Samsung SSD
Magician DC 2.0

User Guide

Legal and additional information

About Samsung Electronics Co., Ltd.

Samsung Electronics Co., Ltd. is a global leader in technology, opening new possibilities for people everywhere. Through relentless innovation and discovery, we are transforming the worlds of TVs, smartphones, tablets, PCs, cameras, home appliances, printers, LTE systems, medical devices, semiconductors and LED solutions. We employ 286,000 people across 80 countries with annual sales of US$216.7 billion. To discover more, please visit www.samsung.com.

For more information

For more information about the Samsung PM853T, visit www.samsung.com/business/ssd or www.samsungssd.com

Samsung Electronics Co., Ltd.   416, Maetan 3-dong, Yeongtong-gu, Suwon-si, Gyeonggi-do 443-772,

Korea
www.samsung.com
2015-12

SAMSUNG

LEGALITIES

DISCLAIMER

SAMSUNG ELECTRONICS RESERVES THE RIGHT TO CHANGE PRODUCTS, INFORMATION AND SPECIFICATIONS WITHOUT NOTICE.

Products and specifications discussed herein are for reference purposes only. All information discussed herein may change without notice and is provided on an "AS IS" basis, without warranties of any kind. This document and all information discussed herein remain the sole and exclusive property of Samsung Electronics. No license of any patent, copyright, mask work, trademark or any other intellectual property right is granted by one party to the other party under this document, by implication, estoppels or otherwise. Samsung products are not intended for use in life support, critical care, medical, safety equipment, or similar applications where product failure could result in loss of life or personal or physical harm, or any military or defense application, or any governmental procurement to which special terms or provisions may apply. For updates or additional information about Samsung products, contact your nearest Samsung office.

COPYRIGHT © 2015

This material is copyrighted by Samsung Electronics. Any unauthorized reproductions, use or disclosure of this material, or any part thereof, is strictly prohibited and is a violation under the Copyright Law. Samsung Electronics reserves the right to make changes in this specification at any time and without notice. The information furnished by Samsung Electronics in this material is believed to be accurate and reliable, but is not warranted true in all cases.

TRADEMARKS & SERVICE MARKS

The Samsung Logo is the trademark of Samsung Electronics. Adobe is a trademark and Adobe Acrobat is a registered trademark of Adobe Systems Incorporated.
All other company and product names may be trademarks of the respective companies with which they are associated.

REVISION HISTORY

Revision	Description	Revision Date
1.0	Initial Release	Nov. 27, 2015

Table of Contents

Introduction

Samsung SSD Magician DC software is designed to help users with easy-to-use disk management and diagnostic features for server and data center usage. In addition to providing vital SSD status information, Magician DC software will assist users in updating firmware, measuring performance, initializing drives, and calculating drive lifetime, etc.

This document is intended as a guide for how to use Samsung SSD Magician DC software under the Linux-based server/data center environments. It provides a command line interface to interact with the Samsung SSD Drives.

Cautions

1. Samsung SSD Magician DC software is only for Samsung SSD products and is not recommended for use with other products.
2. Samsung Electronics is not liable for any data loss or other damages that occur while using the software.
3. Samsung is not able to provide any data restoration service in the event of data loss.

   For more information, please refer to Samsung Magician Software Agreement on End User License (EULA) at the end of this document.

Abbreviations

Abbreviation	Description
ATA	Advanced Technology Attachment
HDD	Hard Disk Drive
CLI	Command Line Interface
IO	Input Output
PATA	Parallel ATA
SATA	Serial ATA
SSD	Solid State Drive
S.M.A.R.T.	Self-Monitoring, Analysis, and Reporting Technology

Features

This user guide describes the commands necessary to interact with Samsung SSD drives. The functionality includes:

Feature	Comments
List	Detect list of attached Samsung SSD Drives in the system
Firmware Update	Update the old firmware of the SSD to the new version
Erase	Erase data on the SSD by issuing an ATA Format Unit command
Overprovision	Resize the user capacity of the SSD
TRIM	Issue trim command to the SSD
S.M.A.R.T	Display smart information and log temperature of the connected Samsung SSD drive, and estimate the lifetime of Samsung SSD
Set Max	Set the maximum address of the Samsung SSD to change its user capacity
Set Feature	Change the certain device features of the Samsung SSD
Disk Info	Display current overprovisioning value; max address value; state of write cache; WWN; phy speed; power mode of the Samsung SSD
SCT	Execute some of SCT commands as specified in ATA specification including: SCT Write Same, SCT Feature Control and SCT Data Table (HDA Temperature History)
Vendor Utility	Collect and display Failure Analysis log or Power Loss Protection log from the Samsung SSD
Command History	Display history of the previously executed commands
Help	Show detailed help

※ In LSI RAID Configuration, some features may not be executed.
   The details are described in "Supported Commands for LSI RAID" table.

System Requirements

Hardware Requirements

1. SSD

- The following Samsung SSDs are supported:
    - Samsung SSD SM863 *
    - Samsung SSD PM863 *

    * This software version has been fully verified only with firmware version that was pre-installed in the device by the company. Therefore, users may be limited from using this software under other firmware versions or other certain circumstances.

2. Others

- On Marvell controller, the Magician feature may not work properly after hot plugging.

Software Requirements

The tool is supported on the following environments.

Linux system requirements

OS	Comments
RHEL 5.7 and later	Refer to the C600 chipset table below
RHEL 6.1 and later	Refer to the C600 chipset table below
CentOS	Follows the same limitations as RHEL above
Ubuntu 12.04 LTS	N/A

- Limited support for the Intel C600 chipset families due to the well-known ISCI (Intel SAS Driver) driver issue.
  (https://github.com/Xilinx/linux-xlnx/commits/master/drivers/scsi/isci?page=1)

- The table below lists the limited support for the Intel C600 chipset families due to the well-known ISCI (Intel SAS Driver) driver issue on Linux platform.
  (https://github.com/Xilinx/linuxxlnx/commits/master/drivers/scsi/isci?page=1)

OS	Feature support	Comments
RHEL 5.7 and later	Limited support for some ATA commands including **Secure Erase, Set Max Address, and FW Update**	
RHEL 6.1 and 6.2	Limited support for some ATA commands including **Secure Erase, Set Max Address, and FW Update**	
RHEL 6.3	Limited support for some ATA commands including Secure Erase, **Set Max Address, and FW Update.** But it can be fully supported when patched with ISCI 1.4 for RHEL 6.3 (refer to comments on the right)	http://sourceforge.net/ projects/intel-sas/files/ RHEL6.3%20Driver%20 Update%20v1.4.1/
RHEL 6.4 and later	Full support	

* Support for C600 chipsets has been determined by evaluations and tests in the major part, and the ISCI driver code analysis.

- On Linux systems, the tool must run with root privileges. This can be done through either sudo or su commands.

Windows system requirements

- The table below lists the limitation found due to default drivers' behavior on handling SCSI and ATA pass through control code.

OS	Feature support	Comments
Windows Server 2008	Limited support for some ATA commands including **Secure Erase, Set Max Address, and FW Update**	
Windows Server 2012	Limited support for some ATA commands including **Secure Erase, Set Max Address, and FW Update**	
Windows Server 2012 R2	Limited support for some ATA commands including **Secure Erase, Set Max Address, and FW Update**	

* Limitation of support for C600 chipsets has been determined by evaluations and tests.

- In addition to the above limitations:
  - On Marvell controller, Magician feature may not work properly after hot plugging.
  - On Linux systems, the tool must run with root privilege. This can be done through either sudo or su commands.

Known Issues

- Known Issues Specific to Linux
  - Trim command supports only the ext4 file system.
  - Set Max Address and Secure Erase require a power cycle of SSD
  - Set Max Address may not work on some Ubuntu distributions due to libATA restrictions
  - Over-Provision only adjusts the last partition for a disk with multiple partitions.
  - The following operations are supported for SSDs when connected through the LSI HBA cards. LSI HBA latest bios using is recommended for proper operation:
    - **List, Firmware Update, Secure Erase, SMART, Set Max, Set Feature, SCT Cache State, Disk Information, Command History**, and **help** features only.
  - SMART Self-Test may not work for SSDs when connected through the LSI MegaRAID cards because of MegaRAID time out issue.
  - Trim and Over-Provision operation induce file window pop up depends on file management tools option because of mount command.
  - The following operations are strongly recommended for RAID reconfiguration after command sending because of RAID information broken.
    - Firmware Update, Secure Erase, Set Max

- Known Issues Specific to Windows
  - Trim command supports only the NTFS file system and after Windows Server 2008.
  - Set Max Address and Secure Erase require a power cycle of SSD.
  - Secure Erase may not work on some Windows Server 2012 R2 due to ATA command restrictions.
  - Over-Provision only adjusts the last partition for a disk with multiple partitions.
  - The following operations are supported for SSDs when connected through the LSI HBA cards. LSI HBA latest bios using is recommended for proper operation:
    - **List, Firmware Update, Secure Erase, SMART, Set Max, Write Cache, SCT Cache State, Disk Information, Command History, Vendor Utility,** and **help** features only.
  - The following operations are strongly recommended for RAID reconfiguration after command sending because of RAID information broken.
    - Firmware Update, Secure Erase, Set Max
  - FW update feature used on OS disk may result in undefined behavior. So, OS re boot is strongly recommended immediately after FW update to OS disk.

Command Line Options

The Samsung SSD Magician DC uses Command Line Interface (CLI) and has two variants: Admin version and Client version.

The table given below briefly explains the available command line options. The detailed description of each feature is provided in the next sections of this chapter. For the purpose of illustration, the name of the tool for all examples will be "Magician" to simplify documentation.

Option	Arguments	Description	Used With
-H [--help]	N/A	Used to display the command line options	N/A
-C [--command -history]	N/A	Used to display the history of the previously executed commands.	N/A
[--force]	N/A	Used to bypass the user prompt.	-E [--erase] -F [--firmwareupdate] -T [--trim]
-d [--disk]	Disk Number.	Used to input the physical disk index listed in the --list command. Note: For --firmware-update, to select all disks -d [--disk] option should be followed by keyword "A"	-E [--erase] -F [--firmware-update] -T [--trim] -S [--smart] -O [--overprovision] -W [--setfeature] -X [--sct] -I [--info]
-L [--list]	N/A	Used to display a list of attached Samsung SSD Drives.	N/A
-S [--smart]	-d [--disk]	Used to select a specific drive connected to the system and get the SMART Value.	N/A
-q [--query]	N/A	Displays the available LBA percentage	-S [--smart]
-t [--temperature]	Optional file path or no argument.	Logs the temperature of the SSD in the file path provided or if no argument is given, then temperature will be logged into file in default folder, refer to **Smart temperature logging file location**	-S [--smart]
-a [--analyzer]	--start --stop	"--start" records the data needed to estimate lifetime of the SSD. "--stop" calculates the lifetime of the SSD from the recorded data.	-S [--smart]

Option	Arguments	Description	Used With
-e [--execute]	--offlineshort --offlineextended --offlineselective --captiveshort --captiveextended --captiveselective --abort --checkstatus	"--[offline/captive|short/extended/selective]" execute SMART Short/Extended/Selective self-test routine in off-line/captive mode. "--abort" abort off-line mode self-test routine. "--checkstatus" get the current progress and result of off-line self-test.	-S [--smart]
-M [--setmax]	-d [--disk], -s [--set]	Performs SETMAX related operations on specified SSD.	N/A
-s [--set]	LBA address	Set Max address value with the given number.	-M [--setmax]
-r [--read-native-max]	N/A	Retrieve Native Max Address of the specified disk.	-M [--setmax]
-W [--setfeature]	-d [--disk]	Used to issue Set Feature command on specified SSD.	N/A
-w [--write cache]	1 [Enable] or 0 [Disable]	Sets the status for write cache.	-W [--setfeature]
-r [--rawdata] arg	Raw values of Feature, Sector Count, LBA in the form of {Feature}:{Sector count}:{LBA}	Send Feature Command with the input raw value. 'arg' is the combination of Feature:SectorCount:LBA. For hexadecimal value should be input with "0x".	-W [--setfeature]
-X [--sct]	-d [--disk]	Used is to execute SCT commands.	N/A
-T [--trim]	-d [--disk]	Used to increase the performance of the selected disk.	N/A
-F [--firmware-update]	-d [--disk]	Used to update the firmware of the selected disk connected to HOST system.	N/A
-E [--erase]	-d [--disk]	Used to erase all the data on the drive by issuing an ATA Format Unit command.	N/A
-I [--info]	-d [--disk]	Used to display details of the selected disk.	N/A
-O [--over-provision]	-d [--disk], -q [--query] or -s [--set] or -c [--clear]	Used to set the -disk's shrink/expand size to the given value	N/A
-q [--query]	N/A	Queries current Over-Provision status of Specified disk.	-O [--over-provision]
-s [--set], arg	N/A	Sets Over-Provisioning on specified disk. 'arg' is amount of over provisioning to be set in format [XXGB or XXMB or XX%]. Percentage is with respect to the disk size. If no value is present, it will default to the recommended OP amount.	-O [--over-provision]

Option	Arguments	Description	Used With
-c [--clear]	N/A	Clears Over-Provisioning from specified disk.	-O [--over-provision]
-V [--vendor-utility]	-fa [--FAlog-dump] -e [--Escape] -p [--PLP-log] -dslr [--DSLR]	Used to execute Vendor Utility Commands for specified disk.	
-license	N/A	Display the End User License Agreement. The license agreement will show the ownership, licensing, dispute resolution and disclaimer	

How to Use Magician DC

Starting Magician DC software

Find a Magician file and execute.

```
[root@localhost ~]# cd Documents/
[root@localhost Documents]# cd 64bin
[root@localhost 64bin]# ./magician
===========================================================================
Samsung(R) SSD Magician DC Version 1.0
Copyright (c) 2014 Samsung Corporation
===========================================================================
Usage:  ./magician  [operation] ..

Allowed Operations:
-L[ --list]              Shows a disk(s) attached to the system.
-F[ --firmware-update]   Updates firmware to specified disk.
-E[ --erase]             Securely Erases all data from specified disk.
-O[ --over-provision]    Performs one of the Over-Provisioning related
                         operations on specified disk.
-T[ --trim]              Optimizes specified disk.
-S[ --smart]             Shows S.M.A.R.T values of specified disk.
-M[ --setmax]            Performs SetMax related operations on specified disk.
-W[ --writecache]        Enables/Disables Write Cache on specified disk.
-X[ --sctcachestate]     Gets the SCT write cache state for specified disk.
-C[ --command-history]   Shows history of the previously executed commands.
-I[ --info]              Displays the disk details to the user.
-license                 Shows the End User License Agreement.
-H[ --help]              Shows detailed Help.
```

-H [--help]

Display the command line options which are supported by Magician application.

Arguments:	None
Used with:	None
Usage:	magician --help [or] magician -H

```
[root@localhost 64bin]# ./magician -H
=============================================================================
Samsung(R) SSD Magician DC Version 1.0
Copyright (c) 2014 Samsung Corporation
=============================================================================
Argument                    Description

-L[ --list ]                Shows the disk(s) attached to the system


-F[ --firmware-update ]     Updates firmware to specified disk
                            Example: magician --disk 1 --firmware-update --fwpackage-path /path/d
                            srdenc [or] magician --disk 1 -F -p /path/dsrdenc --force

                            -d [ --disk ] Disk-Number of the disk or A to select all supported
                             disks to update firmware on.
                            -p [ --fwpackage-path ] Path to the directory containing firmware
                             files.
                            --force Enables the user to perform Firmware Download without
                             prompting for any confirmations.

-E[ --erase ]               Securely erases all data from specified disk

                            -d [ --disk ] Disk-Number of the disk to be securely erased.
                            --force Enables the user to perform Secure Erase without prompting
                             for any confirmations.

-O[ --over-provision ]      Performs one of the Over-Provisioning related operations on specified
                            disk
                            Not specifying any option will set Over-provisioning to recommended v
                            alue [magician -d 1 -O -s]

                            -d [ --disk ] Disk-Number of the disk to query/clear/set
                             Over-Provisioning status for.
                            -q [ --query ] Queries current Over-Provisioning status of specified
                             disk.
                            -c [ --clear ] Clears Over-Provisioning from specified disk.
                            -s [ --set ] Sets Over-Provisioning on specified disk argument is
                            amount of over provisioning to be set in format [XXGB or XXMB or
                            XX%]
```

-C [--command-history]

Display the list of CLI commands executed previously by the user.
Maximum of 500 command history will be displayed:

Arguments:	None
Used with:	None
Usage:	magician -- command-history [or] magician -C

```
[root@localhost 64bin]# ./magician -C
=======================================================================================================
Samsung(R) SSD Magician DC Version 1.0
Copyright (c) 2014 Samsung Corporation
=======================================================================================================
 S.No| Start Time          | End Time            | Command          | Result | Remarks        |
=======================================================================================================
 1   | 11-08-2014(09:48:38)| 11-08-2014(09:48:38)| magician -L      | PASSED | N/A            |
 2   | 11-08-2014(09:52:40)| 11-08-2014(09:52:40)| magician -L      | PASSED | N/A            |
 3   | 11-08-2014(09:52:52)| 11-08-2014(09:52:52)| magician -L      | PASSED | N/A            |
 4   | 11-08-2014(09:53:38)| 11-08-2014(09:53:38)| magician -S -d 0 | PASSED | N/A            |
 5   | 11-08-2014(09:54:13)| 11-08-2014(09:54:13)| magician -L      | PASSED | N/A            |
 6   | 11-08-2014(09:54:27)| 11-08-2014(09:54:28)| magician -L      | PASSED | N/A            |
 7   | 11-08-2014(09:54:28)| 11-08-2014(09:54:28)| magician -d 0 -S | PASSED | N/A            |
 8   | 11-08-2014(09:54:34)| 11-08-2014(09:54:34)| magician -L      | PASSED | N/A            |
 9   | 11-08-2014(09:54:58)| 11-08-2014(09:54:58)| magician -d 0 -I | PASSED | N/A            |
 10  | 11-08-2014(09:55:09)| 11-08-2014(09:55:09)| magician -L      | PASSED | N/A            |
 11  | 11-08-2014(09:55:50)| 11-08-2014(09:55:50)| magician -S -d 0 | PASSED | N/A            |
 12  | 11-08-2014(10:07:01)| 11-08-2014(10:07:01)| magician -L      | PASSED | N/A            |
 13  | 11-08-2014(10:07:06)| 11-08-2014(10:07:06)| magician -L      | PASSED | N/A            |
 14  | 11-08-2014(10:07:33)| 11-08-2014(10:07:33)| magician -d 0 -S | PASSED | N/A            |
 15  | 11-08-2014(10:07:53)| 11-08-2014(10:07:53)| magician -L      | PASSED | N/A            |
 16  | 11-08-2014(10:07:54)| 11-08-2014(10:07:54)| magician -L      | PASSED | N/A            |
 17  | 11-08-2014(10:07:55)| 11-08-2014(10:07:55)| magician -L      | PASSED | N/A            |
 18  | 11-08-2014(10:07:56)| 11-08-2014(10:07:56)| magician -L      | PASSED | N/A            |
 19  | 28-09-2014(03:21:26)| 28-09-2014(03:21:26)| magician -L      | PASSED | N/A            |
 20  | 28-09-2014(03:21:39)| 28-09-2014(03:21:39)| magician -d 1 -S | PASSED | N/A            |
 21  | 28-09-2014(03:22:26)| 28-09-2014(03:22:38)| magician -d 1 -E | PASSED | N/A            |
 22  | 28-09-2014(03:22:51)| 28-09-2014(03:22:51)| magician -d 1 -I | PASSED | N/A            |
```

--force

--force is used to bypass all the acknowledgements displayed by the tool and intimates the tool to complete the operation specified without any further user inputs. This option must be used cautiously as it will not prompt the user for the confirmation, which may result in severe data loss.

Arguments:	None
Used with:	--erase, --trim, --firmware-update
Usage:	magician --disk 1 --erase --force magician --disk 1 --trim --force magician --disk 1 --firmware-update -p < fwpackage-path > --force [or] magician -d 1 -E --force magician -d 1 -T --force magician -d 1 -F -p <fwpackage-path> --force

```
[root@localhost 64bin]# ./magician -d 0 -E --force
================================================
Samsung(R) SSD Magician DC Version 1.0
Copyright (c) 2014 Samsung Corporation
================================================
Disk Number:  0 | Model Name: Samsung SSD 845DC EVO 960GB | Firmware Version: EXT03X3Q
Erase:   Secure Erase is completed successfully.
Completed [  100% ]
```

-d [--disk]

-d or --disk is used to input the physical disk index listed in the –L or --list command.

Arguments:	None
Used with:	--erase, --firmware-update, --trim, --overprovision, --smart, --benchmark, --info, --sctcachestate
Usage:	magician --disk 1 --erase magician --disk 1 --firmware-update --path <fwpackage-path> magician --disk 1 --trim magician --disk 1 --over-provision --set 25% magician --disk 1 --smart magician --disk 1 --setmax --set 123456 magician --disk 1 --writecache --set 1 magician --disk 1 --sctcachestate magician --disk 1 --info [or] magician -d 1 –E magician -d 1 -F -p <fwpackage-path> magician -d 1 -T magician -d 1 -O -s 25% magician -d 1 -S magician -d 1 -M -s 123456 magician -d 1 -W -s 1 magician -d 1 -X magician -d 1 –I

※ Note: Arguments provided above are only for illustration purpose.

For SSDs directly connected to the system, the disk number should be inputted as "-d 0" and for RAID configuration "-d 2:0:1", where

2 -Library type, 0 -Controller number, and 1 -disk number.

-L [--list]

The –L or --list option will display a list of Samsung SSDs which shows the Model Name, Firmware version, Capacity, Disk Heath, TBW, etc.

Arguments:	None
Used with:	None
Usage:	magician --list [or] magician –L

```
[root@localhost 64bin]# ./magician -L
===================================================================================
Samsung(R) SSD Magician DC Version 1.0
Copyright (c) 2014 Samsung Corporation

...................................................................................
| Disk    | Model                   | Serial          | Firmware | Capacity | Drive  | Total Bytes |
| Number  |                         | Number          |          |          | Health | Written     |
| 0       |Samsung SSD 845DC EVO 960GB |S1R1NYAF500316W |EXT03X3Q  | 894 GB   | GOOD   | 0.00 TB     |
| *1      |SAMSUNG 843T                |                |DXM9103Q  | 447 GB   | GOOD   | 0.01 TB     |
|2:0:0    |Samsung SSD 845DC PRO 800GB |S1S1NYAF600127T |DXV8AX3Q  | 745 GB   | GOOD   | 0.00 TB     |
|2:0:1    |Samsung SSD 845DC PRO 800GB |S1S1NYAF600144N |DXV8AX3Q  | 745 GB   | GOOD   | 0.00 TB     |
|2:0:2    |Samsung SSD 845DC EVO 960GB |S1R1NYAF500314A |EXT03X3Q  | 894 GB   | GOOD   | 0.00 TB     |
...................................................................................
```

※Note: in case of OS disk Disk Number is preceded with '*'

※Note: For normal SSDs connected directly to the system, the "Disk Number" is displayed as a single natural number (0 or 1 or

2 etc.), but under RAID configuration, the "Disk Number" will be shown in Library type : Controller ID : Disk ID format(eg- 2:0:1).

   1) LSI Library Type : 1 (IR 1), 2 (IR 2), 4 (IR 3), 8 (MegaRAID)

   2) Controller ID : Identifier of HBA/RAID controller (numbering)

   3) Disk ID : Identifier of SSD in one controller ID

※ "-d 0" for only Samsung SSD and "-d 2:0:1" for RAID configuration.

-S [--smart]

Used to select a specific drive connected to the system and get the SMART Value. For example, if --disk X is specified, where X is the physical disk index, it lists down the SMART attributes of the disk X connected to HOST system. Also used to log temperature of the disk and estimate its life time and the percentage of the available LBA to replace. Also used to execute SMART Self-Test.

Arguments:	-t [--temperature] Enables the user to log the temperature of the disk. -q [--query] Displays the percentage of the available LBA to replace. -a [--analyzer] Displays the lifetime estimation of the disk by SMART value. --analyzer should be followed by either --start or --stop subcommands. -e [--execute] Execute SMART Self-Test. --execute should be followed by --offlineshort, --offlineextended, --offlineselective, --captiveshort, --captiveextended, --captiveselective, --abort, --checkstatus subcommands.
Used with:	--disk [or] -d
Usage:	magician --disk 1 --smart magician --disk 1 --smart --temperature : Use default folder location magician --disk 1 --smart --temperature /home/ : Use /home/ folder location magician --disk 1 --smart --query magician --disk 1 --smart --analyzer --start : Record the data needed to estimate the life time of SSD. magician --disk 1 --smart --analyzer --stop : Analyze the lifetime of the SSD using recorded data. magician --disk 1 --smart --execute --offlineshort magician --disk 1 --smart --execute --offlineextended magician --disk 1 --smart --execute --offlineselective magician --disk 1 --smart --execute --captiveshort magician --disk 1 --smart --execute --captiveextended magician --disk 1 --smart --execute --captiveselective magician --disk 1 --smart --execute --abort magician --disk 1 --smart --execute --checkstatus [or] magician -d 1 -S magician -d 1 -S -t : Uses default folder location magician -d 1 -S -t /home/ : Uses /home/ folder location magician -d 1 -S -q magician -d 1 -S -a --start : Records the data needed to estimate the life time of SSD. magician -d 1 -S -a --stop : Analyze the lifetime of the SSD using recorded data. magician -d 1 -S -e --offlineshort magician -d 1 -S -e --offlineextended magician -d 1 -S -e --offlineselective magician -d 1 -S -e --captiveshort magician -d 1 -S -e --captiveextended magician -d 1 -S -e --captiveselective magician -d 1 -S -e --abort magician -d 1 -S -e --checkstatus

※ Note: Default folder location is /usr/local/Magician/SMARTFiles/. Temperature will be logged into a file "Log_Temperature.txt" in default location if no valid file path is provided.

To estimate the lifetime of the SSD, first --analyzer should be run with --start and then with --stop subcommand. If "Wear Leveling Count" of the SSD is same when executing "--start" and "--stop" subcommands, then lifetime is displayed as infinite.

To check the current progress of SMART OFF-LINE SelfTest, "--checkstatus" subcommand should be used.

To stop the execution of SMART OFF-LINE SelfTest, "--abort" subcommand should be used.

[SMART Information]

```
[root@localhost 64bin]# ./magician -d 2:0:1 -S
==================================================================================
Samsung(R) SSD Magician DC Version 1.0
Copyright (c) 2014 Samsung Corporation
==================================================================================
Disk Number: 2:0:1 | Model Name: Samsung SSD 845DC PRO 800GB | Firmware Version: DXV8AX3Q

 ID  | Description                                  | Raw      | Normalized | Worst | Threshold | Status
 5   | Reallocated Sector Count                     | 0        | 100        | 100   | 10        | OK
 9   | Power-on Hours                               | 0        | 100        | 100   | 0         | OK
 12  | Power-on Count                               | 16       | 99         | 99    | 0         | OK
 177 | Wear Leveling Count                          | 0        | 100        | 100   | 5         | OK
 179 | Used Reserved Block Count (total)            | 0        | 100        | 100   | 10        | OK
 180 | Unused Reserved Block Count (total) - Warranty| 7040     | 100        | 100   | 10        | OK
 181 | Program Fail Count (total)                   | 0        | 100        | 100   | 0         | OK
 182 | Erase Fail Count (total)                     | 0        | 100        | 100   | 0         | OK
 183 | Runtime Bad Count (total)                    | 0        | 100        | 100   | 10        | OK
 184 | Error Detection                              | 0        | 100        | 100   | 97        | OK
 187 | Uncorrectable Error Count                    | 0        | 100        | 100   | 0         | OK
 190 | Airflow Temperature                          | 33       | 67         | 67    | 0         | OK
 195 | ECC Error Rate                               | 0        | 200        | 200   | 0         | OK
 199 | CRC Error Count                              | 0        | 100        | 100   | 0         | OK
 202 | SSD Mode Status                              | 0        | 100        | 100   | 10        | OK
 235 | POR Recovery Count                           | 5        | 99         | 99    | 0         | OK
 241 | Total LBAs Written                           | 1972942  | 99         | 99    | 0         | OK
 242 | Total LBAs Read                              | 1987786  | 99         | 99    | 0         | OK
 250 | SATA Interface Downshifts (total)            | 0        | 100        | 100   | 1         | OK

DRIVE HEALTH STATUS : GOOD
```

[Temperature log]

```
[root@localhost 64bin]# ./magician -d 2:0:1 -S -t
==================================================================================
Samsung(R) SSD Magician DC Version 1.0
Copyright (c) 2014 Samsung Corporation
==================================================================================
Disk Number: 2:0:1 | Model Name: Samsung SSD 845DC PRO 800GB | Firmware Version: DXV8AX3Q

Serial Number: S1S1NYAF600144N              09-11-2014(14:38:42)              33   deg C

Temperature Logging: Successfully logged the temperature.
```

[SSD Lifetime Analyzer]

```
[root@localhost 64bin]# ./magician -d 2:0:1 -S -a --start
=================================================================
Samsung(R) SSD Magician DC Version 1.0
Copyright (c) 2014 Samsung Corporation
=================================================================
-----------------------------------------------------------------
Disk Number: 2:0:1 | Model Name: Samsung SSD 845DC PRO 800GB | Firmware Version: DXV8AX3Q
-----------------------------------------------------------------
Analyzer: [INFO] Started the analyzer to get the lifetime estimation of disk.
-----------------------------------------------------------------
[root@localhost 64bin]# ./magician -d 2:0:1 -S -a --stop
=================================================================
Samsung(R) SSD Magician DC Version 1.0
Copyright (c) 2014 Samsung Corporation
=================================================================
-----------------------------------------------------------------
Disk Number: 2:0:1 | Model Name: Samsung SSD 845DC PRO 800GB | Firmware Version: DXV8AX3Q
-----------------------------------------------------------------
Analyzer:
-----------------------------------------------------------------
Start Time              :2014:11:09  14:40:11
End Time                :2014:11:09  14:40:23
Increase in P/E cycle   :0 (Ave. value)
Increase in Workload    :0 GB
Lifetime(Estimation)    :Infinite Days
```

-T [--trim]

Send LBA ranges information of invalid data such that the SSD can know that the corresponding data inside the SSD is invalid.

Arguments:	None
Used with:	--disk [or] -d
Usage:	magician --disk 1 --trim [or] magician -d 1 -T

```
[root@localhost 64bin]# ./magician -d 1 -T
==============================================================================
Samsung(R) SSD Magician DC Version 1.0
Copyright (c) 2014 Samsung Corporation
==============================================================================
Do you want to continue with Optimization (yes to continue):yes
..............................................................................
Disk Number:  1 | Model Name: Samsung SSD 845DC EVO 960GB | Firmware Version: EXT03X3Q

TRIM:  [INFO] Optimizing Volume --> /dev/sdb1
TRIM:   TRIM operation is completed.
..............................................................................
Completed [  100% ]
..............................................................................
```

-F [--firmware-update]

Update the firmware of the selected Samsung SSD connected to the Host system.
If --force is not used then the user will be prompted whether or not to continue the command.

Firmware update package includes firmware update policy file - DSRD.enc and new firmware. Samsung will provide firmware update package separately.

Arguments:	<fwpackage-path> [This argument provides the path to the directory containing firmware files and it should be given just after the switch]
Used with:	--disk [or] -d
Usage:	magician --disk 1 --firmware-update -p < fwpackage-path > magician --disk A --firmware-update -p < fwpackage-path > [or] magician -d 1 -F -p < fwpackage-path > magician -d A -F -p < fwpackage-path >

※ Note: Firmware update is available for limited Samsung SSD models:
   845DC PRO, 845DC EVO. 850 PRO, 840 PRO

```
[root@localhost 64bin]# ./magician -d 1 -F -p /root/Documents/EXT03X3Q/
===============================================================================
Samsung(R) SSD Magician DC Version 1.0
Copyright (c) 2014 Samsung Corporation
===============================================================================

WARNING :Please Note that Firmware Upgrade may format the disk and you will loose your data.
Please Ensure that data backup is taken before proceeding to Firmware Upgrade.
if you are sure then only proceed, otherwise restart the application after taking a backup.
Continue Firmware Upgrade ? [ yes ]:yes

Disk Number:  1 | Model Name: Samsung SSD 845DC EVO 960GB | Firmware Version: EXT05W3Q

F/W Update:  Disk is Updated with the New Firmware.

Completed [  100% ]

[root@localhost 64bin]# ./magician -L
===============================================================================
Samsung(R) SSD Magician DC Version 1.0
Copyright (c) 2014 Samsung Corporation
===============================================================================

| Disk   | Model                          | Serial          | Firmware  | Capacity | Drive  | Total Bytes |
| Number |                                | Number          |           |          | Health | Written     |

| *0     |SAMSUNG 843T                    |                 |DXM9103Q   | 447 GB   | GOOD   | 0.01 TB     |

| 1      |Samsung SSD 845DC EVO 960GB |S1R1NYAF500316W |EXT03X3Q   | 894 GB   | GOOD   | 0.00 TB     |
```

- [--erase]

Erase all the data on the drive by using an ATA Format Unit command.

If --force is not used then the user will be prompted whether or not to continue the command. --force option must be used cautiously as it will not prompt the user for the confirmation, which may result in severe data loss.

Arguments:	None
Used with:	--disk [or] -d
Usage:	magician --disk 1 --erase [or] magician -d 1 -E

※ Note: When the disk is in frozen state, the user has to unplug and plug-in the power cable and restart the erase operation.

```
[root@localhost 64bin]# ./magician -d 2:0:1 -E
=================================================================================
Samsung(R) SSD Magician DC Version 1.0
Copyright (c) 2014 Samsung Corporation
=================================================================================
.................................................................................
WARNING : All Data on Disk will be Erased and cannot be recovered, Please take a back up of
any data if necessary. Do not REMOVE SSD in middle of operation, otherwise results
may be inaccurate. Continue Secure Erase ? [ yes ]:yes
.................................................................................
Disk Number: 2:0:1 | Model Name: Samsung SSD 845DC PRO 800GB | Firmware Version: DXV8AX3Q
.................................................................................
Erase:  Secure Erase completed successfully, Data loss has occured, Re-configure the RAID.
.................................................................................
Completed [  100% ]
.................................................................................
```

-O [--over-provision]

Set the SSD's overprovision (= OP) area size to the given value.

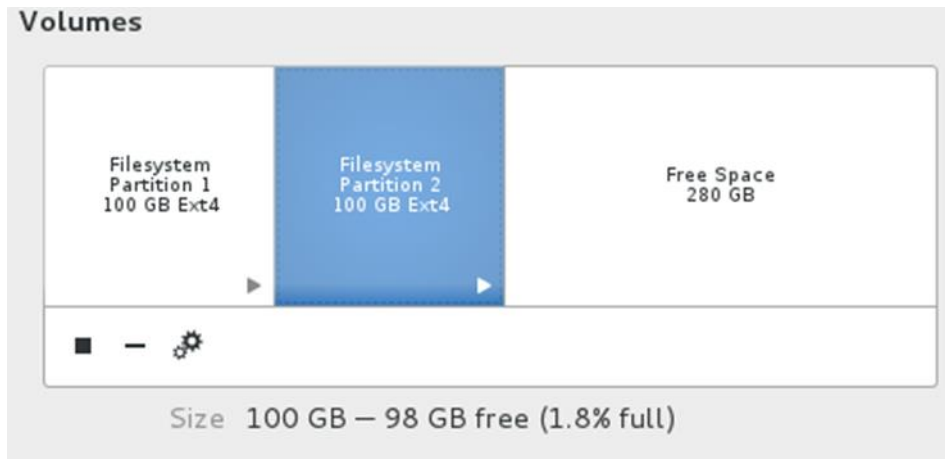| Arguments:	-q [--query]: Displays OP information of the selected SSD. -s [--set]: Sets the OP value either in MB or GB or % of total disk space. -c [--clear]: Clears the current OP value on the last partition of the disk.
Used with:	--disk [or] -d
Usage:	magician --disk 1 --over-provision --query magician --disk 1 --over-provision --set 1024MB magician --disk 1 --over-provision --set 4GB magician --disk 1 --over-provision --set 10% magician --disk 1 --over-provision --set magician --disk 1 --over-provision --clear [or] magician -d 1 -O -q magician -d 1 -O -s 1024MB magician -d 1 -O -s 4GB magician -d 1 -O -s 10% magician -d 1 -O -s magician -d 1 -O -c

※ Note: If no argument is given for --set option, the application will perform Over-Provisioning with default value, 10%. -O short switch can also be used for –over-provision. Short switches for --query, --set and --clear are -q, -s and -c respectively. The values (1024MB, 4GB and 10%) used above are for illustration purpose only.

Overprovisioning on Windows Example

New Volume (D:) 100.00 GB NTFS Healthy (Primary Partition)	New Volume (E:) 100.00 GB NTFS Healthy (Primary Partition)	247.13 GB Unallocated

Display value	Description	Calculation
Current OP	Capacity of total current OP area, each partition reserved by file system. User can only modify the reserved area of the last partition	Unallocated space size of selected disk (247 GB)
Recommended OP	Capacity of recommended OP area, 10% of device size	447 GB * 10% = 48 GB
Maximum OP	Minimum value of either: - 50% of total capacity - Maximum shrinkable area *Increasing OP value greater than 50% of the SSD density will not have further performance benefit beyond the 50%. Therefore, Magician tool supports allocating the OP only up to 50% of the SSD.	Min(447 GB * 50% = 228 GB, 247 GB + shrinkable) => 228GB

Overprovisioning on Linux Example

Display value	Description	Calculation
Current OP	Sum of reserved area of each partition by the file system. Magician will only modify the reserved area of the last partition	sda1 100GB*5% + sda2 100GB*5% = 10GB
Recommended OP	10% of device size.	480GB*10% = 48GB
Maximum OP	Sum of reserved area of all the partition except for the last, and 50% of the size of the last partition.	sda2 100GB*50% + sda1 100GB*5% =55GB

[Over-provision --query]

[Over-provision --set 10%]

```
[root@localhost 64bin]# ./magician -d 1 -O -s 10%
======================================================================
Samsung(R) SSD Magician DC Version 1.0
Copyright (c) 2014 Samsung Corporation
======================================================================
----------------------------------------------------------------------
Disk Number:  1 | Model Name: Samsung SSD 845DC EVO 960GB | Firmware Version: EXT03X3Q
----------------------------------------------------------------------
Over provisioning: [INFO-OP] Overprovisioning Done Successfully.
----------------------------------------------------------------------
Completed [  100% ]

[root@localhost 64bin]# ./magician -d 1 -O -q
======================================================================
Samsung(R) SSD Magician DC Version 1.0
Copyright (c) 2014 Samsung Corporation
======================================================================
----------------------------------------------------------------------
Disk Number:  1 | Model Name: Samsung SSD 845DC EVO 960GB | Firmware Version: EXT03X3Q
----------------------------------------------------------------------
Query Information for Over Provisioning
Current OP (File system default reserved area 5% included):  85.83 GB
Recommended OP (10% of disk total capacity recommended):     85.83 GB
Maximum OP (50% of  last partition limited):                422.35 GB
Over provisioning: [INFO-OP] Query is done successfully.
----------------------------------------------------------------------
Completed [  100% ]
```

[Over-provision -- clear]

```
Directory Hash Seed:       255b3d02-f001-439f-93d4-cce904b501d3
Journal backup:            inode blocks
[root@localhost 64bin]# ./magician -d 5 -O -c
======================================================================
Samsung(R) SSD Magician DC Version 1.0
Copyright (c) 2014 Samsung Corporation
======================================================================
----------------------------------------------------------------------
Disk Number:  5 | Model Name: SAMSUNG SATA SSD | Firmware Version: EXT03X3Q
----------------------------------------------------------------------
Over provisioning: [INFO-OP] User selected to clear Over-Provisioning value.
Over provisioning: [INFO-OP] Overprovisioning Done Successfully.
----------------------------------------------------------------------
Completed [  100% ]
```

-I [--info]

Display the details of the selected Samsung SSD.

Arguments:	None
Used with:	--disk [or] -d
Usage:	magician --disk 1 --info [or] magician -d 1 -I

```
[root@localhost 64bin]# ./magician -L
=======================================================================================
Samsung(R) SSD Magician DC Version 1.0
Copyright (c) 2014 Samsung Corporation
=======================================================================================

| Disk    | Model                       | Serial         | Firmware  | Capacity | Drive  | Total Bytes |
| Number  |                             | Number         |           |          | Health | Written     |

| 0       |Samsung SSD 845DC EVO 960GB  |S1R1NYAF500316W |EXT03X3Q   | 894 GB  | GOOD   | 0.00 TB     |

| *1      |SAMSUNG 843T                 |                |DXM9103Q   | 447 GB  | GOOD   | 0.01 TB     |

|2:0:0    |Samsung SSD 845DC PRO 800GB  |S1S1NYAF600127T |DXV8AX3Q   | 745 GB  | GOOD   | 0.00 TB     |

|2:0:1    |Samsung SSD 845DC PRO 800GB  |S1S1NYAF600144N |DXV8AX3Q   | 745 GB  | GOOD   | 0.00 TB     |

|2:0:2    |Samsung SSD 845DC EVO 960GB  |S1R1NYAF500314A |EXT03X3Q   | 894 GB  | GOOD   | 0.00 TB     |

[root@localhost 64bin]# ./magician -d 2:0:1 -I
=======================================================================================
Samsung(R) SSD Magician DC Version 1.0
Copyright (c) 2014 Samsung Corporation
=======================================================================================

Disk Number: 2:0:1 | Model Name: Samsung SSD 845DC PRO 800GB | Firmware Version: DXV8AX3Q

Over Provision         | Write Cache          | Max address          | SCT Write Cache

N/A                    | Enabled              | 1562824368           | Enabled
```

-M [--setmax]

Perform SETMAX related operations on specified disk, which will decrease or increase the capacity of the SSD. (Can increase up to maximum capacity supported by the SSD).

Arguments:	-s [--set]: Set the disk's capacity by taking value in number of sectors in decimal. -r [--read-native-max]: Display the native max address of the disk in the form of LBA.
Used with:	--disk [or] -d
Usage:	magician --disk 1 --setmax --set 1234566 magician --disk 1 --setmax --read-native-max [or] magician -d 1 -M -s 1234566 magician -d 1 -M -r

[Setmax --set]

```
[root@localhost 64bin]# ./magician -d 0 -M -r
=================================================================
Samsung(R) SSD Magician DC Version 1.0
Copyright (c) 2014 Samsung Corporation
=================================================================
.................................................................
Disk Number:  0 | Model Name: Samsung SSD 845DC EVO 960GB | Firmware Version: EXT03X3Q
.................................................................
Set Max Address: Native SET MAX value of the disk is 1875385007 LBAs.
```

[Setmax --read-native-max]

```
[root@localhost 64bin]# ./magician -d 0 -M -s 1800000000
=================================================================
Samsung(R) SSD Magician DC Version 1.0
Copyright (c) 2014 Samsung Corporation
=================================================================
.................................................................
Disk Number:  0 | Model Name: Samsung SSD 845DC EVO 960GB | Firmware Version: EXT03X3Q
.................................................................
Set Max Address: Disk Capacity updated to 858GB.
Set Max Address: SET MAX Operation Completed. PowerCycle the disk.
.................................................................
[root@localhost 64bin]# ./magician -d 0 -I
=================================================================
Samsung(R) SSD Magician DC Version 1.0
Copyright (c) 2014 Samsung Corporation
=================================================================
.................................................................
Disk Number:  0 | Model Name: Samsung SSD 845DC EVO 960GB | Firmware Version: EXT03X3Q
.................................................................
Over Provision        | Write Cache      | Max address      | SCT Write Cache

No Partitions         | Enabled          | 1800000001       | Enabled
.................................................................
```

-W [--setfeature]

Used to change the certain device features on specified SSD.

Arguments:	-w [--writecache]: Enables (for --writecache 1) or Disables (for --writecache 0) Write Cache on specified SSD. -r [--rawdata]: Set raw value of data to send set feature command on specified disk.
Used with:	--disk [or] -d
Usage:	magician --disk 1 --setfeature --writecache 1 magician --disk 1 --setfeature --writecache 0 magician --disk 1 --rawdata 0x03:0x44 [or] magician -d 1 -W -w 1 magician -d 1 -W -w 0 magician -d 1 -W -r 0x03:0x44

-W [--writecache]

Enable/disable Write Cache on specified SSD.

Arguments:	-s [--set]: Enables (for --set 1) or Disables (for --set 0) Write Cache on the specified SSD.
Used with:	--disk [or] -d
Usage:	magician --disk 1 --writecache --set 1 magician --disk 1 --writecache --set 0 [or] magician -d 1 -W -s 1 magician -d 1 -W -s 0

[Writecache --set 1(enable)]

```
[root@localhost 64bin]# ./magician -d 2:0:1 -W -s 1
================================================================
Samsung(R) SSD Magician DC Version 1.0
Copyright (c) 2014 Samsung Corporation
================================================================

Disk Number: 2:0:1 | Model Name: Samsung SSD 845DC PRO 800GB | Firmware Version: DXV8AX3Q
Write Cache: Write Cache is enabled
[root@localhost 64bin]# ./magician -d 2:0:1 -I
================================================================
Samsung(R) SSD Magician DC Version 1.0
Copyright (c) 2014 Samsung Corporation
================================================================

Disk Number: 2:0:1 | Model Name: Samsung SSD 845DC PRO 800GB | Firmware Version: DXV8AX3Q

Over Provision      Write Cache          | Max address       | SCT Write Cache

N/A                 Enabled              | 1562824368        | Enabled
```

[Writecache--set 0(disable)]

```
[root@localhost 64bin]# ./magician -d 2:0:1 -W -s 0
================================================================
Samsung(R) SSD Magician DC Version 1.0
Copyright (c) 2014 Samsung Corporation
================================================================

Disk Number: 2:0:1 | Model Name: Samsung SSD 845DC PRO 800GB | Firmware Version: DXV8AX3Q
Write Cache: Write Cache is disabled
[root@localhost 64bin]# ./magician -d 2:0:1 -I
================================================================
Samsung(R) SSD Magician DC Version 1.0
Copyright (c) 2014 Samsung Corporation
================================================================

Disk Number: 2:0:1 | Model Name: Samsung SSD 845DC PRO 800GB | Firmware Version: DXV8AX3Q

Over Provision      Write Cache          | Max address       | SCT Write Cache

N/A                 Disabled             | 1562824368        | Disabled
```

-X [--sct]

Used to execute various SCT commands on the specified SSD.

Arguments:	-wb [--writesame-pattern-background] {start}:{count}:{pattern}
	: SCT Write Same repeat write data pattern. Start and Count should be given as hexadecimal number. Setting zero value to Count causes write to all addressable user area.
	-wf [--writesame-pattern-foreground] {start}:{count}:{pattern}
	: SCT Write Same repeat write data pattern foreground
	-xg [--writecache-get]
	: Get SCT Write Cache state
	-xs [--writecache-set] {2|1|0}
	: Set SCT Write Cache
	-xsnv [--writecache-set-non-volatile] {1|0}
	:Set SCT Write Cache as non-volatile
	-rg [--reordering-get]
	: Get SCT Volatile Write Cache Reordering state
	-rs [--reordering-set] {1|0}
	: Set SCT Volatile Write Cache Reordering
	-rsnv [--reordering-set-non-volatile] {1|0}
	: Set SCT Volatile Write Cache Reordering as non-volatile
	-lg [--temperature-logging-get]
	: Get SCT Temperature logging interval
	-ls [--temperature-logging-set] {interval}
	: Set SCT Temperature logging interval. Interval in hexadecimal value with valid range from 1h ~ FFFFh
	-t [--temperature-history]
	: Get SCT HDA Temperature History Table
Used with:	--disk [or] -d
Usage:	magician -d 1 -X -wb 0x0:0x10000:0xff00ff00
	magician -d 1 -X -wf 0x0:0x10000:0xff00ff00
	magician -d 1 -X -xg
	magician -d 1 -X -xs 1
	magician -d 1 -X -xsnv 1
	magician -d 1 -X -rg
	magician -d 1 -X -rs 1
	magician -d 1 -X -rsnv 1
	magician -d 1 -X -lg
	magician -d 1 -X -ls 0x000a
	magician -d 1 -X -t

Notes on Write Same command

During the execution of SCT Write Same Foreground feature it is not possible to issue any other command to the device, and it cannot be stopped.

SCT Write Same Background is an interruptible ATA command. Magician application does not return immediately and the last LBA written is updated until the execution completes. User can stop the execution by providing interrupt using control + C key.

Also note that if any other command such as Identify Device is issued to the device by any other tool, SCT Write Same Background command stops.

-X [--sctcachestate]

Show SCT (Smart Command Transport) write cache state of the specified SSD.

Arguments:	NA
Used with:	--disk [or] -d
Usage:	magician --disk 1 --sctcachestate [or] magician -d 1 -X

※ Note: If the disk does not supports sct write cache commands, and then a message is displayed to notify the user.

[sctcachestate]

-V [--vendor-utility]

Used to execute Vendor Utility Commands

Arguments:	-fa [--FAlog-dump] Enables the user to extract the log data from a coreview block of the SSD
	-p [--PLP-log] Enables the user to extract the PLP log data from a coreview block of the SSD
	-e [--Escape] Attempt to make the device escape from ERROR MODE state
	-dslr [--DSLR] Extracts DSLR from the SSD
Used with:	--disk [or] -d
Usage:	magician --disk 1 --vendor-utility --FAlog-dump [or] magician -d 1 -V -fa magician --disk 1 --vendor-utility --PLP-log [or] magician -d 1 -V -p magician --disk 1 --vendor-utility --Escape [or] magician -d 1 -V -e magician --disk 1 --vendor-utility --DSLR [or] magician -d 1 -V -dslr

-license

Display the End User License Agreement.

Arguments:	None
Used with:	None
-Usage:	magician -license

```
[root@localhost 64bin]# ./magician -license
============================================================================
Samsung(R) SSD Magician DC Version 1.0
Copyright (c) 2014 Samsung Corporation
============================================================================

| -------------------------------------------------------------------------
|  PLEASE CAREFULLY READ THE FOLLOWING TERMS AND CONDITIONS BEFORE USING THE
|  SAMSUNG MAGICIAN  ('SOFTWARE') PROVIDED BY SAMSUNG ELECTRONICS CO., LTD. ('SAMSUNG').
|  IF YOU DO NOT AGREE TO THE TERMS AND CONDITIONS OF
|  THIS SAMSUNG MAGICIAN SOFTWARE LICENSE AGREEMENT ('AGREEMENT'), DO NOT USE THE SOFTWARE.
|
|  1. LIMITED LICENSE:
|  -------------------
|  1.1  Samsung grants to you a nonexclusive, nontransferable and royalty-free license to use
|  the Software only with Samsung SSD (Solid State Drive) products. You may not modify the
|  Software; reverse compile, reverse engineer, disassemble or reverse assemble all or any
|  portion of the Software; rent, lease, license, sublicense, distribute, transfer or sell
|  the Software; or create derivative works of the Software.
|  1.2 The Software contains software that is licensed under BSD 2.0 or is in the
|  public domain.
| -----------------------------|
|  Component  |   License      |
| -----------------------------|
|  hdparm BSD |     2.0        |
|  Json-cpp   | public domain  |
| -----------------------------|
|  - Below is the full license statement from hdparm.
|  * BSD-Style Open Source License : You may freely use, modify, and redistribute the hdparm
|  program, as either binary or source, or both.  The only condition is that the name and
|  copyright notice remain in the source code as-is.  Mark Lord (mlord@pobox.com)
|  - Below is the full license statement from json-cpp.
|  * The json-cpp library and this documentation are in public domain.
|
|  2. OWNERSHIP:
|  -------------
|  Except as expressly licensed above, no title, ownership, or intellectual property rights of
|  any kind, express or implied, are transferred to you, and all right, title, and interest in
|  and to the Software remains with Samsung. The Software is licensed to you and not sold.
|  You must reproduce and include all copyright notices and any other proprietary rights
|  notices appearing on the Software.
|
|  3. NO SUPPORT:
|  --------------
|  Samsung is under no obligation to update, maintain, or provide new versions or other
|  support for the Software. Samsung may make changes to the Software at any time without
|  notice to you.
|
|  4. NO WARRANTY:
|  ---------------
|  The Software is provided "AS IS" without warranty of any kind.
|  SAMSUNG EXPRESSLY DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED
|  TO, NONINFRINGEMENT OF THIRD PARTY RIGHTS, ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR
|  FITNESS FOR ANY PARTICULAR PURPOSE, AND ANY WARRANTIES ARISING FOR ANY COURSE OF DEALING OR
|  USAGE OF TRADE. SAMSUNG DOES NOT WARRANT THAT THE SOFTWARE WILL MEET YOUR REQUIREMENTS, OR
|  THAT THE OPERATION OF THE SOFTWARE WILL BE UNINTERRUPTED OR ERROR-FREE. FURTHERMORE,
|  SAMSUNG DOES NOT MAKE ANY REPRESENTATIONS REGARDING THE USE OR
|  THE RESULTS OF THE USE OF THE SOFTWARE IN TERMS OF ITS CORRECTNESS, ACCURACY, RELIABILITY,
|  OR OTHERWISE. THE ENTIRE RISK ARISING OUT OF USE OR
|  PERFORMANCE OF THE SOFTWARE REMAINS WITH YOU.
```

Examples

This chapter explains the details of the features along with the Command Terminal Input and screenshots of the respective features.

Display History of Commands

The Command history table can be displayed using the -C or --command-history command line option. Maximum of 500 command history will be displayed:

```
magician --command-history
or
magician –C
```

Display Tool Help

The help table can be displayed using the --help command line option:

```
magician –help
or
magician -H
```

Display Disk List

The -L or --list option will display a list of Samsung SSDs which shows the Model Name, Firmware version, Capacity, Disk Heath, TBW etc.

```
magician --list
or
magician -L
```

Below figures show the console screen example of disk list display on Windows and Linux system respectively.

A sample snapshot of disk list feature is shown below, where 4:0:1 is displayed as Disk Number for SSD with model "MZ-7WD2400/0H3".

4 - Library Type, 0 - Controller Number, 1 - Disk Number.

Disk list display on Windows

Disk List display on Linux

Note: To run any feature, the disk Number should be mentioned as displayed under the column "Disk Number" in the above snapshot ("-d 0" for only Samsung SSD and "-d 2:0:1" for RAID configuration)

SMART Information of the Disks

This feature is used to select a specific disk connected to the system and get the SMART value of the disk. This feature will also log the temperature of the SSD and display the estimated life time of the SSD and the percentage of the available LBA to replace.

The below Command Line option will perform the SMART operation:

```
magician --disk 1 --smart
magician --disk 1 --smart --temperature                    (use default location)
magician --disk 1 --smart --temperature /home/      (store the file in /home/)
magician --disk 1 --smart --query
magician --disk 1 --smart --analyzer --start              (record data for

                                                         Lifetime estimation)
magician --disk 1 --smart --analyzer --stop              (display the estimated

                                                         Lifetime)

magician --disk 1 --smart --execute --offlineshort
magician --disk 1 --smart --execute --offlineextended
magician --disk 1 --smart --execute --offlineselective
magician --disk 1 --smart --execute --captiveshort
magician --disk 1 --smart --execute --captiveextended
magician --disk 1 --smart --execute --captiveselective
magician --disk 1 --smart --execute --abort
magician --disk 1 --smart --execute --checkstatus
or
magician -d 1 -S
magician -d 1 -S -t                      (use default location)
magician -d 1 -S -t /home/              (store the file in /home/)
magician -d 1 -S -q
magician -d 1 -S -a --start               (record the data for Lifetime estimation)
magician -d 1 -S -a --stop             (display the estimated Lifetime.)
magician -d 1 -S -e --offlineshort
magician -d 1 -S -e --offlineextended
magician -d 1 -S -e --offlineselective
magician -d 1 -S -e --captiveshort
magician -d 1 -S -e --captiveextended
magician -d 1 -S -e --captiveselective
magician -d 1 -S -e --abort
magician -d 1 -S -e --checkstatus
```

Note: If no file path is provided to -t command, temperature is logged in the file located at /usr/local/Magician/SMARTFiles/. Filename would be Log_Temperature.txt.

The default locations for Smart temperature logging files are:

●   Linux: /usr/local/Magician/SMARTFiles/Log_Temperature.txt
●   Windows: "%AppData%\Magician\SMARTFiles\Log_Temperature.txt"

To estimate the life time of the SSD, run -a command with --start option and then with --stop option. If "ID 177" of SMART information is same during --start and --stop option, then life time is displayed as infinite.

To execute the SMART Self-Test, run -e command with appropriate sub option. If --offlineshort, --offlineextended, --offlineseletive option selected, it will be stopped by --abort option. Its progress can be displayed with --checkstatus option. If --captiveshort, --captiveextended, --captiveselective option selected, it is impossible to escape the execution during the estimated time.

Trim Command

Trim sends LBA ranges information of invalid data such that the SSD can know the corresponding data inside the SSD is invalid.

The below given CLI input will perform the trim operation on the selected disk:

```
magician --disk 1 --trim
or
magician -d 1 –T
```

Firmware Update

This feature is useful for changing SSD's firmware from old version to new version.

The firmware update package includes firmware update policy file - DSRD.enc and the new firmware. Samsung will provide the firmware update package separately.

The below given CLI input will perform the firmware update operation on the selected disk:

```
magician --disk 1 --firmware-update -p <fw-path>
or
magician -d    1 -F -p    <fw-path>
```

Erase

Erase feature is designed to remove all user data from a drive permanently. 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.

The below given CLI input will perform the erase operation on the selected disk:

```
magician --disk -1 --erase
or
magician -d 1 -E
```

Note: When the disk is in frozen state, the user has to unplug and plug-in the power cable and restart the erase operation.

Write amplification is an issue that occurs in SSDs that can decrease the lifespan of the SSD and impact performance. The lower the write amplification, the longer will be the lifespan of SSD.

Over Provisioning

This feature is useful for shrinking or expanding the memory of the given Samsung SSD. User has to give input in size (MB/GB) or percentage to shrink/expand the SSD size. The below given CLI input will perform over provisioning operation on selected disk.

User area (Data area user can use)	Reserved area (Over provision feature set the reserved area base on file system)

```
magician --disk 1 --over-provision --query
magician --disk 1 --over-provision --set 1024MB
magician --disk 1 --over-provision --set 2GB
magician --disk 1 --over-provision --set 10%
magician --disk 1 --over-provision --clear
magician -d 1 -O -q
magician -d 1 -O -s 1024MB
magician -d 1 -O -s 2GB
magician -d 1 -O -s 10%
magician -d 1 -O -c
```

If no option is followed by either -s or --set switch, then the tool will perform Over-Provision with default value (10%).

```
magician --disk 1 --over-provision --set
or
magician -d 1 -O -s
```

Note: Short switch -O can also be used for --over-provision. For --query, --set and --clear, short switches -q, -s and -c can be used respectively.

Note: The maximum percentage of over provisioning to be performed on the drive is restricted to 50% of the drive's physical size. Similarly, the size in MB is also the value equivalent to 50% of the drive's physical size. The OP will be performed always on the last partition of the selected SSDs.

Set Max Address

This feature is for setting maximum address of the SSD. The user has to input the number of sectors in decimal format. This feature is designed to set the physical capacity of SSD. This feature is only recommended to be used on the device at its initial set-up stage. In contrast to over-provisioning modifying max address may result in data loss, particularly when the max address is reduced.

This feature will update the disks capacity with user input value, only if it is successful in reading the max address value of the disk. After successful execution, the updated value of the disk can be observed in --list command.

```
magician --disk 1 --setmax --set 12345678
magician --disk 1 --setmax --read-native-max
or
magician -d 1 -M -s 12345678
magician -d 1 -M -r
```

Set Feature

This feature will change the certain device features on the specified disk depending on the argument supplied.

If it is used with --writecache sub option, it enables the write cache for 1 and disables for 0. And various features can be controlled by user input value with --rawvalue sub option.

```
magician --disk 1 --setfeature --writecache 0
magician --disk 1 --setfeature --writecache 1
magician --disk 1 --setfeature --rawvalue 0x03:0x44
or
magician -d 1 -W -w 1
magician -d 1 -W -w 0
magician -d 1 -W -r 0x03:0x44
```

Disk Info

This feature will display disk details such as Overprovision, Write Cache state, Max address value, SCT Write Cache state, WWN, Phy Speed, current Power Mode, etc. of the specified disk.

```
magician --disk 1 --info
or
magician -d 1 -l
```

SCT

This feature will perform the following SCT commands.
This feature will get the SCT write cache state of the specified disk and displays it on the console. If the disk does not supports sct write cache command, and then a message is displayed to notify the user.

```
magician -d 1 -X -wb 0x0:0x10000:0xff00ff00
magician -d 1 -X -wf 0x0:0x10000:0xff00ff00
magician -d 1 -X -xg
magician -d 1 -X -xs 1
magician -d 1 -X -xsnv 1
magician -d 1 -X -rg
magician -d 1 -X -rs 1
magician -d 1 -X -rsnv 1
magician -d 1 -X -lg
magician -d 1 -X -ls 0x000a
magician -d 0:0:9 -X -t
or
magician --disk 1 --sct -writesame-background 0x0:0x10000:0xff00ff00
magician --disk 1 --sct -writesame-foreground 0x0:0x10000:0xff00ff00
magician --disk 1 --sct --writecache-get
magician --disk 1 --sct --writecache-set 1
magician --disk 1 --sct --writecache-set-non-volatile 1
magician --disk 1 --sct --reordering-get
magician --disk 1 --sct --reordering-set-non-volatile 1
magician --disk 1 --sct --temperature-logging-get
magician --disk 1 --sct --temperature-logging-set 0x000a
magician --disk 1 --sct --temperature-history
```

Bypass confirmation prompt (--force)

The --force option is used to bypass the confirmation prompt for --erase, --trim and --firmware-update features.

```
magician --disk 1 --erase --force
magician --disk 1 --trim --force
magician --disk 1 --firmware-update -p <filepath> --force
```

Vendor Utility

This feature will perform Vendor Utility features such as:

- Get the FA-log-dump data
- Get power protection log from selected device
- Attempt to make the device escape from ERROR MODE state
- Get DSLR data

```
magician --disk 1 --vendor-utility --FAlog-dump    [or] magician -d 1 -V -fa
magician --disk 1 --vendor-utility --PLP-log            [or] magician -d 1 -V -p
magician --disk 1 --vendor-utility --Escape            [or] magician -d 1 -V -e
magician --disk 1 --vendor-utility --DSLR              [or] magician -d 1 -V -dslr
```

License

This feature will show Display the End User License Agreement. The license agreement will show the ownership, licensing, dispute resolution and disclaimer

```
magician -license
```

End User License Agreement (EULA)

PLEASE CAREFULLY READ THE FOLLOWING TERMS AND CONDITIONS BEFORE USING THE SAMSUNG MAGICIAN ("SOFTWARE") PROVIDED BY SAMSUNG ELECTRONICS CO., LTD. ("SAMSUNG"). IF YOU DO NOT AGREE TO THE TERMS AND CONDITIONS OF THIS SAMSUNG MAGICIAN SOFTWARE LICENSE AGREEMENT ("AGREEMENT"), DO NOT USE THE SOFTWARE.

1. LIMITED LICENSE

1.1　Samsung grants to you a nonexclusive, nontransferable and royalty-free license to use the Software only with Samsung SSD (Solid State Drive) products. You may not modify the Software; reverse compile, reverse engineer, disassemble or reverse assemble all or any portion of the Software; rent, lease, license, sublicense, distribute, transfer or sell the Software; or create derivative works of the Software.

1.2 The Software contains software that is licensed under BSD 2.0 or is in the public domain.

Component	License
hdparm	BSD 2.0
Json-cpp	public domain

- Below is the full license statement from hdparm.

  * BSD-Style Open Source License : You may freely use, modify, and redistribute the hdparm program, as either binary or source, or both. The only condition is that the name and copyright notice remain in the source code as-is. Mark Lord (mlord@pobox.com)

- Below is the full license statement from json-cpp.

  * The json-cpp library and this documentation are in public domain.

2. OWNERSHIP

Except as expressly licensed above, no title, ownership, or intellectual property rights of any kind, express or implied, are transferred to you, and all right, title, and interest in and to the Software remains with Samsung. The Software is licensed to you and not sold. You must reproduce and include all copyright notices and any other proprietary rights notices appearing on the Software.

3. NO SUPPORT

Samsung is under no obligation to update, maintain, or provide new versions or other support for the Software. Samsung may make changes to the Software at any time without notice to you.

4 NO WARRANTY

The Software is provided "AS IS" without warranty of any kind.

SAMSUNG EXPRESSLY DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO, NONINFRINGEMENT OF THIRD PARTY RIGHTS, ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE, AND ANY WARRANTIES ARISING FOR ANY COURSE OF DEALING OR USAGE OF TRADE. SAMSUNG DOES NOT WARRANT THAT THE SOFTWARE WILL MEET YOUR REQUIREMENTS, OR THAT THE OPERATION OF THE SOFTWARE WILL BE UNINTERRUPTED OR ERROR-FREE. FURTHERMORE, SAMSUNG DOES NOT MAKE ANY REPRESENTATIONS REGARDING THE USE OR THE RESULTS OF THE USE OF THE SOFTWARE IN TERMS OF ITS CORRECTNESS, ACCURACY, RELIABILITY, OR OTHERWISE. THE ENTIRE RISK ARISING OUT OF USE OR PERFORMANCE OF THE SOFTWARE REMAINS WITH YOU.

5. NO LIABILITY

IN NO EVENT SHALL SAMSUNG OR ITS AFFILIATED COMPANIES BE LIABLE FOR ANY DIRECT, INDIRECT, CONSEQUENTIAL, INCIDENTAL, OR SPECIAL DAMAGES (INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS OF PROFITS, BUSINESS INTERRUPTION, OR LOSS OF INFORMATION) ARISING OUT OF YOUR USE OF OR INABILITY TO USE THE SOFTWARE, EVEN IF SAMSUNG HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

6. TERMINATION

This Agreement is effective until terminated. This Agreement may be terminated by you at any time by deleting the Software and discontinuing its use, or by Samsung if you fail to cure any breach of this Agreement within sixty (60) days' written notice of breach by Samsung. Upon termination, the licenses granted to you shall terminate, and you shall cease all use and distribution of, and cease exercising any and all other rights granted under this Agreement with respect to, the Software.

7. GENERAL

This Agreement constitutes the entire agreement between Samsung and you regarding the subject matter hereof and supersedes all previous oral or written communications between the parties.

8. DISPUTE RESOLUTION

This Agreement shall be governed by and construed in accordance with the laws of the Republic of Korea, without regard to conflicts of laws principles. All disputes, controversies or claims between the parties arising out of or in connection with this Agreement (including its existence, validity or termination) which cannot be amicably settled shall be finally resolved by arbitration to be held in Seoul, Korea in accordance with the Arbitration Rules of the Korean Commercial Arbitration Board by one or more arbitrators. The arbitral award shall be final and binding on the parties.

9. DISCLAIMER

Samsung is not responsible for any loss or damage to your computer, system, or application programs, arising from the use of this application. Samsung also does not take any liability for any kind of data loss and restoration that may occur during the installation or execution of this Software. User of this application has to take complete responsibility.

Supported Commands for LSI RAID

Feature	Comments
-L [--list]	Show a disk(s) attached to the system
-F [--firmware-update]	Update firmware to specified disk
-E [--erase]	Securely Erase all data from specified disk
-S [--smart]	Show S.M.A.R.T values of specified disk
-M [--setmax]	Perform SetMax related operations on specified disk
-W [--writecache]	Set the certain device features on specified disk.
-X [--sctcachestate]	Execute SCT commands
-V [--vendor-utility]	Perform Vendor features specific to Samsung SSD
-C [--command-history]	Show history of the previously executed commands
-I [--info]	Display the disk details to the user
-license	Display End User License Agreement
-H [--help]	Show detailed Help

SAMSUNG