Product Manual

LD25 Series SATA

ST9402115AS
ST920217AS

Seagate

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Revision status summary sheet

Revision	Date	Sheets Affected
Rev. A	06/23/2005	All. Initial release.
Rev. B	08/16/2005	Pages 3, 4, 5, and 14.

Contents

List of Figures

1.0   Introduction

This manual describes the functional, mechanical and interface specifications for the following Seagate®
LD25 Series SATA model drives:

- ST9402115AS
- ST920217AS

Seagate LD25 Series drives comprise a new product category of 2.5-inch form factor drives designed for non-notebook PC applications such as:

- Consumer electronics (gaming, small PVRs/DVRs)
- Ultra-small desktop PCs
- Internet appliances

LD25 Series drives are quieter, lighter and use less power than 3.5-inch drives. They are ideal for applications requiring the form and fit of a notebook drive but without some of the design specifications required by notebook drives such as high shock tolerance, high performance, and power management. LD25 Series drives are not presently suited for notebook applications or environments with high operating temperatures.

These drives provide the following key features:

- 5,400 RPM spindle speed
- 2 Mbyte buffer
- High instantaneous (burst) data-transfer rates (up to 150 Mbytes per second).
- Giant magnetoresistive (GMR) recording heads and EPRML technology, provide the drives with increased areal density.
- State-of-the-art cache and on-the-fly error-correction algorithms.
- Full-track multiple-sector transfer capability without local processor intervention.
- Quiet operation.
- 500 Gs nonoperating 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 disc drives.
- Support for S.M.A.R.T. drive monitoring and reporting.
- Support for Read Multiple and Write Multiple commands.

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 you to install a Serial ATA host adapter and Serial ATA disc drive in your current system and expect all of your existing applications to work as normal.

The Serial ATA interface connects each disc 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: High Speed Serialized AT Attachment" specification. The specification can be downloaded from http://www.serialata.com.

2.0 Drive specifications

Unless otherwise noted, all specifications are measured under ambient conditions, at 25°C, and nominal power. For convenience, the phrases *the drive* and *this drive* are used throughout this manual to indicate the ST9402115AS and ST920217AS models.

2.1 Specification summary table

The specifications listed in this table are for quick reference. For details on specification measurement or definition, see the appropriate section of this manual.

Table 1: Drive specifications

Drive specification	ST9402115AS	ST920217AS
Formatted Gbytes (512 bytes/sector)*	40	20
Guaranteed sectors	82,443,600	41,021,800
Bytes per sector	512	
Default sectors per track	63	
Default read/write heads	16	
Default cylinders	16,383	
Physical read/write heads	2	1
Discs	1	1
Recording density in BPI (bits/inch max)	675,900	
Track density TPI (tracks/inch max)	114,000	
Areal density (Gbits/inch^2 max)	81	
Spindle speed (RPM)	5,400	
Internal transfer rate (Mbytes/sec max)	57.6	
I/O data transfer rate (Mbytes/sec max)	150	
ATA data-transfer modes supported	SATA 1.0, SATA II PIO modes 0–4 Multiword DMA modes 0–2 Ultra DMA modes 0–6	
Cache buffer (Mbytes)	2	
Height (max)	9.5 +/- 0.2 mm (0.374 +/- .0078 inches)	
Width (max)	69.85 mm (2.75 +/- 0.0098 inches)	
Length (max)	100.5078 +/- 1.57 mm (3.957 +/- 0.062 inches)	
Weight (typical)	100 grams (0.22 lb)	
Average latency (msec)	5.6	
Power-on to ready (sec typical)	4.0	
Standby to ready (sec typical)	3.0	
Track-to-track seek time (msec typical)	1.0 (read), 1.5 (write)	
Average seek, read (msec typical)	<16	

Table 1: Drive specifications

Drive specification	ST9402115AS	ST920217AS
Average seek, write (msec typical)	<16	
Full-stroke seek (msec)	22 (typical); 24 (max)	
Startup current 5V, (amps typical) (max = +/- 10%)	1.0	
Seek power, random r/w, desktop usage (watts, typical)	2.9	
Idle mode (watts, typical)	2.5	
Standby and sleep modes (watts, typical)	<1.15	
Voltage tolerance (including noise)	+5.0V ± 5%	
Ambient temperature	5° to 55°C (operating), −40° to 70°C (nonoperating)	
Temperature gradient (°C per hour max, noncondensing)	20°C (operating) 30°C (nonoperating)	
Relative humidity (noncondensing)	8% to 90% (operating) 5% to 95% (nonoperating)	
Relative humidity gradient	30% per hour max	
Wet bulb temperature (°C max)	30 (operating) 40 (nonoperating)	
Altitude, operating	−304.8 m to 3,048 m (−1000 ft to 10,000+ ft)	
Altitude, nonoperating (below mean sea level, max)	−304.8 m to 12,192 m (−1000 ft to 40,000+ ft)	
Shock, operating (Gs max at 2 msec)	100	
Shock, nonoperating (Gs max at 2 msec)	500	
Shock, nonoperating (Gs max at 1 msec)	350	
Shock, nonoperating (Gs max at 0.5 msec)	200	
Vibration, operating	0.5 G (22–350 Hz) 0.25 G (351–500 Hz)	
Vibration, nonoperating	5 Gs (0 to peak, 22–350 Hz) 1.0 G (351–500 Hz)	
Drive acoustics, sound power (bels)		
Idle**	2.4 (typical)	
Seek	2.7 (typical)	
Nonrecoverable read errors	1 per 10^{14} bits read	
Annualized Failure Rate (AFR)	<1.0%, Desktop and gaming use	
Service life	5 Years	
Warranty	To determine the warranty for a specific drive, use a web browser to access the following web page: www.seagate.com/support/service/ From this page, click on the "Verify Your Warranty" link. You will be asked to provide the drive serial number, model number (or part number) and country of purchase. The system will display the warranty information for your drive.	
Load/Unload (U/UL) cycles		
Controlled L/UL cycles (40°C, 50% relative humidity)	50,000	
Emergency L/UL cycles (40°C, 50% relative humidity)	20,000	
Supports Hotplug operation per SATA II specification	Yes	

*One Gbyte equals one billion bytes when referring to hard drive capacity. Accessible capacity may vary depending on operating environment and formatting.

**During periods of drive idle, some offline activity may occur according to the S.M.A.R.T. specification, which may increase acoustic and power to operational levels.

2.2   Formatted capacity

Model	Formatted capacity*	Guaranteed sectors	Bytes per sector
ST9402115AS	40 Gbytes	82,443,600	512
ST920217AS	20 Gbytes	41,021,800	512

*One Gbyte equals one billion bytes when referring to hard drive capacity. Accessible capacity may vary depending on operating environment and formatting.

2.3   Default logical geometry

Cylinders	Read/write heads	Sectors per track
16,383	16	63

LBA mode
When addressing these drives in LBA mode, all blocks (sectors) are consecutively numbered from 0 to *n–1,* where *n* is the number of guaranteed sectors as defined above*.*

2.4   Physical organization

Drive model	Read/write heads	Number of discs
ST9402115AS	2	1
ST920217AS	1	1

2.5   Recording and interface technology

Interface	Serial ATA (SATA)
Recording density BPI (bits/inch max)	675,900
Track density TPI (tracks/inch max)	114,000
Areal density (Gbits/inch^2 max)	81
Spindle speed (RPM) ($\pm$ 0.2%)	5,400
Maximum Internal transfer rate (Mbytes/sec)	57.6
I/O data-transfer rate (Mbytes/sec max)	150 (SATA 1.0)
Interleave	1:1
Cache buffer	2 Mbytes (2,048 kbytes)

2.6   Physical characteristics

Height	(mm)	9.5 +/-0.2
	(inches)	0.374 +/-0.0078
Width	(mm)	69.85 +/-0.25
	(inches)	2.75 +/-0.0098
Length	(mm)	100.5078 +/-1.57
	(inches)	3.957 +/-0.062
Typical weight	(grams)	100
	(pounds)	0.22

2.7   Seek time

Seek measurements are taken with nominal power at 25°C ambient temperature. All times are measured using drive diagnostics. The specifications in the table below are defined as follows:

• Track-to-track seek time is an average of all possible single-track seeks in both directions.

• Average seek time is a true statistical random average of at least 5,000 measurements of seeks between random tracks, less overhead.

Table 2:   Typical seek times

Typical seek times (msec)	Read	Write
Track-to-track	<2	<2
Average	<16	<16
Full-stroke	<24	<24
Average latency	5.6	5.6

Note.   These drives are designed to consistently meet the seek times represented in this manual. Physical seeks, regardless of mode (such as track-to-track and average), are expected to meet the noted values. However, due to the manner in which these drives are formatted, benchmark tests that include command overhead or measure logical seeks may produce results that vary from these specifications.

2.8   Time to ready

Time to ready	Typical	Max @ 25°C
Power-on to Ready (sec)	4.0	8.0
Standby to Ready (sec)	3.0	8.0

2.9 Power specifications

The drive receives DC power (+5V) through a native SATA power connector.

2.9.1 Power consumption

Power requirements for the drives are listed in the table on page 7. Typical power measurements are based on an average of drives tested, under nominal conditions, at 25°C ambient temperature.

- **Spinup power**

  Spinup power is measured from the time of power-on to the time that the drive spindle reaches operating speed.

- **Seek mode**

  During seek mode, the read/write actuator arm moves toward a specific position on the disc surface and does not execute a read or write operation. Servo electronics are active. Seek mode power is measured based on three random seek operations every 100 msecs. This mode is not typical.

- **Read/write power and current**

  Read/write power is measured with the heads on track, based on three 63 sector read or write operations every 100 msecs.

- **Operating power and current**

  Operating power is measured using 40 percent random seeks, 40 percent read/write mode (1 write for each 10 reads) and 20 percent drive idle mode.

- **Idle mode power***

  Idle mode power is measured with the drive up to speed, with servo electronics active and with the heads in a random track location.

- **Standby mode**

  During Standby mode, the drive accepts commands, but the drive is not spinning, and the servo and read/write electronics are in power-down model

Table 3:   DC power

Power dissipation	+5V input average (25° C)
Spinup current	1.0 Amp
Seek, random r/w, desktop usage	2.9 Watts
Idle*	2.5 Watts
Standby and sleep modes	<1.15 Watts

*During periods of drive idle, some offline activity may occur according to the S.M.A.R.T. specification, which may increase acoustic and power to operational levels.
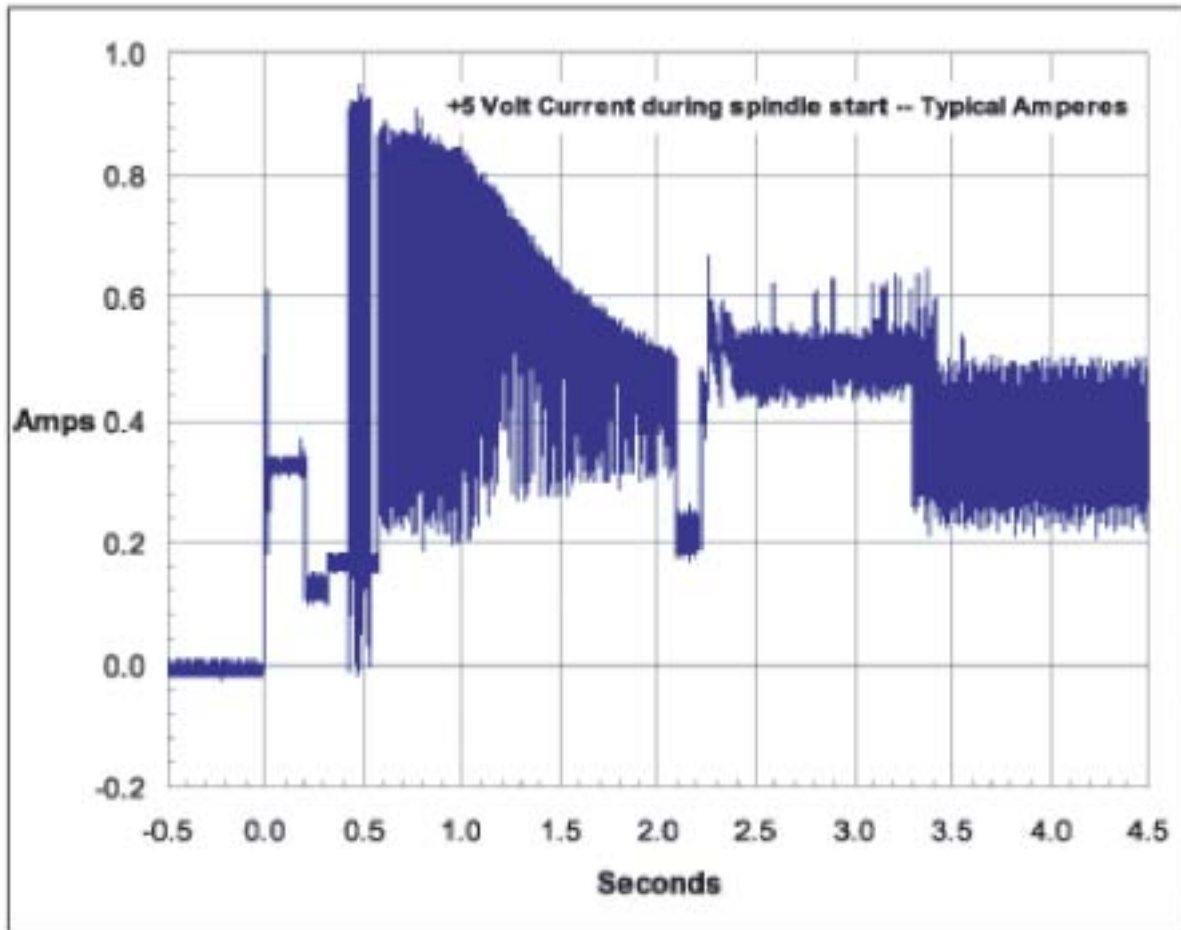
2.9.1.1 Typical current profile

Figure 1. Typical +5V only startup and operation current profile

2.9.2 Deferred spinup

LD25 Series SATA drives provide a deferred spinup feature which storage subsystem controllers can use to sequence disc drive initialization. This is beneficial to systems which include multiple Serial ATA hard disc drives because it allows subsystem controllers to stagger the spinup of each drive to accommodate available power supply current. This feature does not impact time-to-ready in typical desktop systems.

To accommodate the deferred spinup of multiple disc drives in an enclosure, LD25 Series SATA disc drives will spin up only after power is applied to the drive and after successful PHY (Physical layer) initialization. PHY initialization occurs after the PHY enters the DP7:DR_Ready state. This state is reached after a successful exchange of Out-Of-Band (OOB) signals with a functional host-side Serial ATA port. In desktop systems, SATA transceivers should initialize OOB as soon as power comes ready to guarantee the drive spins up quickly. Seagate disc drives will not spin up without an operational host-side Serial ATA transceiver.

Additional details

Upon system power up, PHY communication is initiated with a COMRESET signal, which is generated by the host-side transceiver. COMRESET is followed by a COMINIT signal generated by the disc drive transceiver. COMRESET and COMINIT are followed by an exchange of COMWAKE signals and Align primitives. The disc drive will spin up after the successful exchange of Align primitives cause the PHY to come ready.

For more details, refer to:

• Section 6.8 of the Serial ATA 1.0 High-Speed Serialized AT Attachment specification

• Section 6.2 of the Serial ATA II: Extensions to Serial ATA 1.0 specification

• SATA 1.0 design guides

Note. These specifications and guides are available on the Serial ATA web site (www.serialata.org).

2.9.3   Conducted noise

Input noise ripple is measured at the host system power supply across an equivalent 15-ohm resistive load on the +5 volt line.

Using 5-volt power, the drive is expected to operate with a maximum of 100 mV peak-to-peak square-wave injected noise at up to 10 MHz.

Note. Equivalent resistance is calculated by dividing the nominal voltage by the typical RMS read/write current.

2.9.4   Voltage tolerance

Voltage tolerance (including noise):

5V $\pm$ 5%

2.9.5   Power-management modes

The drive provides programmable power management to provide greater energy efficiency. In most systems, you can control power management through the system setup program. The drive features the following power-management modes:

Table 4:   Power management modes

Power modes	Heads	Spindle	Buffer
Active (operating)	Tracking	Rotating	Enabled
Idle, performance	Tracking	Rotating	Enabled
Idle, active	Floating	Rotating	Disabled
Idle, low power	Parked	Rotating	Disabled
Standby	Parked	Stopped	Disabled
Sleep	Parked	Stopped	Disabled

• **Active mode**

  The drive is in Active mode during the read/write and seek operations.

• **Idle mode**

  The buffer remains enabled, and the drive accepts all commands and returns to Active mode any time disc access is necessary.

- **Standby mode**

  The drive enters Standby mode when the host sends a Standby Immediate command. If the host has set the standby timer, the drive can also enter Standby mode automatically after the drive has been inactive for a specifiable length of time. The standby timer delay is established using a Standby or Idle command. In Standby mode, the drive buffer is enabled, the heads are parked and the spindle is at rest. The drive accepts all commands and returns to Active mode any time disc access is necessary.

- **Sleep mode**

  The drive enters Sleep mode after receiving a Sleep command from the host. In Sleep mode, the drive buffer is disabled, the heads are parked and the spindle is at rest. The drive leaves Sleep mode after it receives a Hard Reset or Soft Reset from the host. After receiving a reset, the drive exits Sleep mode and enters Standby mode with all current translation parameters intact.

- **Idle and Standby timers**

  Each time the drive performs an Active function (read, write or seek), the standby timer is reinitialized and begins counting down from its specified delay times to zero. If the standby timer reaches zero before any drive activity is required, the drive makes a transition to Standby mode. In both Idle and Standby mode, the drive accepts all commands and returns to Active mode when disc access is necessary.

2.10   Environmental specifications

2.10.1   Ambient temperature

Ambient temperature is defined as the temperature of the environment immediately surrounding the drive. Actual drive case temperature should not exceed 65°C (149°F) within the operating ambient conditions.

Above 1,000 feet (305 meters), the maximum temperature is derated linearly by 1°C every 1000 feet.

Operating:	5° to 55°C (41° to 131°F)
Nonoperating:	−40° to 70°C (−40° to 158°F)

2.10.2   Temperature gradient

Operating	20°C per hour (68°F per hour max), without condensation
Nonoperating	30°C per hour (86°F per hour max)

2.10.3   Humidity

2.10.3.1   Relative humidity

Operating	8% to 90% noncondensing (30% per hour max)
Nonoperating	5% to 95% noncondensing (30% per hour max)

2.10.3.2   Wet bulb temperature

Operating	30°C (86°F max)
Nonoperating	40°C (104°F max)

2.10.4   Altitude

Operating	−304.8 m to 3,048 m (−1,000 ft to 10,000+ ft)
Nonoperating	−304.8 m to 12,192 m (−1,000 ft to 40,000+ ft)

2.10.5 Shock

All shock specifications assume that the drive is mounted securely with the input shock applied at the drive mounting screws. Shock may be applied in the X, Y or Z axis.

2.10.5.1 Operating shock

These drives comply with the performance levels specified in this document when subjected to a maximum operating shock of 100 Gs based on half-sine shock pulses of 2 msec. Shocks should not be repeated more than two times per second.

2.10.5.2 Nonoperating shock

The nonoperating shock level that the drive can experience without incurring physical damage or degradation in performance when subsequently put into operation is 500 Gs based on a nonrepetitive half-sine shock pulse of 2 msec duration.

The nonoperating shock level that the drive can experience without incurring physical damage or degradation in performance when subsequently put into operation is 350 Gs based on a nonrepetitive half-sine shock pulse of 1 msec duration.

The nonoperating shock level that the drive can experience without incurring physical damage or degradation in performance when subsequently put into operation is 200 Gs based on a nonrepetitive half-sine shock pulse of 0.5 msec duration.

2.10.6 Vibration

All vibration specifications assume that the drive is mounted securely with the input vibration applied at the drive mounting screws. Vibration may be applied in the X, Y or Z axis.

2.10.6.1 Operating vibration

The maximum vibration levels that the drive may experience while meeting the performance standards specified in this document are specified below.

22–350 Hz	0.5 Gs (0 to peak).
351-500 Hz	0.25 Gs

2.10.6.2 Nonoperating vibration

The maximum nonoperating vibration levels that the drive may experience without incurring physical damage or degradation in performance when subsequently put into operation are specified below.

22–350 Hz:	5.0 Gs (0 to peak).
351-500 Hz	1.0 G

2.11 Acoustics

Drive acoustics are measured as overall A-weighted acoustic sound power levels. All measurements are consistent with ISO document 7779. Sound power measurements are taken under essentially free-field conditions over a reflecting plane. For all tests, the drive is oriented with the cover facing upward.

Note. For seek mode tests, the drive is placed in seek mode only. The number of seeks per second is defined by the following equation:

(Number of seeks per second = 0.4 / (average latency + average access time))

Table 5: Drive level acoustics

Idle*	Seek
2.4 bels (typ)	2.7 bels (typ)

During periods of drive idle, some offline activity may occur according to the S.M.A.R.T. specification, which may increase acoustic and power to operational levels.

2.12 Electromagnetic immunity

When properly installed in a representative host system, the drive operates without errors or degradation in performance when subjected to the radio frequency (RF) environments defined in the following table:

Table 6: Radio frequency environments

Test	Description	Performance level	Reference standard
Electrostatic discharge	Contact, HCP, VCP: ± 4 kV; Air: ± 8 kV	B	EN 61000-4-2: 95
Radiated RF immunity	80 to 1,000 MHz, 3 V/m, 80% AM with 1 kHz sine 900 MHz, 3 V/m, 50% pulse modulation @ 200 Hz	A	EN 61000-4-3: 96 ENV 50204: 95
Electrical fast transient	± 1 kV on AC mains, ± 0.5 kV on external I/O	B	EN 61000-4-4: 95
Surge immunity	± 1 kV differential, ± 2 kV common, AC mains	B	EN 61000-4-5: 95
Conducted RF immunity	150 kHz to 80 MHz, 3 Vrms, 80% AM with 1 kHz sine	A	EN 61000-4-6: 97
Voltage dips, interrupts	0% open, 5 seconds 0% short, 5 seconds 40%, 0.10 seconds 70%, 0.01 seconds	C C C B	EN 61000-4-11: 94

A - 1) No upset or degradation in performance beyond manufacturer's specified limits.
    2) No data loss.

B - 1) Unit self recovers without user intervention.
    2) No data loss.

C - 1) Upset OK provided that unit will function after user intervention.

2.13 Reliability

Measurement type	Specification
Nonrecoverable read errors	1 per 10^{14} bits read, max.
Annualized Failure Rate (AFR)	<1.0% Desktop and Gaming use

Load/Unload (L/UL)
   Controlled L/UL cycles
   (40°C, 50% Relative Humidity)
 	
   Emergency L/UL cycles
   (40°C, 50% Relative Humidity)
	50,000
	
	 20,000

Service Life	5 Years
Warranty	To determine the warranty for a specific drive, use a web browser to access the following web page: www.seagate.com/support/service/ From this page, click on the "Verify Your Warranty" link. You will be asked to provide the drive serial number, model number (or part number) and country of purchase. The system will display the warranty information for your drive.

2.14 Agency certification

2.14.1 Safety certification

The drives are recognized in accordance with UL 1950 and CSA C22.2 (950) and meet all applicable sections of IEC950 and EN 60950 as tested by TUV North America.

2.14.2 Electromagnetic compatibility

Hard drives that display the CE mark comply with the European Union (EU) requirements specified in the Electromagnetic Compatibility Directive (89/336/EEC). Testing is performed to the levels specified by the product standards for Information Technology Equipment (ITE). Emission levels are defined by EN 55022, Class B and the immunity levels are defined by EN 55024.

Seagate uses an independent laboratory to confirm compliance with the EC directives specified in the previous paragraph. Drives are tested in representative end-user systems. Although CE-marked Seagate drives comply with the directives when used in the test systems, we cannot guarantee that all systems will comply with the directives. The drive is designed for operation inside a properly designed enclosure, with properly shielded I/O cable (if necessary) and terminators on all unused I/O ports. Computer manufacturers and system integrators should confirm EMC compliance and provide CE marking for their products.

Korean RRL

If these drives have the Korea Ministry of Information and Communication (MIC) logo, they comply with paragraph 1 of Article 11 of the Electromagnetic Compatibility control Regulation and meet the Electromagnetic Compatibility (EMC) Framework requirements of the Radio Research Laboratory (RRL) Ministry of Information and Communication Republic of Korea.

These drives have been tested and comply with the Electromagnetic Interference/Electromagnetic Susceptibility (EMI/EMS) for Class B products. Drives are tested in a representative, end-user system by a Korean-recognized lab.

• EUT name (model numbers): ST9402115AS, ST920217AS.

• Certificate numbers:

ST9402115AS	E-D011-05-2395(B)
ST920217AS	E-D011-05-2395(B)

• Trade name or applicant: Seagate Technology

• Manufacturing date: June 2005

• Manufacturer/nationality: Seagate Technology International

Australian C-Tick (N176)

If these models have the C-Tick marking, they comply with the Australia/New Zealand Standard AS/NZS3548 1995 and meet the Electromagnetic Compatibility (EMC) Framework requirements of the Australian Communication Authority (ACA).

2.14.3   FCC verification

These drives are intended to be contained solely within a personal computer or similar enclosure (not attached as an external device). As such, each drive is considered to be a subassembly even when it is individually marketed to the customer. As a subassembly, no Federal Communications Commission verification or certification of the device is required.

Seagate Technology LLC has tested this device in enclosures as described above to ensure that the total assembly (enclosure, disc drive, motherboard, power supply, etc.) does comply with the limits for a Class B computing device, pursuant to Subpart J, Part 15 of the FCC rules. Operation with noncertified assemblies is likely to result in interference to radio and television reception.

Radio and television interference. This equipment generates and uses radio frequency energy and if not installed and used in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception.

This equipment is designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television, which can be determined by turning the equipment on and off, you are encouraged to try one or more of the following corrective measures:

• Reorient the receiving antenna.

• Move the device to one side or the other of the radio or TV.

• Move the device farther away from the radio or TV.

• Plug the computer into a different outlet so that the receiver and computer are on different branch outlets.

If necessary, you should consult your dealer or an experienced radio/television technician for additional suggestions. You may find helpful the following booklet prepared by the Federal Communications Commission: *How to Identify and Resolve Radio-Television Interference Problems*. This booklet is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. Refer to publication number 004-000-00345-4.

2.15   Environmental protection

Seagate designs its products to meet environmental protection requirements worldwide, including regulations restricting certain chemical substances.

2.15.1   European Union Restriction of Hazardous Substances (RoHS)

A new law, the European Union Restriction of Hazardous Substances (RoHS) directive, will restrict the presence of chemical substances, including Lead (Pb), in electronic products effective July 2006. The directive's requirements have not been finalized. This drive is manufactured with components and materials that are expected to comply with the RoHS directive when the directive takes effect.

2.16   Corrosive environment

Seagate electronic drive components pass accelerated corrosion testing equivalent to 10 years exposure to light industrial environments containing sulfurous gases, chlorine and nitric oxide, classes G and H per ASTM B845. However, this accelerated testing cannot duplicate every potential application environment.

Users should use caution exposing any electronic components to uncontrolled chemical pollutants and corrosive chemicals as electronic drive component reliability can be affected by the installation environment. The silver, copper, nickel and gold films used in Seagate products are especially sensitive to the presence of sulfide, chloride, and nitrate contaminants. Sulfur is found to be the most damaging. In addition, electronic components should never be exposed to condensing water on the surface of the printed circuit board assembly (PCBA) or exposed to an ambient relative humidity greater than 95%. Materials used in cabinet fabrication, such as vulcanized rubber, that can outgas corrosive compounds should be minimized or eliminated. The useful life of any electronic equipment may be extended by replacing materials near circuitry with sulfide-free alternatives.

3.0 Configuring and mounting the drive

This section contains the specifications and instructions for configuring and mounting the drive.

3.1 Handling and static-discharge precautions

After unpacking, and before installation, the drive may be exposed to potential handling and electrostatic discharge (ESD) hazards. Observe the following standard handling and static-discharge precautions:

Caution:

• Keep the drive in the electrostatic discharge (ESD) bag until you are ready for installation to limit the drive's exposure to ESD.

• Before handling the drive, put on a grounded wrist strap, or ground yourself frequently by touching the metal chassis of a computer that is plugged into a grounded outlet. Wear a grounded wrist strap throughout the entire installation procedure.

• Handle the drive only by its edges or frame.

• The drive is fragile—handle it with care. Do not press down on the drive top cover.

• Always rest the drive on a padded, antistatic surface until you mount it in the computer.

• Do not touch the connector pins or the printed circuit board.

• Do not remove the factory-installed labels from the drive or cover them with additional labels. Removal voids the warranty. Some factory-installed labels contain information needed to service the drive. Other labels are used to seal out dirt and contamination.

3.2   Configuring the drive

Each drive on the Serial ATA interface connects in a point-to-point configuration with the Serial ATA host adapter. There is no master/slave relationship because each drive is considered a master in a point-to-point relationships. 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 means both drives behave as if they are Device 0 (master) devices.

Serial ATA drives are designed for easy installation with no jumpers, terminators, or other settings. It is not necessary to set any jumpers on this drive for proper operation. The jumper block adjacent to the signal connector is for factory use only.

SATA interface connector

Jumper block
(factory use only)   SATA power connector
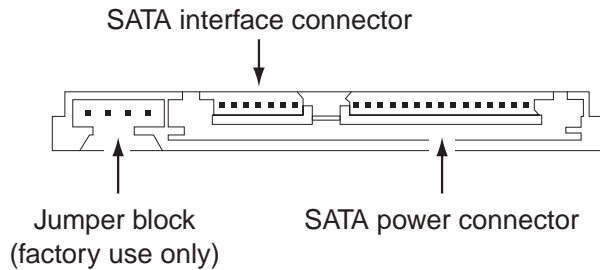
Figure 2. Serial ATA connectors

3.3   Serial ATA cables and connectors

The Serial ATA interface cable consists of four conductors in two differential pairs, plus three ground connections. The cable size may be 30 to 26 AWG with a maximum length of one meter (39.37 inches). See Table 7 for connector pin definitions. Either end of the SATA signal cable can be attached to the drive or host.

For direct backplane connection, the drive connectors are inserted directly into the host receptacle. The drive and the host receptacle incorporate features that enable the direct connection to be hot pluggable and blind mateable.

For installations which require cables, you can connect the drive as illustrated in Figure 3.
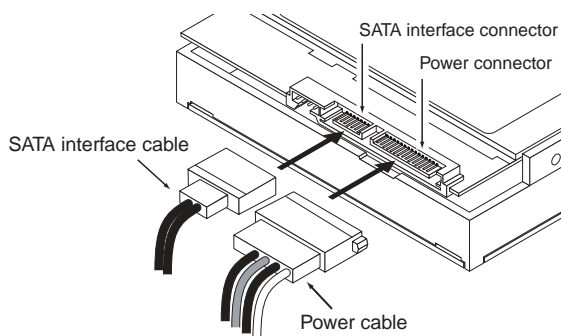
SATA interface connector
Power connector

SATA interface cable

Power cable

Figure 3. Attaching SATA cabling

Each cable is keyed to ensure correct orientation.

3.4 Drive mounting

You can mount the drive using four screws in the side-mounting holes or four screws in the bottom-mounting holes. See Figure 4 for drive mounting dimensions. Follow these important mounting precautions when mounting the drive:

• Allow a minimum clearance of 0.030 inches (0.76 mm) around the entire perimeter of the drive for cooling.

• Use only M3 UNC mounting screws.

• Do not overtighten the mounting screws (maximum torque: 4.0 inch-lb).

• Four (4) threads (0.080 inches) minimum screw engagement recommended.

Measurements shown below are in inches.
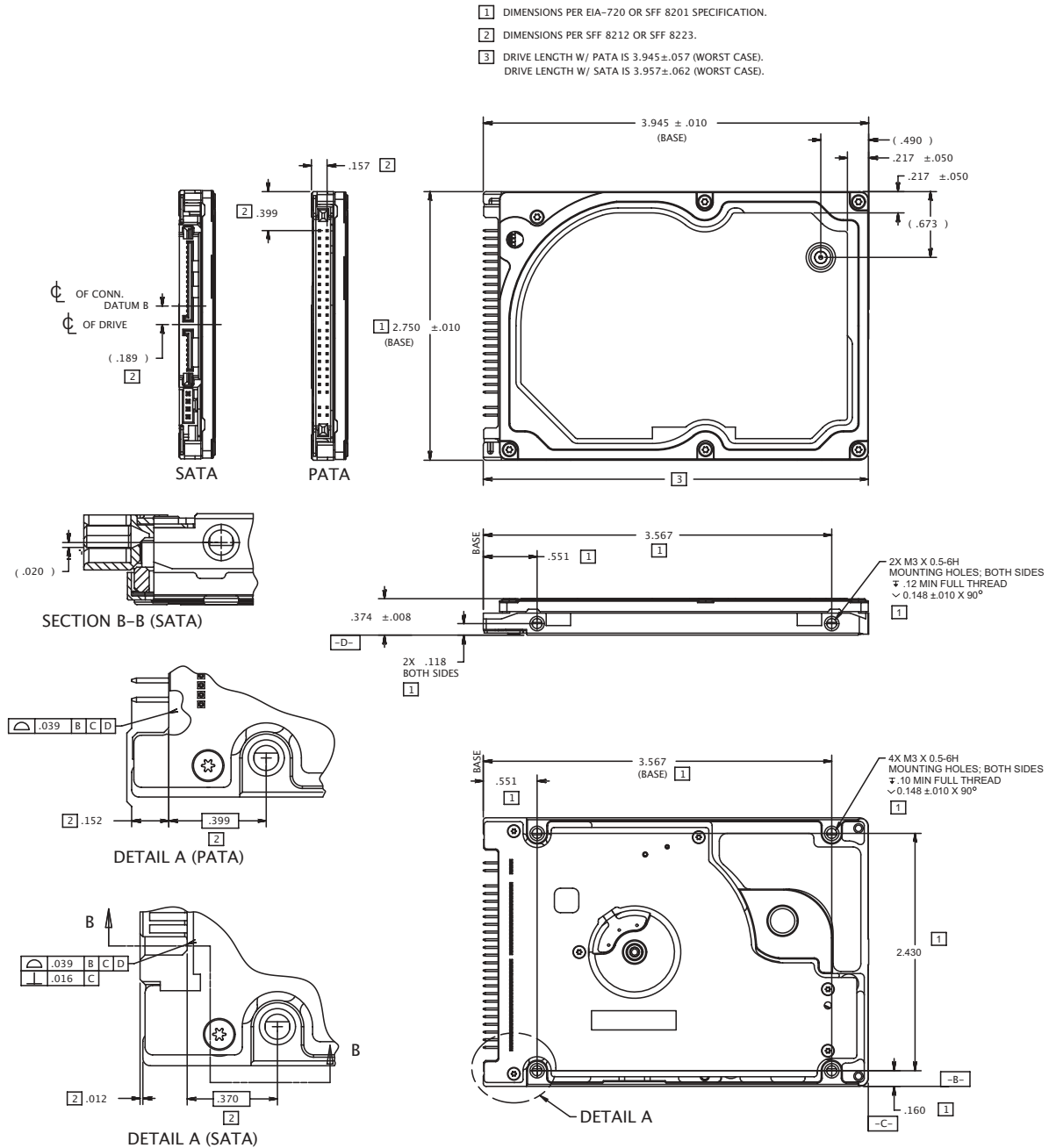
Figure 4. Mounting dimensions—top, side and end view

4.0   Serial ATA (SATA) interface

These drives use the industry-standard Serial ATA interface that supports FIS data transfers. It supports ATA programmed input/output (PIO) modes 0–4; multiword DMA modes 0–2, and Ultra DMA modes 0–6. The drive also supports the use of the IORDY signal to provide reliable high-speed data transfers.

For detailed information about the Serial ATA interface, refer to the "Serial ATA: High Speed Serialized AT Attachment" specification.

Note.   ST9402115AS and ST920217AS drives do not support Native Command Queueing (NCQ).

4.1   Hot-Plug compatibility

LD25 Series SATA drives incorporate connectors which enable you to hot plug these drives in accordance with the Serial ATA: High Speed Serialized AT Attachment specification revision 2.0. This specification can be downloaded from http://www.serialata.com.

4.2   Serial ATA device plug connector pin definitions

Table 7 summarizes the signals on the Serial ATA interface and power connectors..

Table 7:   Serial ATA connector pin definitions

Segment	Pin	Function	Definition
	S1	Ground	2nd mate
	S2	A+	Differential signal pair A from Phy
	S3	A-	
	S4	Ground	2nd mate
	S5	B-	Differential signal pair B from Phy
	S6	B+	
Signal	S7	Ground	2nd mate

Key and spacing separate signal and power segments

Table 7:   Serial ATA connector pin definitions

Segment	Pin	Function	Definition
Power	P1	V_{33}	3.3V power
	P2	V_{33}	3.3V power
	P3	V_{33}	3.3V power, pre-charge, 2nd mate
	P4	Ground	1st mate
	P5	Ground	2nd mate
	P6	Ground	2nd mate
	P7	V_5	5V power, pre-charge, 2nd mate
	P8	V_5	5V power
	P9	V_5	5V power
	P10	Ground	2nd mate
	P11	Reserved	The pin corresponding to P11 in the backplane receptacle connector is also reserved The corresponding pin to be mated with P11 in the power cable receptacle connector shall always be grounded
	P12	Ground	1st mate.
	P13	V_{12}	12V power, pre-charge, 2nd mate
	P14	V_{12}	12V power
	P15	V_{12}	12V power

Notes:

1. All pins are in a single row, with a 1.27 mm (0.050") pitch.

2. The comments on the mating sequence apply to the case of backplane blindmate connector only. In this case, the mating sequences are:
    *   the ground pins P4 and P12.
    *   the pre-charge power pints and the other ground pins.
    *   the signal pins and the rest of the power pins.

3. There are three power pins for each voltage. One pin from each voltage is used for pre-charge when installed in a blind-mate backplane configuration.

4. All used voltage pins (V_x) must be terminated.

4.3 Supported ATA commands

The following table lists Serial ATA standard commands that the drive supports. For a detailed description of the ATA commands, refer to the Serial ATA: High Speed Serialized AT Attachment specification. See "S.M.A.R.T. commands" on page 30.for details and subcommands used in the S.M.A.R.T. implementation.

Command name	Command code (in hex)
ATA-standard commands	
Device Configuration Restore	B1h/C0h
Device Configuration Freeze Lock	B1h/C1h
Device Configuration Identify	B1h/C2h
Device Configuration Set	B1h/C3h
Download Microcode	92h
Execute Device Diagnostics	90h
Flush Cache	E7h
Flush Cache Extended	EAh
Identify Device	ECh
Initialize Device Parameters	91h
Read Buffer	E4h
Read DMA	C8h
Read DMA Extended	25h
Read DMA without Retries	C9h
Read Long with Retries	22h
Read Long without Retries	23h
Read Multiple	C4h
Read Multiple Extended	29h
Read Native Max Address	F8h
Read Native Max Address Extended	27h
Read Sectors	20h
Read Sectors Extended	24h
Read Sectors without Retries	21h
Read Verify Sectors	40h
Read Verify Sectors Extended	42h
Read Verify Sectors without Retries	41h
Seek	70h
Set Features	EFh
Set Max Address	F9h

Command name	Command code (in hex)	
Note: Individual Set Max commands are identified by the value placed in the Set Max Features register as defined to the right.	Address: Password: Lock: Unlock: Freeze Lock:	00_H 01_H 02_H 03_H 04_H
Set Multiple Mode	C6h	
S.M.A.R.T. Disable Operations	B0h/D9h	
S.M.A.R.T. Enable/Disable Autosave	B0h/D2h	
S.M.A.R.T. Enable Operations	B0h/D8h	
S.M.A.R.T. Enable/Disable Auto Offline	B0h/DBh	
S.M.A.R.T. Enable One Attribute Modification	B0h/E0h	
S.M.A.R.T. Execute Offline	B0h/D4h	
S.M.A.R.T. Read Attribute Thresholds	B0h/D1h	
S.M.A.R.T. Read Data	B0h/D0h	
S.M.A.R.T. Read Log Sector	B0h/D5h	
S.M.A.R.T. Return Status	B0h/DAh	
S.M.A.R.T. Save Attribute Values	B0h/D3h	
S.M.A.R.T. Write Attribute Thresholds	B0h/D7h	
S.M.A.R.T. Write Attribute Values	B0h/E1h	
S.M.A.R.T. Write Log Sector	B0h/D6h	
Write Buffer	E8h	
Write DMA	CAh	
Write DMA Extended	35h	
Write DMA without Retries	CBh	
Write Long with Retries	32h	
Write Long without Retries	33h	
Write Multiple	C5h	
Write Sectors	30h, 31h	
Write Sectors Extended	34h	
ATA-standard power-management commands		
Check Power Mode	98h or E5h	
Idle	97h or E3h	
Idle Immediate	95h or E1h	
Sleep	99h or E6h	
Standby	96h or E2h	
Standby Immediate	94h or E0h	
ATA-standard security commands		

Command name	Command code (in hex)
Security Set Password	F1h
Security Unlock	F2h
Security Erase Prepare	F3h
Security Erase Unit	F4h
Security Freeze Lock	F5h
Security Disable Password	F6h

4.3.1 Identify Device command

The Identify Device command (command code EC_H) transfers information about the drive to the host following power up. The data is organized as a single 512-byte block of data, whose contents are shown in the table on page 27. All reserved bits or words should be set to zero. Parameters listed with an "x" are drive-specific or vary with the state of the drive. See Section 2.0 on page 3 for default parameter settings.

The following commands contain drive-specific features that may not be included in the Serial ATA specification.

Word	Description	Value
0	Configuration information: • Bit 15: 0 = ATA; 1 = ATAPI • Bit 7: removable media • Bit 6: removable controller • Bit 0: reserved	$0C5A_H$
1	Number of logical cylinders	16,383
2	ATA-reserved	0000_H
3	Number of logical heads	16
4	Retired	0000_H
5	Retired	0000_H
6	Number of logical sectors per logical track: 63	$003F_H$
7–9	Retired	0000_H
10–19	Serial number: (20 ASCII characters, 0000_H = none)	ASCII
20	Retired	0000_H
21	Retired	0400_H
22	Obsolete	0000_H
23–26	Firmware revision (8 ASCII character string, padded with blanks to end of string)	x.xx
27–46	Drive model number: (40 ASCII characters, padded with blanks to end of string)	ST9402115AS ST920217AS
47	(Bits 7–0) Maximum sectors per interrupt on Read multiple and Write multiple (16)	8010_H
48	Reserved	0000_H
49	Standard Standby timer, IORDY supported and may be disabled	$2F00_H$
50	ATA-reserved	0000_H
51	PIO data-transfer cycle timing mode	0200_H
52	Retired	0200_H
53	Words 54–58, 64–70 and 88 are valid	0007_H
54	Number of current logical cylinders	$xxxx_H$
55	Number of current logical heads	$xxxx_H$
56	Number of current logical sectors per logical track	$xxxx_H$
57–58	Current capacity in sectors	$xxxx_H$

Word	Description	Value
59	Number of sectors transferred during a Read Multiple or Write Multiple command	$xxxx_H$
60–61	Total number of user-addressable LBA sectors available (see Section 2.2 for related information)	ST9402115AS = 82,443,600 ST920217AS = 41,021,800
62	Retired	0000_H
63	Multiword DMA active and modes supported (see note following this table)	$xx07_H$
64	Advanced PIO modes supported (modes 3 and 4 supported)	0003_H
65	Minimum multiword DMA transfer cycle time per word (120 nsec)	0078_H
66	Recommended multiword DMA transfer cycle time per word (120 nsec)	0078_H
67	Minimum PIO cycle time without IORDY flow control (240 nsec)	$00F0_H$
68	Minimum PIO cycle time with IORDY flow control (120 nsec)	0078_H
69–74	ATA-reserved	0000_H
75	Queue depth	0000_H
76–79	ATA-reserved	0000_H
80	Major version number	$003E_H$
81	Minor version number	0000_H
82	Command sets supported	$306B_H$
83	Command sets supported	4001_H
84	Command sets support extension	4000_H
85	Command sets enabled	$30xx_H$
86	Command sets enabled	0001_H
87	Command sets enable extension	4000_H
88	Ultra DMA support and current mode (see note following this table)	$xx3F_H$
89	Security erase time	0000_H
90	Enhanced security erase time	0000_H
92	Master password revision code	$FFFE_H$
93	Hardware reset value (see description following this table)	$xxxx_H$
94	Auto acoustic management setting	$xxxx_H$
95–99	ATA-reserved	0000_H
100–103	Total number of user-addressable LBA sectors available (see Section 2.2 for related information) These words are required for drives that support the 48-bit addressing feature. Maximum value: 0000FFFFFFFFFFFFh.	ST9402115AS = 82,443,600 ST920217AS = 41,021,800

Word	Description	Value
104–127	ATA-reserved	0000$_H$
128	Security status	0001$_H$
129–159	Seagate-reserved	*xxxx*$_H$
160–254	ATA-reserved	0000$_H$
255	Integrity word	xxA5$_H$

Note. See the bit descriptions below for words 63, 88, 93 and 94 of the Identify Drive data:

Description (if bit is set to 1)

	Bit	Word 63
	0	Multiword DMA mode 0 is supported.
	1	Multiword DMA mode 1 is supported.
	2	Multiword DMA mode 2 is supported.
	8	Multiword DMA mode 0 is currently active.
	9	Multiword DMA mode 1 is currently active.
	10	Multiword DMA mode 2 is currently active.
	Bit	**Word 88**
	0	Ultra DMA mode 0 is supported.
	1	Ultra DMA mode 1 is supported.
	2	Ultra DMA mode 2 is supported.
	3	Ultra DMA mode 3 is supported.
	4	Ultra DMA mode 4 is supported.
	8	Ultra DMA mode 0 is currently active.
	9	Ultra DMA mode 1 is currently active.
	10	Ultra DMA mode 2 is currently active.
	11	Ultra DMA mode 3 is currently active.
	12	Ultra DMA mode 4 is currently active.
	13	Ultra DMA mode 5 is currently active.
	Bit	**Word 93**
	13	1 = 80-conductor cable detected, CBLID above V_{IH} 0 = 40-conductor cable detected, CBLID below V_{IL}

4.3.2 Set Features command

This command controls the implementation of various features that the drive supports. When the drive receives this command, it sets BSY, checks the contents of the Features register, clears BSY and generates an interrupt. If the value in the register does not represent a feature that the drive supports, the command is aborted. Power-on default has the read look-ahead and write caching features enabled. The acceptable values for the Features register are defined as follows:

Table 8:   Set Features command values

02_H Enable write cache *(default)*.

03_H Set transfer mode (based on value in Sector Count register).
Sector Count register values:

00_H Set PIO mode to default (PIO mode 2).

01_H Set PIO mode to default and disable IORDY (PIO mode 2).

08_H PIO mode 0

09_H PIO mode 1

$0A_H$ PIO mode 2

$0B_H$ PIO mode 3

$0C_H$ PIO mode 4 *(default)*

20_H Multiword DMA mode 0

21_H Multiword DMA mode 1

22_H Multiword DMA mode 2

40_H Ultra DMA mode 0

41_H Ultra DMA mode 1

42_H Ultra DMA mode 2

43_H Ultra DMA mode 3

44_H Ultra DMA mode 4

45_H Ultra DMA mode 5

55_H Disable read look-ahead (read cache) feature.

82_H Disable write cache

AA_H Enable read look-ahead (read cache) feature *(default)*.

$F1_H$ Report full capacity available

Note.   At power-on, or after a hardware or software reset, the default values of the features are as indicated above.

4.3.3　S.M.A.R.T. commands

S.M.A.R.T. provides near-term failure prediction for disc drives. When S.M.A.R.T. is enabled, the drive monitors predetermined drive attributes that are susceptible to degradation over time. If self-monitoring determines that a failure is likely, S.M.A.R.T. makes a status report available to the host. Not all failures are predictable. S.M.A.R.T. predictability is limited to the attributes the drive can monitor. For more information on S.M.A.R.T. commands and implementation, see the *Draft ATA-5 Standard.*

SeaTools diagnostic software activates a built-in drive self-test (DST S.M.A.R.T. command for D4$_H$) that eliminates unnecessary drive returns. The diagnostic software ships with all new drives and is also available at: http://seatools.seagate.com.

This drive is shipped with S.M.A.R.T. features disabled. You must have a recent BIOS or software package that supports S.M.A.R.T. to enable this feature. The table below shows the S.M.A.R.T. command codes that the drive uses.

Table 9:　S.M.A.R.T. commands

Code in features register	S.M.A.R.T. command
D0$_H$	S.M.A.R.T. Read Data
D1$_H$	Vendor-specific
D2$_H$	S.M.A.R.T. Enable/Disable Attribute Autosave
D3$_H$	S.M.A.R.T. Save Attribute Values
D4$_H$	S.M.A.R.T. Execute Off-line Immediate (runs DST)
D5$_H$	S.M.A.R.T. Read Log Sector
D6$_H$	S.M.A.R.T. Write Log Sector
D7$_H$	Vendor-specific
D8$_H$	S.M.A.R.T. Enable Operations
D9$_H$	S.M.A.R.T. Disable Operations
DA$_H$	S.M.A.R.T. Return Status

Note.　If an appropriate code is not written to the Features Register, the command is aborted and 0*x*04 (abort) is written to the Error register.

5.0   Seagate Technology support services

Online services

Internet
www.seagate.com for information about Seagate products and services. Worldwide support is available 24 hours daily by e-mail for your questions.

Presales Support: www.seagate.com/support/email/email_presales.html *or* Presales@Seagate.com
Technical Support: www.seagate.com/support/email/email_disc_support.html *or* DiscSupport@Seagate.com

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my.seagate.com is the industry's first Web portal designed specifically for OEMs and distributors. It provides self-service access to critical applications, personalized content and the tools that allow our partners to manage their Seagate account functions. Submit pricing requests, orders and returns through a single, password-protected Web interface—anytime, anywhere in the world.

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SeaFONE® (1-800-SEAGATE) is the Seagate toll-free number (1-800-732-4283) to access our automated directory assistance for Seagate Service Center support options. International callers can reach this service by dialing +1-405-324-4770.

Seagate Service Centers

Presales Support
Our Presales Support staff can help you determine which Seagate products are best suited for your specific application or computer system, as well as drive availability and compatibility.

Technical Support
If you need help installing your drive, consult your system's documentation or contact the dealer's support services department for assistance specific to your system. Seagate technical support is also available to assist you online at support.seagate.com or through one of our call centers. Have your system configuration information and your drive's "ST" model number available.

SeaTDD™ (+1-405-324-3655) is a telecommunications device for the deaf (TDD). You can send questions or comments 24 hours daily and exchange messages with a technical support specialist during normal business hours for the call center in your region.

Customer Service Operations

Warranty Service
Seagate offers worldwide customer support for Seagate drives. Seagate distributors, OEMs and other direct customers should contact their Seagate Customer Service Operations (CSO) representative for warranty-related issues. Resellers or end users of drive products should contact their place of purchase or one of the Seagate CSO warranty centers for assistance. Have your drive's "ST" model number and serial number available.

Data Recovery Services
Seagate offers data recovery services for all formats and all brands of storage media. Our Data Recovery Services labs are currently located in North America. To get a free quick quote or speak with a case management representative, call 1-800-475-0143. Additional information, including an online request form and data loss prevention resources, is available at www.datarecovery.seagate.com.

Authorized Service Centers
In some locations outside the US, you can contact an Authorized Service Center for service.

USA/Canada/Latin America support services

Seagate Service Centers

Presales Support

Call center	Toll-free	Direct dial	FAX
Americas	1-877-271-3285[1]	+1-405-324-4730[1]	+1-405-324-4704

Technical Support

Call center	Toll-free	Direct dial	FAX
Americas	1-800-SEAGATE[2]	+1-405-324-4700[2]	+1-405-324-3339

Customer Service Operations

Warranty Service

Call center	Toll-free	Direct dial	FAX / E-mail
USA, Canada, Mexico and Latin America	1-800-468-3472[3]	—	+1-956-664-4725
Brazil			
Jabil Industrial Do Brasil LTDA[4]	—	+55-11-4191-4761	+55-11-4191-5084 SeagateRMA.br@jabil.com

Data Recovery Services

Call center	Toll-free	Direct dial	FAX
USA, Canada, and Mexico	1-800-475-01435	+1-905-474-2162	1-800-475-0158 +1-905-474-2459

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[1]Hours of operation are 8:00 A.M. to 11:45 A.M. and 1:00 P.M. to 6:00 P.M., Monday through Friday (Central time).
[2]Hours of operation are 8:00 A.M. to 8:00 P.M., Monday through Friday (Central time).
[3]Hours of operation are 8:00 A.M. to 5:00 P.M., Monday through Friday (Central time).
[4]Authorized Service Center
[5]Hours of operation are 8:00 A.M. to 8:00 P.M., Monday through Friday, and 9:00 A.M. to 5:00 P.M., Saturday (Eastern time).

European support services

For presales and technical support in Europe, dial the Seagate Service Center toll-free number for your specific location. If your location is not listed here, dial our presales and technical support call center at +1-405-324-4714 from 8:00 A.M. to 11:45 A.M. and 1:00 P.M. to 5:00 P.M. (Central Europe time) Monday through Friday. The presales and technical support call center is located in Oklahoma City, USA.

For European warranty service, dial the toll-free number for your specific location. If your location is not listed here, dial our European CSO warranty center at +31-20-316-7222 from 8:30 A.M. to 5:00 P.M. (Central Europe time) Monday through Friday. The CSO warranty center is located in Amsterdam, The Netherlands.

Seagate Service Centers

Toll-free support numbers

Call center	Presales and Technical Support	Warranty Service
Austria	—	00 800-47324289
Belgium	00 800-47324283 (00 800-4SEAGATE)	00 800-47324289
Denmark	00 800-47324283	00 800-47324289
France	00 800-47324283	00 800-47324289
Germany	00 800-47324283	00 800-47324289
Ireland	00 800-47324283	00 800-47324289
Italy	00 800-47324283	00 800-47324289
Netherlands	00 800-47324283	00 800-47324289
Norway	00 800-47324283	00 800-47324289
Poland	00 800-311 12 38	00 800-311 12 38
Spain	00 800-47324283	00 800-47324289
Sweden	00 800-47324283	00 800-47324289
Switzerland	00 800-47324283	00 800-47324289
Turkey	00 800-31 92 91 40	00 800-31 92 91 40
United Kingdom	00 800-47324283	00 800-47324289

FAX services—All Europe (toll call)

Technical Support	+1-405-324-3339
Warranty Service	+31-20-653-3513

Africa/Middle East support services

For presales and technical support in Africa and the Middle East, dial our presales and technical support call center at +1-405-324-4714 from 8:00 A.M. to 11:45 A.M. and 1:00 P.M. to 5:00 P.M. (Central Europe time) Monday through Friday. The presales and technical support call center is located in Oklahoma City, USA.

For warranty service in Africa and the Middle East, dial our European CSO warranty center at +31-20-316-7222 from 8:30 A.M. to 5:00 P.M. (Central Europe time) Monday through Friday, or send a FAX to +31-20-653-3513. The CSO warranty center is located in Amsterdam, The Netherlands.

Asia/Pacific support services

For Asia/Pacific presales and technical support, dial the toll-free number for your specific location. The Asia/Pacific toll-free numbers are available from 6:00 A.M. to 10:45 A.M. and 12:00 P.M. to 6:00 P.M. (Australian Eastern time) Monday through Friday, except as noted. If your location is not listed here, direct dial one of our technical support locations.

Warranty service is available from 9:00 A.M. to 6:00 P.M. April through October, and 10:00 A.M. to 7:00 P.M. November through March (Australian Eastern time) Monday through Friday.

Seagate Service Centers

Call center	Toll-free	Direct dial	FAX
Australia	1800-14-7201	—	—
China (Mandarin)[1, 4]	800-810-9668	+86-10-6225-5336	—
Hong Kong	800-90-0474	—	—
Hong Kong (Cantonese)[1, 4]	001-800-0830-1730	—	—
India[2, 4]	1-600-180-1104	—	—
Indonesia	001-803-1-003-2165	—	—
Japan[3, 4]	0034 800 400 554	—	—
Korea[3, 4]	007 98 8521 7635	—	—
Malaysia	1-800-80-2335	—	—
New Zealand	0800-443988	—	—
Singapore	800-1101-150	—	+65-6488-7525
Taiwan (Mandarin)[1, 4]	00-800-0830-1730	—	—
Thailand	001-800-11-0032165	—	—

Customer Service Operations

Warranty Service

Call center	Toll-free	Direct dial	FAX
Asia/Pacific	—	+65-6485-3595	+65-6485-4860
Australia	1800-12-9277	—	—
India[4]	—	+91-44-821-6164	+91-44-827-2461

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[1]Hours of operation are 8:30 A.M. to 5:30 P.M., Monday through Friday (Australian Western time).
[2]Hours of operation are 9:00 A.M. to 6:00 P.M., Monday through Saturday.
[3]Hours of operation are 9:30 A.M. to 6:30 P.M., Monday through Friday.
[4]Authorized Service Center

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Index