Maxtor®

DiamondMax 8S 40GB Serial ATA Product Manual

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UL/CSA/VDE/TUV /RoHS

UL standard 1954 recognition granted under File No. E78016

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TUV Rheinland EN 60 950

Tested to FCC Rules for Radiated and Conducted Emissions, Part 15, Sub Part J, for Class-B Equipment.

DiamondMax 8S model number 6N040T0 meets the EU directive for the Restriction and Use of Hazardous Substances (RoHS), 2002/95/EC of the European Parliament and the council of 27 January, 2003. DiamondMax 8S model number 6E040T0 does not meet these initiatives.

PATENTS

These products are covered by or licensed under one or more of the following U.S. Patents: 4,419,701; 4, 538,193 4,625,109; 4,639,798; 4,647,769; 4,647,997; 4,661,696; 4,669,004; 4,675,652; 4,703,176; 4,730,321; 4,772,974; 4,783,705; 4,819,153; 4,882,671; 4,920,442; 4,920,434; 4,982,296; 5,005,089; 5,027,241; 5,031,061; 5,084,791; 5,119,254; 5,160,865; 5,170,229; 5,177,771; Other U.S. and Foreign Patents Pending.

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Part Number: 000001912

Before You Begin: Thank you for your interest in Maxtor hard disk drives. This manual provides technical information for OEM engineers and systems integrators regarding the installation and use of Maxtor hard drives. Drive repair should be performed only at an authorized repair center. For repair information, contact the Maxtor Product Support Center at 1-800-2MAXTOR.

CAUTION: Maxtor hard drives are precision products. Failure to follow these precautions and guidelines outlined here may lead to product failure, damage and invalidation of all warranties.

1. BEFORE unpacking or handling a drive, take all proper electrostatic discharge (ESD) precautions, including personnel and equipment grounding. Stand-alone drives are sensitive to Electrostatic Discharge (ESD) damage.
2. BEFORE removing drives from their packing material, allow them to reach room temperature.
3. During handling, NEVER drop, jar, or bump a drive.
4. Once a drive is removed from the Maxtor shipping container, IMMEDIATELY secure the drive through its mounting holes within a chassis. Otherwise, store the drive on a padded, grounded, antistatic surface.
5. NEVER switch DC power onto the drive by plugging an electrically live DC source cable into the drive's connector. NEVER connect a live bus to the drive by plugging an electrically live signal cable in to the drive's interface connector.
6. ELECTRICAL GROUNDING - For proper operation, the drive must be securely fastened to a device bay that provides a suitable electrical ground to the drive baseplate.

Please do not remove or cover up Maxtor factory-installed drive labels. They contain information required should the drive ever need repair.Thank you for your interest in Maxtor hard disk drives. This manual provides technical information for OEM engineers and systems integrators regarding the installation and use of Maxtor hard drives. Drive repair should be performed only at an authorized repair center. For repair information, contact the Maxtor Customer Service Center at 800-2MAXTOR or 1-303-678-2015.

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Introduction

1.1 Maxtor Corporation

Maxtor corporation is one of the world's largest suppliers of hard disk drive products-products that help store the digital world for millions of users. Maxtor products serve a range of markets, including personal and entertainment, small office/home office, mid-sized business and enterprise

Products

Maxtor storage products include drives and accessories for PC's, workstations, RAID products, enterprise applications, enterprise servers, high-end systems, consumer electronics and personal storage.

Support

Maxtor provides a variety of consumer support options, all designed to make sure the user gets fast, helpful, accurate information to help resolve any difficulties. These options include a broad, searchable knowledge base of FAQ's, product manuals, installation guides, information on previously resolved problems, software downloads, and contact by phone or E-mail with a support person. For more information, visit

www.maxtor.com/en/support.

1.2 Audience

The DiamondMax 8S 40GB SATA product manual is intended for several audiences. These audiences include: the end user, installer, developer, consumer electronics and personal computer original equipment manufacturer (CE/PC,OEM), and distributor. The manual provides information about installation, principles of operation, interface command implementation, and maintenance.

1.3 MANUAL ORGANIZATION

This manual is organized into the following chapters:

- Chapter 1 – *Introduction*
- Chapter 2 – *Product Description*
- Chapter 3 – *Product Specifications*
- Chapter 4 – *Installation*

- Chapter 5 – *SATA Bus Interface and ATA Commands*
- Chapter 6 – *Service and Support*
- Glossary

1.4 TERMINOLOGY AND CONVENTIONS

In the Glossary at the back of this manual, you can find definitions for many of the terms used in this manual. In addition, the following abbreviations are used in this manual:

- ASIC application-specific integrated circuit
- SATA serial advanced technology attachment
- bpi bits per inch
- DA Double Amplitude (represents ph-pk shaker displacement)
- dB decibels
- dBA decibels, A weighted
- DPS Data Protection System
- EOF End Of Frame
- FIS Frame Information Source
- SPS Shock Protection System
- ECC error correcting code
- kfci thousands of flux changes per inch
- Hz hertz
- kB kilobytes
- LSB least significant bit
- mA milliamperes
- MB megabytes (1 MB = 1,000,000 bytes when referring to disk transfer rates or storage capacities and 1,048,576 bytes in all other cases)
- Mb/s megabits per second
- MB/s megabytes per second
- MHz megahertz
- ms milliseconds
- MSB most significant bit
- mV millivolts
- ns nanoseconds

- NCQ Native Command Queuing
- SATA Serial ATA
- SOF Start Of Frame
- tpi tracks per inch
- µs microseconds
- V volts

The typographical and naming conventions used in this manual are listed below. Conventions that are unique to a specific table appear in the notes that follow that table.

Typographical Conventions:

- **Names of Bits:** Bit names are presented in initial capitals. An example is the Host Software Reset bit.
- **Commands:** Interface commands are listed in all capitals. An example is WRITE LONG.
- **Register Names:** Registers are given in this manual with initial capitals. An example is the Alternate Status Register.
- **Parameters:** Parameters are given as initial capitals when spelled out, and are given as all capitals when abbreviated. Examples are Prefetch Enable (PE), and Cache Enable (CE).
- **Hexadecimal Notation:** The hexadecimal notation is given in 9-point subscript form. An example is 30_H.
- **Signal Negation:** A signal name that is defined as active low is listed with a minus sign following the signal. An example is RD–.
- **Messages:** A message that is sent from the drive to the host is listed in all capitals. An example is ILLEGAL COMMAND.

Naming Conventions:

- **Host:** In general, the system in which the drive resides is referred to as the host.
- **Computer Voice:** This refers to items you type at the computer keyboard. These items are listed in 10-point, all capitals, Courier font. An example is FORMAT C:/S.

1.5 REFERENCE

For additional information about the Serial ATA/ High Speed Serialized AT

Attachment, visit the Serial ATA working group at http://www.serialata.org

Chapter 2
PRODUCT DESCRIPTION

2.1 PRODUCT DESCRIPTION

Maxtor drive leadership continues with the DiamondMax 8S 40GB Serial ATA drive - a single head, 7200RPM product. The DiamondMax 8S 40GB Serial ATA drives combine performance and value with the Serial ATA interface making a perfect choice for entry level consumers and commercial/business desktop systems transitioning to the new interface.

The Serial ATA interface provides the fastest desktop interface with maximum data transfer rates of 1.5 Gb/s and additional features.

- Native Command Queuing to improve performance
- MHX Dual Processor Architecture maximizes the performance potential of Serial ATA

Fluid Dynamic Bearing (FDB) motors minimize drive acoustics, allowing the drive to operate with low sound output. DiamondMax 8S 40GB Serial ATA is designed for higher reliability. The drive's inner diameter load/unload ramp locks the recording head into a protective carrier to cradle the head during shipment and any other time the drive is not in operation.

DiamondMax 8S 40GB Serial ATA drive delivers high reliability and data integrity and is enhanced using Maxtor developed Shock Protection System (SPS) and Data Protection System (DPS). SPS and DPS give the user enhanced protection against both operating and non-operating shock and verify essential functions in seconds to minimize costly drive returns.

- Serial ATA, 1.5 Gb/s
- Native Command Queuing to improve performance
- MHX Dual Processor Architecture maximizes the performance potential of Serial ATA
- No need to add or remove jumpers for simplified system configurations
- Supports today's entry capacity - 40GB
- Leading mainstream performance from 7200RPM rotation speed
- FDB (Fluid Dynamic Bearing) motor for quiet operation
- Low height to improve airflow and cooling

- Low weight to reduce shipping costs
- Improved reliability with:
  - ~ Shock Protection System
  - ~ Data Protection System

2.2 THE SERIAL ATA INTERFACE

Serial ATA is the next generation ATA interface. It provides faster data transfer speeds, more bandwidth, more potential for speed increases in future generations and better data integrity. Serial ATA hardware is smaller and more compact than traditional parallel ATA components. A powerful command set and hot plug features make Serial ATA very attractive for RAID applications.

With a maximum external interface data transfer speed of 1.5 Gb/s, Serial ATA improves hard drive performance to keep pace with increasing data intensive environments such as audio/video, consumer electronics and entry-level servers.

Serial ATA brings these powerful benefits for storage solutions:

- Performance increase to 1.5Gb/s maximum external (burst) data transfer rate
- Thin cables for easy routing and improved cooling inside a PC chassis or JBOD box
- Maximum cable length increases to 1 meter for increased design and layout flexibility in a system
- Thinner cables improve system airflow and cooling efficiency
- Backward compatible with existing parallel ATA software and drivers, to allow upgrading from ATA hardware to Serial ATA hardware without having to change software drivers or applications.

For additional information about how Serial ATA emulates parallel ATA, refer to the "Serial ATA: High Speed Serialized AT Attachment, revision 1.0a" specification. The specification can be downloaded from http://www.serialata.com

2.3 KEY FEATURES

The DiamondMax 8S 40GB SATA hard disk drives include the following key features:

General

- Formatted storage capacity of 40.0 GB
- Low profile, 17.5 mm high
- 7200 RPM spin speed
- Industry standard 3 1/2-inch form factor

- Emulation of IBM® PC AT® task file register, and all AT fixed disk commands
- Windows 2000™, WinXP, and 9X Certification

Performance

- Native Command Queuing
- 10.1 ms seek time
- Average rotational latency of 4.17ms
- 2 MB buffer with 1.9MB (approximate) Advance Cache Management (ACM).
- Advanced Multi-burst ECC on-the-fly
- Support of all standard ATA data transfer modes with PIO mode 4 and multiword DMA mode 2, and Ultra DMA modes 0, 1, 2, 3, 4, 5 and 6
- Quiet Drive Technology (QDT)
- Advanced Native Serial ATA 2 interface using 1.5 Gb/s interface
- Fluid Dynamic Bearing Motor for quiet idle operation

Reliability

- Latching Serial ATA cable connector
- 57 Byte Reed-Soloman ECC with up to 54 Byte correction capability.
- S.M.A.R.T. (Self-Monitoring, Analysis and Reporting Technology)
- Auto Park and Lock actuator mechanism
- Transparent media defect mapping
- High performance, in-line defective sector skipping
- Reassignment of defective sectors discovered in the field, without reformatting
- Shock Protection System to reduce handling induced failures
- Data Protection System to verify drive integrity
- High durability with 50,000 cycles for reliable load/unload functions

Versatility

- Power saving modes
- Downloadable firmware

2.4 REGULATORY COMPLIANCE STANDARDS

Maxtor Corporation's disk drive products meet all domestic and international product safety regulatory compliance requirements. Maxtor's disk drive products conform to the following specifically marked Product Safety Standards:

- Underwriters Laboratories (UL) Standard 1950. This certificate is a category certification pertaining to all 3.5-inch series drives models.
- Canadian Standards Association (CSA) Standard C.22.2 No. 1950. This certificate is a category certification pertaining to all 3.5-inch series drives models.
- TUV Rheinland Standard EN60 950. This certificate is a category certification pertaining to all 3.5-inch series drives models.

Product EMI/EMS Qualifications:

- CE Mark authorization is granted by TUV Rheinland in compliance with our qualifying under EN 55022:1998 and EN 55024:1998.
- C-Tick Mark is an Australian authorization marked noted on Maxtor's disk drive products. The mark proves conformity to the regulatory compliance document AS/NZS 3548: 1995 and CISPR 22: 2002.
- Maxtor's disk drives are designed as a separate subassembly that conforms to the FCC Rules for Radiated and Conducted emissions, Part 15 Subpart J; Class B when installed in a given computer system.
- Approval from Taiwan BSMI. Number: 3892A638

2.5 HARDWARE REQUIREMENTS

The DiamondMax 8S 40GB SATA hard disk drives are compatible with SATA equipped IBM PC AT computers and SATA equipped systems that are compatible with the IBM PC AT. It connects to the PC either by means of a third-party SATA adapter board, or by plugging a cable from the drive directly into a PC motherboard that supplies an SATA interface. The DiamondMax 8S 40GB SATA is also compatible with Serial ATA equipped Host Bus Adaptors (HBAs) in storage sub-systems and other non PC applications.

Chapter 3
PRODUCT SPECIFICATIONS

3.1 Models and Capacities

MODEL NUMBERS	
NON ROHS COMPLIANT ROHS COMPLIANT ★	6E040T0 6N040T0★
Formatted Capacity (GB LBA Mode)	40GB
GB means 1 billion bytes. Total accessible capacity varies depending on operating environment.	
* Complies with European Union Directive on Restriction of Hazardous Substances (Section 3.13)	

3.2 Drive Configuration

MODEL 6E040T0	40GB
Data Surfaces/Number of Heads	1
Number of Disks	1
Sectors per Drive (max LBA)	80,293,248
Integrated Interface	Maxtor SATA 1.5 Gb/s
Recording Method	PRML
Servo Type	Embedded
Number of Servo Sectors	180
Data Zones per Surface	16
Data Sectors per Track (ID/OD)	720/1140
Areal Density (Gbits/in^2 max, ID/OD)	63.2/49.7
Flux Density (kfci, ID/OD)	OD = 583 ID = 743

MODEL 6E040T0	40GB
Recording Density (kbpi, ID/OD)	ID = 713 OD = 560
Track Density (ktpi)	88.7

3.3 Performance Specifications

MODEL 6E040T0	40GB
Seek Times (typical read, ms)	
Track-to-Track Seek	0.8
Average (normal seek)	≤ 10.1
Full Stroke (normal seek)	≤ 18.0
Average Latency (ms)	4.17
Controller Overhead (ms)	<0.3
Rotation Speed (RPM ±0.5%)	7200
Data Transfer Speed (MByte/sec max)	
Interface Transfer Speed (Gb/s)	1.5
To/From Media (ID/OD up to nn.n, where nn.n is the maximum transfer rate possible)	ID = 463 OD = 738
Sustained (ID/OD up to nn.n, where nn.n is the maximum transfer rate possible)	ID = 38.2 OD = 60.5
Data Buffer Size (MB)/Type	2/SDRAM
Drive Ready Time (typical sec)	<6.0

3.4 Physical Dimensions

PARAMETER	VALUE
Height (maximum in mm)	17.5
Width (typical mm)	101.6
Length (maximum in mm)	146.3
Weight (maximum in lbs/grams)	1.12/ ≤510

3.5 Power Requirements

MODE	12V (MA)	5V (MA)	POWER (W)
Spin-up (peak)	1562	621	21.8
Seek	502	392	8.0
Read/Write	461	414	7.6
Idle	425	230	6.2
Standby	36	229	1.6
Sleep	36	228	1.6

Note: Power numbers are typical values.

3.6 Power Mode Definitions

Spin-up

The disk drive is spinning up following initial application of power and has not yet reached full speed.

Seek

A random access operation by the drive.

Read/Write

Data is being randomly read from or written to the drive.

Idle

The drive is spinning, the actuator is parked and powered off and all other circuitry is powered on. The drive is capable of responding to read commands within 40 ms.

Standby

The motor is not spinning. The drive will leave this mode upon receipt of a command that requires disk access. The time-out value for this mode is programmable. The buffer is active to accept write data.

Sleep

This is the lowest power state – with the interface set to inactive. A software reset is required to return the drive to the Standby state.

3.7 EPA Energy Star Compliance

Maxtor Corporation supports the goals of the U.S. Environmental Protection Agency's Energy Star program to reduce the electrical power consumption of computer equipment.

3.8 Environmental Limits

PARAMETER	OPERATING	NON-OPERATING/ STORAGE
Temperature	0° C to 60° C	low temperature (-40° C) high temperature (71° C) per MIL-STD-810E, method 501.3, climatic category; hot-induced conditions.
Thermal Gradient	30° C per hour (maximum)	
Relative Humidity	5% to 95% (non-condensing)	
Wet Bulb	30° C (maximum)	
Altitude (relative to sea level)	-650 to 10,000 feet	-650 to 40,000 feet

Acoustic Noise[2]	IDLE MODE (Track Following at Speed)	NORMAL SEEK MODE	QUIET SEEK MODE
Fluid Bearing	2.8 bel average 3.0 bel maximum	3.0 bel average 3.2 bel maximum	2.9 average 3.1 maximum

Notes:

1. Margin Demonstrated implies the product will operate at the stated conditions with an acceptable impact to the ARR specification for any OEM requiring those values in their purchase specification.
2. The testing performed by Maxtor is consistent with ISO 7779. Variation in acoustic levels from the idle specification may occur due to offline activity according to the SMART specification and/or atmospheric conditions.

3.9 Shock and Vibration

PARAMETER	OPERATING		NON-OPERATING
Mechanical Shock	R = 0.988/shock at 60 Gs; R = 0.999/shock at 30 Gs		2 msec, 1/2 sine R = 0.90@ > = 300G R = 0.95@ > = 250G R = 0.99@ > = 200G
Rotational Shock	R = 0.988 @ 2000 rad/sec^2		R = 0.95 @ 20K rad/sec^2,1ms input R = 0.99 @ 15K rad/sec^2,2ms input
Rotational Random Vibration	10 - 2000 Hz 12.5 rad/sec^2 RMS Overall		2 - 300 Hz 96.5 rad/sec^2 RMS
Random Vibration	10 - 2000 Hz 0.86 GRMS Overall		PSD: 7 - 800 Hz at 3.08 GRMS No Damage
Linear Sine Vibration	Frequency (Hz) 10 260 1000	Acceleration (Gpk) 1.000 1.000 0.050	
Rotational Sine Vibration	Frequency (Hz) 10 260 1000	Acceleration (Rad/Sec2pk) 12.500 12.500 0.700	

3.10 Reliability Specifications

Annualized Return Rate

<1.0% Annualized Return Rate (ARR) indicates the average against products shipped. ARR includes all reasons for returns (failures, handling, damage, NDF) but does not include inventory credit returns.

Load/Unload Cycles

50,000 This indicates the average minimum cycles for reliable load/unload function.

Data Reliability

<1 per 10e15 bits read- Data errors (non-recoverable). Average data error rate allowed with all error recovery features activated.

Component Design Life - 5 years (minimum)

Component design life is defined as a.) the time period before identified wear-out mechanisms impact the failure rate, or b.) the time period up to the wear-out point when useful component life expires.

3.11 EMC/EMI

3.11.1 Radiated Electromagnetic Field Emissions - EMC Compliance

The hard disk drive mechanism is designed as a subassembly for installation into a suitable enclosure and is therefore not subject to Subpart J of Part 15 of FCC Rules (47CFR15) or the Canadian Department of Communications Radio Interference Regulations. Although not required, the disk mechanism has been tested within a suitable end-use product and found to comply with Class B limits of the FCC Rules and Regulations of the Canadian Department of Communications.

The CE Marking indicates conformity with the European Union Low Voltage Directive (73/23/EEC) when the disk mechanism is installed in a typical personal computer. Maxtor recommends that testing and analysis for EMC compliance be performed with the disk mechanism installed within the user's end-use application.

3.11.2 Canadian Emissions Statement

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus as set out in the radio interference regulations of the Canadian department of communications.

Le present appareil numerique n'emet pas de bruit radioelectriques depassant les limites applicables aux appareils numeriques de Class B prescrites dans le reglement sur le brouillage radioelectrique edicte pa le ministere des communications du Canada.

3.12 Safety Regulatory Compliance

All Maxtor hard drives comply with relevant product safety standards such as CE, CUL, TUV and UL rules and regulations. As delivered, Maxtor hard drives are designed for system integration before they are used.

3.13 RoHS Compliance

Versions of DiamondMax 8S drives, commonly called RoHS, will become available during 2005 that will meet the Restriction of Hazardous Substances (RoHS) compliance directive of the European Union as applicable. The full description of this legislation, is "Directive 2002/95/EC of the European Parliament and the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment".

Chapter 4
INSTALLATION

This chapter explains how to unpack, configure, mount, and connect the Maxtor DiamondMax 8S 40GB SATA hard disk drive prior to operation. It also explains how to start up and operate the drive.

4.1 SPACE REQUIREMENTS

The Maxtor DiamondMax 8S 40GB SATA hard disk drives are shipped without a faceplate. Figure 4-1 shows the external dimensions of the Maxtor DiamondMax 8S 40GB SATA drives.

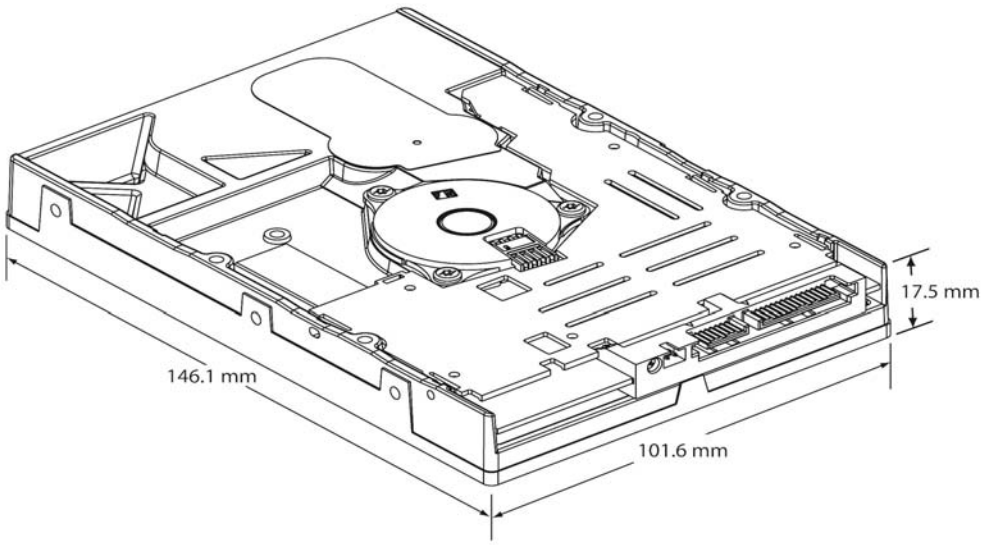


Figure 4-1 *Mechanical Dimensions of Maxtor DiamondMax 8S 40GB SATA Hard Disk Drive*

4.2 UNPACKING INSTRUCTIONS

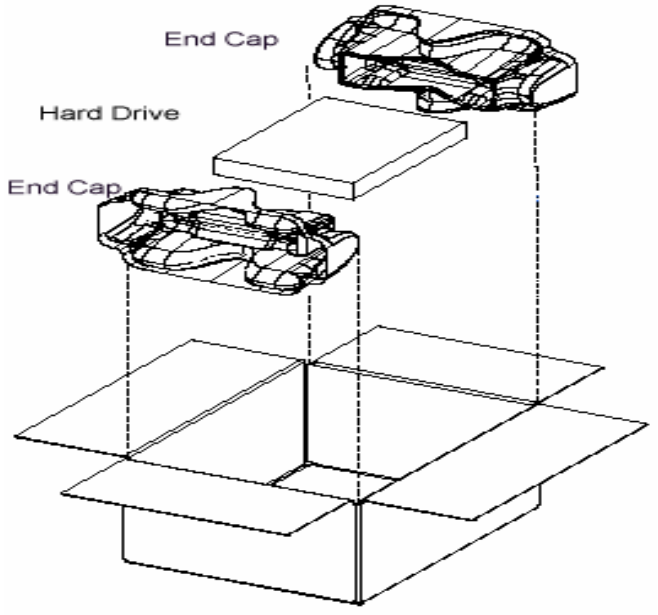
> ***CAUTION:*** The maximum limits for physical shock can be exceeded if the drive is not handled properly. Special care should be taken not to bump or drop the drive. It is highly recommended that Maxtor DiamondMax 8 SATA drives are not stacked or placed on any hard surface after they are unpacked. Such handling could cause media damage.

1. Open the shipping container and remove the packing assembly that contains the drive.
2. Remove the drive from the packing assembly.

> ***CAUTION:*** During shipment and handling, the antistatic electrostatic discharge (ESD) bag prevents electronic component damage due to electrostatic discharge. To avoid accidental damage to the drive, do not use a sharp instrument to open the ESD bag and do not touch PCB components. Save the packing materials for possible future use.

3. When you are ready to install the drive, remove it from the ESD bag.

Figure 4-2 *Single Pack Shipping Container*



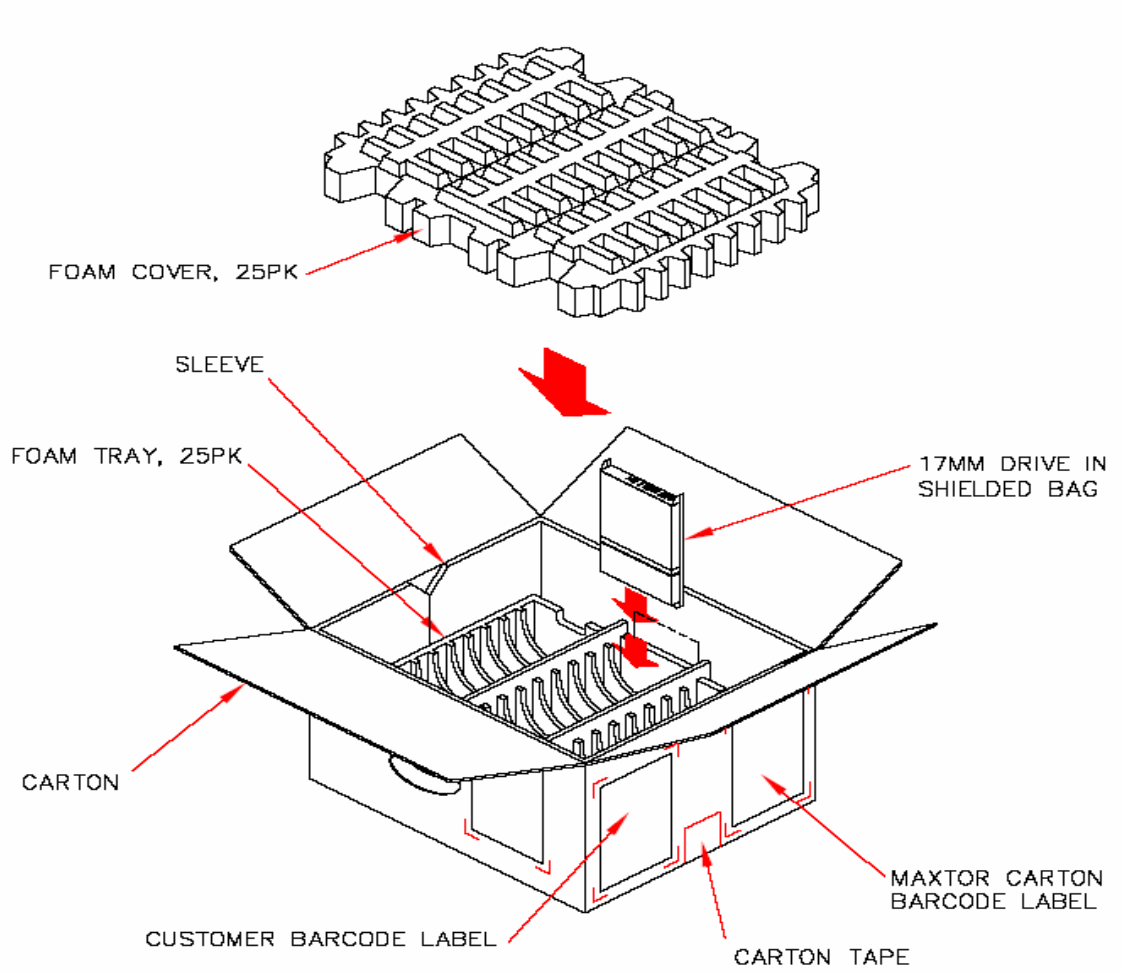


Figure 4-3 *25 Pack Shipping Container*

4.3 HARDWARE OPTIONS

The configuration of a Maxtor DiamondMax 8S 40GB SATA hard disk drive depends on the host system in which it is to be installed. This section describes the hardware options that you must take into account prior to installation.

4.3.1 Jumper Position

The DiamondMax 8S 40GB SATA interface connector shown in Figure 4-4 includes a position for a jumper. See section 4.3.2 *Staggered Spin-up*, for details on how the jumper is used.

4.3.2 Staggered Spin-up

The staggered spin-up feature allows the host to control when a SATA drive initiates spin-up. In a system with many drives, the host may choose not to spin all disk drives at one time, but instead spin up the drives in a sequence. In the latter case, the host "staggers" the time at which each drive spins-up.

DiamondMax 8S 40GB SATA implements the staggered spin-up feature as defined by the SATA II Extensions to Serial ATA 1.0a revision 1.2 specification. After power is applied to the drive, and before the first FIS is received, the drive samples pin 11 on the power connector (See Figure 4-4). If the pin is sampled as low or grounded, then Staggered Spin-up is disabled and the drive automatically spins up. If the pin is sampled as floating or high, then Staggered Sign-up is enabled and the drive waits for COMRESET and PHY initialization before spinning up. For more details on SATA PHY initialization, see section 6.8 of the Serial ATA: High speed Serialized AT Attachment Specification, revision 1.0a.

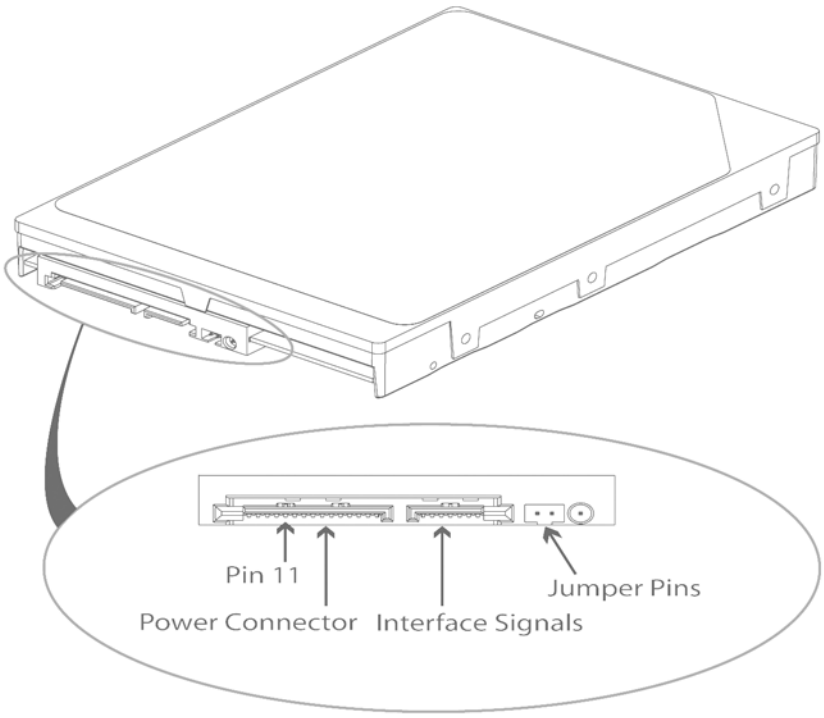


Figure 4-4 *DiamondMax 8S 40GB SATA Power/Interface Connector*

For systems using Serial ATA cables, the Serial ATA II specification mandates that host systems connecting to disk drives using SATA cables must ground Pin 11, resulting in disabling staggered spin-up. Typical desktop systems use this configuration.

In backplane (non-cabled) environments or other systems that do not ground Pin 11, DiamondMax 8S 40GB SATA samples pin 11 after power up and before the first FIS is received, detects the floating or high condition of Pin 11, and enables staggered spin-up. In such a system, the host initiates spin-up by sending a COMRESET signal to the drive.

Where Pin 11 has been grounded, but the system builder wants Staggered Spin-up enabled, DiamondMax 8S drives allow use of a jumper to turn on Staggered Spin-up mode. Using a jumper will force a staggered spin-up, overriding whatever state is on Pin 11.

Putting a jumper across the jumper pins (See Figure 4-4) forces the drive to delay spin-up, whether Pin 11 is grounded or not. In older systems where Pin 11 is grounded, this method provides the ability to sequentially spin-up each drive in the system. Table 4-1 shows the different configuration for staggered spin-up when using Pin 11 or jumper.

Table 4-1 SATA Pin 11 and Jumper Configuration

	Native SATA Power-Up Modes	
Jumper Condition	SATA-P11	Behavior
No Jumper	Low	Drive Spins Up
	Float/ High[1]	Drive doesn't spin up until PHY initialization completes
Jumper Inserted	Any State	Drive doesn't spin-up until PHY unitization completes

Note: 1. Pin 11 must not exceed 3.6V.

Note: 2. If a jumper is required, Maxtor recommends a 2 position, low profile shunt with 2 mm pitch and gold finish.

CAUTION: The PCB is very close to the mounting holes. Do not exceed the specified penetration for the mounting screws. The specified screw penetration allows full use of the mounting hole threads, while avoiding damaging or placing unwanted stress on the PCB. Figure 4-5 specifies the minimum clearance between the PCB and the screws in the mounting holes.

The Maxtor hard drive design allows greater shock tolerance than that afforded by larger, heavier drives. The drive may be mounted in any attitude using four size 6-32 screws with 3 mm maximum penetration and a maximum torque of 5-inch pounds. Allow adequate ventilation to the drive to ensure reliable operation.

4.4 MOUNTING

Drive mounting orientation, clearance, and ventilation requirements are described in the following subsections.

4.4.1 Orientation

The mounting holes on the Maxtor DiamondMax 8S 40GB SATA hard disk drives allow the drive to be mounted in any orientation. Figure 4-5 shows the location of the three mounting holes on each side of the drive. The drive can also be mounted using the four mounting hole locations on the PCB side of the drive.

Note: It is highly recommended that the drive is hard mounted on to the chassis of the system being used for general operation, as well as for test purposes. Failure to hard mount the drive can result in

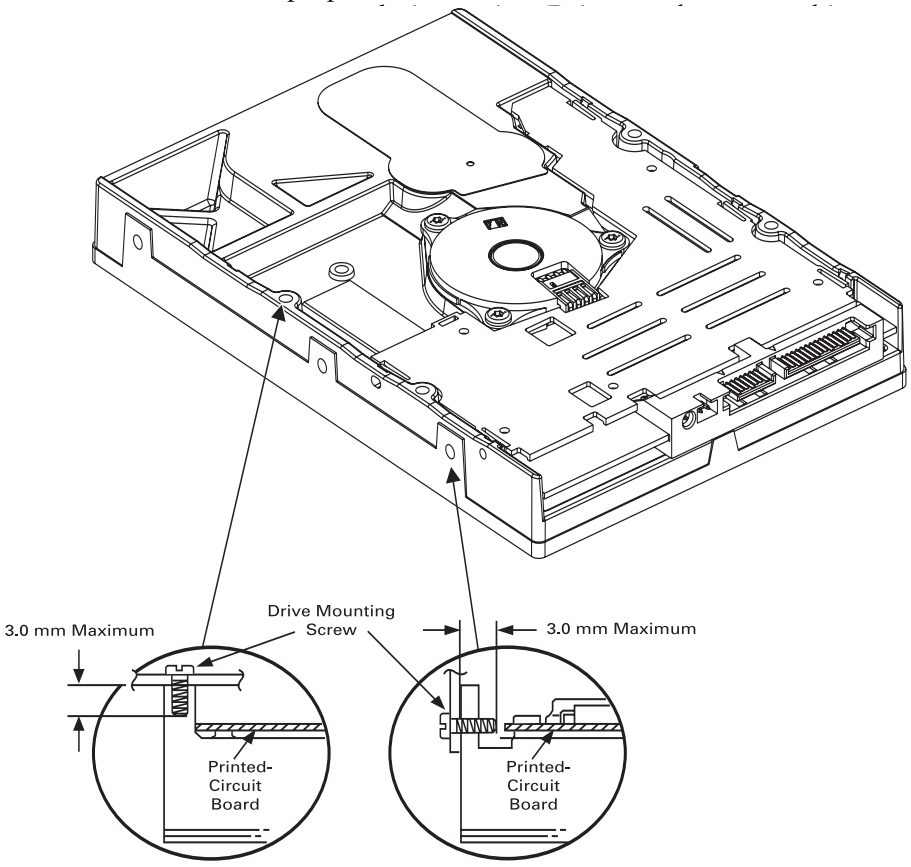
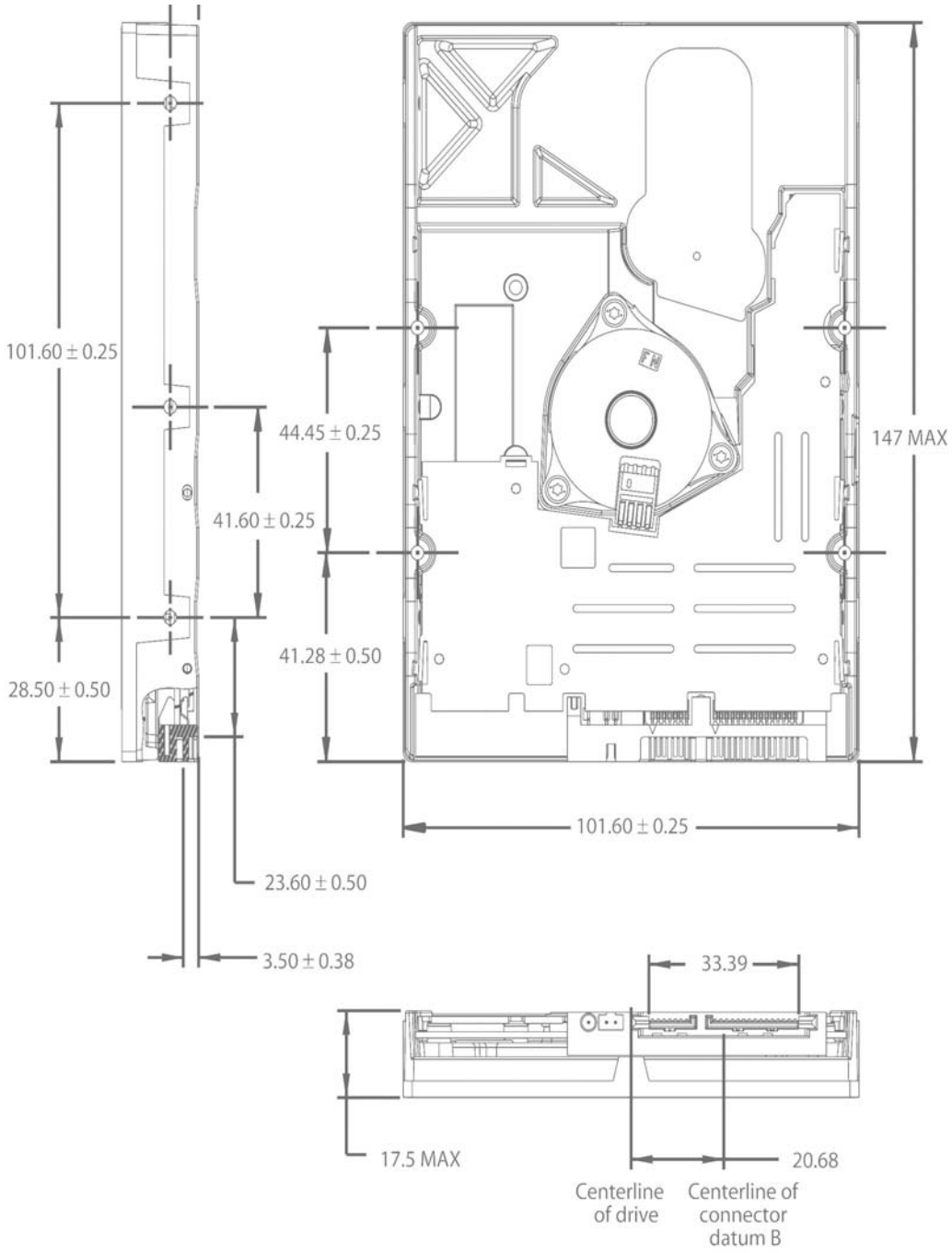


Figure 4-5 *Mounting Screw Clearance*

Clearance from the drive to any other surface (except mounting surfaces) must be a minimum of 1.25 mm (0.05 inches).



4.4.2 Ventilation

The Maxtor DiamondMax 8S 40GB SATA hard disk drives operate without a cooling fan, provided the ambient air temperature does not exceed 140° F (60° C).

4.5 COMMBINATION CONNECTOR (J1)

The DiamondMax 8S 40GB SATA is equipped with a serial ATA interface connector with integrated power connector, as shown in Figure 4-4.

4.5.1 DC Power (J1, Section A)

The recommended mating connectors for the +5 VDC and +12 VDC input power are listed in Table 4-2. Device Plug Connector Pin Definitions.

4.5.2 External Drive Activity LED

DiamondMax 8S 40GB SATA supports the activity LED through Pin 11 as defined by the SATA II Extensions to Serial ATA 1.0a r1.2 specification. In systems with SATA cables, the Serial ATA II spec mandates that pin 11 is grounded. However, in a backplane environment or other system where Pin 11 is not grounded, DiamondMax 8S may drive an "activity indicator LED" via pin 11.

After power up and before the first FIS is received, the drive samples pin 11 to detect whether to enable/disable staggered spinup mode (see section 4.3.2). After sampling Pin 11, Pin 11 is driven by the disk drive as needed to turn the LED on. Note that pin 11 behaves like an open collector output, sinking current to activate an LED.

4.5.3 SATA Bus Interface Connector

There are two ways you can configure a system to allow the Maxtor DiamondMax 8S 40GB SATA hard disk drives to communicate over the Serial ATA bus of an IBM or IBM-compatible PC:

1. Connect the drive to a Serial ATA bus connector on the motherboard of the PC.
2. Install an SATA adapter board in the PC, and connect the drive to the adapter board.

To prevent the possibility of incorrect installation, the connector is polarized. This ensures that a connector cannot be installed upside down.

See Chapter 6 "Cables and Connectors Specifications" in the "Serial ATA: High Speed Serialized AT Attachment, Revision 1.0a" specification for more information about cable and power requirements.

4.6 FOR SYSTEMS WITH A MOTHERBOARD CONTAINING AN EMBEDDED SATA HOST

You can install the Maxtor DiamondMax 8S 40GB SATA hard disk drive in a SATA compatible system that contains a SATA bus connector on the motherboard. To connect the DiamondMax hard disk drive to the motherboard use a SATA cable to connect the drive to the motherboard. Note that power and signal cables should be connected before power is applied to the drive or motherboard.

4.7 FOR SYSTEMS WITH AN ADD-IN SATA ADAPTER BOARD

If your PC motherboard does not contain a built-in Serial ATA bus interface connector, you must install a Serial ATA bus adapter board and connecting cable to allow the drive to interface with the motherboard. Maxtor does not supply such an adapter board, but they are available from several third-party vendors.

Please carefully read the instruction manual that comes with your adapter board to ensure signal compatibility between the adapter board and the drive. Also, make sure that the adapter board jumper settings are appropriate.

4.7.1 Connecting the Adapter Board and the Drive

1. Locate an available Serial ATA (SATA) port on your motherboard or on a SATA PCI card and plug in one end of the SATA interface cable.

2. Locate the SATA port on the rear of the hard drive and plug in the SATA interface cable as shown in Figure 4-7.

3. Secure the drive to the system chassis by using the mounting screws, as shown in Figure 4-8.

Note: If you have an existing installation of Windows 2000 or XP, you must install a Windows driver for the SATA interface before connecting the drive. Suppliers of host adapters, motherboards, and systems with embedded SATA, typically supply SATA drivers. For maximum compatibility, Maxtor recommends downloading and installing the latest SATA driver from the website of the host adapter, motherboard, or system manufacturer.

Table 4-2 *Device Plug Connector Pin Definitions*

Signal Segment	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
Signal Segment "L"			
Central Connector Polarizer			
Power Segment "L"			
Power Segment	P1	V_{33}	3.3V power[1]
	P2	V_{33}	3.3V power[1]
	P3	V_{33}	3.3V power, pre-charge, 2nd mate[1]
	P4	Ground	1st mate
	P5	Ground	2nd mate[2]
	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	1. The pin corresponding to P11 in the backplane receptacle connector is used to enable staggered spin-up and activity LED features, when used in backplane enviro-ments. 2. The corresponding pin to be mated with P11 in the power cable receptacle connec-tor will 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
POWER SEGMENT KEY			

Note 1. 3.3V power is not used by DiamondMax 8S 40GB SATA

Note 2. Host system should ground P4,P5, and P6. Failure to do so may cause improper drive operation.

The following points should be noted:

All pins are in a single row, with a 1.27 mm (.050") pitch.

- The comments on the mating sequence apply to the case of backplane blind mate connector only. In this case, the mating sequences are: (1) the ground pins P4 and P12; (2) the pre-charge power pins and the other ground pins; and (3) 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 in the backplane blind-mate situation.
- If a device uses 3.3 V, then all V_{33} pins must be terminated. Otherwise, it is optional to terminate any of the V_{33} pins. If a device uses 5.0 V, then all V_5 pins must be terminated. Otherwise, it is optional to terminate any of the V_5 pins.
- If a device uses 12.0 V, then all V_{12} pins must be terminated. Otherwise, it is optional to terminate any of the V_{12} pins.

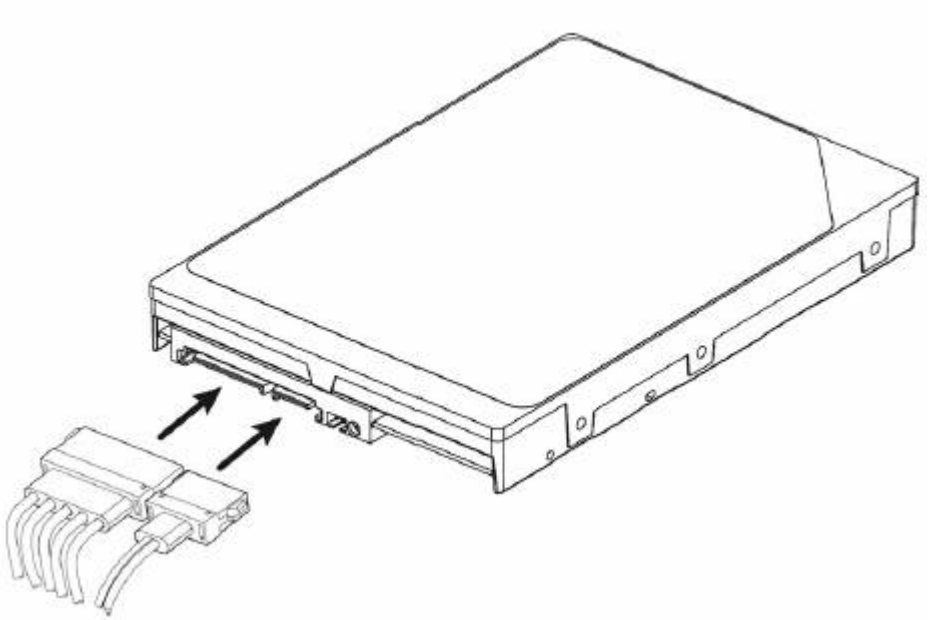


Figure 4-7 *Drive Power Supply and SATA Bus Interface Cables*

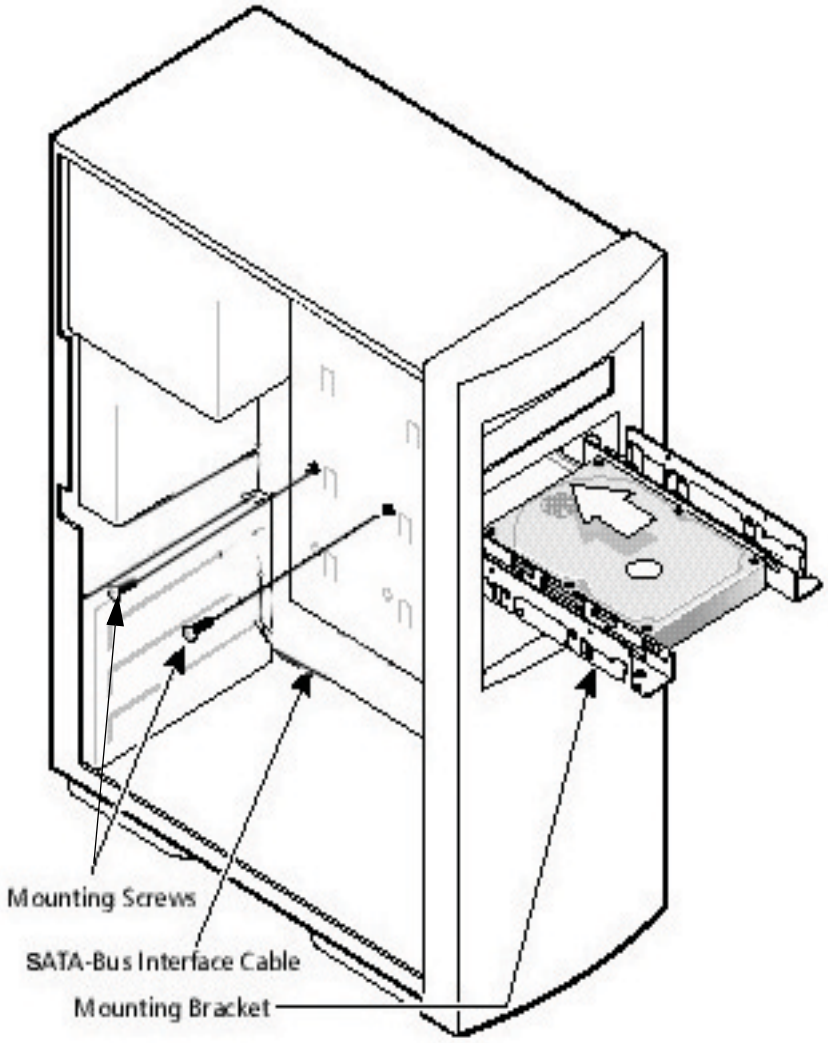


Figure 4-8 *Completing the Drive Installation*

Chapter 5
SATA BUS INTERFACE AND ATA COMMANDS

This chapter describes the interface between DiamondMax 8S 40GB Serial ATA hard disk drives and the Serial ATA bus. The commands that are issued from the host to control the drive are listed, as well as the electrical and mechanical characteristics of the interface.

5.1 INTRODUCTION

Maxtor DiamondMax 8S 40GB Serial ATA hard disk drives use the Serial ATA interface. Support of various options in the standard are explained in the following sections.

5.2 MECHANICAL INTERFACE

5.2.1 Signal Cable and Connector

The DiamondMax 8S 40GB Serial ATA hard disk drive contains a unitized connector for both signal and power connections.

5.3 ELECTRICAL INTERFACE

5.3.1 SATA Bus Interface

5.3.1.1 Electrical Characteristics

Signals on the SATA interface are assigned to connector pins according to Section 6.3.4 in the Serial ATA: High Speed Serialized ATA Attachment standard. The signaling protocol complies with Section 6.6 of the standard.

5.4 REGISTER ADDRESS DECODING

The DiamondMax 8S 40GB Serial ATA hard disk drives allow their host systems to address the full set of command and control registers as specified in clause 5 and 6 of the ATA/ATAPI-7, volume 1 standard.

5.5 COMMAND INTERFACE

5.5.1 General Feature Set

The µProcessor, Disk Controller, and SATA Interface electronics are contained in a proprietary ASIC developed by Maxtor.

5.5.2 Supported Commands

The DiamondMax 8S 40GB Serial ATA hard disk drives support all the mandatory commands from the general feature set for devices not supporting the Packet command feature set. Refer to the ATA/ATAPI-7, volume 1 standard for a detailed description of these commands. The IDENTIFY DRIVE command, however, is elaborated in *Identify Drive Command Parameters, table 5-2*.

Table 5-1 lists the supported commands.

Table 5-1 *Supported Commands*

Command	Command Code	Feature Register Value(s)
CHECK POWER MODE	98h, E5h	
DEVICE CONFIGURATION FREEZE LOCK	B1h	C1h
DEVICE CONFIGURATION IDENTIFY	B1h	C2h
DEVICE CONFIGURATION RESTORE	B1h	C0h
DEVICE CONFIGURATION SET	B1h	C3h
DOWNLOAD MICROCODE	92h	07h, 01h
EXECUTE DRIVE DIAGNOSTIC	90h	
FLUSH CACHE	E7h	
FLUSH CASHE EXT	EAh	
IDENTIFY DEVICE	ECh	
IDLE	97h, E3h	
IDLE IMMEDIATE	95h, E1h	
INITIALIZE DEVICE PARAMETERS	91h	
NOP	00h	
READ BUFFER	E4h	
READ DMA	C8h, C9h	
READ LONG	22h, 23h	
READ LONG EXT	2Fh	
READ MULTIPLE	C4h	

Table 5-1 *Supported Commands*

Command	Command Code	Feature Register Value(s)
READ NATIVE MAX ADDRESS	F8h	
READ NATIVE MAX ADDRESS EXT	27h	
READ SECTOR(S)	20h, 21h	
READ SECTOR(S) EXT	24h	
READ DMA EXT	25h	
READ DMA QUEUED	C7h	
READ DMA QUEUED EXT	26h	
READ MULTIPLE EXT	29h	
READ VERIFY SECTOR(S)	40h, 41h	
READ VERIFY SECTOR(S)EXT	42h	
READ FPDMA QUEUED	60h	
SECURITY DISABLE PASSWORD	F6h	
SECURITY ERASE PREPARE	F3h	
SECURITY ERASE UNIT	F4h	
SECURITY FREEZE LOCK	F5H	
SECURITY SET PASSWORD	F1h	
SECURITY UNLOCK	F2h	
SEEK	70h	
SET FEATURES	EFh	Note 1
SET MAX ADDRESS	F9h	00h
SET MAX ADDRESS EXT	37h	
SET MAX SET PASSWORD	F9h	01h
SET MAX LOCK	F9h	02h
SET MAX UNLOCK	F9h	03h
SET MAX FREEZE LOCK	F9h	04h

Table 5-1 *Supported Commands*

Command	Command Code	Feature Register Value(s)
SET MULTIPLE MODE	C6h	
SLEEP	99h, E6h	
SMART DISABLE AUTO OFFLINE	B0h	DBh
SMART DISABLE OPERATIONS	B0h	D9h
SMART ENABLE OPERATIONS	B0h	D8h
SMART ENABLE/DISABLE ATTRIBUTE AUTOSAVE	B0h	D2h
SMART EXECUTE OFF-LINE IMMEDIATE	B0h	D4h
SMART READ DATA	B0h	D0h
SMART READ LOG	B0h	D5h
SMART RETURN STATUS	B0h	DAh
SMART SAVE ATTRIBUTE VALUES	B0h	D3h
SMART WRITE LOG	B0h	D6h
STANDBY	96h, E2h	
STANDBY IMMEDIATE	94h, E0h	
WRITE BUFFER	E8h	
WRITE DMA	CAh, CBh	
WRITE FPDMA QUEUED	61h	
WRITE MULTIPLE	C5h	
WRITE MULITPLE FUA EXT	CEh	
WRITE PIO OVERLAP	34h	
WRITE SECTOR(S)	30h, 31h	
WRITE SECTOR(S) EXT	34h	
WRITE DMA EXT	35h	
WRITE DMA QUEUED	CCh	
WRITE DMA QUEUED EXT	36h	

Table 5-1 *Supported Commands*

Command	Command Code	Feature Register Value(s)
WRITE MULITPLE EXT	39h	
WRITE VERIFY	3Ch	
WRITE DMA FUA EXT	3Dh	
WRITE DMA QUEUED FUA EXT	3Eh	

Note: 1. As defined in the ATA/ATAPI-6 standard.

Identify Drive Command

This command allows the host to receive parameter information from the drive.

When the command is received, the drive:

1. Sets BSY
2. Stores the required parameter information in the sector buffer
3. Sets the DRQ bit
4. Generates an interrupt

The host may then read the information out of the sector buffer. Parameter words in the buffer are shown in Table 5-2.

Note: All reserved bits or words should be zeroes.

Table 5-2 *Identify Drive Command Parameter*

Word	Content Description
0	General configuration bit-significant information:
	15: 0 = ATA device
	14-8: Retired
	7: 1 = removable media device
	6: Obsolete
	5-3: Retired
	2: Response incomplete
	1: Retired
	0: Reserved
1	Obsolete
2	Specific configuration
3	Obsolete
4-5	Retired
6	Obsolete
7-8	Reserved for assignment by the CompactFlash Association
9	Retired
10-19	Serial number (20 ASCII characters)
20-21	Retired
22	Obsolete
23-26	Firmware revision (8 ASCII characters)
27-46	Model number (40 ASCII characters)
47	15-8: 80h
	7-0: 00h = Reserved
	01h-FFh: = Maximum number of sectors that shall be transferred per interrupt on READ/WRITE MULTIPLE commands
48	Reserved

Word	Content Description
49	Capabilities
	15-14: Reserved for the IDENTIFY PACKET DEVICE command.
	13: 1 = Standby timer values as specified in this standard are supported. 0 = Standby timer values shall be managed by the device
	12: Reserved for the IDENTIFY PACKET DEVICE command.
	11: 1 = IORDY supported. 0 = IORDY may be supported
	10: 1 = IORDY may be disabled
	9: 1 = LBA supported
	8: 1 = DMA supported.
	7-0: Retired
50	Capabilities
	15: Shall be cleared to zero.
	14: Shall be set to one.
	13-2: Reserved.
	1: Obsolete
	0: Shall be set to one to indicate a device specific Standby timer value minimum.
51-52	Obsolete

Word	Content Description
53	15-3: Reserved
	2: 1 = the fields reported in word 88 are valid. 0 = the fields reported in word 88 are not valid
	1: 1 = the fields reported in words (70:64) are valid. 0 = the fields reported in words (70:64) are not valid
	0: Obsolete
54-58	Obsolete
59	15-9: Reserved
	8: 1 = Multiple sector setting is valid
	7-0: xxh = Current setting for number of sectors that shall be transferred per interrupt on R/W Multiple command
60-61	Total number of user addressable sectors
62	Obsolete
63	15-11: Reserved
	10: 1 = Multiword DMA mode 2 is selected. 0 = Multiword DMA mode 2 is not selected
	9: 1 = Multiword DMA mode 1 is selected. 0 = Multiword DMA mode 1 is not selected
	8: 1 = Multiword DMA mode 0 is selected. 0 = Multiword DMA mode 0 is not selected
	7-3: Reserved
	2: 1 = Multiword DMA mode 2 and below are supported
	1: 1 = Multiword DMA mode 1 and below are supported
	0: 1 = Multiword DMA mode 0 is supported
64	15-8: Reserved
	7-0: PIO modes supported

Word	Content Description
65	Minimum Multiword DMA transfer cycle time per word
	15-0: Cycle time in nanoseconds
66	Manufacturer's recommended Multiword DMA transfer cycle time
	15-0: Cycle time in nanoseconds
67	Minimum PIO transfer cycle time without flow control
	15-0: Cycle time in nanoseconds
68	Minimum PIO transfer cycle time with IORDY flow control
	15-0: Cycle time in nanoseconds
69-70	Reserved (for future command overlap and queuing)
71-74	Reserved for IDENTIFY PACKET DEVICE command.
75	As defined in the ATA reference
76	Serial ATA capabilities 15-10 Reserved 9 Supports receipt of host-initiated interface power management requests 8-4 Reserved 3 Reserved for future Serial ATA 2 1= Supports SERIAL ATA Gen-2 signaling speed 1 1= Supports SERIAL ATA Gen -1 signaling speed (1.5Gbps) 0 Reserved (set to 0)
77	Reserved for future Serial ATA definition
78	Serial ATA features supported 15-4 Reserved 3 1= device supports initiating interface power management 2 1= supports DMA Setup Auto-Activate optimization 1 1= supports non-zero buffer offsets in DMA Setup FIS 0 0= Reserved (set to 0)
79	Serial ATA features enabled 15-4 Reserved 3 1= device supports initiating interface power management enabled 2 1= supports DMA Setup Auto-Active optimization enabled 1 1= supports non-zero buffer offsets in DMA Setup FIS 0 0= Reserved (set to 0)

Word	Content Description
80	Major version number
	0000h or FFFFh = device does not report version
	15: Reserved
	14: Reserved for ATA/ATAPI-14
	13: Reserved for ATA/ATAPI-13
	12: Reserved for ATA/ATAPI-12
	11: Reserved for ATA/ATAPI-11
	10: Reserved for ATA/ATAPI-10
	9: Reserved for ATA/ATAPI-9
	8: Reserved for ATA/ATAPI-8
	7: 1 = supports ATA/ATAPI-7
	6: 1 = supports ATA/ATAPI-6
	5: 1 = supports ATA/ATAPI-5
	4: 1 = supports ATA/ATAPI-4
	3: 1 = supports ATA-3
	2: Obsolete
	1: Obsolete
	0: Reserved

Word	Content Description
81	Minor version number
	0000h or FFFFh = device does not report version. 0001h-FFFEh = see 6.16.41 of ATA/ATAPI-7 specification
82	Command set supported.
	15: Obsolete
	14: 1 = NOP command supported
	13: 1 = READ BUFFER command supported
	12: 1 = WRITE BUFFER command supported
	11: Obsolete
	10: 1 = Host Protected Area feature set supported
	9: 1 = DEVICE RESET command supported
	8: 1 = SERVICE interrupt supported
	7: 1 = release interrupt supported
	6: 1 = look-ahead supported
	5: 1 = write cache supported
	4: Shall be cleared to zero to indicate that the PACKET Command feature set is not supported
	3: 1 = mandatory Power Management feature set supported
	2: 1 = Removable Media feature set supported
	1: 1 = Security Mode feature set supported
	0: 1 = SMART feature set supported

Word	Content Description
83	Command sets supported.
	15: Shall be cleared to zero
	14: Shall be set to on
	13: 1 = FLUSH CACHE EXT command supported
	12: 1 = mandatory FLUSH CACHE command supported
	11: 1 = Device Configuration Overlay feature set supported
	10: 1 = 48-bit Address feature set supported
	9: 1 = Automatic Acoustic Management feature set supported
	8: 1 = SET MAX security extension supported
	7: See Address Offset Reserved Area Boot, INCITS TR27:2001
	6: 1 = SET FEATURES subcommand required to spinup after power-up
	5: 1 = Power-Up In Standby feature set supported
	4: 1 = Removable Media Status Notification feature set supported
	3: 1 = Advanced Power Management feature set supported
	2: 1 = CFA feature set supported
	1: 1 = READ/WRITE DMA QUEUED supported
	0: 1 = DOWNLOAD MICROCODE command supported

Word	Content Description
84	Command set/feature supported extension.
	15: Shall be cleared to zero
	14: Shall be set to one
	13: 1= Device supports IDLE IMMEDIATE with UNLOAD FEATURE
	12: Reserved for technical report
	11: Reserved for technical report
	10: 1= The device supports the URG bit for WRITE STREAM DMA EXT and WRITE STREAM EXT commands
	9: 1= The device supports the URG bit for READ STREAM DMA EXT and READ STREAM EXT commands
	8: 1= The device supports a world wide name
	7: 1 = WRITE DMA QUEUED FUA EXT command supported
	6: 1 = WRITE DMA FUA EXT and WRITE MULTIPLE FUA EXT commands supported
	5: 1 = General Purpose Logging feature set supported
	4: 1 = Streaming feature set supported
	3: 1 = Media Card Pass Through Command feature set supported
	2: 1 = Media serial number supported
	1: 1 = SMART self-test supported
	0: 1 = SMART error logging supported

Word	Content Description	
85	Command set/feature enabled.	
	15:	Obsolete
	14:	1 = NOP command enabled
	13:	1 = READ BUFFER command enabled
	12:	1 = WRITE BUFFER command enabled
	11:	Obsolete
	10:	1 = Host Protected Area feature set enabled
	9:	1 = DEVICE RESET command enabled
	8:	1 = SERVICE interrupt enabled
	7:	1 = release interrupt enabled
	6:	1 = look-ahead enabled
	5:	1 = write cache enabled
	4:	Shall be cleared to zero to indicate that the PACKET Command feature set is not supported.
	3:	1 = Power Management feature set enabled
	2:	1 = Removable Media feature set enabled
	1:	1 = Security Mode feature set enabled
	0:	1 = SMART feature set enabled

Word	Content Description
86	Command set/feature enabled.
	15-14: Reserved
	13: 1 = FLUSH CACHE EXT command supported
	12: 1 = FLUSH CACHE command supported
	11: 1 = Device Configuration Overlay supported
	10: 1 = 48-bit Address features set supported
	9: 1 = Automatic Acoustic Management feature set enabled
	8: 1 = SET MAX security extension enabled by SET MAX SET PASSWORD
	7: See Address Offset Reserved Area Boot, INCITS TR27:2001
	6: 1 = SET FEATURES subcommand required to spin-up after power-up
	5: 1 = Power-Up In Standby feature set enabled
	4: 1 = Removable Media Status Notification feature set enabled
	3: 1 = Advanced Power Management feature set enabled
	2: 1 = CFA feature set enabled
	1: 1 = READ/WRITE DMA QUEUED command supported
	0: 1 = DOWNLOAD MICROCODE command supported

Word	Content Description
87	Command set/feature default.
	15: Shall be cleared to zero
	14: Shall be set to one
	13: 1= The device supports IDLE IMMEDIATE with UNLOAD FEATURE
	12: Reserved for technical report
	11: Reserved for technical report
	10: 1= The device supports the URG bit for WRITE STREAM DMA EXT and WRITE STREAM EXT commands
	9: 1= The device supports the URG bit for READ STREAM DMA EXT and READ STREAM EXT commands.
	8: 1= The device supports a world wide name.
	7: 1 = WRITE DMA QUEUED FUA EXT command supported
	6: 1 = WRITE DMA FUA EXT and WRITE MULTIPLE FUA EXT commands supported
	5: General Purpose Logging feature set supported
	4: 1 = Valid CONFIGURE STREAM command has been executed
	3: 1 = Media Card Pass Through Command feature set enabled
	2: 1 = Media serial number is valid
	1: 1 = SMART self-test supported
	0: 1 = SMART error logging supported

Word	Content Description
88	15: Reserved
	14: 1 = Ultra DMA mode 6 is selected. 0 = Ultra DMA mode 6 is not selected
	13: 1 = Ultra DMA mode 5 is selected. 0 = Ultra DMA mode 5 is not selected
	12: 1 = Ultra DMA mode 4 is selected. 0 = Ultra DMA mode 4 is not selected
	11: 1 = Ultra DMA mode 3 is selected. 0 = Ultra DMA mode 3 is not selected
	10: 1 = Ultra DMA mode 2 is selected. 0 = Ultra DMA mode 2 is not selected
	9: 1 = Ultra DMA mode 1 is selected. 0 = Ultra DMA mode 1 is not selected
	8: 1 = Ultra DMA mode 0 is selected. 0 = Ultra DMA mode 0 is not selected
	7: Reserved
	6: 1 = Ultra DMA mode 6 and below are supported
	5: 1 = Ultra DMA mode 5 and below are supported
	4: 1 = Ultra DMA mode 4 and below are supported
	3: 1 = Ultra DMA mode 3 and below are supported
	2: 1 = Ultra DMA mode 2 and below are supported
	1: 1 = Ultra DMA mode 1 and below are supported
	0: 1 = Ultra DMA mode 0 is supported
89	Time required for security erase unit completion
90	Time required for Enhanced security erase completion
91	Current advanced power management value
92	Master Password Revision Code

Word	Content Description
93	Hardware reset result. The contents of bits (12:0) of this word shall change only during the execution of a hardware reset
	15: Shall be cleared to zero.
	14: Shall be set to one.
	13: 1 = device detected CBLID- above ViH. 0 = device detected CBLID- below ViL
	12-8: Device 1 hardware reset result. Device 0 shall clear these bits to zero. Device shall set these bits as follows:
	12: Reserved.
	11: 0 = Device 1 did not assert PDIAG-. 1 = Device 1 asserted PDIAG-.
	10-9: These bits indicate how Device 1 determined the device number:
	00 = Reserved.
	01 = a jumper was used.
	10 = the CSEL signal was used.
	11 = some other method was used or the method is unknown.
	8: Shall be set to one.
	7-0: Device 0 hardware reset result. Device 1 shall clear these bits to zero. Device shall set these bits as follows:
	7: Reserved.
	6: 0 = Device 0 does not respond when Device 1 is selected. 1 = Device 0 responds when Device 1 is selected.
	5: 0 = Device 0 did not detect the assertion of DASP-. 1 = Device 0 detected the assertion of DASP-
	4: 0 = Device 0 did not detect the assertion of PDIAG-. 1 = Device 0 detected the assertion of PDIAG-.
	3: 0 = Device 0 failed diagnostics. 1 = Device 0 passed diagnostics.
	2-1: These bits indicate how Device 0 determined the device number:
	00 = Reserved.
	01 = a jumper was used.
	10 = the CSEL signal was used.

Word	Content Description
94	15-8: Vendor's recommended acoustic management value.
	7-0: Current automatic acoustic management value
95	Stream Minimum Request Size
96	Stream Transfer Time - DMA
97	Stream Access Latency - DMA
98-99	Streaming Performance Granularity
100-103	Maximum user LBA for 48-bit Address feature set.
104	Stream Transfer Time – PIO
105	Stream Access Latency – PIO
106	Physical sector size
	15: Shall be cleared to zero
	14: Shall be set to one
	13: 1 = Device has multiple logical sectors per physical sector.
	12-4: Reserved
	3-0: 2^X logical sectors per physical sector
107	Inter-seek delay for ISO-7779 acoustic testing in microseconds
108	Shall contain the optional value of the world wide name (WWN) for the device 15-12: shall contain 5h, indicating that the naming authority is IEEE. All other values are reserved. 11-0: Shall contain the Organization Unique Identifier (OUI) for the device manufacturer. The OUI shall be assigned by the IEEE/RAC as specified by ISO/IEC 13213:1994
109	15-4: Shall contain the Organization Unique Identifier (OUI) for the device manufacturer. The OUI shall be assigned by the IEEE/RAC as specified by ISO/IEC 13213:1994 3-0: Shall contain a value assigned by the vendor that is unique for the OUI domain
110	Shall contain a value assigned by the vendor that is unique for the OUI domain
111	Shall contain a value assigned by the vendor that is unique for the OUI domain
115-112	Reserved for a 128-bit world wide name

Word	Content Description
116	Reserved for technical report
117-118	Logical Sector Size The value shall be equal to or greater than 256. The value in words 117,118 shall be valid when word 106 bit 12 is set to 1. All logical sectors on a device shall be 117,118 words long.
126-119	Reserved
127	Removable Media Status Notification feature set support
	15-2: Reserved
	1-0:
	00 = Removable Media Status Notification feature set not supported
	01 = Removable Media Status Notification feature supported
	10 = Reserved
	11 = Reserved

Word	Content Description
128	Security status
	15-9: Reserved
	8: Security level 0 = High, 1 = Maximum
	7-6: Reserved
	5: 1 = Enhanced security erase supported
	4: 1 = Security count expired
	3: 1 = Security frozen
	2: 1 = Security locked
	1: 1 = Security enabled
	0: 1 = Security supported
129-159	Vendor specific
160	CFA power mode 1
	15: Word 160 supported
	14: Reserved
	13: CFA power mode 1 is required for one or more commands implemented by the device
	12: CFA power mode 1 disabled
	11-0: Maximum current in ma
161-175	Reserved for assignment by the CompactFlash Association
176-205	Current media serial number
206-254	Reserved
255	Integrity word
	15-8: Checksum
	7-0: Signature

Chapter 6
SERVICE AND SUPPORT

6.1 GETTING HELP

Before contacting Maxtor Support, use the Hard Disk Information feature in MaxBlast to view the model number and serial number of your drive. These numbers can be used to get help from Maxtor Support, register your drive, and look up information on the Maxtor website.

Please visit www.maxtor.com to obtain comprehensive support information, such as:

- **Warranty Services**
  - ~ Drive returns (RMS), Warranty Status, Limited Warranty Statement
- **Product Support**
  - ~ Installation Tutorials, Specifications, Jumper Settings, Installation Guides, Product Manuals
- Software Downloads
  - ~ Installation Software, Utilities, Diagnostics
- Knowledge Base
  - ~ Troubleshooting information, FAQs, resolved problem database
- Product Index
  - ~ Current and Legacy Maxtor product's listing

Click on Worldwide Support to access the Knowledge Base, download software updates, register your drive, and get assistance via e-mail.

A

ACCESS – (v) Read, write, or update information on some storage medium, such as a disk. (n) One of these operations.

ACCESS TIME – The interval between the time a request for data is made by the system and the time the data is available from the drive. Access time includes the actual seek time, rotational latency, and command processing overhead time. See also seek, rotational latency, and overhead.

ACTUATOR – Also known as the *positioner*. The internal mechanism that moves the read/write head to the proper track. The Maxtor actuator consists of a rotary voice coil and the head mounting arms. One end of each head mounting arm attaches to the rotor with the read/write heads attached at the opposite end of each arm. As current is applied to the rotor, it rotates, positioning the heads over the desired cylinder on the media.

ALLOCATION – The process of assigning particular areas of the disk to particular files. See also allocation unit.

ALLOCATION UNIT – An allocation unit, also known as a *cluster*, is a group of sectors on the disk that can be reserved for the use of a particular file.

AVERAGE SEEK TIME – The average time it takes for the read/write head to move to a specific location. To compute the average seek time, you divide the time it takes to complete a large number of random seeks all over the disk by the number of seeks performed.

B

BACKUP – A copy of a file, directory, or volume on a separate storage device from the original, for the purpose of retrieval in case the original is accidentally erased, damaged, or destroyed.

BAD BLOCK – A block (usually the size of a sector) that cannot reliably hold data because of a media flaw or damaged format markings.

BAD TRACK TABLE – A label affixed to the casing of a hard disk drive that tells which tracks are flawed and cannot hold data. The listing is typed into the low-level formatting program when the drive is being installed. Because Maxtor disk drive's defect-management scheme handles all such flaws automatically, there is no need to concern yourself with bad track tables.

BIT – Abbreviation for binary digit. A binary digit may have one of two values—1 or 0. This contrasts with a decimal digit, which may have a value from 0 to 9. A bit is one of the logic 1or logic 0 binary settings that make up a byte of data. See also byte.

BLOCK – A sector or group of sectors. By default, a block of data consists of 512 bytes.

BPI – Abbreviation for *bits per inch*. A measure of how densely information is packed on a storage medium. Flux changes per inch is also a term commonly used in describing storage density on a magnetic surface.

BUFFER – An area of RAM reserved for temporary storage of data that is waiting to be sent to a device that is not yet ready to receive it. The data is usually on its way to or from the disk drive or some other peripheral device.

BUS – The part of a chip, circuit board, or interface designed to send and receive data.

BYTE – The basic unit of computer memory, large enough to hold one character of alphanumeric data. Comprised of eight bits. See also bit.

C

CACHE – Random-access memory used as a buffer between the CPU and a hard disk. Information more likely to be read or changed is placed in the cache, where it can be accessed more quickly to speed up general data flow.

CAPACITY – The amount of information that can be stored on a disk drive. The data is stored in bytes, and capacity is usually expressed in megabytes.

CDB – Command Descriptor Block. The

SCSI structure used to communicate requests from an initiator (system) to a target (drive).

CLEAN ROOM – An environmentally controlled dust-free assembly or repair facility in which hard disk drives are assembled or can be opened for internal servicing.

CLUSTER – A group of sectors on a disk drive that is addressed as one logical unit by the operating system.

CONTROLLER – Short form of *disk controller*. The chip or complete circuit that translates computer data and commands into a form suitable for use by the disk drive.

CONTROLLER CARD – An adapter holding the control electronics for one or more hard disks, usually installed in a slot in the computer.

CPU – Acronym for *Central Processing Unit*. The microprocessor chip that performs the bulk of data processing in a computer.

CRC – Acronym for *Cyclic Redundancy Check*. An error detection code that is recorded within each sector and is used to see whether parts of a string of data are missing or erroneous.

CYLINDER – On a disk drive that has more than one recording surface and heads that move to various tracks, the group of all tracks located at a given head position. The number of cylinders times the number of heads equals the number of tracks per drive.

D

DATA SEPARATOR – On a disk drive that stores data and timing information in an encoded form, the circuit that extracts the data from the combined data and clock signal.

DEDICATED SERVO – A surface separate from the surface used for data that contains only disk timing and positioning information and contains no data.

DEFECT MANAGEMENT – A method that is implemented to ensure long term data integrity. Defect management eliminates the need for user defect maps. This is accomplished by scanning the disk drives at the factory for defective sectors. Defective sectors are deallocated prior to shipment. In addition, during regular use, the drive continues to scan and compensate for any new defective sectors on the disk.

DISK – In general, any circular-shaped data-storage medium that stores data on the flat surface of the platter. The most common type of disk is the magnetic disk, which stores data as magnetic patterns in a metal or metal-oxide coating. Magnetic disks come in two forms: floppy and hard. Optical recording is a newer disk technology that gives higher capacity storage but at slower access times.

DISK CONTROLLER – A plug-in board, or embedded circuitry on the drive, that passes information to and from the disk. The Maxtor disk drives all have controllers embedded on the drive printed-circuit board.

DISKWARE – The program instructions and data stored on the disk for use by a processor.

DMA – Acronym for *direct memory access*. A process by which data moves directly between a disk drive (or other device) and system memory without passing through the CPU, thus allowing the system to continue processing other tasks while the new data is being retrieved.

DRIVE – Short form of *disk drive*.

DRIVE GEOMETRY – The functional dimensions of a drive in terms of the number of heads, cylinders, and sectors per track. See also logical format.

E

ECC – Acronym for *error correction code*. The recording of extra verifying information encoded along with the disk data. The controller uses the extra information to check for data errors, and corrects the errors when possible.

EMBEDDED SERVO – A timing or location signal placed on the disk's surface on the tracks that also store data. These signals allow the actuator to fine-tune the position of the read/write heads.

ENCODING – The protocol by which particular data patterns are changed prior to being written on the disk surface as a pattern of On and Off or 1 and 0 signals.

EOF - End Of Frame

EXTERNAL DRIVE – A drive mounted in an enclosure separate from the PC or computer system enclosure, with its own power supply and fan, and connected to the system by a cable.

F

FAT – Acronym for *file allocation table*. A data table stored on the outer edge of a disk that tells the operating system which sectors are allocated to each file and in what order.

FCI – Acronym for *flux changes per inch*. See also BPI.

FILE SERVER – A computer that provides network stations with controlled access to shareable resources. The network operating system is loaded on the file server, and most shareable devices (disk subsystems, printers) are attached to it. The file server controls system security and monitors station-to-station communications. A dedicated file server can be used only as a file server while it is on the network. A non dedicated file server can be used simultaneously as a file server and a workstation.

FIS - See Frame Information Structure

FLUX DENSITY – The number of magnetic field patterns that can be stored in a given length of disk surface. The number is usually stated as flux changes per inch (FCI), with typical values in the thousands.

FLYING HEIGHT – The distance between the read/write head and the disk surface caused by a cushion of air that keeps the head from contacting the media. Smaller flying heights permit more dense storage of data, but require more precise mechanical designs.

FORMAT – To write onto the disk surface a magnetic track pattern that specifies the locations of the tracks and sectors. This information must exist on a disk before it can store any user data. Formatting erases any previously stored data.

FORMATTED CAPACITY – The amount of room left to store data on the disk after the required space has been used to write sector headers, boundary definitions, and timing information generated by a format operation. All Maxtor drive capacities are expressed in formatted capacity.

FORM FACTOR – The physical outer dimensions of a device as defined by industry standard. For example, most Maxtor disk drives use a 3 1/2-inch form factor.

FRAME - A frame is an indivisible unit of information exchanged between a host and device. A frame consists of a SOF (Start Of Frame) primitive, a Frame Information Structure, a CRC calculated over the contents of the FIS, and an EOF (End Of Frame) primitive.

FRAME INFORMATION STRUCTURE - The user payload of a frame, does not include the SOF (Start Of Frame), CRC, and EOF (End Of Frame) delimiters.

G

GIGABYTE (GB) – One billion bytes (one thousand megabytes).

GUIDE RAILS – Plastic strips attached to the sides of a disk drive mounted in an IBM AT and compatible computers so that the drive easily slides into place.

H

HALF HEIGHT – Term used to describe a drive that occupies half the vertical space of the original full size 5 1/4-inch drive. 1.625 inches high.

HARD DISK – A type of storage medium that retains data as magnetic patterns on a rigid disk, usually made of an iron oxide or alloy over a magnesium or aluminum platter. Because hard disks spin more rapidly than floppy disks, and the head flies closer to the disk, hard disks can transfer data faster and store more in the same volume.

HARD ERROR – A repeatable error in disk data that persists when the disk is reread, usually caused by defects in the media surface.

HEAD – The tiny electromagnetic coil and metal pole piece used to create and read back the magnetic patterns (write and read information) on the media.

HIGH-LEVEL FORMATTING – Formatting performed by the operating system's format program. Among other things, the formatting program creates the root directory and file allocation tables. See also low-level formatting.

HOME – Reference position track for re-calibration of the actuator, usually the outer track (track 0).

HOST ADAPTER – A plug-in board that forms the interface between a particular type of computer system bus and the disk drive.

I

INITIALIZE – See low level formatting.

INITIATOR – A SCSI device that requests another SCSI device to perform an operation. A common example of this is a system requesting data from a drive. The system is the initiator and the drive is the target.

INTERFACE – A hardware or software protocol, contained in the electronics of the disk controller and disk drive, that manages the exchange of data between the drive and computer.

INTERLEAVE – The arrangement of sectors on a track. A 1:1 interleave arranges the sectors so that the next sector arrives at the read/write heads just as the computer is ready to access it. See also interleave factor.

INTERLEAVE FACTOR – The number of sectors that pass beneath the read/write heads before the next numbered sector arrives. When the interleave factor is 3:1, a sector is read, two pass by, and then the next is read. It would take three revolutions of the disk to access a full track of data. Maxtor drives have an interleave of 1:1, so a full track of data can be accessed within one revolution of the disk, thus offering the highest data throughput possible.

INTERNAL DRIVE – A drive mounted inside one of a computer's drive bays (or a hard disk on a card, which is installed in one of the computer's slots).

J

JUMPER – A tiny box that slips over two pins that protrude from a circuit board. When in place, the jumper connects the pins electrically. Some board manufacturers use Dual In-Line Package (DIP) switches instead of jumpers.

JBOD - Just a Bunch of Drives

K

KILOBYTE (kB) – A unit of measure consisting of 1,024 (2^{10}) bytes.

L

LATENCY – The period of time during which the read/write heads are waiting for the data to rotate into position so that it can be accessed. Based on a disk rotation speed of 3,662 rpm, the maximum latency time is 16.4 milliseconds, and the average latency time is 8.2 milliseconds.

LOGICAL FORMAT – The logical drive geometry that appears to an AT system BIOS as defined by the drive tables and stored in CMOS. With an installation program like Disk Manager, the drive can be redefined to any logical parameters necessary to adapt to the system drive tables.

LOOK AHEAD – The technique of buffering data into cache RAM by reading

subsequent blocks in advance to anticipate the next request for data. The look ahead technique speeds up disk access of sequential blocks of data.

LOW-LEVEL FORMATTING – Formatting that creates the sectors on the platter surfaces so the operating system can access the required areas for generating the file structure. Maxtor drives are shipped with the low-level formatting already done.

M

MB – See megabyte.

MEDIA – The magnetic film that is deposited or coated on an aluminum substrate which is very flat and in the shape of a disk. The media is overcoated with a lubricant to prevent damage to the heads or media during head take off and landing. The media is where the data is stored inside the disk in the form of magnetic flux or polarity changes.

MEGABYTE (MB) – A unit of measurement equal to 1,024 kilobytes, or 1,048,576 bytes except when referring to disk storage capacity.

1 MB = 1,000,000 bytes when referring to disk storage capacity.

See also kilobyte.

MEGAHERTZ – A measurement of frequency in millions of cycles per second.

MHz – See megahertz.

MICROPROCESSOR – The integrated circuit chip that performs the bulk of data processing and controls the operation of all of the parts of the system. A disk drive also contains a microprocessor to handle all of the internal functions of the drive and to support the embedded controller.

MICROSECOND (µs) – One millionth of a second (.000001 sec.).

MILLISECOND (ms) – One thousandth of a second (.001 sec.).

MTTF – MTTF is a basic measure of reliability for non-repairable systems. It is the mean time expected until the first failure of a piece of equipment. MTTF is a statistical value and is meant to be the mean over a long period of time and large number of units. For constant failure rate systems, MTTF is the inverse of the failure rate. If failure rate is in failures/million hours, MTTF = 1,000,000 / Failure Rate for components with exponential distributions.

MTTR – Mean Time To Repair. The average time it takes to repair a drive that has failed for some reason. This only takes into consideration the changing of the major sub-assemblies such as circuit board or sealed housing. Component level repair is not included in this number as this type of repair is not performed in the field.

O

OVERHEAD – The processing time of a command by the controller, host adapter or drive prior to any actual disk accesses taking place.

OVERWRITE – To write data on top of existing data, erasing it.

OXIDE – A metal-oxygen compound. Most magnetic coatings are combinations of iron or other metal oxides, and the term has become a general one for the magnetic coating on tape or disk.

P

PARTITION – A portion of a hard disk devoted to a particular operating system and accessed as one logical volume by the system.

PERFORMANCE – A measure of the speed of the drive during normal operation. Factors affecting performance are seek times, transfer rate and command overhead.

PERIPHERAL – A device added to a system as an enhancement to the basic CPU, such as a disk drive, tape drive or printer.

PHYSICAL FORMAT – The actual physical layout of cylinders, tracks, and sectors on a disk drive.

PLATED MEDIA – Disks that are covered with a hard metal alloy instead of an iron-oxide compound. Plated disks can store greater amounts of data in the same area as a coated disk.

PLATTER – An disk made of metal (or other rigid material) that is mounted inside a fixed disk drive. Most drives use more than one platter mounted on a single spindle (shaft) to provide more data storage surfaces in a small package. The platter is coated with a magnetic material that is used to store data as transitions of magnetic polarity.

POH – Acronym for *power on hours*. The unit of measurement for Mean Time Between Failure as expressed in the number of hours that power is applied to the device regardless of the amount of actual data transfer usage. See MTBF.

POSITIONER – See actuator.

R

RAM – Acronym for *random access memory*. An integrated circuit memory chip which allows information to be stored and retrieved by a microprocessor or controller. The information may be stored and retrieved in any order desired, and the address of one storage location is as readily accessible as any other.

RAM DISK – A "phantom disk drive" for which a section of system memory (RAM) is set aside to hold data, just as if it were a number of disk sectors. The access to this data is extremely fast but is lost when the system is reset or turned off.

READ AFTER WRITE – A mode of operation that has the computer read back each sector on the disk, checking that the data read back is the same as recorded. This slows disk operations, but raises reliability.

READ VERIFY – A disk mode where the disk reads in data to the controller, but the controller only checks for errors and does not pass the data on to the system.

READ/WRITE HEAD – The tiny electromagnetic coil and metal pole piece used to create and read back the magnetic patterns (write or read information) on the disk. Each side of each platter has its own read/write head.

REMOVABLE DISK – Generally said of disk drives where the disk itself is meant to be removed, and in particular of hard disks using disks mounted in cartridges. Their advantage is that multiple disks can be used to increase the amount of stored material, and that once removed, the disk can be stored away to prevent unauthorized use.

RLL – Run Length Limited. A method used on some hard disks to encode data into magnetic pulses. RLL requires more processing, but stores almost 50% more data per disk than the MFM method.

ROM – Acronym for *read only memory*. Usually in the form of an ROM in the controller that contains programs that can be accessed and read but not modified by the system.

ROTARY ACTUATOR – The rotary actuator replaces the stepper motor used in the past by many hard disk manufacturers. The rotary actuator is perfectly balanced and rotates around a single pivot point. It allows closed-loop feedback positioning of the heads, which is more accurate than stepper motors.

ROTATIONAL LATENCY – The delay between when the controller starts looking for a specific block of data on a track and when that block rotates around to where it can be read by the read/write head. On the average, it is half of the time needed for a full rotation (about 8 ms.).

S

Serial ATA (SATA) - Serial ATA (Serial Advanced Technology Attachment or SATA) is a standard for connecting hard drives to computers. The Serial ATA standard defines a physical interface that uses serial signaling technology unlike the ATA standard (sometimes referred to as Parallel ATA that uses parallel technology.

SCSI – Acronym for Small Computer System Interface, an American National Standards Institute (ANSI) version of Shugart Associates' SASI interface between the computer and controller. SCSI has grown in popularity and is one of the most flexible and intelligent interfaces available.

SECTOR – A section of space along a track on the disk, or the data that is stored in that section. Hard disks most often have sectors that are 512 data bytes long plus several bytes overhead for error correcting codes. Each sector is preceded by ID data known as a header, which cannot be overwritten.

SEEK – A movement of the disk read/write head in or out to a specific track.

SERVO DATA – Magnetic markings written on the media that guide the read/write heads to the proper position.

SERVO SURFACE – A separate surface containing only positioning and disk timing information but no data.

SETTLE TIME – The interval between when a track to track movement of the head stops, and when the residual vibration and movement dies down to a level sufficient for reliable reading or writing.

SHOCK RATING – A rating (expressed in Gs) of how much shock a disk drive can sustain without damage.

SOFT ERROR – An error in reading data from the disk that does not recur if the same data is reread. Often caused by power fluctuations or noise spikes.

SOFT SECTORED – Disks that mark the beginning of each sector of data within a track by a magnetic pattern.

SPINDLE – The center shaft of the disk upon which the drive's platters are mounted.

SPUTTER – A type of coating process used to apply the magnetic coating to some high-performance disks. In sputtering, the disks are placed in a vacuum chamber and the coating is vaporized and deposited on the disks. The resulting surface is hard, smooth, and capable of storing data at high density. Maxtor disk drives use sputtered thin film disks.

SOF - Start Of Frame

STEPPER – A type of motor that moves in discrete amounts for each input electrical pulse. Stepper motors used to be widely used for read/write head positioner, since they can be geared to move the head one track per step. Stepper motors are not as fast or reliable as the rotary voice coil actuators which Maxtor disk drives use.

SUBSTRATE – The material the disk platter is made of beneath the magnetic coating. Hard disks are generally made of aluminum or magnesium alloy (or glass, for optical disks) while the substrate of floppies is usually mylar.

SURFACE – The top or bottom side of the platter which is coated with the magnetic material for recording data. On some drives one surface may be reserved for positioning information.

T

THIN FILM – A type of coating, used for disk surfaces. Thin film surfaces allow more bits to be stored per disk.

TPI – Acronym for *tracks per inch*. The number of tracks or cylinders that are written in each inch of travel across the surface of a disk.

TRACK – One of the many concentric magnetic circle patterns written on a disk surface as a guide to where to store and read the data.

TRACK DENSITY – How closely the tracks are packed on a disk surface. The number is specified as tracks per inch (TPI).

TRACK TO TRACK SEEK TIME – The time required for the read/write heads to move to an adjacent track.

TRANSFER RATE – The rate at which the

disk sends and receives data from the controller. Drive specifications usually reference a high number that is the burst mode rate for transferring data across the interface from the disk buffer to system RAM. Sustained data transfer is at a much lower rate because of system processing overhead, head switches, and seeks.

U

UNFORMATTED CAPACITY – The total number of bytes of data that could be fit onto a disk. Formatting the disk requires some of this space to record location, boundary definitions, and timing information. After formatting, user data can be stored on the remaining disk space, known as formatted capacity. The size of a Maxtor drive is expressed in formatted capacity.

V

VOICE COIL – A type of motor used to move the disk read/write head in and out to the right track. Voice-coil actuators work like loudspeakers with the force of a magnetic coil causing a proportionate movement of the head. Maxtor's actuator uses voice-coil technology, and thereby eliminates the high stress wearing parts found on stepper motor type actuators.

W

WEDGE SERVO – The position on every track that contains data used by the closed loop positioning control. This information is used to fine tune the position of the read/write heads exactly over the track center.

WINCHESTER DISKS – Hard disks that use a technology similar to an IBM model using Winchester as the code name. These disks use read/write heads that ride just above the magnetic surface, held up by the air flow created by the turning disk. When the disk stops turning, the heads land on the surface, which has a specially lubricated coating. Winchester disks must be sealed and have a filtration system since ordinary dust particles are large enough to catch between the head and the disk.

WRITE ONCE – In the context of optical disks, technologies that allow the drive to store data on a disk and read it back, but not to erase it.