1.0 Introduction

This manual describes the functional, mechanical and interface specifications for the following Seagate® Laptop SSHD model drives:

Standard models		Standard SED models	SED (FIPS 140-2) models
ST1000LX000	ST1000LM014	ST1000LM015	ST1000LM028
ST1000LX001	ST750LM000		

Note	Previous generations of Seagate Self-Encrypting Drive models were called Full Disk Encryption (FDE) models before a differentiation between drive-based encryption and other forms of encryption was necessary.

For more information on SED drives see About (SED) Self-Encrypting Drives on page 22.

For more information on FIPS 140-2 Level 2 certification About FIPS on page 21.

These drives provide the following key features:

- 5400-RPM spindle speed.
- 64MB buffer.
- 8GB NAND flash on models ST1000LM014, ST1000LM015, ST1000LM028 & ST750LM0000
- 16GB NAND flash on model ST1000LX000
- 32GB NAND flash on model ST1000LX001

Note	For improved reliability, Seagate SSHDs incorporate a technique referred to as 'Combo Mode', utilizing proprietary controls to reduce the number of bits stored to a portion of the NAND Flash.

- Quiet operation. Fluid Dynamic Bearing (FDB) motor.
- High instantaneous (burst) data-transfer rates (up to 6Gb/s).
- Perpendicular recording technology.
- State-of-the-art cache and on-the-fly error-correction algorithms.
- Native Command Queuing (NCQ) with command ordering.
- Full-track multiple-sector transfer capability without local processor intervention.
- 1000 Gs nonoperating shock and 350 Gs of operating shock.
- SeaTools™ diagnostic software performs a drive self-test that eliminates unnecessary drive returns.
- The 3D Defense System™, which includes Drive Defense, Data Defense and Diagnostic Defense, offers the industry's most comprehensive protection for disk drives.
- Support for S.M.A.R.T. drive monitoring and reporting.
- Support for Read Multiple and Write Multiple commands.
- Worldwide Name (WWN) capability uniquely identifies the drive.

Seagate Laptop SSHD Self-Encrypting Drive models have the following additional features

- Automatic data encryption/decryption
- Controlled access
- Random number generator
- Drive locking
- 16 independent data bands
- Cryptographic erase of user data for a drive that will be repurposed or scrapped
- Authenticated firmware download.

There is no significant performance difference between Self-Encrypting Drive and standard (non-Self-Encrypting Drive) models.

1.1 About the Serial ATA Interface

The Serial ATA interface provides several advantages over the traditional (parallel) ATA interface. The primary advantages include:

- Easy installation and configuration with true plug-and-play connectivity. It is not necessary to set any jumpers or other configuration options.
- Thinner and more flexible cabling for improved enclosure airflow and ease of installation.
- Scalability to higher performance levels.

In addition, Serial ATA makes the transition from parallel ATA easy by providing legacy software support. Serial ATA was designed to allow users to install a Serial ATA host adapter and Serial ATA disk drive in the current system and expect all of the existing applications to work as normal.

The Serial ATA interface connects each disk drive in a point-to-point configuration with the Serial ATA host adapter. There is no master/slave relationship with Serial ATA devices like there is with parallel ATA. If two drives are attached on one Serial ATA host adapter, the host operating system views the two devices as if they were both "masters" on two separate ports. This essentially means both drives behave as if they are Device 0 (master) devices.

Note	The host adapter may, optionally, emulate a master/slave environment to host software where two devices on separate Serial ATA ports are represented to host software as a Device 0 (master) and Device 1 (slave) accessed at the same set of host bus addresses. A host adapter that emulates a master/slave environment manages two sets of shadow registers. This is not a typical Serial ATA environment.

The Serial ATA host adapter and drive share the function of emulating parallel ATA device behavior to provide backward compatibility with existing host systems and software. The Command and Control Block registers, PIO and DMA data transfers, resets, and interrupts are all emulated.

The Serial ATA host adapter contains a set of registers that shadow the contents of the traditional device registers, referred to as the Shadow Register Block. All Serial ATA devices behave like Device 0 devices. For additional information about how Serial ATA emulates parallel ATA, refer to the *Serial ATA International Organization: Serial ATA* (Revision 3.0). The specification can be downloaded from www.serialata.org.