



Product Manual

## EE25.2 Series

### SATA

ST980817SM  
ST980818SM  
ST960817SM  
ST960818SM  
ST940817SM  
ST940818SM  
ST930817SM  
ST930818SM

### PATA

ST980817AM  
ST980818AM  
ST960817AM  
ST960818AM  
ST940817AM  
ST940818AM  
ST930817AM  
ST930818AM

100448541  
Rev. E  
December 2008

Copyright © 2007 - 2008 Seagate Technology LLC. All rights reserved. Printed in USA.

Publication number: 100448541, Rev. E, December 2008

Seagate, Seagate Technology and the Wave logo are registered trademarks of Seagate Technology LLC in the United States and/or other countries. EE25 Series is either a trademark or registered trademark of Seagate Technology LLC or one of its affiliated companies in the United States and/or other countries. All other trademarks or registered trademarks are the property of their respective owners.

When referring to hard drive capacity, one gigabyte, or GB, equals one billion bytes. Your computer's operating system may use a different standard of measurement and report a lower capacity. In addition, some of the listed capacity is used for formatting and other functions, and thus will not be available for data storage. Quantitative usage examples for various applications are for illustrative purposes. Actual quantities will vary based on various factors, including file size, file format, features and application software. Seagate reserves the right to change, without notice, product offerings or specifications.

# Contents

<b>1.0</b>	<b>Introduction</b>	<b>1</b>
<b>2.0</b>	<b>Drive specifications</b>	<b>3</b>
2.1	Specification summary	3
2.2	Formatted capacity	12
2.3	Default logical geometry	12
2.4	Physical organization	13
2.5	Recording technology	13
2.6	Physical characteristics	14
2.7	Seek time	14
2.8	Start/stop times	15
2.9	Power specifications	15
2.9.1	Power consumption	15
2.9.2	Conducted noise	17
2.9.3	Voltage tolerance	17
2.9.4	Power-management modes	18
2.10	Environmental specifications	19
2.10.1	Ambient temperature	19
2.10.2	Temperature gradient	19
2.10.3	Humidity	19
2.11	Altitude	19
2.11.1	Shock	19
2.11.2	Vibration	20
2.12	Acoustics	20
2.13	Electromagnetic immunity	21
2.14	Reliability	22
2.15	Agency certification	22
2.15.1	Safety certification	22
2.15.2	Electromagnetic compatibility	22
2.15.3	FCC verification	23
2.16	Environmental protection	24
2.16.1	European Union Restriction of Hazardous Substances (RoHS)	24
2.17	Corrosive environment	24
<b>3.0</b>	<b>Mounting and configuring the drive</b>	<b>25</b>
3.1	Handling and static discharge precautions	25
3.2	Drive mounting	25
3.3	Breather filter hole precautions	27
3.4	How to configure the drive	28
3.4.1	How to configure and connect Serial ATA (SATA) drives	28
3.4.2	How to configure Parallel ATA (PATA) drives	29
<b>4.0</b>	<b>Interface</b>	<b>31</b>
4.1	Serial ATA (SATA) interface	32
4.1.1	Hot-Plug compatibility	32
4.1.2	Serial ATA device plug connector pin definitions	32
4.2	Parallel ATA (ATA) interface	34
4.2.1	PATA interface signals and connector pins	34
4.3	Supported ATA commands	35
4.4	Identify Device command	37
4.5	Set Features command	40
4.6	S.M.A.R.T. commands	41
<b>5.0</b>	<b>Seagate Technology support services</b>	<b>43</b>



## List of Figures

Figure 1.	Typical 5V startup and operation current profile . . . . .	17
Figure 2.	Mounting dimensions—top, side and end view . . . . .	26
Figure 3.	Breather filter hole location . . . . .	27
Figure 4.	SATA connectors . . . . .	28
Figure 5.	Attaching SATA cabling . . . . .	28
Figure 6.	Jumper settings . . . . .	29



## 1.0 Introduction

---

This manual describes the functional, mechanical and interface specifications for the following Seagate® EE25.2 Series drives:

Market	Capacity	Interface	Model
Extreme	80 GBytes	PATA	ST980817AM
Extreme	80 Gbytes	SATA	ST980817SM
Extreme	60 Gbytes	PATA	ST960817AM
Extreme	60 Gbytes	SATA	ST960817SM
Extreme	40 Gbytes	PATA	ST940817AM
Extreme	40 Gbytes	SATA	ST940817SM
Extreme	30 Gbytes	PATA	ST930817AM
Extreme	30 Gbytes	SATA	ST930817SM
Rugged	80 GBytes	PATA	ST980818AM
Rugged	80 Gbytes	SATA	ST980818SM
Rugged	60 Gbytes	PATA	ST960818AM
Rugged	60 Gbytes	SATA	ST960818SM
Rugged	40 Gbytes	PATA	ST940818AM
Rugged	40 Gbytes	SATA	ST940818SM
Rugged	30 Gbytes	PATA	ST930818AM
Rugged	30 Gbytes	SATA	ST930818SM

These drives provide the following key features:

- Extreme operating environment capabilities:
  - Extreme temperature range: -30°C to 85°C
  - Rugged temperature range: -20°C to 75°C
- 5,400-RPM spindle speed and 8-Mbyte buffer combine for superior performance.
- Quiet operation. Fluid Dynamic Bearing (FDB) motor.
- High instantaneous (burst) data transfer rates (up to 3 Gbytes per second) using SATA interface.
- Giant magnetoresistive (GMR) recording heads and EPRML technology, which 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.

- 900 Gs nonoperating shock and 300 Gs 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 disc drives.
- Support for S.M.A.R.T. drive monitoring and reporting.
- Support for Read Multiple and Write Multiple commands.
- PATA models support for autodetection of master/slave drives that use cable select (CSEL).



## **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 to indicate the models documented in this manual.

### **2.1 Specification summary**

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

**Table 1: Specifications for 80 Gbyte models**

Drive specification	ST980817AM (Extreme)	ST980818AM (Rugged)	ST980817SM (Extreme)	ST980818SM (Rugged)
Formatted (512 bytes/sector)*	80 Gbytes			
Guaranteed sectors	156,301,488			
Interface	PATA		SATA	
Bytes per sector	512			
Physical read/write heads	2			
Discs	1			
Cache	8 Mbytes			
Recording density, BPI	840k bits/inch (typical)			
Track density, TPI	150k tracks/inch (typical)			
Areal density	126 Gbits/inch <sup>2</sup> (typical)			
Spindle speed	5,400 RPM			
Internal data transfer rate	450 Mbits/sec max			
I/O data transfer rate	100 Mbytes/sec		Up to 3 Gbits/sec	
Sustained throughput, typical (nominal operating conditions)	45 Mbytes/sec maximum			
ATA data-transfer modes supported	PIO modes 0–4; Multiword DMA modes 0–2; Ultra DMA modes 0–5			
Height	9.5 +/-0.2 mm (0.374 +/-0.008 inches)			
Width	69.85 +/-0.25 mm (2.750 +/-0.010 inches)			
Length	100.2 +/-0.25 mm (3.945 +/-0.010 inches)		100.5 +/- 1.58 mm (3.957 +/- 0.062 inches)	
Weight	102 grams (0.22 lb) (maximum)			
Average latency	5.6 msec			
Power-on to ready -20 to 85°C for extreme models (75°C for rugged models) -30 to -20°C (extreme models only) 3 sigma maximum at extreme cold temperature	3.0 seconds (typical), 5 seconds (max) 12 seconds (typical) <30 seconds			
Standby to ready -20 to 85°C for extreme models (75°C for rugged models) -30 to -20°C (extreme models only) 3 sigma maximum at extreme cold temperature	3.0 seconds (typical), 5 seconds (max) 12 seconds (typical) <30 seconds			
Track-to-track seek time	1.0 msec (read, typical), 1.5 msec (write, typical)			
Average seek time (random)	12.5 msec (typical), 14 msec (max)			
Average seek, read (random)	13 msec (typical), 14 msec (max)			
Average seek, write (random)	14 msec (typical), 15 msec (max)			
Full-stroke seek	23 msec (typical); 24 msec (max)			
Startup current 5V	1.30 amps (typical) 1.55 amps (max)		1.30 amps (typical) 1.55 amps (max)	
Seek power at 25°C	1.65 watts / 0.33 amps (typical)		2.45 watts / 0.49 amps	
Read power at 25°C	1.40 watts / 0.28 amps (typical)		3.00 watts / 0.60 amps (typical)	
Write power at 25°C	1.50 watts / 0.30 amps (typical)		2.30 watts / 0.46 amps (typical)	
Idle mode (active idle at 25°C)	1.65 watts / 0.33 amps (typical)		2.35 watts / 0.47 amps (typical)	
Standby mode at 25°C	0.26 watts / 0.05 amps (typical)***		1.10 watts / 0.22 amps (typical)***	
Sleep mode at 25°C	0.26 watts / 0.05 amps (typical)***		1.10 watts / 0.22 amps (typical)***	
Voltage tolerance (including noise)	5V ± 5%			
Ambient temperature Operating Nonoperating	-30° to 85°C (Extreme); -20° to 75°C (Rugged); -40° to 95°C (Extreme and Rugged)			

Drive specification	ST980817AM (Extreme)	ST980818AM (Rugged)	ST980817SM (Extreme)	ST980818SM (Rugged)
Temperature gradient (noncondensing)	20°C/hour (operating) 30°C/hour (nonoperating)			
Relative humidity (noncondensing)	5% to 90% (operating) 5% to 95% (nonoperating)			
Relative humidity gradient (noncondensing)	30% per hour max			
Wet bulb temperature	30°C (operating, max) 40°C (nonoperating, max)			
Altitude, operating (Extreme models: -30°C to 85°C) Altitude, operating (Rugged models: -20°C to 75°C)	-304.8 m to 5,500 m (-1000 ft to 18,100 ft)			
Altitude, nonoperating (below mean sea level, max)	-304.8 m to 12,192 m (-1,000 ft to 40,000 ft)			
Shock, operating at 2 msec at 11 msec	300 Gs max 150 Gs max			
Shock, nonoperating at 2 msec at 1 msec at 0.5 msec	800 Gs max 900 Gs max 400 Gs max			
Vibration, operating (linear swept sine) (max displacement may apply below 10 hz)	2.0 Gs (0 to peak, 5–500 Hz); (X, Y, Z axis, 45° angles)			
Vibration, nonoperating (linear swept sine) (max displacement may apply below 22 hz)	5.0 Gs (0 to peak, 5–500 Hz); (X, Y, Z axis, 45° angles)			
Vibration, operating (linear random)	.003 G <sup>2</sup> /hz (5–500 Hz); (X, Y, Z axis, 45° angles)			
Vibration, nonoperating (linear random)	.025 G <sup>2</sup> /Hz, 3.5 Grms (5–500 Hz); (X, Y, Z axis, 45° angles)			
Drive acoustics, sound power				
Idle**	1.7 Bels (typical) 1.9 Bels (max)			
Seek	1.9 Bels (typical) 2.1 Bels (max)			
Nonrecoverable read errors	1 per 10 <sup>14</sup> bits read			
Mean Time Before Failure (MTBF)	1,000,000 power-on hours At 8,760 POH (Power On Hours) per year Max ambient air temperature: 25°C.			
Load/Unload (U/UL) cycles				
25°C, 50% relative humidity	1,200,000 software-controlled power on/off cycles 100,000 hard power on/off cycles			
-30°C, 0% relative humidity (extreme models) 85°C, 20% relative humidity (extreme models)	300,000 software-controlled 100,000 hard power on/off cycles			
-20°C, 0% relative humidity (rugged models) 75°C, 20% relative humidity (rugged models)	300,000 software-controlled 100,000 hard power on/off cycles			
Service life	10 years (form, fit, and function replacement)			
Warranty	To determine the warranty for a specific drive, use a web browser to access the follow-ing web page:  support.seagate.com/customer/warranty_validation.jsp  You will be asked to provide the drive serial number, model number (or part number) and country of purchase. After submitting this information, the system will display the warranty information for your drive.			

\* 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.

\*\*\* Typical host and S4; while in the S3 and S4 states, drive sleep and drive standby modes will not contribute to battery power consumption.

**Table 2: Specifications for 60 Gbyte models**

Drive specification	ST960817AM (Extreme)	ST960818AM (Rugged)	ST960817SM (Extreme)	ST960818SM (Rugged)
Formatted (512 bytes/sector)*	60 Gbytes			
Guaranteed sectors	117,210,240			
Interface	PATA		SATA	
Bytes per sector	512			
Physical read/write heads	2			
Discs	1			
Cache	8 Mbytes			
Recording density, BPI	840k bits/inch (typical)			
Track density, TPI	150k tracks/inch (typical)			
Areal density	126 Gbits/inch <sup>2</sup> (typical)			
Spindle speed	5,400 RPM			
Internal data transfer rate	450 Mbits/sec max			
I/O data transfer rate	100 Mbytes/sec		Up to 3 Gbits/sec	
Sustained throughput, typical (nominal operating conditions)	45 Mbytes/sec maximum			
ATA data-transfer modes supported	PIO modes 0–4; Multiword DMA modes 0–2; Ultra DMA modes 0–5			
Height	9.5 +/-0.2 mm (0.374 +/- .008 inches)			
Width	69.85 +/-0.25 mm (2.750 +/-0.010 inches)			
Length	100.2 +/-0.25 mm (3.945 +/-0.010 inches)		100.5 +/- 1.58 mm (3.957 +/- 0.062 inches)	
Weight	102 grams (0.22 lb) (maximum)			
Average latency	5.6 msec			
Power-on to ready -20 to 85°C for extreme models (75°C for rugged models) -30 to -20°C (extreme models only) 3 sigma maximum at extreme cold temperature	3.0 seconds (typical), 5 seconds (max) 12 seconds (typical) <30 seconds			
Standby to ready -20 to 85°C for extreme models (75°C for rugged models) -30 to -20°C (extreme models only) 3 sigma maximum at extreme cold temperature	3.0 seconds (typical), 5 seconds (max) 12 seconds (typical) <30 seconds			
Track-to-track seek time	1.0 msec (read, typical), 1.5 msec (write, typical)			
Average seek time (random)	12.5 msec (typical), 14 msec (max)			
Average seek, read (random)	13 msec (typical), 14 msec (max)			
Average seek, write (random)	14 msec (typical), 15 msec (max)			
Full-stroke seek	23 msec (typical); 24 msec (max)			
Startup current 5V	1.30 amps (typical) 1.55 amps (max)		1.30 amps (typical) 1.55 amps (max)	
Seek power at 25°C	1.65 watts / 0.33 amps (typical)		2.45 watts / 0.49 amps	
Read power at 25°C	1.40 watts / 0.28 amps (typical)		3.00 watts / 0.60 amps (typical)	
Write power at 25°C	1.50 watts / 0.30 amps (typical)		2.30 watts / 0.46 amps (typical)	
Idle mode (active idle at 25°C)	1.65 watts / 0.33 amps (typical)		2.35 watts / 0.47 amps (typical)	
Standby mode at 25°C	0.26 watts / 0.05 amps (typical)***		1.10 watts / 0.22 amps (typical)***	
Sleep mode at 25°C	0.26 watts / 0.05 amps (typical)***		1.10 watts / 0.22 amps (typical)***	
Voltage tolerance (including noise)	5V ± 5%			
Ambient temperature Operating Nonoperating	-30° to 85°C (Extreme); -20° to 75°C (Rugged); -40° to 95°C (Extreme and Rugged)			

Drive specification	ST960817AM (Extreme)	ST960818AM (Rugged)	ST960817SM (Extreme)	ST960818SM (Rugged)
Temperature gradient (noncondensing)	20°C/hour (operating) 30°C/hour (nonoperating)			
Relative humidity (noncondensing)	5% to 90% (operating) 5% to 95% (nonoperating)			
Relative humidity gradient (noncondensing)	30% per hour max			
Wet bulb temperature	30°C (operating, max) 40°C (nonoperating, max)			
Altitude, operating (Extreme models: -30°C to 85°C) Altitude, operating (Rugged models: -20°C to 75°C)	-304.8 m to 5,500 m (-1000 ft to 18,100 ft)			
Altitude, nonoperating (below mean sea level, max)	-304.8 m to 12,192 m (-1,000 ft to 40,000 ft)			
Shock, operating at 2 msec at 11 msec	300 Gs max 150 Gs max			
Shock, nonoperating at 2 msec at 1 msec at 0.5 msec	800 Gs max 900 Gs max 400 Gs max			
Vibration, operating (linear swept sine) (max displacement may apply below 10 hz)	2.0 Gs (0 to peak, 5–500 Hz); (X, Y, Z axis, 45° angles)			
Vibration, nonoperating (linear swept sine) (max displacement may apply below 22 hz)	5.0 Gs (0 to peak, 5–500 Hz); (X, Y, Z axis, 45° angles)			
Vibration, operating (linear random)	.003 G <sup>2</sup> /hz (5–500 Hz); (X, Y, Z axis, 45° angles)			
Vibration, nonoperating (linear random)	.025 G <sup>2</sup> /Hz, 3.5 Grms (5–500 Hz); (X, Y, Z axis, 45° angles)			
Drive acoustics, sound power				
Idle**	1.7 Bels (typical) 1.9 Bels (max)			
Seek	1.9 Bels (typical) 2.1 Bels (max)			
Nonrecoverable read errors	1 per 10 <sup>14</sup> bits read			
Mean Time Before Failure (MTBF)	1,000,000 power-on hours At 8,760 POH (Power On Hours) per year Max ambient air temperature: 25°C.			
Load/Unload (U/UL) cycles				
25°C, 50% relative humidity	1,200,000 software-controlled power on/off cycles 100,000 hard power on/off cycles			
-30°C, 0% relative humidity (extreme models) 85°C, 20% relative humidity (extreme models)	300,000 software-controlled 100,000 hard power on/off cycles			
-20°C, 0% relative humidity (rugged models) 75°C, 20% relative humidity (rugged models)	300,000 software-controlled 100,000 hard power on/off cycles			
Service life	10 years (form, fit, and function replacement)			
Warranty	To determine the warranty for a specific drive, use a web browser to access the follow-ing web page:  support.seagate.com/customer/warranty_validation.jsp  You will be asked to provide the drive serial number, model number (or part number) and country of purchase. After submitting this information, the system will display the warranty information for your drive.			

\* 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.

\*\*\* Typical host systems will pull power to the drive when entering S3 and S4; while in the S3 and S4 states, drive sleep and drive standby modes will not contribute to battery power consumption.

**Table 3: Specifications for 40 Gbyte models**

Drive specification	ST940817AM (Extreme)	ST940818AM (Rugged)	ST940817SM (Extreme)	ST940818SM (Rugged)
Formatted (512 bytes/sector)*	40 Gbytes			
Guaranteed sectors	78,140,160			
Interface	PATA		SATA	
Bytes per sector	512			
Physical read/write heads	1			
Discs	1			
Cache	8 Mbytes			
Recording density, BPI	840k bits/inch (typical)			
Track density, TPI	150k tracks/inch (typical)			
Areal density	126 Gbits/inch <sup>2</sup> (typical)			
Spindle speed	5,400 RPM			
Internal data transfer rate	450 Mbits/sec max			
I/O data transfer rate	100 Mbytes/sec		Up to 3 Gbits/sec	
Sustained throughput, typical (nominal operating conditions)	45 Mbytes/sec maximum			
ATA data-transfer modes supported	PIO modes 0–4; Multiword DMA modes 0–2; Ultra DMA modes 0–5			
Height	9.5 +/-0.2 mm (0.374 +/- .008 inches)			
Width	69.85 +/-0.25 mm (2.750 +/-0.010 inches)			
Length	100.2 +/-0.25 mm (3.945 +/-0.010 inches)		100.5 +/- 1.58 mm (3.957 +/- 0.062 inches)	
Weight	102 grams (0.22 lb) (maximum)			
Average latency	5.6 msec			
Power-on to ready -20 to 85°C for extreme models (75°C for rugged models) -30 to -20°C (extreme models only) 3 sigma maximum at extreme cold temperature	3.0 seconds (typical), 5 seconds (max) 12 seconds (typical) <30 seconds			
Standby to ready -20 to 85°C for extreme models (75°C for rugged models) -30 to -20°C (extreme models only) 3 sigma maximum at extreme cold temperature	3.0 seconds (typical), 5 seconds (max) 12 seconds (typical) <30 seconds			
Track-to-track seek time	1.0 msec (read, typical), 1.5 msec (write, typical)			
Average seek time (random)	12.5 msec (typical), 14 msec (max)			
Average seek, read (random)	13 msec (typical), 14 msec (max)			
Average seek, write (random)	14 msec (typical), 15 msec (max)			
Full-stroke seek	23 msec (typical); 24 msec (max)			
Startup current 5V	1.30 amps (typical) 1.55 amps (max)		1.30 amps (typical) 1.55 amps (max)	
Seek power at 25°C	1.65 watts / 0.33 amps (typical)		2.45 watts / 0.49 amps	
Read power at 25°C	1.40 watts / 0.28 amps (typical)		3.00 watts / 0.60 amps (typical)	
Write power at 25°C	1.50 watts / 0.30 amps (typical)		2.30 watts / 0.46 amps (typical)	
Idle mode (active idle at 25°C)	1.65 watts / 0.33 amps (typical)		2.35 watts / 0.47 amps (typical)	
Standby mode at 25°C	0.26 watts / 0.05 amps (typical)***		1.10 watts / 0.22 amps (typical)***	
Sleep mode at 25°C	0.26 watts / 0.05 amps (typical)***		1.10 watts / 0.22 amps (typical)***	
Voltage tolerance (including noise)	5V ± 5%			
Ambient temperature Operating Nonoperating	-30° to 85°C (Extreme); -20° to 75°C (Rugged); -40° to 95°C (Extreme and Rugged)			

Drive specification	ST940817AM (Extreme)	ST940818AM (Rugged)	ST940817SM (Extreme)	ST940818SM (Rugged)
Temperature gradient (noncondensing)	20°C/hour (operating) 30°C/hour (nonoperating)			
Relative humidity (noncondensing)	5% to 90% (operating) 5% to 95% (nonoperating)			
Relative humidity gradient (noncondensing)	30% per hour max			
Wet bulb temperature	30°C (operating, max) 40°C (nonoperating, max)			
Altitude, operating (Extreme models: -30°C to 85°C) Altitude, operating (Rugged models: -20°C to 75°C)	-304.8 m to 5,500 m (-1000 ft to 18,100 ft)			
Altitude, nonoperating (below mean sea level, max)	-304.8 m to 12,192 m (-1,000 ft to 40,000 ft)			
Shock, operating at 2 msec at 11 msec	300 Gs max 150 Gs max			
Shock, nonoperating at 2 msec at 1 msec at 0.5 msec	800 Gs max 900 Gs max 400 Gs max			
Vibration, operating (linear swept sine) (max displacement may apply below 10 hz)	2.0 G (0 to peak, 5–500 Hz); (X, Y, Z axis, 45° angles)			
Vibration, nonoperating (linear swept sine) (max displacement may apply below 22 hz)	5.0 Gs (0 to peak, 5–500 Hz); (X, Y, Z axis, 45° angles)			
Vibration, operating (linear random)	.003 G <sup>2</sup> /hz (5–500 Hz); (X, Y, Z axis, 45° angles)			
Vibration, nonoperating (linear random)	.025 G <sup>2</sup> /Hz, 3.5 Grms (5–500 Hz); (X, Y, Z axis, 45° angles)			
Drive acoustics, sound power				
Idle**	1.7 Bels (typical) 1.9 Bels (max)			
Seek	1.9 Bels (typical) 2.1 Bels (max)			
Nonrecoverable read errors	1 per 10 <sup>14</sup> bits read			
Mean Time Before Failure (MTBF)	1,000,000 power-on hours At 8,760 POH (Power On Hours) per year Max ambient air temperature: 25°C.			
Load/Unload (U/UL) cycles				
25°C, 50% relative humidity	1,200,000 software-controlled power on/off cycles 100,000 hard power on/off cycles			
-30°C, 0% relative humidity (extreme models) 85°C, 20% relative humidity (extreme models)	300,000 software-controlled 100,000 hard power on/off cycles			
-20°C, 0% relative humidity (rugged models) 75°C, 20% relative humidity (rugged models)	300,000 software-controlled 100,000 hard power on/off cycles			
Service life	10 years (form, fit, and function replacement)			
Warranty	To determine the warranty for a specific drive, use a web browser to access the follow-ing web page:  support.seagate.com/customer/warranty_validation.jsp  You will be asked to provide the drive serial number, model number (or part number) and country of purchase. After submitting this information, the system will display the warranty information for your drive.			

\* 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.

\*\*\* Typical host systems will pull power to the drive when entering S3 and S4; while in the S3 and S4 states, drive sleep and drive standby modes will not contribute to battery power consumption.

**Table 4: Specifications for 30 Gbyte models**

Drive specification	ST930817AM (Extreme)	ST930818AM (Rugged)	ST930817SM (Extreme)	ST930818SM (Rugged)
Formatted (512 bytes/sector)*	30 Gbytes			
Guaranteed sectors	58,605,120			
Interface	PATA		SATA	
Bytes per sector	512			
Physical read/write heads	1			
Discs	1			
Cache	8 Mbytes			
Recording density, BPI	840k bits/inch (typical)			
Track density, TPI	150k tracks/inch (typical)			
Areal density	126 Gbits/inch <sup>2</sup> (typical)			
Spindle speed	5,400 RPM			
Internal data transfer rate	450 Mbits/sec max			
I/O data transfer rate	100 Mbytes/sec		Up to 3 Gbits/sec	
Sustained throughput, typical (nominal operating conditions)	45 Mbytes/sec maximum			
ATA data-transfer modes supported	PIO modes 0–4; Multiword DMA modes 0–2; Ultra DMA modes 0–5			
Height	9.5 +/-0.2 mm (0.374 +/-0.008 inches)			
Width	69.85 +/-0.25 mm (2.750 +/-0.010 inches)			
Length	100.2 +/-0.25 mm (3.945 +/-0.010 inches)		100.5 +/- 1.58 mm (3.957 +/- 0.062 inches)	
Weight	102 grams (0.22 lb) (maximum)			
Average latency	5.6 msec			
Power-on to ready -20 to 85°C for extreme models (75°C for rugged models) -30 to -20°C (extreme models only) 3 sigma maximum at extreme cold temperature	3.0 seconds (typical), 5 seconds (max) 12 seconds (typical) <30 seconds			
Standby to ready -20 to 85°C for extreme models (75°C for rugged models) -30 to -20°C (extreme models only) 3 sigma maximum at extreme cold temperature	3.0 seconds (typical), 5 seconds (max) 12 seconds (typical) <30 seconds			
Track-to-track seek time	1.0 msec (read, typical), 1.5 msec (write, typical)			
Average seek time (random)	12.5 msec (typical), 14 msec (max)			
Average seek, read (random)	13 msec (typical), 14 msec (max)			
Average seek, write (random)	14 msec (typical), 15 msec (max)			
Full-stroke seek	23 msec (typical); 24 msec (max)			
Startup current 5V	1.30 amps (typical) 1.55 amps (max)		1.30 amps (typical) 1.55 amps (max)	
Seek power at 25°C	1.65 watts / 0.33 amps (typical)		2.45 watts / 0.49 amps	
Read power at 25°C	1.40 watts / 0.28 amps (typical)		3.00 watts / 0.60 amps (typical)	
Write power at 25°C	1.50 watts / 0.30 amps (typical)		2.30 watts / 0.46 amps (typical)	
Idle mode (active idle at 25°C)	1.65 watts / 0.33 amps (typical)		2.35 watts / 0.47 amps (typical)	
Standby mode at 25°C	0.26 watts / 0.05 amps (typical)***		1.10 watts / 0.22 amps (typical)***	
Sleep mode at 25°C	0.26 watts / 0.05 amps (typical)***		1.10 watts / 0.22 amps (typical)***	
Voltage tolerance (including noise)	5V ± 5%			
Ambient temperature Operating Nonoperating	-30° to 85°C (Extreme); -20° to 75°C (Rugged); -40° to 95°C (Extreme and Rugged)			



Drive specification	ST930817AM (Extreme)	ST930818AM (Rugged)	ST930817SM (Extreme)	ST930818SM (Rugged)
Temperature gradient (noncondensing)	20°C/hour (operating) 30°C/hour (nonoperating)			
Relative humidity (noncondensing)	5% to 90% (operating) 5% to 95% (nonoperating)			
Relative humidity gradient (noncondensing)	30% per hour max			
Wet bulb temperature	30°C (operating, max) 40°C (nonoperating, max)			
Altitude, operating (Extreme models: -30°C to 85°C) Altitude, operating (Rugged models: -20°C to 75°C)	-304.8 m to 5,500 m (-1000 ft to 18,100 ft)			
Altitude, nonoperating (below mean sea level, max)	-304.8 m to 12,192 m (-1,000 ft to 40,000 ft)			
Shock, operating at 2 msec at 11 msec	300 Gs max 150 Gs max			
Shock, nonoperating at 2 msec at 1 msec at 0.5 msec	800 Gs max 900 Gs max 400 Gs max			
Vibration, operating (linear swept sine) (max displacement may apply below 10 hz)	2.0 Gs (0 to peak, 5–500 Hz); (X, Y, Z axis, 45° angles)			
Vibration, nonoperating (linear swept sine) (max displacement may apply below 22 hz)	5.0 Gs (0 to peak, 5–500 Hz); (X, Y, Z axis, 45° angles)			
Vibration, operating (linear random)	.003 G <sup>2</sup> /hz (5–500 Hz); (X, Y, Z axis, 45° angles)			
Vibration, nonoperating (linear random)	.025 G <sup>2</sup> /Hz, 3.5 Grms (5–500 Hz); (X, Y, Z axis, 45° angles)			
Drive acoustics, sound power				
Idle**	1.7 Bels (typical) 1.9 Bels (max)			
Seek	1.9 Bels (typical) 2.1 Bels (max)			
Nonrecoverable read errors	1 per 10 <sup>14</sup> bits read			
Mean Time Before Failure (MTBF)	1,000,000 power-on hours At 8,760 POH (Power On Hours) per year Max ambient air temperature: 25°C.			
Load/Unload (U/UL) cycles				
25°C, 50% relative humidity	1,200,000 software-controlled power on/off cycles 100,000 hard power on/off cycles			
-30°C, 0% relative humidity (extreme models) 85°C, 20% relative humidity (extreme models)	300,000 software-controlled 100,000 hard power on/off cycles			
-20°C, 0% relative humidity (rugged models) 75°C, 20% relative humidity (rugged models)	300,000 software-controlled 100,000 hard power on/off cycles			
Service life	10 years (form, fit, and function replacement)			
Warranty	To determine the warranty for a specific drive, use a web browser to access the follow-ing web page:  support.seagate.com/customer/warranty_validation.jsp  You will be asked to provide the drive serial number, model number (or part number) and country of purchase. After submitting this information, the system will display the warranty information for your drive.			

\* 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.

\*\*\* Typical host systems will pull power to the drive when entering S3 and S4; while in the S3 and S4 states, drive sleep and drive standby modes will not contribute to battery power consumption.

## 2.2 Formatted capacity

Model	Formatted capacity*	Guaranteed sectors	Bytes per sector
ST980817AM	80 Gbytes	156,301,488	512
ST980818AM	80 Gbytes	156,301,488	512
ST980817SM	80 Gbytes	156,301,488	512
ST980818SM	80 Gbytes	156,301,488	512
ST960817AM	60 Gbytes	117,210,240	512
ST960818AM	60 Gbytes	117,210,240	512
ST960817SM	60 Gbytes	117,210,240	512
ST960818SM	60 Gbytes	117,210,240	512
ST940817AM	40 Gbytes	78,140,160	512
ST940818AM	40 Gbytes	78,140,160	512
ST940817SM	40 Gbytes	78,140,160	512
ST940818SM	40 Gbytes	78,140,160	512
ST930817AM	30 Gbytes	58,605,120	512
ST930818AM	30 Gbytes	58,605,120	512
ST930817SM	30 Gbytes	58,605,120	512
ST930818SM	30 Gbytes	58,605,120	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

Model	Read/write heads	Number of disks
ST980817AM	2	1
ST980818AM	2	1
ST980817SM	2	1
ST980818SM	2	1
ST960817AM	2	1
ST960818AM	2	1
ST960817SM	2	1
ST960818SM	2	1
ST940817AM	1	1
ST940818AM	1	1
ST940817SM	1	1
ST940818SM	1	1
ST930817AM	1	1
ST930818AM	1	1
ST930817SM	1	1
ST930818SM	1	1

## 2.5 Recording technology

Technology	Specification
Recording density BPI	840k bits/inch typical
Track density TPI	150k tracks/inch typical
Areal density	126 Gbits/inch <sup>2</sup> typical
Spindle speed	5,400 RPM ( $\pm$ 0.2%)
Internal data-transfer rate	450 Mbits/sec max
I/O data transfer rate	PATA: 100 Mbytes/sec max SATA: Up to 3 Gbits/sec max
Sustained throughput, typical (nominal operating conditions)	45 Mbytes/sec maximum
Interleave	1:1
Cache buffer	8 Mbytes (8,192 kbytes)

## 2.6 Physical characteristics

		PATA	SATA
Height	(mm) (inches)	9.5 +/-0.2 0.374 +/-0.008	9.5 +/-0.2 0.374 +/-0.008
Width	(mm) (inches)	69.85 +/-0.25 2.750 +/-0.010	69.85 +/-0.25 2.750 +/-0.010
Length	(mm) (inches)	100.2 +/-0.25 3.945 +/-0.010	100.5 +/- 1.58 3.957 +/- 0.062
Maximum weight	(grams) (pounds)	102 0.22	102 0.22

## 2.7 Seek time

Seek measurements are taken with nominal power. All times are measured using drive diagnostics. The specifications 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.

**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 or exceed 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.

	Read (all temperatures)		Write (all temperatures)	
	msec		msec	
	Typical	Max	Typical	Max
Track-to-track	0.7	1	1	2
Average	13	14	14	15
Full-stroke	23	24	25	27
Average latency	5.6		5.6	

## 2.8 Start/stop times

	Typical	Max
Power-on to ready -20 to 85°C for extreme models (75°C for rugged models) -30 to -20°C (extreme models only) 3 sigma maximum at extreme cold temperature	3.0 seconds 12 seconds -	5.0 seconds - <30 seconds
Standby to ready -20 to 85°C for extreme models (75°C for rugged models) -30 to -20°C (extreme models only) 3 sigma maximum at extreme cold temperature	3.0 seconds 12 seconds -	5.0 seconds - <30 seconds
Spin down (secs typical at 1 to 85°C)	5.0	8.0
Spin down (secs typical at -30 to 0°C)	15	20

## 2.9 Power specifications

The drive receives DC power (+5V) through the interface connector.

### 2.9.1 Power consumption

Power requirements for the drives are listed in the table below. Typical power measurements are based on an average of drives tested, under nominal conditions, using 5.0V input voltage 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 msec. 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 msec.

- **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 mode.

Power dissipation	+5V Average	
	25C	
SATA	Watts	Amps
Spinup, typical	5.0	1.0
Spinup, maximum	6.70	1.34
Idle, active*	2.35	0.47
Seeking	2.45	0.49
Read	3.00	0.60
Write	2.30	0.46
Standby	1.10	0.22
Sleep	1.10	0.22
PATA		
Spinup, typical	5.0	1.0
Spinup, maximum	6.70	1.34
Idle, active*	1.65	0.33
Seeking	1.65	0.33
Read	1.40	0.28
Write	1.50	0.30
Standby	0.26	0.05
Sleep	0.26	0.05

\* 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

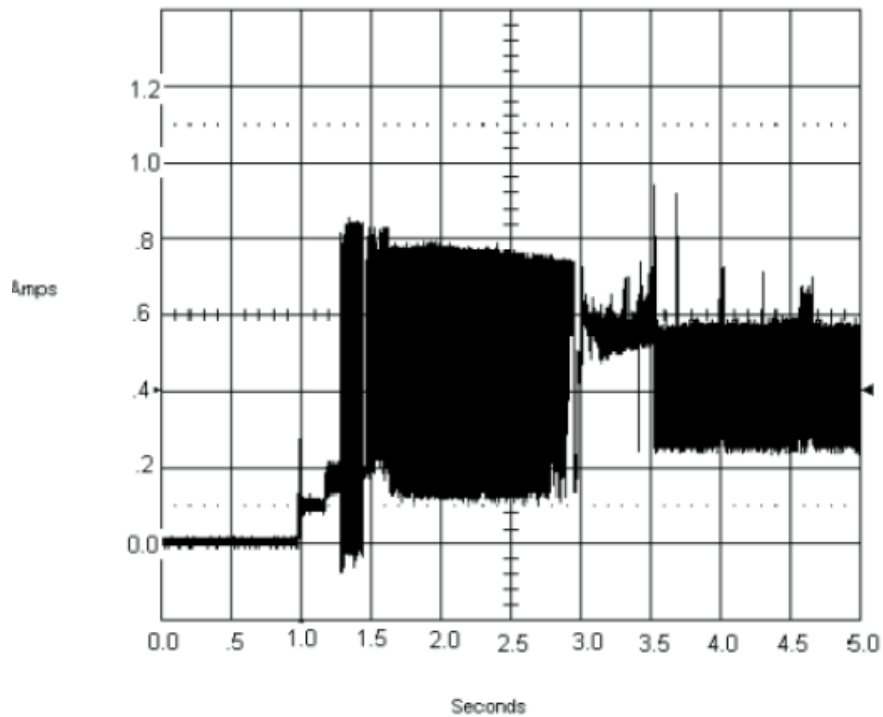


Figure 1. Typical 5V startup and operation current profile

### 2.9.2 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.

### 2.9.3 Voltage tolerance

Voltage tolerance (including noise):

5V  $\pm$  5%

## 2.9.4 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:

Power modes	Heads	Spindle	Buffer	Std timing
Active (operating)	Tracking	Rotating	Enabled	
Idle, performance	Tracking	Rotating	Enabled	
Idle, active	Floating	Rotating	Disabled	100ms
Idle, low power	Parked	Rotating	Disabled	5.00 secs
Standby	Parked	Stopped	Disabled	Set by host
Sleep	Parked	Stopped	Disabled	Set by host

- **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, measured on baseplate, should not exceed 90°C (194°F) within the operating ambient conditions.

Operating	Extreme: -30° to 85°C (-86° to 185°F) Rugged: -20° to 75°C (-68° to 167°F)
Nonoperating	-40° to 95°C (-140° to 203°F)

### 2.10.2 Temperature gradient

Operating	20°C/hour without condensation
Nonoperating	30°C/hour

### 2.10.3 Humidity

#### 2.10.3.1 Relative humidity

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

#### 2.10.3.2 Wet bulb temperature

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

## 2.11 Altitude

Operating (Extreme models: -30°C to 85°C) Operating (Rugged models: -20°C to 75°C)	-304.8 m to 5,500 m (-1000 ft to 18,100 ft)
Nonoperating (below mean sea level, max)	-304.8 m to 12,192 m (-1,000 ft to 40,000 ft)

### 2.11.1 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.

#### 2.11.1.1 Operating shock

These drives comply with the performance levels specified in this document when subjected to a maximum operating shock of 300 Gs based on half-sine shock pulses of 2 msec. Shocks should not be repeated more than two times per second. For 11 msec shock duration, these drives will withstand operating shock up to 150 Gs.

### 2.11.1.2 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 800 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 900 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 400 Gs based on a nonrepetitive half-sine shock pulse of 0.5 msec duration.

## 2.11.2 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.

### 2.11.2.1 Operating vibration

The following table lists the maximum vibration levels that the drive may experience while meeting the performance standards specified in this document.

5–500 Hz	2.0 G (0 to peak) Linear swept sine Max displacement may apply below 10 Hz X, Y, Z axis, 45° angles
5–500 Hz	.003 G <sup>2</sup> /Hz (5–500 Hz) X, Y, Z axis, 45° angles

### 2.11.2.2 Nonoperating vibration

The following table lists the maximum nonoperating vibration that the drive may experience without incurring physical damage or degradation in performance when subsequently put into operation.

5–500 Hz	5.0 Gs (0 to peak) Linear swept sine Max displacement may apply below 22 Hz X, Y, Z axis, 45° angles
5–500 Hz	.025 G <sup>2</sup> /Hz, 3.5 Grms (5–500 Hz) X, Y, Z axis, 45° angles

## 2.12 Acoustics

Drive acoustics are measured as overall A-weighted acoustic sound power levels (no pure tones). 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))

---

**Acoustic mode**

---

<b>Idle*</b>	<b>Seeks</b>
1.7 bels (typ)	1.9 bels (typ)
1.9 bels (max)	2.1 bels (max)

---

\* 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.

## 2.13 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:

Test	Description	Performance level	Reference standard
Electrostatic discharge	Contact, HCP, VCP: $\pm 4$ kV; Air: $\pm 8$ kV	B	EN 61000-4-2: 95
Radiated RF immunity	80 to 2,000 MHz, 10 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	$\pm 1$ kV on AC mains, $\pm 0.5$ kV on external I/O	B	EN 61000-4-4: 95
Surge immunity	$\pm 1$ kV differential, $\pm 2$ 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
Power Frequency H-field immunity	1 A/m, 50Hz/60Hz, 3 axes	A	EN 61000-4-8: 97
Voltage dips, interrupts	30% Reduction for 25 cycles >95% Reduction for 250 cycles >95%, 0.5 cycles	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.

## 2.14 Reliability

Measurement type	Specification
Nonrecoverable read errors	1 per 10 <sup>14</sup> bits read, max.
Mean time between failures (MTBF)	1,000,000 power-on hours At 8,760 POH (Power On Hours) per year Max ambient air temperature: 25°C.
Load/Unload (U/UL) cycles  25°C, 50% relative humidity  -30°C, 0% relative humidity (extreme models) 85°C, 20% relative humidity (extreme models)  -20°C, 0% relative humidity (rugged models) 75°C, 20% relative humidity (rugged models)	1,200,000 software-controlled power on/off cycles 100,000 hard power on/off cycles  300,000 software-controlled 100,000 hard power on/off cycles  300,000 software-controlled 100,000 hard power on/off cycles
Service Life	10 years, form, fit, and function replacement.
Warranty	To determine the warranty for a specific drive, use a web browser to access the following web page:  <a href="http://support.seagate.com/customer/warranty_validation.jsp">support.seagate.com/customer/warranty_validation.jsp</a>  You will be asked to provide the drive serial number, model number (or part number) and country of purchase. After submitting this information, the system will display the warranty information for your drive.

## 2.15 Agency certification

### 2.15.1 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.

### 2.15.2 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: EE25 Series
- Certificate numbers:STX-EE251 (B)
- Trade name or applicant: Seagate Technology International
- Manufacturing date: March 2006
- 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).

### **2.15.3 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.

## **2.16 Environmental protection**

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

### **2.16.1 European Union Restriction of Hazardous Substances (RoHS)**

The European Union Restriction of Hazardous Substances (RoHS) Directive restricts the presence of chemical substances, including Lead (Pb), in electronic products effective July 2006.

A number of parts and materials in Seagate products are procured from external suppliers. We rely on the representations of our suppliers regarding the presence of RoHS substances in these parts and materials. Our supplier contracts require compliance with our chemical substance restrictions, and our suppliers document their compliance with our requirements by providing material content declarations for all parts and materials for the disc drives documented in this publication. Current supplier declarations include disclosure of the inclusion of any RoHS-regulated substance in such parts or materials.

Seagate also has internal systems in place to ensure ongoing compliance with the RoHS Directive and all laws and regulations which restrict chemical content in electronic products. These systems include standard operating procedures that ensure that restricted substances are not utilized in our manufacturing operations, laboratory analytical validation testing, and an internal auditing process to ensure that all standard operating procedures are complied with.

## **2.17 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 Mounting and configuring the drive

---

This section contains the specifications and instructions for mounting and configuring 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 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 2 for drive mounting dimensions (dimensions in inches with mm in parentheses). 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 x 0.5 mounting screws.
- Do not overtighten the mounting screws (maximum torque: 4.0 inch-lb).
- Four (4) threads (0.080 inches) minimum screw engagement recommended.
- If mounting drive using the bottom holes, ensure the coplanarity of the mating surface is 0.010 inches or less.

- 1 DIMENSIONS PER EIA-720 OR SFF 8201 SPECIFICATION.
- 2 DIMENSIONS PER SFF 8212 OR SFF 8223.
- 3 DRIVE LENGTH W/ PATA IS 3.945±.057 (WORST CASE).  
DRIVE LENGTH W/ SATA IS 3.957±.062 (WORST CASE).

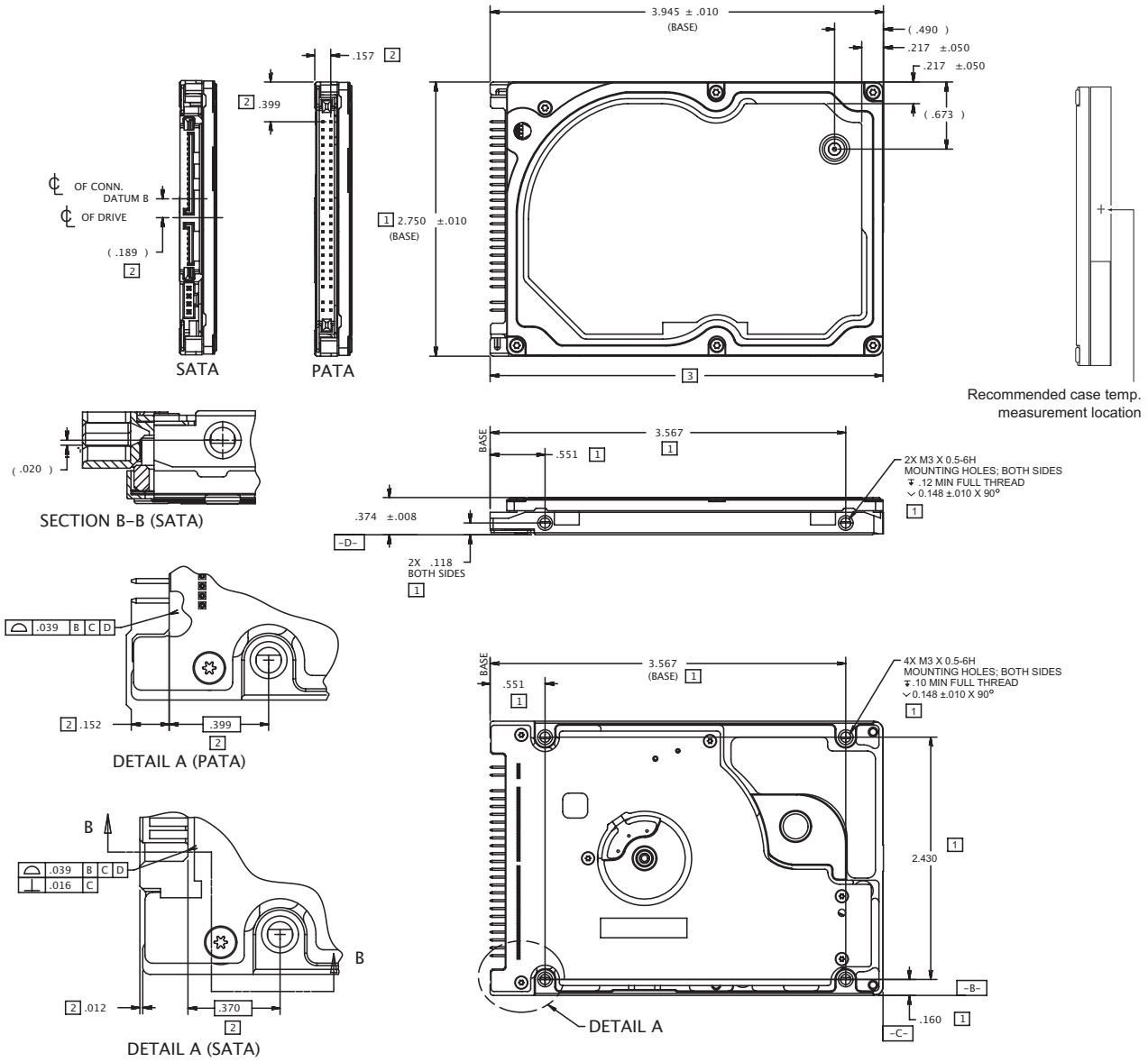
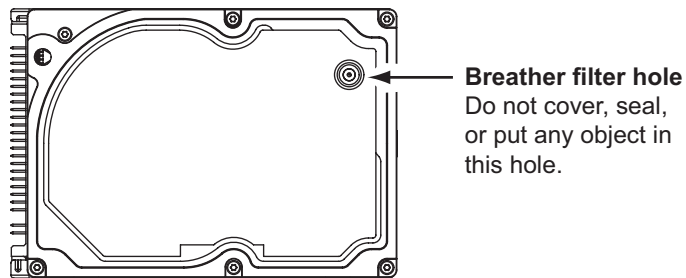


Figure 2. Mounting dimensions—top, side and end view

### 3.3 Breather filter hole precautions

Observe the following breather filter hole precautions to ensure full functionality and prevent possible damage to the drive.



**Figure 3 Breather filter hole location**

**Caution: Do not cover, seal, or insert any object into this hole.**

This hole has two purposes:

- To allow condensation inside the hard disc to escape
- To allow air pressure inside the hard disc to equalize with ambient pressure

**Note.** If this hole is covered, sealed, or penetrated by any object, drive reliability may be compromised and could lead to permanent damage. Covering or sealing this hole voids the warranty.

### 3.4 How to configure the drive

See Section 3.4.1 beginning on page 30 for SATA drives.

See Section 3.4.2 beginning on page 31 for PATA drives.

#### 3.4.1 How to configure and connect Serial ATA (SATA) drives

##### 3.4.1.1 How to configure the drive

Each drive on the SATA interface connects in a point-to-point configuration with the SATA 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 SATA 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.

SATA 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.

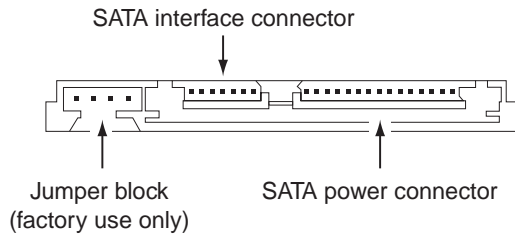


Figure 4. SATA connectors

##### 3.4.1.2 How to connect SATA cables

The SATA 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 5 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 5.

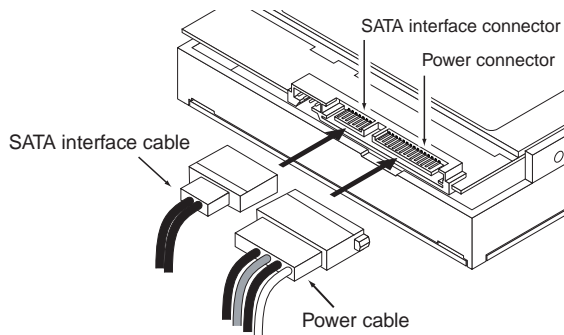


Figure 5. Attaching SATA cabling

Each cable is keyed to ensure correct orientation.

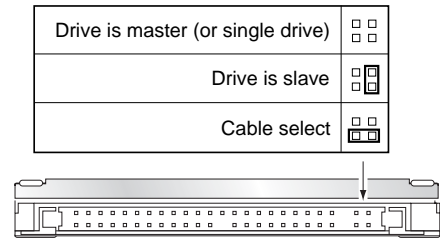
### 3.4.2 How to configure Parallel ATA (PATA) drives

Use the options jumper block shown in Figure 6 to configure the drive for operation. This jumper block is the 4-pin header adjacent to pins 1 and 2 of the I/O signal pins. For additional information about using the Cable select option, see Section 3.4.2.1.

**Note.** Limit the number of PATA interface connector connects and disconnects to a maximum of 50 cycles.

#### 3.4.2.1 How to configure the drive as a master or slave

The “Drive is master (or single drive)” option is the default setting.



**Figure 6. Jumper settings**

#### 3.4.2.2 How to use the cable-select option

Computers that use cable select determine the master and slave drives by selecting or deselecting pin 28, CSEL, on the interface bus. Master and slave drives are determined by their physical position on the cable. To enable cable select, set a jumper as shown in Figure 6. Refer to your computer manual to determine whether your computer supports this option.



## 4.0 Interface

---

Interface	Reference
SATA	See Section 4.1 beginning on page 34
PATA	See Section 4.2 beginning on page 36

The following sections apply to both SATA and PATA drives:

- Supported commands (See Section 4.3 beginning on page 37 )
- Identify Device command (See Section 4.4 beginning on page 39 )
- Set Features command (See Section 4.5 beginning on page 42 )
- S.M.A.R.T. commands (See Section 4.6 beginning on page 43 )

## 4.1 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.

### 4.1.1 Hot-Plug compatibility

EE25.2 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>.

### 4.1.2 Serial ATA device plug connector pin definitions

Table 5 summarizes the signals on the Serial ATA interface and power connectors..

**Table 5: Serial ATA connector pin definitions**

Segment	Pin	Function	Definition
Signal	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+	
	S7	Ground	2nd mate

Key and spacing separate signal and power segments



**Table 5: Serial ATA connector pin definitions**

Segment	Pin	Function	Definition
Power	P1	V <sub>33</sub>	3.3V power
	P2	V <sub>33</sub>	3.3V power
	P3	V <sub>33</sub>	3.3V power, pre-charge, 2nd mate
	P4	Ground	1st mate
	P5	Ground	2nd mate
	P6	Ground	2nd mate
	P7	V <sub>5</sub>	5V power, pre-charge, 2nd mate
	P8	V <sub>5</sub>	5V power
	P9	V <sub>5</sub>	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 <sub>12</sub>	12V power, pre-charge, 2nd mate
	P14	V <sub>12</sub>	12V power
	P15	V <sub>12</sub>	12V power

**Notes:**

- All pins are in a single row, with a 1.27 mm (0.050") pitch.
- 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.
- 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.
- All used voltage pins (V<sub>x</sub>) must be terminated.

## 4.2 Parallel ATA (ATA) interface

These drives use the industry-standard ATA task file interface that supports 16-bit data transfers. It supports ATA programmed input/output (PIO) modes 0–4; multiword DMA modes 0–2, and Ultra DMA modes 0–5. The drive also supports the use of the IORDY signal to provide reliable high-speed data transfers.

For detailed information about the ATA interface, refer to the *AT Attachment - 6 with Packet Interface (ATA/ATAPI-6)*, *ANSI NCITS 361-200*, subsequently referred to as the *ATA-6 Standard*.

### 4.2.1 PATA interface signals and connector pins

The following table summarizes the signals on the 44-pin ATA interface connector. For a detailed description of these signals, refer to the draft *ATA-6 Standard*. Limit the number of PATA interface connector connects and disconnects to a maximum of 50 cycles.

**Table 6: Connector signals**

Signal Name	Connector Contact	Cable Conductor
RESET-	1	1
DD7	3	3
DD6	5	5
DD5	7	7
DD4	9	9
DD3	11	11
DD2	13	13
DD1	15	15
DD0	17	17
Ground	19	19
DMARQ	21	21
DIOW-	23	23
DIOR-	25	25
IORDY	27	27
DMACK-	29	29
INTRQ	31	31
DA1	33	33
DA0	35	35
CS1FX-	37	37
DASP-	39	39
+5 V (Logic)	41	41
Ground (Return)	43	43

Cable Conductor	Connector Contact	Signal Name
2	2	Ground
4	4	DD8
6	6	DD9
8	8	DD10
10	10	DD11
12	12	DD12
14	14	DD13
16	16	DD14
18	18	DD15
20	20	(keypin)
22	22	Ground
24	24	Ground
26	26	Ground
28	28	PSYNC:CSEL
30	30	Ground
32	32	IOCS16-
34	34	PDIAG-
36	36	DA2
38	38	CS3FX-
40	40	Ground
42	42	+5V (Motor)
44	44	No connection

### 4.3 Supported ATA commands

The following table lists ATA-standard commands that the drive supports. For a detailed description of the ATA commands, refer to the *ATA-6 Standard*.

EE25.2 Series drives support all standard 48-bit extended commands.

Command name	Command code (in hex)
<b>ATA-standard commands</b>	
ATA Device Configuration Overlay	B1 <sub>H</sub>
ATA Service	A2 <sub>H</sub>
Check Power Mode	98 <sub>H</sub> , E5 <sub>H</sub>
Download Microcode	92 <sub>H</sub>
Execute Device Diagnostics	90 <sub>H</sub>
Flush Cache	E7 <sub>H</sub>
Format Track (Legacy)	50 <sub>H</sub>
Identify Device	EC <sub>H</sub>
Idle	97 <sub>H</sub> , E3 <sub>H</sub>
Idle Immediate	95 <sub>H</sub> , E1 <sub>H</sub>
Initialize (Set) Device Parameters	91 <sub>H</sub>
Read Buffer	E4 <sub>H</sub>
Read DMA	C8 <sub>H</sub> , C9 <sub>H</sub>
Read Log Extended	2F <sub>H</sub>
Read Multiple	C4 <sub>H</sub>
Read Native Max Address	F8 <sub>H</sub>
Read Sectors	20 <sub>H</sub> , 21 <sub>H</sub>
Read Verify Sectors	40 <sub>H</sub> , 41 <sub>H</sub>
Recalibrate	10 <sub>H</sub>
Security Disable Password	F6 <sub>H</sub>
Security Erase Prepare	F3 <sub>H</sub>
Security Erase Unit	F4 <sub>H</sub>
Security Freeze Lock	F5 <sub>H</sub>
Security Set Password	F1 <sub>H</sub>
Security Unlock	F2 <sub>H</sub>
Seek	70 <sub>H</sub>
Set Drive Parameters	91 <sub>H</sub>
Set Features	EF <sub>H</sub>
Set Max Address	F9 <sub>H</sub>
Note: Individual Set Max commands are identified by the value placed in the Set Max Features register as defined to the right.	Address    00 <sub>H</sub> Password   01 <sub>H</sub> Lock        02 <sub>H</sub> Unlock     03 <sub>H</sub> Freeze Lock 04 <sub>H</sub>

<b>Command name</b>	<b>Command code (in hex)</b>
Set Multiple Mode	C6 <sub>H</sub>
Sleep	99 <sub>H</sub> , E6 <sub>H</sub>
S.M.A.R.T.	B0 <sub>H</sub>
Standby	96 <sub>H</sub> , E2 <sub>H</sub>
Standby Immediate	94 <sub>H</sub> , E0 <sub>H</sub>
Vendor Unique	9A <sub>H</sub> , FA <sub>H</sub> , FB <sub>H</sub>
Write Buffer	E8 <sub>H</sub>
Write DMA	CA <sub>H</sub> , CB <sub>H</sub>
Write Log Extended	3F <sub>H</sub>
Write Multiple	C5 <sub>H</sub>
Write Sectors	30 <sub>H</sub> , 31 <sub>H</sub>
<b>ATA-standard power-management commands</b>	
Check Power Mode	98 <sub>H</sub> or E5 <sub>H</sub>
Idle	97 <sub>H</sub> or E3 <sub>H</sub>
Idle Immediate	95 <sub>H</sub> or E1 <sub>H</sub>
Sleep	99 <sub>H</sub> or E6 <sub>H</sub>
Standby	96 <sub>H</sub> or E2 <sub>H</sub>
Standby Immediate	94 <sub>H</sub> or E0 <sub>H</sub>
<b>ATA-standard security commands</b>	
Security Set Password	F1 <sub>H</sub>
Security Unlock	F2 <sub>H</sub>
Security Erase Prepare	F3 <sub>H</sub>
Security Erase Unit	F4 <sub>H</sub>
Security Freeze Lock	F5 <sub>H</sub>
Security Disable Password	F6 <sub>H</sub>

## 4.4 Identify Device command

The Identify Device command (command code EC<sub>H</sub>) transfers information about the drive to the host following power up. The data, shown below, is organized as a single 512-byte block of data. 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 *ATA-6 Standard*.

Word	Description	Value
0	Configuration information: <ul style="list-style-type: none"> <li>• Bit 15: 0 = ATA; 1 = ATAPI</li> <li>• Bit 7: removable media</li> <li>• Bit 6: removable controller</li> <li>• Bit 0: reserved</li> </ul>	0C5A <sub>H</sub>
1	Number of logical cylinders	16,383
2	ATA-reserved	0000 <sub>H</sub>
3	Number of logical heads	16
4	Retired	0000 <sub>H</sub>
5	Retired	0000 <sub>H</sub>
6	Number of logical sectors per logical track: 63	003F <sub>H</sub>
7–9	Retired	0000 <sub>H</sub>
10–19	Serial number: (20 ASCII characters, 0000 <sub>H</sub> = none)	ASCII
20	Retired	0000 <sub>H</sub>
21	Retired	0400 <sub>H</sub>
22	Obsolete	0000 <sub>H</sub>
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)	ST980817AM ST980818AM ST980817SM ST980818SM ST960817AM ST960818AM ST960817SM ST960818SM ST940817AM ST940818AM ST940817SM ST940818SM ST930817AM ST930818AM ST930817SM ST930818SM
47	(Bits 7–0) Maximum sectors per interrupt on Read multiple and Write multiple (16)	8010 <sub>H</sub>
48	Reserved	0000 <sub>H</sub>
49	Standard Standby timer, IORDY supported and may be disabled	2F00 <sub>H</sub>
50	ATA-reserved	0000 <sub>H</sub>
51	PIO data-transfer cycle timing mode	0200 <sub>H</sub>
52	Retired	0200 <sub>H</sub>

Word	Description	Value
53	Words 54–58, 64–70 and 88 are valid	0007 <sub>H</sub>
54	Number of current logical cylinders	xxxx <sub>H</sub>
55	Number of current logical heads	xxxx <sub>H</sub>
56	Number of current logical sectors per logical track	xxxx <sub>H</sub>
57–58	Current capacity in sectors	xxxx <sub>H</sub>
59	Number of sectors transferred during a Read Multiple or Write Multiple command	xxxx <sub>H</sub>
60–61	Total number of user-addressable LBA sectors available (see Section 2.2 for related information)	ST980817AM = 156,301,488 ST980818AM = 156,301,488 ST980817SM = 156,301,488 ST980818SM = 156,301,488 ST960817AM = 117,210,240 ST960818AM = 117,210,240 ST960817SM = 117,210,240 ST960818SM = 117,210,240 ST940817AM = 78,140,160 ST940818AM = 78,140,160 ST940817SM = 78,140,160 ST940818SM = 78,140,160 ST930817AM = 58,605,120 ST930818AM = 58,605,120 ST930817SM = 58,605,120 ST930818SM = 58,605,120
62	Retired	0000 <sub>H</sub>
63	Multiword DMA active and modes supported (see note following this table)	xx07 <sub>H</sub>
64	Advanced PIO modes supported (modes 3 and 4 supported)	0003 <sub>H</sub>
65	Minimum multiword DMA transfer cycle time per word (120 nsec)	0078 <sub>H</sub>
66	Recommended multiword DMA transfer cycle time per word (120 nsec)	0078 <sub>H</sub>
67	Minimum PIO cycle time without IORDY flow control (240 nsec)	00F0 <sub>H</sub>
68	Minimum PIO cycle time with IORDY flow control (120 nsec)	0078 <sub>H</sub>
69–74	ATA-reserved	0000 <sub>H</sub>
75	Queue depth	0000 <sub>H</sub>
76–79	ATA-reserved	0000 <sub>H</sub>
80	Major version number	007E <sub>H</sub>
81	Minor version number	0000 <sub>H</sub>
82	Command sets supported	346B <sub>H</sub>
83	Command sets supported	7D01 <sub>H</sub>
84	Command sets support extension	4003 <sub>H</sub>
85	Command sets enabled	34xx <sub>H</sub>
86	Command sets enabled	3xxx <sub>H</sub>
87	Command sets enable extension	4003 <sub>H</sub>
88	Ultra DMA support and current mode (see note following this table)	xx3F <sub>H</sub>

Word	Description	Value
89	Security erase time	0000 <sub>H</sub>
90	Enhanced security erase time	0000 <sub>H</sub>
91	Advanced power management value	0040 <sub>H</sub>
92	Master password revision code	FFFE <sub>H</sub>
93	Hardware reset value (see description following this table)	xxxx <sub>H</sub>
94	Auto acoustic management setting	xxxx <sub>H</sub>
95–127	ATA-reserved	0000 <sub>H</sub>
128	Security status	0001 <sub>H</sub>
129–159	Seagate-reserved	xxxx <sub>H</sub>
160–254	ATA-reserved	0000 <sub>H</sub>
255	Integrity word	xxA5 <sub>H</sub>

**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 <sub>IH</sub> 0 = 40-conductor cable detected, CBLID below V <sub>IL</sub>

## 4.5 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:

02 <sub>H</sub>	Enable write cache ( <i>default</i> ).	
03 <sub>H</sub>	Set transfer mode (based on value in Sector Count register).	
	Sector Count register values:	
	00 <sub>H</sub>	Set PIO mode to default (PIO mode 2).
	01 <sub>H</sub>	Set PIO mode to default and disable IORDY (PIO mode 2).
	08 <sub>H</sub>	PIO mode 0
	09 <sub>H</sub>	PIO mode 1
	0A <sub>H</sub>	PIO mode 2
	0B <sub>H</sub>	PIO mode 3
	0C <sub>H</sub>	PIO mode 4 ( <i>default</i> )
	20 <sub>H</sub>	Multiword DMA mode 0
	21 <sub>H</sub>	Multiword DMA mode 1
	22 <sub>H</sub>	Multiword DMA mode 2
	40 <sub>H</sub>	Ultra DMA mode 0
	41 <sub>H</sub>	Ultra DMA mode 1
	42 <sub>H</sub>	Ultra DMA mode 2
	43 <sub>H</sub>	Ultra DMA mode 3
	44 <sub>H</sub>	Ultra DMA mode 4
	45 <sub>H</sub>	Ultra DMA mode 5
05 <sub>H</sub>	Enable advanced power management	
55 <sub>H</sub>	Disable read look-ahead (read cache) feature.	
82 <sub>H</sub>	Disable write cache.	
AA <sub>H</sub>	Enable read look-ahead (read cache) feature ( <i>default</i> ).	
F1 <sub>H</sub>	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.



## 4.6 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<sub>H</sub>) 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 7: S.M.A.R.T. commands**

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

If an appropriate code is not written to the Features Register, the command is aborted and 0x04 (abort) is written to the Error register.



## 5.0 Seagate Technology support services

---

### Internet

For information regarding Seagate products and services, visit [www.seagate.com](http://www.seagate.com). Worldwide support is available 24 hours daily by email for your questions.

### Presales Support:

Presales@Seagate.com

### Technical Support:

DiscSupport@Seagate.com

### Warranty Support:

<http://www.seagate.com/support/service/index.html>

### mySeagate

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.

### spp.seagate.com

spp.seagate.com supports Seagate resellers with product information, program benefits and sales tools. You may register for customized communications that are not available on the web. These communications contain product launch, EOL, pricing, promotions and other channel-related information. To learn more about the benefits or to register, go to spp.seagate.com, any time, from anywhere in the world.

## 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 product availability and compatibility.

### Technical Support

Seagate technical support is available to assist you online at [support.seagate.com](http://support.seagate.com) or through one of our call centers. Have your system configuration information and your "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 products. 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 Seagate warranty service for assistance. Have your serial number and model or part 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 throughout the world. . Additional information, including an online request form and data loss prevention resources, is available at <http://services.seagate.com/index.aspx>

### Authorized Service Centers

Seagate Service Centers are available on a global basis for the return of defective products. Contact your customer support representative for the location nearest you.

### USA/Canada/Latin America support services

For an extensive list of telephone numbers to technical support, presales and warranty service in USA/Canada/Latin America, including business hours, go to the "Contact Us" page on [www.seagate.com](http://www.seagate.com).

## Global Customer Support

### Presales, Technical, and Warranty Support

Call Center	Toll-free	Direct dial
USA, Canada, and Mexico	1-800-SEAGATE	+1-405-324-4700

### 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

## Europe, the Middle East and Africa Support Services

For an extensive list of telephone numbers to technical support, presales and warranty service in Europe, the Middle East and Africa, go to the "Contact Us" page on [www.seagate.com](http://www.seagate.com).

## Asia/Pacific Support Services

For an extensive list of telephone numbers to technical support, presales and warranty service in Asia/Pacific, go to the "Contact Us" page on [www.seagate.com](http://www.seagate.com).

# Index

## Numerics

3D Defense System 2

## A

acoustics 20  
Active mode 18  
agency certification (regulatory) 22  
altitude 19  
ambient conditions 3  
ambient temperature 19  
areal density 1, 13  
ATA-standard commands 35  
Australian C-Tick 23  
autodetection 2  
average seek time 14

## B

BPI 13  
breather filter hole precautions 27  
buffer 1, 13  
burst 1

## C

cable select 2  
cables and connectors 28  
cable-select option 29  
cache 1, 13  
case temperature 19  
CE mark 22  
certification 22  
Check Power Mode 36  
commands 35  
compliance 22  
conducted noise 17  
conducted RF immunity 21  
connector pins 34  
Corrosive environment 24  
CSA C22.2 (950) 22  
CSEL 29  
C-Tick 23  
current profile 17

## D

Data Defense 2  
data-transfer rates 1  
DC power 15  
density 13  
Diagnostic Defense 2  
diagnostic software 2  
discs 13

Download Microcode 35  
Drive Defense 2  
drive diagnostics 14  
drive monitoring 2  
drive self-test 2

## E

electrical fast transient 21  
electromagnetic compatibility 22  
Electromagnetic Compatibility Directive 22  
electromagnetic immunity 21  
electrostatic discharge 21  
EMC compliance 22  
EN 60950 22  
enclosures 23  
environmental specifications 19  
EPRML 1  
error-correction algorithms 1  
errors 22  
European Union 22  
European Union Restriction of Hazardous Substances 24  
Execute Device Diagnostics 35

## F

FCC verification 23  
Features register 40  
Flush Cache 35  
formatted capacity 12  
frequency 21

## G

GMR 1  
guaranteed sectors 12

## H

handling 25  
heads 1, 13  
height 14  
humidity 19

## I

Identify Device 35  
Identify Device command 37  
Idle 16, 36  
Idle and Standby timers 18  
Idle Immediate 36  
Idle mode 18  
Idle mode power 15  
IEC950 22  
Information Technology Equipment 22  
Initialize Device Parameters 35  
interface 31

interface signals 34  
interference 23  
interleave 13  
internal data-transfer rate OD 13  
ISO document 7779 20

## K

Korean RRL 22

## L

LBA mode 12  
length 14  
logical geometry 12

## M

master/slave 2  
Master/slave configuration 29  
Mean time between failures 22  
modes 34  
monitoring 2  
mounting the drive 25  
MTBF 22

## N

noise 17  
nominal power 3  
nonoperating shock 20  
nonoperating vibration 20  
nonrecoverable read errors 22

## O

operating shock 19  
operating vibration 20

## P

physical characteristics 14  
physical organization 13  
pins 34  
PIO 34  
point-to-point 28  
power consumption 15  
power frequency h-field immunity 21  
power management 18  
power specifications 15  
power-management commands 36  
power-management modes 18  
precautions 25  
programmable power management 18

## R

radiated RF immunity 21  
radio and television interference 23

radio frequency (RF) 21  
random track location 15  
Read Buffer 35  
Read DMA 35  
read errors 22  
Read Multiple 2, 35  
Read Native Max Address 35  
Read Sectors 35  
Read Verify Sectors 35  
read/write heads 13  
read/write power and current 15  
recording and interface technology 13  
recording density 13  
recording heads 1  
register 40  
relative humidity 19  
reliability 22  
resistance 17  
RF 21  
RoHS 24

## S

S.M.A.R.T. 36  
S.M.A.R.T. drive monitoring 2  
safety certification 22  
screws 25  
SeaTools 2  
sectors 12  
security commands 36  
Security Disable Password 36  
Security Erase Prepare 36  
Security Erase Unit 36  
Security Freeze Lock 36  
Security Set Password 36  
Security Unlock 36  
Seek 35  
seek mode 15  
seek time 14  
Seeking 16  
Service Life 22  
servo electronics 15  
Set Features 35  
Set Features command 40  
Set Max 35  
Set Multiple Mode 36  
shock 19  
signals 34  
single-track seeks 14  
Sleep 16, 36  
Sleep mode 18  
sound 20  
specifications 3  
Spin down 15  
spindle speed 13  
Spinup 16

- spinup power 15
- Standby 16, 36
- Standby Immediate 36
- Standby mode 15, 18
- static-discharge precautions 25
- subassembly 23
- support services 43
- surge immunity 21

## **T**

- technical support services 43
- temperature 19
- temperature gradient 19
- time to ready 15
- timers 18
- track density 13
- track-to-track seek time 14
- TUV North America 22

## **U**

- UL 1950 22

## **V**

- vibration 20
- voltage 17
- voltage dips, interrupts 21
- voltage tolerance 17

## **W**

- Warranty 22
- weight 14
- wet bulb temperature 19
- width 14
- Write Buffer 36
- Write DMA 36
- Write Multiple 2, 36
- Write Sectors 36









**Seagate Technology LLC**  
**920 Disc Drive, Scotts Valley, California 95066-4544, USA**  
*Publication Number: 100448541, Rev. E, Printed in U.S.A.*

## Free Manuals Download Website

<http://myh66.com>

<http://usermanuals.us>

<http://www.somanuals.com>

<http://www.4manuals.cc>

<http://www.manual-lib.com>

<http://www.404manual.com>

<http://www.luxmanual.com>

<http://aubethermostatmanual.com>

Golf course search by state

<http://golfingnear.com>

Email search by domain

<http://emailbydomain.com>

Auto manuals search

<http://auto.somanuals.com>

TV manuals search

<http://tv.somanuals.com>