

Failure Prevention and Data Protection Through Data Lifeguard™

**Exclusive Feature Automatically Identifies and Repairs Hard Drive Sectors Before
Data Loss Occurs**

Overview/Executive Summary

Data Lifeguard™ is a Western Digital exclusive feature that automatically detects, isolates and repairs problem areas on hard drives to prevent data loss. This proactive data-reliability feature improves hard drive performance through a continuous self-tuning process that performs scans and repairs while the hard drive is idle. It identifies defects that can result from component wear, and repairs or isolates them to protect the data.

Data Lifeguard is both an enhancement and an extension to Western Digital's S.M.A.R.T. (Self Monitoring, Analysis and Reporting Technology) System that monitors and predicts the performance of hard drives. When enabled, S.M.A.R.T. protects against system downtime and possible loss of productivity and data by communicating reliability status to the user. Data Lifeguard is always enabled, and works independently from S.M.A.R.T. to provide a self-tuning capability.

The feature is incorporated in Western Digital's latest generation of high-performance Enhanced IDE (EIDE) hard drives—the WD Caviar AC13200, AC24300, AC26400, AC38400 and AC310100.

Background

Data that is stored on hard drives can represent vital company or individual records, important project information, essential client and employee records, critical tax information, historical records, graphics, etc. Risking the loss of such data that often takes years to accumulate is not a viable option in today's marketplace. Hard drives featuring the highest reliability are a vital imperative for every computer system user. Western Digital's exclusive new Data Lifeguard feature helps provide the utmost reliability attainable in preventing data loss on hard drives.

Data Lifeguard is an advanced version of Western Digital's self-tuning feature that is performed during every off-line data collection scan. All user sectors on the hard drive are scanned during times of inactivity from the host. Sectors requiring extended retries to recover are rewritten and read back to ensure the storage integrity of the sector. If read back performed is still less than optimal, the sector will be relocated to a new good sector. Data Lifeguard is always actively guarding data, even if S.M.A.R.T. operations for monitoring and predicting hard drive performance are disabled.

In S.M.A.R.T. technology's brief history, it has progressed through three versions.

- S.M.A.R.T. I provides failure prediction by monitoring certain online hard drive activities.
- S.M.A.R.T. II improves failure prediction by adding an automatic off-line read scan to monitor additional operations.
- S.M.A.R.T. III not only monitors hard drive activities but adds failure prevention by attempting to detect and repair sector errors.

Western Digital has implemented all three versions of the S.M.A.R.T. reliability monitor on its hard drives.

Data Lifeguard

Data Lifeguard is a unique feature to Western Digital's latest generation of high-performance Enhanced IDE (EIDE) hard drives—the WD Caviar AC13200, AC24300, AC26400, AC38400 and AC310100. While the S.M.A.R.T. System provides early warnings to pending hard drive failure, Data Lifeguard actually helps prevent such failure. It uses the more than 90 percent of the time that a hard drive is idle to prevent data loss and reduce field failure.

How Data Lifeguard Works

Data Lifeguard automatically identifies and repairs sectors before data loss occurs. It performs off-line read surface scans while the hard drive is idle, and refreshes weak data. The overall hard drive performance is improved because error recovery is performed off-line during idle times. The feature initiates automatically every eight operating hours for daily protection, with the goal of performing one scan per day.

Specifically, after the hard drive has had eight hours of spin time and 15 seconds of idle time, Data Lifeguard performs an off-line scan of all user data sectors. The spin time counts only the time the hard drive is actively spinning. The idle time is defined as the time the hard drive is not performing a host-initiated command. If the off-line scan is interrupted by a host command or power cycle, the scan will resume at the point where it left off after 15 additional minutes of spin time and 15 seconds of idle time. Power cycle and power management events do not reset the spin time counter, and the counter resumes counting after the next spin up.

The time it takes to complete an entire off-line scan is proportional to the size of the hard drive; for example, it takes about 16 minutes for a WD Caviar AC310100 10.1 GB hard drive. A vendor unique command is available that will indicate if an off-line scan is in progress, and also provide the percent the scan has completed.

Data Lifeguard's off-line scan—the same as implemented for S.M.A.R.T. III—identifies and repairs marginal sectors. When the off-line scan encounters an ECC Firmware Correctable Error, it runs a Sector Test to determine if a media defect exists. If one does, Data Lifeguard rewrites the corrected data back to the original sector, then rereads it to ensure that the sector is fixed. Data Lifeguard also protects future data to be written to suspect sectors.

If the hard drive has been issued a power management Standby with Timer or Idle with Timer command—and if the expiration of the standby timer occurs before the off-line scan starts—then the hard drive will spin down into the standby mode, and the spin time counter will resume after the hard drive is spinning again. If the expiration of the standby timer occurs in the middle of a scan, the scan will complete before the hard drive will spin down into the standby mode.

Summary

Data Lifeguard is Western Digital's exclusive hard drive feature that automatically detects, isolates, and repairs problem areas that may develop over the extended use of your hard drive.

Western Digital understands that customers value their data, as data storage is one of the most important features of PC and enterprise usage. Western Digital is committed to continually enhancing the quality of our products and services to better protect data—through improved quality processes, customer support and services, or additional features built into the hard drive to guard against data loss.

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79-850105-000 S0115 9/98