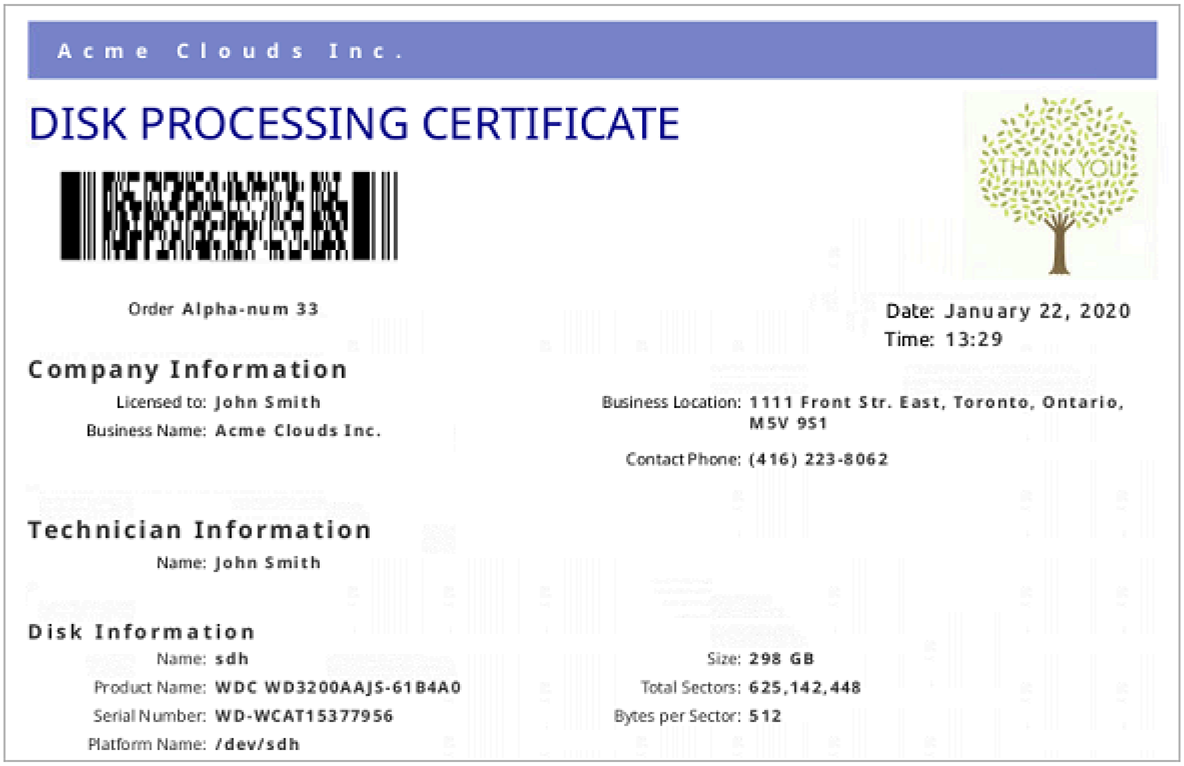
Certificate file (PDF) can be signed with a default digital signature (supplied **KillDisk.pfx** certificate) or with your custom digital signature (.PFX file). Digital signature can be verified later on. If Adobe Reader successfully verified PDF document, it is guaranteed that its content hasn't been modified since issue. If custom digital signature is required, please issue a certificate and specify full path to the custom certificate (.PFX file), as well as .PFX open password (if any) in the related fields.

Display digital signature

Digital signature can be displayed as an overlay text on the first page of certificate. After turning this option on, you can specify overlay text using tags (see tags section), its position on the first page, rectangle dimensions and text size.

Note: Encrypting certificates with a password and digital signing options are not available when running KillDisk under 32-bit Operating Systems. Only 64-bit platforms supported.

Sample of Erase Certificate



Acme Clouds Inc.

DISK PROCESSING CERTIFICATE

Order Alpha-num 33

Date: January 22, 2020
Time: 13:29

Company Information

Licensed to: John Smith
Business Name: Acme Clouds Inc.

Business Location: 1111 Front Str. East, Toronto, Ontario, M5V 9S1
Contact Phone: (416) 223-8062

Technician Information

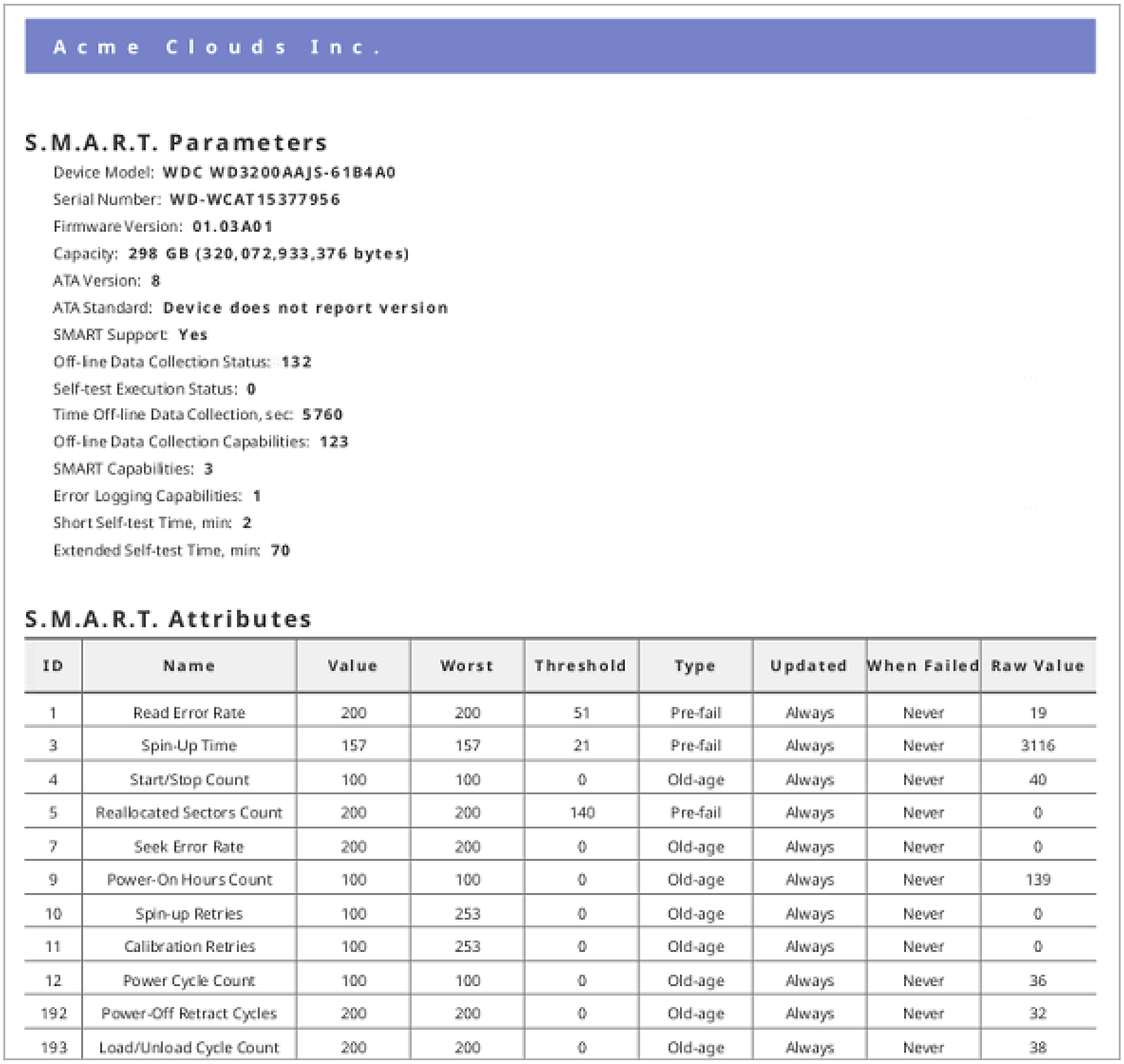
Name: John Smith

Disk Information

Name: sdh
Product Name: WDC WD3200AAJS-61B4A0
Serial Number: WD-WCAT15377956
Platform Name: /dev/sdh

Size: 298 GB
Total Sectors: 625,142,448
Bytes per Sector: 512

Figure 41: Erase Certificate - 1-st Page



Acme Clouds Inc.

S.M.A.R.T. Parameters

Device Model: **WDC WD3200AAJS-61B4A0**

Serial Number: **WD-WCAT15377956**

Firmware Version: **01.03A01**

Capacity: **298 GB (320,072,933,376 bytes)**

ATA Version: **8**

ATA Standard: **Device does not report version**

SMART Support: **Yes**

Off-line Data Collection Status: **132**

Self-test Execution Status: **0**

Time Off-line Data Collection, sec: **5760**

Off-line Data Collection Capabilities: **123**

SMART Capabilities: **3**

Error Logging Capabilities: **1**

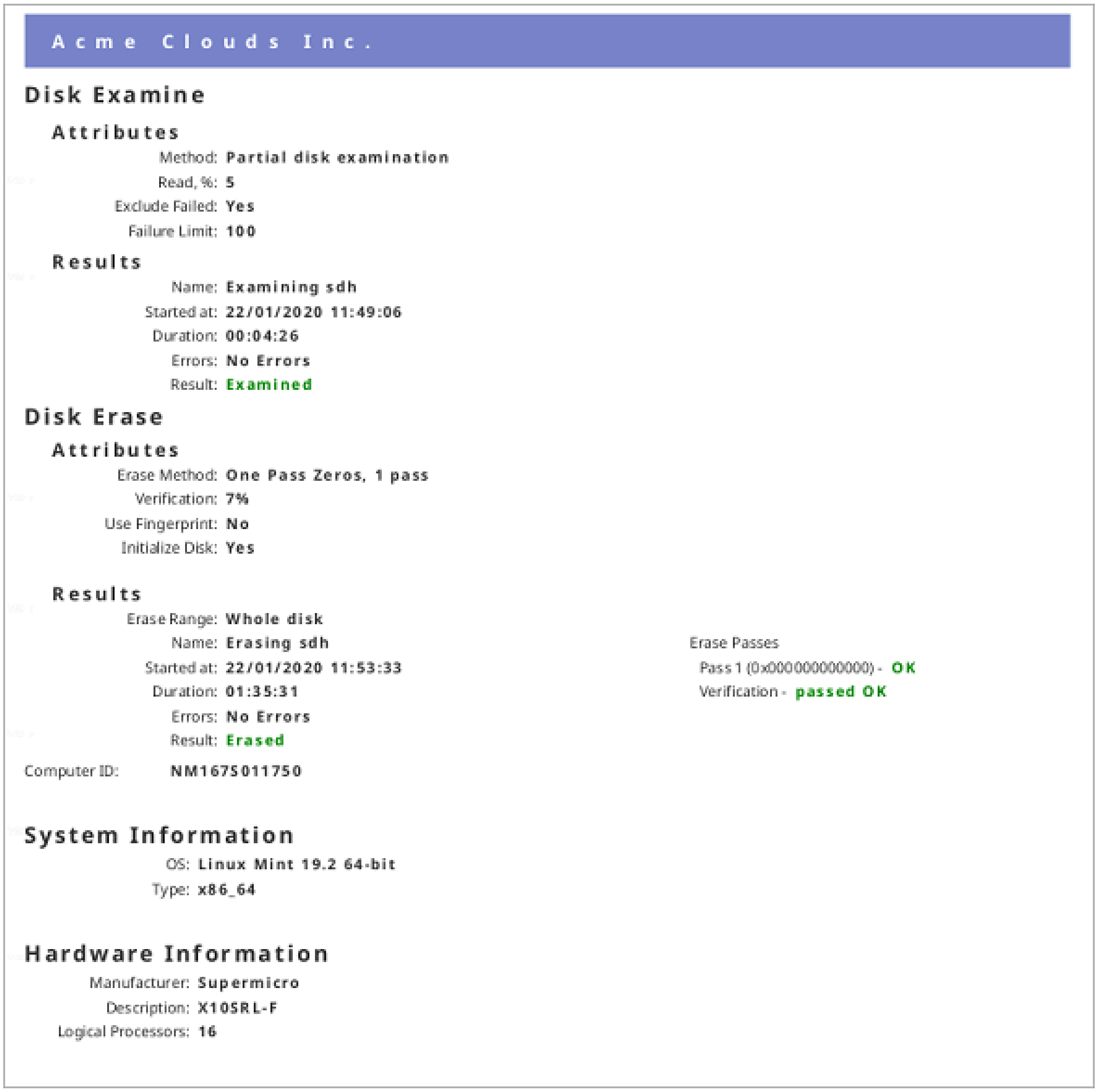
Short Self-test Time, min: **2**

Extended Self-test Time, min: **70**

S.M.A.R.T. Attributes

ID	Name	Value	Worst	Threshold	Type	Updated	When Failed	Raw Value
1	Read Error Rate	200	200	51	Pre-fail	Always	Never	19
3	Spin-Up Time	157	157	21	Pre-fail	Always	Never	3116
4	Start/Stop Count	100	100	0	Old-age	Always	Never	40
5	Reallocated Sectors Count	200	200	140	Pre-fail	Always	Never	0
7	Seek Error Rate	200	200	0	Old-age	Always	Never	0
9	Power-On Hours Count	100	100	0	Old-age	Always	Never	139
10	Spin-up Retries	100	253	0	Old-age	Always	Never	0
11	Calibration Retries	100	253	0	Old-age	Always	Never	0
12	Power Cycle Count	100	100	0	Old-age	Always	Never	36
192	Power-Off Retract Cycles	200	200	0	Old-age	Always	Never	32
193	Load/Unload Cycle Count	200	200	0	Old-age	Always	Never	38

Figure 42: Erase Certificate - 2-nd Page



Acme Clouds Inc.

Disk Examine

Attributes

Method: Partial disk examination
Read, %: 5
Exclude Failed: Yes
Failure Limit: 100

Results

Name: Examining sdh
Started at: 22/01/2020 11:49:06
Duration: 00:04:26
Errors: No Errors
Result: Examined

Disk Erase

Attributes

Erase Method: One Pass Zeros, 1 pass
Verification: 7%
Use Fingerprint: No
Initialize Disk: Yes

Results

Erase Range: Whole disk
Name: Erasing sdh
Started at: 22/01/2020 11:53:33
Duration: 01:35:31
Errors: No Errors
Result: Erased

Erase Passes
Pass 1 (0x000000000000) - OK
Verification - passed OK

Computer ID: NM1675011750

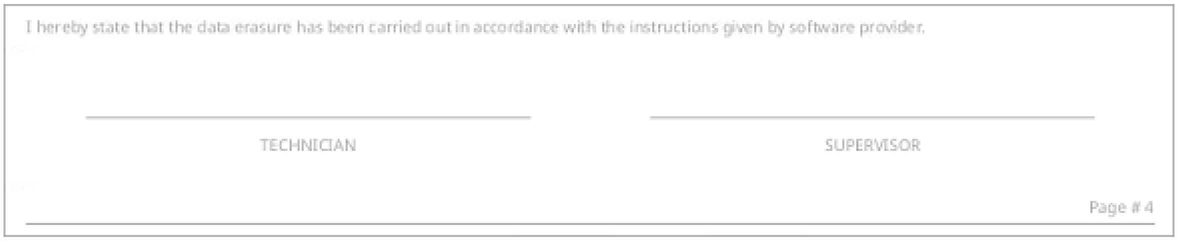
System Information

OS: Linux Mint 19.2 64-bit
Type: x86_64

Hardware Information

Manufacturer: Supermicro
Description: X10SRL-F
Logical Processors: 16

Figure 43: Erase Certificate - 3-rd Page



I hereby state that the data erasure has been carried out in accordance with the instructions given by software provider.

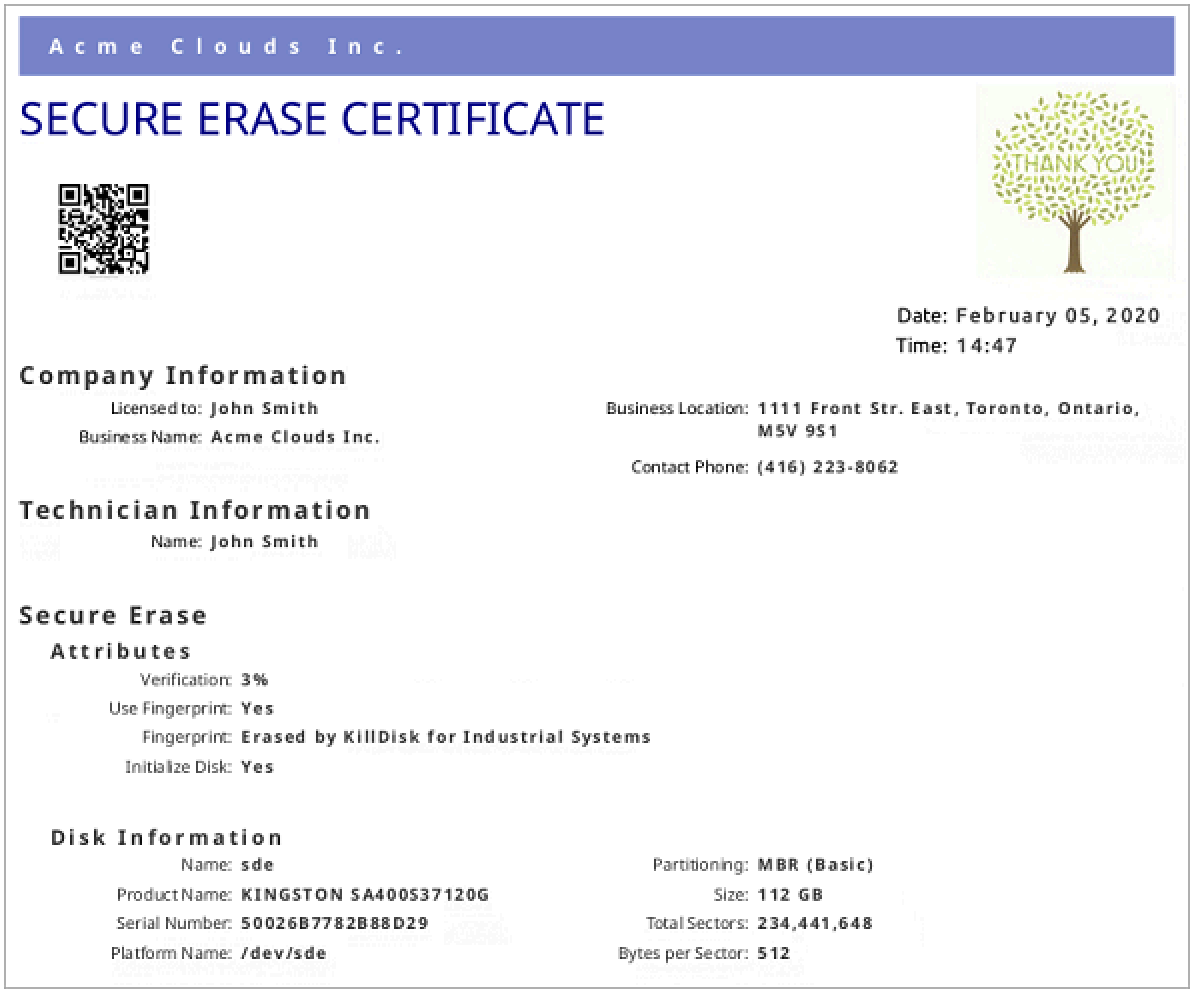
TECHNICIAN

SUPERVISOR

Page # 4

Figure 44: Erase Certificate - Last Page

Sample of Secure Erase Certificate



Acme Clouds Inc.

SECURE ERASE CERTIFICATE

Date: February 05, 2020
Time: 14:47

Company Information

Licensed to: John Smith
Business Name: Acme Clouds Inc.
Business Location: 1111 Front Str. East, Toronto, Ontario, M5V 951
Contact Phone: (416) 223-8062

Technician Information

Name: John Smith

Secure Erase

Attributes

Verification: 3%
Use Fingerprint: Yes
Fingerprint: Erased by KillDisk for Industrial Systems
Initialize Disk: Yes

Disk Information

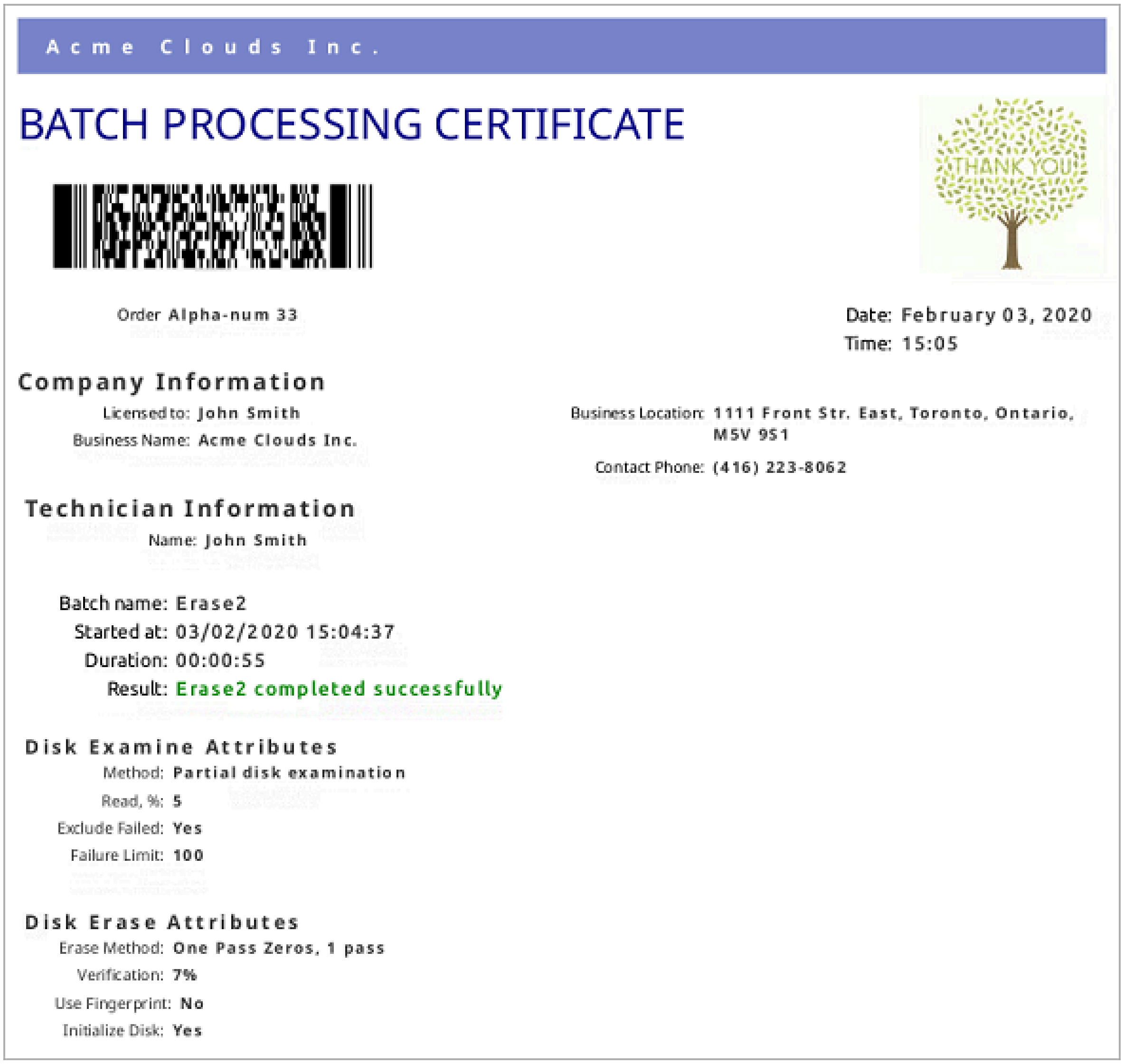
Name: sde
Product Name: KINGSTON SA400S37120G
Serial Number: 50026B7782B88D29
Platform Name: /dev/sde
Partitioning: MBR (Basic)
Size: 112 GB
Total Sectors: 234,441,648
Bytes per Sector: 512

Figure 45: Secure Erase Certificate - 1-st Page

Sample of Batch Certificate

Note:

For operations on group of disks (Batches) **KillDisk** is able to create both Batch Summary certificate as well as separate Certificates for each disk in the Batch. To configure this, Edit Batch and change **Batch Certificate > Save to PDF** options.



Acme Clouds Inc.

BATCH PROCESSING CERTIFICATE

Order Alpha-num 33

Date: February 03, 2020
Time: 15:05

Company Information

Licensed to: John Smith
Business Name: Acme Clouds Inc.

Business Location: 1111 Front Str. East, Toronto, Ontario, M5V 9S1
Contact Phone: (416) 223-8062

Technician Information

Name: John Smith

Batch name: Erase2
Started at: 03/02/2020 15:04:37
Duration: 00:00:55
Result: Erase2 completed successfully

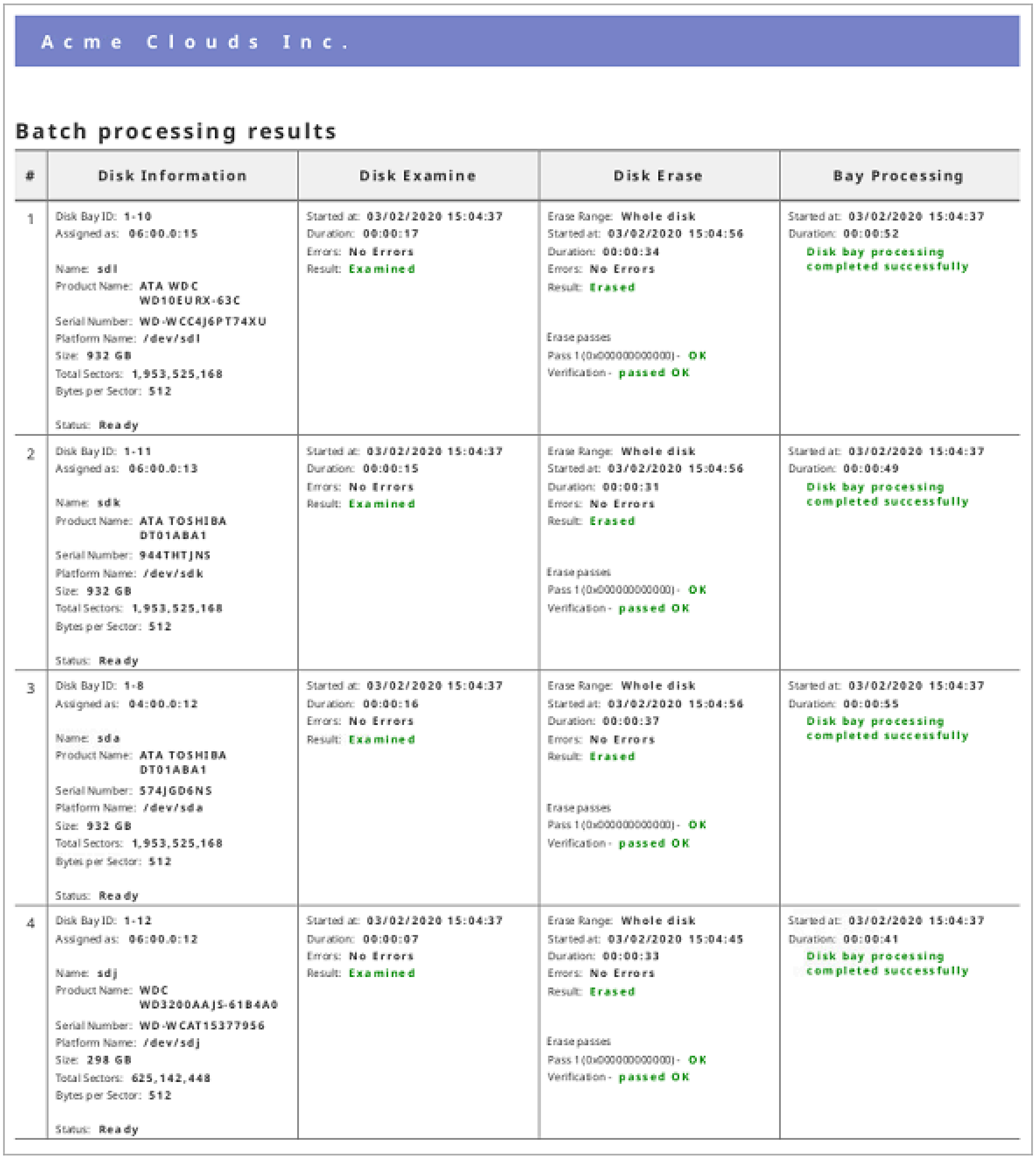
Disk Examine Attributes

Method: Partial disk examination
Read, %: 5
Exclude Failed: Yes
Failure Limit: 100

Disk Erase Attributes

Erase Method: One Pass Zeros, 1 pass
Verification: 7%
Use Fingerprint: No
Initialize Disk: Yes

Figure 46: Batch Certificate - 1-st Page



Acme Clouds Inc.

Batch processing results

#	Disk Information	Disk Examine	Disk Erase	Bay Processing
1	Disk Bay ID: 1-10 Assigned as: 06:00.0:15 Name: sdl Product Name: ATA WDC WD10EURX-63C Serial Number: WD-WCC4J6PT74XU Platform Name: /dev/sdl Size: 932 GB Total Sectors: 1,953,525,168 Bytes per Sector: 512 Status: Ready	Started at: 03/02/2020 15:04:37 Duration: 00:00:17 Errors: No Errors Result: Examined	Erase Range: Whole disk Started at: 03/02/2020 15:04:56 Duration: 00:00:34 Errors: No Errors Result: Erased Erase passes Pass 1 (0x000000000000) - OK Verification - passed OK	Started at: 03/02/2020 15:04:37 Duration: 00:00:52 Disk bay processing completed successfully
2	Disk Bay ID: 1-11 Assigned as: 06:00.0:13 Name: sdk Product Name: ATA TOSHIBA DT01ABA1 Serial Number: 944THTJNS Platform Name: /dev/sdk Size: 932 GB Total Sectors: 1,953,525,168 Bytes per Sector: 512 Status: Ready	Started at: 03/02/2020 15:04:37 Duration: 00:00:15 Errors: No Errors Result: Examined	Erase Range: Whole disk Started at: 03/02/2020 15:04:56 Duration: 00:00:31 Errors: No Errors Result: Erased Erase passes Pass 1 (0x000000000000) - OK Verification - passed OK	Started at: 03/02/2020 15:04:37 Duration: 00:00:49 Disk bay processing completed successfully
3	Disk Bay ID: 1-8 Assigned as: 04:00.0:12 Name: sda Product Name: ATA TOSHIBA DT01ABA1 Serial Number: 574JGD6NS Platform Name: /dev/sda Size: 932 GB Total Sectors: 1,953,525,168 Bytes per Sector: 512 Status: Ready	Started at: 03/02/2020 15:04:37 Duration: 00:00:16 Errors: No Errors Result: Examined	Erase Range: Whole disk Started at: 03/02/2020 15:04:56 Duration: 00:00:37 Errors: No Errors Result: Erased Erase passes Pass 1 (0x000000000000) - OK Verification - passed OK	Started at: 03/02/2020 15:04:37 Duration: 00:00:55 Disk bay processing completed successfully
4	Disk Bay ID: 1-12 Assigned as: 06:00.0:12 Name: sdj Product Name: WDC WD3200AAJS-61B4A0 Serial Number: WD-WCAT15377956 Platform Name: /dev/sdj Size: 298 GB Total Sectors: 625,142,448 Bytes per Sector: 512 Status: Ready	Started at: 03/02/2020 15:04:37 Duration: 00:00:07 Errors: No Errors Result: Examined	Erase Range: Whole disk Started at: 03/02/2020 15:04:45 Duration: 00:00:33 Errors: No Errors Result: Erased Erase passes Pass 1 (0x000000000000) - OK Verification - passed OK	Started at: 03/02/2020 15:04:37 Duration: 00:00:41 Disk bay processing completed successfully

Figure 47: Batch Certificate - 2-nd Page

Related information

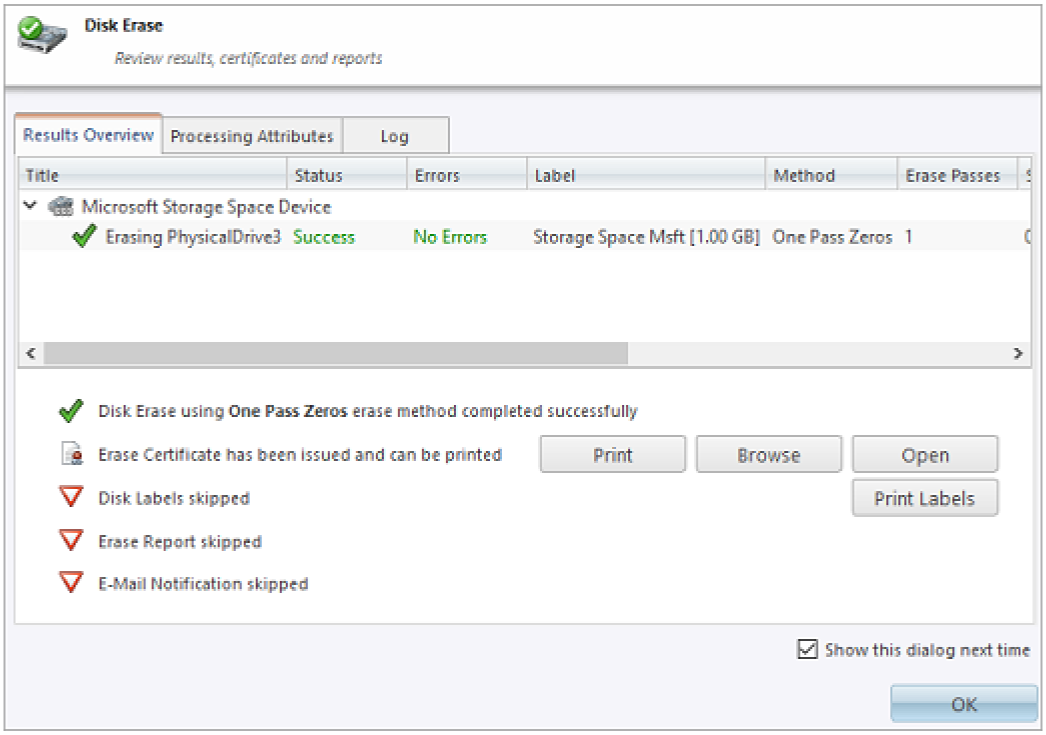
Disk Labels on page 49
XML Reports on page 53
Barcode on page 90

Disk Labels

Along with the PDF certificate **KillDisk** allows you to print Disk Labels to attach to the disks being erased. Disk Labels with erase status and essential disk information could be issued for any disk processing (such as Disk Erase Secure Erase Disk Examine Disk Clone Disk Wipe). These labels may be completely customizable to print on label tape or on sheet with any dimensions. Simply specify the parameters and **KillDisk** will prepare the printable labels for you.

Print Labels Option

Upon the completion of a major **KillDisk** operation you will see a report dialog. In the list of completed tasks you will see the **Print Labels** button. Click it to open the Print Labels Dialog.



Disk Erase

Review results, certificates and reports

Title	Status	Errors	Label	Method	Erase Passes
Microsoft Storage Space Device					
✓ Erasing PhysicalDrive3	Success	No Errors	Storage Space Msft [1.00 GB]	One Pass Zeros	1

✓ Disk Erase using **One Pass Zeros** erase method completed successfully

Erase Certificate has been issued and can be printed

▽ Disk Labels skipped

▽ Erase Report skipped

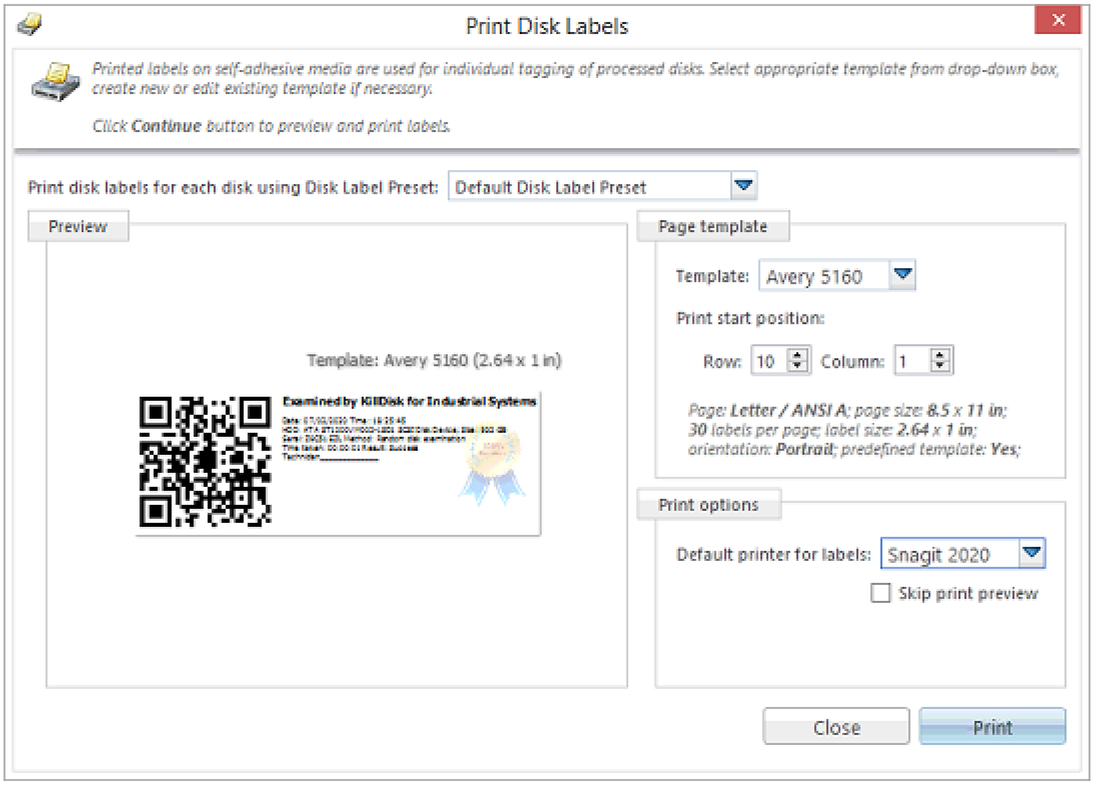
▽ E-Mail Notification skipped

☑ Show this dialog next time

Figure 48: Print Labels from Processing Summary

Print Labels Dialog

This dialog allows you to configure the labels and prepare them for printing. The top of the dialog shows a list of the drives that will have labels generated for them. At any point in the operation a sample of the label is shown in the **Preview** window on the left side. The right side of the dialog has the styling and template configuration options.



Print Disk Labels

Printed labels on self-adhesive media are used for individual tagging of processed disks. Select appropriate template from drop-down box, create new or edit existing template if necessary.

Click ***Continue*** *button to preview and print labels.*

Print disk labels for each disk using Disk Label Preset: Default Disk Label Preset

Template: Avery 5160 (2.64 x 1 in)

Examined by KillDisk for Industrial Systems

Date: [illegible] Time: [illegible]
HDD: [illegible]
Serial: [illegible] Method: [illegible]
Time taken: [illegible] Result: [illegible]
Technician:____________

Template: Avery 5160

Print start position:

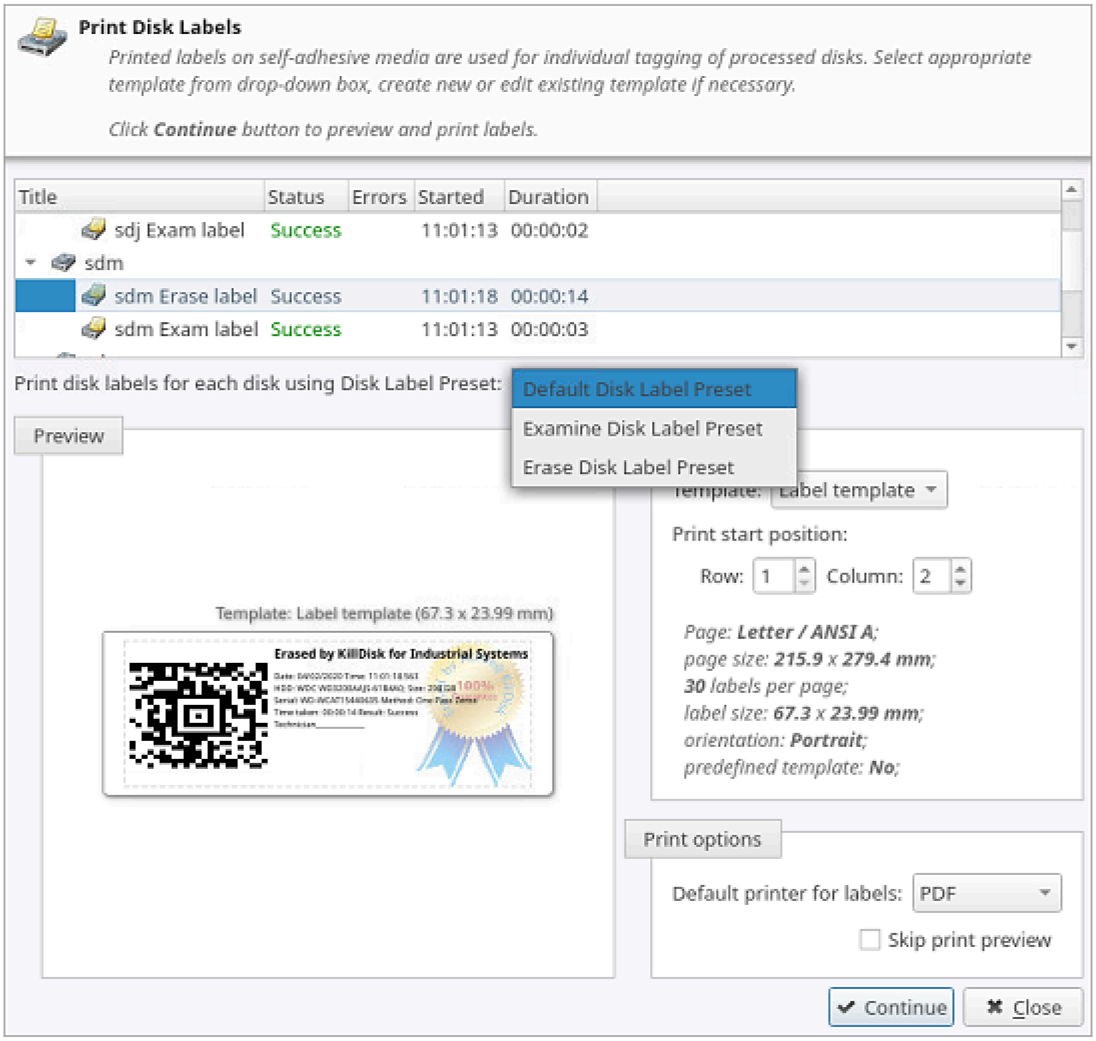
Row: 10 Column: 1

Page: ***Letter / ANSI A****; page size:* ***8.5*** *x* ***11 in****;*
30 *labels per page; label size:* ***2.64*** *x* ***1 in****;*
orientation: ***Portrait****; predefined template:* ***Yes****;*

Default printer for labels: Snagit 2020

□ Skip print preview

Figure 49: Print Labels Dialog



Print Disk Labels

Printed labels on self-adhesive media are used for individual tagging of processed disks. Select appropriate template from drop-down box, create new or edit existing template if necessary.

*Click **Continue** button to preview and print labels.*

Title	Status	Errors	Started	Duration
sdj Exam label	Success		11:01:13	00:00:02
sdm				
sdm Erase label	Success		11:01:18	00:00:14
sdm Exam label	Success		11:01:13	00:00:03

Print disk labels for each disk using Disk Label Preset: Default Disk Label Preset

Template: Label template

Print start position:

Row: 1 Column: 2

*Page: **Letter / ANSI A**;*
*page size: **215.9** x **279.4 mm**;*
***30** labels per page;*
*label size: **67.3** x **23.99 mm**;*
*orientation: **Portrait**;*
*predefined template: **No**;*

Default printer for labels: PDF

□ Skip print preview

Default Disk Label Preset
Examine Disk Label Preset
Erase Disk Label Preset
Preview
Template: Label template (67.3 x 23.99 mm)
Erased by KillDisk for Industrial Systems
Technician
100%
Print options
✔ Continue
✖ Close

Figure 50: Print Labels Dialog for Batch

Page template options

The print label dialog gives you an access to a number of predefined standard presets and custom templates you may create. These templates may be easily selected without opening any additional dialogs. All the details of the selected template will be displayed below the selection box.

Print start position

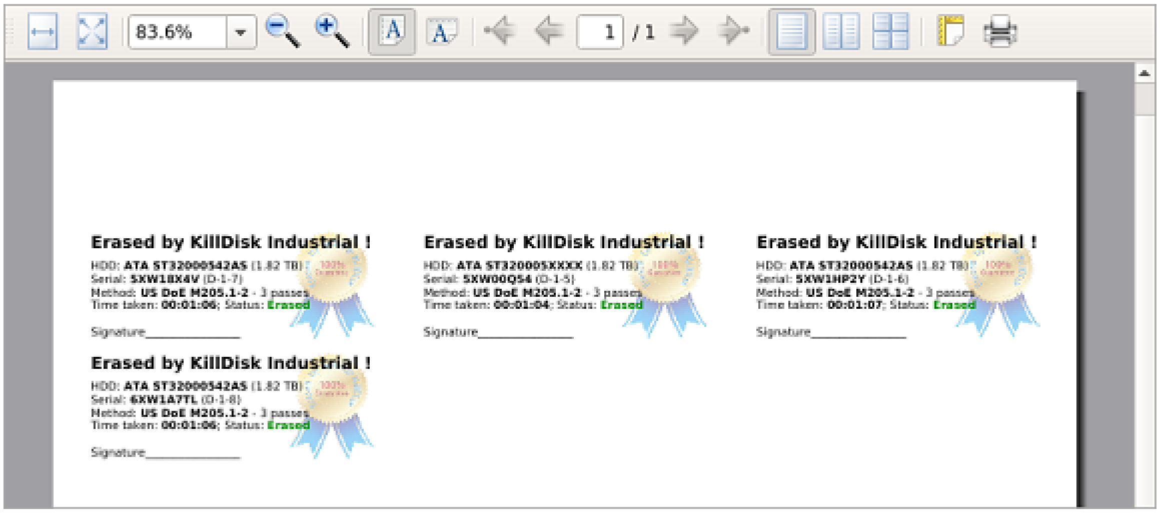
The print start position section of the dialogue allows you to select what label on the page start printing from. The labels won't always start from the 1x1 position so you can adjust this setting accordingly.

Print preview and actual printing

Once all the settings are configured you may see the Print Preview by clicking the **Continue** button. The Preview displays what the print is going to look like and from here the print job can be sent to a printer that is configured in the system .

Skip Print Preview

Disables system Print Preview dialog and prints labels immediately.



Erased by KillDisk Industrial !
HDD: **ATA ST32000542AS** (1.82 TB)
Serial: **5XW18X4V** (D-1-7)
Method: **US DoE M205.1-2** - 3 passes
Time taken: **00:01:06**; Status: **Erased**

Signature______________

Erased by KillDisk Industrial !
HDD: **ATA ST320005XXXX** (1.82 TB)
Serial: **5XW00Q54** (D-1-5)
Method: **US DoE M205.1-2** - 3 passes
Time taken: **00:01:04**; Status: **Erased**

Signature______________

Erased by KillDisk Industrial !
HDD: **ATA ST32000542AS** (1.82 TB)
Serial: **5XW1HP2Y** (D-1-6)
Method: **US DoE M205.1-2** - 3 passes
Time taken: **00:01:07**; Status: **Erased**

Signature______________

Erased by KillDisk Industrial !
HDD: **ATA ST32000542AS** (1.82 TB)
Serial: **6XW1A7TL** (D-1-8)
Method: **US DoE M205.1-2** - 3 passes
Time taken: **00:01:06**; Status: **Erased**

Signature______________

Figure 51: Example of Print Preview

Related information

Erase Certificates on page 43

Disk Label Presets on page 97

XML Reports

KillDisk gives you the option to store XML reports for any major operation it performs (Disk Erase Secure Erase Disk Examine Disk Clone and Disk Wipe) on a disk.

Configure Processing Report Preferences in order to get XML reports generated and saved to particular location.

These reports may include detailed information regarding erase processes, such as:

Company Information

- Name
- License
- Location
- Phone
- Disclaimer

Technician Information

- Name
- Comments

System & Hardware Info

- OS version
- Architecture
- Kernel
- Processors
- Manufacturer

Erase Attributes

- Erase Verify
- Passes
- Method
- Verification Passes

Error Handling Attributes

- Errors Terminate
- Skip Interval
- Number of Retries
- Source Lock
- Ignore Write Error
- Ignore Read Error
- Ignore Lock Error

Disks

- Device Size
- Device Type
- Serial Number
- Revision
- Product Number
- Name
- Geometric Information
- Partitioning Scheme

Batches

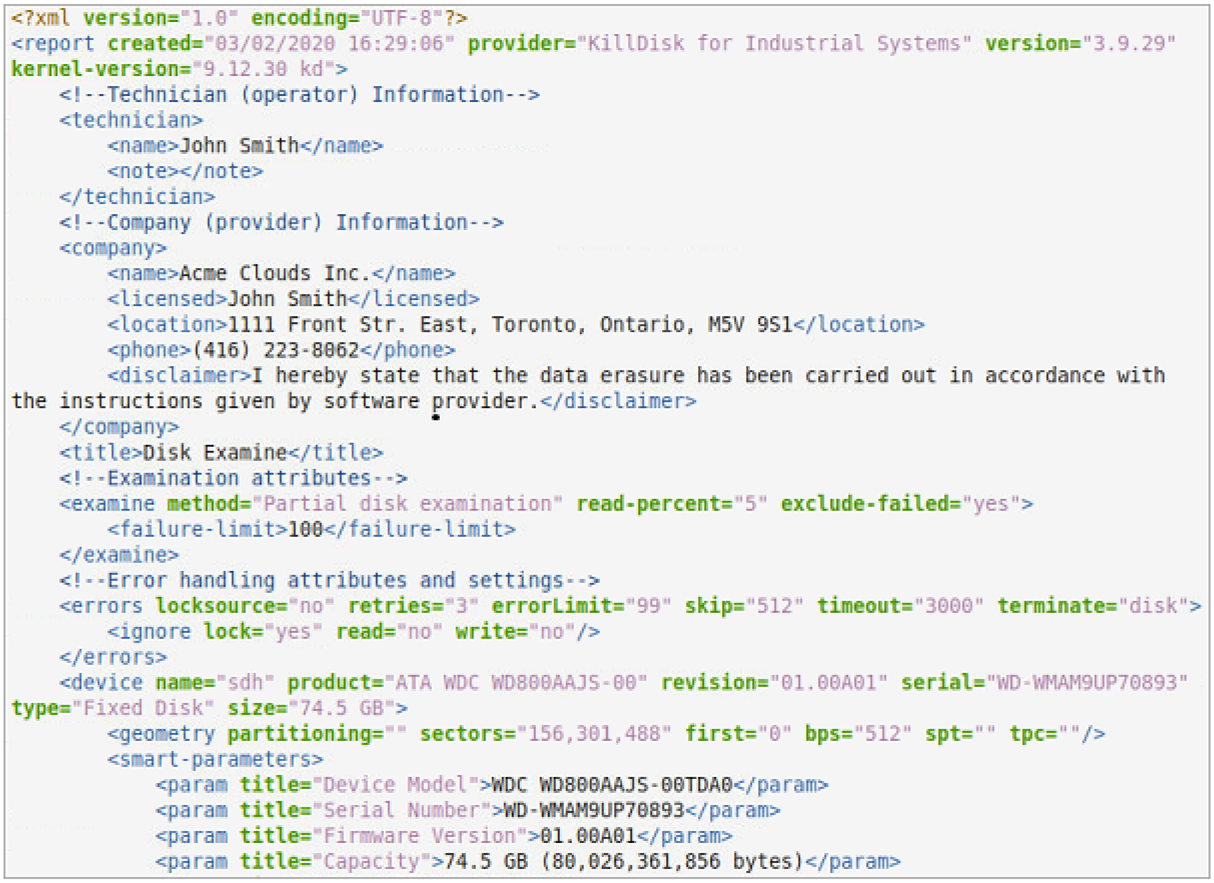
- Name
- Disks
- Time

Additional Attributes

- Fingerprint Information
- Initialization

Erase Result

- Bay
- Time and Date Started
- Disk Information
- Status
- Result
- Time Elapsed
- Errors
- Name of Operation



```
<?xml version="1.0" encoding="UTF-8"?>
<report created="03/02/2020 16:29:06" provider="KillDisk for Industrial Systems" version="3.9.29"
kernel-version="9.12.30 kd">
    <!--Technician (operator) Information-->
    <technician>
        <name>John Smith</name>
        <note></note>
    </technician>
    <!--Company (provider) Information-->
    <company>
        <name>Acme Clouds Inc.</name>
        <licensed>John Smith</licensed>
        <location>1111 Front Str. East, Toronto, Ontario, M5V 9S1</location>
        <phone>(416) 223-8062</phone>
        <disclaimer>I hereby state that the data erasure has been carried out in accordance with
the instructions given by software provider.</disclaimer>
    </company>
    <title>Disk Examine</title>
    <!--Examination attributes-->
    <examine method="Partial disk examination" read-percent="5" exclude-failed="yes">
        <failure-limit>100</failure-limit>
    </examine>
    <!--Error handling attributes and settings-->
    <errors locksource="no" retries="3" errorLimit="99" skip="512" timeout="3000" terminate="disk">
        <ignore lock="yes" read="no" write="no"/>
    </errors>
    <device name="sdh" product="ATA WDC WD800AAJS-00" revision="01.00A01" serial="WD-WMAM9UP70893"
type="Fixed Disk" size="74.5 GB">
        <geometry partitioning="" sectors="156,301,488" first="0" bps="512" spt="" tpc=""/>
        <smart-parameters>
            <param title="Device Model">WDC WD800AAJS-00TDA0</param>
            <param title="Serial Number">WD-WMAM9UP70893</param>
            <param title="Firmware Version">01.00A01</param>
            <param title="Capacity">74.5 GB (80,026,361,856 bytes)</param>
```

Figure 52: XML Report Sample

Operating Modes

KillDisk Industrial has advanced operating modes to simplify product usage in the industrial environment. Compact modes are the most suitable solution for operating industrial touch screen monitors having low resolutions, like 800x600 or 1024x768 pixels.

There are two compact modes available:

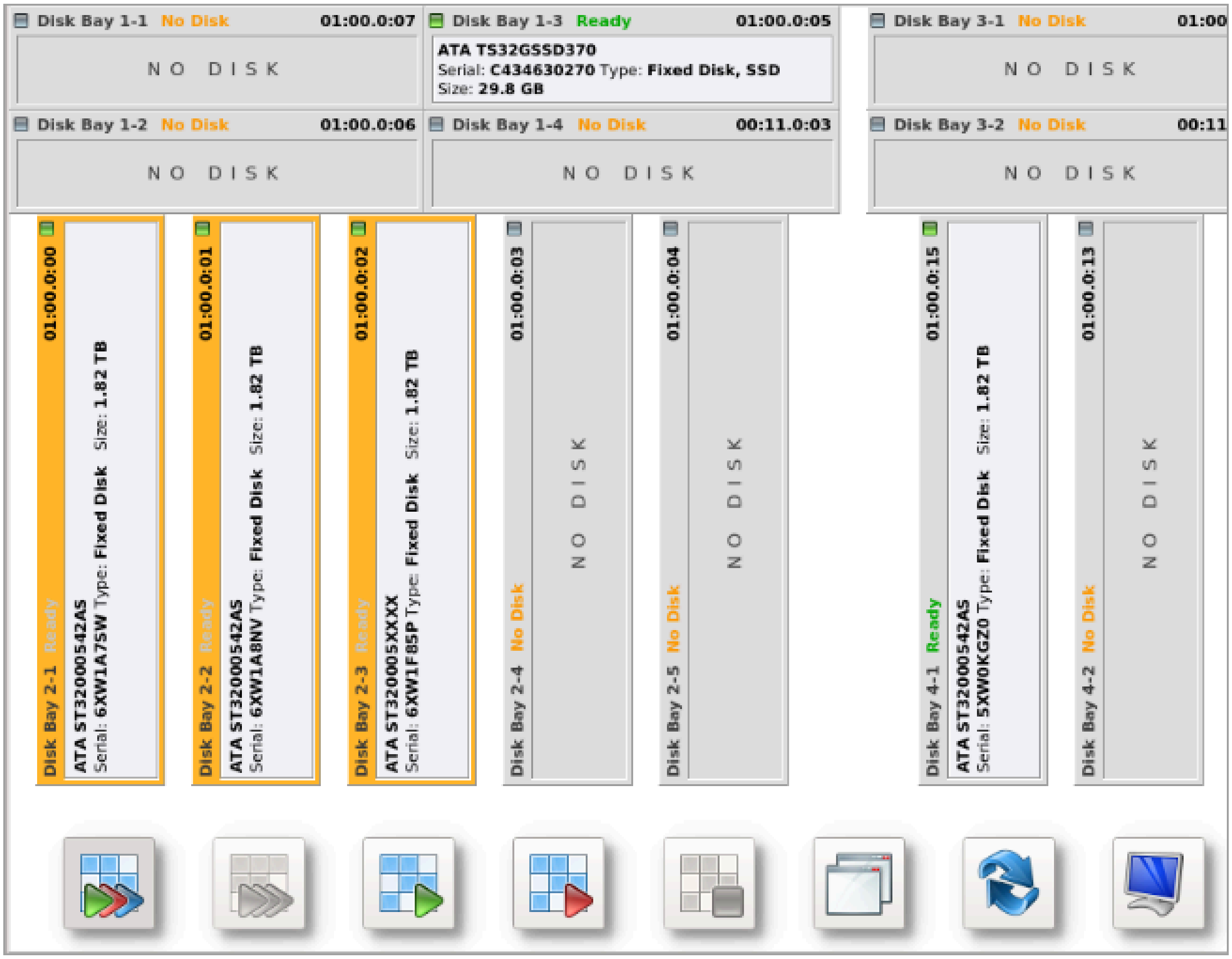
- **Touch Mode** - designed to support industrial grade compact touch-screen monitors. It does not support mouse operations.
- **Kiosk Mode** - works similar to previous one, but also supports mouse and designed to support commercial grade monitors. It attempts to show as many Disk Bays as possible at once, simplifying visual control and ongoing processes for operator. Additionally user can run Batches, view Event Journal and use other tools.

Touch Mode & Kiosk Mode

Compact operating modes added to simplify routing tasks. In these modes user have an access only to the features being used most frequently.

To switch to compact mode, select **Kiosk Mode** (or **Touch Mode** depending on the product) from the **View** menu. Also, you can press **Ctrl+T** to switch to and return back from compact mode.

All menus, tool bars and other supplementary windows, like Properties and Output are hidden while operating in compact mode. Access to most important commands provided through the expandable floating menu at the bottom left corner.


Disk Bay 1-1 No Disk 01:00.0:07
NO DISK
Disk Bay 1-3 Ready 01:00.0:05
ATA TS32GSSD370
Serial: C434630270 Type: Fixed Disk, SSD
Size: 29.8 GB
Disk Bay 3-1 No Disk 01:00
NO DISK
Disk Bay 1-2 No Disk 01:00.0:06
NO DISK
Disk Bay 1-4 No Disk 00:11.0:03
NO DISK
Disk Bay 3-2 No Disk 00:11
NO DISK
Disk Bay 2-1 Ready 01:00.0:00
ATA ST32000542AS
Serial: 6XW1A75W Type: Fixed Disk Size: 1.82 TB
Disk Bay 2-2 Ready 01:00.0:01
ATA ST32000542AS
Serial: 6XW1A8NV Type: Fixed Disk Size: 1.82 TB
Disk Bay 2-3 Ready 01:00.0:02
ATA ST32000SXXXX
Serial: 6XW1F85P Type: Fixed Disk Size: 1.82 TB
Disk Bay 2-4 No Disk 01:00.0:03
NO DISK
Disk Bay 2-5 No Disk 01:00.0:04
NO DISK
Disk Bay 4-1 Ready 01:00.0:15
ATA ST32000542AS
Serial: 5XW0KGZ0 Type: Fixed Disk Size: 1.82 TB
Disk Bay 4-2 No Disk 01:00.0:13
NO DISK

To switch from compact mode back to windowed operating mode press **Ctrl+T** or click the most right button (blue computer monitor) at the bottom.

Helper Features

KillDisk has a number of extra features to ensure the most complete sanitation operations, flexibility to meet the most strict requirements and compatibility with a wide range of systems. This section outlines these features.

Map Network Shares

This feature creates a specific local drive letter for remote locations to save logs and certificates to, as well as provides a central location for erase reports to be stored.

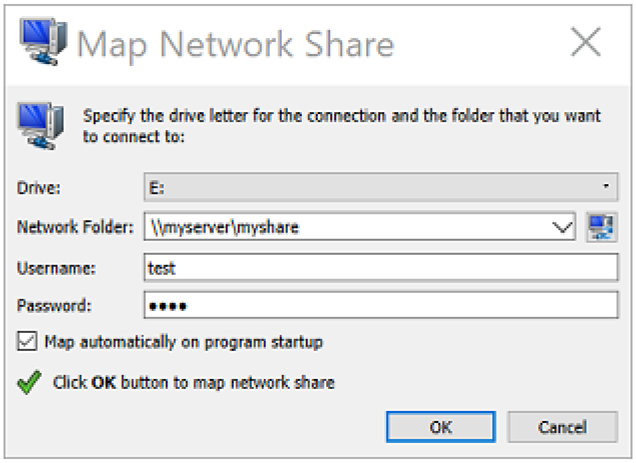
To map a network share:

1. Open Mapping Dialog

   Navigate to **File > Map Network Share...** from the main menu.

2. Configure Mapping

   Assign a drive letter, type a network folder location or click **Browse** button to browse local network and select a proper network share. If sharing policy requires, type user name and password:



Specify the drive letter for the connection and the folder that you want to connect to:

Drive: E:

Network Folder: \\myserver\myshare

Username: test

Password: ••••

☑ Map automatically on program startup

✓ Click **OK** button to map network share

Figure 53: Mapping a Network Drive

   If you want to save configured mapping for future use, make sure **Map automatically on program start up** is marked.

   Note:

   KillDisk will identify all connected network drives, so you may use the drop-down list to select the one you'd like to use

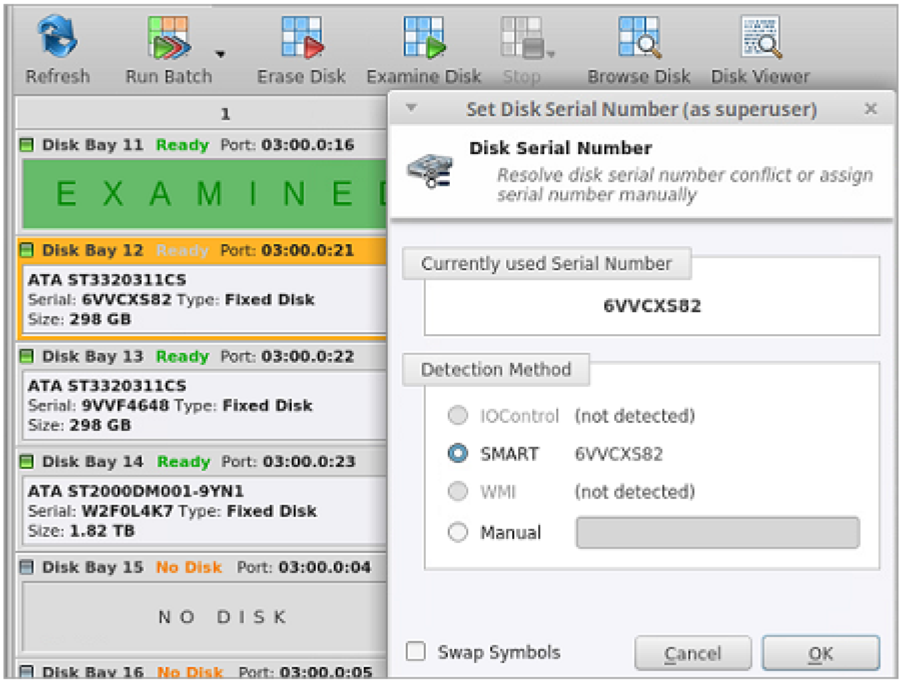
3. Attach a Network Share

   Click **OK** to attach a network share mapped to the local drive letter.

After your network drive is configured, you may select it as a destination for certificates and reports in Preferences.

Set Disk Serial Number

If you notice that disk serial number displayed in **KillDisk** does not match the number displayed on the label attached to the physical disk, **KillDisk** let you option to change it manually. To access this feature right-click the disk and select **Set Serial Number** from the context menu.


Refresh
Run Batch
Erase Disk
Examine Disk
Stop
Browse Disk
Disk Viewer
1
Disk Bay 11 Ready Port: 03:00.0:16
EXAMINE
Disk Bay 12 Ready Port: 03:00.0:21
ATA ST3320311CS
Serial: 6VVCXS82 Type: Fixed Disk
Size: 298 GB
Disk Bay 13 Ready Port: 03:00.0:22
ATA ST3320311CS
Serial: 9VVF4648 Type: Fixed Disk
Size: 298 GB
Disk Bay 14 Ready Port: 03:00.0:23
ATA ST2000DM001-9YN1
Serial: W2F0L4K7 Type: Fixed Disk
Size: 1.82 TB
Disk Bay 15 No Disk Port: 03:00.0:04
NO DISK
Disk Bay 16 No Disk Port: 03:00.0:05

Set Disk Serial Number (as superuser)

Disk Serial Number

Resolve disk serial number conflict or assign serial number manually

Currently used Serial Number: 6VVCXS82

Detection Method

○ IOControl (not detected)
● SMART 6VVCXS82
○ WMI (not detected)
○ Manual

□ Swap Symbols

Cancel OK

Figure 54: Set Disk Serial Number

There are several methods of disk serial number detection, application pulls it from various sources: **IOControl**, **SMART** and **WMI** (some of them can be disabled and grayed out, depending on Operating System support). Click the different options to apply different serial number detection method for the particular disk. Default serial number detection method applied to all disks can be set up in Preferences.

Note:

If you don't see your serial number in any of the detection methods try marking the **Swap Symbols** check box. If this doesn't help you can input disk serial number manually to be printed on certificates properly (ultimate option).

Reset Hidden Areas

KillDisk is able to perform erasing of a disk's hidden zones: **HPA** and **DCO**.

To perform this task, right click on the disk and select **Reset Hidden Areas** from the context menu:

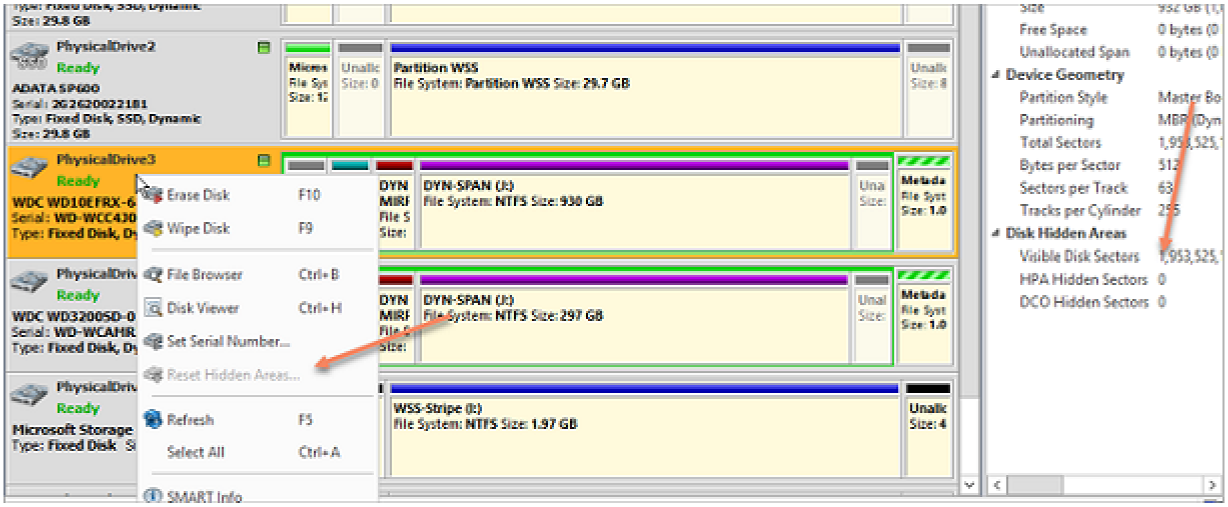


Figure 55: Disk Hidden Areas Reset

When related context menu item is disabled, this means that there are no hidden areas on the disk has been detected, so nothing to reset for the particular disk.

Related information

Disk Hidden Zones on page 125

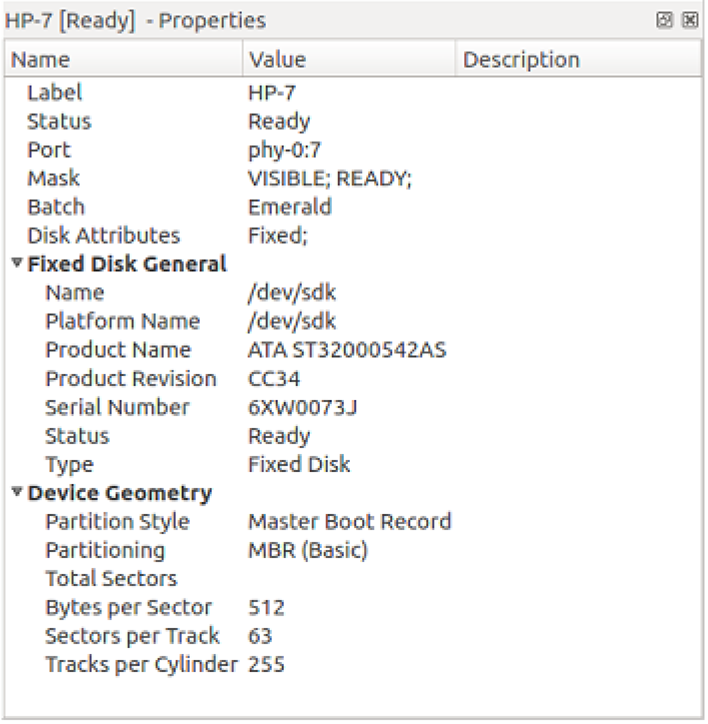
Property Views

To show detailed information about any subject of an application (such as disk, partition, volume, file etc.) **KillDisk** uses information views. When displayed these views show information about the object being selected in the Disk Explorer. If selected object is changed, displayed information refreshes.

Property View

To open Property View for selected item do one of the following:

- Click **View** > **Windows** > **Properties** from the main menu
- Press **F4** (keyboard shortcut)
- Click **Properties** command from object's context menu



HP-7 [Ready] - Properties

Name	Value	Description
Label	HP-7	
Status	Ready	
Port	phy-0:7	
Mask	VISIBLE; READY;	
Batch	Emerald	
Disk Attributes	Fixed;	
▾ **Fixed Disk General**		
Name	/dev/sdk	
Platform Name	/dev/sdk	
Product Name	ATA ST32000542AS	
Product Revision	CC34	
Serial Number	6XW0073J	
Status	Ready	
Type	Fixed Disk	
▾ **Device Geometry**		
Partition Style	Master Boot Record	
Partitioning	MBR (Basic)	
Total Sectors		
Bytes per Sector	512	
Sectors per Track	63	
Tracks per Cylinder	255	

Figure 56: Property View Example

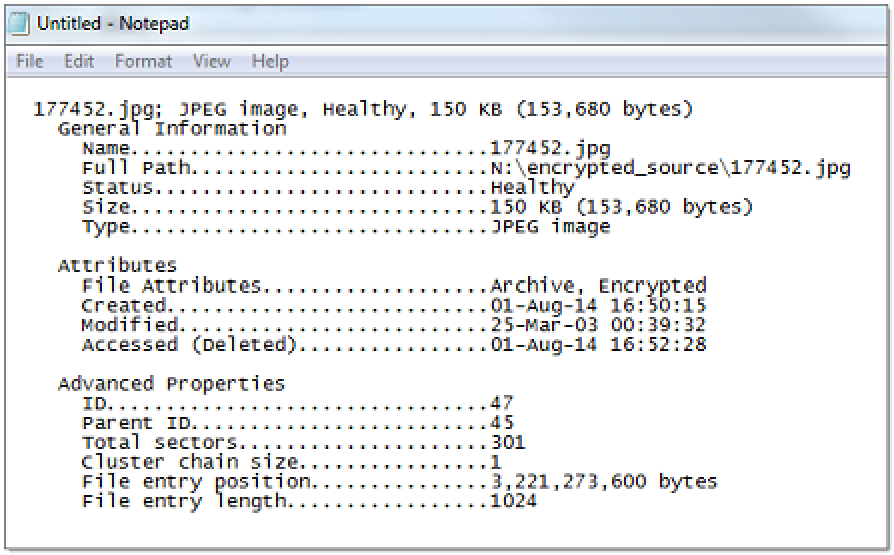
Besides displaying a valuable data it also allows you to copy that information into a clipboard by using context menu commands.

Context menu commands:

Copy Value
Copy Value of selected field to the clipboard (value only)

Copy Field
Copy formatted Name and Value pair to the clipboard

Copy All
Copy all information as formatted set of Name and Value pairs



```
177452.jpg; JPEG image, Healthy, 150 KB (153,680 bytes)
  General Information
    Name..............................177452.jpg
    Full Path.........................N:\encrypted_source\177452.jpg
    Status............................Healthy
    Size..............................150 KB (153,680 bytes)
    Type..............................JPEG image

  Attributes
    File Attributes...................Archive, Encrypted
    Created...........................01-Aug-14 16:50:15
    Modified..........................25-Mar-03 00:39:32
    Accessed (Deleted)................01-Aug-14 16:52:28

  Advanced Properties
    ID................................47
    Parent ID.........................45
    Total sectors.....................301
    Cluster chain size................1
    File entry position...............3,221,273,600 bytes
    File entry length.................1024
```

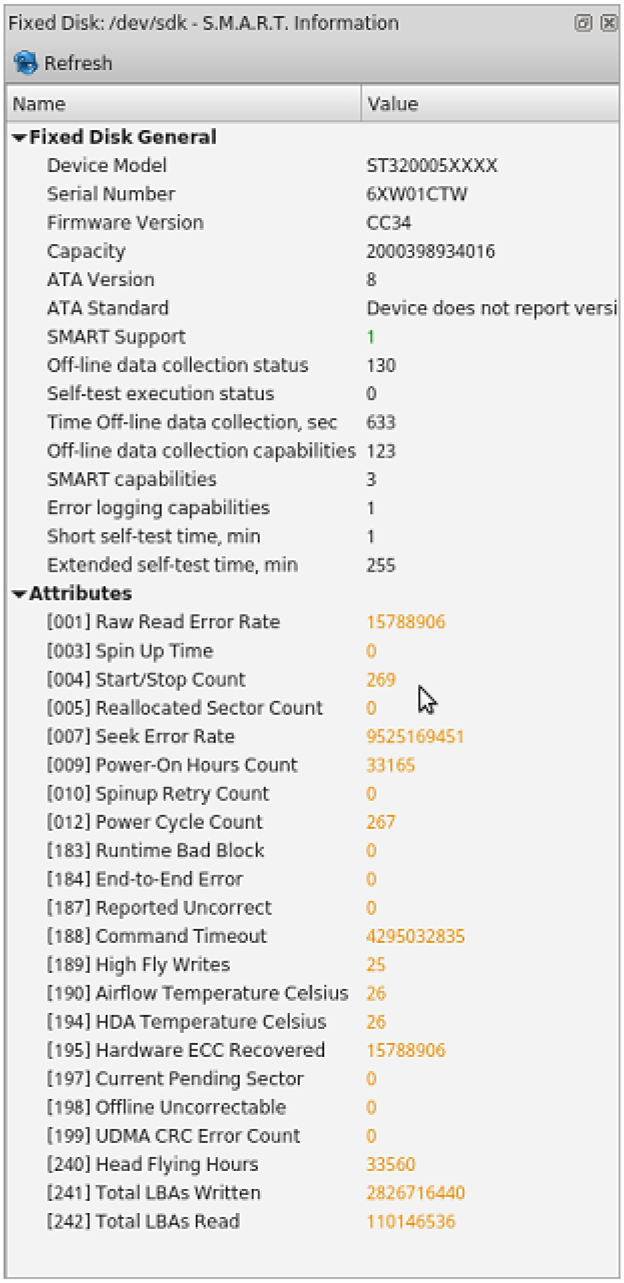
Figure 57: Copied Information Example

S.M.A.R.T. Information

Another informational view displays S.M.A.R.T. (Self Monitoring, Analysis and Reporting Technology) data for the selected disk (if the device supports it).

To show this view do one of the following:

- Click **View** > **Windows** > **SMART Info** from the main menu
- Use **SMART Info** context menu command for the selected disk



Name	Value
Fixed Disk General	
Device Model	ST320005XXXX
Serial Number	6XW01CTW
Firmware Version	CC34
Capacity	2000398934016
ATA Version	8
ATA Standard	Device does not report versi
SMART Support	1
Off-line data collection status	130
Self-test execution status	0
Time Off-line data collection, sec	633
Off-line data collection capabilities	123
SMART capabilities	3
Error logging capabilities	1
Short self-test time, min	1
Extended self-test time, min	255
Attributes	
[001] Raw Read Error Rate	15788906
[003] Spin Up Time	0
[004] Start/Stop Count	269
[005] Reallocated Sector Count	0
[007] Seek Error Rate	9525169451
[009] Power-On Hours Count	33165
[010] Spinup Retry Count	0
[012] Power Cycle Count	267
[183] Runtime Bad Block	0
[184] End-to-End Error	0
[187] Reported Uncorrect	0
[188] Command Timeout	4295032835
[189] High Fly Writes	25
[190] Airflow Temperature Celsius	26
[194] HDA Temperature Celsius	26
[195] Hardware ECC Recovered	15788906
[197] Current Pending Sector	0
[198] Offline Uncorrectable	0
[199] UDMA CRC Error Count	0
[240] Head Flying Hours	33560
[241] Total LBAs Written	2826716440
[242] Total LBAs Read	110146536

Figure 58: SMART Information View Example

S.M.A.R.T. data can be used to detect problem disks as long as important disk information has been reflected such as Power-on Hours, Reallocated Sectors and Current Pending Sectors.

Note:

When Current Pending Sectors parameter differs from zero, this means the disk has bad sectors. It will cause problems in the future. Dispose these disks as soon as possible.

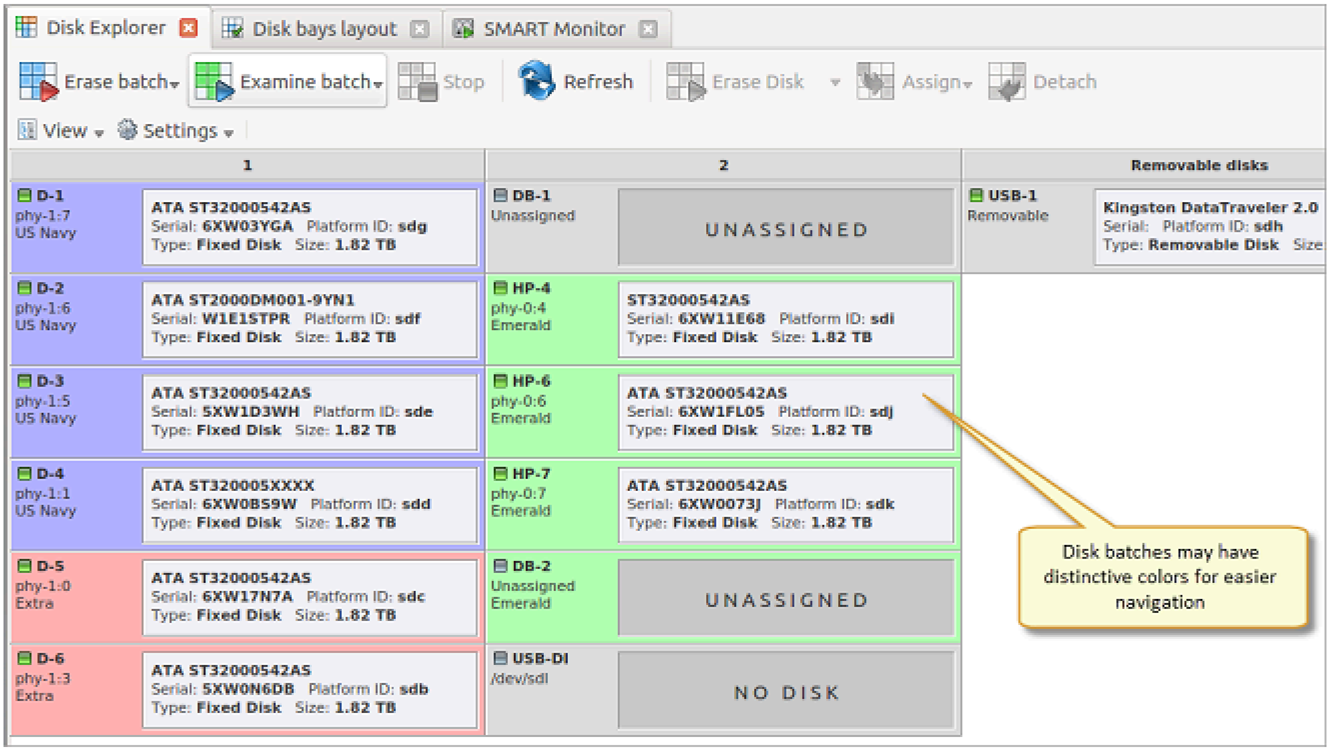
Related information

S.M.A.R.T Monitor on page 75

Preferences on page 79

Disk Batches

Disk Batches needed to organize Disk Bays into groups depending on work orders, disk types or the desired operation to be performed: **Examine**, **Erase**, **Clone** and combinations. Disk Bays can be added or removed from the Batch at any time.



1		2		Removable disks	
D-1 phy-1:7 US Navy	ATA ST32000542AS Serial: 6XW03YGA Platform ID: sdg Type: Fixed Disk Size: 1.82 TB	DB-1 Unassigned	UNASSIGNED	USB-1 Removable	Kingston DataTraveler 2.0 Serial: Platform ID: sdh Type: Removable Disk Size
D-2 phy-1:6 US Navy	ATA ST2000DM001-9YN1 Serial: W1E1STPR Platform ID: sdf Type: Fixed Disk Size: 1.82 TB	HP-4 phy-0:4 Emerald	ST32000542AS Serial: 6XW11E68 Platform ID: sdi Type: Fixed Disk Size: 1.82 TB		
D-3 phy-1:5 US Navy	ATA ST32000542AS Serial: 5XW1D3WH Platform ID: sde Type: Fixed Disk Size: 1.82 TB	HP-6 phy-0:6 Emerald	ATA ST32000542AS Serial: 6XW1FL05 Platform ID: sdj Type: Fixed Disk Size: 1.82 TB		
D-4 phy-1:1 US Navy	ATA ST320005XXXX Serial: 6XW0BS9W Platform ID: sdd Type: Fixed Disk Size: 1.82 TB	HP-7 phy-0:7 Emerald	ATA ST32000542AS Serial: 6XW0073J Platform ID: sdk Type: Fixed Disk Size: 1.82 TB		
D-5 phy-1:0 Extra	ATA ST32000542AS Serial: 6XW17N7A Platform ID: sdc Type: Fixed Disk Size: 1.82 TB	DB-2 Unassigned Emerald	UNASSIGNED		
D-6 phy-1:3 Extra	ATA ST32000542AS Serial: 5XW0N6DB Platform ID: sdb Type: Fixed Disk Size: 1.82 TB	USB-DI /dev/sdl	NO DISK		

Disk batches may have distinctive colors for easier navigation

Figure 59: Colored Disk Batches

Once disks are batched together they may be treated as a group and similar settings applied for the group. Likewise, operations may be performed on these batches - initiating any operation on a batch performs the operation on all the disks in the batch.

Related tasks

Assign Disk Bays on page 64

Related information

Manage Batches on page 62

Batch Editor on page 64

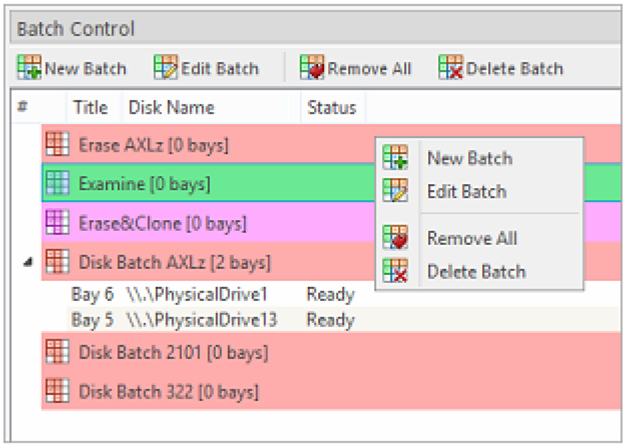
Manage Batches

Create a Disk Batch

Disk Batches can be created using the Batch Control toolbox. This toolbox is accessible only in Disk Bays view.

Note:

If you can't find the Batch Control toolbox make sure that you have a proper View activated. To do this, switch to Disk Bays view and navigate to the file menu bar and click **View** > **Windows** > **Batch Control**.



#	Title	Disk Name	Status
	Erase AXLz [0 bays]		
	Examine [0 bays]		
	Erase&Clone [0 bays]		
	Disk Batch AXLz [2 bays]		
	Bay 6	\\.\PhysicalDrive1	Ready
	Bay 5	\\.\PhysicalDrive13	Ready
	Disk Batch 2101 [0 bays]		
	Disk Batch 322 [0 bays]		

Figure 60: Batch Control Toolbox

In the Batch Control toolbox click **New Batch**. This will open the Create a New Batch configuration wizard. Follow wizard steps and configure Batch settings and click **Finish**. New Batch will appear in the Batch Control toolbox.

Add Disks to a Batch

Disk Bays can be added to Batch in several ways:

- From Disk Bays view
- From **Edit** menu

Read Assign Disk Bays for more information.

Remove Disks from a Batch

Disk Bays can be removed from a Batch in a very similar way to the way they are attached. Select Disk Bays that are attached to batches and choose the **Detach Bays** command from the context menu.

Delete Disk Batches

Disk Batches can be easily deleted. Select the batch in the Batch Control toolbar and choose **Delete Batch** or **Remove All** toolbar commands.

Edit Batch Attributes

Batch attributes can be edited at any time after batch has been created, with one exception: when Disk Batch is running, no editing attributes is allowed.

See: Batch Editor on page 64.

Note:

Disk batch attributes change every time if altered in Edit Disk Batch dialog.

Related tasks

Assign Disk Bays on page 64

Related information

Disk Batches on page 62

Batch Editor on page 64

Assign Disk Bays

Disk Bays can be assigned to existing Batches in order to apply same batch attributes for common tasks (disk erase, wipe, clone, etc).

Note:

Particular Disk Bay can only belong to the single Batch.

Disk Bays can be assigned to Batches :

1. Select disk(s)

   In the Disk Bays view select the disk or group of disks that you'd like to add to a Batch.
2. Open menu

   Click **Edit** menu or right-click the disk to open a context menu . Hover the **Assign Bays to** option to see a list of available Batches.
3. Select target batch

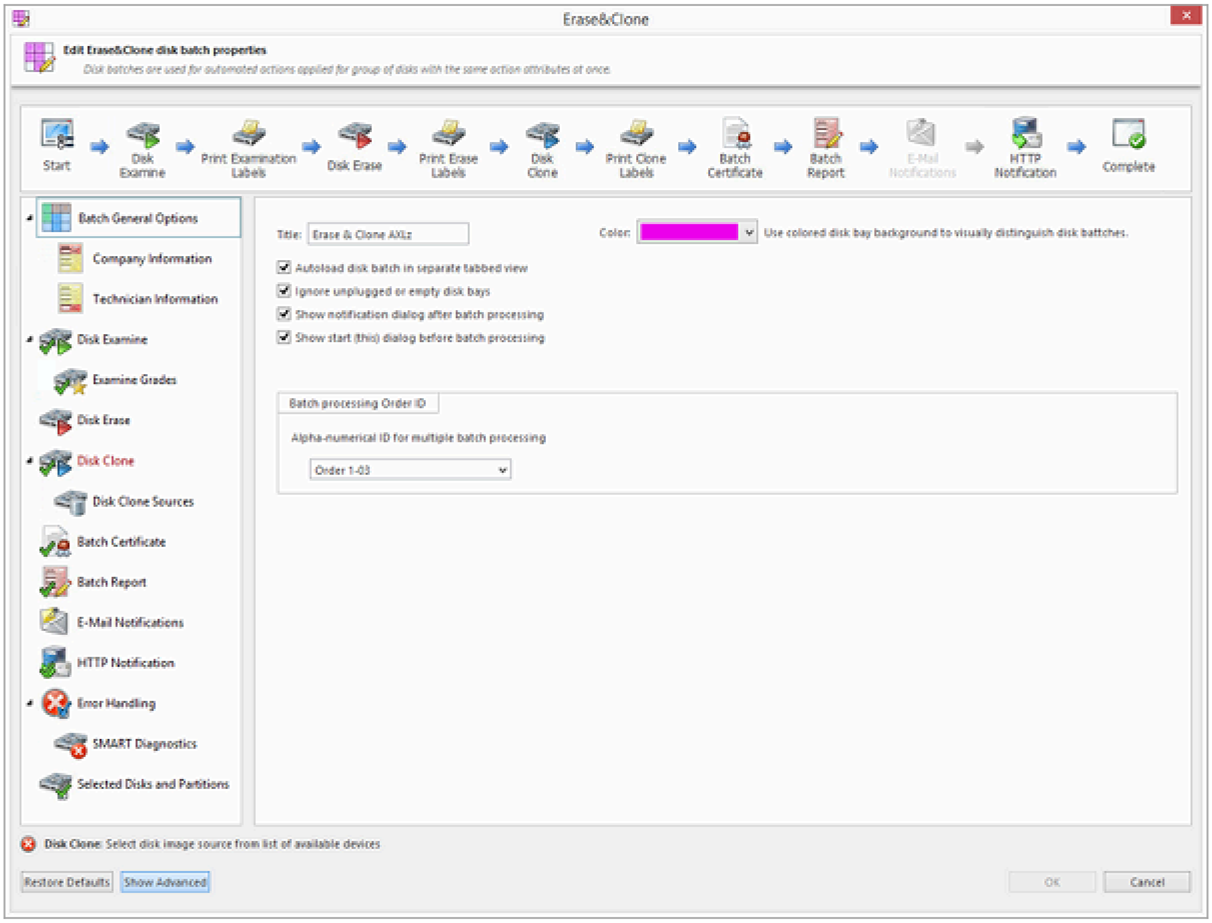
   Select desired Batch from the list to assign the selected disk(s) into.

Batch Editor

After a new Disk Batch has been created, Edit Batch dialog can display Batch settings and let user change it. To access this dialog, select existing Batch in the Batch Control toolbox and click **Edit Batch** toolbar button. Edit Batch dialog has several tabs, some of them can be inactive or hidden depending on tasks selected. For example, if Examine step is configured when Erase Batch was created then Disk Examine tab will be visible and accessible.

General Settings

Batch General Settings configure parameters, such as Title, Color, Order ID, how the Batch is displayed etc.



Edit Erase&Clone disk batch properties

Disk batches are used for automated actions applied for group of disks with the same action attributes at once.

Title: Erase & Clone AXLz

Color: Use colored disk bay background to visually distinguish disk batches.

☑ Autoload disk batch in separate tabbed view

☑ Ignore unplugged or empty disk bays

☑ Show notification dialog after batch processing

☑ Show start (this) dialog before batch processing

Batch processing Order ID

Alpha-numerical ID for multiple batch processing

Order 1-03

Disk Clone: Select disk image source from list of available devices

Figure 61: Batch Editor - General Settings

Company Information

These settings allow user to configure Company Information for Erase Certificates and Batch Processing Reports.

It is the same dialog as application's **Preferences** > **Company Information**.

Technician Information

These settings allows user to configure Technician Information for Erase Certificates and Batch Processing Reports.

It is the same dialog as application's **Preferences** > **Technician Information**.

Disk Examine

These settings configure disk examine settings for the Batch. Type of examination and Disk Label presets can be selected here. Examine grade colors can be individually configured by clicking **Examine Grades** button.

Read Disk Examine on page 85 for description of each attribute.

Disk Erase

These settings configure disk erase settings for the Batch. Erase methods, verification and report settings can be changed here.

Read Disk Erase on page 82 for description of each attribute.

Disk Wipe

These settings configure disk wipe settings for the Batch. Wipe methods, verification and report settings can be changed here.

Read Disk Wipe on page 84 for description of each attribute.

Disk Clone

This feature allows user to configure either a disk or disk image for cloning to all the disks in the batch. This option is available for Erase Batches with examined disks only.

Read Clone Sources on page 87 for description of each attribute.

Batch Certificate

These settings give you the option to issue or not an erasure certificate upon erase and configure the options to include (like a name, destination, details and comments etc.). Options for printing and issuing individual certificates for the particular disk in the Batch can be configured.

Read Erase Certificate on page 88 for description of each attribute.

Batch Report

These settings give user an option to issue or not an erasure XML report upon erase and configure the options to include (like a name, destination, S.M.A.R.T. details etc.). Options for issuing individual XML reports for the particular disks in the batch can be configured.

Read Processing Report on page 93 for description of each attribute.

Email Notifications

User can turn on email notifications for Batch operations and attach a Certificate, XML Report and Erase Log to the email.

Read E-mail Notifications on page 103 for description of each attribute and SMTP settings configuration.

HTTP Notifications

User can turn on HTTP notifications for Batch operations.

Read HTTP Notifications on page 105 and specify server address, port and parameters (name tags) in the URL field.

Disk Labels

User can turn on displaying and printing disk labels after Batch completion, as well as configuring a default printer and customizing label templates.

Read Disk Label Presets on page 97 for description of each attribute.

Error Handling

For each Batch error handling attributes can be set individually. S.M.A.R.T. attributes may also be configured in error handling via **SMART Diagnostics** button.

Read Error Handling on page 102 for description of each attribute.

Related information

Disk Batches on page 62

Manage Batches on page 62

Advanced Tools

KillDisk offers a number of advanced tools to work in conjunction with the software to make operations easier to perform and the disks easier to explore. **KillDisk** makes it possible to explore disks both on a file level (in file Browser) and on a low level (in Hexadecimal Viewer). Disk health analysis can be performed with S.M.A.R.T. monitor. Logs and reports export to the external SQL databases is fully supported in **KillDisk Industrial** version.

This section describes these features:

- File Browser
- Hexadecimal Viewer
- SMART monitor
- Event Journal on page 76
- Journal Export on page 78

File Browser

KillDisk includes a built-in File Browser to examine disks' surface for verification purposes, for proper disk selection for the erase, and for deleted files validation after wipe. File Browser is able to preview volumes and display files and folders located on all existing file systems used in Windows, Linux, Unix or Mac OS.

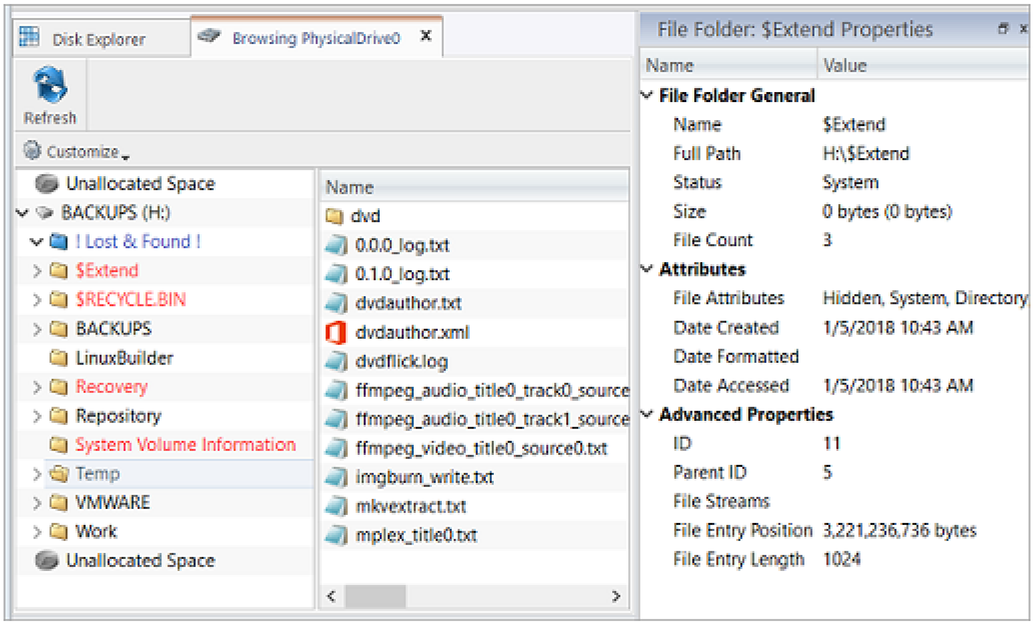
Note:

KillDisk detects existing files as well as files that have been deleted but NOT sanitized. They appear in Gray color and indicate deleted files with a high probability of being recovered with a special file recovery tools.

Browse Disk View

To browse the contents of a specific disk from the Disk Bay Layout View simply select the desired disk and click **Browse Disk** on the action toolbar or select the related command from the context menu.

Another way is to use a keyboard shortcut which is **Ctrl-B**. This will open the File Browser window:



File Folder: $Extend Properties

Name	Value
File Folder General	
Name	$Extend
Full Path	H:\$Extend
Status	System
Size	0 bytes (0 bytes)
File Count	3
Attributes	
File Attributes	Hidden, System, Directory
Date Created	1/5/2018 10:43 AM
Date Formatted	
Date Accessed	1/5/2018 10:43 AM
Advanced Properties	
ID	11
Parent ID	5
File Streams	
File Entry Position	3,221,236,736 bytes
File Entry Length	1024

Figure 62: File Browser Window

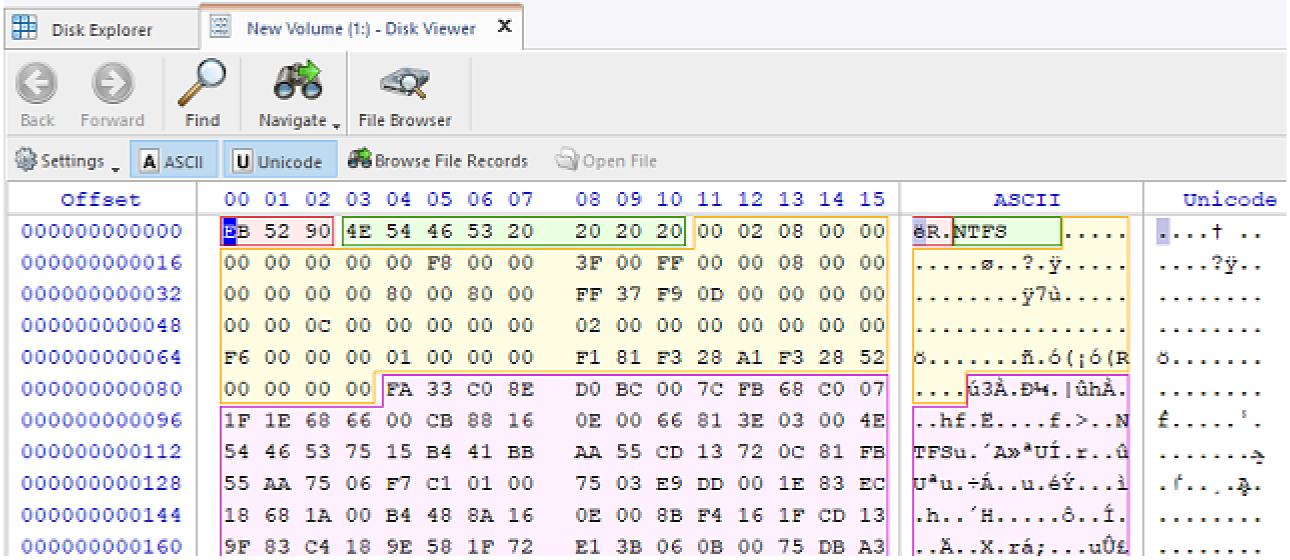
The File Browser tab displays files and folders on the disk being selected. Browsing over the folders tree performed the same way as in Windows Explorer.

Note:

Found deleted files appear in their original directory (before they were deleted). The **! Lost & Found !** folder is a virtual directory created for deleted files which are found without directory information.

Disk Viewer

Disk Viewer allows users to view the contents of connected drives on a sector's level in a hexadecimal, ASCII and Unicode representations. Disk Viewer for the selected disk can be launched from the main view as well as through the main menu bar. Shortcut is **Ctrl-H** .

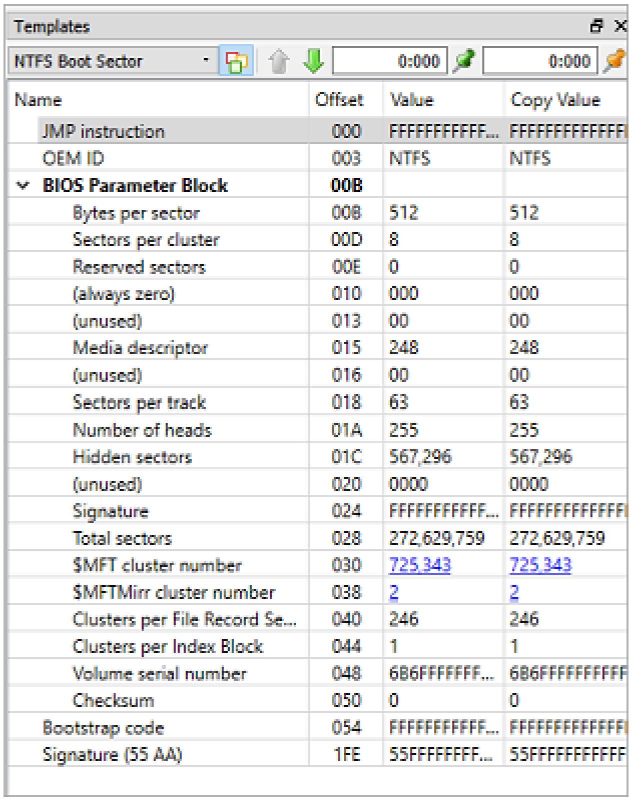


```
    Offset      00 01 02 03 04 05 06 07   08 09 10 11 12 13 14 15        ASCII           Unicode
000000000000    EB 52 90 4E 54 46 53 20   20 20 20 00 02 08 00 00   ëR.NTFS     .....    ....† ..
000000000016    00 00 00 00 00 F8 00 00   3F 00 FF 00 00 08 00 00   .....ø..?.ÿ.....    ....?ÿ..
000000000032    00 00 00 00 80 00 80 00   FF 37 F9 0D 00 00 00 00   ........ÿ7ù.....    ........
000000000048    00 00 0C 00 00 00 00 00   02 00 00 00 00 00 00 00   ................    ........
000000000064    F6 00 00 00 01 00 00 00   F1 81 F3 28 A1 F3 28 52   ö.......ñ.ó(¡ó(R    ö.......
000000000080    00 00 00 00 FA 33 C0 8E   D0 BC 00 7C FB 68 C0 07   ....ú3À.Ð¼.|ûhÀ.    ........
000000000096    1F 1E 68 66 00 CB 88 16   0E 00 66 81 3E 03 00 4E   ..hf.Ë....f.>..N    ....... .
000000000112    54 46 53 75 15 B4 41 BB   AA 55 CD 13 72 0C 81 FB   TFSu.´A»ªUÍ.r..û    ........
000000000128    55 AA 75 06 F7 C1 01 00   75 03 E9 DD 00 1E 83 EC   Uªu.÷Á..u.éÝ...ì    ........
000000000144    18 68 1A 00 B4 48 8A 16   0E 00 8B F4 16 1F CD 13   .h..´H.....ô..Í.    ........
000000000160    9F 83 C4 18 9E 58 1F 72   E1 3B 06 0B 00 75 DB A3   ..Ä..X.rá;...uÛ£    ........
```

Figure 63: NTFS Volume in Disk Viewer

Templates

KillDisk also offers a list of templates to help display volume structure on the disk by colored sections. Example above displays what happens when NTFS volume is opened in the Disk Viewer. In this case NTFS Boot Sector template has been attached automatically. Below is NTFS Boot Sector template details in Templates view.



Name	Offset	Value	Copy Value
JMP instruction	000	FFFFFFFFFFF...	FFFFFFFFFFFFF
OEM ID	003	NTFS	NTFS
BIOS Parameter Block	**00B**		
Bytes per sector	00B	512	512
Sectors per cluster	00D	8	8
Reserved sectors	00E	0	0
(always zero)	010	000	000
(unused)	013	00	00
Media descriptor	015	248	248
(unused)	016	00	00
Sectors per track	018	63	63
Number of heads	01A	255	255
Hidden sectors	01C	567,296	567,296
(unused)	020	0000	0000
Signature	024	FFFFFFFFFFF...	FFFFFFFFFFFFF
Total sectors	028	272,629,759	272,629,759
$MFT cluster number	030	725,343	725,343
$MFTMirr cluster number	038	2	2
Clusters per File Record Se...	040	246	246
Clusters per Index Block	044	1	1
Volume serial number	048	6B6FFFFFFF...	6B6FFFFFFFFFF
Checksum	050	0	0
Bootstrap code	054	FFFFFFFFFFF...	FFFFFFFFFFFFF
Signature (55 AA)	1FE	55FFFFFFFF...	55FFFFFFFFFFF

Figure 64: NTFS Boot Sector Template View

Low-level Search

Disk Viewer has an advanced search feature for locating specific data in sectors while low-level disk scan. Click **Find** toolbar button to open Find Text dialog.

Find what
Input the characters you are searching for in ANSI, Hex or Unicode

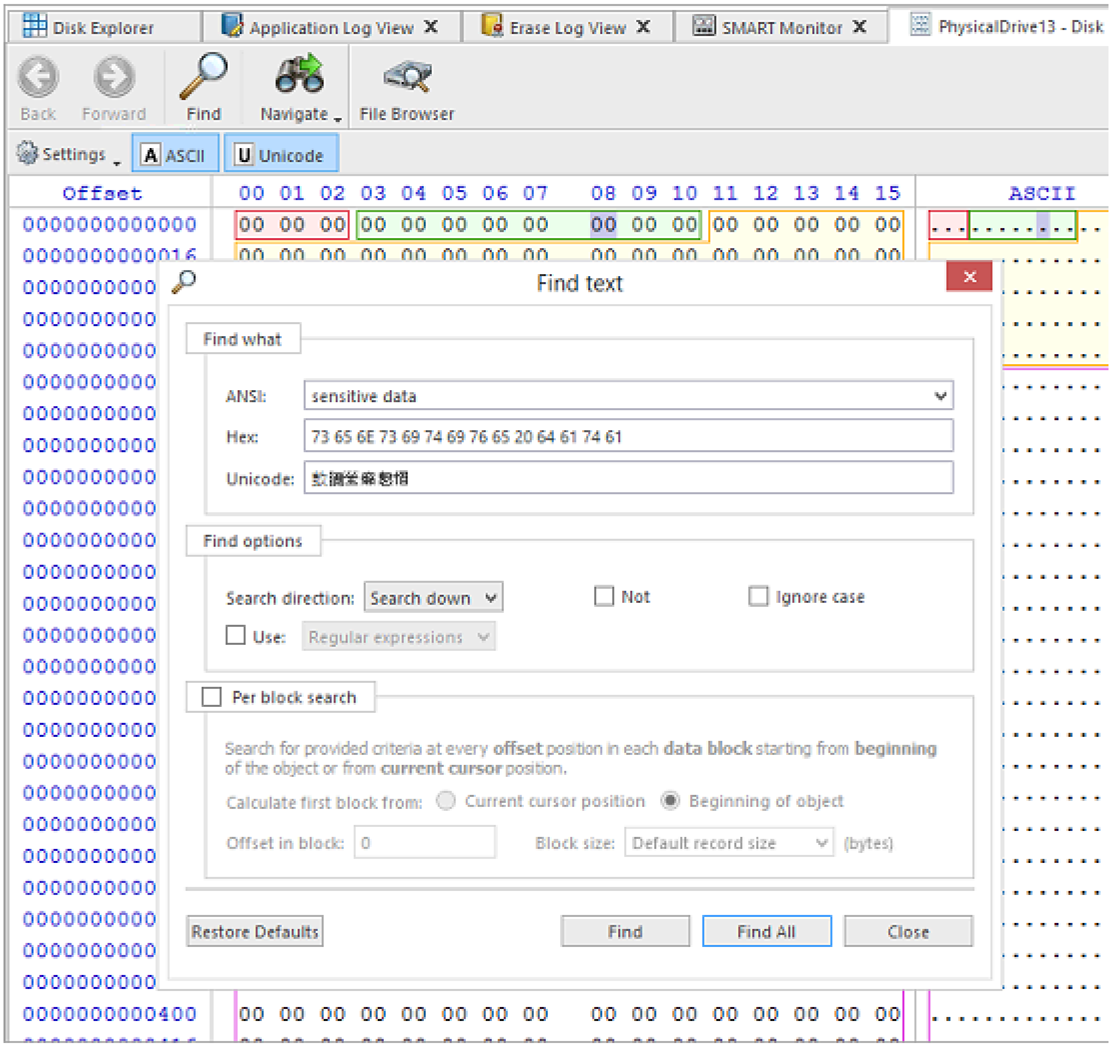
Search direction
If you have an idea of where the data may be located specify where to search

Not
Search for characters that do not correspond to the **Find what** parameter

Ignore case
Disables case-sensitivity in text search

Use
Switch between Regular Expressions and Wildcards

Per block search
if you are familiar with the location of the data in the data block you can specify a search with an offset of the object to speed up the search process



Find text

Find what

ANSI: sensitive data

Hex: 73 65 6E 73 69 74 69 76 65 20 64 61 74 61

Unicode: 敳獮瑩癩⁥慤慴

Find options

Search direction: Search down   □ Not   □ Ignore case

□ Use: Regular expressions

□ Per block search

Search for provided criteria at every **offset** position in each **data block** starting from **beginning** of the object or from **current cursor** position.

Calculate first block from: ○ Current cursor position ● Beginning of object

Offset in block: 0   Block size: Default record size (bytes)

Figure 65: Find Text Dialog

Navigation

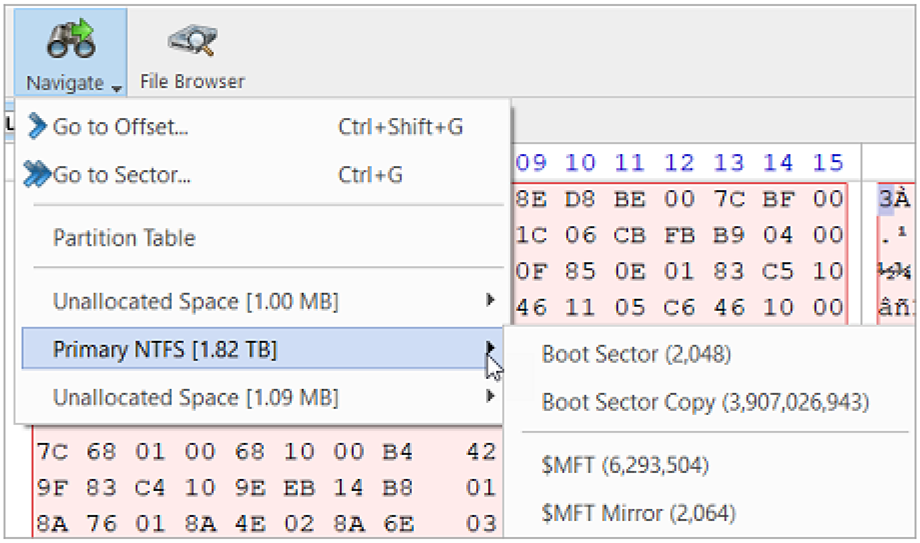
Disk Viewer's Navigate options simplify navigation on the disk. Click **Navigate** toolbar button to access these options, which are:

Go to offset
Jumps to the particular offset that needs to be entered manually in a decimal or hexadecimal form

Go to sector
Jumps to the particular sector or cluster on the disk

Partition table
Jumps to the sector where partition table is located

Particular partition
Lists all partitions and allows to jump to the boot sectors, to the beginning and to the end of any available partition



```
09 10 11 12 13 14 15
8E D8 BE 00 7C BF 00   3À
1C 06 CB FB B9 04 00   .¹
0F 85 0E 01 83 C5 10   ½¾
46 11 05 C6 46 10 00   âñ

7C 68 01 00 68 10 00 B4   42
9F 83 C4 10 9E EB 14 B8   01
8A 76 01 8A 4E 02 8A 6E   03
```

Figure 66: Disk Viewer Navigation Options

Web Service

KillDisk supports monitoring of workstations' state and all running processes from remote computer via standard HTTP protocol in any Web Browser.

Web Service Configuration

In order to start the Web Service properly, connection parameters for the remote host must be configured first. Navigate **Tools** > **Web Service** > **Settings** or the related tab in **Preferences** to configure remote connection parameters. Read Web Access options for more information.

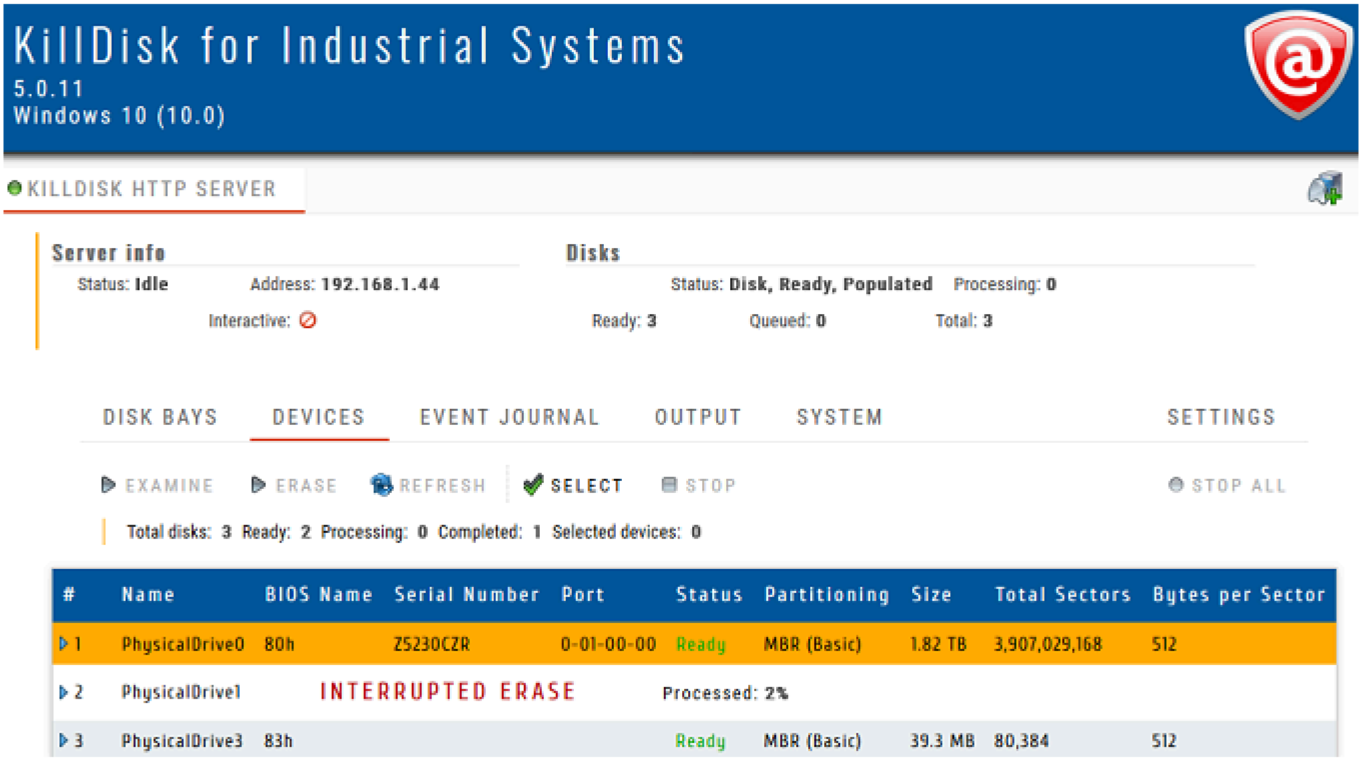
Web Service Start

Navigate to the menu bar and select **Tools** > **Web Service** > **Start Web Service** to activate build-in Web Server and allow remote web clients to monitor the state of application. Icon on the status bar displays a web service status: Started/Stopped and Interactive/Read Only.

To monitor and control KillDisk workstations remotely, type workstation's IP address in the Address Bar of your favorite Web Browser (supported all modern browsers including Chrome, Firefox, Opera, Edge, etc).

Web Service Views

If **KillDisk** is up and running in the local network environment and **Web Service** is configured and started properly, then after HTTP connection is established, Web Service main page is displayed:



Server info

Status: **Idle** Address: **192.168.1.44**

Interactive: ⊘

Disks

Status: **Disk, Ready, Populated** Processing: **0**

Ready: **3** Queued: **0** Total: **3**

Total disks: 3 Ready: 2 Processing: 0 Completed: 1 Selected devices: 0

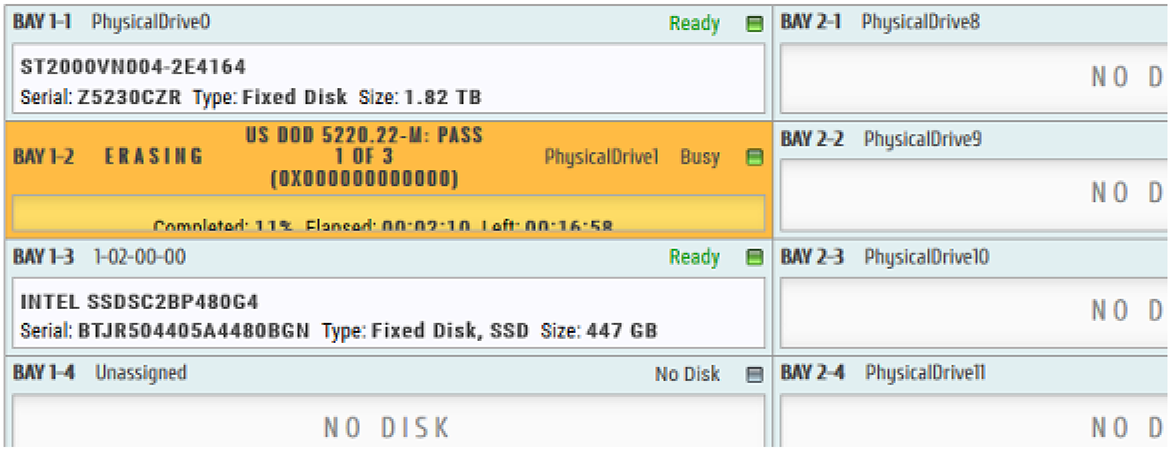
#	Name	BIOS Name	Serial Number	Port	Status	Partitioning	Size	Total Sectors	Bytes per Sector
▸ 1	PhysicalDrive0	80h	Z5230CZR	0-01-00-00	Ready	MBR (Basic)	1.82 TB	3,907,029,168	512
▸ 2	PhysicalDrive1		INTERRUPTED ERASE		Processed: 2%				
▸ 3	PhysicalDrive3	83h			Ready	MBR (Basic)	39.3 MB	80,384	512

Figure 67: Web Service - Devices View

Workstations' name and status shown in the first line. Steady green icon at the left means there is no activities. Blinking green/yellow icon show that some operations are in progress (Erase, Examine, Wipe, Clone). **Server info** section below displays basic information about connected workstation (IP Address, Activity Status, Read Only/Interactive mode) and disks connected currently. Several tabs (default is **DEVICES** tab) allow you to switch current view to obtain more information about server, disks and processes.

Disk Bays

Display Bays the same way as in application's Disk Bays View. Mouse click on the disk selects it. Erase progress can be displayed on top of disks being erased.


BAY 1-1 PhysicalDrive0 Ready
ST2000VN004-2E4164
Serial: Z5230CZR Type: Fixed Disk Size: 1.82 TB

BAY 1-2 ERASING US DOD 5220.22-M: PASS 1 OF 3 (0X00000000000000) PhysicalDrive1 Busy
Completed: 11% Elapsed: 00:02:10 Left: 00:16:58

BAY 1-3 1-02-00-00 Ready
INTEL SSDSC2BP480G4
Serial: BTJR504405A4480BGN Type: Fixed Disk, SSD Size: 447 GB

BAY 1-4 Unassigned No Disk
NO DISK

BAY 2-1 PhysicalDrive8
NO D

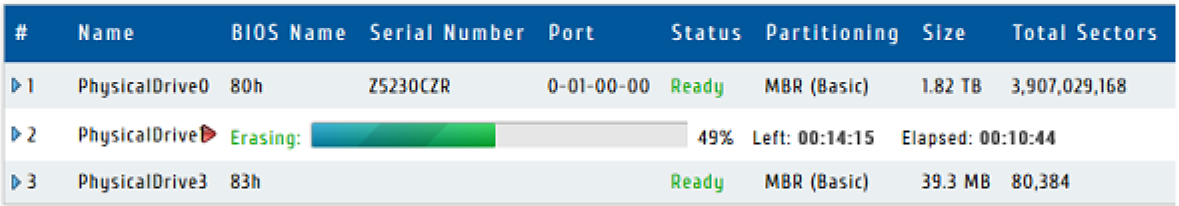
BAY 2-2 PhysicalDrive9
NO D

BAY 2-3 PhysicalDrive10
NO D

BAY 2-4 PhysicalDrive11
NO D

Devices

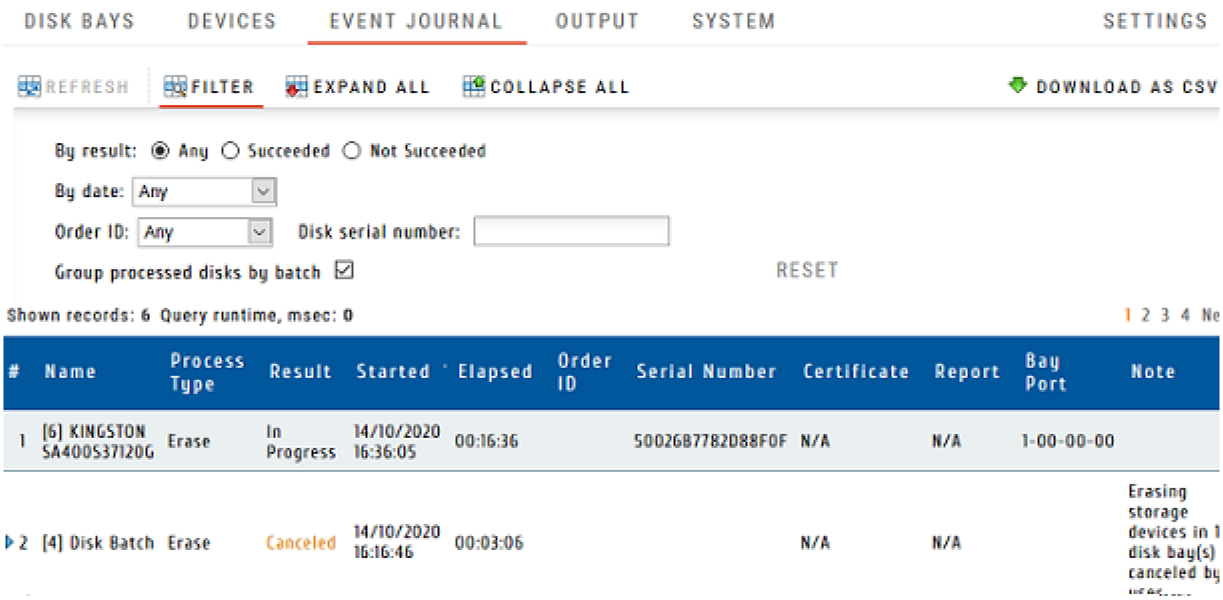
All disks displayed as a flat list. Mouse click on the disk selects it. Double click on the disk expands disk's attributes and S.M.A.R.T parameters. Erase progress can be displayed for the disks being erased.



#	Name	BIOS Name	Serial Number	Port	Status	Partitioning	Size	Total Sectors
▶ 1	PhysicalDrive0	80h	Z5230CZR	0-01-00-00	Ready	MBR (Basic)	1.82 TB	3,907,029,168
▶ 2	PhysicalDrive	Erasing:		49%	Left: 00:14:15		Elapsed: 00:10:44	
▶ 3	PhysicalDrive3	83h			Ready	MBR (Basic)	39.3 MB	80,384

Event Journal

Displays current **Event Journal** as a flat list. User can filter records by Status, Time Frame, Order ID, Disk Serial the same way as in KillDisk application. Supported grouping by Batches. Resulting record set could be downloaded in CSV format.



By result: ● Any ○ Succeeded ○ Not Succeeded

By date: Any

Order ID: Any   Disk serial number:

Group processed disks by batch ☑

Shown records: 6 Query runtime, msec: 0

#	Name	Process Type	Result	Started	Elapsed	Order ID	Serial Number	Certificate	Report	Bay Port	Note
1	[6] KINGSTON SA400S37120G	Erase	In Progress	14/10/2020 16:36:05	00:16:36		50026B7782D88F0F	N/A	N/A	1-00-00-00	
▶ 2	[4] Disk Batch	Erase	Canceled	14/10/2020 16:16:46	00:03:06			N/A	N/A		Erasing storage devices in 1 disk bay(s) canceled by

Output View

Displays Application Log (Output). Log can be downloaded in full as a text file.

System View

Displays all information about workstation: Software version, Licensing info, Operating System information and Hardware information. All information can be downloaded in full as a text file.

Settings View

Configures General Options (refresh rate) and Event Journal (page size, download options). Settings can be saved for the local display and restored to default values.

Remote Interaction

Remote Web client is able not only monitor Servers' state, but interact with a Workstation remotely, for example, start Disk Erase, start Batch Exam or Stop All current operations.

Note:

To be able to interact with a Workstation remotely , Read Only (Monitor) Mode should be turned off in Workstations' Web Access settings.

To interact with a Workstation remotely:

1. Select the disk or group of disks to be erased by clicking in **Bays View** or **Devices View**. To select all accessible disks click **SELECT** toolbar button.

2. Click **EXAMINE** or **ERASE** toolbar button to start the related process

   Warning:

   Be careful! There will be no action confirmation dialog, process will just start automatically. Client must be fully aware of the consequences.

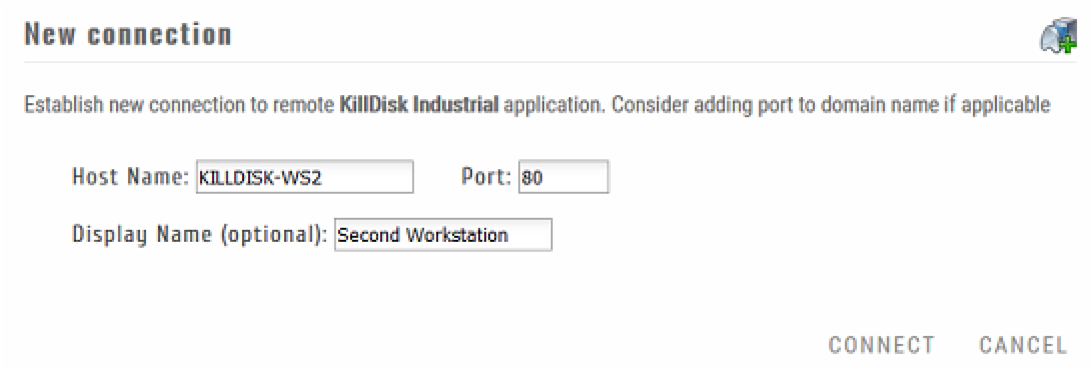
3. Observe the progress which is displayed on top of the disk. Client can stop any process anytime by selecting particular disk and clicking **STOP** toolbar button, or stop all running processes by clicking **STOP ALL** toolbar button.

Monitor Several Workstations

Remote Web Client is able not only monitor the single Workstation, but connect to and interact with several Workstations in one place on the single web page.

To work with several Workstations:

1. Configure all Workstations you want to connect to. On each unit set up IP Address, Port, Firewall, Red Only/Interactive mode properly, start Web Service and check it is up and running.
2. Connect to the first Workstation by typing **IP Address:Port** in the Address Bar of the Web Browser.
3. Connect other Workstations by clicking icon with Green Plus sign at the right side. New Connection dialog appears:



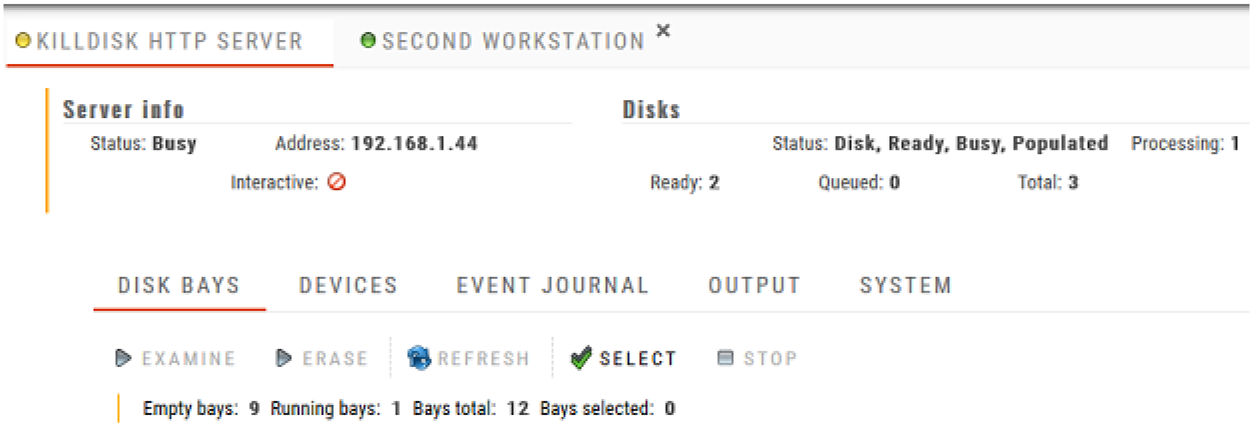
New connection

Establish new connection to remote **KillDisk Industrial** application. Consider adding port to domain name if applicable

Host Name: KILLDISK-WS2 Port: 80

Display Name (optional): Second Workstation

4. Type the Host Name on the Local Network (or related IP Address), Port and Display Name and click **CONNECT** button.
5. After connection is established, the second tab appears. Clicking another Workstations' Display Name will switch main view to display its information and current processes.



Server info

Status: **Busy** Address: **192.168.1.44**

Interactive: ⊘

Disks

Status: **Disk, Ready, Busy, Populated** Processing: **1**

Ready: **2** Queued: **0** Total: **3**

Empty bays: **9** Running bays: **1** Bays total: **12** Bays selected: **0**

   If security policy permits you will be able not only monitor, but start Disk Erase/Exam processes for remote hosts (Interactive mode must be turned on).

6. Repeat steps 3 and 4 to add more Workstations to monitor and interact with.

Important:

Monitoring several workstations from the single location can be very useful to check overall current status (whether something being erased or Workstations are in idle state). In case if any process is running on the Workstation (the Host is busy) - the icon on the left of Workstations' Display Name is blinking (yellow and green). In case if Workstation is in idle mode, the icon is steady green.

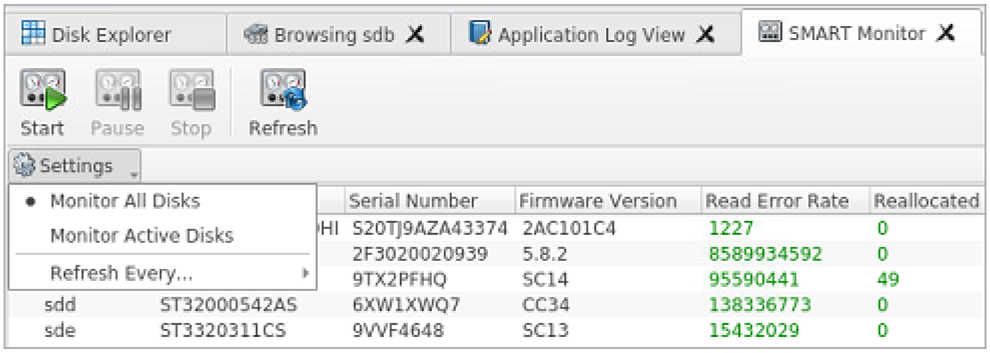
Related information

Web Access on page 104

S.M.A.R.T Monitor

KillDisk supports displaying low-level disk specific S.M.A.R.T information.

To open the S.M.A.R.T monitor view, navigate the menu bar and select **Tools** > **SMART Monitor**



		Serial Number	Firmware Version	Read Error Rate	Reallocated
	HI	S20TJ9AZA43374	2AC101C4	1227	0
		2F3020020939	5.8.2	8589934592	0
		9TX2PFHQ	SC14	95590441	49
sdd	ST32000542AS	6XW1XWQ7	CC34	138336773	0
sde	ST3320311CS	9VVF4648	SC13	15432029	0

Figure 68: S.M.A.R.T. Monitor View

S.M.A.R.T Information

The S.M.A.R.T monitor displays a list of all discovered disks and shows S.M.A.R.T information in a grid. The following S.M.A.R.T information displayed in separate columns:

- Display Name
- Device Model
- Serial Number
- Firmware Version
- Read Error Rate
- Reallocated Sectors Count
- Spin-up Retries
- Command Timeout
- Reallocated Event Count
- Current Pending Sectors
- Reported Uncorrectable Errors
- Soft Read Error Rate
- Read Error Retry Rate

Configurable Settings

Parameters that can be configured in the drop-down **Settings** menu located on a toolbar:

Monitored disks

Here you have the option to either display **All Disks** seen by the system or only the **Active Disks** (being erased or examined).

Refresh rate

This specifies the interval in seconds between updates to the S.M.A.R.T. information displayed when the S.M.A.R.T. monitor is running.

S.M.A.R.T Monitor Start

The S.M.A.R.T monitor can either be refreshed manually or run continuously to keep the information current. To run the S.M.A.R.T monitor, click the **Start** button on the action toolbar. To pause or stop auto-refreshing sequence click **Pause** or **Stop** buttons in view's toolbar accordingly.

Note:

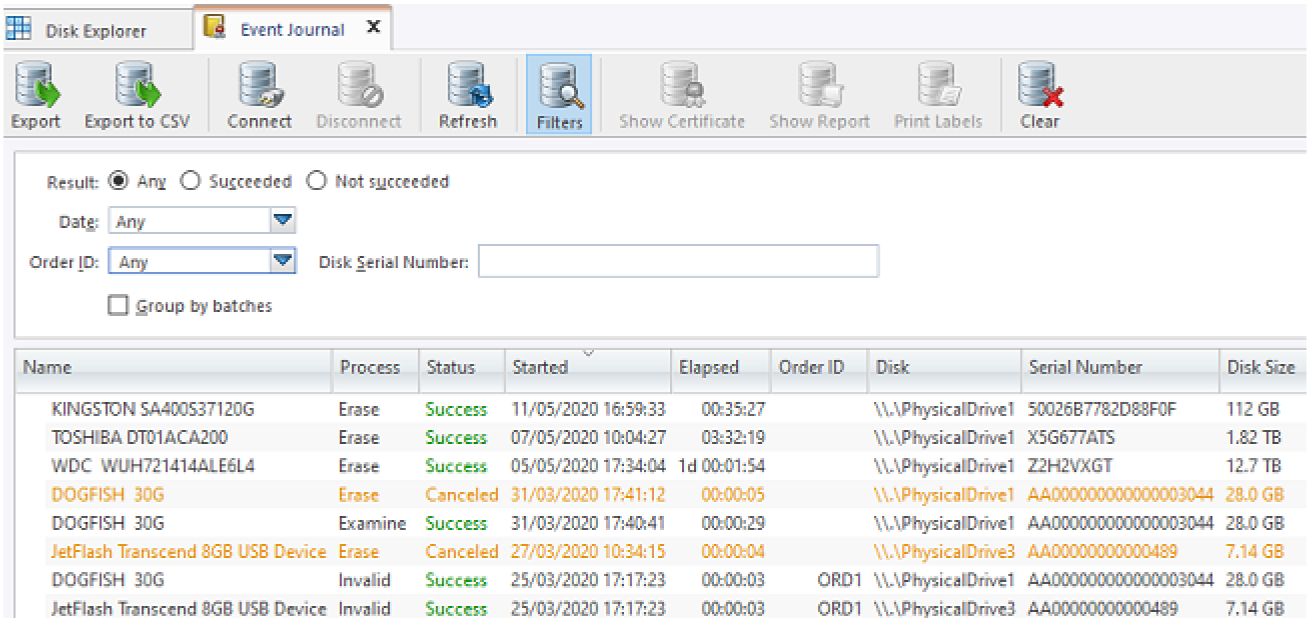
S.M.A.R.T monitoring is a process that requires a lot of resources. It can slow down Erase or Examine process significantly. We advise you to avoid querying S.M.A.R.T information often.

Event Journal

Event Journal is a feature that allows to collect and export all operations history. Once current **KillDisk** operation completes, the results have been added to the Event Journal or Log stored in the local database and are available for reviewing, filtering and exporting to the external source.

To access the Event Journal do one of the following:

- In the file menu bar navigate to **Tools** > **Event Journal**
- Press **CTRL + L** shortcut



Result: ● Any ○ Succeeded ○ Not succeeded

Date: Any

Order ID: Any Disk Serial Number:

□ Group by batches

Name	Process	Status	Started	Elapsed	Order ID	Disk	Serial Number	Disk Size
KINGSTON SA400S37120G	Erase	Success	11/05/2020 16:59:33	00:35:27		\\.\PhysicalDrive1	50026B7782D88F0F	112 GB
TOSHIBA DT01ACA200	Erase	Success	07/05/2020 10:04:27	03:32:19		\\.\PhysicalDrive1	X5G677ATS	1.82 TB
WDC WUH721414ALE6L4	Erase	Success	05/05/2020 17:34:04	1d 00:01:54		\\.\PhysicalDrive1	Z2H2VXGT	12.7 TB
DOGFISH 30G	Erase	Canceled	31/03/2020 17:41:12	00:00:05		\\.\PhysicalDrive1	AA00000000000000003044	28.0 GB
DOGFISH 30G	Examine	Success	31/03/2020 17:40:41	00:00:29		\\.\PhysicalDrive1	AA00000000000000003044	28.0 GB
JetFlash Transcend 8GB USB Device	Erase	Canceled	27/03/2020 10:34:15	00:00:04		\\.\PhysicalDrive3	AA00000000000489	7.14 GB
DOGFISH 30G	Invalid	Success	25/03/2020 17:17:23	00:00:03	ORD1	\\.\PhysicalDrive1	AA00000000000000003044	28.0 GB
JetFlash Transcend 8GB USB Device	Invalid	Success	25/03/2020 17:17:23	00:00:03	ORD1	\\.\PhysicalDrive3	AA00000000000489	7.14 GB

Figure 69: Event Journal View

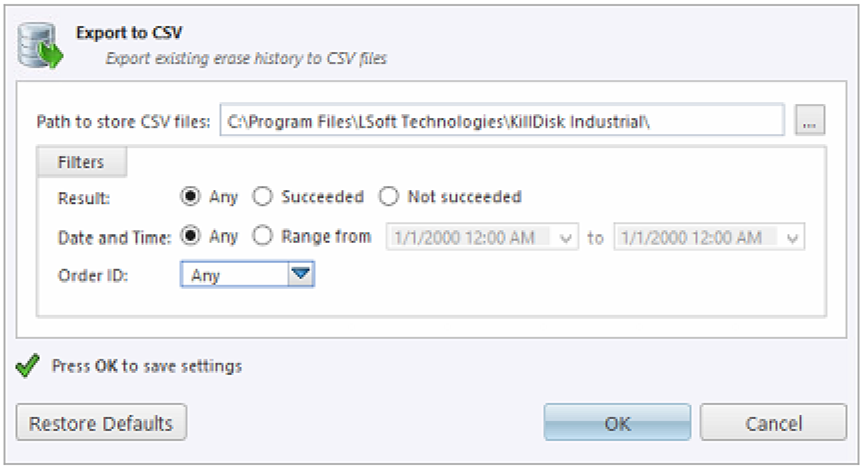
Toolbar Actions

Export

Exports existing Event Journal or filtered journal records into external SQL database.

Export to CSV

Provides an export into standard CSV (comma separated values) file. User should specify the path to store CSV file. Standard filters are available.



Export to CSV

Export existing erase history to CSV files

Path to store CSV files: C:\Program Files\LSoft Technologies\KillDisk Industrial\

Filters

Result: ● Any ○ Succeeded ○ Not succeeded

Date and Time: ● Any ○ Range from 1/1/2000 12:00 AM to 1/1/2000 12:00 AM

Order ID: Any

✓ Press OK to save settings

Connect

Allows user to connect to an external SQL database and export journal records using current database connection. User can specify all required connection parameters in this dialog or in applications' Preferences. After providing required credentials and establishing a database connection **KillDisk** is able to export certificates and reports as well as Event Journal to the external database.

Note:

The button is dimmed when the connection has been successfully established.

Disconnect

Disconnects and stops exporting to the external SQL database. However, all Events are still kept and accumulating in Journal stored in the local database.

Note:

The button is dimmed when there is no active connection to the external database.

Refresh

Refreshes the Event Journal to reflect recently completed operations.

Filters

Toggles displaying/hiding filtering parameters.

Show certificate

Shows corresponding PDF Certificate with system default PDF viewer for the selected journal entry.

Show report

Shows the corresponding XML report with system default XML viewer for the selected journal entry.

Print labels

Shows a pop-up dialog for printing the corresponding label for the selected journal entry.

Clear

Clears an internal database where Event Journal is stored.

Filtering Options

Result

Display all events, or only Succeeded/Failed operations.

Date and time

Display Today's operations or operations from This Week, Month, Year, or within the Custom Range.

Order ID

Display all events or only records for the particular Order ID. Drop-down list contains all existing Orders being entered previously.

Disk serial number

Filters by Disk Serial number. Displays the only records containing pattern of typed symbols.

Group by batches

Rather than showing history for each individual disk, this option groups operations by Batches and displays Journal in tree list.

For the individual disk history: completed processes can be viewed, filtered with applied standard filters and sorted by attributes like Name, Status, Order ID, etc.

Right mouse click on Results table headers creates a custom set of data, columns can be added or removed.

Note:

Export and **Connect** - both features share the same fields/interface for database connection. There are two modes for Event Journal export : *one-at-a-time* export and *real-time* export modes.

Export is a *one-at-a-time* transaction.

Connect establishes and maintains *real-time* connection, so there are two replicas of Event Journal at a time: local and remote.

Related information

Journal Export on page 78

Journal Export

KillDisk's Export feature allows to send out all the current logs, certificates and reports from locally stored database over the network to the external SQL database. Both local Event Journal and all future transactions can be exported after connection to database is established.

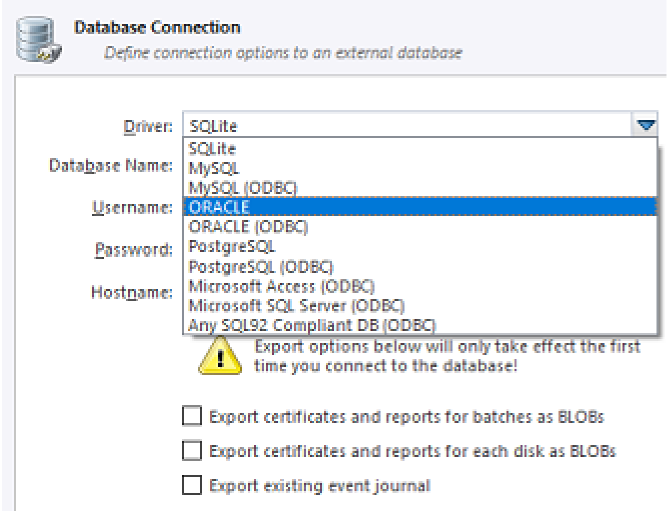
Supported connections to different SQL databases:

- Any SQL92 Compliant Database (via ODBC)
- Microsoft Access
- Microsoft SQL Server
- PostgreSQL
- ORACLE
- MySQL
- SQLite

To connect to the external SQL database do one of the following:

1. Navigate to **Tools** > **Preferences** or press **F10**. Then click **Database Connection** tab on the left.
2. Alternatively on the file menu bar navigate to **Tools** > **Event Journal** or press **CTRL + L**. Then click **Connect** toolbar button.

3. Database Connection dialog appears:



Database Connection

Define connection options to an external database

Driver: SQLite

Database Name:

Username:

Password:

Hostname:

Export options below will only take effect the first time you connect to the database!

□ Export certificates and reports for batches as BLOBs

□ Export certificates and reports for each disk as BLOBs

□ Export existing event journal

4. Select a Driver for the particular database you want to connect to from the list of databases.
5. Type in the database Name on the remote end.
6. Type in the database Username for the connection.
7. Type in the database Password for the selected user.
8. Type in the Hostname (which can be IP address or local Network Server Name).
9. Select a TCP/IP Port to use if it is different from the default value.
10. Verify settings for the additional export options:
    - Export certificates and reports for batches
    - Export certificates and reports for particular disks
    - Export existing event journal (can be done only once per a new connection)
11. Click **OK** to test connection and store connection parameters in settings for future use.

Once a connection to the external SQL database is established **KillDisk** starts exporting all information related to all current operations automatically.

Note:

For the database export to be successful you need to provide a database user with privileges enough for creation two tables (**DISKS** and **BATCHES**) and populating these tables.

Related information

Event Journal on page 76

Preferences

KillDisk Preferences dialog is the central location where **KillDisk** features and settings can be configured.

To open **Preferences** dialog:

- From main menu choose **Tools** > **Preferences...**

  or
- Press **F10** keyboard shortcut at any time

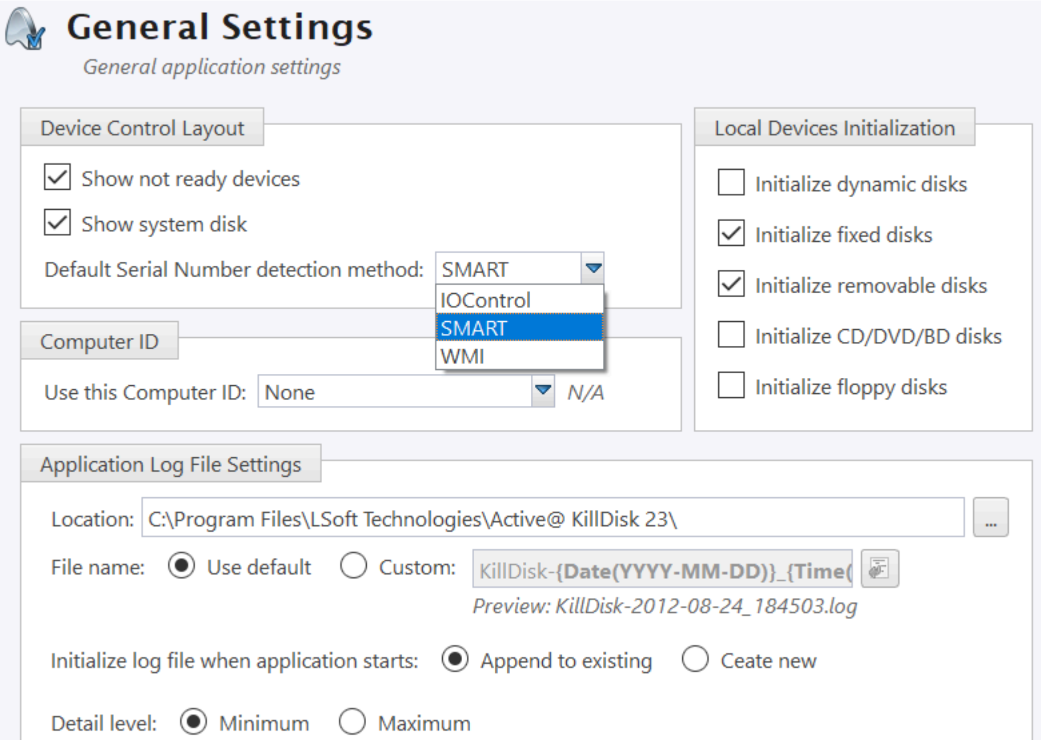
Preferences dialog divided into several sections:

- General Settings
- Disk Erase

Preferences allow to configure all the settings needed for the application proper operation.

General Settings

The General Settings section allows to configure general preferences as well as the applications' visual and sound representation.



General Settings

General application settings

Device Control Layout

☑ Show not ready devices

☑ Show system disk

Default Serial Number detection method: SMART

Computer ID

Use this Computer ID: None *N/A*

Local Devices Initialization

□ Initialize dynamic disks

☑ Initialize fixed disks

☑ Initialize removable disks

□ Initialize CD/DVD/BD disks

□ Initialize floppy disks

Application Log File Settings

Location: C:\Program Files\LSoft Technologies\Active@ KillDisk 23\ ...

File name: ● Use default ○ Custom: KillDisk-**{Date(YYYY-MM-DD)}_{Time(**

Preview: KillDisk-2012-08-24_184503.log

Initialize log file when application starts: ● Append to existing ○ Ceate new

Detail level: ● Minimum ○ Maximum

Device Control Layout

These settings control visual disk behavior in Disk Explorer and allow to Show or Hide a System Disk and devices which are not ready (offline).

Default serial number detection method

Select how **KillDisk** retrieves the disk serial number by default. Values are: **SMART**, **IOControl** & **WMI**.

Local devices initialization

Select which types of devices appear in **KillDisk** by default: **Dynamic Disks, Fixed disks**, **Removable disks**, **CD/DVD/BD** and **Floppies**.

Computer ID

Configure how the **KillDisk** workstation is identified in logs & reports. Values are: **None**, **BIOS Serial Number**, **Motherboard Serial Number**.

Application Log File Settings

These settings apply to the log file generated by the application. All operations performed in a **KillDisk** session will be saved in this log.

Log file location

Allows the user to specify where the application log file is saved. By default this is set to a **KillDisk** installation directory.

Application log detail level

Manipulate the amount of details included in the logs. Options are: **Minimum** and **Maximum**.

Initialize application log when application starts

This setting configures whether **KillDisk** generates a new log file for every session (erasing the log of the previous session) or appends new sessions to one log file. Moreover, logs can be placed to the files being named using naming pattern specified.

Environment

These are configurable options pertaining to the applications user interface and user experience.

Application style

Configures the color scheme used in the application. Values are: **Blue**, **Olive**, **None (Use OS default)**, **Silver** and **Dark**.

Default toolbars style

Configures how icons are shown in the toolbar. Values are: **Large icons, no text**; **Large icons, with text beside icon**; **Large icons, with text under icon**; **Small icons, with text beside icon;** **Small icons, no text.**

Default help source

If available, user can select help documentation source to be addressed when requested. Values are: **PDF**, **Context Help** and **On-line web help.**

Reset all dialogs

Resets all the settings to the default state.

Sound Notifications

These are configurable options related to application sounds: you can use either predefined values or assign your own sounds (User defined sound file).

Use Sound Notifications

Toggles sound tones being used for notifying the user of the completion of a task, errors and notification during an operation: **Success**, **With Warnings**, **With Errors**, **Failure**.

Action Triggers

Configure actions performed while application is running.

Automatically check for software updates

If this option set, application will check for a new update after every start up.

Action after all processes complete

Select either **None**, **Hibernate**, **Shutdown** or **Restart** system after all running processes completed.

CAUTION:

You will have 30 seconds to abort system hibernation, restart or shutdown.

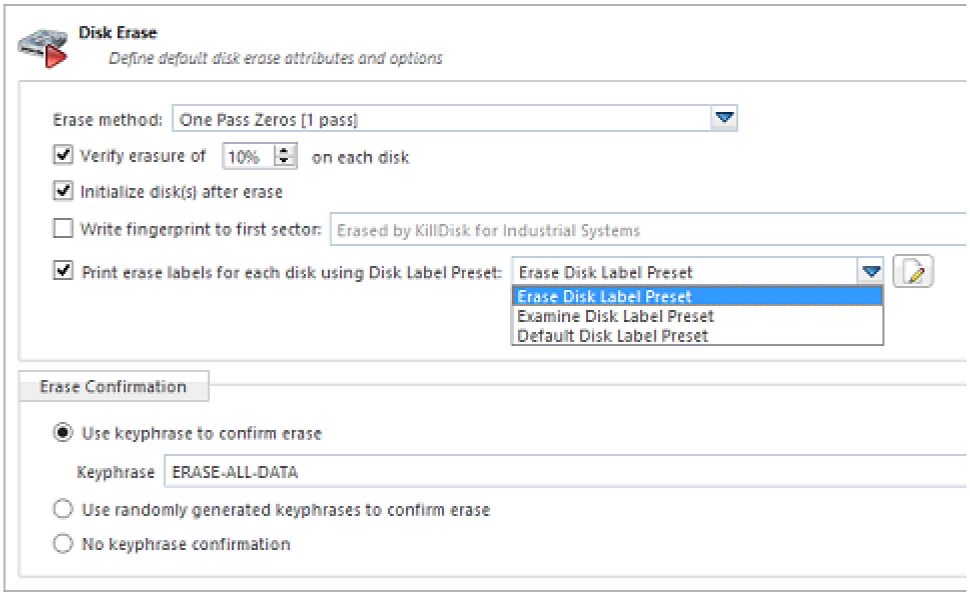
Export erase certificates and application log to all detected removable media

Upon erase completion all certificates and logs will be automatically exported to attached USB disks (all detected media of removable type).

Disk Erase

The Disk Erase section provides settings' configuration for the **KillDisk** erase procedures.

The same erase options for each batch could be set through Batch Editor dialog.



Disk Erase

Define default disk erase attributes and options

Erase method: One Pass Zeros [1 pass]

☑ Verify erasure of 10% on each disk

☑ Initialize disk(s) after erase

□ Write fingerprint to first sector: Erased by KillDisk for Industrial Systems

☑ Print erase labels for each disk using Disk Label Preset: Erase Disk Label Preset

Erase Confirmation

● Use keyphrase to confirm erase

Keyphrase ERASE-ALL-DATA

○ Use randomly generated keyphrases to confirm erase

○ No keyphrase confirmation

Erase method

Choose one of more than 20 sanitizing methods including many international standards and custom patterns.

Erase verification

Percentage of disk to be verified after disk erasure. The large percentage, the more time it takes to verify written data.

Note:

In some erase methods such as the US DoD 5220.22-M this option is mandatory. After the erase operation has completed this feature will scan the entire drive evenly and verify the integrity of the erase operation. This option is the percent of the sectors to check across the disk. Most standards specify 10% as an accurate sample size for the verification.

Initialize disk(s) after erase

Writes proper MBR to disk's first sector after erasure complete. This is needed for disk to be visible and accessible by most Operating Systems.

Write fingerprint to first sector

This feature writes the specified fingerprint to the first sector of the erased drive. If erased disk is plugged into the system and system boots from this disk the user will see a message on the screen about the disk being erased by KillDisk.

Print erase labels

This feature prints erase label automatically after erase completion using specific Disk Label configuration.

Erase confirmation

As a safety precaution to prevent accidental removal of disks' data **KillDisk** uses the *user-typed keyphrase* mechanism just before the erase procedure is initiated (see below). By default this precaution mechanism is initialized with the key phrase **ERASE-ALL-DATA**. The key phrase can be modified, configured as a randomly generated set of characters or disabled. The keyphrase should be typed correctly in order to start the erase procedure.

Related information

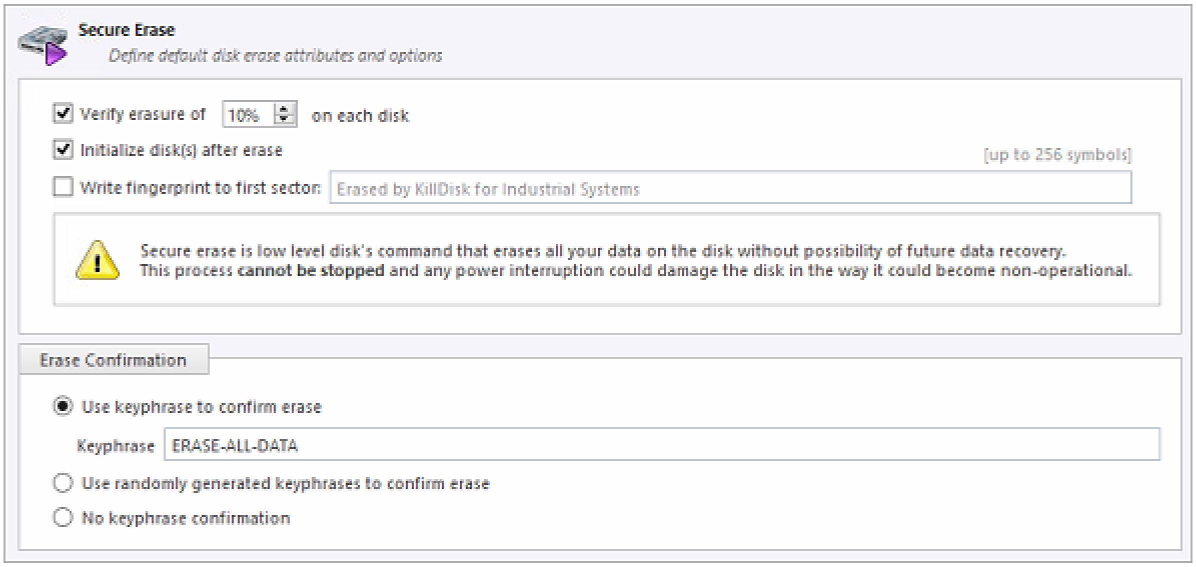
Erase Methods on page 120

Erase Disk Concepts on page 111

Disk Label Presets on page 97

Secure Erase

The Secure Erase section provides settings' configuration for the Solid State Drive (SSD) specific erase procedures.



Secure Erase

Define default disk erase attributes and options

☑ Verify erasure of 10% on each disk

☑ Initialize disk(s) after erase

□ Write fingerprint to first sector: Erased by KillDisk for Industrial Systems [up to 256 symbols]

Secure erase is low level disk's command that erases all your data on the disk without possibility of future data recovery. This process **cannot be stopped** and any power interruption could damage the disk in the way it could become non-operational.

Erase Confirmation

● Use keyphrase to confirm erase

Keyphrase ERASE-ALL-DATA

○ Use randomly generated keyphrases to confirm erase

○ No keyphrase confirmation

Verify erasure

Percentage of disk to be verified after Secure Erase completes.

Initialize disk(s) after erase

Writes proper MBR to disk's first sector after erasure complete. This is needed for disk to be visible and properly accessible by most Operating Systems.

Write fingerprint to first sector

This feature writes the specified fingerprint to the first sector of the erased drive. If erased disk is plugged into the system and system boots from this disk the user will see a message on the screen about the disk being erased by KillDisk.

Erase confirmation

As a safety precaution to prevent accidental removal of disks' data **KillDisk** uses the *user-typed keyphrase* mechanism just before the erase procedure is initiated (see below). By default this precaution mechanism is initialized with the key phrase **ERASE-ALL-DATA**. The key phrase can be modified, configured as a randomly generated set of characters or disabled. The keyphrase should be typed correctly in order to start the erase procedure.

Related tasks

Secure Erase on page 38

Related information

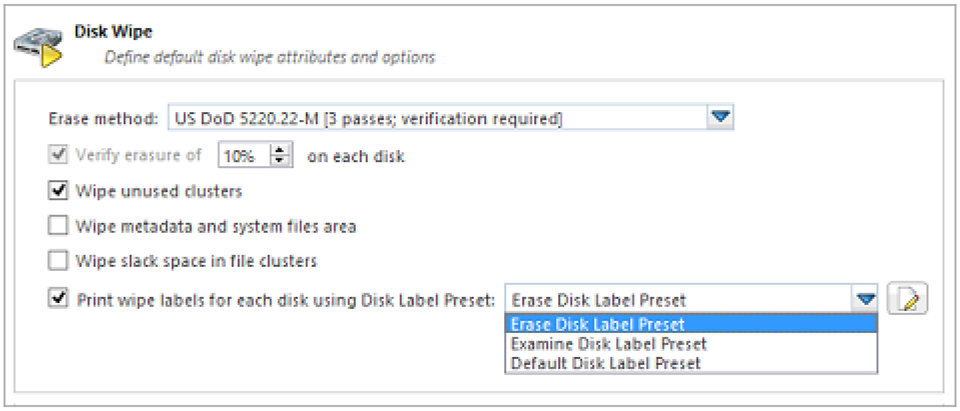
Secure Erase (SSD) on page 133

Secure Erase Concepts on page 113

Secure Erase (ANSI ATA, SE) on page 122

Disk Wipe

The Disk Wipe section provides settings' configuration for Wipe procedure and allows you to specify the erase method to use, verification and a few additional wipe-specific options.



Disk Wipe

Define default disk wipe attributes and options

Erase method: US DoD 5220.22-M [3 passes; verification required]

☑ Verify erasure of 10% on each disk

☑ Wipe unused clusters

☐ Wipe metadata and system files area

☐ Wipe slack space in file clusters

☑ Print wipe labels for each disk using Disk Label Preset: Erase Disk Label Preset

Erase method

Choose one of more than 20 sanitizing methods including many international standards and custom patterns.

Verify erasure

Percentage of disk to be verified after wiping out unused disks' clusters.

Wipe unused clusters

Erase areas of the hard drive that are not formatted and not currently used by the Operating System (data has not been recently written there unless this is a recently deleted partition).

Wipe metadata and system files area

Erase areas on the disk containing information about previous files on the volume. Wiping prevents recovery of files using their remained directory records.

Wipe slack space in file clusters

Erase slack space within files. Because files are usually never exactly the size of the space allocated to them there may be unused space within a file that may contain traces of data stored there previously. This algorithm wipes that space to remove these data traces.

Print wipe labels

This feature prints wipe labels automatically after wipe is completed using a specific Disk Label configuration.

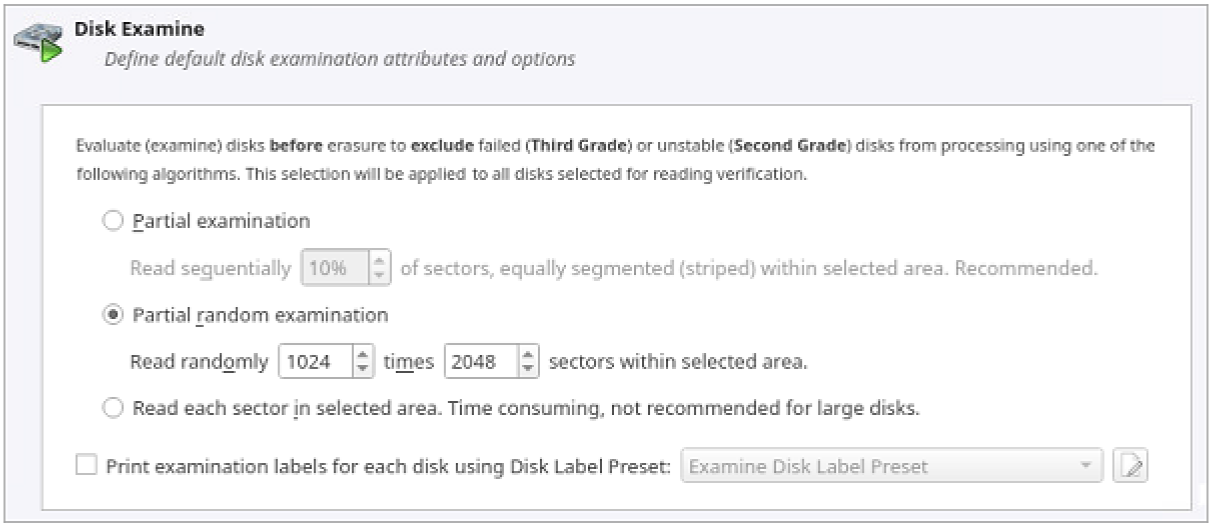
Related information

Erase Methods on page 120
Wipe Disk Concepts on page 115
Disk Label Presets on page 97

Disk Examine

KillDisk offers different Disk Examination options depending on user needs. Each examination type has its own strengths and weaknesses, mainly tradeoffs between time and thoroughness. Any of the examination types can be performed on an entire disk or on some selected segment.

Examination options are required for disk integrity examination and optional for disk erasure but can be used to sort away faulty disk from following processing in sequence.



Disk Examine

Define default disk examination attributes and options

Evaluate (examine) disks **before** erasure to **exclude** failed (**Third Grade**) or unstable (**Second Grade**) disks from processing using one of the following algorithms. This selection will be applied to all disks selected for reading verification.

○ Partial examination

Read sequentially 10% of sectors, equally segmented (striped) within selected area. Recommended.

● Partial random examination

Read randomly 1024 times 2048 sectors within selected area.

○ Read each sector in selected area. Time consuming, not recommended for large disks.

□ Print examination labels for each disk using Disk Label Preset: Examine Disk Label Preset

To examine disk integrity the following algorithms being used:

Partial examination
Examines a percentage of the disk equally segmented in a selected area.

Partial random examination
Examines a predefined number of randomly distributed sections of the disk within the selected area.

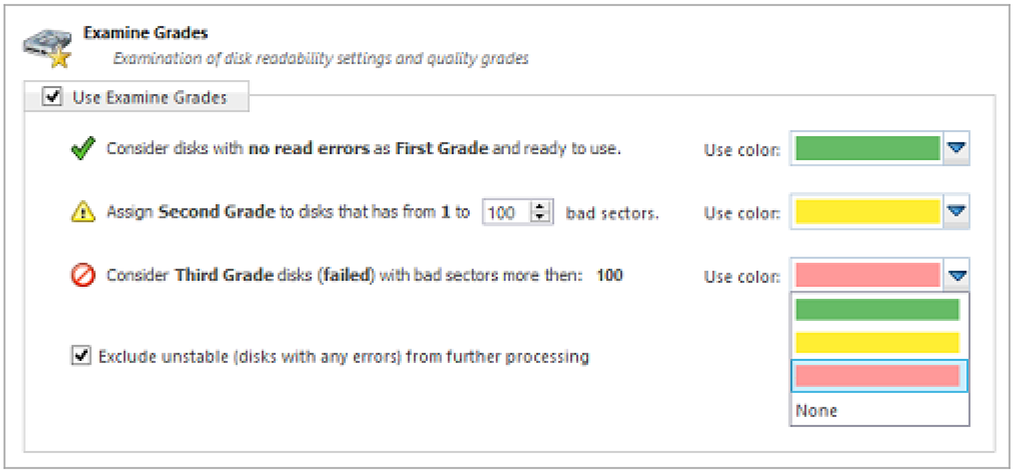
Read each sector in selected area
Examines entirely all the selected area. Because this reads each sector in the selected area it is the most lengthy, but thorough examination procedure.

Print examination labels
This feature prints labels automatically after examination completion using specific Disk Label Preset configuration.

Examine Grades

Based on examination results disks could be "graded" depending on amount of failed sectors. Specific grade attributes can be set on **Examine Grades** page of application preferences. Further Disk Erase command can be executed or canceled based on current disk's grade.

For each grade you can select Green, Yellow, or Red colors in order to represent the disk grade visually. Multiple grades may share the same color:



Examine Grades

Examination of disk readability settings and quality grades

☑ Use Examine Grades

✓ Consider disks with **no read errors** as **First Grade** and ready to use. Use color: 🟩

Assign **Second Grade** to disks that has from **1** to 100 bad sectors. Use color: 🟨

Consider **Third Grade** disks (**failed**) with bad sectors more then: **100** Use color: 🟥

🟩
🟨
🟥
None

☑ Exclude unstable (disks with any errors) from further processing

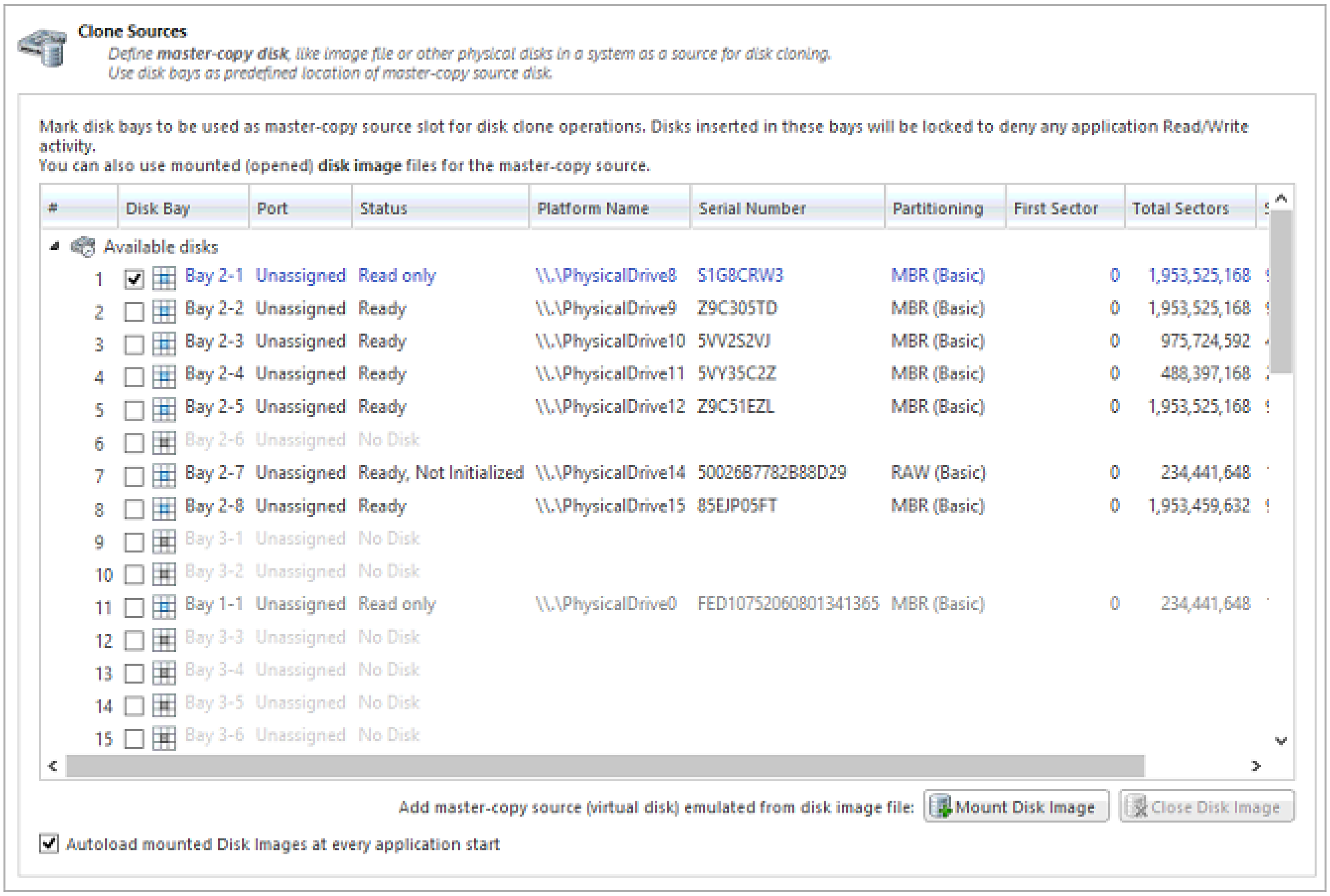
Limits for errors
Defined under the second grade disks section, the maximum read errors settings allow the user to define the maximum read error tolerance before a disk is categorized as a 3rd grade disk. Such disks are the worst grade level and are considered as unreliable for use.

Exclude unstable disks from further processing

If this option is turned on - all disks having any type of errors will be automatically excluded from further batch operations.

Clone Sources

Clone Sources preferences section allows you to select a master-copy disk to use for cloning to other disks after they have been erased.



Clone Sources

*Define **master-copy disk**, like image file or other physical disks in a system as a source for disk cloning.*
Use disk bays as predefined location of master-copy source disk.

Mark disk bays to be used as master-copy source slot for disk clone operations. Disks inserted in these bays will be locked to deny any application Read/Write activity.
You can also use mounted (opened) **disk image** files for the master-copy source.

Available disks

#	Disk Bay	Port	Status	Platform Name	Serial Number	Partitioning	First Sector	Total Sectors
1	☑ Bay 2-1	Unassigned	Read only	\\.\PhysicalDrive8	S1G8CRW3	MBR (Basic)	0	1,953,525,168
2	□ Bay 2-2	Unassigned	Ready	\\.\PhysicalDrive9	Z9C305TD	MBR (Basic)	0	1,953,525,168
3	□ Bay 2-3	Unassigned	Ready	\\.\PhysicalDrive10	5VV2S2VJ	MBR (Basic)	0	975,724,592
4	□ Bay 2-4	Unassigned	Ready	\\.\PhysicalDrive11	5VY35C2Z	MBR (Basic)	0	488,397,168
5	□ Bay 2-5	Unassigned	Ready	\\.\PhysicalDrive12	Z9C51EZL	MBR (Basic)	0	1,953,525,168
6	□ Bay 2-6	Unassigned	No Disk					
7	□ Bay 2-7	Unassigned	Ready, Not Initialized	\\.\PhysicalDrive14	50026B7782B88D29	RAW (Basic)	0	234,441,648
8	□ Bay 2-8	Unassigned	Ready	\\.\PhysicalDrive15	85EJP05FT	MBR (Basic)	0	1,953,459,632
9	□ Bay 3-1	Unassigned	No Disk					
10	□ Bay 3-2	Unassigned	No Disk					
11	□ Bay 1-1	Unassigned	Read only	\\.\PhysicalDrive0	FED10752060801341365	MBR (Basic)	0	234,441,648
12	□ Bay 3-3	Unassigned	No Disk					
13	□ Bay 3-4	Unassigned	No Disk					
14	□ Bay 3-5	Unassigned	No Disk					
15	□ Bay 3-6	Unassigned	No Disk					

Add master-copy source (virtual disk) emulated from disk image file:
Mount Disk Image
Close Disk Image

☑ Autoload mounted Disk Images at every application start

Select a Master Disk for Cloning

Any recognized physical disk can be used as a master-copy for cloning. Simply find the disk under the **Disks Bays as clone sources** and check the box next to the desired Disk Bay. This disk will be locked and read/write operations will be restricted until the cloning operation is complete.

Select a Disk Image for Cloning

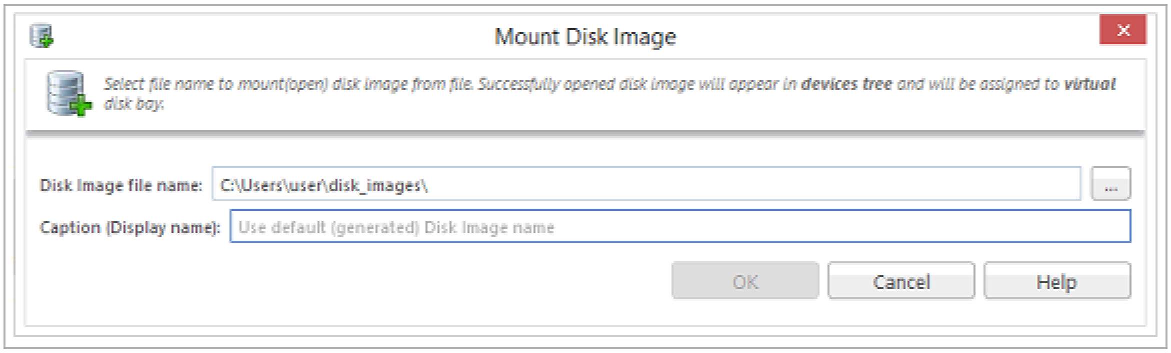
Additionally to cloning a physical disk, cloning can be done for a disk image (raw disks' sectors stored in a single file or set of files) being mounted.

Note:

Supported raw disk images, disk images created by LSoft products (*.DIM), VMWare images (*.VMDK) and VirtualPC images (*.vhd).

To mount a disk image:

1. At the bottom of the dialog, click **Mount Disk Image** button. Mount Disk Image dialog appears:



Mount Disk Image

Select file name to mount(open) disk image from file. Successfully opened disk image will appear in ***devices tree*** *and will be assigned to* ***virtual*** *disk bay.*

Disk Image file name: C:\Users\user\disk_images\

Caption (Display name): Use default (generated) Disk Image name

Figure 70: Mount Disk Image Dialog

2. Click the **...** button to the right of the "Disk Image file name" field
3. Find the desired disk image in the file explorer and click **Open**
4. Fill in the "Display name" text box with a desired name for the image and click **OK**
5. The mounted disk image should appear under **Disk Images** in the Master-copy sources window.

Note:

To avoid repeating steps 1-4 every time the application is launched check the "Autoload mounted Disk Images at every application start" box. This will complete the mounting process automatically in the future.

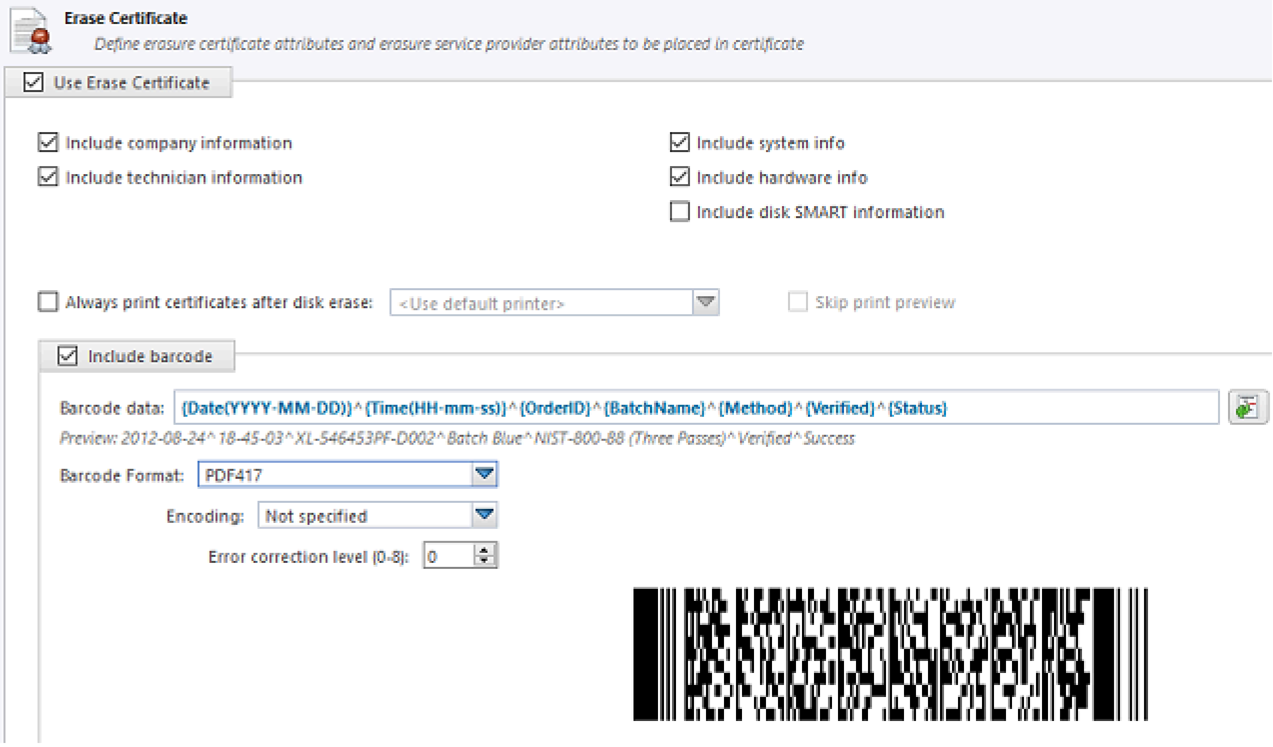
Related tasks

Mount Disk Image

Disk Clone

Erase Certificate

Erase Certificates section configures options for appearance and storage of certificates in PDF format. If **Use Erase Certificate** check box is selected, PDF certificates will be created and available for the immediate printing and storage for future use. Certificates can be customized with Company Information, Technician Information and other information.



Erase Certificate

Define erasure certificate attributes and erasure service provider attributes to be placed in certificate

☑ Use Erase Certificate

☑ Include company information

☑ Include technician information

☑ Include system info

☑ Include hardware info

□ Include disk SMART information

□ Always print certificates after disk erase: <Use default printer>

□ Skip print preview

☑ Include barcode

Barcode data: {Date(YYYY-MM-DD)}^{Time(HH-mm-ss)}^{OrderID}^{BatchName}^{Method}^{Verified}^{Status}

Preview: 2012-08-24^18-45-03^XL-546453PF-D002^Batch Blue^NIST-800-88 (Three Passes)^Verified^Success

Barcode Format: PDF417

Encoding: Not specified

Error correction level (0-8): 0

Include company information

Use this option to include company's information section to the certificate.

Include technician information

Use this option to include technician's information section to the certificate.

Include system info

Ensures that the Operating System specific information for the workstation used for erasure is saved to the certificate, such as:

- Operating system
- Kernel version
- Architecture

Include hardware info

Ensures that the Chassis-specific information for the workstation used for erasure is saved to the certificate, such as:

- Motherboard manufacturer
- Motherboard description
- Number of processors

Include disk SMART information

Use this option to include S.M.A.R.T. information section for the disk being erased.

Print Options

Always print certificate after disk erase

Prints erase certificate after erase completion automatically.

Skip print preview

Prints erase certificate skipping certificate preview step.

Default printer

Select a default printer for printing erase certificates.

Barcode

If **Include Barcode** check box is selected, a barcode section has been added to the certificate in desired format. Barcode section includes the following options:

Barcode data

Is a string of available tags and attributes concatenated by **^** (*CARET*) delimiter. User is able to compose a custom string with selected values from drop-down list or by simple typing.

Preview

Shows the composed data representation. Barcode data encoded to the actual barcode.

Barcode format

There is a drop-down list of available barcode formats.

Encoding

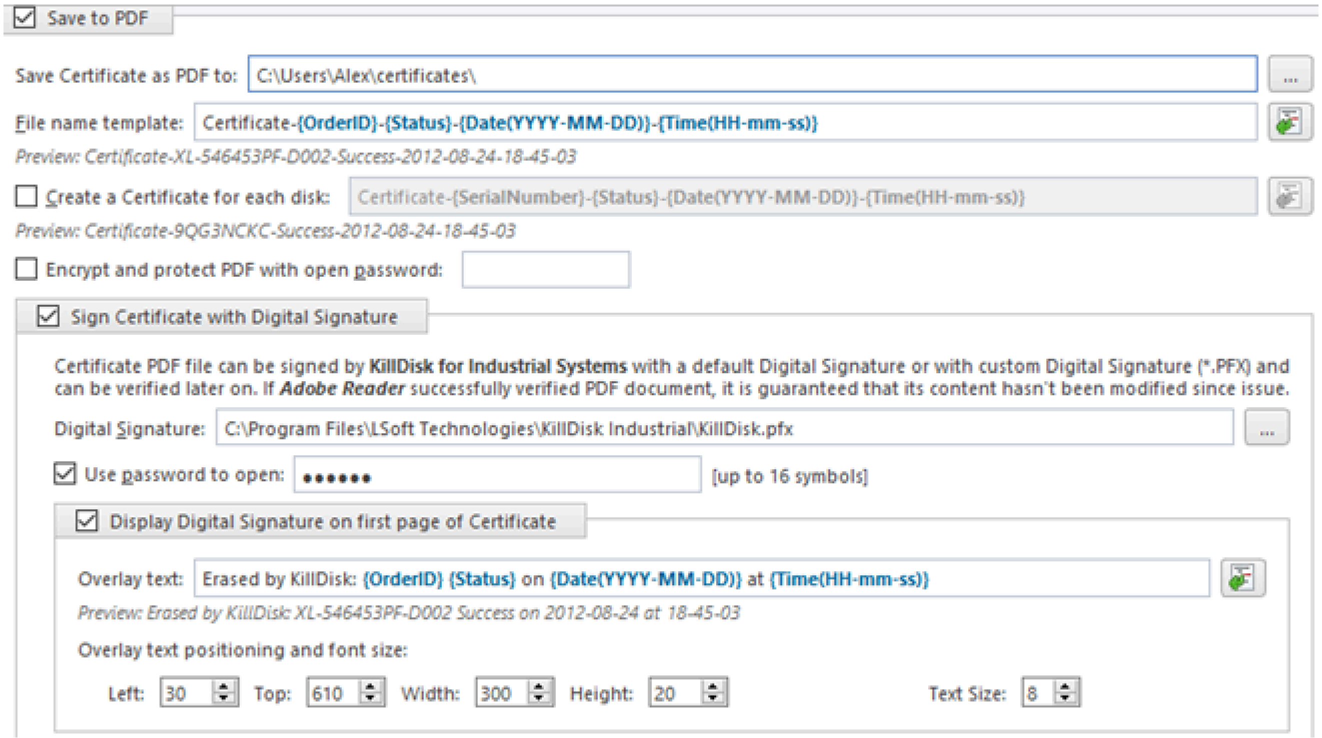
There is a drop-down list of available encoding schemes for the particular barcode format. The selected encoding is used to encode the barcode data.

Error correction level (0-8)

Affects a size of the barcode. Increasing the level value provides a better scanner readability. Values depend on the barcode format selected.

Save to PDF Options

Section **Save to PDF** offers options for storing a certificate to file in PDF format as well as encrypting it with a password.



☑ Save to PDF

Save Certificate as PDF to: C:\Users\Alex\certificates\

File name template: Certificate-{OrderID}-{Status}-{Date(YYYY-MM-DD)}-{Time(HH-mm-ss)}

Preview: Certificate-XL-546453PF-D002-Success-2012-08-24-18-45-03

□ Create a Certificate for each disk: Certificate-{SerialNumber}-{Status}-{Date(YYYY-MM-DD)}-{Time(HH-mm-ss)}

Preview: Certificate-9QG3NCKC-Success-2012-08-24-18-45-03

□ Encrypt and protect PDF with open password:

☑ Sign Certificate with Digital Signature

Certificate PDF file can be signed by **KillDisk for Industrial Systems** with a default Digital Signature or with custom Digital Signature (*.PFX) and can be verified later on. If ***Adobe Reader*** successfully verified PDF document, it is guaranteed that its content hasn't been modified since issue.

Digital Signature: C:\Program Files\LSoft Technologies\KillDisk Industrial\KillDisk.pfx

☑ Use password to open: •••••• [up to 16 symbols]

☑ Display Digital Signature on first page of Certificate

Overlay text: Erased by KillDisk: {OrderID} {Status} on {Date(YYYY-MM-DD)} at {Time(HH-mm-ss)}

Preview: Erased by KillDisk: XL-546453PF-D002 Success on 2012-08-24 at 18-45-03

Overlay text positioning and font size:

Left: 30 Top: 610 Width: 300 Height: 20 Text Size: 8

Certificate location

Use this option to save erase certificate as a file in PDF format to the selected location.

File name template

Specify the template composed of different tags for the Erase Certificate. See the tags available in Appendix tags section.

Create a certificate for each disk

This option is available for Batch settings only. If selected - in addition to Batch group certificate, a separate certificate will be created for each disk in Batch with file name that you can specify using different tags.

Encrypt with password

If password field is not empty, output certificate (PDF file) will be encrypted and protected with specified password. This password needs to be typed in any PDF viewer next time user opens a certificate for printing or previewing.

Sign Certificate

Section **Sign Certificate** offers options for signing an output PDF certificate with digital signature.

Sign certificate with digital signature

Certificate file (PDF) can be signed with a default Digital Signature (supplied **KillDisk.pfx**) or with your custom Digital Signature (*.PFX) and can be verified later on. If Adobe Reader successfully verified PDF document, it is guaranteed that its content hasn't been modified since issue.

If custom Digital Signature is required, please issue a certificate and specify full path to the custom certificate (*.PFX file) as well as its open password in the related fields below (**Digital Signature** and **Use password to open**)

Display digital signature

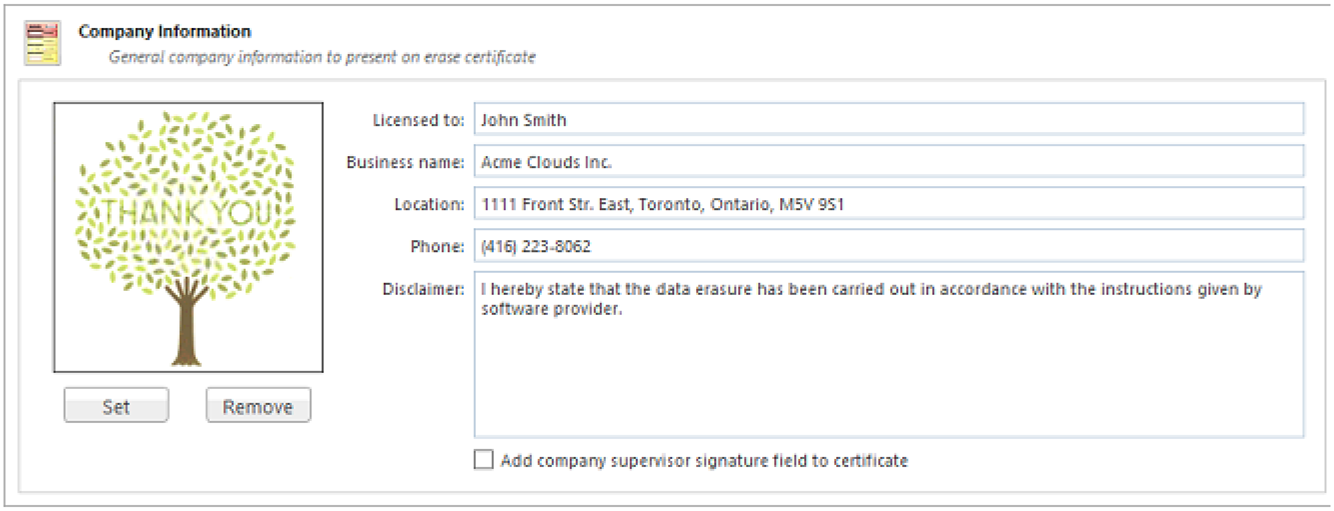
Digital Signature can be displayed as an overlay text on the first page of the certificate. After you turn this option on, you can specify overlay text using tags (see tags section) and configure signature position on the first page, rectangle dimensions and text size.

Related information

Name Tags on page 122

Company Information

Company Information section allows to configure business specific information for Erase Certificates, Processing Reports and Disk Labels.



Company Information

General company information to present on erase certificate

Licensed to: John Smith

Business name: Acme Clouds Inc.

Location: 1111 Front Str. East, Toronto, Ontario, M5V 9S1

Phone: (416) 223-8062

Disclaimer: I hereby state that the data erasure has been carried out in accordance with the instructions given by software provider.

□ Add company supervisor signature field to certificate

To specify a Company Logo image use the **Set** button. Select a desired logo image file. Most of the image formats are supported: JPEG, TIFF, BMP and PNG. The logo is previewed in the Company Logo space.

Tip:

It is recommended to use company logo with resolution suitable for printing (300dpi) with a side not exceeding 300px.

Add company's information to the related fields: **Licensed to** , **Business name** , **Location** , **Phone** , **Disclaimer** .

When the **Add company supervisor signature field to certificate** check box is marked the related field is added to the certificate.

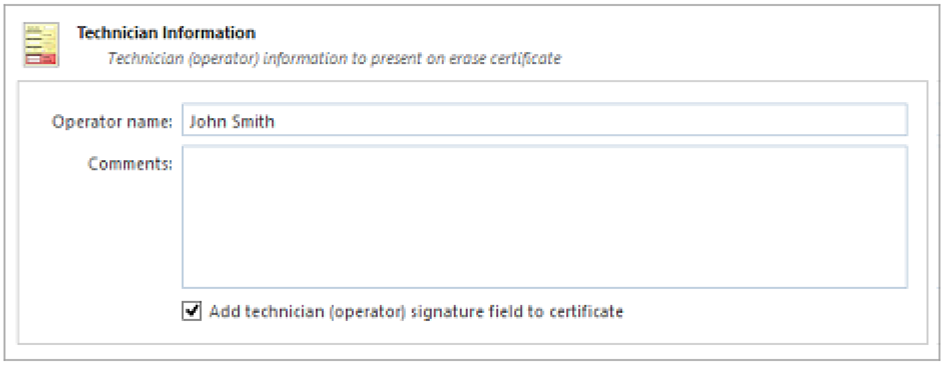
Related information

Erase Certificate on page 88

Processing Report on page 93

Technician Information

Technician Information section allows to configure a specific technician information for Erase Certificates, Processing Reports and Disk Labels.



Technician Information

Technician (operator) information to present on erase certificate

Operator name: John Smith

Comments:

☑ Add technician (operator) signature field to certificate

Type **Operator name** and **Comments** to the related fields.

When the **Add technician (operator) signature field to certificate** check box is marked the related field is added to the certificate.

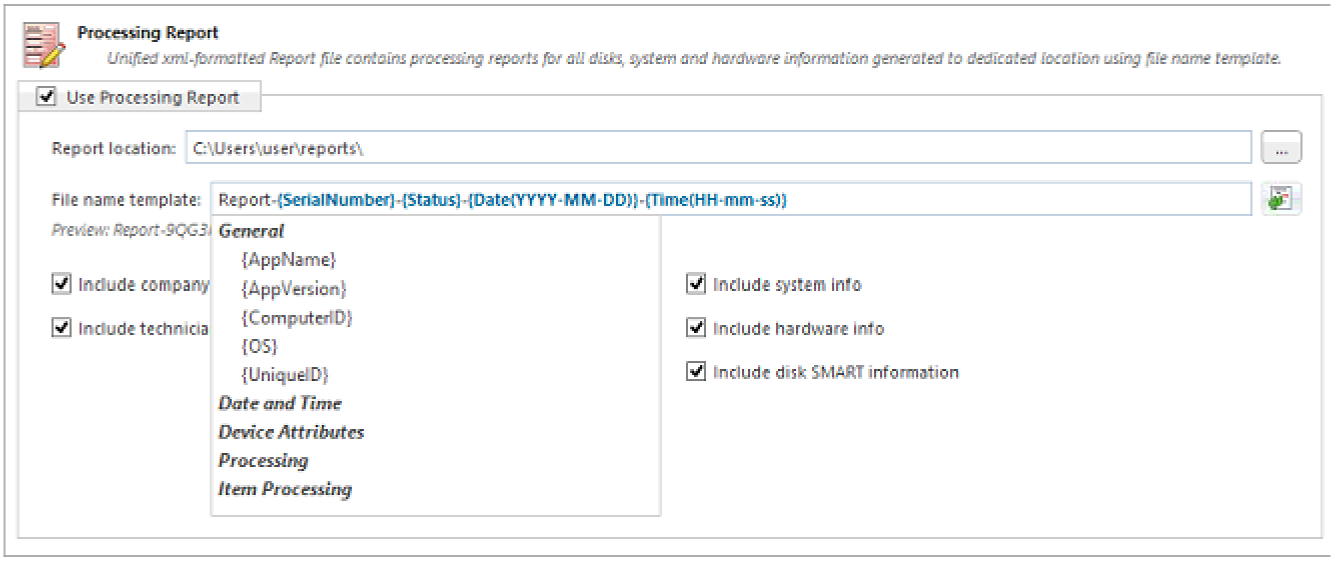
Related information

Erase Certificate on page 88

Processing Report on page 93

Processing Report

Processing Report section allows to configure the XML reports generated by **KillDisk** after operation is complete.



Processing Report

Unified xml-formatted Report file contains processing reports for all disks, system and hardware information generated to dedicated location using file name template.

☑ Use Processing Report

Report location: C:\Users\user\reports\

File name template: Report-{SerialNumber}-{Status}-{Date(YYYY-MM-DD)}-{Time(HH-mm-ss)}

Preview: Report-9QG3

☑ Include company

☑ Include technicia

☑ Include system info

☑ Include hardware info

☑ Include disk SMART information

Report location

Configure where XML erasure reports will be stored. You can use mapped network resource as a storage target.

File name template

Define a template for the file name for the reports. The main tags available are:

Available element:	Tag:
Serial ID	{Serial ID}

Available element:	Tag:
Erasure Status	{Status}
Date of Erasure	{Date(YYYY-MM-DD)}
Time of Erasure	{Time(HH-mm-ss)}

More tags are available, see the tags section in Appendix.

Include company information

Adds the company information (defined in Company Information) into the XML erasure report.

Include technician information

Adds the technician information (defined in Technician Information) into the XML erasure report.

Include system info

Ensures that the system-specific information is saved in the XML report, such as:

- Operating system
- Kernel version
- Architecture (x86, x64)

Include hardware info

Ensures that the system-specific information is saved in the XML report, such as:

- Motherboard manufacturer
- Motherboard description
- Host (name, domain)
- CPU (logical, physical)
- Memory

Include SMART information for each disk

Adds the information about disk health based on S.M.A.R.T. attributes into the XML erasure report.

The **KillDisk** XML report contains the following parts:

Type of Information	Specific data
Technician Information	*Name*
	Note
Company Information	*Name*
	Licensed
	Location
	Phone

Type of Information	Specific data
	Disclaimer
System Information	*OS version*
	Platform
	Kernel
Hardware Information	*Motherboard Manufacturer*
	Motherboard Description
	Number of Processors
Erase Attributes	*Erase Verify*
	Passes
	Method
	Verification Passes
Error Handling Attributes	*Errors Terminate*
	Skip interval
	Number of Retries
	Lock
	Source?
	Ignore Write?
	Read?
	Lock?
Disks	*Device Size*
	Device Type
	Serial Number
	Revision
	Product Number
	Name
	Geometric Information
	Partitioning Scheme
Additional Report Attributes	*Fingerprint Information*
	Initialize disk?
Results	*Bay*
	Time and Date Started
	Disk Information
	Status
	Result

Type of Information	Specific data
	Time Elapsed
	Errors
	Name of operation
Conclusion	*Overall result of the operation*

Note:

If internal tag <task> is present, Results are appeared inside.

Related information

Name Tags on page 122

Database Connection

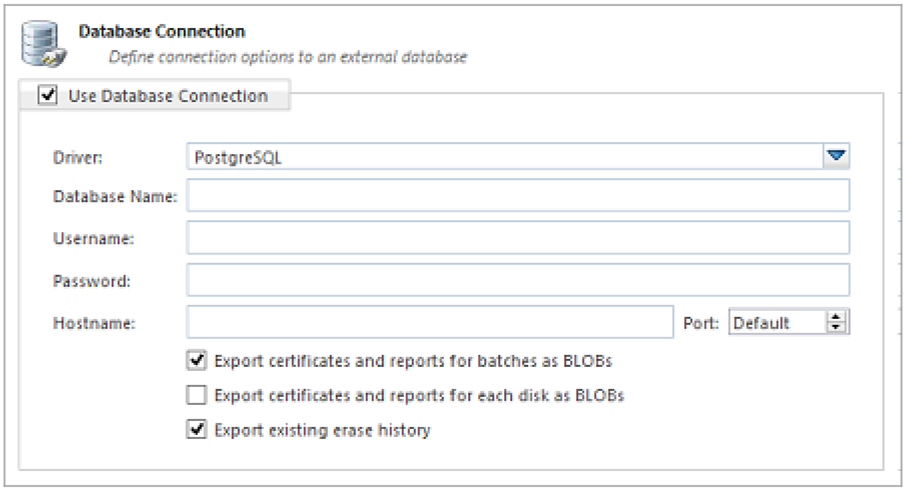
Database Connection section allows to set up connection parameters for the external SQL database to use **KillDisk**'s export feature, which allows to send out all current logs, certificates and reports from locally stored database over the network to an external SQL database. Both local Event Journal and all future transactions can be exported after connection to database is established.

Supported connection to SQL databases:

- Any SQL92 Compliant Database (via ODBC)
- Microsoft SQL Server
- Microsoft Access
- PostgreSQL
- ORACLE
- MySQL
- SQLite

To connect to an external SQL database do one of:

1. Navigate to **Tools** > **Preferences** or press **F10**. Then click **Database Connection** section
2. Database Connection dialog appears:



Database Connection

Define connection options to an external database

☑ Use Database Connection

Driver: PostgreSQL

Database Name:

Username:

Password:

Hostname: Port: Default

☑ Export certificates and reports for batches as BLOBs

☐ Export certificates and reports for each disk as BLOBs

☑ Export existing erase history

3. Select Driver for the particular database you want to connect to from the list of databases
4. Type in the database *Name* on the remote end
5. Type in the database Username for the connection
6. Type in the database Password for the selected user

7. Type in the Hostname (which can be IP address or local Network Server Name)
8. Select a TCP/IP Port to use if it is different from the default value
9. Set check marks (if needed) for the additional export options:

- Export certificates and reports for batches
- Export certificates and reports for particular disks
- Export existing erase history (can be done only once per a new connection)

Once a connection to the external SQL database is established **KillDisk** starts exporting all information related to the current operations automatically.

Note:

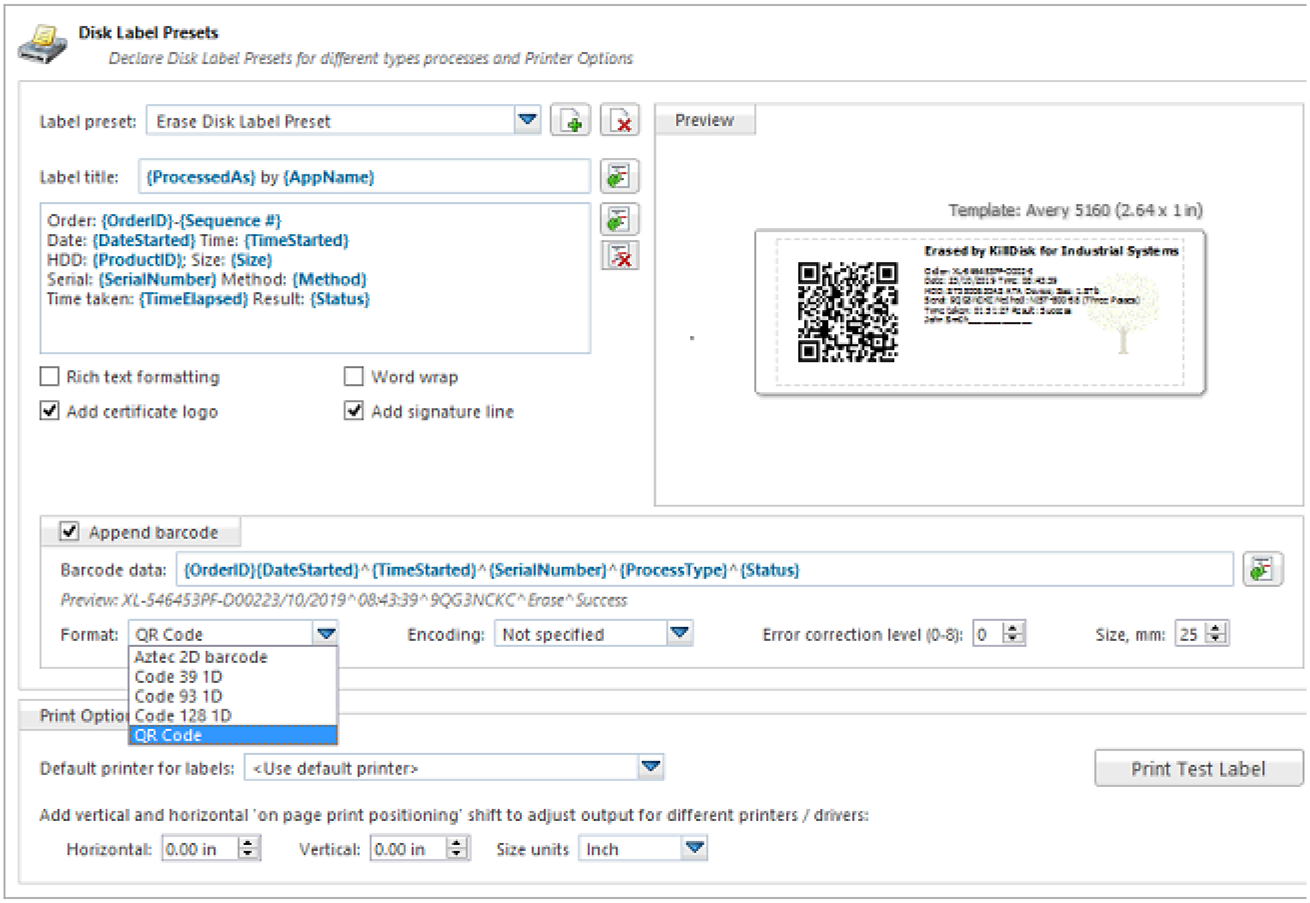
For the database export to be successful you need to provide a database user with privileges enough for creation two tables (**DISKS** and **BATCHES**) and populating these tables.

Related information

Event Journal on page 76

Disk Label Presets

Disk Label Presets section allows to adjust label settings for the **KillDisk**. Labels can be formatted for any printer, page or label type using **KillDisk** highly customizable labels' formatting features.



Disk Label Presets

Declare Disk Label Presets for different types processes and Printer Options

Label preset: Erase Disk Label Preset

Label title: {ProcessedAs} by {AppName}

Order: {OrderID}-{Sequence #}
Date: {DateStarted} Time: {TimeStarted}
HDD: {ProductID}; Size: {Size}
Serial: {SerialNumber} Method: {Method}
Time taken: {TimeElapsed} Result: {Status}

☐ Rich text formatting ☐ Word wrap
☑ Add certificate logo ☑ Add signature line

☑ Append barcode

Barcode data: {OrderID}{DateStarted}^{TimeStarted}^{SerialNumber}^{ProcessType}^{Status}

Preview: XL-546453PF-D00223/10/2019^08:43:39^9QG3NCKC^Erase^Success

Format: QR Code Encoding: Not specified Error correction level (0-8): 0 Size, mm: 25

Default printer for labels: <Use default printer>

Add vertical and horizontal 'on page print positioning' shift to adjust output for different printers / drivers:

Horizontal: 0.00 in Vertical: 0.00 in Size units Inch

Label preset

Displays and let you select a default Label Preset or create a new one. Click **Add New Label Preset** button to create a custom label preset with your own specifications. Click **Delete** button to delete the selected label preset .

Label title

Sets a title to be printed (in bold) at the top of the labels. It can be a company name, batch name or any other descriptors you may consider useful to identify the operation. Static text can be typed in or any dynamic attributes (tags) can be inserted at current cursor's position. Click **Insert Name Tag** button to insert predefined tag from the drop-down list.

Label area

Label's content for the preset. Static text can be typed in or any dynamic attributes (tags) can be inserted at current cursor's position. Click **Insert Name Tag** button to insert predefined tag from the drop-down list. Click **Clear Pattern** button to empty all label's area.

Label attributes

You can use **RTF formatting** and set **Word Wrapping** behavior using related check boxes.

Add signature line

Adds a line at the bottom of the label for the technician to sign off on upon completion of the operation.

Add certificate logo

Includes the logo used in the certificate as a label's watermark background.

Label preview

Displays a preview of the label with the current input settings. Refreshes automatically when any adjustments are made to the settings.

Barcode options

Selecting **Append barcode** check-box will print QR Code or Barcode on the label to be able to be scanned thereafter for third party inventory database

Barcode data

String including essential erase parameters to be encoded and transformed to QR Code or Barcode. Static text can be typed in or any dynamic attributes (tags) can be inserted at current cursor's position. Click **Insert Name Tag** button to insert predefined tag from the drop-down list.

Preview

Displays a preview of encoded string with the current input settings. Refreshes when any adjustments are made to the settings.

Format

List of supported QR Code and Barcode formats. Currently supported: **Aztec 2D barcode**, **Code 39 1D**, **Code 93 1D**, **Code 128 1D**, **QR Code**. Note that different types of Barcodes can accept different size of encoded string.

Encoding

If barcode string contains symbols other than English letters, you can specify encoding (code page) for the particular language.

Error correction level

The lower the error correction level, the less dense the QR code image is, which improves minimum printing size. The higher the error correction level, the more damage it can sustain before it becomes unreadable.

Size, mm

Size in millimeters for the Barcode/QR Code to be printed on the label.

Print options

Define options for label printing including special label printers (Brother QL-700, etc):

Default printer

Define printer to be used exclusively to print labels from the list of installed printers.

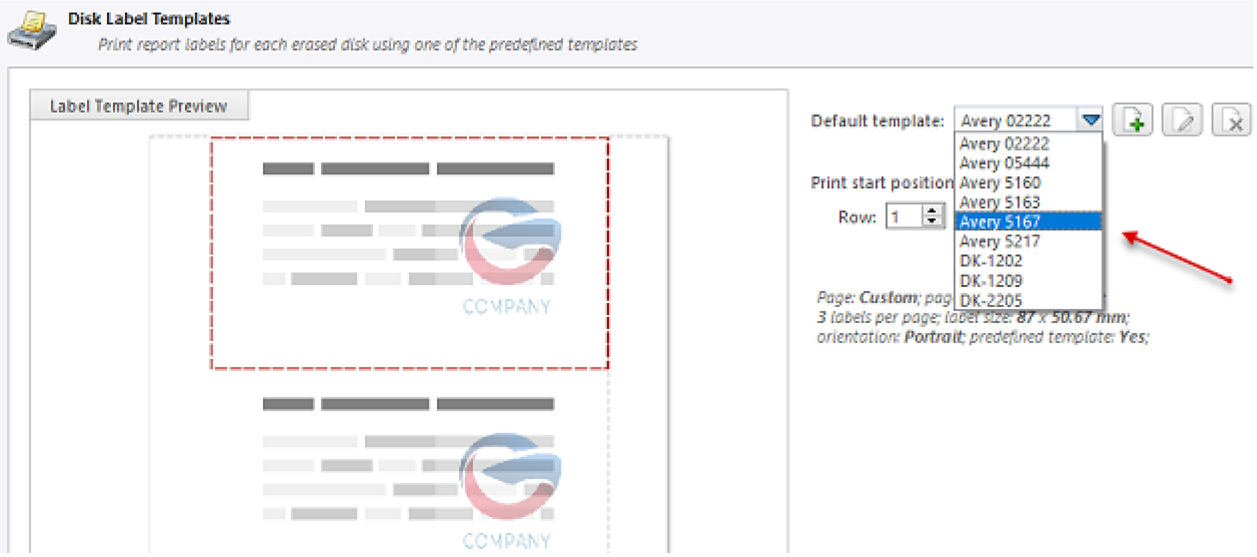
Print output adjustments

The print output adjustments section of the dialogue allows you to vertically or horizontally displace the position measured in specific print units to adjust to different printers.

Print test label command let you print Disk Label sample to verify your settings and selected layout attributes.

Disk Label Templates

Disk Label Templates section defines set of predefined label templates for usage in different scenarios.



Disk Label Templates

Print report labels for each erased disk using one of the predefined templates

Label Template Preview

Default template: Avery 02222

Print start position

Row: 1

Page: Custom; pag
3 labels per page; label size: 87 x 50.67 mm;
orientation: Portrait; predefined template: Yes;

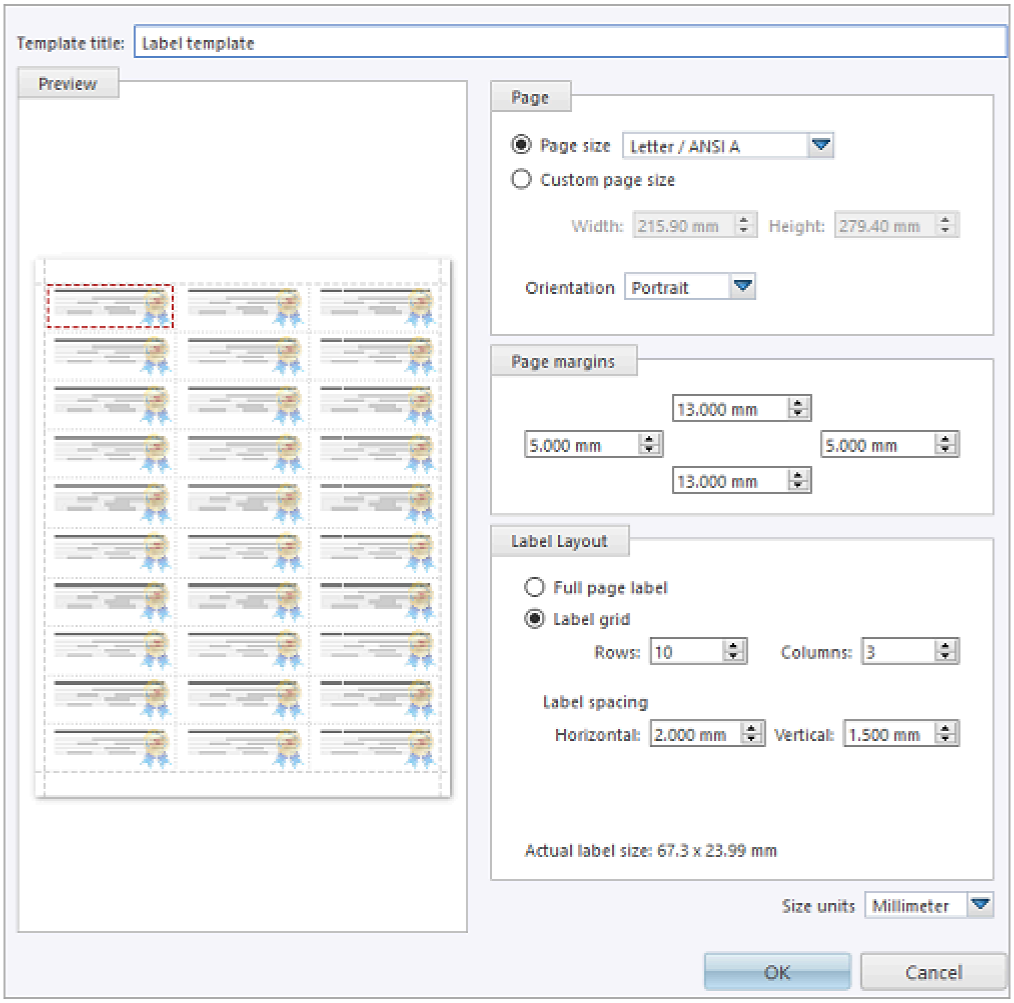
Disk Label Templates dialog gives you an access to a number of predefined standard templates and to any custom templates you can create. These templates may be easily selected without opening any additional dialogs. The details of the selected template are displayed below the selection box. If your custom labels differ from any of the templates available, the button allows you to create a custom template with your own specifications. Additionally, the button allows you to modify an existing template and the button deletes the selected template.

Print Start Position

The Print Start Position section of the dialogue allows you to select the starting position of the label on the page to print from. The printing won't always start from the 1x1 position, so you can adjust this setting accordingly.

Creating a New Template

To open a Template Editor, click the button on the Disk Label Templates dialog .



Template title: Label template

Page

● Page size Letter / ANSI A

○ Custom page size

Width: 215.90 mm Height: 279.40 mm

Orientation Portrait

Page margins

13.000 mm

5.000 mm 5.000 mm

13.000 mm

Label Layout

○ Full page label

● Label grid

Rows: 10 Columns: 3

Label spacing

Horizontal: 2.000 mm Vertical: 1.500 mm

Actual label size: 67.3 x 23.99 mm

Size units Millimeter

Figure 71: Erase Labels Page Template

Template title

Sets a custom title for your template. This is the name to refer this template when selecting it in the Print Label dialog.

Page

Specify the dimensions of the page being used to print the labels. Select page size from the list of standard sizes or define custom size using exact measurements. Define page orientation.

Page margins

Page margins are defined for the top, bottom, left and right sides of the page.

Label layout

Define how the labels appear on the page. Define the spacing in between labels on the page and the dimensions of the label grid. Once you entered the proper measurements, **KillDisk** takes care of all formatting.

Size units

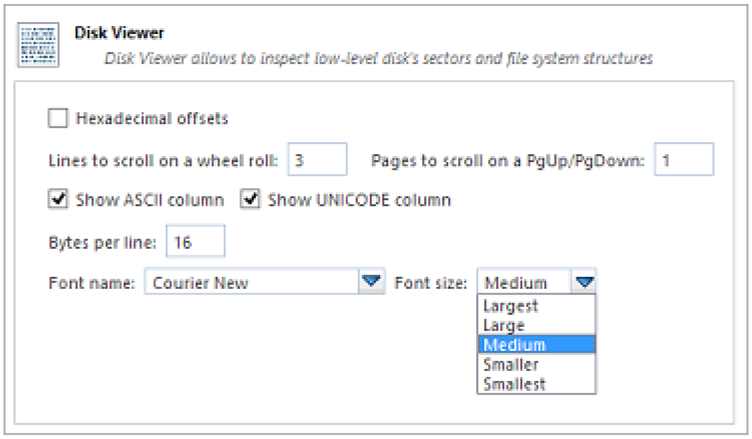
The units of measurement may vary between millimeters, inches, pixels and points. If a value is entered in one measurement and then size unit is changed, the appropriate conversion takes place.

Related information

Name Tags on page 122

Disk Viewer

Disk Viewer section allows to set hexadecimal view settings, font and user interaction parameters.



Disk Viewer

Disk Viewer allows to inspect low-level disk's sectors and file system structures

□ Hexadecimal offsets

Lines to scroll on a wheel roll: 3   Pages to scroll on a PgUp/PgDown: 1

☑ Show ASCII column ☑ Show UNICODE column

Bytes per line: 16

Font name: Courier New   Font size: Medium

Hexadecimal offsets

Toggles offset format between decimal and hexadecimal.

Lines to scroll

Number of lines to scroll for a single mouse wheel sweep.

Pages to scroll

Number of pages to skip for a single **Page Up** or **Page Down**.

Show ASCII column

Toggles display content in ASCII format.

Show UNICODE column

Toggles display content in UNICODE format.

Bytes per line

Defines amount of bytes per line in hexadecimal display.

Font name

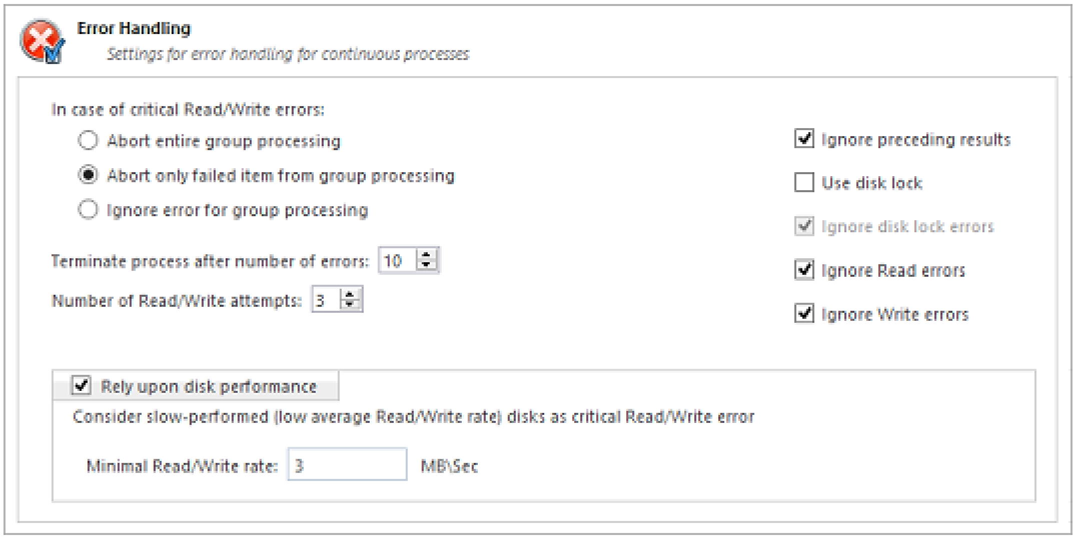
Select any mono-space font from the list of available ones for better view experience.

Font size

Font size to be used in hexadecimal display.

Error Handling

Error Handling section has the advanced settings to configure error handling while erasing or cloning the data.



Error Handling

Settings for error handling for continuous processes

In case of critical Read/Write errors:

○ Abort entire group processing

● Abort only failed item from group processing

○ Ignore error for group processing

Terminate process after number of errors: 10

Number of Read/Write attempts: 3

☑ Ignore preceding results

□ Use disk lock

☑ Ignore disk lock errors

☑ Ignore Read errors

☑ Ignore Write errors

☑ Rely upon disk performance

Consider slow-performed (low average Read/Write rate) disks as critical Read/Write error

Minimal Read/Write rate: 3 MB\Sec

Error handling attributes

KillDisk allows to select one of ways to handle Read/Write Errors:

Abort entire group processing
If erase Batch is in progress and one of the disks has errors, the erase process for ALL the disks in the Batch will be terminated.

Abort only failed disk from group processing
This is the default setting. Failed disks return an error and terminate the erase process. Other disks in the Batch will continue current operation.

Ignore error for group processing
Ignores the read/write error and continues erasing whatever is possible on the disk. None active or forth going operations will be terminated.

Terminate process after number of errors
Sets the error threshold to a certain amount before the disk operation is terminated and deemed unsuccessful.

Number of read/write attempts
Sets the number of attempts **KillDisk** makes to perform an operation when an error is encountered before it stops execution.

Ignore preceding results
Errors (if any) on previous steps (i.e. Examination) are ignored and following steps (i.e. Erase, Clone) will be executed. If turned off the errors on previous steps will stop all further actions.

Use disk lock
Locks disks from being used by any other applications while operation is in progress.

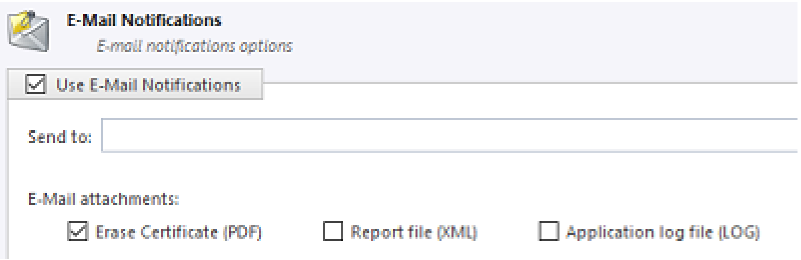
Ignore disk lock errors
Errors encountered with **KillDisk** not being able to access locked disks will be ignored.

Ignore read/write errors
Toggle whether read errors or write errors will be just ignored.

Rely upon disk performance
Sets a minimum acceptable read/write speed in megabytes per second for disks to flag under-performing drives.

E-mail Notifications

E-mail Notifications sections allows to configure how client can be notified after operation is complete. **KillDisk** can deliver results of its sanitation process (certificates, reports, logs) by e-mail.



E-Mail Notifications
E-mail notifications options

☑ Use E-Mail Notifications

Send to:

E-Mail attachments:

☑ Erase Certificate (PDF) □ Report file (XML) □ Application log file (LOG)

Send to

Type e-mail address where erasing/wiping reports will be sent to.

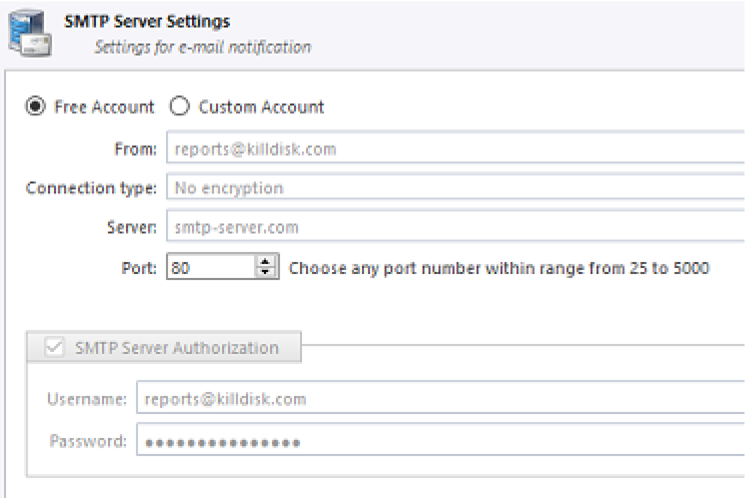
E-mail attachments

Certificate, XML Report or Log File can be emailed, just mark the related check box.

When you mark **Use E-Mail Notifications** check box, the **SMTP Server Settings** section becomes accessible for the configuration.

SMTP Server Settings

These settings allow to configure mailer settings for delivering erasing/wiping reports to user's mailbox. Simple Mail Transport Protocol (SMTP) is responsible for transmitting e-mail messages and SMTP Server settings need to be configured properly.



SMTP Server Settings

Settings for e-mail notification

● Free Account ○ Custom Account

From: reports@killdisk.com

Connection type: No encryption

Server: smtp-server.com

Port: 80 Choose any port number within range from 25 to 5000

☑ SMTP Server Authorization

Username: reports@killdisk.com

Password: ●●●●●●●●●●●●●●●

Account type

KillDisk offers you a free SMTP account located on **www.smtp-server.com** that can be used for sending reports out. By default all the required parameters are filled up and configured properly. If your corporate policy does not allow using services other than its own you need to switch this option to the Custom Account and configure all the settings manually. Ask your system/network administrator to get these parameters.

From

Type e-mail address which you expect these reports to come from.

Connection type

Select encryption type to use: **No encryption**, **SSL** or **TLS**.

SMTP server

KillDisk offers you the use of smtp-server.com for a free SMTP account. This account is pre-configured for **KillDisk** users. Ask your system/network administrator to get the proper SMTP server domain to be used.

SMTP port

For the free SMTP account **KillDisk** allows you to use smtp-server.com on port 80. This is a standard port being used by all web browsers to access the Internet. This port most likely is open on a corporate and home networks. Other ports can be filtered by and restricted by a network firewall. Ask your system/network administrator to set up a proper SMTP port for the custom SMTP server.

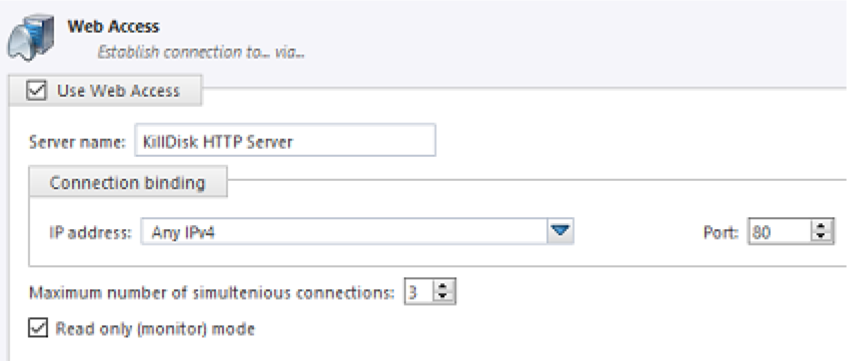
SMTP server authorization

To avoid spam and other security issues some SMTP servers require each user to be authorized before sending e-mails. In this case proper Username and Password required to be typed. Ask your system/network administrator to get proper authorization settings.

Web Access

Web Access section allows to configure remote connections to the workstation. **KillDisk** supports monitoring the workstation's state including all running processes from remote computer via standard

HTTP protocol in any Web Browser. In order to start the Web Service properly, connection parameters for the remote host must be configured first.



Web Access

Establish connection to... via...

☑ Use Web Access

Server name: KillDisk HTTP Server

Connection binding

IP address: Any IPv4

Port: 80

Maximum number of simultenious connections: 3

☑ Read only (monitor) mode

Server name

Type the name of current workstation to be displayed on remote hosts.

IP address

Web Service can be running on all IP addresses (version 4 protocol) assigned to current workstation or on the particular IP. Drop-down list box enumerates all available IP addresses for the workstation.

Port

Web Service can be set up on a default TCP/IP port (80), or on any other port provided it is open and accessible through the firewall.

Important:

Make sure that selected Port is open on the Local firewall for the host to be accessible over the network. Contact you local Network Administrator if you are not sure how to configure Firewall settings.

Maximum number of simultaneous connections

Workstation can serve requests from several web clients, however each connection consumes resources such as CPU, RAM & Network Bandwidth. You can limit the number of web clients which can monitor current KillDisk workstation. Default value is 3.

Read only or interactive node

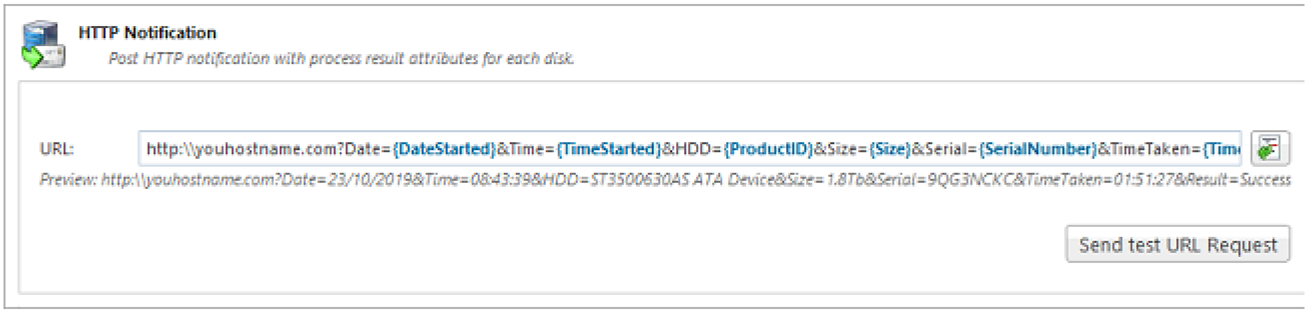
Web Service can be used either for monitoring only or be interactive service. In interactive mode user can start Disk Erase, Wipe, Stop processes and other commands for Disks and Batches.

Important:

Be careful when you clear Read Only check box! In this case any remote client can not only monitor, but start/stop processes on the workstation without physical access to the system and without up-to-date knowledge of disks attached and business needs, so it can interfere with local technicians' work.

HTTP Notifications

HTTP Notification section allows to configure a feature for collecting and managing erase statistics using your own remotely deployed HTTP server.



HTTP Notification

Post HTTP notification with process result attributes for each disk.

URL: http:\\youhostname.com?Date={DateStarted}&Time={TimeStarted}&HDD={ProductID}&Size={Size}&Serial={SerialNumber}&TimeTaken={Tim

Preview: http:\\youhostname.com?Date=23/10/2019&Time=08:43:39&HDD=ST3500630AS ATA Device&Size=1.8Tb&Serial=9QG3NCKC&TimeTaken=01:51:27&Result=Success

The server address, port and parameters (attributes) can be specified in the URL field. Preview shows the assembled request string. Click the **Send test URL Request** button in order to test the connection. If everything is configured properly your server is going to receive a list of desired parameters (described as name tags) after completion of Disk Erase procedure.

Related information

Name Tags on page 122

Troubleshooting

In the events of technical difficulties with **KillDisk** you may choose to either troubleshoot the system yourself or, within an active maintenance period (you receive 1 year free with your purchase), you can contact our support team. Attach your application log and hardware configuration (hardware diagnostic file) with your support request.

Common Tips

Common Problems

Disk data can not be erased

Ensure that disk is fully functional (no physically damages) and is accessible by Operating System.

Ensure you are not erasing the system disk or the disk KillDisk launched from (application won't let you erase these disks).

Data still found after a Wipe operation

The Wipe operation sanitizes the only data that has already been deleted and not visible by Operating System. To sanitize ALL the data including existing files and the Operating System itself, use the **Erase Disk** operation.

Erased the wrong disk

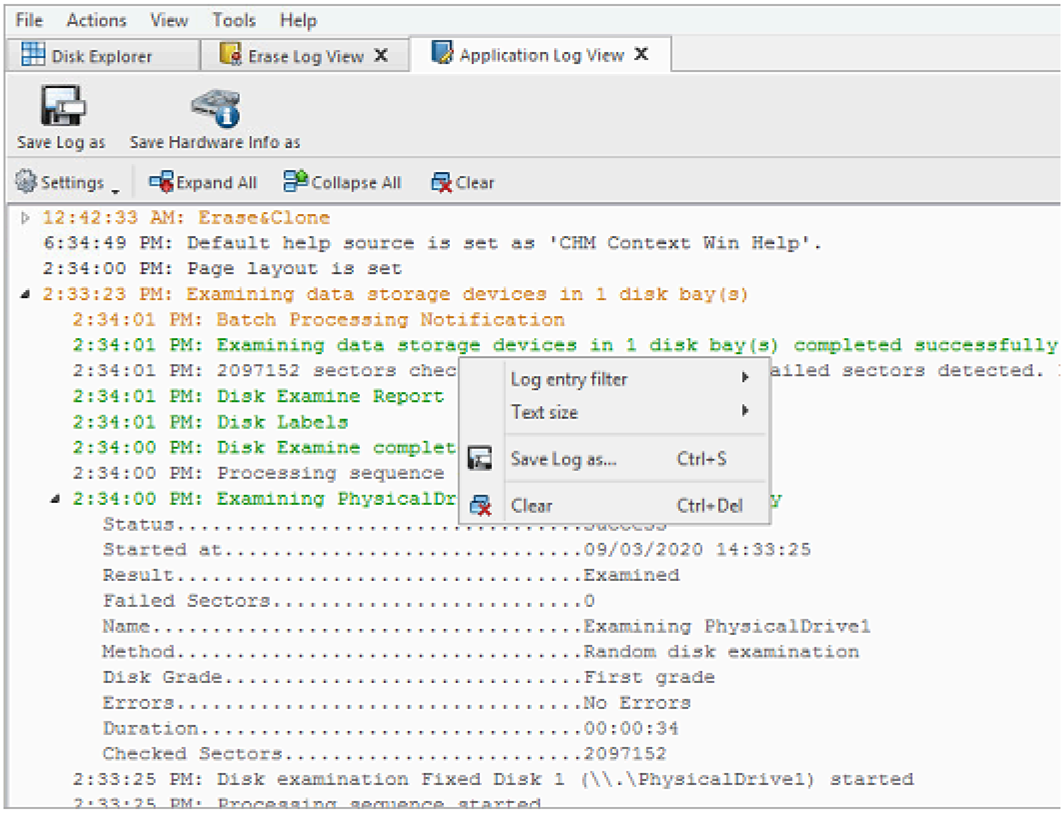
Stop erase operation as soon as possible. Once the data completely sanitized, it won't longer be accessible. Use a tool like **Active@ File Recovery** (https://www.file-recovery.com) to recover remains of data that has not been sanitized yet.

Application Log

Application Log View reflects every action taken by the application and displays messages, notifications and other service information. Use these messages to observe and analyze erase processes.

To open Application Log View do one of the following:

- Click **Tools** > **Application Log** from the main menu
- Press **F8** keyboard shortcut



```
▷ 12:42:33 AM: Erase&Clone
  6:34:49 PM: Default help source is set as 'CHM Context Win Help'.
  2:34:00 PM: Page layout is set
◢ 2:33:23 PM: Examining data storage devices in 1 disk bay(s)
    2:34:01 PM: Batch Processing Notification
    2:34:01 PM: Examining data storage devices in 1 disk bay(s) completed successfully
    2:34:01 PM: 2097152 sectors chec                          ailed sectors detected.
    2:34:01 PM: Disk Examine Report
    2:34:01 PM: Disk Labels
    2:34:00 PM: Disk Examine complet
    2:34:00 PM: Processing sequence
  ◢ 2:34:00 PM: Examining PhysicalDr                          y
        Status.................................
        Started at.............................09/03/2020 14:33:25
        Result.................................Examined
        Failed Sectors.........................0
        Name...................................Examining PhysicalDrive1
        Method.................................Random disk examination
        Disk Grade.............................First grade
        Errors.................................No Errors
        Duration...............................00:00:34
        Checked Sectors........................2097152
    2:33:25 PM: Disk examination Fixed Disk 1 (\\.\PhysicalDrive1) started
    2:33:25 PM: Processing sequence started
```

Once Application Log View is open and active, you can use toolbar buttons and the context menu to perform the following tasks:

Save log as

Opens a standard **Save As** dialog. Save the actual application log file to the local disk Default is .LOG file extension.

Save hardware info as

Opens a standard **Save As** dialog. Save the disk diagnostic file to the local disk. Default is .XML file extension.

Log entry filter

Shows or hides specific entry types in Log View:

Minimum details

Shows non-critical warning entries.

Maximum details

Shows advanced entries related to the application behavior and data analysis.

Text size

Changes text size to Large, Normal or Small.

Expand All

Expands all collapsed log nodes.

Collapse All

Collapses all log nodes.

Clear

Clear the log for the current application session.

Tip:

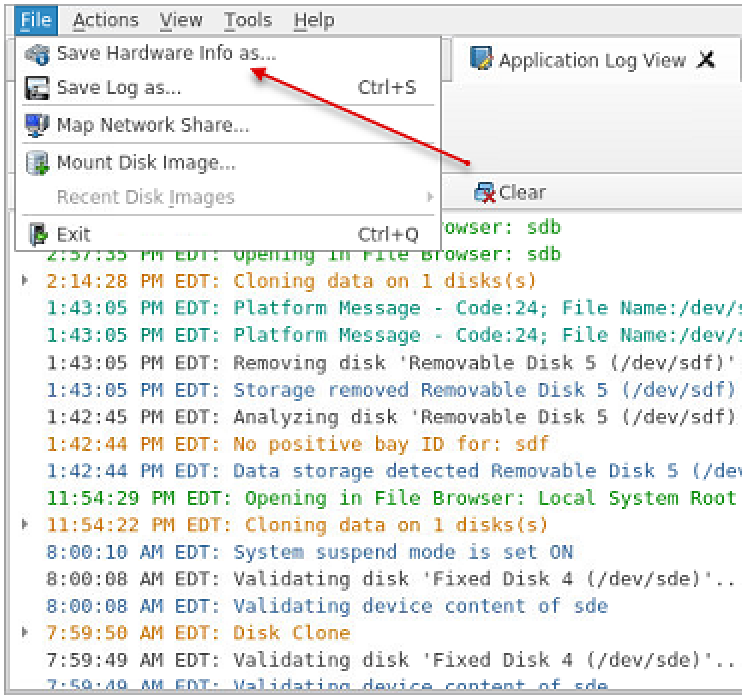
We recommend that you attach a copy of the log file to all requests made to our technical support group. The entries in this file will help us to resolve certain issues.

Hardware Diagnostic File

If you want to contact our technical support a file that contains a summary of your local devices and hardware configuration is very helpful and it is required to submit it for the proper problem investigation.

KillDisk allows you to create a hardware summary file in XML format. This data format is "human-readable" and can help our technical support staff to analyze your computer configuration or point out disk failures or abnormal behavior.

To create a hardware diagnostic file, click **Save Hardware Info as** from the **File** menu .



```
                                       owser: sdb
  2:57:35 PM EDT: Opening in File Browser: sdb
▸ 2:14:28 PM EDT: Cloning data on 1 disks(s)
  1:43:05 PM EDT: Platform Message - Code:24; File Name:/dev/
  1:43:05 PM EDT: Platform Message - Code:24; File Name:/dev/
  1:43:05 PM EDT: Removing disk 'Removable Disk 5 (/dev/sdf)'
  1:43:05 PM EDT: Storage removed Removable Disk 5 (/dev/sdf)
  1:42:45 PM EDT: Analyzing disk 'Removable Disk 5 (/dev/sdf)
  1:42:44 PM EDT: No positive bay ID for: sdf
  1:42:44 PM EDT: Data storage detected Removable Disk 5 (/de
  11:54:29 PM EDT: Opening in File Browser: Local System Root
▸ 11:54:22 PM EDT: Cloning data on 1 disks(s)
  8:00:10 AM EDT: System suspend mode is set ON
  8:00:08 AM EDT: Validating disk 'Fixed Disk 4 (/dev/sde)'..
  8:00:08 AM EDT: Validating device content of sde
▸ 7:59:50 AM EDT: Disk Clone
  7:59:49 AM EDT: Validating disk 'Fixed Disk 4 (/dev/sde)'..
  7:59:49 AM EDT: Validating device content of sde
```

Note:

To save time on initial contact with our technical support staff we highly recommend that you submit a hardware diagnostic file, otherwise, most likely, it will be requested from you by our support team later on.

Related information

Application Log on page 106

Appendix

How Fast Erasing Occurs?

An actual erase speed depends on many factors:

- Drive Speed: RPM and/or controller sequential write speeds - the most important factor
- Drive Interface: PCI-E IV (2GB/s), SAS (6/12GB/s), SATA III (6GB/s), SATA II (3GB/s), SATA I (1.5GB/s)
- Interface Controller: Motherboard controller interface and/or HBA/RAID card
- Computer overall performance (CPU+RAM) and workload (how many parallel erases occur)

For most modern computers and disks (manufactured within last 5-7 years) SATA III standard is supported, so erase speed is limited by HDD throughput (disk write speed) only.

Our tests give the results: **10 GB per minute (in average) per pass** with decent computer configuration and disks with age of up to 5 years old.

For example, 2 TB Toshiba disk has been erased on Windows platform with one pass within 3 hours and 32 minutes, 14 TB Western Digital disk - within 18 hours 53 minutes.

The following snapshots are real-test results for erasing of:

1) **600 GB** HP SAS 15000rpm disk with [One Pass Zeros] and [US DoD 5220.22-M, 3 passes + verification] showing the average speed of **10 GB/min per pass**

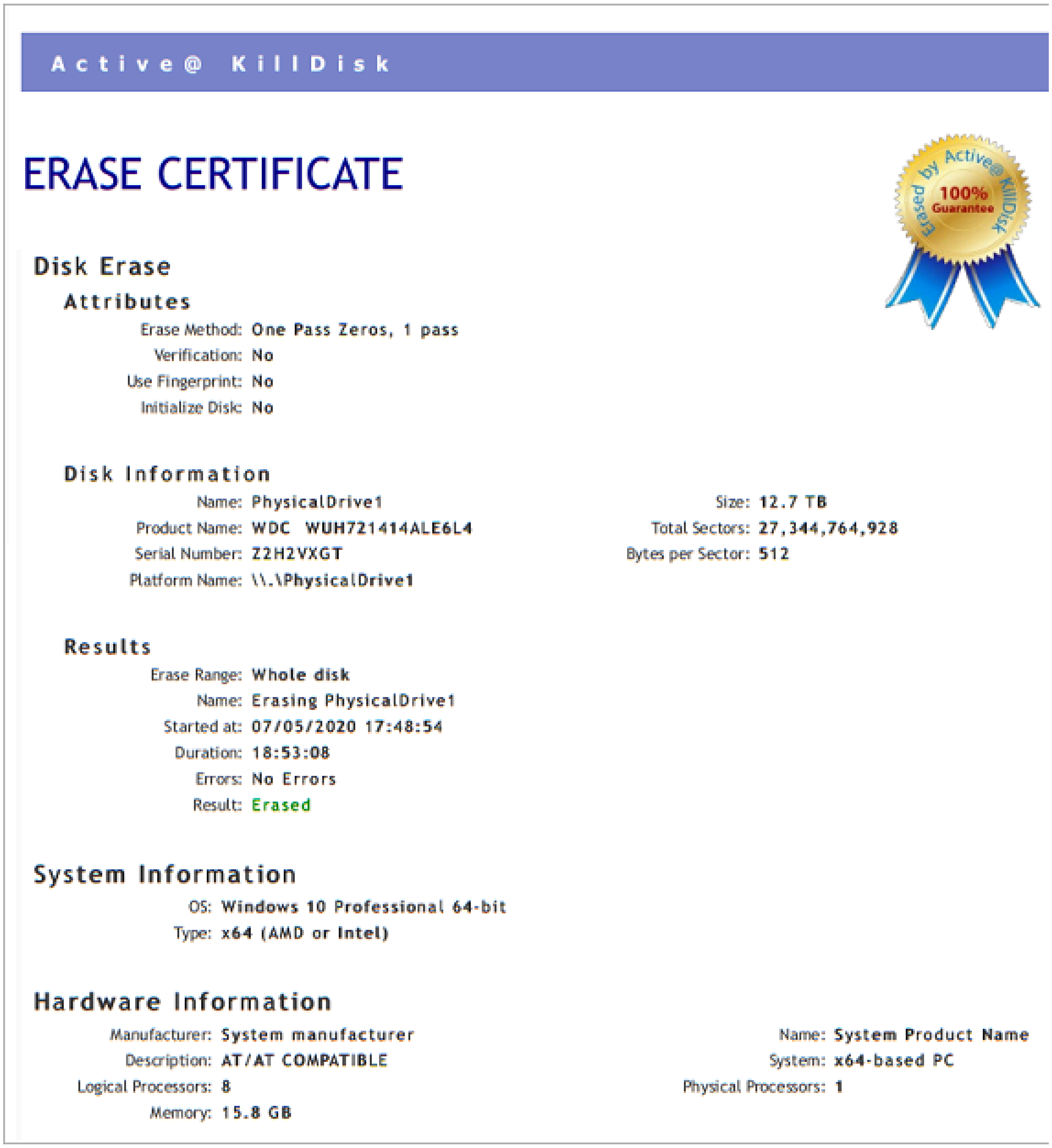
2) **120 GB** SSD Kingston SATA III SSD with [One Pass Zeros] and [US DoD 5220.22-M, 3 passes + verification] showing the average speed of **17 GB/min per pass**

3) **256 GB** Samsung EVO 970 NVME SSD with [One Pass Zeros] and [US DoD 5220.22-M, 3 passes + verification] showing the average speed of **23 GB/min per pass**

4) **1 TB** Kingston U.2 NVME SSD with [One Pass Zeros] and [US DoD 5220.22-M, 3 passes + verification] showing the average speed of **90 GB/min per pass**

5) **2 TB** Toshiba (manufactured in 2015) SATA III (6 GBps) 7200 rpm disk with One Pass Zeros and US DoD 5220.22-M (3 passes + verification) showing the average speed of **9 GB/min per pass**

6) **14 TB** (Western Digital manufactured in 2019) SATA III (6 Gbps) 7200 rpm disk with One Pass Zeros and US DoD 5220.22-M (3 passes + 10% verification) showing the average speed of **12 GB/min per pass**



Active@ KillDisk

ERASE CERTIFICATE

Disk Erase

Attributes

Erase Method: One Pass Zeros, 1 pass
Verification: No
Use Fingerprint: No
Initialize Disk: No

Disk Information

Name: PhysicalDrive1
Product Name: WDC WUH721414ALE6L4
Serial Number: Z2H2VXGT
Platform Name: \\.\PhysicalDrive1

Size: 12.7 TB
Total Sectors: 27,344,764,928
Bytes per Sector: 512

Results

Erase Range: Whole disk
Name: Erasing PhysicalDrive1
Started at: 07/05/2020 17:48:54
Duration: 18:53:08
Errors: No Errors
Result: Erased

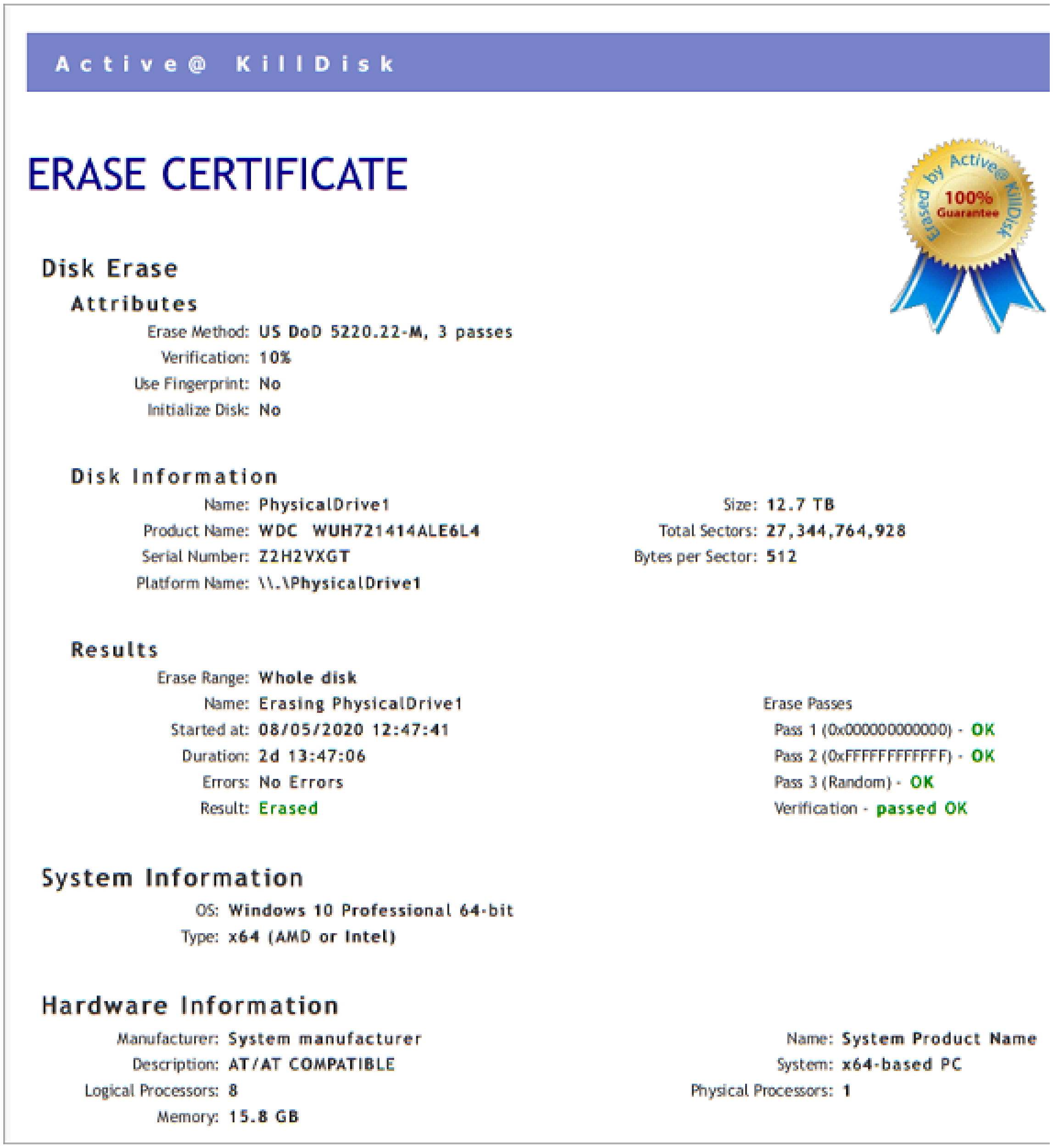
System Information

OS: Windows 10 Professional 64-bit
Type: x64 (AMD or Intel)

Hardware Information

Manufacturer: System manufacturer
Description: AT/AT COMPATIBLE
Logical Processors: 8
Memory: 15.8 GB

Name: System Product Name
System: x64-based PC
Physical Processors: 1


Erased by Active@ KillDisk
100%
Guarantee

Active@ KillDisk

ERASE CERTIFICATE

Disk Erase

Attributes

Erase Method: US DoD 5220.22-M, 3 passes
Verification: 10%
Use Fingerprint: No
Initialize Disk: No

Disk Information

Name: PhysicalDrive1
Product Name: WDC WUH721414ALE6L4
Serial Number: Z2H2VXGT
Platform Name: \\.\PhysicalDrive1

Size: 12.7 TB
Total Sectors: 27,344,764,928
Bytes per Sector: 512

Results

Erase Range: Whole disk
Name: Erasing PhysicalDrive1
Started at: 08/05/2020 12:47:41
Duration: 2d 13:47:06
Errors: No Errors
Result: Erased

Erase Passes
Pass 1 (0x000000000000) - OK
Pass 2 (0xFFFFFFFFFFFF) - OK
Pass 3 (Random) - OK
Verification - passed OK

System Information

OS: Windows 10 Professional 64-bit
Type: x64 (AMD or Intel)

Hardware Information

Manufacturer: System manufacturer
Description: AT/AT COMPATIBLE
Logical Processors: 8
Memory: 15.8 GB

Name: System Product Name
System: x64-based PC
Physical Processors: 1

Erase Disk Concepts

Erasing Confidential Data

Modern methods of data encryption are deterring network attackers from extracting sensitive data from stored database files.

Attackers (who want to retrieve confidential data) become more resourceful and look for places where data might be stored temporarily. For example, the Windows **DELETE** command merely changes the files attributes and location so that the operating system will not look for the file located on FAT/exFAT volumes. The situation with NTFS file system is similar.

One avenue of attack is the recovery of data from residual data on a discarded hard drive. When deleting confidential data from hard drives, removable disks or USB devices, it is important to extract all traces of the data so that recovery is not possible.

Most official guidelines regarding the disposal of confidential magnetic data do not take into account the depth of today's recording densities nor the methods used by the OS when removing data.

Removal of confidential personal information or company trade secrets in the past might have been performed using the `FORMAT` command or the `FDISK` command. Using these procedures gives users a sense of confidence that the data has been completely removed.

When using the `FORMAT` command Windows displays a message like this: `Formatting a disk removes all information from the disk.`

Actually the `FORMAT` utility creates new empty directories at the root area, leaving all previous data on the disk untouched. Moreover, an image of the replaced FAT tables is stored so that the `UNFORMAT` command can be used to restore them.

`FDISK` merely cleans the Partition Table (located in the drive's first sector) and does not touch anything else.

Moreover, most of hard disks contain hidden zones (disk areas that cannot be accessed and addressed on a logical access level). **KillDisk** is able to detect and reset these zones, cleaning up the information inside.

Sanitization Types

NIST 800-88 international security standard (Guidelines for Media Sanitization) defines different types of sanitization.

Regarding sanitization, the principal concern is ensuring that data is not unintentionally released. Data is stored on media, which is connected to a system. Simply data sanitization applied to a representation of the data as stored on a specific media type.

When media is re-purposed or reaches end of life, the organization executes the system life cycle sanitization decision for the information on the media. For example, a mass-produced commercial software program contained on a DVD in an unopened package is unlikely to contain confidential data. Therefore, the decision may be made to simply dispose of the media without applying any sanitization technique. Alternatively, an organization is substantially more likely to decide that a hard drive from a system that processed Personally Identifiable Information (PII) needs sanitization prior to Disposal.

Disposal without sanitization should be considered only if information disclosure would have no impact on organizational mission, would not result in damage to organizational assets, and would not result in financial loss or harm to any individuals. The security categorization of the information, along with internal environmental factors, should drive the decisions on how to deal with the media. The key is to first think in terms of information confidentiality, then apply considerations based on media type. In organizations, information exists that is not associated with any categorized system. Sanitization is a process to render access to target data (the data subject to the sanitization technique) on the media infeasible for a given level of recovery effort. The level of effort applied when attempting to retrieve data may range widely. NIST SP 800-88 Rev. 1 Guidelines for Media Sanitization Clear, Purge, and Destroy are actions that can be taken to sanitize media. The categories of sanitization are defined as follows:

Clear

Clear applies logical techniques to sanitize data in all user-addressable storage locations for protection against simple non-invasive data recovery techniques; typically applied through the standard Read and Write commands to the storage device, such as by rewriting with a new value or using a menu option to reset the device to the factory state (where rewriting is not supported).
For HDD/SSD/SCSI/USB media this means overwrite media by using organizationally approved and validated overwriting technologies/methods/tools. The Clear pattern should be at least a single write pass with a fixed data value, such as all zeros. Multiple write passes or more complex values may optionally be used.

KillDisk supports Clear sanitization type through the `Disk Erase` command for all R/W magnetic types of media, more than 20 international sanitation methods including custom patterns implemented and can be used.

Purge

Purge applies physical or logical techniques that render Target Data recovery infeasible using state of the art laboratory techniques.
For HDD/SSD/SCSI/USB media this means ATA SECURE ERASE UNIT, ATA CRYPTO SCRAMBLE EXT, ATA EXT OVERWRITE, ATA/SCSI SANITIZE and other low-level direct controller commands.

KillDisk supports Purge sanitization type through the **Secure Erase** command only for media types supporting ATA extensions.

Destroy

Destroy renders Target Data recovery infeasible using state of the art laboratory techniques and results in the subsequent inability to use the media for storage of data due to physical damages.
For HDD/SSD/SCSI media this means Shred, Disintegrate, Pulverize, or Incinerate by burning the device in a licensed incinerator.

It is suggested that the user categorize the information, assess the nature of the medium on which it is recorded, assess the risk to confidentiality, and determine the future plans for the media. Then, the organization can choose the appropriate type(s) of sanitization. The selected type(s) should be assessed as to cost, environmental impact, etc., and a decision should be made that best mitigates the risk to confidentiality and best satisfies other constraints imposed on the process.

Advanced Data Recovery Systems

Advances in data recovery have been made such that data can be reclaimed in many cases from hard drives that have been wiped and disassembled. Security agencies use advanced applications to find cybercrime related evidence. Also there are established industrial spy agencies using sophisticated channel coding techniques such as PRML (Partial Response Maximum Likelihood), a technique used to reconstruct the data on magnetic disks. Other methods include the use of magnetic force microscopy and recovery of data based on patterns in erase bands.

Although there are very sophisticated data recovery systems available at a high price. Almost all the data can also be easily restored with an off-the-shelf data recovery utility like Active@ File Recovery, making your erased confidential data quite accessible.

Using **KillDisk** all data on your hard drive or removable device can be destroyed without the possibility of future recovery. After using **KillDisk** the process of disposal, recycling, selling or donating your storage device can be done with peace of mind.

International Standards in Data Removal

KillDisk conforms to more than 20 international standards for clearing and sanitizing data (US DoD 5220.22-M, Gutmann and others). You can be sure that sensitive information is destroyed forever once you erase a disk with KillDisk.

KillDisk is a professional security application that destroys data permanently on any computer that can be started using a bootable CD/DVD/BD or USB Flash Disk. Access to the drive's data is made on the physical level via the BIOS (Basic Input-Output System) bypassing the operating system’s logical drive structure organization. Regardless of the operating system, file systems, or type of machine, this utility can destroy all the data on all storage devices. It does not matter which operating systems or file systems are located on the machine.

Secure Erase Concepts

Secure Erase for SSD is used to permanently delete data from the media and to restore the drive’s speed if it starts to drop to noticeably lower performance than stated (at the same time, we don’t consider SLC-caching and other "official" reasons for speed reduction since it’s hardware drive features).

The essence of the problem that Secure Erase can solve: drive began to work slowly (writing and reading data). There can be a lot of reasons, some of them are related to the hardware component and some to the software component. SSDs are very different in service from classic HDDs, therefore, simply deleting data or formatting the drive does not really mean resetting the cell - you need to clear it before recording, which slows down the process of recording new data. In theory, there shouldn't be such problems, because TRIM exists - a command to clear the data marked for deletion in cells. This command only works with 2.5" and M.2 SATA drives. For drives connected to the PCIe bus (M.2 or PCIe on the motherboard) there is an analogue - Deallocate. But it happens that these functions are disabled for some reason - an OS error, a user error in setting up a disk through third-party software, or the use of non-standard OS assemblies with unknown software components. So, the disk starts to work noticeably slower and it is quite noticeable without any benchmark performance measurements.

SSDs use a number of mapping layers that hide the physical layout of the flash-based memory, as well as help in managing how flash memory data integrity and lifetime are managed. Collectively, these layers are referred to as the Flash Translation Layer (FTL).

SSDs are also over-provisioned: they contain a bit more flash memory than what they're rated for. This extra memory is used internally by the FTL as empty data blocks, used when data needs to be rewritten, and as out-of-band sections for use in the logical to physical mapping.

The mapping layers, and how the flash controller manages memory allocation, pretty much ensure that either erasing or performing a conventional hard drive type of secure erase won't ensure all data is overwritten, or even erased at all.

One example of how data gets left behind intact is due to how data is managed in an SSD. When you edit a document and save the changes, the saved changes don't overwrite the original data (an in-place update). Instead, SSDs write the new content to an empty data block and then update the logical to physical map to point to the new location. This leaves the space the original data occupied on the SSD marked as free, but the actual data is left intact. In time, the data marked as free will be reclaimed by the SSD's garbage collection system, but until then, the data could be recovered.

A conventional Secure Erase, as used with hard drives, is unable to access all of the SSD's memory location, due to the FTL and how an SSD actually writes data, which could lead to intact data being left behind.

SSD manufacturers understand the need for an easy way to sanitize an SSD, and most have implemented the ATA command, Secure Erase Unit (used with SATA-based SSDs), or the NVMe command, Format NVM (used with PCIe-based SSDs) as a fast and effective method of securely erasing an SSD.

So, SSD drives have a non-trivial system of work, therefore, the scheme for the complete destruction of data should also not be the easiest. But in reality, this is not so at all. Any SSD has a controller that is the "brain" of the drive. He not only tells the system where to write data, but also encrypts the information passing through it and stores the key with himself. If you remove (or rather replace) a given key, then all the information will turn into a random set of 1 and 0 - it will be impossible to decrypt it in any way. Just one simple action by the user can solve the problem of safe data erasure. This method is the fastest and most effective.

Note:

To protect information that is critical, both for serious organizations that are concerned about the safety of data and for public sector enterprises working with information classified as state secrets, information systems should usually use certified sanitation algorithms (US DoD 5220.22-M, Canadian OPS-II, NSA 130-2 etc.).

If you combine these two methods (replacing the key and resetting the cells), you get the perfect algorithm for obtaining a completely sterile disk in the state of its maximum performance. This, firstly, solves the problem that we raised at the very beginning, and, secondly, it can help us answer the question about the degree of drive wear.

It is important to note that some drives with built-in encryption can receive only one algorithm upon receipt of a safe erase command - it depends on the controller settings by the manufacturer. If you "reset" your SSD and compare the actual performance with the declared one, you will get the answer to this question. This procedure does not affect disk wear (which is very important). Note that these actions are designed specifically for analyzing the state of the disk, but it will not be possible to achieve a long-term increase in the read/write speed due to the peculiarities of the operation of SSD disks - the situation may depend on both the drive model and the controller firmware. And it must be noted that not all drives support encryption. In this case, the controller simply resets the cells.

Wipe Disk Concepts

Wiping Unoccupied Disk's Space

You may have confidential data on your hard drive in spaces where data may have been stored temporarily.

You may also have deleted files by using the Windows Recycle Bin and then emptying it. While you are still using your local hard drive, there may be confidential information available in these unoccupied spaces.

Wiping the logical drive's deleted data does not delete existing files and folders. It processes all unoccupied drive space so that recovery of previously deleted files becomes impossible.

Installed applications and existing data are not touched by this process. When you wipe unoccupied drive space, the process is run from the bootable CD/DVD operating system. As a result, the wipe or erase process uses an operating system that is outside the local hard drive and is not impeded by Windows system caching. This means that deleted Windows system records can be wiped clean.

KillDisk wipes unused data residue from file slack space, unused sectors, and unused space in MTF records or directory records.

Wiping drive space can take a long time, so do this when the system is not being otherwise utilized. For example, this can be done overnight.

Wipe Algorithms

The process of deleting files does not eliminate them from the hard drive. Unwanted information may still be left available for recovery on the computer. A majority of software that advertises itself as performing reliable deletions simply wipes out free clusters. Deleted information may be kept in additional areas of a drive. **KillDisk** therefore offers different wipe algorithms to ensure secure deletion: overwriting with zeros, overwriting with random values, overwriting with multiple passes using different patterns and much more. **KillDisk** supports more than 20 international data sanitizing standards, including US DoD 5220.22M and the most secure Gutmann's method overwriting with 35 passes.

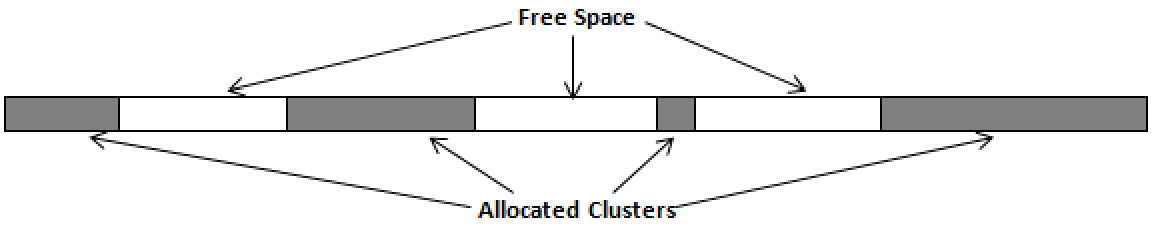


Figure 72: Disk Free Space and Allocated Clusters

Wiping File Slack Space

This relates to any regular files located on any file system. Free space to be wiped is found in the "tail" end of a file because disk space is usually allocated in 4 Kb clusters. Most files have sizes that are not 4 Kb increments and thus have slack space at their end.

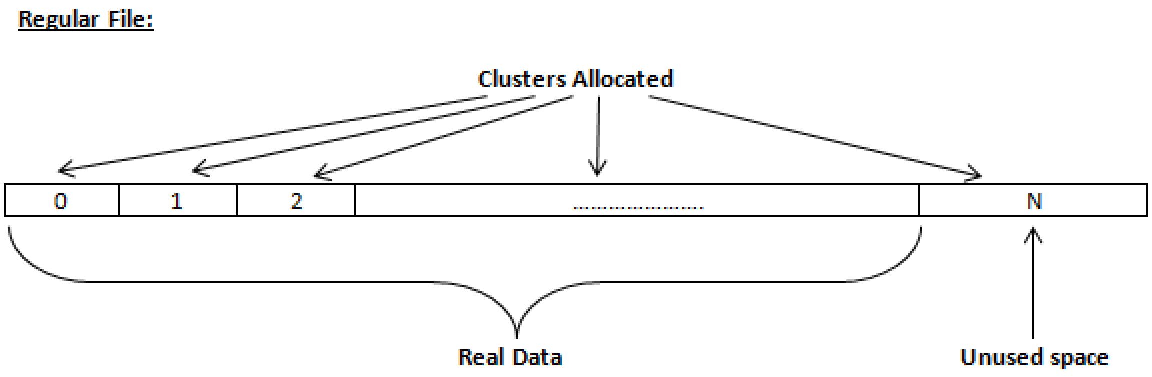


Figure 73: File Slack Space and Allocated Clusters

Specifics of Wiping Microsoft NTFS File System

NTFS Compressed Files

Wiping free space inside a file: The algorithm NTFS uses to "compress" a file operates by separating the file into compressed blocks (usually 64 Kb long). After it is processed, each of these blocks has been allocated a certain amount of space on the volume. If the compressed information takes up less space than the source file, then the rest of the space is labeled as sparse space and no space on the volume is allocated to it. Because the compressed data often doesn't have a size exactly that of the cluster, the end of each of these blocks stays as unusable space of significant size. Our algorithm goes through each of these blocks in a compressed file and wipes the unusable space, erasing previously deleted information that was kept in those areas.

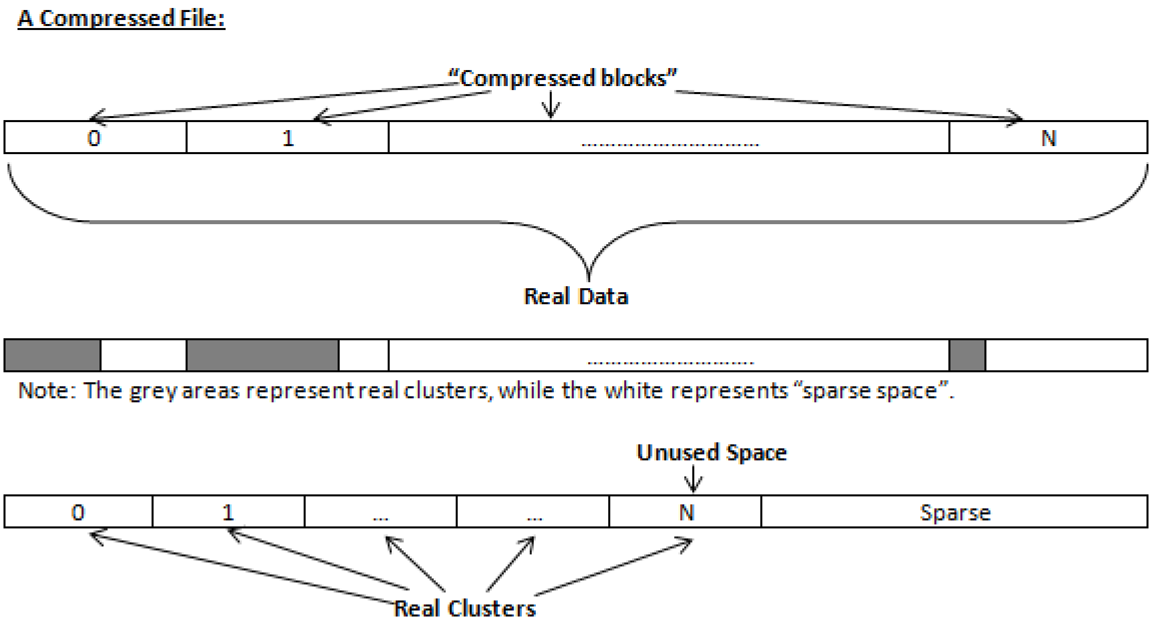


Figure 74: Compressed File Structure

The MFT (Master File Table) Area

Wiping the system information:

The MFT file contains records, describing every file on the volume. During the deletion of these files, the records of their deletion are left untouched - they are simply recorded as "deleted". Therefore file recovery software can use this information to recover anything from the name of the file and the structure of the deleted directories down to files smaller than 1Kb that are able to be saved in the MFT directly. The algorithm used by **KillDisk** wipes all of the unused information out of the MFT records and wipes the unusable space, making a recovery process impossible.

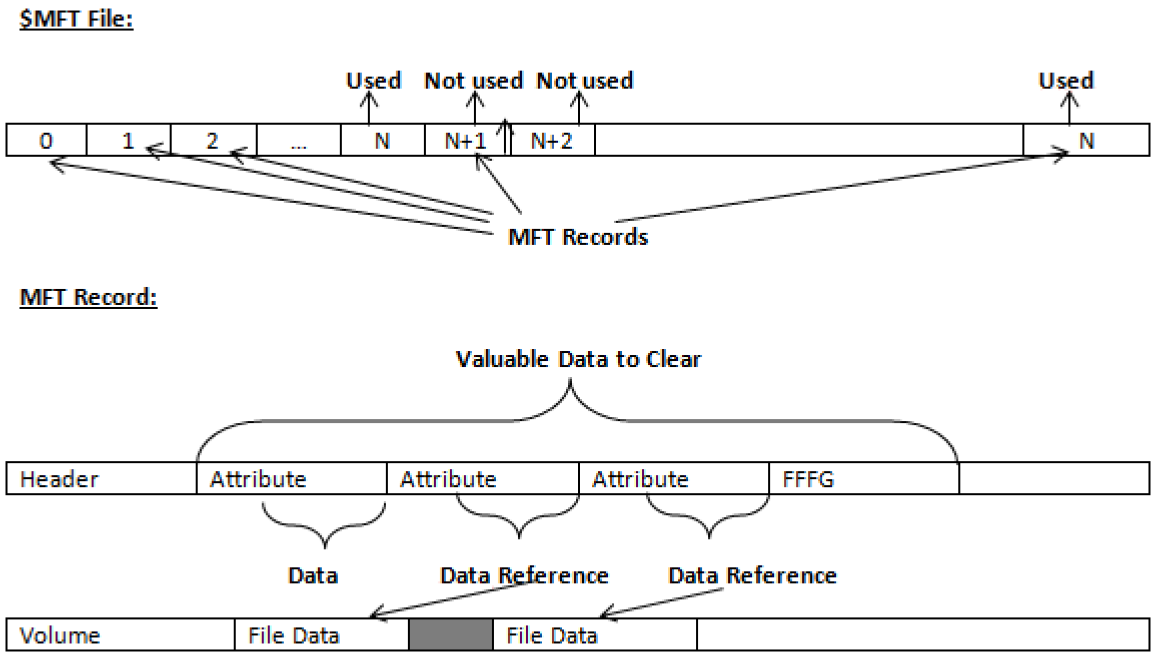


Figure 75: MFT Structure

Specifics of Wiping Microsoft FAT File System

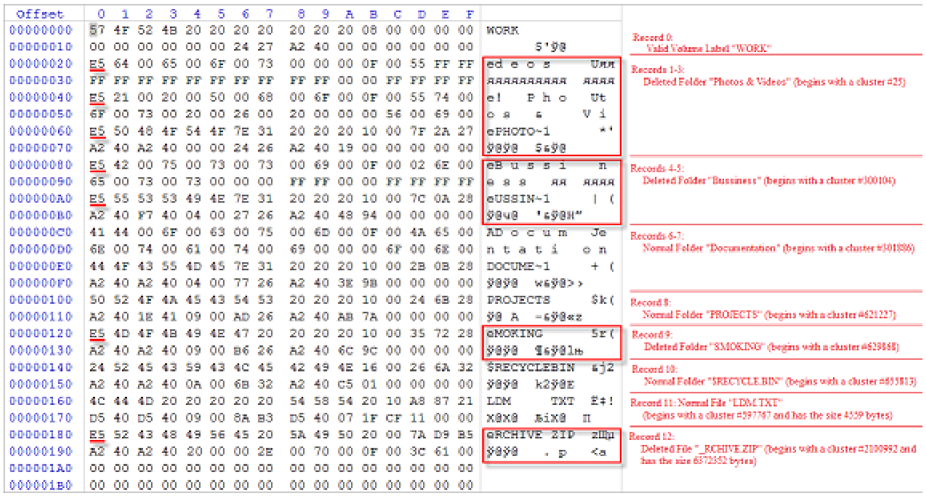
Wiping Directory Areas

Each directory on a FAT/FAT32 or an exFAT volume can be considered as a specific file, describing the contents of the directory. Inside this descriptor there are many 32-byte records, describing every file and other inner folders.

When you delete files this data is not being fully erased. It is just marked as deleted (hex symbol 0xE5). That's why data recovery software can detect and use these records to restore file names and full directory structures.

In some cases dependent on whether a space where item located has been overwritten yet or not, files and folders can be fully or partially recovered..

KillDisk makes data recovery impossible by using an algorithm that wipes out all unused information from directory descriptors. **KillDisk** not only removes unused information, but also defragments Directory Areas, thus speeding up directory access.



```
Offset     0  1  2  3  4  5  6  7   8  9  A  B  C  D  E  F
00000000  57 4F 52 4B 20 20 20 20  20 20 20 08 00 00 00 00  WORK
00000010  00 00 00 00 00 00 24 27  A2 40 00 00 00 00 00 00        $'ў@
00000020  E5 64 00 65 00 6F 00 73  00 00 00 0F 00 55 FF FF  еd e o s    Uяя
00000030  FF FF FF FF FF FF FF FF  FF FF 00 00 FF FF FF FF  яяяяяяяяяя  яяяя
00000040  E5 21 00 20 00 50 00 68  00 6F 00 0F 00 55 74 00  е!   P h o   Ut
00000050  6F 00 73 00 20 00 26 00  20 00 00 00 56 00 69 00  o s   &     V i
00000060  E5 50 48 4F 54 4F 7E 31  20 20 20 10 00 7F 2A 27  еPHOTO~1     *'
00000070  A2 40 A2 40 00 00 24 26  A2 40 19 00 00 00 00 00  ў@ў@  $&ў@
00000080  E5 42 00 75 00 73 00 73  00 69 00 0F 00 02 6E 00  еB u s s i     n
00000090  65 00 73 00 73 00 00 00  FF FF 00 00 FF FF FF FF  e s s   яя  яяяя
000000A0  E5 55 53 53 49 4E 7E 31  20 20 20 10 00 7C 0A 28  еUSSIN~1     | (
000000B0  A2 40 F7 40 04 00 27 26  A2 40 48 94 00 00 00 00  ў@ч@  '&ў@H"
000000C0  41 44 00 6F 00 63 00 75  00 6D 00 0F 00 4A 65 00  AD o c u m   Je
000000D0  6E 00 74 00 61 00 74 00  69 00 00 00 6F 00 6E 00  n t a t i   o n
000000E0  44 4F 43 55 4D 45 7E 31  20 20 20 10 00 2B 0B 28  DOCUME~1     + (
000000F0  A2 40 A2 40 04 00 77 26  A2 40 3E 9B 00 00 00 00  ў@ў@  w&ў@>›
00000100  50 52 4F 4A 45 43 54 53  20 20 20 10 00 24 6B 28  PROJECTS     $k(
00000110  A2 40 1E 41 09 00 AD 26  A2 40 AB 7A 00 00 00 00  ў@ A  -&ў@«z
00000120  E5 4D 4F 4B 49 4E 47 20  20 20 20 10 00 35 72 28  еMOKING      5r(
00000130  A2 40 A2 40 09 00 B6 26  A2 40 6C 9C 00 00 00 00  ў@ў@  ¶&ў@lњ
00000140  24 52 45 43 59 43 4C 45  42 49 4E 16 00 26 6A 32  $RECYCLEBIN  &j2
00000150  A2 40 A2 40 0A 00 6B 32  A2 40 C5 01 00 00 00 00  ў@ў@  k2ў@Е
00000160  4C 44 4D 20 20 20 20 20  54 58 54 20 10 A8 87 21  LDM     TXT  Ё‡!
00000170  D5 40 D5 40 09 00 8A B3  D5 40 07 1F CF 11 00 00  Х@Х@  ЉіХ@   П
00000180  E5 52 43 48 49 56 45 20  5A 49 50 20 00 7A D9 B5  еRCHIVE ZIP  zЩµ
00000190  A2 40 A2 40 20 00 00 2E  00 70 00 0F 00 3C 61 00  ў@ў@   . p  <a
000001A0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00
000001B0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00
```

Record 0:
Valid Volume Label "WORK"

Records 1-3:
Deleted Folder "Photos & Videos" (begins with a cluster #25)

Records 4-5:
Deleted Folder "Bussiness" (begins with a cluster #300104)

Records 6-7:
Normal Folder "Documentation" (begins with a cluster #301886)

Record 8:
Normal Folder "PROJECTS" (begins with a cluster #621227)

Record 9:
Deleted Folder "SMOKING" (begins with a cluster #629868)

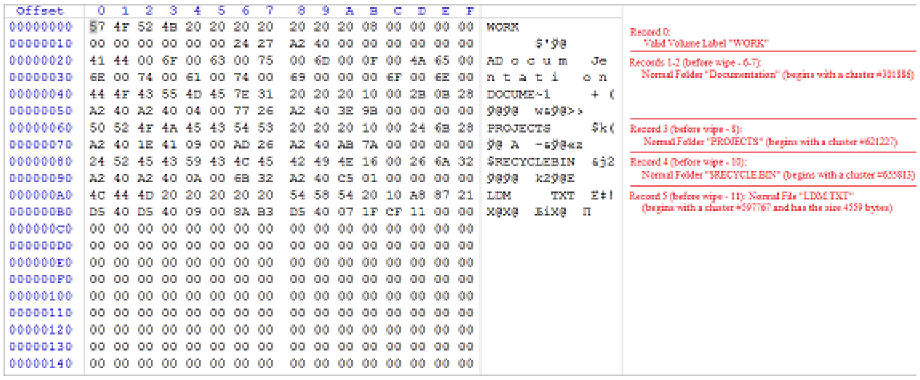
Record 10:
Normal Folder "$RECYCLE.BIN" (begins with a cluster #655813)

Record 11: Normal File "LDM.TXT"
(begins with a cluster #597767 and has the size 4559 bytes)

Record 12:
Deleted File "_RCHIVE.ZIP" (begins with a cluster #2100992 and has the size 6372352 bytes)

In this example red rectangles display deleted records.

Figure 76: FAT Directory before Wipe



```
Offset     0  1  2  3  4  5  6  7   8  9  A  B  C  D  E  F
00000000  57 4F 52 4B 20 20 20 20  20 20 20 08 00 00 00 00  WORK
00000010  00 00 00 00 00 00 24 27  A2 40 00 00 00 00 00 00        $'ў@
00000020  41 44 00 6F 00 63 00 75  00 6D 00 0F 00 4A 65 00  AD o c u m   Je
00000030  6E 00 74 00 61 00 74 00  69 00 00 00 6F 00 6E 00  n t a t i   o n
00000040  44 4F 43 55 4D 45 7E 31  20 20 20 10 00 2B 0B 28  DOCUME~1     + (
00000050  A2 40 A2 40 04 00 77 26  A2 40 3E 9B 00 00 00 00  ў@ў@  w&ў@>›
00000060  50 52 4F 4A 45 43 54 53  20 20 20 10 00 24 6B 28  PROJECTS     $k(
00000070  A2 40 1E 41 09 00 AD 26  A2 40 AB 7A 00 00 00 00  ў@ A  -&ў@«z
00000080  24 52 45 43 59 43 4C 45  42 49 4E 16 00 26 6A 32  $RECYCLEBIN  &j2
00000090  A2 40 A2 40 0A 00 6B 32  A2 40 C5 01 00 00 00 00  ў@ў@  k2ў@Е
000000A0  4C 44 4D 20 20 20 20 20  54 58 54 20 10 A8 87 21  LDM     TXT  Ё‡!
000000B0  D5 40 D5 40 09 00 8A B3  D5 40 07 1F CF 11 00 00  Х@Х@  ЉіХ@   П
000000C0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00
000000D0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00
000000E0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00
000000F0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00
00000100  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00
00000110  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00
00000120  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00
00000130  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00
00000140  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00
```

Record 0:
Valid Volume Label "WORK"

Records 1-2 (before wipe - 6-7):
Normal Folder "Documentation" (begins with a cluster #301886)

Record 3 (before wipe - 8):
Normal Folder "PROJECTS" (begins with a cluster #621227)

Record 4 (before wipe - 10):
Normal Folder "$RECYCLE.BIN" (begins with a cluster #655813)

Record 5 (before wipe - 11): Normal File "LDM.TXT"
(begins with a cluster #597767 and has the size 4559 bytes)

In this example all deleted records removed and root folder defragmented.

Figure 77: FAT Directory after Wipe

Specifics of Wiping Apple HFS+ File System

HFS+ B-tree

A B-tree file is divided up into fixed-size nodes, each of which contains records consisting of a key and some data.

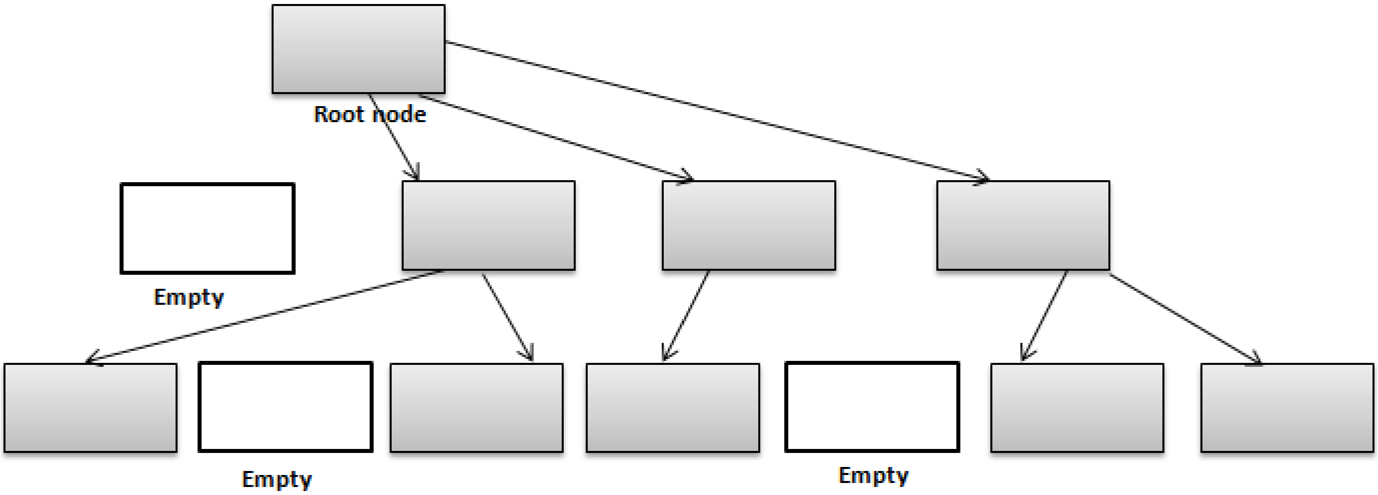
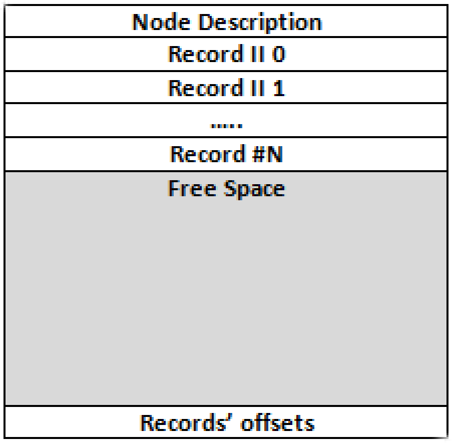


Figure 78: B-tree Structure

In the event of the deletion of a file or folder, there is a possibility of recovering the metadata of the file, (such as its name and attributes), as well as the actual data that the file consists of. **KillDisk**'s Wipe method clears out all of this free space in the system files.



Node Description
Record II 0
Record II 1
.....
Record #N
Free Space
Records' offsets

Figure 79: HFS+ System Table

Specifics of Wiping Linux Ext2/Ext3/Ext4 File Systems

A Linux Ext file system (Ext2/Ext3/Ext4) volume has a global descriptors table. Descriptors table records are called group descriptors and describe each blocks group. Each blocks group has an equal number of data blocks.

A data block is the smallest allocation unit: size vary from 1024 bytes to 4096 bytes. Each group descriptor has a blocks allocation bitmap. Each bit of the bitmap shows whether the block is allocated (1) or available (0). **KillDisk** software enumerates all groups, and for each and every block within the group on the volume checks the related bitmap to define its availability. If the Block is available, **KillDisk** wipes it using the method supplied by the user.

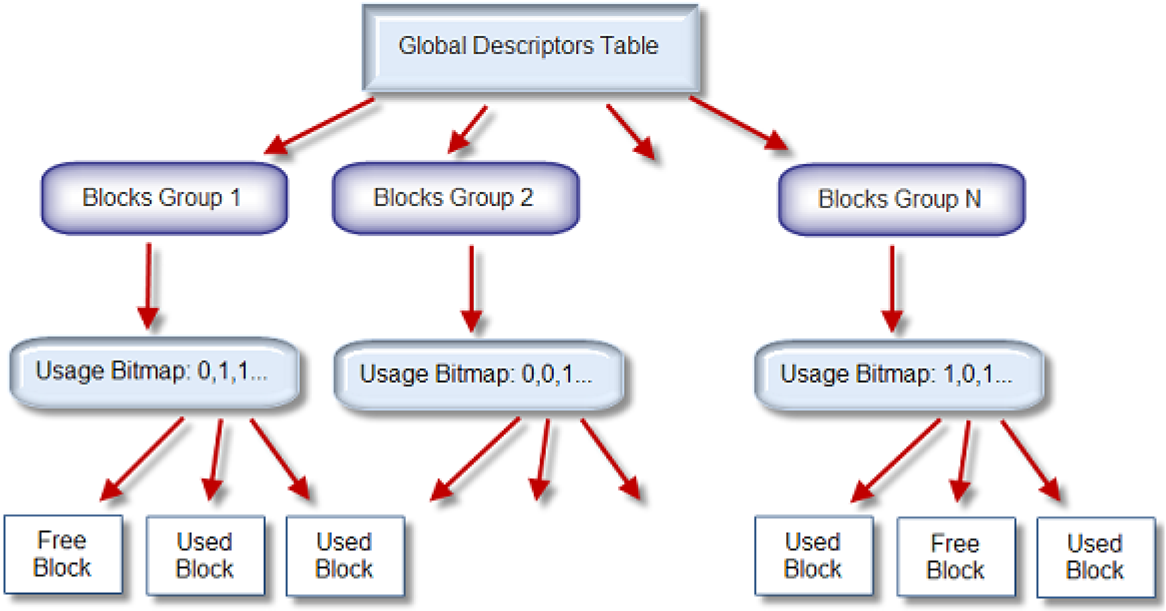


Figure 80: Ext2/Ext3/Ext4 Descriptors Table

Erase Methods

One Pass Zeros or One Pass Random

When using One Pass Zeros or One Pass Random standard, the number of passes is fixed and cannot be changed. When the write head passes through a sector, it writes only zeros or a series of random characters.

US DoD 5220.22-M

The write head passes over each sector three times. The first time with zeros 0x00, second time with 0xFF and the third time with random characters. There is one final pass to verify random characters by reading.

Canadian CSEC ITSG-06

The write head passes over each sector, writing a random character. On the next pass, writes the compliment of previously written character. Final pass is random, proceeded by a verify.

Canadian OPS-II

The write head passes over each sector seven times (0x00, 0xFF, 0x00, 0xFF, 0x00, 0xFF, random). There is one final pass to verify random characters by reading.

British HMG IS5 Baseline

Baseline method overwrites disk's surface with just zeros 0x00. There is one final pass to verify random characters by reading.

British HMG IS5 Enhanced

Enhanced method - the write head passes over each sector three times. The first time with zeros 0x00, second time with 0xFF and the third time with random characters. There is one final pass to verify random characters by reading.

Russian GOST p50739-95

The write head passes over each sector two times: 0x00, Random. There is one final pass to verify random characters by reading.

US Army AR380-19

The write head passes over each sector three times. The first time with 0xFF, second time with zeros 0x00 and the third time with random characters. There is one final pass to verify random characters by reading.

US Air Force 5020

The write head passes over each sector three times. The first time with random characters, second time with zeros 0x00 and the third time with 0xFF. There is one final pass to verify random characters by reading.

NAVSO P-5329-26 RL

RL method - the write head passes over each sector three times: 0x01, 0x27FFFFFF, Random. There is one final pass to verify random characters by reading.

NCSC-TG-025

The write head passes over each sector three times: 0x00, 0xFF, Random. There is one final pass to verify random characters by reading.

NSA 130-2

The write head passes over each sector two times: Random, Random. There is one final pass to verify random characters by reading.

NIST 800-88

Supported three NIST 800-88 media sanitation standards:

- 1. The write head passes over each sector one time (0x00).
- 2. The write head passes over each sector one time (Random).
- 3. The write head passes over each sector three times (0x00, 0xFF, Random).

For details about this,the most secure data clearing standard, you can read the original article at the link below: http://csrc.nist.gov/publications/nistpubs/800-88/NISTSP800-88_with-errata.pdf

German VSITR

The write head passes over each sector seven times.

Bruce Schneier

The write head passes over each sector seven times: 0xFF, 0x00, Random, Random, Random, Random, Random. There is one final pass to verify random characters by reading.

Peter Gutmann

The write head passes over each sector 35 times. For details about this, the most secure data clearing standard, you can read the original article: http://www.cs.auckland.ac.nz/%7Epgut001/pubs/se%0Acure_del.html

Australian ISM-6.2.93

The write head passes over each sector once with random characters. There is one final pass to verify random characters by reading.

IEEE Std 2883-2022

IEEE Std 2883-2022 clear sanitization method consists of at least two passes of writes, to include a pattern in the first pass and its complement in the second pass. (0x00 in the first pass and 0xFF in the second). Verification step selects random locations on the storage media that represent at least 5% of the addressable space.

Secure Erase (ANSI ATA, SE)

According to National Institute of Standards and Technology (NIST) Special Publication 800-88: Guidelines for Media Sanitation, *Secure Erase* is "*An overwrite technology using firmware based process to overwrite a hard drive. Is a drive command defined in the ANSI ATA and SCSI disk drive interface specifications, which runs inside drive hardware. It completes in about 1/8 the time of 5220 block erasure.*" The guidelines also state that "*degaussing and executing the firmware Secure Erase command (for ATA drives only) are acceptable methods for purging.*" ATA Secure Erase (SE) is designed for SSD controllers. The SSD controller resets all memory cells making them empty. In fact, this method restores the SSD to the factory state, not only deleting data but also returning the original performance. When implemented correctly, this standard processes all memory, including service areas and protected sectors.

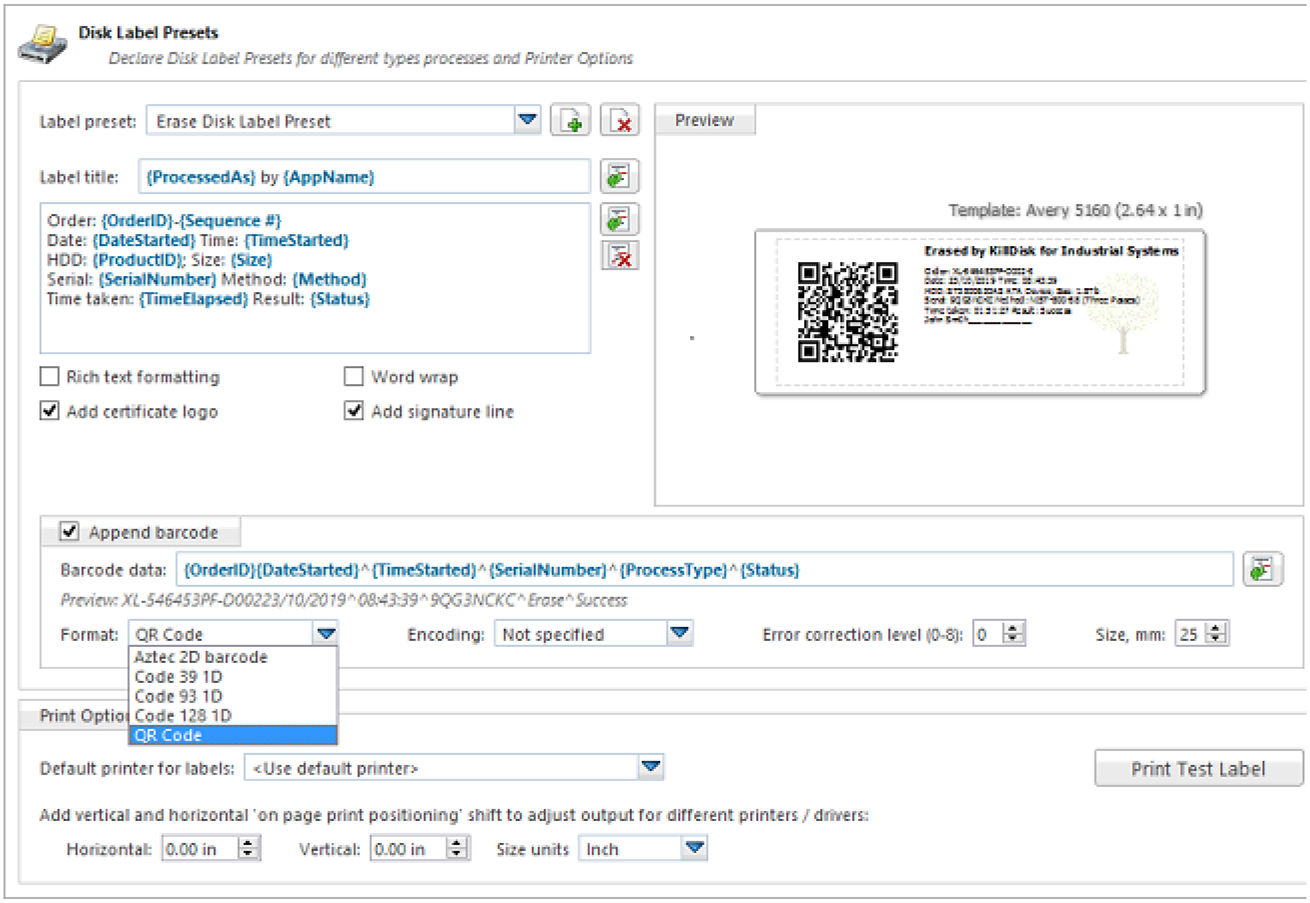
User Defined

User indicates the number of times the write head passes over each sector. Each overwriting pass is performed with a buffer containing user-defined or random characters. User Defined method allows to define any kind of new erase algorithms based on user requirements.

Name Tags

Name Tags Idea

Name tags used in different scenarios to form meaningful File Names, Label or Barcode data and more. Predefined constant value in brackets, for example **{SerialNumber}**, will be replaced with actual disk's Serial Number when Label or Barcode is formed and printed out.



Disk Label Presets

Declare Disk Label Presets for different types processes and Printer Options

Label preset: Erase Disk Label Preset

Label title: {ProcessedAs} by {AppName}

Order: {OrderID}-{Sequence #}
Date: {DateStarted} Time: {TimeStarted}
HDD: {ProductID}; Size: {Size}
Serial: {SerialNumber} Method: {Method}
Time taken: {TimeElapsed} Result: {Status}

☐ Rich text formatting ☐ Word wrap

☑ Add certificate logo ☑ Add signature line

☑ Append barcode

Barcode data: {OrderID}{DateStarted}^{TimeStarted}^{SerialNumber}^{ProcessType}^{Status}

Preview: XL-546453PF-D00223/10/2019^08:43:39^9QG3NCKC^Erase^Success

Format: QR Code Encoding: Not specified Error correction level (0-8): 0 Size, mm: 25

Default printer for labels: <Use default printer>

Add vertical and horizontal 'on page print positioning' shift to adjust output for different printers / drivers:

Horizontal: 0.00 in Vertical: 0.00 in Size units Inch

Figure 81: Name Tags in Labels and Barcodes

Below is description of different Name Tags grouped by sections.

General

{Computer ID}
Workstation (computer) ID
{OS}
Operating System name
{AppName}
Application name
{AppVersion}
Application full version
{KernelVersion}
Kernel version
{UniqueID}
Generated unique 8 symbols ID

Date & Time

Tags to represent current date in different formats:

{Date(YYYYMMDD)}
Complete date in full form without delimiters
{Date(YYYY-MM-DD)}
Complete date in full form with delimiters
{Date(YYMMDD)}
Complete date in short form without delimiters
{Date(YYYY)}
Year in full form
{Date(YY)}
Year in short form
{Date(Month)}
Full month name as literal
{Date(MM)}
Month as digital with leading zero
{Date(DD)}
Day of month with leading zero
{Time(HHmmss)}
Time with hours, minutes and seconds without delimiters
{Time(HH-mm-ss)}
Time with hours, minutes and seconds with delimiters
{Time(HH)}
Hours with leading zero
{Time(mm)}
Minutes with leading zero
{Time(ss)}
Seconds with leading zero

Disk

Values for these name tags retrieved from the context device:

{Serial ID}
Disk serial number, retrieved from OS or from S.M.A.R.T. attributes
{Platform ID}
Disk platform identification (may be vary due to OS format)
{Product ID}
Disk manufacturer Id
{Model}
Disk model name (if available)

{Size}
Disk size in gigabytes
{Sectors}
Disk size in sectors

Processing attributes

Disk processing attributes based on execution conditions:

{ExamGrade}
Disk examination result grade
{BatchName}
Batch name (if a part of a batch processing)
{DiskCount}
Quantity of disk processed in batch
{DiskBayID}
Disk Bay label
{Method}
Erase method
{Passes}
Erases passes description
{Verified}
Verification attribute
{DateStarted}
Process start date
{TimeStarted}
Process start time
{TimeElapsed}
Process elapsed time
{Status}
Overall completion status for group processing or separate disk processing status.
{StatusCode}
Overall process result digital code

Item processing attributes

Item processing attributes based on execution conditions:

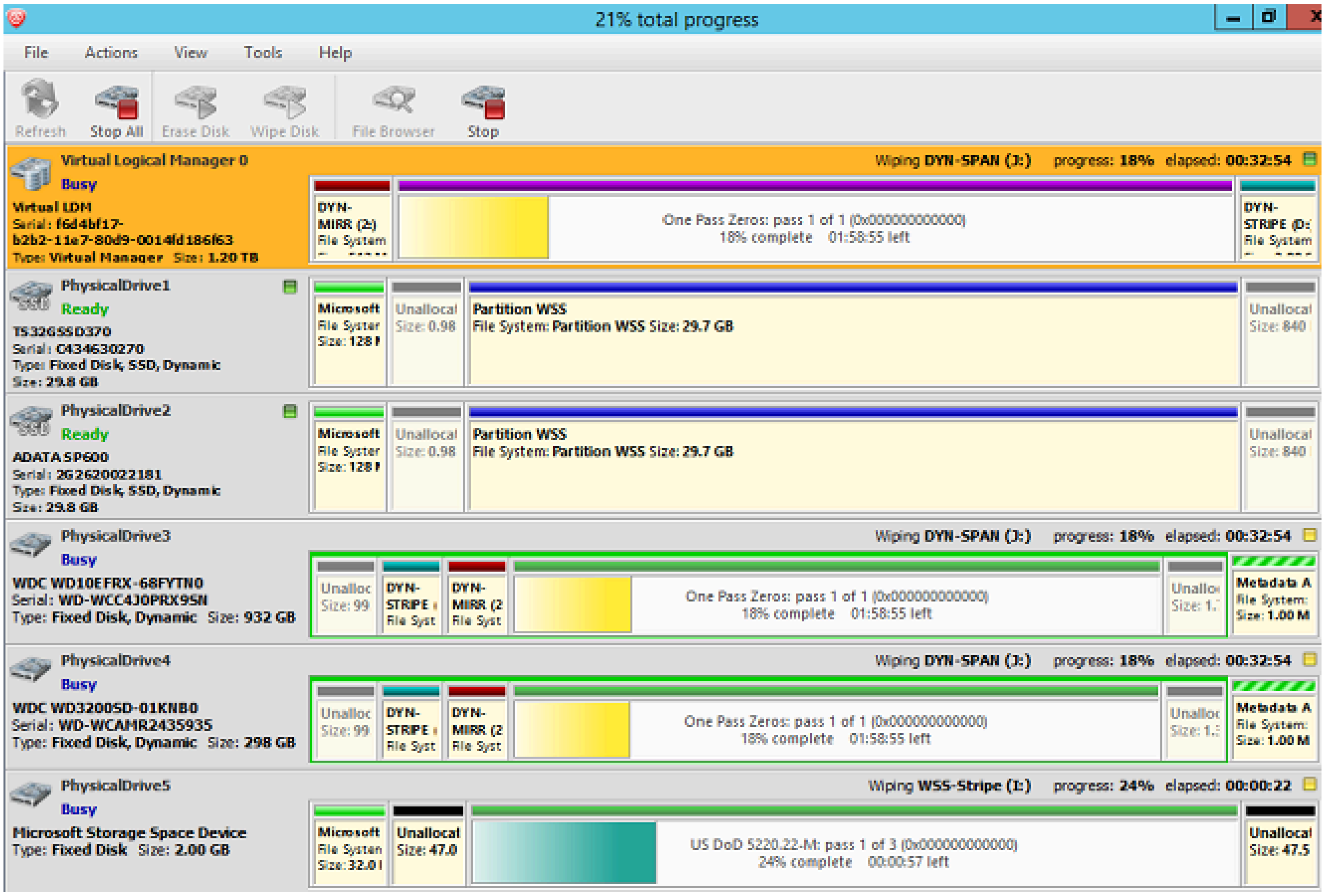
{Sequence #} ... {Sequence 000#}
Sequential number. Used for group (batch) processing.
{ProcessType}
Process type name
{ProcessedAs}
Process short name
{Range}
Processed disk range

Virtual Disks

KillDisk provides full support for Virtual Disks - dynamic disks created and managed by:

- **Logical Disk Manager** (LDM on Windows)
- **Logical Volume Manager** (LVM on Linux)
- **Windows Storage Spaces** (WSS on Windows)

Virtual Disks are virtual devices which look like regular physical disks to all applications. These virtual devices are stored on one or more physical disks and emulate different types of volumes and RAID disk arrays not on a hardware level (inside disk controller), but on Operating System level (software emulation). Virtual devices are fully supported by the **KillDisk**. These disks will appear in **Local Devices** view like any other regular disks. When you launch an erase for the virtual disk, the progress is displayed in the same color on all components of the composite virtual drive.



Virtual Logical Manager 0 — Busy — Virtual LDM — Serial: f6d4bf17-b2b2-11e7-80d9-0014fd186f63 — Type: Virtual Manager Size: 1.20 TB — Wiping **DYN-SPAN (J:)** progress: **18%** elapsed: **00:32:54**
DYN-MIRR (2:) File System | One Pass Zeros: pass 1 of 1 (0x000000000000) 18% complete 01:58:55 left | DYN-STRIPE (D: File System

PhysicalDrive1 — Ready — TS32GSSD370 — Serial: C434630270 — Type: Fixed Disk, SSD, Dynamic — Size: 29.8 GB
Microsoft File Syster Size: 128 | Unallocal Size: 0.98 | Partition WSS File System: Partition WSS Size: 29.7 GB | Unallocal Size: 840

PhysicalDrive2 — Ready — ADATA SP600 — Serial: 2G2620022181 — Type: Fixed Disk, SSD, Dynamic — Size: 29.8 GB
Microsoft File Syster Size: 128 | Unallocal Size: 0.98 | Partition WSS File System: Partition WSS Size: 29.7 GB | Unallocal Size: 840

PhysicalDrive3 — Busy — WDC WD10EFRX-68FYTN0 — Serial: WD-WCC4J0PRX9SN — Type: Fixed Disk, Dynamic Size: 932 GB — Wiping **DYN-SPAN (J:)** progress: **18%** elapsed: **00:32:54**
Unalloc Size: 99 | DYN-STRIPE File Syst | DYN-MIRR (2 File Syst | One Pass Zeros: pass 1 of 1 (0x000000000000) 18% complete 01:58:55 left | Unalloc Size: 1. | Metadata A File System: Size: 1.00 M

PhysicalDrive4 — Busy — WDC WD3200SD-01KNB0 — Serial: WD-WCAMR2435935 — Type: Fixed Disk, Dynamic Size: 298 GB — Wiping **DYN-SPAN (J:)** progress: **18%** elapsed: **00:32:54**
Unalloc Size: 99 | DYN-STRIPE File Syst | DYN-MIRR (2 File Syst | One Pass Zeros: pass 1 of 1 (0x000000000000) 18% complete 01:58:55 left | Unalloc Size: 1. | Metadata A File System: Size: 1.00 M

PhysicalDrive5 — Busy — Microsoft Storage Space Device — Type: Fixed Disk Size: 2.00 GB — Wiping **WSS-Stripe (I:)** progress: **24%** elapsed: **00:00:22**
Microsoft File System Size: 32.0 | Unallocal Size: 47.0 | US DoD 5220.22-M: pass 1 of 3 (0x000000000000) 24% complete 00:00:57 left | Unallocal Size: 47.5

Figure 82: Erasing a Virtual Drive (Striped Disk Array)

Note: By default Virtual Disks are not being displayed in the list of devices. To display Virtual Disks go to **Preferences** > **General Settings** and turn on **Initialize virtual disks** option.

Disk Hidden Zones

KillDisk is able to detect and reset Disk's Hidden Zones: HPA and DCO.

HPA - Host Protected Area

The Host Protected Area (HPA) is an area of a hard drive or solid-state drive that is not normally visible to an operating system. It was first introduced in the ATA-4 standard CXV (T13) in 2001.

How it works:

The IDE controller has registers that contain data that can be queried using ATA commands. The data returned gives information about the drive attached to the controller. There are three ATA commands involved in creating and using a host protected area. The commands are:

- IDENTIFY DEVICE
- SET MAX ADDRESS
- READ NATIVE MAX ADDRESS

Operating systems use the IDENTIFY DEVICE command to find out the addressable space of a hard drive. The IDENTIFY DEVICE command queries a particular register on the IDE controller to establish the size of a drive.

This register however can be changed using the SET MAX ADDRESS ATA command. If the value in the register is set to less than the actual hard drive size then effectively a host protected area is created. It is protected because the OS will work with only the value in the register that is returned by the IDENTIFY DEVICE command and thus will normally be unable to address the parts of the drive that lie within the HPA.

The HPA is useful only if other software or firmware (e.g. BIOS) is able to use it. Software and firmware that are able to use the HPA are referred to as 'HPA aware'. The ATA command that these entities use is called READ NATIVE MAX ADDRESS. This command accesses a register that contains the true size of the hard drive. To use the area, the controlling HPA-aware program changes the value of the register read by IDENTIFY DEVICE to that found in the register read by READ NATIVE MAX ADDRESS. When its operations are complete, the register read by IDENTIFY DEVICE is returned to its original fake value.

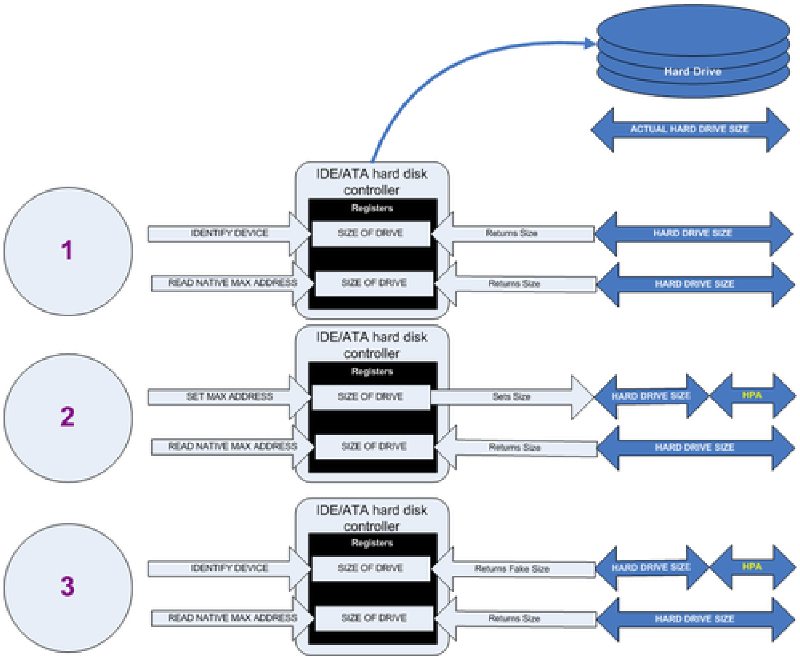


Figure 83: Creation of an HPA

The diagram shows how a host protected area (HPA) is created:

1. IDENTIFY DEVICE returns the true size of the hard drive. READ NATIVE MAX ADDRESS returns the true size of the hard drive.
2. SET MAX ADDRESS reduces the reported size of the hard drive. READ NATIVE MAX ADDRESS returns the true size of the hard drive. An HPA has been created.
3. IDENTIFY DEVICE returns the now fake size of the hard drive. READ NATIVE MAX ADDRESS returns the true size of the hard drive, the HPA is in existence.

Usage:

- At the time HPA was first implemented on hard-disk firmware, some BIOS had difficulty booting with large hard disks. An initial HPA could then be set (by some jumpers on the hard disk) to limit the number of cylinder to 4095 or 4096 so that older BIOS would start. It was then the job of the boot loader to reset the HPA so that the operating system would see the full hard-disk storage space.
- HPA can be used by various booting and diagnostic utilities, normally in conjunction with the BIOS. An example of this implementation is the Phoenix First BIOS, which uses Boot Engineering Extension Record (BEER) and Protected Area Run Time Interface Extension Services (PARTIES). Another example is the Gujin installer which can install the bootloader in BEER, naming that

pseudo-partition /dev/hda0 or /dev/sdb0; then only cold boots (from power-down) will succeed because warm boots (from Ctrl-Alt-Delete) will not be able to read the HPA.
- Computer manufacturers may use the area to contain a preloaded OS for install and recovery purposes (instead of providing DVD or CD media).
- Dell notebooks hide Dell MediaDirect utility in HPA. IBM ThinkPad and LG notebooks hide system restore software in HPA.
- HPA is also used by various theft recovery and monitoring service vendors. For example, the laptop security firm Computrace use the HPA to load software that reports to their servers whenever the machine is booted on a network. HPA is useful to them because even when a stolen laptop has its hard drive formatted the HPA remains untouched.
- HPA can also be used to store data that is deemed illegal and is thus of interest to government and police.
- Some vendor-specific external drive enclosures (Maxtor) are known to use HPA to limit the capacity of unknown replacement hard drives installed into the enclosure. When this occurs, the drive may appear to be limited in size (e.g. 128 GB), which can look like a BIOS or dynamic drive overlay (DDO) problem. In this case, one must use software utilities (see below) that use READ NATIVE MAX ADDRESS and SET MAX ADDRESS to change the drive's reported size back to its native size, and avoid using the external enclosure again with the affected drive.
- Some rootkits hide in the HPA to avoid being detected by anti-rootkit and antivirus software.
- Some NSA exploits use the HPA for application persistence.

DCO - Device Configuration Overlay

Device Configuration Overlay (DCO) is a hidden area on many of today’s hard disk drives (HDDs). Usually when information is stored in either the DCO or host protected area (HPA), it is not accessible by the BIOS, OS, or the user. However, certain tools can be used to modify the HPA or DCO. The system uses the IDENTIFY_DEVICE command to determine the supported features of a given hard drive, but the DCO can report to this command that supported features are nonexistent or that the drive is smaller than it actually is. To determine the actual size and features of a disk, the DEVICE_CONFIGURATION_IDENTIFY command is used, and the output of this command can be compared to the output of IDENTIFY_DEVICE to see if a DCO is present on a given hard drive. Most major tools will remove the DCO in order to fully image a hard drive, using the DEVICE_CONFIGURATION_RESET command. This permanently alters the disk, unlike with the (HPA), which can be temporarily removed for a power cycle.

Usage:

The Device Configuration Overlay (DCO), which was first introduced in the ATA-6 standard, "allows system vendors to purchase HDDs from different manufacturers with potentially different sizes, and then configure all HDDs to have the same number of sectors. An example of this would be using DCO to make an 80-gigabyte HDD appear as a 60-gigabyte HDD to both the (OS) and the BIOS.... Given the potential to place data in these hidden areas, this is an area of concern for computer forensics investigators. An additional issue for forensic investigators is imaging the HDD that has the HPA and/or DCO on it. While certain vendors claim that their tools are able to both properly detect and image the HPA, they are either silent on the handling of the DCO or indicate that this is beyond the capabilities of their tool.

Glossary

BIOS Settings

Basic **I**nput **O**utput **S**ubsystem is the program a personal computer's microprocessor uses to get the computer system started after you turn it on. It also manages data flow between the computer's operating system and attached devices such as the hard disk, video adapter, keyboard, mouse and printer. A typical method to access the BIOS settings screen is to press **Delete** / **F1** / **F2** / **F8** / **F10** or **Esc** during the boot sequence.

BCD

Boot **C**onfiguration **D**ata. Firmware-independent database for boot-time configuration data. It is used by Microsoft's new Windows Boot Manager and replaces the **boot.ini** that was used by NTLDR.

Boot Priority

BIOS settings allow you to run a boot sequence from a floppy drive, a hard drive, a CD/DVD/BD drive or a USB device. You may configure the order that your computer searches these physical devices for the boot sequence. The first device in the order list has the first boot priority. For example, to boot from a CD/DVD/BD drive instead of a hard drive, place the CD/DVD/BD drive ahead of the hard drive in priority.

Boot Record

See MBR for **M**aster **B**oot **R**ecord - located in the physical disk's first sector. Each volume on the disk has its own Boot Record called Volume or Partition Boot Sector, the content is file system specific.

Boot Sector

The boot sector continues the process of loading the operating system into computer memory. It can be either the MBR or the Partition Boot Sector.

Compressed Cluster

When you set a file or folder property to compress data, the file or folder uses less disk space. While the size of the file is smaller, it must use a whole cluster in order to exist on the hard drive. As a result, compressed clusters contain file slack space. This space may contain residual confidential data from the file that previously occupied this space. **KillDisk** can wipe out the residual data without touching the existing data.

CSV File

A comma-separated values (**CSV**) file is a delimited text file that uses a comma to separate values. Each line of the file is a data record. Each record consists of one or more fields, separated by commas. The use of the comma as a field separator is the source of the name for this file format. A CSV-file typically stores tabular data (numbers and text) in plain text, in which case each line will have the same number of fields.

Data Cluster

A cluster or allocation unit is a unit of disk space allocation for files and directories. To reduce the overhead of managing on-disk data structures, the file system does not allocate individual disk sectors by default, but contiguous groups of sectors, called clusters. A cluster is the smallest logical amount of disk space that can be allocated to hold a file. Storing small files on a file system with large clusters will therefore waste disk space; such wasted disk space is called slack space. For cluster sizes which are small versus the average file size, the wasted space per file will be statistically about half of the cluster size; for large cluster sizes, the wasted space will become greater. However, a larger cluster size reduces bookkeeping overhead and fragmentation, which may improve reading and writing speed overall. Typical cluster sizes range from 1 sector (512 B) to 128 sectors (64 Kb). The operating system keeps track of clusters in the hard disk's root records or MFT records, see Lost Cluster.

Device Node

Device node in the Local System Devices list is a physical device containing logical drives. The first physical device on older versions of Operating Systems is named 80h, now more typical name is PhysicalDrive0.

Exclusive Access

Lock is applied to a partition for exclusive writing access. For example, while recovering deleted or damaged files or folders, the recovery application must have exclusive access to the target partition while recovering files. If another application or the operating system are using the target partition - the processes could interfere, so user/process must close all applications or system processes that may be using the target partition before locking it.

FAT

File **A**llocation **T**able. Area that contains the records of every other file and directory in a FAT-formatted disk drive. The operating system needs this information to access the files. There are FAT32, FAT16 and exFAT versions. FAT file systems are still commonly found on flash disks and other memory cards and modules (including USB flash drives), as well as many portable and embedded devices. FAT is the standard file system for digital cameras per the DCF specification.

FTP

File **T**ransfer **P**rotocol. This is a standard network protocol used for the transfer of computer files between a Client and Server on a computer network. FTP is built on a client-server model architecture using separate control and data connections between the client and the server. FTP users may authenticate themselves with a clear-text sign-in protocol, normally in the form of a username and password, but can connect anonymously if the server is configured to allow it. For secure transmission that protects the username and password, and encrypts the content, FTP is often secured with SSL/TLS (FTPS) or replaced with SSH File Transfer Protocol (SFTP). The first FTP client applications were command-line programs developed before operating systems had graphical user interfaces, and are still shipped with most Windows, Unix, and Linux operating systems. Many FTP clients and automation utilities have since been developed for desktops, servers, mobile devices, and hardware, and FTP has been incorporated into productivity applications, such as HTML editors.

File Slack Space

The smallest file (and even an empty folder) takes up an entire cluster. A 10-byte file will take up 2,048 bytes if that is the cluster size. File slack space is the unused portion of a cluster. This space may contain residual confidential data from the file that previously occupied this space. **KillDisk** can wipe out the residual data without touching the existing data.

Free Cluster

A cluster that is not occupied by a file. This space may contain residual confidential data from the file that previously occupied this space. **KillDisk** can wipe out the residual data.

FreeDOS

A free operating system for PC compatible computers. It intends to provide a complete DOS-compatible environment for running legacy software and supporting embedded systems. FreeDOS can be booted from a floppy disk or USB flash drive. It is designed to run well under virtualization or x86 emulation. Unlike most versions of MS-DOS, FreeDOS is composed of free and open-source software, licensed under the terms of the GNU General Public License.

Deleted Boot Records

All disks and partitions start with a boot sector. For a damaged disk and volumes (where the location of the boot records known) the partition table can be reconstructed. The boot record contains a file system identifier.

iSCSI

Internet **S**mall **C**omputer **S**ystems **I**nterface. iSCSI is a transport layer protocol that works on top of the Transport Control Protocol (TCP). It enables block-level SCSI data transport between the iSCSI initiator and the storage target over TCP/IP networks.

ISO

An International Organization for Standardization ISO-9660 file system is a standard CD-ROM file system that allows you to read the same CD-ROM whether you're on a PC, Mac, or other major computer platform. Disk images of ISO-9660 file systems (ISO images) are a common way to electronically transfer the contents of CD-ROMs. They often have the file name extension .ISO (though not necessarily), and are commonly referred to as "ISO".

Logical Drive

A partition is a logical drive because it does not affect the physical hard disk other than the defined space that it occupies, yet it behaves like a separate disk drive.

Lost Cluster

A cluster that has an assigned number in the file allocation table, even though it is not assigned to any file. You can free up disk space by reassigning lost clusters. In DOS and Windows you can find lost clusters with the ScanDisk utility.

MBR

Master **B**oot **R**ecord. All physical disks start with MBR. When you start the computer, the code in the MBR executes before the operating system is started. The location of the MBR is always track (cylinder) 0, side (head) 0, and sector 1. The MBR contains a partition table with file system identifiers.

MFT Records

Master **F**ile **T**able. A file that contains the records of every other file and directory in the NTFS-formatted volume. The operating system needs this information to access the files.

Named Streams

NTFS supports multiple data streams where the stream name identifies a new data attribute on the file. A handle can be opened to each data stream. A data stream, then, is a unique set of file attributes. Streams have separate opportunistic locks, file locks, and sizes, but common permissions.

NTFS

New **T**echnology **F**ile **S**ystem (developed by Microsoft) is the file system that the Windows NT operating system uses for storing and retrieving files on a hard disk. NTFS is the Windows NT equivalent of the Windows 95 file allocation table (FAT) and the OS/2 High Performance File System (HPFS). All the latest Windows Operating Systems (Windows Vista, Windows 7, Windows 10) still use NTFS as a default file system.

NTLDR

Aka NT loader is the boot loader for all releases of Windows NT operating system up to and including Windows XP and Windows Server 2003. NTLDR is typically run from the primary hard disk drive, but it can also run from portable storage devices such as a CD/DVD or USB flash drive.

OpenSUSE

A Linux distribution. It is widely used throughout the world. The focus of its development is creating usable open-source tools for software developers and system administrators, while providing a user-friendly desktop and feature-rich server environment.

Partition

A section of the hard disk isolated for a specific purpose. Each partition can behave like a separate disk drive .

Partition Boot Sector

On NTFS or FAT file systems, the partition boot sector is a small program that is executed when the operating system tries to access a particular partition. On personal computers, the Master Boot Record uses the partition boot sector on the system partition to determine file system type, cluster size, etc., and to load the operating system kernel files. Partition boot sector is usually the first sector of the partition.

Physical Device

A piece of hardware that is attached to your computer by screws or wires. A hard disk drive is a physical device. It is also referred to as a physical drive.

RAID

RAID ("**R**edundant **A**rray of **I**nexpensive **D**isks" or "**R**edundant **A**rray of **I**ndependent **D**isks") is a data storage virtualization technology that combines multiple physical disk drive components into one or more logical units for the purposes of data redundancy, performance improvement, or both. Data is distributed across the drives in one of several ways, referred to as RAID levels, depending on the required level of redundancy and performance. The different schemes, or data distribution layouts, are named by the word "RAID" followed by a number, for example RAID ***0*** or RAID ***1***. Each scheme, or *RAID* level, provides a different balance among the key goals: reliability, availability, performance, and capacity. RAID levels greater than RAID 0 provide protection against unrecoverable sector read errors, as well as against failures of whole physical drives.

RAID 0

RAID 0 consists of striping, but no mirroring or parity. Compared to a spanned volume, the capacity of a RAID 0 volume is the same; it is the sum of the capacities of the drives in the set. But because striping distributes the contents of each file among all drives in the set, the failure of any drive causes the entire RAID 0 volume and all files to be lost. In comparison, a spanned volume preserves the files on the unfailing drives. The benefit of RAID 0 is that the throughput of read and write operations to any file is multiplied by the number of drives because, unlike spanned volumes, reads and writes are done concurrently. The cost is increased vulnerability to drive failures—since any drive in a RAID 0 setup failing causes the entire volume to be lost, the average failure rate of the volume rises with the number of attached drives.

RAID 1

RAID 1 consists of data mirroring, without parity or striping. Data is written identically to two or more drives, thereby producing a "mirrored set" of drives. Thus, any read request can be serviced by any drive in the set. If a request is broadcast to every drive in the set, it can be serviced by the drive that accesses the data first (depending on its seek time and rotational latency), improving performance. Sustained read throughput, if the controller or software is optimized for it, approaches the sum of throughputs of every drive in the set, just as for RAID 0. Actual read throughput of most RAID 1 implementations is slower than the fastest drive. Write throughput is always slower because every drive must be updated, and the slowest drive limits the write performance. The array continues to operate as long as at least one drive is functioning.

RAID 2

RAID 2 consists of bit-level striping with dedicated Hamming-code parity. All disk spindle rotation is synchronized and data is striped such that each sequential bit is on a different drive. Hamming-code parity is calculated across corresponding bits and stored on at least one parity drive. This level is of historical significance only; although it was used on some early machines (for example, the Thinking Machines CM-2), as of 2014 it is not used by any commercially available system.

RAID 3

RAID 3 consists of byte-level striping with dedicated parity. All disk spindle rotation is synchronized and data is striped such that each sequential byte is on a different drive. Parity is calculated across corresponding bytes and stored on a dedicated parity drive. Although implementations exist, RAID 3 is not commonly used in practice.

RAID 4

RAID 4 consists of block-level striping with dedicated parity. This level was previously used by NetApp, but has now been largely replaced by a proprietary implementation of RAID 4 with two parity disks, called RAID-DP. The main advantage of RAID 4 over RAID 2 and 3 is I/O parallelism: in RAID 2 and 3, a single read I/O operation requires reading the whole group of data drives, while in RAID 4 one I/O read operation does not have to spread across all data drives. As a result, more I/O operations can be executed in parallel, improving the performance of small transfers.

RAID 5

RAID 5 consists of block-level striping with distributed parity. Unlike RAID 4, parity information is distributed among the drives, requiring all drives but one to be present to operate. Upon failure of a single drive, subsequent reads can be calculated from the distributed parity such that no data is lost. RAID 5 requires at least three disks. Like all single-parity concepts, large RAID 5 implementations are susceptible to system failures because of trends regarding array rebuild time and the chance of drive failure during rebuild. Rebuilding an array requires reading all data from all disks, opening a chance for a second drive failure and the loss of the entire array.

RAID 6

RAID 6 consists of block-level striping with double distributed parity. Double parity provides fault tolerance up to two failed drives. This makes larger RAID groups more practical, especially for high-availability systems, as large-capacity drives take longer to restore. RAID 6 requires a minimum of four disks. As with RAID 5, a single drive failure results in reduced performance of the entire array until the failed drive has been replaced. With a RAID 6 array, using drives from multiple sources and manufacturers, it is possible to mitigate most of the problems associated with RAID 5. The larger the drive capacities and the larger the array size, the more important it becomes to choose RAID 6 instead of RAID 5. RAID 10 (see Nested RAID levels) also minimizes these problems

PXE

Preboot E**X**ecution **E**nvironment. In computing the Preboot Execution Environment specification describes a standardized client-server environment that boots a software assembly, retrieved from a network, on PXE-enabled clients. On the client side it requires only a PXE-capable network interface controller, and uses a small set of industry-standard network protocols such as DHCP and TFTP.

RAS

Remote **A**ccess **S**ervice. Is any combination of hardware and software to enable the remote access tools or information that typically reside on a network of IT devices. A remote access service connects a client to a host computer, known as a remote access server. The most common approach to this service is remote control of a computer by using another device which needs internet or any other network connection.

Registry Hive

Highest level of organization in the Windows registry. It is a logical group of keys, subkeys, and values in the registry that has a set of supporting files loaded into memory when Windows is started or an user logs in.

Root Records

Used in FAT file system. A table that contains the records of every other file and directory in a FAT-formatted hard disk drive. The operating system needs this information to access the files. There are FAT32, FAT16 and FAT versions.

SAM

Security **A**ccount **M**anager. Database file that stores users' passwords in a hashed format. Since a hash function is one-way, this provides some measure of security for the storage of the passwords. It can be used to authenticate local and remote users. Beginning with Windows 2000 SP4, Active Directory authenticates remote users.

Sector

The smallest unit that can be accessed on a disk. Typically sector size is 512 or 4096 bytes.

SCSI

Small **C**omputer **S**ystem **I**nterface. A set of standards for physically connecting and transferring data between computers and peripheral devices. The SCSI standards define commands, protocols, electrical, optical and logical interfaces. SCSI is most commonly used for hard disk drives and tape drives, but it can connect a wide range of other devices, including scanners and CD drives, although not all controllers can handle all devices. The SCSI standard defines command sets for specific peripheral device types; the presence of "unknown" as one of these types means that in theory it can be used as an interface to almost any device, but the standard is highly pragmatic and addressed toward commercial requirements.

Secure Erase (SSD)

The ATA Secure Erase command is designed to remove all user data from a drive. With an SSD without integrated encryption, this command will put the drive back to its original out-of-box state. This will initially restore its performance to the highest possible level and the best (lowest number) possible write amplification, but as soon as the drive starts garbage collecting again the performance and write amplification will start returning to the former levels. Drives which encrypt all writes on the fly can implement ATA Secure Erase in another way. They simply zeroize and generate a new random encryption key each time a secure erase is done. In this way the old data cannot be read anymore, as it cannot be decrypted. Some drives with an integrated encryption will physically clear all blocks after that as well, while other drives may require a TRIM command to be sent to the drive to put the drive back to its original out-of-box state (as otherwise their performance may not be maximized).

Secure Erase (Frozen State)

SSD disk is blocked (frozen) by BIOS. The reasons can differ. Modern ATA hard drives and SSDs offer security options that help user to control access and reliably destroy data if necessary. Brand new HDD or SSD from a store have all the security features initially disabled... BIOS of many motherboards run the SECURITY_FREEZE_LOCK ATA command when booting to provide protection against manipulation.

Signature Files

File types are recognized by specific patterns that may serve as a reference for file recovery. When a file header is damaged, the type of file may be determined by examining patterns in the damaged file and comparing these patterns to known file type templates.

Span Array

A series of dynamic drives linked together to make one contiguous spanned volume.

S.M.A.R.T.

S.M.A.R.T. (Self-Monitoring, Analysis and Reporting Technology; often written as SMART) is a monitoring system included in computer hard disk drives (HDDs), solid-state drives (SSDs) and embedded MultiMediaCards (eMMC) drives. Its primary function is to detect and report various indicators of drive reliability with the intent of anticipating imminent hardware failures. When SMART data indicates a possible imminent drive failure, software running on the host system may notify the user so preventative action can be taken to prevent data loss and the failing drive can be replaced and data integrity maintained.

Templates (Patterns)

File types are recognized by specific patterns that may serve as a reference for file recovery. When a file header is damaged, the type of file may be determined by examining patterns in the damaged file and comparing these patterns to known file type templates. This same pattern-matching process can be applied to deleted or damaged partitions. Using FAT or NTFS templates, recovery software can assume that a particular sector is a FAT or NTFS boot sector because parts of it match a known pattern.

Tiny Core Linux

A minimal Linux kernel based operating system focusing on providing a base system functionality. The distribution is notable for its small size (11 to 16 MB) and minimalism; additional functions are provided by extensions. Tiny Core Linux is free and open source software and is licensed under the GNU General Public License version 2.

Track

Tracks are concentric circles around the disk and the sectors are segments within each circle.

Unallocated Space

Space on a hard disk where no partition exists. A partition may have been deleted or damaged or a partition may not have been created.

UEFI

Unified **E**xtensible **F**irmware **I**nterface is a specification for a software program that connects a computer's firmware to its operating system (OS). UEFI is expected to eventually replace BIOS. Like BIOS, UEFI is installed at the time of manufacturing and is the first program that runs when a computer is turned on.

Unused Space in MFT-records

Applicable to NTFS file system on Windows. The performance of the computer system depends a lot on the performance of the MFT. When you delete files, the MFT entry for that file is not deleted, it is marked as deleted. This is called unused space in the MFT. If unused space is not removed from the MFT, the size of the table could grow to a point where it becomes fragmented, affecting the performance of the MFT and possibly the performance of the computer. This space may also contain residual confidential data (file names, file attributes, resident file data) from the files that previously occupied these spaces. **KillDisk** can wipe out the residual data without touching the existing data.

Volume

A fixed amount of storage on a hard disk. A physical device may contain a number of volumes. It is also possible for a single volume to span to a number of physical devices.

Volume Shadow Copy

Shadow Copy (also known as Volume Snapshot Service, Volume Shadow Copy Service or VSS) is a technology included in Microsoft Windows that can create backup copies or snapshots of computer files or volumes, even when they are in use. It is implemented as a Windows service called the Volume Shadow Copy service.

Windows System Caching

Windows reserves a specified amount of volatile memory for file system operations. This is done in RAM because it is the quickest way to do these repetitive tasks.

Windows System Records

The Windows logs keeps track of almost everything that happens in Windows OS. This enhances performance of the computer when doing repetitive tasks. Over time, these records can take up a lot of space.

WinPE

WinPE is a compact Windows-based operating system used as a recovery environment to install, deploy, and repair Windows Desktop Editions, Windows Server, and other Windows operating systems. After boot to WinPE, user can:

- Set up a hard drive before installing Windows.
- Install Windows by using apps or scripts from a network or a local drive.

- Capture and apply Windows images.
- Modify the Windows operating system while it's not running.
- Set up automatic recovery tools.
- Recover data from unbootable devices.
- Add a custom shell or GUI to automate these kinds of tasks.

Legal Statement

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