Maxtor D740X-6L 20.0/40.0/60.0/80.0GB AT
Product Manual

September 19, 2001
81-127378-01

Manual abstract:

:& TQVZC/ © September 19, 2001 Maxtor Corporation. All rights reserved. @@@@@@E78016 CSA standard C22.2-950 certification granted under File No. @@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. Maxtor , MaxFax and No Quibble Service are registered trademarks of Maxtor Corporation, registered in ® ® ® the U.S.A.
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You can request Maxtor publications from your Maxtor Sales Representative or order them directly from Maxtor. Publication Number: 81-127378-01 Corporate Headquarters: 510 Cottonwood Drive Milpitas, California 95035 Tel: 408-432-1700 Fax: 408-432-4510 Research and Development Center: 2190 Miller Drive Longmont, Colorado 80501 Tel: 303-651-6000 Fax: 303-678-2165 PKIG$ WQ; GTQHG$ 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 408-922-2085. 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 electro-static discharge (ESD) precautions, including personnel and equipment grounding. Stand-alone drives are sensitive to ESD damage. 2 3 4 BEFORE removing drives from their packing material, allow them to reach room temperature.

During handling, NEVER drop, jar, or bump a drive. 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'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. 1.1 1. 2 1.3 1.4 AUDIENCE ...

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. 6-14 6-17 6-18 6-18 Maxtor D540X-4K 20.0/40.0/60.0/80.

0GB AT UGNDC 6 HQ VUK. i Table of Contents ii Maxtor D540X-4K 20.0/40.0/60.0/80.

0GB AT This chapter gives an overview of the contents of this manual, including the intended audience, how the manual is organized, terminology and conventions, and references. The Maxtor D740X-6L 20.0/40.0/60.0/80.0GB AT 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. The Maxtor D740X-6L 20.0/40.

*0/60.0/80.0GB AT family of drives provide a highquality, low-cost, market leading 40 GB per disk products to serve the consumer and mainstream commercial markets, as well as the consumer electronics market. This manual is organized into the following chapters: · Chapter 1 About This Manual · Chapter 2 General Description · Chapter 3 Installation · Chapter 4 Specifications · Chapter 5 Basic Principles of Operation · Chapter 6 ATA Bus Interface and ATA Commands 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 · ATA application-specific integrated circuit advanced technology attachment Maxtor D740X-6L 20.0/40.0/60.0/80.0GB AT .#70#/ 5+*6 671$# TGVRCJ% 501+60'801% &0# ;)1.*

10+/4'6 01+6#<+0#)41 .#70#/ '%0'+&7# 1-1 TA BG0 .08/0 .06/0 .04/0 .

02 L6-X04 7D ro tx a M 2-1 la una M sihT tuo b A · bpi · dB · dBA · DPS · SPS · ECC · Kfci · Hz · KB · LSB · mA · MB bits per inch decibels decibels, A weighted Data Protection System Shock Protection System error correcting code thousands of flux changes per inch hertz kilobytes least significant bit milliamperes 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) megabits per second megabytes per second megahertz milliseconds most significant bit millivolts nanoseconds tracks per inch microseconds volts · Mb/s · MB/s · MHz · ms · MSB · mV · ns · tpi · µs ·V 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. About This Manual · 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 30H. · 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. #"" For additional information about the ATA interface, refer to the latest revision of the draft standard on the internet at http://www.t13.org/ using the link under "1410D AT Attachment - 6 with Packet Interface (ATA/ATAPI - 6)." Maxtor D740X-6L 20.0/40.

0/60.0/80.0GB AT 1-3 TA BG0 .08/0 .06/0 .

04/0 .02 L6-X04 7D ro tx a M 4-1 la una M sihT tuo b A This chapter summarizes the general functions and key features of the Maxtor D740X-6L 20.0/40.0/60.0/80.

0GB AT hard disk drives, as well as the applicable standards and regulations. Maxtor's D740X-6L hard disk drives are part of a family of high performance, 1-inchhigh hard disk drives manufactured to meet the highest product quality standards. These hard disk drives use nonremovable, 3 1/2-inch hard disks and are available with the ATA interface. The Maxtor D740X-6L 20.0/40.0/60.0/80.0GB AT hard disk drives feature an embedded hard disk drive controller, and use ATA commands to optimize system performance. Because the drive manages media defects and error recovery internally, these operations are fully transparent to the user. The innovative design of the Maxtor D740X-6L hard disk drives incorporate leading edge technologies such as Ultra ATA/133, Advanced Cache Management, Shock Protection SystemTM (SPS), Data Protection System (DPS) and Quiet Drive Technology (QDT).

These enhanced technologies enable Maxtor to produce a family of high-performance, high-reliability drives. 5'476#'(;' The Maxtor D740X-6L 20.0/40.0/60.0/80.0GB AT hard disk drives include the following key features: General · Formatted storage capacity of 20.0GB (1 disk, 1 head), 40.0GB (1 disk, 2 heads), 60.0GB (2 disks, 3 heads), and 80.0GB (2 disks, 4 heads) · Low profile, 1-inch height · Industry standard 3 1/2-inch form factor · Emulation of IBM ® PC AT ® task file register, and all AT fixed disk commands · Windows NT and 9X Certification Maxtor D740X-6L 20.

0/40.0/60.0/80.0GB AT 01+62+4%5'& .#4'0') TGVRCJ% 9'+84'81 6%7&142 2-1 TA BG0 .

08/0 .06/0 .04/0 .02 L6-X04 7D ro tx a M 2-2 noitpircseD lareneG Performance · Average seek time of 8.5ms · Average rotational latency of 4. 17ms · New Ultra ATA interface with Maxtor-patented Ultra ATA/133 protocol supporting burst data transfer rates of 133MB/s. · 2 MB buffer with 1.9MB (approximate) Advance Cache Management (ACM). · Look-ahead DisCache feature with continuous prefetch and WriteCache write-buffering capabilities · AutoTask Register update, Multi-block AutoRead, and Multi-block AutoWrite features in a custom ASIC · Read-on-arrival firmware · Quadruple-burst ECC, and double burst ECC on-the-fly · 1:1 interleave on read/write operations · 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 and 5 · Adaptive cache segmentation Reliability · 800,000 hours mean time between failure (MTBF) in the field · Automatic retry on read errors · 320-bit, non-interleaved Reed-Solomon Error Correcting Code (ECC), with cross checking correction up to fifteen separate bursts of 10 bits each totalling up to 150 bits in length · S.

M.A.R.T. 4 (Self-Monitoring, Analysis and Reporting Technology) · Patented Airlock® automatic shipping lock, magnetic actuator retract, and dedicated landing zone · 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 · Quiet Drive Technology (QDT) · 800,000 MTBF General Description Versatility · Power saving modes · Downloadable firmware · Cable select feature · Ability to daisy-chain two drives on the interface 5&4#&0#65 '%0#+.2/1% ;416#.

7)'4 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. 560'/'4+73'4 '4#9&4# UPQKVCEKHKNCW3 5/'+/' VEWFQT2 · CE Mark authorization is granted by TUV Rheinland in compliance with our qualifying under EN 55022:1994 and EN 50082-1:1997. · 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 BS EN 55022: 1995. · 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 The Maxtor D740X-6L hard disk drives are compatible with the IBM PC AT, and other computers that are compatible with the IBM PC AT. It connects to the PC either by means of a third-party IDE-compatible adapter board, or by plugging a cable from the drive directly into a PC motherboard that supplies an ATA interface.
Maxtor D740X-6L 20.0/40.0/60.0/80.0GB AT 2-3 TA BG0 .08/0 .06/0 .04/0 .02 L6-X04 7D ro tx a M 4-2 noitpircseD lareneG This chapter explains how to unpack, configure, mount, and connect the Maxtor D740X-6L 20.0/40.

0/60.0/80.0GB AT hard disk drive prior to operation. It also explains how to start up and operate the drive. The Maxtor D740X-6L hard disk drives are shipped without a faceplate. Figure 31 shows the external dimensions of the Maxtor D740X-6L 20.0/40.0/60.0/80.0GB AT drives.
147 mm (max) (5.75 inches) 101.6 ± 0.25 mm (4.00 inches) Mechanical Dimensions of Maxtor D740X-6L Hard Disk Drive Maxtor D740X-6L 20. 0/40.0/60.0/80.0GB AT 01+6#..
#650+ TGVRCJ% 560'/'4+73'4 '%#25 26.1 mm (max) (1.00 inches) G T W IK(3-1 Installation 3-2 Maxtor D740X-6L 20.0/40.0/60.0/80.0GB AT 501+6%74650+)0+-%#207 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 D740X-6L drives are not stacked or placed on any hard surface after they are unpacked. Such handling could cause media damage.

3. When you are ready to install the drive, remove it from the ESD bag. Figure 3-2 shows the packing assembly for a single Maxtor D740X-6L hard disk drive. A 20-pack shipping container is available for multiple drive shipments. G T W IK (0 1+ 6 7 # % 0 1+ 6 7 # % 1. Open the shipping container and remove the packing assembly that contains the drive. 2. Remove the drive from the packing assembly. 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. Drive Packing Assembly Installation Drive Packing Assembly of a Polypropylene 20-Pack Container G T WIK(Note: The 20-pack container should be shipped in the same way it was received from Maxtor. When individual drives are shipped from the 20-pack container then it should be appropriately packaged (not supplied with the 20-pack) to prevent damage. Maxtor D740X-6L 20.0/40. 0/60.0/80.0GB AT 3-3 Installation 3-4 Maxtor D740X-6L 20.0/40.0/60.
0/80.0GB AT 501+621 '4#9&4# G T W IK(The configuration of a Maxtor D740X-6L 20.0/40.0/60.0/80.0GB AT 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. Figure 34 shows the printed circuit board (PCB) assembly, indicating the jumpers that control some of these options. Jumper Locations for the Hard Disk Drive Installation Jumper Locations on the Interface Connector The configuration of the following Three jumpers controls the drive's five modes of operation: · CS Cable Select · DS Drive Select · PK Jumper Parking Position (Slave mode) · AC Alternate Capacity The AT PCB has two jumper locations provided to configure the drive in a system. The default configuration for the drive as shipped from the factory is with a jumper across the DS location, and open positions in the CS, PK and AC positions.*

Table 3-1 defines the operation of the master/slave jumpers and their function relative to pin 28 on the interface. 1 indicates that the specified jumper is installed; 0 indicates that the jumper is not installed. GT W IK (Maxtor D740X-6L 20.0/40.0/60.0/80.0GB AT 3-5 Installation AT Jumper Options DESCRIPTION CS 0 1 DS 0 0 PK X X PIN 28 X Gnd 0 1 1 0 X X X Open 1 1 X X Note: In Table 3-1, a 0 indicates that the jumper is removed, a 1 indicates that the jumper is installed, and an X indicates that the jumper setting does not matter. When a Maxtor D740X-6L 20.0/40.0/60.
0/80.0GB AT hard disk drive and another ATA hard disk drive are daisy-chained together, they can be configured as Master or Slave either by the CS or DS jumpers. To configure the drive as a Master or Slave with the CS feature, the CS jumper is installed (1). The drive's position on the 80 conductor Ultra ATA data cable then determines whether the drive is a Master (Device 0) or a Slave (Device 1). If the drive is connected to the end of the Ultra (cable Select) data cable the drive is a Master.
If the drive is connected to the middle connection it is set as a Slave.

Once you install the CS jumper, the drive is configured as a Master or Slave by the state of the Cable Select signal: pin 28 of the ATA bus connector. Please note that pin 28 is a vendor-specific pin that Maxtor is using for a specific purpose. More than one function is allocated to CS, according to the ATA CAM specification (see reference to this specification in Chapter 1). If pin 28 is a 0 (grounded), the drive is configured as a Master.
If it is a 1 (high), the drive is configured as a Slave. In order to configure two drives in a Master/Slave relationship using the CS jumper, you need to use a cable that provides the proper signal level at pin 28 of the ATA bus connector. This allows two drives to operate in a Master/Slave relationship according to the drive cable placement. The Maxtor D740X-6L 20.0/40.0/60.0/80.0GB AT hard disk drives are shipped from the factory as a Master (Device 0 - CS jumper installed). To configure a drive as a Slave (Device 1- DS scheme), the CS jumper must be removed. In this configuration, the spare jumper removed from the CS position may be stored on the PK jumper pins.

3-6 Maxtor D740X-6L 20.0/40.0/60.0/80.0GB AT GN D C 6 Drive is configured as a slave Drive is configured as Master (Device 0) when attached to the end of a 80 conductor Ultra ATA cable Drive is configured as a Master Drive is configured as a Slave (Device 1) when attached to the middle of a 80 conductor Ultra ATA cable Drive is configured as a Master with an attached slave that does not support DASP TGROW, 5% VEGNG5 GNDC% Installation PQKVKUQ2 -2 IPKMTC2 TGROW, PQKVCTWIKHPQE TGROW, TGVUC/ TGROW, 5& VEGNG5 GXKT& You can also daisy-chain two drives on the ATA bus interface by using their Drive Select (DS) jumpers. To use the DS feature, the CS jumper must not be installed. To configure a drive as the Master (Device 0), a jumper must be installed on the DS pins. Note: The order in which drives are connected in a daisy chain has no significance. In combination with the current DS or CS jumper settings, the Slave Present (SP) jumper can be implemented if necessary as follows: Note: The CS position doubles as the Slave present on this drive. · When the drive is configured as a Master (DS jumper installed or CS jumper installed, and the Cable Select signal is set to (0), adding an additional jumper (both jumpers DS and CS now installed) will indicate to the drive that a Slave drive is present.
This Master with Slave Present jumper configuration should be installed on the Master drive only if the Slave drive does not use the Drive Active/Slave Present (DASP) signal to indicate its presence. The PK position is used as a holding place for the jumper for a slave drive in systems that do not support Cable Select. The pins used for the parking position are vendor unique. Maxtor D740X-6L 20.0/40.
0/60.0/80.0GB AT 3-7 Installation 20GB 40GB 60GB 80GB 3-8 Maxtor D740X-6L 20.0/40.0/60.
0/80.0GB AT %# [VKECRC% GVCPTGVN# For user capacities below 66,055,248 sectors (32GB), inserting the AC jumper limits the Number of Cylinders field 1 to a value of 16,383, as reported in IDENTIFY DEVICE data word. This allows software drivers to determine that the actual capacity is larger than indicated by the maximum CHS, requiring LBA addressing to use the full capacity. A summary of these effects for the Maxtor D740X-6L drives is shown in the following table: AC JUMPER OUT C=16,383 H=16 S=63 LBA=40,132,503 C=16,383 H=16 S=63 LBA=78,177,792 C=16,383 H=16 S=63 LBA=117,266,688 C=16,383 H=16 S=63 LBA=156,355,584 AC JUMPER IN C=4,092 H=16 S=63 LBA=39,876,479 C=16,383 H=16 S=63 LBA=66,055,247 C=16,383 H=16 S=63 LBA=66,055,247 C=16,383 H=16 S=63 LBA= 66,055,247 G T W IK (AT Connector and Jumper Location Installation Most PC motherboards have a built-in 40-pin ATA bus connector that is compatible with the 40-pin ATA interface of the Maxtor D740X-6L 20.0/40.0/60.0/80.0GB AT hard disk drives. If the motherboard has an ATA connector, simply connect a 40-pin ribbon cable between the drive and the motherboard. You should also refer to the motherboard instruction manual, and refer to Chapter 6 of this manual to ensure signal compatibility.

If your PC motherboard does not contain a built-in 40-pin ATA bus interface connector, you must install an 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, as well as Chapter 6 of this manual to ensure signal compatibility between the adapter board and the drive. Also, make sure that the adapter board jumper settings are appropriate. . C P e h t f o dr a o br e ht o m e h t n o) e l b a l i a v a fi (r o t c e n n o c s u b A T A ni p - 0 4 a o t e v i r d e h t t c e n n o C . 1 TQVEGPPQ% UW$ #6# PK2 "$ #% $ FTCQ$ TGVRCF# There are two ways you can configure a system to allow the Maxtor D740X-6L hard disk drives to communicate over the ATA bus of an IBM or IBM-compatible PC: 2. Install an IDE-compatible adapter board in the PC, and connect the drive to the adapter board. Maxtor D740X-6L 20.0/40.
0/60.0/80.0GB AT 3-9 Installation 3-10 Maxtor D740X-6L 20.0/40.0/60.
0/80.0GB AT)0+6071/ Drive mounting orientation, clearance, and ventilation requirements are described in the following subsections. PQKVCVPGKT1 G T W IK(The mounting holes on the Maxtor D740X-6L 20.0/40.0/60.
0/80.0GB AT hard disk drives allow the drive to be mounted in any orientation. Figure 3-6 and Figure 3-7 show 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 erroneous errors during testing. Drives can be mounted in any orientation. Normal position is with the PCB facing down. All dimensions are in millimeters. For mounting, #6-32 UNC screws are recommended.

Mounting Dimensions for the Maxtor D740X-6L Hard Disk Drives Installation Mounting Screw Clearance for the Maxtor Hard Disk Drives G T WIK(01 +6 7 #% The PCB is very close to the mounting holes. Do not exceed the specified length for the mounting screws. The specified screw length allows full use of the mounting hole threads, while avoiding damaging or placing unwanted stress on the PCB. Figure 3-8 specifies the minimum clearance between the PCB and the screws in the mounting holes. To avoid stripping the mounting hole threads, the maximum torque applied to the screws must not exceed 8 inch-pounds. A maximum screw length of 0.25 inches may be used. Maxtor D740X-6L 20.0/40.0/60.
0/80.0GB AT 3-11 Installation 3-12 Maxtor D740X-6L 20.

0/40.0/60.0/80.
0GB AT , 416%'001% 01+6#0+$/1% GT W IK (PQKVCNKVPG8 The Maxtor D740X-6L 20.0/40.0/60.0/80.0GB AT hard disk drives operate without a cooling fan, provided the ambient air temperature does not exceed 131°F (55°C) at any point along the drive form factor envelope.
J1 is a three-in-one combination connector. The drive's DC power can be applied to section A. The ATA bus interface (40-pin) uses section C. The connector is mounted on the back edge of the printed-circuit board (PCB), as shown in Figure 3-9. J1 IDE (40-Pin)/DC (4-Pin) Combination Connector 40-Pin IDE (J1 Section C) Pin 1 4-Pin DC Power (J1 Section A) 4 3 2 1 Pin 40 GEPCTCGN% Clearance from the drive to any other surface (except mounting surfaces) must be a minimum of 1.25 mm (0.05 inches). J1 DC Power and ATA Bus Combination Connector Installation PIN NUMBER J1 Section A (4-Pin): 1 2 +12 VDC Ground Return for +12 VDC Ground Return for +5 VDC +5 VDC 4-Pin Connector: AMP P/N 1-480424-0 Loose piece contacts: AMP P/N VS 60619-4 Strip contacts: AMP P/N VS 61117-4 3 4 % PQKVEG5 , TQVEGPPQ% GECHTGVP+ UW$ #6# &'. [VKXKVE# GXKT& NCPTGVZ' # PQKVEG5 , TGYQ2 %& The recommended mating connectors for the +5 VDC and +12 VDC input power are listed in Table 3-2. J1 Power Connector, Section A MATING CONNECTOR TYPE AND PART NUMBER (OR EQUIVALENT) VOLTAGE LEVEL Note: Labels indicate the pin numbers on the connector.

Pins 2 and 3 of section A are the +5 and +12 volt returns and are connected together on the drive. An external drive activity LED may be connected to the DASP-I/O pin 39 on J1. For more details, see the pin description in Table 6-1. On the Maxtor D740X-6L 20.0/40.0/60.0/80.0GB AT hard disk drives, the ATA bus interface cable connector (J1, section C) is a 40-pin Universal Header, as shown in Figure 3-9. To prevent the possibility of incorrect installation, the connector has been keyed by removing Pin 20. This ensures that a connector cannot be installed upside down.
See Chapter 6, "ATA Bus Interface and ATA Commands," for more detailed information about the required signals. Refer to Table 6-1 for the pin assignments of the ATA bus connector (J1, section C). GN D C 6 Maxtor D740X-6L 20.0/40.0/60.
0/80.0GB AT 3-13 Installation 3-14 Maxtor D740X-6L 20.0/40.0/60.0/80.
*0GB AT 4'62#&# #6# &4#1$4'*61/ # *6+9 5/'65;5 41(You can install the Maxtor D740X-6L 20.0/40.0/60.0/80.0GB AT hard disk drives in an AT-compatible system that contains a 40-pin ATA bus connector on the motherboard. To connect the drive to the motherboard, use a 40 conductor ribbon cable (80 conductor ribbon cable if using Ultra ATA/133 drive) 18 inches in length or shorter. Ensure that pin 1 of the drive is connected to pin 1 of the motherboard connector. &4#1$ 4'62#&# #6# 0# *6+9 5/'65;5 41(PQKVCNNCVUP+ FTCQ$ TGVRCF# To install the Maxtor D740X-6L 20.0/40.0/60.*

0/80.0GB AT hard disk drive in an AT-compatible system without a 40-pin ATA bus connector on its motherboard, you need a third-party IDE-compatible adapter board. Carefully read the manual that accompanies your adapter board before installing it. Make sure that all the jumpers are set properly and that there are no address or signal conflicts. You must also investigate to see if your AT-compatible system contains a combination floppy and hard disk controller board. If it does, you must disable the hard disk drive controller functions on that controller board before proceeding. Once you have disabled the hard disk drive controller functions on the floppy/hard drive controller, install the adapter board. Again, make sure that you have set all jumper straps on the adapter board to avoid addressing and signal conflicts. Note: For Sections 3.7 and 3.
8, power should be turned off on the computer before installing the drive. Installation 2. Insert the other end of the cable into the header on the drive. When inserting this end of the cable, make sure that pin 1 of the cable connects to pin 1 of the drive connector. 3.
Secure the drive to the system chassis by using the mounting screws, as shown in Figure 3-11. . el b a c e h t n o 1 n i p h t i w s e h c t a m r o t c e n n o c e h t f o 1 ni p t a h t e r u s e k a M . d r a o b r e t p a d a e h t f o r o t c e n n o c g ni t a m e ht o t ni r o t c e n n o c el b a c n i p - 0 4 e ht t r e s n I Drive Power Supply and ATA Bus Interface Cables Maxtor D740X-6L 20.0/40.
0/60.0/80.0GB AT 3-15 GXKT & GJV FP C FT CQ $ TGVR CF # GJV IPKV EGPP Q% G TW IK(.1 Use a 40-pin ribbon cable to connect the drive to the board. See Figure 3-10. To connect the drive to the board: Installation Completing the Drive Installation 3-16 Maxtor D740X-6L 20.0/40.0/60.0/80.0GB AT TGKTTC$ UGV[DCIG/ GJ6 01+6#47)+(01% '8+4& 0+ 5'73+0%'6 Older BIOS that only support Int 13 commands for accessing ATA drives through DOS based operating systems will be limited to use only 1024 cylinders.*

This will reduce the effective capacity of the drive to 528Mbytes. Whenever possible the Maxtor D740X-6L 20.0/40.0/60.0/80.0GB AT drive should be used on systems that support LBA translation to ensure the use of the entire capacity of the disk drive. If that is not possible the following are some techniques that can be used to overcome this barrier. · Use a third party software program that translates the hard drive parameters to an acceptable configuration for MS-DOS. G T W IK(Installation · Use a hard disk controller that translates the hard drive parameters to an appropriate setup for both MS-DOS and the computer system's ROMBIOS. · Insert the Alternate Capacity (AC) jumper on the drive (see Section 3.
3.5). UPQKVCVKOKN OGVU[U IPKVCTGR1 TGKTTC$ UGV[DCIK) GJ6 Newer BIOS's allow users to configure disk drives to go beyond the 528MB barrier by using several BIOS translation schemes. However, while using these translations the BIOS using Int 13 functions are limited to 24 bits of addressing which results in another barrier at the 8.4GB capacity.
To overcome this barrier a new set of Int 13 extensions are being implemented by most BIOS manufacturers. The new Int 13 extension allows for four words of addressing space (64 bits) resulting in 9.4 Terrabytes of accessible space. Whenever possible the Maxtor D740X-6L 20.0/40.
0/60.0/80.0GB AT drive should be used on systems with BIOS that support Int 13 extensions. If that is not possible the following are some techniques that can be used to overcome this barrier: · Use a third party software that supplements the BIOS and adds Int 13 extension support. · Obtain a BIOS upgrade from the system board manufacturer. Many system board manufacturers allow their BIOS to be upgraded in the field using special download utilities. Information on BIOS upgrades can be obtained on the System Board Customer Service respective web sites on the Internet.

· Insert the Alternate Capacity (AC) jumper on the drive (see Section 3.3.5).

Most popular operating systems available today have additional limitations which affect the use of large capacity drives. However, these limitations can not be corrected on the BIOS and it is up to the operating system manufacturers to release improved versions to address these problems. The most popular operating systems available today, DOS and Win 95, use a File Allocation Table (FAT) size of 16 bits which will only support partitions up to 2.1GB. A newer release of Win 95 called OSR2 with a 32 bit FAT has been released to system manufacturers only. This new FAT size table will support partitions of up to 2.2 Terrabytes. Maxtor D740X-6L 20.0/40.0/60.

0/80.0GB AT 3-17 Installation 20.0GB LBA Capacity CHS Capacity Logical Cylinders Logical Heads Logical Sectors/ Track Total Number Logical Sectors 20.0GB 8,455MB 40.0GB 40.

*0GB 8,455MB 16 63 16 63 16 63 16 63 40,132,503 78,177,792 117,266,688 Note: *Capacity may be restricted to 8.4GB (or less) due to system BIOS limitations. Check with your system manufacturer to determine if your BIOS supports LBA Mode for hard drives greater than 8.4GB. Default logical cylinders is limited to 16,383 as per the ATA-4 specifications.*

*3-18 Maxtor D740X-6L 20.0/40.0/60.0/80.0GB AT)633 ,611 (*3 83, 61 . : & 4 16 : #/)755 ,77 (*3 83, 61 01+6#4'21 &0# 2764#65 /'65;5 2. Run the SETUP program. This is generally on a Diagnostics or Utilities disk, or within the system's BIOS. Some system BIOS have an autodetecting feature making SETUP unnecessary. 3.*

*Enter the appropriate parameters. The SETUP program allows you to enter the types of optional hardware installed-- such as the hard disk drive type, the floppy disk drive capacity, and the display adapter type. The system's BIOS uses this information to initialize the system when the power is switched on. For instructions on how to use the SETUP program, refer to the system manual for your PC. During the AT system CMOS setup, you must enter the drive type for the Maxtor D740X-6L hard disk drives. The drive supports the translation of its physical drive geometry parameters such as cylinders, heads, and sectors per track to a logical addressing mode. The drive can work with different BIOS drive-type tables of the various host systems. You can choose any drive type that does not exceed the capacity of the drive. Table 3-3 gives the logical parameters that provide the maximum capacity on the Maxtor D740X-6L family of hard disk drives. Logical Addressing Format GN D C 6)861 ,85 (* 383, 61 .*

*me ts ys eh t no r ewo P)318 ,93 (* 383, 61 .1 Once you have installed the Maxtor D740X-6L 20.0/40.0/60.0/80.*

0GB AT hard disk drive, and adapter board (if required) in the host system, you are ready to partition and format the drive for operation. To set up the drive correctly, follow these steps: 60.0GB 60.0GB 8,455MB 80.0GB 80.

0GB 8,455MB 156,355,584 Installation To match the logical specifications of the drive to the drive type of a particular BIOS, consult the system's drive-type table. This table specifies the number of cylinders, heads, and sectors for a particular drive type. You must choose a drive type that meets the following requirements: For the 10.2GB, 20.0GB, 30.0GB, 40.0GB, 60.0GB: Logical Cylinders x Logical Heads x Logical Sectors/Track x 512 = 8,455,200,768 4. Boot the system using the operating system installation disk--for example, MS-DOS--then follow the installation instructions in the operating system manual. Maxtor D740X-6L 20.

0/40.0/60.0/80.0GB AT 3-19 Installation 3-20 Maxtor D740X-6L 20.0/40.0/60.0/80.0GB AT This chapter gives a detailed description of the physical, electrical, and environmental characteristics of the Maxtor D740X-6L hard disk drives. Table 4-1 gives a summary of the Maxtor D740X-6L hard disk drives. Specifications GND C6 Formatted Capacity Nominal rotational speed (rpm) Number of Disks Number of R/W heads Data Organization: Zones per surface Tracks per surface Total tracks Sectors per track: Inside zone Outside zone Total User Sectors Bytes per sector Number of tracks per cylinder Recording: Recording technology Maximum linear density Encoding method Interleave Track density 20,547MB 7,200 1 1 15 58,970 58,970 481 882 40,132,503 512 1 Multiple Zone 568,451 fci 50/52 NPR 1:1 60,000 tpi 40,027MB 7,200 1 2 15 58,970 117,940 481 882 78,177,792 512 2 Multiple Zone 568,451 fci 50/52 NPR 1:1 60,000 tpi Maxtor D740X-6L 20.

0/40.0/60.0/80.0GB AT 501+6#%+(+%'25 TGVRCJ% 60,040MB 7,200 2 3 15 58,970 176,910 481 882 117,266,688 512 3 Multiple Zone 568,451 fci 50/52 NPR 1:1 60,000 tpi 80,054MB 7,200 2 4 15 58,970 235,880 481 882 156,355,584 512 4 Multiple Zone 568,451 fci 50/52 NPR 1:1 60,000 tpi $) $) . : & 4 16 : #/ $) ;4#//75 01+6#%+(+%'25 $) 01 +62 + 4% 5 ' & 4-1 Maximum effective areal density (Gb/in) Performance: Seek times: Read-on-arrival Track-to-track Average write Full stroke Data transfer Rates: Disk to Read Once a Revolution1, 2 2 Max.

34.1 Min. 22.6 Max. 34.

1 Min. 22.6 Max. 34.1 Min. 22.6 Max. 34.1 Min. 22.

6 8.5 ms typ. 0.8 ms typ. 10.5 ms typ. 17.8 ms typ. 236Mb/sec min. 433Mb/sec maximum 257Mb/sec minimum 472Mb/sec maximum 16.

7MB/sec. maximum 133MB/sec. maximum 2MB 6 8.5 ms typ. 0.

8 ms typ. 10.5 ms typ. 17.8 ms typ.

236Mb/sec min. 433Mb/sec maximum 257Mb/sec minimum 472Mb/sec maximum 16.7MB/sec. maximum 133MB/sec. maximum 2MB 6 8.5 ms typ. 0.8 ms typ. 10.5 ms typ.

17.8 ms typ. 236Mb/sec min. 433Mb/sec maximum 257Mb/sec minimum 472Mb/sec maximum 16.7MB/sec. maximum 133MB/sec. maximum 2MB 6 8.5 ms typ. 0.8 ms typ.

10.5 ms typ. 17.8 ms typ. 236Mb/sec min.

433Mb/sec maximum 257Mb/sec minimum 472Mb/sec maximum 16.7MB/sec. maximum 133MB/sec. maximum 2MB 6 Disk to Read Instantaneously1 36 Bytes Reed Solomon 800,000 hrs 50,000 min. 36 Bytes Reed Solomon 800,000 hrs 50,000 min.

36 Bytes Reed Solomon 800,000 hrs 50,000 min. 36 Bytes Reed Solomon 800,000 hrs 50,000 min. 1. Disk to read buffer transfer rate is zone-dependent, instantaneous 2. Refer to Section 4.1, "DISK ERRORS" for details on error rate definitions. 3. CSS specifications assumes a duty cycle of one power off operation for every one idle spin down. 41 41 41 TA BG0.08/0.

06/0.04/0.02 L6-X047D rotxaM 2-4 41 Read Buffer to ATA Bus (PIO Mode with IORDY) Read Buffer to ATA Bus (Ultra ATA Mode) Buffer Size Reliability: Seek error rate Unrecoverable error rate Error correction method (with cross check) Projected MTBF Contact Start/Stop Cycles (Ambient temperature) Auto head-park method 3 2 3 2 1 in 10 1 in 10 1 in 10 1 in 10 1 in 10 1 in 10 1 in 10 1 in 10 $) $) . : & 4 16 : #/ $) $) 01 +62 + 4% 5 ' & snoitacificepS Specifications Formatted Capacity Number of 512-byte sectors available 20,547MB 40,132,503 40,027MB 78,177,792 60,040MB 117,266,688 80,054MB 156,355,582 Note: The AT capacity is artificially limited to a 2.

1GB partition boundary. Data is transferred from the disk to the read buffer at a rate of up to 750Mb/s in bursts. Data is transferred from the read buffer to the ATA bus at a rate of up to 16.7MB/s using programmed I/O with IORDY, or at a rate of up to 133MB/s using Ultra ATA/133. For more detailed information on interface timing, refer to Chapter 6. Maxtor D740X-6L 20.

0/40.0/60.0/80.0GB AT $) $) $) GNDC 6 5'6#4 4'(50#46 #6#& ;6+%#2#% &'66#/41(At the factory, the Maxtor D740X-6L 20.0/40.

0/60.0/80.0GB AT hard disk drives receive a low-level format that creates the actual tracks and sectors on the drive. Table 4-2 shows the capacity resulting from this process. Formatting done at the user level, for operation with DOS, UNIX, or other operating systems, may result in less capacity than the physical capacity shown in Table 4-2.

Formatted Capacity $) 4-3 1. Nominal conditions are as follows: ·Nominal temperature 77°F (25°C) ·Nominal supply voltages (12.0V, 5.0V) ·No applied shock or vibration 2. Worst case conditions are as follows: ·Worst case temperature extremes 41 to 131°F (5°C to 55°C) ·Worst case supply voltages (12.0V ±10%, 5.0V ±5%) 3. Sequential Cylinder Switch Time is the time from the conclusion of the last sector of a cylinder to the first logical sector on the next cylinder (no more than 6% of cylinder switches exceed this time). 4. Sequential Head Switch Time is the time from the last sector of a track to the beginning of the first logical sector of the next track of the same cylinder (no more than 6% of head switches exceed this time).

5. Power On is the time from when the supply voltages reach operating range to when the drive is ready to accept any command. 6. Drive Ready is the condition in which the disks are rotating at the rated speed, and the drive is able to accept and execute commands requiring disk access without further delay at power or start up. Error recovery routines may extend the time to as long as 45 seconds for drive ready. 7. Standby is the condition at which the microprocessor is powered, but not the HDA. When the host sends the drive a shutdown command, the drive parks the heads away from the data zone, and spins down to a complete stop. 8. After this time it is safe to move the disk drive 6 8 8 Sequential Cylinder Switch Time Sequential Head Switch Time Random Average (Read or Seek) Random Average (Write) Full-Stroke Seek Average Rotational Latency Power On to Drive Ready Standby to Interface Ready Spindown Time, Standby Command Spindown Time, Power loss 3 9 4 6 9 5 7 0.

8ms 1ms 8.5ms 10.5ms 17.8ms 4.163ms 12.

5 seconds 10.0 seconds 19.0 seconds 20.0 seconds 1.2ms 1.

75ms 12ms 13ms 24ms -- 30.0 seconds -- 25.0 seconds 30.0 seconds 2 ' 5 #% 6 5 41 9 1 . # 0+ / 1 0 . #% +2 ;6 TA BG0.08/0.06/0.04/0.02 L6-X047D rotxaM 4-4 GND C6 501+6#%+(+%'25)0+/+6 Table 4-3 illustrates the timing specifications of the Maxtor D740X-6L hard disk drives.

Timing Specifications 4'6 ' / # 4 # 2 snoitacificepS Specifications 9. Average random seek is defined as the average seek time between random logical block addresses (LBAs). 4'912 The Maxtor D740X-6L 20.0/40.0/60.0/80.0GB AT hard disk drives operate from two supply voltages: · +12V ±10% · +5V ±5% The allowable ripple and noise is 250 mV peak-to-peak for the +12 Volt supply and 150 mV peak-to-peak for the +5Volt supply. IPKEPGWSG5 TGYQ2 You may apply the power in any order, or open either the power or power return line with no loss of data or damage to the disk drive. However, data may be lost in the sector being written at the time of power loss. The drive can withstand transient voltages of +10% to 100% from nominal while powering up or down. dlohserhT +12 V V = 8.7V minimum 9.7V maximum dlohserhT +5 V V = 4.3V minimum 4.6V maximum 60 mV (typical) 180 mV (typical) Maxtor D740X-6L 20.

*0/40.0/60.0/80.0GB AT 5 + 5' 4 '6 5 ; * & .1 * 5 ' 4 *6 GNDC 6 UVKOK.*

VGUG4 TGYQ2 When powering up, the drive remains reset (inactive) until both rising voltage thresholds reset limits are exceeded for 30 ms. When powering down, the drive becomes reset when either supply voltage drops below the falling voltage threshold for µ1 ms. Power Reset Limits ') #6 .1 8 % & 4-5 Startup (peak) 3 23.9 6.5 11.6 0.8 7.1 6 4 Idle Maximum Seeking 4 Standby Read/Write On Track (peak) 1. Current is rms except for startup.

Startup current is the typical peak current of the peaks greater than 10 ms in duration. This power is required for less than 6 seconds. 2. Power requirements reflect nominal for +12V and +5V power. 5 6 6 # 9 2 4 ' 9 1 2 ') # 4 ' 8 # . # %+ 2 ; 6 24.0 7.4 12.5 0.8 8.

0 $) UM UK & $) M U K& TA BG0.08/0.06/0.04/0.02 L6-X047D rotxaM 6-4 0 1 +6 # 4' 21 (1 ' & 1 / 4 '$ /7 0 .

' & 1 / 6 Read/Write On Track 1 5 Standby 4 Maximum Seeking 3 Idle 1 Startup (peak) 1800 350 780 25 375 1800 425 850 25 450 450 375 450 100 475 450 375 450 100 475 $) U M UK & F G V Q P G UK Y T G J V Q U U GN P W 5 / 4 U R O # O ') # 4 ' 8# . #% +2 ;6 8 2 6 0 ' 4 4 7% $) M U K& $) UM UK & 8 $) GNDC 6 M U K& UVPGOGTKWSG4 TGYQ2 0 1 +6 # 4' 21 (1 ' & 1 / 4 '$ /7 0 .' & 1 / snoitacificepS Table 4-5 lists the voltages and typical average corresponding currents for the various modes of operation of the Maxtor D740X-6L hard disk drives. Typical Power and Current Consumption Specifications 3. Idle mode is in effect when the drive is not reading, writing, seeking, or executing any commands.

A portion of the R/W circuitry is powered down, the motor is up to speed and the Drive Ready condition exists. 4. Maximum seeking is defined as continuous random seek operations with minimum controller delay. 5. Standby mode is defined as when the motor is stopped, the actuator is parked, and all electronics except the interface control are in low power state. Standby occurs after a programmable time-out after the last host access. Drive ready and seek complete status exist. The drive leaves standby upon receipt of a command that requires disk access or upon receiving a spinup command. 6. Read/Write On Track is defined as 50% read operations and 50% write operations on a single physical track.

Ball Bearing Spindle Idle Seek Fluid Bearing Spindle Idle Seek 3.0/3.3 Bels 3.5/3.8 Bels 3.2/3.5 Bels 3.5/3.8 Bels 2.7/2.

9 Bels 3.2/3.4 Bels 2.8/3.0 Bels 3.

3/3.6 Bels Maxtor D740X-6L 20.0/40.0/60.0/80.

0GB AT - 5+ & - 5+ & GND C6 5%+6571%# Table 4-6 specifies the acoustical characteristics of the Maxtor D740X-6L 20.0/40.0/ 60.0/80.0GB AT hard disk drive. The acoustics are measured in an anechoic chamber with background noise at least <10dBA less than the expected sound pressure Lp(A).

To distinguish between sound power and sound pressure standards, sound power Lw(A) is specified in Bels. The relationship between bels and dBA for sound power is 1 bel = 10dBA. Acoustical Characteristics--Sound Power '& 1 /) 0 +6# 4 ' 21 4-7 Temperature (Non-condensing) Temperature Gradient (Non-condensing) Humidity (Non-condensing) Maximum Wet Bulb Temperature Humidity Gradient 4 ,3 2 1 5° to 55°C (41° to 131°F) 20°C/hr maximum (68°F/hr) 10% to 85% RH 30°C (86°F) -40° to 65°C (-40° to 149°F) 30°C/hr maximum (86°F/hr) 5% to 95% RH 40°C (104°F) 10% / hour 200m to 3,000m (650 to 10,000ft.) 1.

5 kPa/min 10% / hour 200m to 12,000m (650 to 40,000ft.) 8 kPa/min Altitude Altitude Gradient 1. Maximum operating temperature must not exceed the drive at any point along the drive form factor envelope. Airflow or other means must be used as needed to meet this requirement. 2. The humidity range shown is applicable for temperatures whose combination does not result in condensation in violation of the wet bulb specifications. 3. Altitude is relative to sea level. 4. The specified drive uncorrectable error rate will not be exceeded over these conditions.
) 0+ 6 # 4 ' 2 1 0 1 0) 0 +6 #4 ' 21 TA BG0.08/0.06/0.04/0.02 L6-X047D rotxaM 8-4 501+6+&01% .
#60'/014+80' GNDC 6 .#%+0#%'/ Maxtor D740X-6L hard disk drives are designed to meet the form factor dimensions of the SFF committee specification SFF8300. Height: 25.4 mm maximum Width: 101.6 ± 0.*
25mm Depth: 147.0 mm maximum Weight: 1.3 lb Table 4-7 summarizes the environmental specifications of the Maxtor D740X-6L hard disk drives. Environmental Specifications 4 '6 ' /# 4 # 2 snoitacificepS Specifications Translational 1/2 sine wave Rotational 2 ms applied at geometry center of the drive Vibration Translational Random Vibration (G /Hz) Sine wave (peak to peak) 2 1 30.0Gs, 2ms (write) 63.0Gs, 2ms (read) 2 300Gs, 2ms 150Gs, 1ms 2 2,000 rad/sec 20,000 rad/sec 0.004 (10 500Hz) .5G P-P 5-500Hz 1/2 octave per minute sweep 12.5 rad/sec (10 300Hz) 2 0.05 (10 500Hz) 2G P-P 5500Hz 1 octave per minute sweep Rotational 1.

*The specified drive unrecovered error rate will not be exceeded over these conditions. '8+4& '*6)0+.&0#* Before handling the Maxtor hard disk drive some precautions must to be taken to ensure that the drive is not damaged. Use both hands while handling the drive and hold the drive by its edges. Maxtor drives are designed to withstand normal handling, however, hard drives can be damaged by electrostatic discharge (ESD), dropping the drive, rough handling, and mishandling. Use of a properly grounded wrist strap to the earth is strongly recommended. Always keep the drive inside its special antistatic bag until ready to install. Note: To avoid causing any damage to the drive do not touch the Printed Circuit Board (PCB) or any of its components when handling the drive. Maxtor D740X-6L 20.0/40.*
*0/60.0/80.0GB AT) 0 +6# 4 ' 21 0 1 0) 0+ 6 # 4 ' 2 1 GND C6 01+6#4$+8 &0# -%1*5 The Maxtor D740X-6L 20.0/40.0/60.*
*0/80.0GB AT hard disk drives can withstand levels of shock and vibration applied to any of its three mutually perpendicular axes, or principal base axis, as specified in Table 4-8. A functioning drive can be subjected to specified operating levels of shock and vibration. When a drive has been subjected to specified nonoperating levels of shock and vibration, with power to the drive off, there will be no loss of user data at power on. When packed in its 1-pack shipping container, the Maxtor D740X-6L drives can withstand a drop from 30 inches onto a concrete surface on any of its surfaces, six edges, or three corners. The 20-pack shipping container can withstand a drop from 30 inches onto a concrete surface on any of its surfaces, six edges, or three corners. Shock and Vibration Specifications 1 - %1 * 5 4-9 ;6+.+$+62'%575 %+6'0)#/146%'.' TA BG0.08/0.06/0.04/0.02 L6-X047D rotxaM '%0#.#$/+ '.&0+25 ;6+.*

+$#+.'4 Mean Time Between Failures (MTBF): The projected field MTBF is 800,000 hours. The Maxtor MTBF numbers represent Bell-Core TR-332 Issue #6, December 1997 MTBF predictions and represent the minimum MTBF that Maxtor or a customer would expect from the drive. 5 years Not required 50,000 cycles at ambient temperature (minimum) Component Life: Preventive Maintenance (PM): Start/Stop: Note: CSS specification assumes a duty cycle of one power off operation for every one idle mode spin downs. E Field: (3Volts/meter at 27-1000 MHz)10. 10 Standard as per 61000-4-3 is 3Volts/ meter. B Field: As per standard EN61004-8 0.5 g-mm maximum (This is approximately equivalent to 0.04 G emitted vibrations) snoitacificepS 01-4 Specifications 1. Retry recovered read errors are errors which require retries for data correction.
Errors corrected by ECC on-the-fly are not considered recovered read errors. Read on arrival is disabled to meet this specification. Errors corrected by the thermal asperity correction are not considered recovered read errors. 2. Unrecovered read errors are errors that are not correctable using ECC or retries. The drive terminates retry reads either when a repeating error pattern occurs, or after the programmed limit for unsuccessful retries and the application of quadruple-burst error correction. 3. Seek errors occur when the actuator fails to reach (or remain) over the requested cylinder and the drive requires the execution of a full recalibration routine to locate the requested cylinder. Note: Error rates are for worst case temperature and voltage. Maxtor D740X-6L 20.0/40.0/60.0/80.0GB AT 6 3 Seek errors 1 error per 10 seeks 41 2 Unrecovered read errors 1 event per 10 9 1 Retry recovered read errors 1 event per 10 bits read bits read 5 41 4 4 ' (1 4 '$ / 7 0 / 7 / + :# / GND C6 ' 2;6 4 1 4 4' 54144' -5+& Table 4-9 provides the error rates for the Maxtor D740X-6L hard disk drives. Error Rates 4-11 This chapter describes the operation of Maxtor D740X-6L hard disk drives' functional subsystems. It is intended as a guide to the operation of the drive, rather than a detailed theory of operation. This section describes the drive mechanism. Section 5.2 describes the drive electronics. The Maxtor D740X-6L hard disk drives consist of a mechanical assembly and a PCB as shown in Figure 5-1.

The head/disk assembly (HDA) contains the mechanical subassemblies of the drive, which are sealed under a metal cover. The HDA consists of the following components: g ni tsac es a B · · Automatic actuator lock · Air filter The drive is assembled in a Class-100 clean room. 01+6#4'21 (1 5'.2+%0+42 %+5#$ TGVRCJ% /5+0#%'/ '8+4& .*

:& 416:#/ yl b m e s s a r e n oi ti s o p y r at o R · 01+ 6 7 #% ylbm essa kca ts dae H · ylbm essa kca ts ks i D · ylbmessa rotom CD · To ensure that the air in the HDA remains free of contamination, never remove or adjust its cover and seals. Tampering with the HDA will void your warranty. Maxtor D740X-6L 20.0/40.0/60.0/80.

0GB AT 5-1 Basic Principles of Operation A Generic Hard Disk Drive Exploded View Maxtor D740X-6L 20.0/40.0/60.0/80.0GB AT 5-2 GT WIK(1. For user data, zone 15 is the innermost zone and zone 1 is the outermost zone. '6 # 4 #6 # & 82.155 95.345 02.635 22. 035 15.025 26.905 88.984 45.164 26.434 50.704 69.783 59.063 26.443 35.

323 02.403 32.964 -% # 46 4 '2 5 416% ' 5 st n e t n o C r e d n i l y C 738 628 418 508 987 487 447 007 856 616 885 845 225 094 754 992 5-% # 46 (1 4 '$ / 7 0 2852 2144 3214 9353 8604 0834 8834 2205 0915 6044 2333 5893 3392 4192 6963 86 T A BG0 .08/0 .06/0 .04/0 .02 L6-X047 D r ot xa M GND C 6 [NDOGUU# IPKVUC% GUC$ UGKNDOGUU# MECV5 MUK& 1 ' 0 1< [NDOGUU# TQVQ/ %& 01 11 21 31 41 51 1 2 3 4 5 6 7 8 9 0 56 0 '6 0 1% 4 ' & 0+ . ; % noitarepO fo selpicnirP cisaB ataD metsyS A single-piece, e-coated, aluminum-alloy base casting provides a mounting surface for the drive mechanism and PCB. The base casting also acts as the flange for the DC motor assembly. To provide a contamination-free environment for the HDA, a gasket provides a seal between the base casting, and the metal cover that encloses the drive mechanism.

Integral with the base casting, the DC motor assembly is a fixed-shaft, brushless DC spindle motor that drives the counter-clockwise rotation of the disks. The disk stack assembly in the Maxtor D740X-6L hard disk drives consist of disks secured by a disk clamp. The aluminum-alloy disks have a sputtered thin-film magnetic coating. A carbon overcoat lubricates the disk surface. This prevents head and media wear due to head contact with the disk surface during head takeoff and landing.

Head contact with the disk surface occurs only in the landing zone outside of the data area, when the disk is not rotating at full speed. The landing zone is located at the inner diameter of the disk, beyond the last cylinder of the data area. 3-5 Basic Principles of Operation When DC power is applied to the motor and the disk stack rotates, the rotation generates an airflow on the surface of the disk. As the flow of air across the air vane increases with disk rotation, the locking arm pivots away from the actuator arm, enabling the headstack to move out of the landing zone. When DC power is removed from the motor, an electronic return mechanism automatically pulls the actuator into the landing zone, where the magnetic actuator retract force holds it until the Airlock closes and latches it in place.

Maxtor D740X-6L 20.0/40.0/60.0/80.0GB AT 5-4 ® [NDOGUU# TGPQKVKUQ2 [TCVQ4 MEQ. TQVCWVE# EKVCOQVW# [NDOGUU# MECVUFCG The headstack assembly consists of read/write heads, head arms, and a coil joined together by insertion molding to form a rotor subassembly, bearings, and a flex circuit. Read/write heads mounted to spring-steel flexures are swage mounted onto the rotary positioner assembly arms. The flex circuit exits the HDA through the base casting. A cover gasket seals the gap. The flex circuit connects the headstack assembly to the PCB.*

The flex circuit contains a read preamplifier/write driver IC. The rotary positioner, or rotary voice-coil actuator, is a Maxtor-proprietary design that consists of upper and lower permanent magnet plates, a rotary single-phase coil molded around the headstack mounting hub, and a bearing shaft. The single bi-polar magnet consists of two alternating poles and is bonded to the magnet plate. A resilient crash stop prevents the heads from being driven into the spindle or off the disk surface. Current from the power amplifier induces a magnetic field in the voice coil. Fluctuations in the field around the permanent magnet cause the voice coil to move. The movement of the voice coil positions the heads over the requested cylinder. To ensure data integrity and prevent damage during shipment, the drive uses a dedicated landing zone, an actuator magnetic retract, and Maxtor's patented Airlock . The Airlock holds the headstack in the landing zone whenever the disks are not rotating. It consists of an air vane mounted near the perimeter of the disk stack, and a locking arm that restrains the actuator arm assembly.

T A BG0 .08/0 .06/0 .04/0 .02 L6-X047 D r ot xa M 5%+0146%'.

' '8+4& GTW IK (PQKVCTVNK(TK# noitarepO fo selpicnirP cisaB The Maxtor D740X-6L hard disk drives are Winchester-type drives. The heads fly very close to the media surface. Therefore, it is essential that the air circulating within the drive be kept free of particles. Maxtor assembles the drive in a Class-100 purified air environment, then seals the drive with a metal cover. When the drive is in use, the rotation of the disks forces the air inside of the drive through an internal 0.

3 micron filter. The internal HDA cavity pressure equalizes to the external pressure change by passing air through a 0.3 micron, carbon impregnated breather filter. 5-5 Advanced circuit (Very Large Scale Integration) design and the use of miniature surface-mounted devices and proprietary VLSI components enable the drive electronics, including the ATA bus interface, to reside on a single printed circuit board assembly (PCBA). Figure 5-2 contains a simplified block diagram of the Maxtor D740X-6L hard disk drive electronics. The only electrical component not on the PCBA is the PreAmplifier and Write Driver IC. It is on the flex circuit (inside of the sealed HDA). Mounting the preamplifier as close as possible to the read/write heads improves the signal-to-noise ratio. The flex circuit (including the PreAmplifier and Write Driver IC) provides the electrical connection between the PCB, the rotary positioner assembly, and read/ write heads. Maxtor D740X-6L Hard Disk Drive Block Diagram Basic Principles of Operation UEKPQTVEGN' GECHTGVP+ #6# FPC TGNNQTVPQ% MUK& TQUUGEQT2z FGVCTIGVP+ The µProcessor, Disk Controller, and ATA Interface electronics are contained in a proprietary ASIC developed by Maxtor, as shown below in Figure 5-3.

Block Diagram GTWIK(Maxtor D740X-6L 20.0/40.0/60.0/80.0GB AT 5-6 T A BG0 .08/0 .06/0 .04/0 .02 L6-X047 D r ot xa M NQTVPQ% %%' GFQ% PQKVEGTTQ% TQTT' GMQR5 UWQPQTJEP[5 NCVKIK& TGNNQTVPQ% TGHHW$ noitarepO fo selpicnirP cisaB The integrated µProcessor, Disk Controller, and ATA Interface Electronics have nine functional modules (described below): · µProcessor · Digital Synchronous Spoke (DSS) · Error Correction Code (ECC) Control · Formatter · Buffer Controller · Servo Controller, including PWM · Serial Interface · ATA Interface Controller · Motor Controller TQUUGEQT2z TGVVCOTQ(The µProcessor core provides local processor services to the drive electronics under program control.