

# S.M.A.R.T

## Verifying your Disk's S.M.A.R.T, APM, AAC capabilities

Verify your HDD capabilities for S.M.A.R.T, APM and AAC via the Diagnostic: Information page, ataidle Tab.

Examples of Advanced Hard Drive capabilities:

```
List of Advanced ATA capabilities on all ATA disk:
```

```
Results for ada0:
```

```
Device Info:
```

```
Model:          FUJITSU MPF3102AT
Serial:         31277991
Firmware Rev:   1402
ATA revision:   ATA-5
Geometry:      16383 cyls, 16 heads, 63 spt
Capacity:      9GB
SMART Supported: yes
SMART Enabled:  yes
APM Supported:  yes
APM Enabled:   no
AAC Supported:  yes
AAC Enabled:   no
Note:  AAC = AutoAcoustic
       APM = Advanced Power Management
       SMART = Self-Monitoring, Analysis and Reporting Technology
```

```
Results for ada2:
```

```
Device Info:
```

```
Model:          SAMSUNG SP2014N
Serial:         S088J1RY906273
Firmware Rev:   VC100-33
ATA revision:   ATA-7
Geometry:      16383 cyls, 16 heads, 63 spt
Capacity:      127GB
SMART Supported: yes
SMART Enabled:  yes
APM Supported:  no
AAC Supported:  yes
AAC Enabled:   no
Note:  AAC = AutoAcoustic
       APM = Advanced Power Management
       SMART = Self-Monitoring, Analysis and Reporting Technology
```

From this you can see that on ada0, there is no value in setting APM or AAC for this drive as it is not

supported. Similarly on ada2, APM is not supported, but AAC is support, but not enabled.

## Enable S.M.A.R.T

SMART is enabled on a system-wide basis via the *System:Advanced* page by checking the *Enable the S.M.A.R.T daemon* option and clicking the Save button.



This option can prevent the disk Advanced Power Management from working correctly.

## About S.M.A.R.T.

S.M.A.R.T. is an attempt to predict imminent drive failure by monitoring selected drive performance and calibration characteristics. Each monitored characteristic (Attribute) is used to calculate an Attribute Value. Attribute Values range from 1 to 253 with 1 being worst case, 253 being best case, and 100 being nominal.

For WD drives, the normalized attribute value will range from 1 to 100 or 1 to 200, depending on the attribute. Error rate, total spin ups, spin up retries and calibration retries attributes are implemented as during normal operation (“on-line”); whereas, Multi-zone Error Rate test is performed “off-line”. This test performs a read-verify-all operation and calculates an error rate. These Attributes are updated and stored on the drive in the reserved area of the disk. Also stored on the drive is a set of Attribute Thresholds that correspond to the calculated Attribute Values. An impending degrading or faulty condition is indicated when the calculated Attribute Value becomes less than or equal to its corresponding Attribute Threshold value.

The drive periodically saves all data associated with the S.M.A.R.T. feature. The data is written to the reserved area of the disk after certain time of inactivity by the host. The save of the data is performed in the background and will not cause a decrease in performance.

## Some S.M.A.R.T info of an WD RED drive

Below examples of Diagnostics > Information > S.M.A.R.T.

The screenshot shows the XigmaNAS web interface. At the top, there's a navigation menu with 'System', 'Network', 'Disks', 'Access', 'Services', 'Virtualization', 'Status', 'Diagnostics', 'Tools', and 'Help'. Below that, the breadcrumb path is 'Diagnostics > Information > S.M.A.R.T.'. A sub-menu includes 'Disks', 'Disks (Info)', 'Partitions', 'S.M.A.R.T.', 'Space Used', 'Swap', 'Mounts', 'Software RAID', 'iSCSI Initiator', 'MS Domain', 'CIFS/SMB', 'FTP', 'iSYNc Client', 'Netat', 'Sockets', 'IPMI Stats', and 'UPS'. The main content area is titled 'Device /dev/da0 - Western Digital Red' and shows the following SMART information:

```

=== START OF INFORMATION SECTION ===
Model Family:      Western Digital Red
Device Model:      WDC WD30EFRX-68AX9N0
Serial Number:     WD-WMC1T0941506
LU WWN Device Id: 5 0014ee 602e027c8
Firmware Version: 80.00A80
User Capacity:     3,000,592,982,016 bytes [3.00 TB]
Sector Sizes:     512 bytes logical, 4096 bytes physical
Device is:         In smartctl database [for details use: -P show]
ATA Version is:   ACS-2 (minor revision not indicated)
SATA Version is:  SATA 3.0, 6.0 Gb/s (current: 6.0 Gb/s)
Local Time is:    Sun Sep 30 23:56:23 2018 CEST
SMART support is: Available - device has SMART capability.
SMART support is: Enabled
  
```

Below the text is a table of SMART attributes:

ID	Attribute Name	Raw Value	Description
1	Raw_Read_Error_Rate	0	(Vendor specific raw value.) Stores data related to the rate of hardware read errors that occurred when reading data from a disk surface. The raw value has different structure for different vendors and is often not meaningful as a decimal number.
3	Spin_Up_Time	5875	Average time of spindle spin up (from zero RPM to fully operational).
4	Start_Stop_Count	159	A tally of spindle start/stop cycles. The spindle turns on, and hence the count is increased, both when the hard disk is turned on after having before been turned entirely off (disconnected from power source) and when the hard disk returns from having previously been put to sleep mode.
5	Reallocated_Sector_Ct	0	Count of reallocated sectors. When the hard drive finds a read/write/verification error, it marks that sector as 'reallocated' and transfers data to a special reserved area (spare area). This process is also known as remapping, and reallocated sectors are called 'remaps'. The raw value normally represents a count of the bad sectors that have been found and remapped. Thus, the higher the attribute value, the more sectors the drive has had to reallocate. This allows a drive with bad sectors to continue operation; however, a drive which has had any reallocations at all is significantly more likely to fail in the near future. While primarily used as a metric of the life expectancy of the drive, this number also affects performance. As the count of reallocated sectors increases, the read/write speed tends to become worse because the drive head is forced to seek to the reserved area whenever a remap is accessed. If sequential access speed is critical, the remapped sectors can be manually marked as bad blocks in the file system in order to prevent their use.
7	Seek_Error_Rate	0	(Vendor specific raw value.) Rate of seek errors of the magnetic heads. If there is a partial failure in the mechanical positioning system, then seek errors will arise. Such a failure may be due to numerous factors, such as damage to a servo, or thermal widening of the hard disk. The raw value has different structure for different vendors and is often not meaningful as a decimal number.
9	Power_On_Hours	51088	Count of hours in power-on state. The raw value of this attribute shows total count of hours (or minutes, or seconds, depending on manufacturer) in power-on state.
10	Spin_Retry_Count	0	Count of retry of spin start attempts. This attribute stores a total count of the spin start attempts to reach the fully operational speed (under the condition that the first attempt was unsuccessful). An increase of this attribute value is a sign of problems in the hard disk mechanical subsystem.
11	Calibration_Retry_Count	0	This attribute indicates the count that recalibration was requested (under the condition that the first attempt was unsuccessful). An increase of this attribute value is a sign of problems in the hard disk mechanical subsystem.
12	Power_Cycle_Count	157	This attribute indicates the count of full disk power on/off cycles.
193	Power-Off Retract Count	114	Count of times the heads are loaded off the media. Heads can be unloaded without actually powering

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```

=== START OF INFORMATION SECTION ===
Model Family:      Western Digital Red
Device Model:      WDC WD30EFRX-68AX9N0
Serial Number:     WD-WMC1T0941506
LU WWN Device Id: 5 0014ee 602e027c8
Firmware Version: 80.00A80
User Capacity:     3,000,592,982,016 bytes [3.00 TB]
Sector Sizes:     512 bytes logical, 4096 bytes physical
Device is:         In smartctl database [for details use: -P show]
ATA Version is:   ACS-2 (minor revision not indicated)
SATA Version is:  SATA 3.0, 6.0 Gb/s (current: 6.0 Gb/s)
Local Time is:    Sun Sep 30 23:56:23 2018 CEST
SMART support is: Available - device has SMART capability.
SMART support is: Enabled
  
```

```

=== START OF READ SMART DATA SECTION ===
SMART overall-health self-assessment test result: PASSED
  
```

```

General SMART Values:
Offline data collection status: (0x00) Offline data collection activity
was never started.
Auto Offline Data Collection: Disabled.
Self-test execution status:      ( 0) The previous self-test routine
completed
without error or no self-test has ever
  
```

been run.  
Total time to complete Offline data collection: (38160) seconds.  
Offline data collection capabilities: (0x7b) SMART execute Offline immediate.  
Auto Offline data collection on/off support.  
Suspend Offline collection upon new command.  
Offline surface scan supported.  
Self-test supported.  
Conveyance Self-test supported.  
Selective Self-test supported.  
SMART capabilities: (0x0003) Saves SMART data before entering power-saving mode.  
Supports SMART auto save timer.  
Error logging capability: (0x01) Error logging supported.  
General Purpose Logging supported.  
Short self-test routine recommended polling time: ( 2) minutes.  
Extended self-test routine recommended polling time: ( 383) minutes.  
Conveyance self-test routine recommended polling time: ( 5) minutes.  
SCT capabilities: (0x70bd) SCT Status supported.  
SCT Error Recovery Control supported.  
SCT Feature Control supported.  
SCT Data Table supported.

SMART Attributes Data Structure revision number: 16

Vendor Specific SMART Attributes with Thresholds:

ID#	ATTRIBUTE_NAME	FLAG	VALUE	WORST	THRESH	TYPE	UPDATED
1	Raw_Read_Error_Rate	0x002f	200	200	051	Pre-fail	Always
-	0						
3	Spin_Up_Time	0x0027	182	178	021	Pre-fail	Always
-	5875						
4	Start_Stop_Count	0x0032	100	100	000	Old_age	Always
-	159						
5	Reallocated_Sector_Ct	0x0033	200	200	140	Pre-fail	Always
-	0						
7	Seek_Error_Rate	0x002e	200	200	000	Old_age	Always
-	0						
9	Power_On_Hours	0x0032	031	031	000	Old_age	Always
-	51088						
10	Spin_Retry_Count	0x0032	100	100	000	Old_age	Always
-	0						
11	Calibration_Retry_Count	0x0032	100	100	000	Old_age	Always
-	0						
12	Power_Cycle_Count	0x0032	100	100	000	Old_age	Always

```

-      157
192 Power-Off_Retract_Count 0x0032  200  200  000  Old_age  Always
-      114
193 Load_Cycle_Count      0x0032  200  200  000  Old_age  Always
-      44
194 Temperature_Celsius   0x0022  121  098  000  Old_age  Always
-      29
196 Reallocated_Event_Count 0x0032  200  200  000  Old_age  Always
-      0
197 Current_Pending_Sector 0x0032  200  200  000  Old_age  Always
-      0
198 Offline_Uncorrectable  0x0030  100  253  000  Old_age  Offline
-      0
199 UDMA_CRC_Error_Count   0x0032  200  200  000  Old_age  Always
-      0
200 Multi_Zone_Error_Rate  0x0008  200  200  000  Old_age  Offline
-      0

```

SMART Error Log Version: 1  
No Errors Logged

SMART Self-test log structure revision number 1

Num	Test_Description	Status	Remaining	LifeTime(hours)
# 1	Conveyance offline	Completed without error	00%	0

SMART Selective self-test log data structure revision number 1

SPAN	MIN_LBA	MAX_LBA	CURRENT_TEST_STATUS
1	0	0	Not_testing
2	0	0	Not_testing
3	0	0	Not_testing
4	0	0	Not_testing
5	0	0	Not_testing

Selective self-test flags (0x0):

After scanning selected spans, do NOT read-scan remainder of disk.  
If Selective self-test is pending on power-up, resume after 0 minute delay.

### SMART Attribute Information

Each SMART attribute indicates a certain characteristic of the drive and has its own value derived from a special normalization algorithm and formula. The attributes listed below are specific to WD drives. Other drive manufacturers may have their own attribute definition.

**RAW Read Error Rate:** This attribute indicates the average rate of read error retries.

**Spin Up Time:** This attribute indicates the average spin up time, which describes amount of time it took to spin the platters up to their rated rotation speed.

**Start/Stop Count:** This attribute indicates the amount of drive's start/stop cycles.

**Reallocated Sector Count:** The attribute indicates the amount of bad sectors relocated to a spare area.

**Seek Error Rate:** This attribute indicates the average rate of seek errors.

**Power On Hour Count:** This attribute indicates how long the drive was working (powered on).

**Spin Retry Count:** This attribute indicates the number of retry of drive spin up at power up.

**Calibration Retry Count:** This attribute indicates the number of retry of drive calibration after spin up.

**Power Cycle Count:** This attribute indicates the number of disk power cycles.

**Relocation Event Count:** This attribute indicates the number of times recalibration was requested. “

**Current Pending Sector Count:** This attribute indicates the amount of sectors pending for relocation. Sectors with read or write errors are recorded and await relocations to spare sectors when next write commands are issued.

**Off-line Scan Uncorrectable Sector Count:** This attribute indicates the number of firmware uncorrectable error sectors detected during the last off-line scan.

**UltraDMA CRC Error Rate:** UDMA controller performs a CRC error checking on data while transferring between the host and HDD. Each time the error occurs, a retransmission is requested. This attribute indicates the average rate of the CRC errors.

**Multi Zone Error Rate:** This attribute indicates a rate at which write retries are requested.

**GMR Head Amp:** This attribute indicates the amplitude of GMR (Giant Magnetoresistive) head.

**Temperature:** This attribute indicates the temperature for drives equipped with thermal sensor.

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