

SMART IV Technology on HP Business Desktop Hard Drives



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History of SMART

For the past several years, hard drives have incorporated a feature known as Self-Monitoring Analysis and Reporting Technology (SMART). The advantage of SMART technology is that it provides an early warning system of imminent hard drive failure so that the drive can be replaced before it actually fails. Hard drives equipped with SMART technology automatically monitor certain key parameters for potential drive failure without affecting hard drive performance. If an error is detected, a failure message is displayed on the user's screen.

There are several iterations, or versions of SMART:

- SMART: Originally named Drive Failure Prediction (DFP) and invented by Compaq Computer Corporation in 1995, SMART tracks certain drive attributes and parameters during drive activity. If any of these parameters being monitored by the drive exceed certain defined limits, an imminent hard drive failure message is displayed to the user by the BIOS or Client Management Software.
- SMART II: Improves upon the reliability of the original SMART technology by adding the capability to use "off-line data collection" to check the hard drive health even during periods of inactivity.
- SMART III: Supports SMART I and II. With SMART III, the hard drive does a complete media self-scan every 60 hours. Any questionable sectors can be either validated or remapped. The latest implementation of SMART III includes enforcement of coverage even during heavy-duty cycle usage of the drive.

Why SMART IV?

Starting in late 2007, new HP business desktops and Workstations will begin incorporating SMART IV technology in hard drives. While the current versions of SMART do a good job monitoring the data on the hard drive media, the ever increasing emphasis on reliability and quality led Hewlett-Packard and hard drive manufacturers to better ensure that the data flow from host interface to media and media to host interface is not compromised. This is done by adding a parity code to every 512 byte block in the data path of the hard drive's Cache RAM. This parity checking, which is called SMART IV by HP, provides more complete error detection coverage of the entire data path between the host and the hard drive. In the hard drive industry, SMART IV is also known as End-to-End Error Detection.

How SMART IV works

- SMART IV uses a 2 byte parity code to enable it to better detect if data is valid during transfers to and from the data buffer of the hard drive. If the parity data does not match after transferring through the cache RAM data buffer, then depending upon the command, the drive can do a background retry to get data again or report the error message to the host.
- During a disk read, a 2 byte parity code is generated after the data is transferred from the disk. After transfer from the data buffer to the drive interface, the parity data is checked (see Figure 1).
- During a disk write, a 2 byte parity code is generated and appended to the data going into the data buffer. The parity code is checked before it goes into the data buffer and before it is written to the disk (see Figure 2).
- If an error is detected by the drive and the data cannot be retrieved or sent without failure, a protocol is in place to notify the host operating system of the error. The host operating system can then decide to resend the command or notify the user that a data error may have occurred.

- If errors are detected, a SMART attribute called End-to-End Error Detection Count is updated. If the SMART threshold is crossed, an imminent failure error message is reported to the user either through Client Management Software that has been installed in the operating system or by the HP BIOS on the next reboot. Since all HP BIOS issue the SMART status command, no additional software is required.

How to identify a SMART IV hard drive

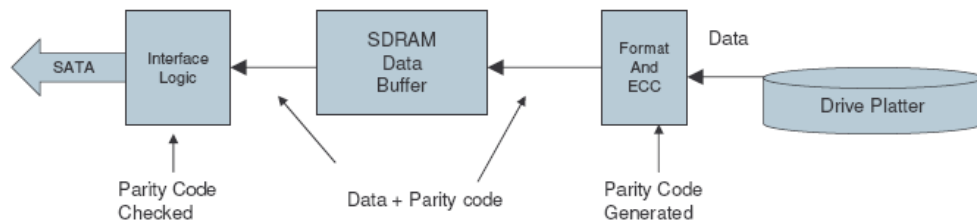
Open the Computer Setup (F10) utility in the system BIOS to determine if the system has a SMART IV hard drive.

1. Turn on the computer and press the F10 key during boot to access the Computer Setup utility.
2. In Computer Setup, select "Device Configuration" from the "Storage" menu. If the hard drive supports SMART IV technology it will be identified as SMART IV in the description. If the hard drive supports SMART III technology it will be identified as SMART III in the description. Older hard drives prior to SMART III technology will not reference SMART in the description, but all shipping HP business desktop hard drives support prior versions of SMART.
3. Select "Ignore Changes and Exit" from the "File" menu to exit Computer Setup.

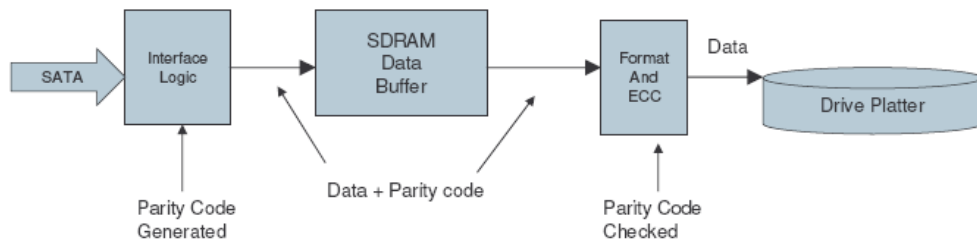
Note:

If the drive indicates SMART IV support, it also supports SMART III.

SMART IV Read (Figure 1)



SMART IV Write (Figure 2)



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