

# Hitachi TrueTrack™ Servo Technology

## Technology Overview

**TrueTrack™ technology is a series of significant servo technologies that enhance hard disk reliability, increases robustness of the drive against shock and vibration and eases system integration.**

One of the key considerations in the design of hard disk drives and the host systems that incorporate them is the effect of shock and vibration on the integrity of user data. At the hard drive level, increases in track density and rotational speed present design challenges in the area of dynamic head-track misalignment errors, or data processing errors that may occur due to an off-track condition of the Read/Write heads. Dynamic head-track misalignment can be caused by spindle vibration or shifting of the disk position in response to various shock and vibration events including self-induced vibration during operation of single- and multiple-drive applications, as well as external forces such as momentary low frequency interference like moving a notebook PC or jogging while the disk drive is operating. Shock and vibration can cause data processing errors by forcing the Read/Write into an off-track position as a result of shifts in the disk position.

Over four decades of experience in the design and manufacture of hard disk drives have resulted in Hitachi's expertise in technologies which address and enhance the data integrity of hard drives in a wide range of usage and integration conditions. Hitachi invented and owns the majority of patents that enable any hard disk drive, regardless of form factor or rotational speed, the level of robustness to resist and compensate for head positioning errors. One of the key patents in Hitachi's extensive portfolio is an enhanced servo technology defining a filter tuned to screen vibration which is used to maintain head position accuracy. This patent (US 5,608,586) was issued on March 4, 1997 and is still widely used by the hard disk drive industry for the data integrity and robustness it affords.

Hitachi coined the name "TrueTrack" after this and the ability of several other servo technologies to maintain true tracking accuracy of the heads despite disk shift from shock or vibration. Since TrueTrack servo technology is integrated into the system architecture of the drive, TrueTrack technology can be used in any form factor. Hitachi has used TrueTrack for over twenty generations of enterprise, desktop and mobile drives, and is today incorporated into all Hitachi Ultrastar™, Deskstar™, Travelstar™ and CinemaStar™ products.

Benefits of TrueTrack™ Servo Technology:

- 1. Greater data integrity**

Hard disk drives using TrueTrack technology have greater robustness against errors caused by persistent self-vibration or disk shift due to the improved tracking accuracy it provides. This results in greater integrity of data user in either multiple or single drive environments as well as product applications requiring drive operation in a wide temperature range.

2. **Easier drive qualification and system integration**

Since TrueTrack technology substantially minimizes the negative effects of vibration on head positioning, qualification of the drive in a broad range of applications is greatly simplified. The inherent accuracy of the drive also allows more flexibility in host system chassis selection.

3. **Improved reliability**

TrueTrack servo technology also incorporates an adaptive re-calibration technique which compensates for changes in vibration or disk shift over time. This dramatically increases the robustness of the hard drive over the life of the host product.

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