

THE COMPUTER CORNER

No. 143. Is Your Hard Drive SMART?

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I bet it is! Back a while ago, the major hard drive manufacturers got together and made a set of (sort of) standards that they would (sort of) follow. They called it **Self-Monitoring, Analysis and Reporting Technology**, or **SMART** for short. Since then, virtually every hard drive manufacturer follows the (sort of) standards. What are they, and what do they mean to you?

When a hard drive is running, the logic board on the bottom of every drive monitors events that occur in the drive. It records those events, and even reacts to them to correct errors – unwanted occurrences that might have unwanted consequences. In other words, modern hard drives have a limited ability to fix themselves – on the fly. Even more important, some of the data they record can be used to predict when the hard drive will fail, down to the day and minute! While not perfect in their predictions, it can give you a “heads up” to back up your data and to think about shopping for a replacement before the failure occurs.

There are a whole bunch of (free) programs that will read the SMART data on your hard drive and report to you. For example, System Information for Windows (SIW, <http://www.gtopala.com/>) will show SMART data as well as everything else about your machine, and it is an excellent freebie. However, my favorite for this particular task is Disk Checkup (<http://www.passmark.com/products/diskcheckup.htm>). This will check all your hard drives and even record the data with date and time, so you can run it periodically and see if anything is changing for the worse.

Now, be prepared. The data is not easy or intuitive to interpret! Clearly, hard drive engineering geeks designed SMART data reporting, and far be it from normal human beings to be able to decipher the all the data that is shown! However, the data shown by Disk Checkup is presented in a clean way, and that makes the job of figuring out what is going on the easier. Further, there is a handy STATUS column that simply shows OK when there are no problems. Here is the SMART data for one of the two drives in my main computer – a 38 GB Western Digital. This is my C: drive.

SMART ATTRIBUTES: Western Digital 38162 MB Drive 06Jan08 Disk Checkup V2.1 Build 1001

ID	Description	Raw Value	Status	Value	Worst	Threshold	TEC
1	Raw Read Error Rate	0	OK	200	200	51	N.A.
3	Spin Up Time	2391ms	OK	100	100	21	N.A.
4	Start/Stop Count	285	OK	100	100	40	N.A.
5	Reallocated Sector Count	0	OK	200	200	140	N.A.
7	Seek Error Rate	0	OK	200	200	51	N.A.
9	Power On Time	145356	OK	1	1	0	N.A.
A	Spin Retry Count	0	OK	100	100	51	N.A.
B	Calibration Retry Count	0	OK	100	100	51	N.A.
C	Power Cycle Count	284	OK	100	100	0	N.A.
C2	Temperature	46 C	OK	97	16	0	N.A.
C4	Reallocation Event Count	0	OK	200	200	0	N.A.
C5	Current Pending Sector Count	0	OK	200	200	0	N.A.
C6	Uncorrectable Sector Count	0	OK	200	200	0	N.A.
C7	UltraDMA CRC Error Count	0	OK	200	200	0	N.A.
C8	Write Error Count	0	OK	200	200	51	N.A.

First and foremost, the **Status** column shows OK throughout, and the **TEC** column (predicted date and time of the **Threshold Exceed Condition**, or “geek speak” for catastrophic failure) shows N.A. (**Not Applicable**, since everything is OK). All that is good, and shows no indication that the drive is about to

fail. Most people will look at the Status and TEC columns, and nothing else. Beyond that, the numbers get really geekie!

For example, a zero in the Threshold column means that the manufacturer is providing this row of data for informational purposes only – it has nothing to do with reliability of the drive. The Value column has a number that is better, the larger it is. Unfortunately, this normalized number can be between 1 and 100 in some cases, and 1 and 200 in other cases, depending upon the manufacturer! The Worst column is the lowest value that has ever been recorded for this attribute, showing the moment when the drive was closest to falling below the threshold (except for temperature, when it was the highest number ever recorded). By the way, the Temperature (row C2) was the temperature in C° at the time this data was recorded (46°C, or 115°F). The Raw Value of Spin Up Time is the average time (2.391 seconds) to spin up to an operational state from a stopped state. Start/Stop Count is the actual number of times the drive has been started up from an off state or from a suspended state, while the Power Cycle Count is just the times the drive has been turned on. Obviously, this drive has been turned on 284 times, and was started from a suspended state once, for a total of 285.

Now, the Power On Time is supposed to be the total number of hours this drive has been on. However, I don't believe it! If the drive has truly been on for 145,356 hours, that computes to 6,057 - 24 hour days, or almost 17 years. Not likely! Maybe this manufacturer is showing the number of minutes it has been on, in which case, the total would be 101 days. More like it. I just do not know.

Anyway, you see what I mean. Perhaps there should be a column for Geek Rate, in which case all the cells in it should be rated 1,000.

On the other hand, the Reallocated Sector Count relates to a truly amazing attribute of modern drives. Every drive contains a batch of spare sectors, often 512 of them, that are not normally used – nothing is normally written to them and they are not available for use by the owner. These are silently remapped on the fly. For example, if the drive finds it cannot read a sector because of damage to the platter surface in that area or whatever, it will mark that sector as unusable and take a spare out of the pool to replace it. Now that is truly smart! Anyway, if the raw value of the Reallocated Sector Count is anything other than zero, those numbers of sectors have been swapped into use to replace bad ones. In the case of my drive, the Value is 200 and the Worst is 200, both of which are much higher than the Threshold of 140. If the Value and Worst drop to 180, the drive is still usable and may not fail in the near future, but it will pay to watch it. I think that remapping of spare sectors is a clever and highly useful thing! Hard drives truly fix themselves!

Notwithstanding the difficult-to-interpret data (and Disk Checkup simply shows what is there – it does not create the numbers), it is still of some value to you and me in giving us a “heads up” before something goes wrong. It is nice to know that our hard drives are perking along with no imminent disasters lurking to hit us next month. On the other hand, when that snowplow goes by outside and vibrates the whole house, causing the hard disk heads to vibrate just a smidge while you are working on an Excel spreadsheet ... you just never know! Happy Computing!