DRIVESCOPE

S.M.A.R.T. TOOL FOR MACINTOSH

It is important that you register Drive Scope if you require technical support or wish to be notified of updates and upgrades. Online registration is the preferred way to register. It immediately places your information into our user base and saves you the inconvenience of filling out, stamping, and mailing in the registration. If you purchased Drive Scope from micromat.com, you are automatically registered.

Drive Scope Registration

To register online go to:
http://www.micromat.com

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Windsor, CA 95492

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About Drive Scope

Drive Scope is an advanced SMART utility for the Apple Macintosh. SMART (or S.M.A.R.T.) is an acronym which stands for Self Monitoring Analysis and Reporting Technology.

This technology was developed through the efforts of the SMART Working Group (SWG), a consortium of major hard disk manufacturers, to increase the reliability of hard drives. SMART routines are now incorporated into most new hard disk and solid state drives. Although the SMART specification was developed by the SWG, each drive manufacturer uses their own proprietary routines in their drives. The routines monitor important drive parameters as a drive operates and stores the results in the drive's SMART registry. An examination and analysis of these parameters can aid in the prediction of drive failure. This could provide the warning you need to back up your data and repair or replace a drive before it fails. It is estimated that SMART monitoring can predict 70% of drive hardware failures before they occur.

SMART technology monitors a drive as it is used and looks for unusual behavior. In rotational drives, the routines keep track of disk performance, bad sectors, calibration, CRC (data) errors, disk spin-up time, distance between the head and the disk, temperature, features of the media, heads, motor and servomechanism. For example, motor or bearing failure can be predicted by an increase in the drive spin-up time and the number of retries required to spin-up the drive. Excessive use of error correction routines could indicate a broken drive head or contamination on the head. Spotting these types of errors early may prevent future catastrophe.

SMART Technology continues to be utilized for Solid State Drives (SSDs). Because SMART originated on rotational drives, some attributes (such as spin-up count) are unused or set to static values, while others have been added to keep track of potential failures specific to solid state technology, such as wear leveling.

The SMART specification also includes drive self-test routines that can be executed to verify that a drive is able to accurately read and write data. Drive Scope includes functionality to execute a self-test on a drive as well as check on the results stored its SMART registry. Problems found in either of these areas can indicate possible impending drive failure. This advance notice can provide enough time to back up your data before it becomes inaccessible.

Getting Started

System Requirements

- Apple Silicon or Intel Mac
- macOS 11 or later

(Specifications subject to change without notice.)

Installation

Drive Scope is a self-contained application which does not require a traditional installer application. To install, simply drag the application icon to the Applications folder. Running the Drive Scope application will install extra files:

~/Library/Application Support/Drive Scope

~/Library/Preferences/com.micromat.DriveScope.plist

Starting Monitoring will add these files for Macs running macOS 12 and earlier:

~/Library/Application Support/Drive Scope/Drive Scope Agent.app

~/Library/LaunchAgents/com.micromat.Drive-Scope.launchAgent.plist

Installing the macOS Widget installs the following:

~/Library/Containers/Drive Scope Widget

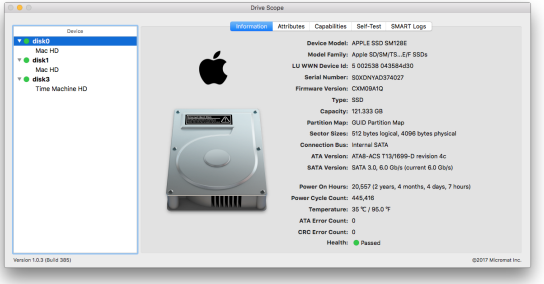
An uninstall application is included to remove the extra files created by running Drive Scope. To uninstall, simply double-click the uninstall application icon.

Using Drive Scope

The Drive Scope Interface

Drive Scope runs from an installation on your hard drive. To launch the program, double-click the Drive Scope icon. After the program has launched, you will see the main Drive Scope window.

Drive Scope



The window contains a table listing available SMART enabled drives, and a series of tabs which separate the functions available for each SMART enabled drive.

SATA Hard drives

Information

The information tab provides an overview of a drive's hardware information, capacity, and current overall SMART status. Each data point is gathered directly from the drive and displayed beside a graphic of the drive and the manufacturer logo. If the drive does not provide a particular piece of information a "-" is displayed. The data points provided include:

Device Model: Drive model number

Model Family: Designation of the group of drives the model belongs to (if available)

LU WWN Device Id: Logical Unit Worldwide Device identifier (if available)

Serial Number: The serial number of the drive

Firmware Version: Current firmware version installed on the drive

Type: Type of drive, such as SSD (solid state) or HDD (rotational) - may include form factor and/or rotational speed

Capacity: Total formatted drive size

Partition Map: Partition map scheme in use on the drive

Sector Sizes: Bytes used per sector by data - lists logical and physical values

Connection Bus: Bus used to connect the drive, i.e. Internal SATA

ATA Version: ATA version information provided by the drive

SATA Version: SATA version information provided by the drive

Power On Hours: Time that the drive has been powered on

Temperature: Current drive temperature

Power Cycle Count: The count power on/off cycles - from SMART attribute 12

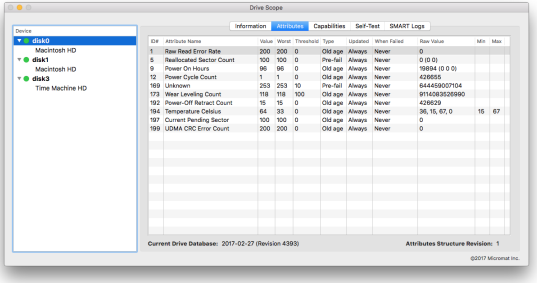
ATA Error Count: The count of all the errors the drive has encountered for the lifetime of the drive

CRC Error Count: The count of uncorrectable errors encountered when transferring data across the interface, i.e. the drive cables and connectors. Derived from SMART attribute 199 - see Glossary.

Health: Overall health of the device, as determined by SMART attributes. Possible values are Passed, Warning, and Failed. The warning state means that a SMART attribute classified as 'critical' is in a pre-fail state, and that the drive as a whole may soon enter a Failed state.

Attributes

The Attributes tab lists the attributes reported by the drive, along with the values reported for that attribute. Note that the attribute data is presented exactly as it is gathered from the drive, not interpreted by the software.



NOTE: The first 13 attribute ID numbers are standardized, and are consistent across the majority of drives (though not all of the first 13 attributes are

always implemented). Attributes with ID numbers higher than thirteen may be implemented differently amongst various manufacturers.

The table column descriptions are below; descriptions for the attributes themselves can be found in the glossary.

ID #: Identification number for the attribute

Attribute Name: Descriptive name of the SMART attribute

Value: Normalized value, used to compare with failure threshold (see below)

Worst: Lowest (or worst) value recorded for the attribute

Threshold: Point below which the value will trigger a SMART failure (on certain attributes)

Type: Attribute type is either Old Age or Pre-fail. Old Age attributes report when the drive has exceeded its designed life span, but may continue to operate, whereas Pre-fail attributes tend to be unrelated to drive age. When a pre-fail attribute reports failure, this typically means that total drive failure is imminent.

Updated: An Always value means that this attribute is checked continuously. An Offline value means that drive monitors this attribute when in an 'offline' mode, when reads or writes are not occurring.

When Failed: A Never value indicates that this attribute has never reported failure. *Failing Now* indicates that a failure is currently being reported. *In the past* indicates that the attribute had fallen below the threshold value in the past, but is now reporting an above-threshold value. *In the past* is most often used for temperature related attributes.

Raw Value: The actual value stored on the drive for a given attribute. Depending on the attribute, the

value may or may not be human-readable.

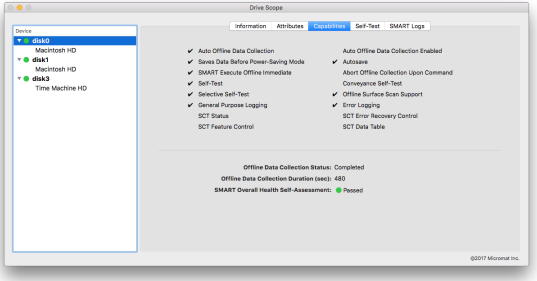
Min: If the attribute stores minimum and maximum values, the minimum is stored here.

Max: If the attribute stores minimum and maximum values, the maximum is stored here.

NOTE: Drive manufacturers may be inconsistent in their implementation of SMART attributes. The glossary contains the available details of each SMART attribute, but the actual implementation on a given drive may vary from the available documentation.

Capabilities

The Capabilities tab lists the capabilities of the selected drive. Available capabilities will have a check mark icon next to them, while those capabilities without a check mark are unavailable for that drive.



Offline Data Collection Status: SMART attribute data may be collected when the disk is idle or while the disk is in use. If the SMART data has ever been collected while the disk is idle, the Offline Data Collection Status will be listed as Completed. If SMART data has only been collected while the drive is ac-

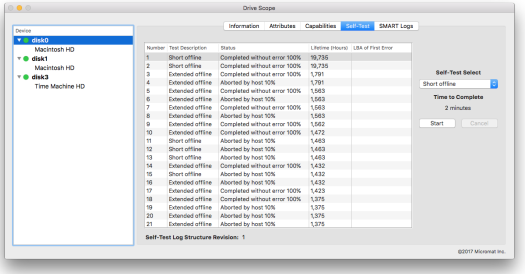
tive, the status will be Never Started.

Offline Data Collection Duration (sec): If SMART data has been gathered while the disk is idle, this is the time taken for disk to collect data.

SMART Overall Health Self-Assessment: Reports passed or failed. The Overall Health Self-Assessment is the overall SMART result reported by many utilities, such as Apple's Disk Utility.

Self Test

The Self Test tab lists the drive's stored test results and provides an interface for running the drive's internal test routines manually.



SMART enabled drives save the 21 most recent test results, and the Self Test tab lists those results in a table. The table fields are as follows:

Number: The order of the test in the list. The most recent are listed first.

Test Description: The name of the test that was run. Typically will be either Short offline or Extended offline.

Status: A description of the result of the test. The re-

sult includes the percentage success, and whether the test was aborted.

Lifetime (Hours): Records the number of hours of operation that have progressed when the test is run. The result can be inconsistent for solid state drives.

LBA of First Error: Lists the Logical Block Address (LBA) of the first error encountered during testing. If no errors are found, the field is left blank.

Self Test Select

The Self-Test tab also includes controls to manually initiate the SMART testing built into the drive. The drop down menu allows choosing between the Short and Extended offline tests. Clicking Start will begin the chosen test. During testing, the Cancel button will be available to stop the test, and the current progress will be shown. At the conclusion of the test, the result will be added to the test results table described above.

NOTE: If the self-test encounters an error during testing, the drive will cease testing and the error will be logged to the self-test status column.

NOTE: Drive Scope can only initiate self-testing, which is internal to the drive. Any failures are handled by the drive's internal testing mechanism.

Short Offline:

This self-test usually takes about two minutes to complete. Its purpose is to confirm the read performance of the drive and to quickly identify any possible drive issues. For rotational drives, it confirms the electrical and mechanical performance. Electrical checks may include tests of the read/write circuitry, a test of the read/write heads, and a check of buffer RAM. Mechanical checks include seeking and servo on data tracks as well as scanning small parts of the drive's surface (area is vendor-specific

and there is a time limit on the test). Lastly, it checks the list of pending blocks (or sectors) that may have read errors.

Extended offline:

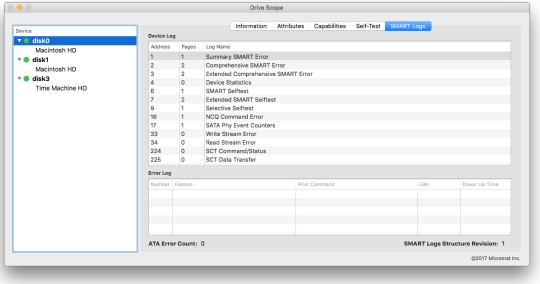
Sometimes referred to as the Long offline self-test, this self-test is a much more comprehensive and thorough version of the Short self-test. Unlike the Short self-test which only takes about two minutes to complete, the Extended offline test usually will take several hours, depending on the read/write speed of the drive and its size. The Extended offline self-test can also confirm the result of the Short self-test since the time constraint may not adequately supply sufficient testing time to identify a potential drive issue.

NOTE: Running a self-test is completely safe and will not cause damage to the selected drive or any of its data. Self-tests can be performed during normal operation. However, running a self-test may reduce performance of the drive while testing is in progress. Self-tests will take longer to complete if the drive is busy.

SMART Logs

The SMART Logs tab contains two tables. The first lists the device logs, the second error logs. The logs are utilized by the SMART system as implemented by the drive manufacturer, and are not human readable, but their titles can be used to gain insight into the SMART activity on the drive.

NOTE: Some drive manufacturers may not enable SMART logging, so one or both tables may be blank.



Device Logs

There are three device log columns: Address, Pages and Log Name. The name describes the data in the associated log. Each log name has an associated numeric value that is the log address. The log address is used by the drive to access a specific log. Each log is composed of one or more "pages." Each page consists of data stored by the drive for that particular log. Some logs can have multiple pages, while others will have no more than one page. The logs themselves are used internally by the device and are not human-readable.

Error Logs

The Error Log table will only contain data if errors have been found. The error log will store the five most recent errors, if any errors are present. The error log has the following columns.

Number: Number (1-5) of the most recent error

Feature: Lists the type of error

Prior Command: The command issued prior to the error being detected

LBA: Logical Block Address of the error

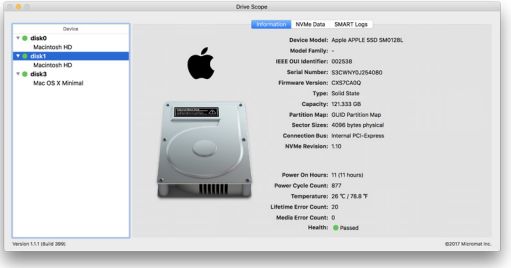
Power Up Time: The number of hours the drive has been in use at the time the error is detected

NVMe Drives

The solid state drives (SSDs) found in MacBooks released in 2015 and later as well as MacBook Pros and iMacs released in 2016 and later, utilize a new connection type: NVMe (Nonvolatile Memory Express). NVMe drives do not utilize the SMART paradigm utilized in drives that use SATA connections. They do still track their health internally, but present that data differently. Drive Scope presents this data using a different set of tabs.

Information

The information tab provides an overview of a drive's hardware information, capacity, and current overall health status. Each data point is gathered directly from the drive and displayed beside a graphic of the drive and the manufacturer logo. If the drive does not provide a particular piece of information a "-" is displayed.



The data points provided include:

Device Model: Drive model number

Model Family: Designation of the group of drives the model belongs to (if available)

IEEE OUI Identifier: Organizationally Unique Identifier. A 24-bit number that uniquely identifies a vendor or manufacturer of the device

Serial Number: The serial number of the drive

Firmware Version: Current firmware version installed on the drive

Type: Type of drive, such as Solid State (SSD) - may include form factor

Capacity: Total formatted drive size

Partition Map: Partition map scheme in use on the drive

Sector Sizes: Bytes used per sector by data - lists logical and physical values

Connection Bus: Bus used to connect the drive, i.e. Internal PCI-Express

NVMe Revision: NVMe version

Power On Hours: Time that the drive has been powered on

Power Cycle Count: The count power on/off cycles - from SMART attribute 12

Temperature: Current drive temperature

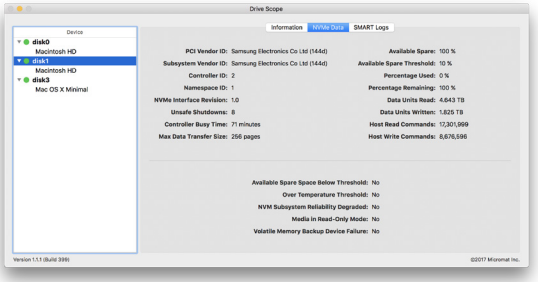
Lifetime Error Count: The count of all the errors the drive has encountered for the lifetime of the drive

Media Error Count: The count of unrecoverable data integrity errors detected by the controller

Health: Overall health of the device. Possible values are Passed, Warning, and Failed. The warning state means that an attribute has failed which indicates that drive may fail soon, while the failed state indicates that the drive needs to be replaced immediately.

NVMe Data

The NVMe Data tab is the equivalent of the Attributes tab for a SMART enabled SATA device. The NVMe Data tab includes the SMART data tracked by the drive, along with flags that can trigger a warning or a failure.



PCI Vendor ID: Vendor ID as defined by the PCI-SIG standards consortium

Subsystem Vendor ID: Vendor ID for the device subsystem as defined by the PCI-SIG standards consortium

Controller ID: Identification number of the connection bus used by the device

Namespace ID: Identifier used by a controller to provide access to a namespace

NVMe Interface Revision: Version of NVMe utilized by the device

Unsafe Shutdowns: Count of instances when a shutdown notification is not received prior to power loss

Controller Busy Time: The amount of time that the controller is busy with I/O commands

Max Data Transfer Size: The maximum size of data that can be transferred between host and controller

Available Spare: Normalized (percentage) of the remaining spare capacity available

Available Spare Threshold: If the Available Spare capacity drops below this threshold, a warning will be triggered, and the Available Spare Space Below Threshold flag will indicate Yes

Percentage Used: Normalized estimate of the percentage of device life used based on device usage and the manufacturer's prediction of device life

Percentage Remaining: Inverse of Percentage Used

Data Units Read: The number of blocks (in 512 byte units) the host has read from the controller - not including metadata

Data Units Written: The number of blocks (in 512 byte units) the host has written to the controller - not including metadata

Host Read Commands: The number of read commands completed by the controller - this includes compare commands

Host Write Commands: The number of write commands completed by the controller

Available Spare Space Below Threshold: This flag is set to yes if the Available Spare attribute falls below the Available Spare Threshold. This indicates that the drive is failing, and the overall health will be set to "failing."

Over Temperature Threshold: This flag is set to yes if the drive's temperature exceeds the maximum set by the vendor. This indicates that the drive could be damaged and will set the overall health to "warning."

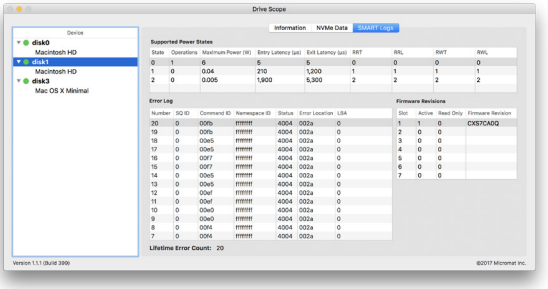
NVM Subsystem Reliability Degraded: This flag is set to yes when the device reliability has been compromised. This may be due to significant media errors, an internal error, the media being placed in read only mode, or a volatile memory backup device failing. Overall health will be set to "failing."

Media in Read-Only Mode: This flag is set to yes when the device can no longer be written to. This will set the overall drive health to "failing."

Volatile Memory Backup Device Failure: This flag is set to yes if the volatile memory backup device has failed. However, not all NVMe devices utilize a volatile memory backup device. Overall health will be set to "warning."

SMART Logs

NVMe drives log a number of events, and these are presented in the SMART Logs tab. Much of the data in this tab will likely become more 'human readable' in the future, both as NVMe evolves, and as more of the data is documented by manufacturers.



Supported Power States: This table displays the power levels supported by the drive. It will typically show an active power state along with lower power states for the various "resting" power levels.

Firmware Revisions: This table displays firmware available to the drive, there may be just one firmware revision, or as many as seven, depending on the manufacturer.

Error Log: This table displays log of the errors that the drive has encountered. At the time of publication, this table is primarily useful to count the number of errors. More readable data will hopefully become available in future versions.

Menus and Preferences

Drive Scope uses many of the standard menu items. Additional menu items and items that differ from their normal usage are listed below.

Drive Scope Menu

The Drive Scope menu includes several menu items to access additional functionality within the program. Choosing Check for Updates... causes Drive Scope to check for a newer version. If one is found, Drive Scope offers to download the update.

The Install SAT SMART Driver... menu item allows installation of a third-party driver to allow reading SMART data from USB and FireWire connected hard drives. (See FAQ for more information.)

The Preferences... menu item opens a preferences pane that provides the option to customize which attributes trigger a critical failure for a connected drive.

The Start Monitoring menu item will install the Drive Scope Agent, which is responsible for Background Monitoring. This menu item will change to "Stop Monitoring" when Background Monitoring is enabled, and will then uninstall the Drive Scope Agent. See below for more information about Background Monitoring.

File Menu

The File Menu includes a Save as PDF... menu item to save the SMART data of the selected disk to a PDF. The PDF will consist of one page for each tab of the Drive Scope interface.

View Menu

The view menu has five options, one for each tab. In addition to choosing tabs directly, changing tabs can also be accomplished from this menu.

Drives Menu

The Drives Menu has two menu items, Rescan Drives and Update SMART Info. The Rescan Drives menu item causes Drive Scope to scan for SMART enabled drives.

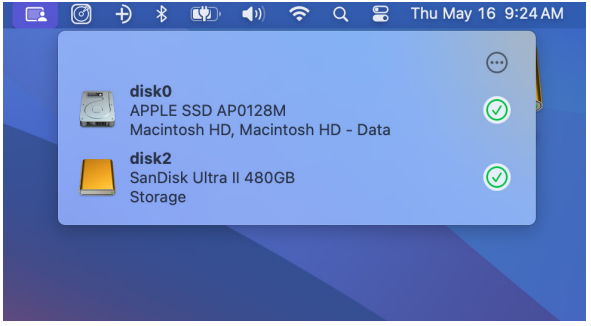
Update SMART Info reloads the SMART data for the selected drive.

Background Monitoring

When the Drive Scope Agent is installed, it will monitor supported drives for changes in their SMART status. If a drive begins to show signs of failure, it will post a notification in your Mac's notification center. Clicking the notification will open the main Drive Scope application to provide additional information.

Drive Scope Agent Menu

When monitoring is enabled, a new icon will be available in your Mac's menu bar to provide quick access to overall drive health.



Drives with normal SMART health will display a

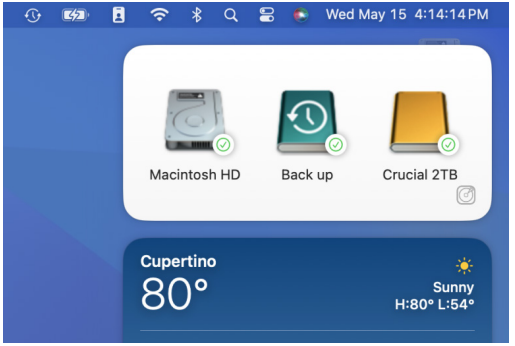
check mark. Drives which indicate a warning will display a warning triangle with an exclamation mark, and drives that are failing will display a red 'x' icon. If SMART health data is unavailable, a gray circle will be displayed.

The 'three dot' menu includes options to Open Drive Scope, Rescan Drives, and to Contact Support.

Drive Scope Widget

When the Drive Scope Agent is installed, a macOS widget will also be available to install, providing glanceable access to current drive health. Supported drives are displayed, each with a corresponding health icon.

Like the Drive Scope Agent menu item, Drives with normal SMART health will display a check mark. Drives which indicate a warning will display a warning triangle with an exclamation mark, and drives that are failing will display a red 'x' icon. If SMART health data is unavailable, a gray circle will be displayed.



To add a Drive Scope Agent widget, click on the date and time in your Mac's menu bar, and scroll through the notification center until you see the

Edit Widgets button. After clicking Edit Widgets, you should see Drive Scope Agent in the list of applications with widgets. You can then select a widget bysize, and place it in your Notification Center. Macs running macOS 14 'Sonoma' can also place widgets on the desktop.

The smallest widget will display your startup drive. The medium and large widgets can display up to three or nine devices, respectively. The widget will display the device's icon, volume name, and health status for each displayed drive. For drives with more than one volume, the first volume name is displayed.

SMART Attribute Glossary

Raw Value

Raw data reported by a SMART attribute. The raw value may not be human readable. For example, the "Reallocated Sector Count" typically reports the actual number of reallocated sectors. Other attributes report values that can only be parsed by the device.

Type

The type of a SMART attribute. Either Pre-Fail for attributes are said to indicator impending failure, or "Old Age/Advisory" for attributes that just indicate wear and tear. Note that one and the same attribute can be classified as "Pre-Fail" by one manufacturer or for one model and as "Old Age/Advisory" by another manufacturer or for another model.

Updated

Indicates whether a particular SMART attribute is updated all the time (Always) or only updated when the device temporarily slows down disk read/write activity (Offline).

State

The condition of a particular attribute at a given time.

Threshold

Value below which a SMART attribute can trigger a failure. Once the value is reached the attribute "Fails".

NOTE: Not all SMART attributes are Pre-Fail attributes. The threshold below which the normalized value will be considered "exceeding specifications". If the SMART attribute type is Pre-Fail, this indicates that SMART thinks the disk is approaching failure. Exceeding the threshold value on a Pre-Fail attribute will trigger "SMART impending failure" or similar status.

Value

The current normalized value for the attribute.

Worst

The worst normalized value ever detected. 1 generally is worst, 253 best.

S.M.A.R.T Attributes

Attribute 1 - Raw Read Error Rate

Lower Raw Value is better

Reports the rate of hardware read errors that occur when reading data from a disk surface. The raw value has a different structure for different vendors and is often not meaningful as a decimal number. If this SMART attribute reports a failure, it could be an indication of a problem with the the disk surface or with the read/write heads of the hard drive.

Attribute 2 - Throughput Performance

General throughput performance of a hard drive. If a failure is reported for this SMART attribute, this would indicate a problem with the hard drive motor, servo or bearings. If the raw value of this SMART attribute is decreasing there is a high probability that there is a problem with the hard drive.

Attribute 3 - Spin-Up Time

Lower Raw Value is better

Reports the time required (in seconds or milliseconds) for the spindle of a rotational hard drive to spin up to operational speed. Typically, spin up occurs during while the computer is starting up.

Most modern computers feature the ability to spin down the drive while running in energy saving or noise reduction mode. A decline of this attribute can indicate that the drive may not be getting adequate power (which is somewhat common in en-

closures and portable computers) and/or symptom of an aging drive with electromechanical issues.

This SMART attribute is not used for solid state devices since they have no moving parts.

Attribute 4 - Start Stop Count

Count of hard drive spindle start/stop cycles. Every drive has its own limited number of these cycles depending on the manufacturer. Degradation of this SMART attribute can be an indicator of hard drive aging and/or possible electromechanical issues.

Attribute 5 - Reallocated/Retired Block Count

Critical Attribute

Reallocated Sector Count is the total number of reallocated (or retired) blocks since manufacturing. This SMART attribute is also known as the grown defect count.

The raw value of this SMART health indicator represents the number of blocks that have been moved as a result of a read error, write error, or a verification error. If the firmware of the device detects any of these types of errors, all valid data on the block the data originates from must be transferred to a new, unoccupied block. The normalized equation for this health indicator decrements as blocks are reallocated (or retired) and the reserve (over-provisioned) block count is decremented.

Even though this health indicator is not as critical for Solid State Drives (SSD) as for Hard Disk Drives (HDD), an increase in the count of reallocated (or retired) blocks reduces available reserved space and SSD lifetime. Moreover, this number should be low because a high number would indicate a large number of failures for this SMART attribute. A large number of reallocated (or retired) blocks is a sign of serious internal defects and problems with an SSD. If the number remains the same and is not large, then concern is not warranted. However, if the

number is increasing over time, this could indicate problems with the drive, and the drive manufacturer should be contacted.

Attribute 6 - Read Channel Margin

Margin of a channel while reading data. At the time of publication, additional technical information regarding this attribute is not available, and this attribute is not typically used.

Attribute 7 - Seek Error Rate

Reports the frequency of seek errors during disk head positioning. Failures of this attribute can be caused by many conditions, including thermal widening of the drive or damage to the drive's servo.

Attribute 8 - Seek Time Performance

Higher Raw Value is better

Average performance of seek operations by the magnetic heads. If this attribute is decreasing, it is a sign of problems in the mechanical subsystem or servo.

Attribute 9 - Power-On Hours (POH)

Reports the number of hours that device has been powered on. The normalized value decreases over time, starting at 100 and decreasing to 0. The raw value of this attribute shows the actual powered-on time, typically in hours.

Attribute 10 - Spin Retry Count

Lower Raw Value is better - Critical Attribute

The count of retries of spin start attempts. If the drive cannot start its spindle on the first attempt, it will make another attempt and continue to retry until the spindle rotates normally. An increase of the raw value of this SMART attribute could be a sign of problems in the drive mechanical subsystem.

Attribute 11 - Recalibration Retries/Calibration Retry Count

Lower Raw Value is better

This SMART attribute indicates the count of the number of times recalibration was requested by the drive (under the condition that the first attempt was unsuccessful). An increase of this SMART attribute raw value is a sign of problems in the hard disk mechanical subsystem such as the hard drive motor, bearings or power supply.

Attribute 12 - Device Power Cycle Count

This attribute indicates the count of full hard disk power on/off cycles. The raw value of this attribute indicates both sudden power off and normal power off cycles and does not directly affect the condition of the hard drive.

Attribute 13 - Soft Read Error Rate

Lower Raw Value is better

This SMART attribute reports the number of software read errors and uncorrected read errors reported to the operating system.

Attribute 16 - Total LBAs Read

Found only on select Western Digital (WDC) hard drive models. Indicates the total amount of LBAs (Logical Block Address) read since the drive was deployed. This attribute is stored in 4-byte chunks. The raw value represents the number of bytes read by the host to the drive, in 64 GB increments.

Attribute 22 - Current Helium Level

Specific to He series of hard drives from Hitachi (HGST). This value measures the helium inside of the drive specific to this manufacturer. It is a pre-fail attribute that trips once the drive detects that the internal environment is out of specification.

Attribute 32 - Write Amplification

Write amplification (WA) is a phenomenon specific to solid state drives that occurs when the actual amount data physically written to disk is more than the amount of logical data that is written by the host computer. WA is an indicator of accelerated wear as a function of workload.

Attribute 99 - Average Flying Height Control

This is typically a Maxtor hard drive SMART attribute. This SMART attribute can be an indicator of drive aging and/or a potential electromechanical problem.

Attribute 100 - Program/Erase Cycles

This attribute counts the number of flash program and erase cycles across the entire drive over the life of the drive.

Attribute 101 - Maximum Flying Height Control

Typically a Maxtor SMART attribute. This attribute can be an indicator of drive aging and/or potential electromechanical problem.

Attribute 103 - Translation Table Rebuild

Typically a Maxtor hard drive attribute. Nothing much is known about the purpose of this attribute.

Attribute 108 - Unknown/Reserved

Attribute 148 - Total SLC Erase Count

This attribute is the total count of flash erase events.

Attribute 149 - Maximum SLC Erase Count

This attribute is the maximum number of flash erase counts.

Attribute 150 - Minimum SLC Erase Count

This attribute is the minimum number of flash erase counts.

Attribute 151 - Average SLC Erase Count

This attribute is the average number of flash erase counts.

Attribute 160 - Uncorrectable Error Count (Read/ Write)

This attribute is the total number of uncorrectable errors registered on the device.

Attribute 161 - Valid Spare Block Count

Contains the remaining spare block percentage available on a solid state device. The percentage starts at 100% and will typically decrease to 0% during use. If this attribute reaches 0%, the solid state device becomes read-only. The raw value of this attribute may contain the actual number of spare blocks.

Attribute 162 - Unknown/Reserved

Attribute 163 - Initial Bad Block Count

This attribute is the initial bad block count of the device when leaving the factory.

Attribute 164 - Total Erase Count

This attribute is the total number of erase counts for the device. When the flash memory is worn out, it can no longer be written to and becomes read-only.

Attribute 165 - Total Write/Erase Count

This attribute is the total (or maximum) amount of flash erase counts.

Attribute 166 - Minimum Erase Count

This attribute is the minimum number of erase counts for the device. When the flash memory is

worn out, it can no longer be written to and becomes read-only.

Attribute 167 - Average Erase Count

This attribute is the average number of erase counts for the device. When the flash memory is worn out, it can no longer be written to and becomes read-only.

Attribute 168 - Maximum Erase Count by Spec

This attribute is the maximum number of program-erase counts by specification.

Attribute 169 - Remaining Lifetime Percentage

This attribute measures the approximate life left from a combination of program-erase cycles and available reserve blocks of the device.

Attribute 170 - Reserved Block Count/Available Reserved Space

The number of reserved spares for bad block handling. On an SSD, this attribute describes the state of the reserve block pool. The value of the attribute shows the percentage of the pool remaining. The raw value sometimes contains the actual number of used reserve blocks.

Attribute 171 - SSD Program Fail Count

Counts the number of flash program failures. When the flash memory is worn out, it cannot be written to any longer and becomes read-only. The raw value for this is the actual number of failures. A significant rise of this raw value number could indicate that SSD is worn out or flash chips are dying prematurely (before reaching their rated number of erase/write cycles).

Attribute 172 - SSD Erase Fail Count

Typically found on Kingston devices, this attribute counts the number of flash erase failures since the SSD was deployed. When the flash memory is worn out, it cannot be written to any longer and becomes read-only. The raw value for this actual number of failures. A significant rise of this raw value number could indicate that SSD is worn out or flash chips are dying prematurely (before reaching their rated number of erase/write cycles).

Attribute 173 - Percent Drive Life Used/SSD Wear Leveling Count

Counts the maximum worst erase count on any block. The percent drive life used is based on the percentage of over-provisioned erase blocks that are defective. This is the complement to attribute 177.

Sometimes referred to as "worst case SSD erase count," this attribute indicates the amount of exhausted program-erase cycles. The maximum number erase operations performed on a single flash memory block. This SMART health indicator could decrease between 92 to 96 percent during the first week of drive lifetime, and then remain the same for a long period of time.

A solid state device program-erase cycle is a sequence of events in which data is written to solid-state NAND flash memory cell, erased, and then rewritten. Program-erase cycles can serve as a criterion for quantifying the endurance of a flash storage device. Flash memory devices are capable of a limited number of program-erase cycles because each cycle causes a small amount of physical damage to the medium. The damage accumulates over time, eventually rendering the device unusable.

Wear leveling is a technique that spreads flash block use over the entire memory array to equalize the program-erase cycles on all blocks in the array. This in turn helps to enhance the lifespan of the SSD.

Attribute 174 - Unexpected Power Loss Count

Also known as "Power-off Retract Count" this attribute counts the number of unexpected power loss events since the drive was deployed. Some solid state drive models are very sensitive to unexpected power loss with the potential of data loss or significant file corruption under power faults. It is recommended to have a battery backup on all critical servers and desktop computers to mitigate these type of errors.

Attribute 175 - Power Loss Protection Failure

The total number of times over the lifetime of the drive in which the drive has lost data intended to be written during a power down.

Attribute 176 - Erase Fail Count (Chip)

The number of times an erase operation on a flash memory has failed. The complete write cycle of a flash memory consists of two stages. The memory has to be erased first, and then the data has to be written into flash memory. When the flash memory is worn out, it cannot be written to any longer and becomes read-only. The raw value shows the actual number of failures.

Attribute 177 - Wear Range Delta

Returns the percent difference (delta) in wear between the most-worn block and least-worn block. It describes how effective the wear leveling of the SSD is.

Attribute 178 - Unknown/Reserved

Information for this attribute is unavailable at the time of publication.

Attribute 179 - Used Reserved Block Count Total

A Pre-Fail SMART attribute typically found on Samsung devices. On an SSD, this attribute describes the state of the reserve block pool. The value of the attribute shows the percentage of the pool remaining. The raw value sometimes contains the actual number of used reserve blocks.

Attribute 180 - Unused Reserved Block Count Total

A Pre-Fail attribute typically found on HP devices. On SSD, this attribute describes the state of the reserve block pool. The value of the attribute shows the percentage of the pool remaining. The raw value sometimes contains the actual number of unused reserve blocks.

Attribute 181 - Program Fail Count/Non-4K Aligned Access Count

Lower Raw Value is better

The total number of flash program operation (write attempt) failures since the drive was deployed. Four bytes used to show the program (write) failures since the drive was deployed (identical to SMART attribute 171).

Attribute 182 - Erase Fail Count

A Pre-Fail attribute typically found on Samsung devices. Four bytes used to show the number of block erase failures since the drive was deployed (identical to SMART attribute 172).

Attribute 183 - SATA Downshift Count/Runtime Bad Block

Lower Raw Value is better

Indicates how often the drive has needed to decrease the SATA transmission speed (from 6 Gbps to

3 or 1.5 Gbps, or from 3 Gbps to 1.5 Gbps) in order to transfer data successfully. The value is compared to the previously recorded value and if the new value is lower then the previous, a downshift has occurred and the downshift count is incremented. If the attribute value is decreasing, try replacing the SATA cable.

Attribute 184 - Reported I/O Error Detection Code Rate/End-to-End Error

Lower Raw Value is better - Critical Attribute

This SMART attribute tracks the number of end-to-end CRC (Cyclic Redundancy Check) errors encountered during host initiated reads and writes. These errors occur when the disk cache malfunctions.

Attribute 185 - Head Stability

A Pre-Fail SMART attribute typically found on Western Digital devices. Further technical information is not available at the time of publication.

Attribute 186 - Induced Op-Vibration Detection

A Pre-Fail attribute typically found on Western Digital devices. No other technical information is available at the time of publication.

Attribute 187 - Reported Uncorrectable Errors

Lower Raw Value is better - Critical Attribute

This attribute tracks the number of uncorrectable read errors that could not be recovered during hardware ECC (Error Correcting Code) and is reported back to the host for all data access commands. If the raw value for this SMART attribute continues to grow, there is a very high probability of impending drive failure.

WARNING: If this attribute is elevated, backup the data immediately and consider replacing the device as soon as possible.

Attribute 188 - Command Timeout

Lower Raw Value is better - Critical Attribute

The number of aborted operations due to drive timeout (drive was unable to read or write properly in a reasonable time period). If the raw value for this attribute is far above zero, it becomes more likely that there is an issue with either the power supply or possibly oxidation of the data cable.

WARNING: If the raw value for this attribute is elevated, backup the data on this hard drive immediately and consider replacing the device as soon as possible.

Attribute 189 - High Fly Writes

Lower Raw Value is better

Count of errors detected while the drive head is flying outside its normal operating range over the lifetime of the drive. This attribute is implemented in most modern Seagate drives and some drives manufactured by Western Digital.

Attribute 190 - Drive Temperature Warning/Airflow Temperature

Internal airflow temperature inside the hard drive housing. Allows manufacturer to set a minimum threshold which corresponds to a maximum temperature. If the current temperature exceeds the threshold value, the drive throttles performance.

Attribute 191 - G-Sense Error Rate

Lower Raw Value is better

The number of errors caused by externally-induced mechanical shock and vibration. Acceleration (i.e. falling) can cause mechanical shock.

Attribute 192 - Unsafe Shutdown Count/Power-off Retract Count/Emergency Retract Cycle

Lower Raw Value is better

The raw value of this SMART attribute reports the cumulative number of unsafe shutdown events over the life of the device. An unsafe shutdown occurs whenever the device is powered off without standby immediate being the last command. Some solid state devices are very sensitive to unexpected power loss. SSDs could lose some amount of data or become significantly corrupted due to power faults. It is recommended to have a battery backup on all critical servers and desktop computers to mitigate these types of errors.

Attribute 193 - Load/Unload Cycle Count

Lower Raw Value is better

The number of load/unload cycles from data to drive head landing zone position. Some laptop drives and "green power" desktop drives are programmed to unload the heads whenever there has not been any activity for a short period, to save power.

The value counts down, usually from 100 to 0. The raw value often reports the actual number of cycles.

Attribute 194 - Temperature (Celsius)

Lower Raw Value is better

The current internal temperature of the drive.

Attribute 195 - Hardware ECC Recovered/ECC On the Fly Count

This attribute tracks the number of uncorrectable errors (UECC). The raw value has different structure for different vendors and is often not meaningful as a decimal number.

Attribute 196 - Reallocation Event Count

Lower Raw Value is better - Critical Attribute

This attribute shows the total count of attempts

to transfer data from reallocated sectors to a spare area. Both successful and unsuccessful attempts are counted, as well as offline and mid-write reallocation events.

Attribute 197 - Current Pending Sectors Count

Lower Raw Value is better - Critical Attribute

This attribute is the current count of unstable blocks waiting to be remapped. If a sector marked for remapping is subsequently written or read successfully, this value is decreased and the sector is not remapped to the reserve sector table. Remapping will only occur on a failed write attempt and if a spare sector is available, while failed reads do not cause remapping. After remapping a sector, the raw value will be decreased and reallocated sector count will be increased. See SMART attribute 5 increases in reallocated sectors.

WARNING: If a failure is reported for this attribute, backup the data immediately and consider replacing the device as soon as possible.

Attribute 198 - Uncorrectable Sector Count/Offline Uncorrectable

Lower Raw Value is better - Critical Attribute

The total number of uncorrectable RAISE (URAISE) errors when reading/writing a sector (The number of bad blocks/sectors which were detected during offline scan of a disk). A rise in the raw value of this SMART attribute indicates defects. When idling, a modern disk starts to test itself, the process known as offline scan, in order to detect possible defects in rarely used surface areas.

WARNING: If this attribute rises, backup the data immediately and consider replacing the device as soon as possible.

Attribute 199 - SATA R-Errors (CRC) Error Count/ UDMA CRC Error Count

Lower Raw Value is better

This Error Count attribute indicates the number of sectors that encountered a CRC error (Cyclic Redundancy Check) while in UDMA mode. It is the total count of errors in data transfer via the interface cable. Each time the error is detected, controller requests a retransmission, this slowing down the overall transfer speed. Increase of the raw value for this SMART attribute indicate problems with the power supply or the data cable.

The UDMA controller performs error checking on data it receives from the drive, ensuring that data was not damaged while transmitted over the cable. Each time the error is detected, the controller requests a retransmission, thus slowing down the overall transfer speed. Lower values of "Ultra ATA/ DMA CRC Error Rate" correspond to higher number of errors, usually indicating a cabling problem.

The raw value contains a count of errors occurred in UDMA transfer data mode.

WARNING: If the drive is reporting this error, consider replacing the cable.

Attribute 200 - Multi-Zone Error Rate/Write Error Rate

Lower Raw Value is better

This attribute reports the number of errors encountered while writing raw data from a sector. The higher the raw value, the worse the mechanical condition is of the device.

Attribute 201 - Uncorrectable Soft Read Error Rate

Lower Raw Value is better - Critical Attribute

The meaning of this attribute is uncertain. Some documentation reports this attribute to represent the number of soft read off-track errors that cannot be fixed on-the-fly. Others report it as the number

of errors that have been fixed.

Attribute 202 - Data Address Mark Errors/TA Counter Increased

Lower Raw Value is better

Count of Data Address Mark errors, or number of errors encountered when the drive head is searching for the requested sector.

Attribute 203 - Run Out Cancel

Lower Raw Value is better

The number of errors caused by an incorrect checksum during error correction. Drives can self-correct certain errors using Error Correcting Code (ECC). This attribute reports errors when this process fails.

Attribute 204 - Soft ECC Correction Rate

Lower Raw Value is better

The number of corrected data errors by the internal error correcting code (ECC).

Attribute 205 - Thermal Asperity Rate (TAR)

Lower Raw Value is better

The total number of thermal errors caused by high temperature.

Attribute 206 - Flying Height

The height of heads above the disk surface. If too low, head crash is more likely; if too high, read/write errors are more likely.

Attribute 207 - Spin High Current

Lower Raw Value is better

The electrical current required to spin up the hard drive. Used only in rotational drives.

Attribute 208 - Spin Buzz

The number of cycles and retries during spin up because of low current available.

Attribute 209 - Offline Seek Performance

This SMART attribute is the seek performance of the drive during its internal self tests.

Attribute 210 - Vibration During Write

Is a SMART attribute typically found on Maxtor 6B200M0 200GB and Maxtor 2R015H1 15GB disks. Presumably this attribute is the same as attribute 211, but unconfirmed.

Attribute 211 - Vibration During Write

A recording of a vibration encountered during write operations.

Attribute 212 - Shock During Write

A recording of shock encountered during write operations.

Attribute 213 - Ground Seek Error/RRO-C ERP Count

Found only on Hitachi Deskstar P7K500. No other technical information is available at time of publication.

Attribute 214 - Ground Load Errors Count

Found only on Hitachi Deskstar P7K500. No other technical information is available at time of publication.

Attribute 215 - Ground SpinUp Errors

Found only on Hitachi Deskstar P7K500. No other technical information is available at time of publication.

Attribute 216 - Unexpectant Errors Count

Found only on Hitachi Deskstar P7K500. No other

technical information is available at time of publication.

Attribute 217 - Unlock/Mis-read Count

Found only on Hitachi Deskstar P7K500. No other technical information is available at time of publication.

Attribute 218 - FlashROM ECC Correction Count

Found only on Hitachi Deskstar P7K500. No other technical information is available at time of publication.

Attribute 219 - Unknown/Reserved

Attribute 220 - Disk Shift - Lower Raw Value is better

This SMART attribute is the distance the disk has shifted relative to the spindle. Incorrect disk spin can be caused by mechanical shock or high temperature. Unit of measure is unknown.

Attribute 221 - G-Send Error Rate/Shock Sense Error Rate

Lower Raw Value is better

This SMART attribute is the count of errors resulting from externally induced shock or vibration. This attribute is typically is used in laptop hard drives. If present in desktop drives, the attribute may be listed but never change, because the vibration detection circuitry is not present.

Attribute 222 - Loaded Hours

Time a disk head spent in the data zone of the disk, rather than parked or on a head ramp. The value usually counts down from 100 to 0. The raw value often holds the actual number of hours.

Attribute 223 - Load/Unload Retry Count

The number of times the drive head enters/leaves the data zone.

Attribute 224 - Load Friction

Lower Raw Value is better

This SMART attribute is the rate of friction between mechanical parts. A failure is an indication of problems with the mechanical subsystem of the drive.

Attribute 225 - Load/Unload Cycle Count

Lower Raw Value is better

Total count of movement cycles between data zone and head parking area. The value counts down from 100 to 0, and the raw value is typically the actual count of cycles.

Some drives use SMART attribute 193 for Load Cycle Count instead.

Attribute 226 - Load-in Time

Total time of loading on the magnetic heads actuator (time spent in the data zone) and does not include time spent in parking area. The value usually counts down from 100 to 0. The raw value often holds the actual number of hours.

Attribute 227 - Torque Amplification Count

Lower Raw Value is better

Indicates the number of attempts to compensate for platter speed variations by increasing current applied to achieve the correct rotational speed.

Attribute 228 - Power-Off Retract Cycle

Lower Raw Value is better

The number of power-off cycles which are counted whenever there is a "retract event" and the heads are loaded off of the media such as when the machine is powered down, put to sleep, or is idle.

Attribute 229 - Unknown/Reserved

Attribute 230 - Life Curve Status/GMR Head Amplitude

Critical Attribute

On an SSD, the life curve used to help predict life in terms of the endurance based on the number of writes to flash. When the flash memory is worn out, it cannot be written to any longer and becomes read-only.

A solid state device program-erase cycle is a sequence of events in which data is written to solid-state NAND flash memory cell, then erased, then rewritten. Program-erase cycles can serve as a criterion for quantifying the endurance of a flash storage device. Flash memory devices are capable of a limited number of program-erase cycles because each cycle causes a small amount of physical damage to the medium. The damage accumulates over time, eventually rendering the device unusable.

On a rotational drive, this attribute represents the amplitude of drive head "thrashing" (repetitive head moving motions) between operations.

Attribute 231 - SSD Life Left/Hard Disk Temperature

On an SSD, this attribute indicates the approximate percentage of useful life left, in terms of program/erase cycles or flash blocks currently available for use.

For a rotational drive, this attribute is occasionally used to report drive internal temperature of the hard drive housing (usually found at attribute 194).

Attribute 232 - Available Reserved Space

The number of reserved blocks remaining. Also, the number of physical erase cycles completed on the drive as a percentage of the maximum physical erase cycles the drive is designed to endure.

All solid state devices reserve some amount of

space for extra write operations, as well as for the controller firmware, failed block replacements, garbage collection, wear-leveling, and other unique features that vary between solid state device manufacturers.

Counts down from 100 to 0, though the raw value is vendor specific.

Attribute 233 - Power-On Hours/Media Wearout Indicator

Number of hours elapsed in the power-on state. This attribute is also a Pre-fail which reports a normalized value of 100 (when the SSD is new) and declines to a minimum value of 1.

Attribute 234 - Percentage Total Program-Erase Count/Maximum Erase Count

Typically an SSD attribute, this attribute can either represent a total count of sectors programmed (written to) or a count of erased sectors.

If used as an erase count, it can be decoded as: byte 0-1-2 = average erase count (big endian) and byte 3-4-5 = max erase count (big endian).

Attribute 235 - Power Fail Backup Health/POR Recovery Count/Good Block Count

In Kingston SSDs, Power Fail Backup Health (if implemented) is an estimation of capacitive hold-up capability based on a timed discharge test, wherein discharge (past a pre-defined voltage threshold) faster than a predefined time-value threshold indicates a capacitor bank whose capacitance value is degraded past the point of reliability to protect SSD data. If an SSD has never run a "Supercapacitor Test", the normalized value of this Attribute remains at 100.

On Samsung SSDs, it is a count of the number of sudden power off cases. If there is a sudden power off, the firmware must recover all of the mapping and user data during the next power on. This is a

count of the number of times this has happened.

Otherwise, this attribute can be the count of good blocks on the device.

Attribute 236 - Unknown/Reserved

Attribute 237 - Unknown/Reserved

Attribute 238 - Unknown/Reserved

Attribute 239 - Unknown/Reserved

Attribute 240 - Head Flying Hours

The time spent during the positioning of the drive heads. For certain Fujitsu drives, it is the number of times the link is reset during a data transfer.

Attribute 241 - Lifetime Written by Host/Total LBAs Written

Indicates the total amount of LBAs (Logical Block Address) written since the drive was deployed. This is stored in 4 bytes. The raw value represents the number of bytes written by the host to the drive.

To calculate the total size for Samsung SSDs (in Bytes), multiply the raw value of this attribute by 512B.

Attribute 242 - Lifetime Reads by Host/Total LBAs Read

Indicates the total amount of LBAs (Logical Block Address) read since the drive was deployed. This is stored in 4 bytes. The number stores represents the number of bytes read by the host to the drive.

Attribute 243 - Total LBAs Written Expanded

Rarely used. Technical information not readily available at time of publication.

Attribute 244 - Total LBAs Read Expanded

Rarely used. Technical information not readily available at time of publication.

Attribute 245 - Percent Drive Life Used / Max Erase Count

The percent drive life used based on the percentage of over-provisioned erase blocks that are defective. This is the complement to attribute 177.

This attribute can also be used for Max Erase Count.

Attribute 246 - Total SLC Write Count

This attribute is the total amount of flash write counts.

Attribute 247 - RAID Recovery Count

This attribute is the number of times a disk array has gone into recovery mode.

Attribute 248 - Remaining Life Percentage

This attribute measures the approximate life left from a combination of program-erase cycles and available reserve blocks of the device.

Attribute 249 - NAND Writes (1GiB)

Total NAND Writes. Raw value reports the number of writes to NAND in 1 GB increments.

Attribute 250 - Read Error Retry Rate

Lower Raw Value is better

This SMART attribute is the number errors found during reading a sector from the disk surface. A higher raw value indicates that there is a problem with either the disk surface or read/write heads.

Attribute 251 - Minimum Spares Remaining

This attribute indicates the number of remaining spare blocks as a percentage of the total number of spare blocks available.

Attribute 252 - Newly Added Bad Flash Block

The Newly Added Bad Flash Block attribute indicates the total number of bad flash blocks the drive detected since it was first initialized in manufacturing.

Attribute 253 - Abnormal Shutdown Count

This attribute is reserved for manufacturer maintenance.

Attribute 254 - Free Fall Protection

Lower Raw Value is better

Count of "Free Fall Events" detected by the accelerometer sensor.

Frequently Asked Questions

1. Can Drive Scope check the SMART information of my external USB and Firewire devices?

Reading SMART attributes from external drives connected via USB or Firewire requires that you install the SAT SMART Driver so that your Mac can 'see' the SMART data on the external drive. The SAT SMART Driver is a kernel extension which extends the operating systems ability to access the SMART data of an external USB or FireWire hard drive.

Install the SAT SMART driver using the Install SAT SMART driver menu item in the Drive Scope menu. For Macs running 10.8 visit the link below:

https://github.com/kasbert/OS-X-SAT-SMART-Driver

NOTE: Various versions of the SMART driver are available. If you find that installing the version included with Drive Scope doesn't allow it to read your external drive, you might try installing a different version found at the above URL.

NOTE: The SAT SMART Driver is a third party open source solution and it is not officially supported by Micromat.

For Macs running 10.13 or later, additional steps are required to install the SAT SMART Driver. With the release of macOS 10.13 "High Sierra," Apple has incorporated a new feature that requires a user's approval before loading new third-party kernel extensions. After the successful installation of the SAT SMART Driver, you will see a dialog "blocking" the extension.

When this dialog is displayed, it means that the SAT SMART Driver kernel extensions were installed

successfully, but further steps are neeeded. Quit the SAT SMART Driver installer and proceed to the Security & Privacy system preference which is located with the System Preference option under the Apple menu. With the System Preferences window open, select the Security & Privacy system preference.

You will notice that a new statement is presented stating that, 'System software from developer "Micromat, Inc." was blocked from loading'. In order for the SAT SMART Driver to load and work for external USB and FireWire drives in Drive Scope, you will need to click on the Allow button in the Security & Privacy system preference. Once you have clicked on the Allow button, you will be prompted to restart.

After clicking on the Restart button, your Mac should proceed with restarting. Once restarted, the SAT SMART extensions will load whenever your Mac starts up, allowing SMART data from external drives to display in Drive Scope.

NOTE: Approval is already granted to the SAT SMART Driver kernel extensions if they were already installed prior to upgrading to macOS 10.13 'High Sierra'.

2. I just replaced my hard drive with an OWC Aura SSD and Drive Scope isn't seeing it. How come?

OWC Aura SSDs don't pass SMART data over the PCIe connection, so these drives are listed as Not Supported in Disk Utility, and will be missing from the the drive list in Drive Scope.

3. I have a Mac Pro (or Xserve) with an internal Apple RAID card. Why isn't Drive Scope able to read the SMART information of the drives connected to the Apple RAID card?

SMART data relies on the hardware passing that data directly. However, RAID controllers simulate their drives to the system as logical (virtual) disks.

Because they are logical disks, hard drives connected to Apple RAID cards do not provide SMART data to macOS, and so are unsupported.

If you want to know the SMART status of each of the individual hard drives that make up your hardware RAID, use Apple's RAID Utility (/Applications/Utilities) or Apple's System Information application (/Applications/Utilities) and select the Hardware RAID option in the Hardware disclosure view for the SMART status information. However, the SMART status reading from either of these utilities is a SMART overall health self-assessment result and doesn't provide the predictive ability that Drive Scope does.

4. I have a MacBook Air (Mid 2013/Early 2014) with an Apple SSD and it is reporting a Warning for health. How Come?

There is a known issue with solid state drives produced by Toshiba for Apple. Solid state drives for these particular MacBook Airs (model numbers APPLE SSD TS0128F or APPLE SSD TS0256F) are known to have this issue. It would appear the SMART attribute data for these models of SSD are inaccurate and should not be trusted. As long as the SMART Overall Health Self-Assessment result in the Capabilities tab is reporting a Passed result, the drive can continue to be used.

Contacting Technical Support

Micromat provides technical support via email. For a current listing of contact information, please visit our website at www.micromat.com. Technical support is available Monday through Friday (excluding public holidays), from 9:00 AM to 5:00 PM Pacific time.

- Email: help@micromat.com

Please provide the following information in any technical support email you send to Micromat.

- A brief description of your problem.
- Version number of your Drive Scope software.
- Type of Macintosh and configuration, including Processor and RAM installed. (Example: MacBook Pro 3 GHz Intel i7, 4 GB RAM, 512 GB internal solid state drive)
- Version of macOS installed.

About Micromat Inc.

Micromat Incorporated has been developing Macintosh diagnostic utilities since 1989. As the first company to offer diagnostic products for Macintosh, Micromat has pioneered many new technologies for helping Macintosh users bring their computers back to life and to keep them running their absolute best.