



DK440LX Motherboard Specification Update

Release Date: June 1998

Order Number: 686887-007

The DK440LX motherboard may contain design defects or errors known as errata which may cause the product to deviate from published specifications. Current characterized errata are documented in this Specification Update.

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The DK440LX motherboard may contain design defects or errors known as errata which may cause the product to deviate from published specifications. Current characterized errata are available on request.

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REVISION HISTORY

Date of Revision	Version	Description
November 1997	-001	This document is the first Specification Update for the Intel® DK440LX motherboard.
December 1997	-002	Added Erratum 5.
January 1998	-003	Added Specification Changes 1-2 and Errata 6-7.
February 1998	-004	Added Specification Change 3, Errata 8-10 and Specification Clarification 1.
March 1998	-005	Added Specification Change 4. Updated Specification Change 3. Updated status of Errata 1 and 4.
May 1998	-006	Added Specification Change 5. Added Errata 11-12.
June 1998	-007	Added Specification Clarification 2 and Documentation Change 2.

PREFACE

This document is an update to the specifications contained in the *DK440LX Motherboard Technical Product Specification* (Order number 682717). It is intended for hardware system manufacturers and software developers of applications, operating systems, or tools. It will contain Specification Changes, Errata, Specification Clarifications, and Documentation Changes.

Refer to the *Pentium® II Processor Specification Update* (Order number 243337) for specification updates concerning the Pentium II processor. Items contained in the *Pentium II Processor Specification Update* that either do not apply to the DK440LX motherboard or have been worked around are noted in this document. Otherwise, it should be assumed that any processor errata for a given stepping are applicable to the PBA revision(s) associated with that stepping.

Refer to the *82443LX PAC AGPset Specification Update* (Order Number 297655) for specification updates concerning the 82440LX PCIset. Items contained in the *82440LX PCIset Specification Update* that either do not apply to the DK440LX motherboard or have been worked around are noted in this document. Otherwise, it should be assumed that any PCIset errata for a given stepping are applicable to the PBA revision(s) associated with that stepping.

Refer to the *82371AB PIIX4 Specification Update* (Order Number 297738) for specification updates concerning the 82371AB PIIX4. Items contained in the *82371AB PIIX4 Specification Update* that either do not apply to the DK440LX motherboard or have been worked around are noted in this document. Otherwise, it should be assumed that any PIIX4 errata for a given stepping are applicable to the Printed Board Assembly (PBA) revision(s) associated with that stepping.

Nomenclature

Specification Changes are modifications to the current published specifications. These changes will be incorporated in the next release of the specifications.

Errata are design defects or errors. Characterized errata may cause the DK440LX motherboard's behavior to deviate from published specifications. Hardware and software designed to be used with any given Printed Board Assembly (PBA) and BIOS revision level must assume that all errata documented for that PBA and BIOS revision level are present on all motherboards.

Specification Clarifications describe a specification in greater detail or further highlight a specification's impact to a complex design situation. These clarifications will be incorporated in the next release of the specifications.

Documentation Changes include typos, errors, or omissions from the current published specifications. These changes will be incorporated in the next release of the specifications.

Specification Update for DK440LX Motherboards

GENERAL INFORMATION

Basic DK440LX Motherboard Identification Information

AA Revision	PBA Revision	82440LX PCISet Stepping	BIOS Revision	Notes
681940-505	672282-505	A3	4D4KLOX0.86A.0011.P03	1-5
681940-506	672282-506	A3	4D4KLOX0.86A.0011.P03	1-5
681940-508	672282-508	A3	4D4KLOX0.86A.0011.P03	1-5
681940-509	672282-509	A3	4D4KLOX0.86A.0011.P03	1-5
681940-510	672282-510	A3	4D4KLOX0.86A.0017.P08	1-5
681940-511	672282-511	A3	4D4KLOX0.86A.0017.P08	1-5
681942-501	681943-501	A3	4D4KLOX0.86A.0011.P03	1-5
681942-508	681943-508	A3	4D4KLOX0.86A.0011.P03	1-5
681942-509	681943-509	A3	4D4KLOX0.86A.0011.P03	1-5
681942-510	681943-510	A3	4D4KLOX0.86A.0017.P08	1-5
681942-511	681943-511	A3	4D4KLOX0.86A.0017.P08	1-5
683709-501	683712-501	A3	4D4KLOX0.86A.0011.P03	1-5
683709-508	683712-508	A3	4D4KLOX0.86A.0011.P03	1-5
683709-509	683712-509	A3	4D4KLOX0.86A.0011.P03	1-5
683709-510	683712-510	A3	4D4KLOX0.86A.0017.P08	1-5
683709-511	683712-511	A3	4D4KLOX0.86A.0017.P08	1-5

NOTES:

1. The PBA number or AA number is found on a small label on the component side of the board.

2. The 82440LX PCiset kit used on this PBA revision consists of two components as follows:

Device	Stepping	S-Spec Numbers
82443LX	A3	SL2KK
82371AB	B0	SL23P SL2KM

3. The following errata are contained in the *Pentium® II Processor Specification Update* (Order Number 243337) for the Pentium II processor and either do not apply to the DK440LX motherboard or have been worked-around in this PBA and/or BIOS revision: 3, 10-11, 17, 1AP-3AP. All other errata associated with the processor apply to this PBA revision.
4. The following items are contained in the *Intel® 82443LX PAC AGPset Specification Update* (Order Number 297655) and either do not apply to the DK440LX motherboard or have been worked around in this PBA and/or BIOS revision: 1-2, 4-5. All other errata associated with the AGPset apply to this PBA revision.
5. The following items are contained in the *82371AB PIIX4 Stepping Information* (Order Number 297738) and either do not apply to the DK440LX motherboard or have been worked around in this PBA and/or BIOS revision: 2, 3, 5. All other errata associated with the PIIX4 apply to this PBA revision.

Summary Table of Changes

The following table indicates the Specification Changes, Errata, Specification Clarifications, or Documentation Changes which apply to the DK440LX motherboard. Intel intends to fix some of the errata in a future revision of the motherboard, and to account for the other outstanding issues through documentation or specification changes as noted. This table uses the following notations:

CODES USED IN SUMMARY TABLE

- Doc: Document change or update that will be implemented.
- Fix: This erratum is intended to be fixed in a future revision of the motherboard or BIOS.
- Fixed: This erratum has been previously fixed.
- NoFix: There are no plans to fix this erratum.
- Shaded: This erratum is either new or modified from the previous version of the document.

NO.	PLANS	SPECIFICATION CHANGES
1	Doc	Revision of external battery specification
2	Doc	Revision of Section 1.15.5, Adaptec* RAIDport*
3	Doc	Support for 333 MHz Pentium® II processors
4	Doc	Change to description of bootable controllers
5	Doc	Change to main memory requirements
NO.	PLANS	ERRATA
1	Fixed	LS-120 drive does not work as expected in Windows* 95
2	Fix	Serial mouse activity does not wake system after APM shutdown
3	Fix	Stuck or depressed key during POST may cause system hang
4	Fixed	System BIOS does not detect ECC memory errors
5	Fix	Onboard SCSI controller identifies tape drive as hard drive
6	Fix	System cannot recover BIOS from LS-120 drive
7	Fix	SCO* UnixWare* will not install from onboard SCSI channel B
8	NoFix	Advanced Power Management may suspend system during CD-ROM playback
9	Fix	System will not boot with network as first boot device
10	Fix	System BIOS does not recognize hard drives larger than 8.4 GB
11	Fix	BIOS Setup does not support changing User Password or Unattended Start in user mode
12	Fix	BIOS does not release IRQ if no mouse is present
NO.	PLANS	SPECIFICATION CLARIFICATIONS
1	Doc	Network operating system may report lost hardware interrupts
2	Doc	The Intel® Celeron™ processor
NO.	PLANS	DOCUMENTATION CHANGES
1	Doc	Revision of Section 3.4, PCI IDE Support

NO.	PLANS	DOCUMENTATION CHANGES
2	Doc	Revision of Section 6.3, BIOS Beep Codes
3	Doc	Change to Description of Manufacturing Options

The errata described in this specification update apply to combinations of PBA revision and BIOS revision as shown in the table below. Descriptions of the individual errata referred to by number in the table below are found in the ERRATA section of this document.

PBA Revision	BIOS Revision	Errata That Apply
672282-505	4D4KLOX0.86A.0011.P03	1-12
	4D4KLOX0.86A.0012.P04	2-12
	4D4KLOX0.86A.0014.P06	2-3, 5-12
	4D4KLOX0.86A.0017.P08	2-3, 5-12
	4D4KLOX0.86A.0018.P09	2-3, 5-12
672282-506	4D4KLOX0.86A.0011.P03	1-12
	4D4KLOX0.86A.0012.P04	2-12
	4D4KLOX0.86A.0014.P06	2-3, 5-12
	4D4KLOX0.86A.0017.P08	2-3, 5-12
	4D4KLOX0.86A.0018.P09	2-3, 5-12
672282-508	4D4KLOX0.86A.0011.P03	1-12
	4D4KLOX0.86A.0012.P04	2-12
	4D4KLOX0.86A.0014.P06	2-3, 5-12
	4D4KLOX0.86A.0017.P08	2-3, 5-12
	4D4KLOX0.86A.0018.P09	2-3, 5-12

PBA Revision	BIOS Revision	Errata That Apply
672282-509	4D4KLOX0.86A.0011.P03	1-12
	4D4KLOX0.86A.0012.P04	2-12
	4D4KLOX0.86A.0014.P06	2-3, 5-12
	4D4KLOX0.86A.0017.P08	2-3, 5-12
	4D4KLOX0.86A.0018.P09	2-3, 5-12
672282-510	4D4KLOX0.86A.0011.P03 [†]	1-12
	4D4KLOX0.86A.0012.P04 [†]	2-12
	4D4KLOX0.86A.0014.P06 [†]	2-3, 5-12
	4D4KLOX0.86A.0017.P08	2-3, 5-12
	4D4KLOX0.86A.0018.P09	2-3, 5-12
672282-511	4D4KLOX0.86A.0011.P03 [†]	1-12
	4D4KLOX0.86A.0012.P04 [†]	2-12
	4D4KLOX0.86A.0014.P06 [†]	2-3, 5-12
	4D4KLOX0.86A.0017.P08	2-3, 5-12
	4D4KLOX0.86A.0018.P09	2-3, 5-12
681943-501	4D4KLOX0.86A.0011.P03	1-12
	4D4KLOX0.86A.0012.P04	2-12
	4D4KLOX0.86A.0014.P06	2-3, 5-12
	4D4KLOX0.86A.0017.P08	2-3, 5-12
	4D4KLOX0.86A.0018.P09	2-3, 5-12

PBA Revision	BIOS Revision	Errata That Apply
681943-508	4D4KLOX0.86A.0011.P03	1-12
	4D4KLOX0.86A.0012.P04	2-12
	4D4KLOX0.86A.0014.P06	2-3, 5-12
	4D4KLOX0.86A.0017.P08	2-3, 5-12
	4D4KLOX0.86A.0018.P09	2-3, 5-12
681943-509	4D4KLOX0.86A.0011.P03	1-12
	4D4KLOX0.86A.0012.P04	2-12
	4D4KLOX0.86A.0014.P06	2-3, 5-12
	4D4KLOX0.86A.0017.P08	2-3, 5-12
	4D4KLOX0.86A.0018.P09	2-3, 5-12
681943-510	4D4KLOX0.86A.0011.P03 [†]	1-12
	4D4KLOX0.86A.0012.P04 [†]	2-12
	4D4KLOX0.86A.0014.P06 [†]	2-3, 5-12
	4D4KLOX0.86A.0017.P08	2-3, 5-12
	4D4KLOX0.86A.0018.P09	2-3, 5-12
681943-511	4D4KLOX0.86A.0011.P03 [†]	1-12
	4D4KLOX0.86A.0012.P04 [†]	2-12
	4D4KLOX0.86A.0014.P06 [†]	2-3, 5-12
	4D4KLOX0.86A.0017.P08	2-3, 5-12
	4D4KLOX0.86A.0018.P09	2-3, 5-12

PBA Revision	BIOS Revision	Errata That Apply
683712-501	4D4KLOX0.86A.0011.P03	1-12
	4D4KLOX0.86A.0012.P04	2-12
	4D4KLOX0.86A.0014.P06	2-3, 5-12
	4D4KLOX0.86A.0017.P08	2-3, 5-12
	4D4KLOX0.86A.0018.P09	2-3, 5-12
683712-508	4D4KLOX0.86A.0011.P03	1-12
	4D4KLOX0.86A.0012.P04	2-12
	4D4KLOX0.86A.0014.P06	2-3, 5-12
	4D4KLOX0.86A.0017.P08	2-3, 5-12
	4D4KLOX0.86A.0018.P09	2-3, 5-12
683712-509	4D4KLOX0.86A.0011.P03	1-12
	4D4KLOX0.86A.0012.P04	2-12
	4D4KLOX0.86A.0014.P06	2-3, 5-12
	4D4KLOX0.86A.0017.P08	2-3, 5-12
	4D4KLOX0.86A.0018.P09	2-3, 5-12
683712-510	4D4KLOX0.86A.0011.P03 [†]	1-12
	4D4KLOX0.86A.0012.P04 [†]	2-12
	4D4KLOX0.86A.0014.P06 [†]	2-3, 5-12
	4D4KLOX0.86A.0017.P08	2-3, 5-12
	4D4KLOX0.86A.0018.P09	2-3, 5-12

PBA Revision	BIOS Revision	Errata That Apply
683712-511	4D4KLOX0.86A. 0011.P03 [†]	1-12
	4D4KLOX0.86A. 0012.P04 [†]	2-12
	4D4KLOX0.86A. 0014.P06 [†]	2-3, 5-12
	4D4KLOX0.86A. 0017.P08	2-3, 5-12
	4D4KLOX0.86A. 0018.P09	2-3, 5-12

[†] Note: This combination of BIOS revision and PBA revision has not undergone regression testing. Use of a PBA with down-revision BIOS is an untested combination and is undertaken at the user's risk.

SPECIFICATION CHANGES

The Specification Changes listed in this section apply to the *DK440LX Motherboard Technical Product Specification* (Order Number 682717). All Specification Changes will be incorporated into a future version of that specification.

1. **Revision of External Battery Specification**

The estimated life of the external battery when the system is not plugged into an AC power source has been changed. Paragraph 3 of Section 1.8.7, Real-Time Clock, CMOS SRAM, and Battery will be replaced in its entirety as follows:

An external coin-cell battery powers the real-time clock and CMOS memory. When the computer is not plugged into a wall socket, the battery has an estimated life of one year. When the computer is plugged in, the 3 V standby current from the power supply extends the life of the battery. The clock is accurate to ± 13 minutes/year at 25 °C with 5 V applied.

2. **Revision of Section 1.15.5, Adaptec* RAIDport***

The name of the Adaptec* RAIDport* card that can be installed in the onboard RAID connector will be changed from Adaptec ARO*-1130CA-B RAIDport card to Adaptec ARO-1130CA RAIDport II card. This card supports only RAID levels 0 and 1. Reference to support for level 0/1 will be removed.

3. **Support for 333 MHz Pentium® II Processors**

The motherboard supports 333 MHz Pentium® II processors. Section 1.4, Microprocessor, will be modified to add 333 MHz to the list of supported processor speeds.

333 MHz has been added to the list of speeds that can be selected in the BIOS Setup program configure mode and Table 58, Maintenance Menu, will be updated to include that speed.

BIOS revision 4D4KL0X0.86A.0016.P07.9801051509 or later is required for the motherboard to properly support a 333 MHz processor.

Note: Conformity with FCC open chassis emission standards was verified with processor speeds up to 300 MHz, the highest processor speed available at the time the motherboard was introduced.

Higher speed processors may increase system electro-magnetic emissions. It is the responsibility of the system integrator to verify that a system based on this motherboard and any new higher speed processor, including the newly announced 333 MHz Pentium II processor, complies with EMC emission standards.

4. **Change to Description of Bootable Controllers**

In Table 71 of Section 4.6.1, Hard Drive Submenu, the description "Bootable ISA Cards" will be changed to "Bootable Add-in Cards."

5. **Change to Main Memory Requirements**

256 MB EDO DIMMs have not been qualified on the motherboard and will not be supported. The following changes will be made to the document to support this change:

In Section 1.1, Overview, the second bullet under Main Memory will be replaced in its entirety as follows:

- Supports up to 512 MB of synchronous DRAM (SDRAM) or extended data out (EDO) memory

In Section 1.7.1, Main Memory, the first paragraph will be replaced in its entirety as follows:

The motherboard has four dual inline memory module (DIMM) sockets. Minimum memory size is 16 MB; maximum memory size is 512 MB. The BIOS automatically detects memory type, size, and speed.

Table 1, Supported DIMM sizes, will be replaced in its entirety as follows:

Table 1. Supported DIMM Sizes

DIMM Size	Configuration
16 MB	2 Mbit x 72/64
32 MB	4 Mbit x 72/64
64 MB	8 Mbit x 72/64
128 MB	16 Mbit x 72/64

ERRATA

1. ***LS-120 Drive Does Not Work as Expected in Windows* 95***

PROBLEM: After restarting Windows* 95 from MS-DOS* mode, the system BIOS does not configure the diskette parameter table correctly if an LS-120 drive is the only floppy drive in the system.

IMPLICATION: Windows 95 will report the LS-120 drive as a hard drive instead of a floppy drive and will report a floppy drive available as Drive A. If drive A is subsequently accessed, the system will lock up. The problem does not occur if a 1.44 MB 3-1/2" floppy drive is also present as either drive A or drive B.

WORKAROUND: None.

STATUS: This erratum was fixed in BIOS revision 4D4KL0X0.86A.0012.P04.

2. ***Serial Mouse Activity Does Not Wake System After APM Shutdown***

PROBLEM: The system BIOS does not recognize activity from a serial mouse as an APM event.

IMPLICATION: The system will not be restored from a power-managed state until keyboard activity occurs.

WORKAROUND: The system BIOS does recognize activity from a PS/2* style mouse.

STATUS: This erratum will be fixed in a future BIOS revision.

3. ***Stuck or Depressed Key During POST May Cause System Hang***

PROBLEM: The BIOS is unable to detect when a key on the keyboard is stuck or depressed during Power On Self Test (POST).

IMPLICATION: If a key is stuck or depressed during POST, the system BIOS will continue to read data from the keyboard, resulting in a system hang condition.

WORKAROUND: None.

STATUS: This erratum will be fixed in a future BIOS revision.

4. ***System BIOS Does Not Detect ECC Memory Errors***

PROBLEM: The system BIOS does not detect when a single or double bit ECC memory error is identified by the memory controller.

IMPLICATION: For single bit errors, the error will be corrected based on the memory checkbits. The corrected data will be passed to the system by the controller, but the error will not be signaled to the system BIOS.

For double-bit errors identified during run time, no error will be signaled to the system BIOS and the system will not be halted. The erroneous data will be passed to the system by the controller.

Because these errors are not detected by the system BIOS, they will not be flagged in the DMI log stored in non-volatile flash memory and the user will not receive information from this log that could be useful in isolating a failing memory module.

WORKAROUND: None.

STATUS: This erratum was fixed in BIOS revision 4D4KL0X0.86A.0014.P06.

5. Onboard SCSI Controller Identifies Tape Drive as Hard Drive

PROBLEM: The onboard SCSI controller may incorrectly identify an attached SCSI tape backup drive as a hard disk drive.

IMPLICATION: The tape drive is not accessible, although it appears in the BIOS Setup Boot Menu.

WORKAROUND: None.

STATUS: This erratum will be fixed in a future BIOS revision.

6. System Cannot Recover BIOS From LS-120 Drive

PROBLEM: The permanent system BIOS code stored in the boot block section of the BIOS flash memory device does not include initialization code for the LS-120 drive.

IMPLICATION: If the system requires a BIOS recovery because the BIOS was corrupted during an update, that BIOS recovery cannot be performed from an LS-120 drive. An attempt to recover the BIOS from an LS-120 drive, using the BIOS recovery setting of the configuration jumper, will result in a media device error.

WORKAROUND: Temporarily replace the LS-120 drive with a standard diskette drive to perform the BIOS recovery.

STATUS: This erratum will be fixed in a future PBA revision.

7. SCO* UnixWare* Will Not Install From Onboard SCSI Channel B

PROBLEM: The SCSI driver for the SCO* UnixWare* operating system disables Channel B during installation of the operating system.

IMPLICATION: An attempt to install from a SCSI device attached to onboard SCSI channel B will fail with the error message: "Warning: adsl: Command timed out."

WORKAROUND: None.

STATUS: This erratum will be fixed in a future revision of the SCSI driver.

8. Advanced Power Management May Suspend System During CD-ROM Playback

PROBLEM: ATAPI devices (such as CD-ROM and DVD drives) do not reset the inactivity timer that is used by Advanced Power Management to determine when to place the system into suspend mode.

IMPLICATION: When playback of an audio CD or a DVD file is the only system activity, the system will go into suspend mode when the inactivity timer expires.

WORKAROUND: Temporarily disable the Low-power standby and Shut off monitor options on the Display Properties, Screen Saver menu. This menu is available from the Windows 95 Control Panel.

STATUS: This erratum will not be fixed.

9. System Will Not Boot with Network as First Boot Device

PROBLEM: The feature allowing the system to boot from the network is not implemented. After the attempt to boot from a network device selected as the first boot device fails, the system BIOS does not attempt to boot from any additional boot devices specified in the BIOS Setup program.

IMPLICATION: If Network boot is selected as the first boot device, the system will hang.

WORKAROUND: Remove Network boot from the boot sequence.

STATUS: This erratum will be fixed in a future BIOS revision.

10. System BIOS Does Not Recognize Hard Drives Larger Than 8.4 GB

PROBLEM: The system BIOS does not include hard drive parameters to recognize drives larger than 8.4 GB.

IMPLICATION: An installed hard drive larger than 8.4 GB will not be available to the operating system.

WORKAROUND: None.

STATUS: This erratum will be fixed in a future BIOS revision.

11. BIOS Setup Does Not Support Changing User Password or Unattended Start in User Mode

PROBLEM: Although the BIOS specification calls for the user password to be changed and the unattended start feature to be enabled or disabled in User Mode the current BIOS does not allow this.

IMPLICATION: The administrative password must be entered in order for the user to modify either of these options.

WORKAROUND: None.

STATUS: This erratum will be fixed in a future BIOS revision.

12. BIOS Does Not Release IRQ if No Mouse is Present

PROBLEM: The BIOS does not release the default IRQ12 used by a PS/2* mouse even if no mouse is detected in the system.

IMPLICATION: Some system resources may not be assigned an IRQ in a system with a large number of peripherals.

WORKAROUND: None.

STATUS: This erratum will be fixed in a future BIOS revision.

SPECIFICATION CLARIFICATIONS

The Specification Clarifications listed in this section apply to the *DK440LX Motherboard Technical Product Specification* (Order Number 682717). All Specification Clarifications will be incorporated into a future version of that specification.

1. Network Operating System May Report Lost Hardware Interrupts

Because of an interaction between the Intel® 82093AA I/O Advanced Programmable Interrupt Controller (IOAPIC) and the Novell Netware operating system, Novell may post a message to the screen that reports lost or spurious hardware interrupts. These messages and the time required to process them may cause some small increased processor latency, but they have no other impact for the end user. Certain debug hooks built into the operating system may not operate correctly and this could affect application developers.

2. The Intel® Celeron™ Processor

While the Intel® Celeron™ processor uses the same P6 microarchitecture as the Pentium® II processor, there are some differences. No qualification or compatibility testing has been performed using the Celeron processor and the BIOS does not contain support for this processor. A Celeron processor will be identified as a Pentium II processor by the system. While the Celeron processor may appear to work in the motherboard, the reliability of operation is not known.

DOCUMENTATION CHANGES

The Documentation Changes listed in this section apply to the *DK440LX Motherboard Technical Product Specification* (Order Number 682717). All Documentation Changes will be incorporated into a future version of that specification.

1. **Revision of Section 3.4, PCI IDE Support**

Section 3.4, PCI IDE Support, will be replaced in its entirety as follows:

If Auto is selected as a primary or secondary IDE device (see Section 4.2.2) in Setup, the BIOS automatically sets up the two local-bus IDE connectors with independent I/O channel support. The IDE interface supports hard drives up to PIO Mode 4 and recognizes ATAPI devices, including CD-ROM drives, tape drives and Ultra DMA drives (see Section 6.2 for the supported version of ATAPI). Add-in ISA IDE controllers are not supported. The BIOS determines the capabilities of each drive and configures them so as to optimize capacity and performance. To take advantage of the high-capacity storage devices, hard drives are automatically configured for logical block addressing (LBA) and to PIO Mode 3 or 4, depending on the capability of the drive. To override the autoconfiguration options, use the specific IDE device options in Setup. The ATAPI specification recommends that ATAPI devices be configured as shown in Table 54.

2. **Revision of Section 6.3, BIOS Beep Codes**

Section 6.3, BIOS Beep Codes, will be replaced in its entirety as follows:

BIOS BEEP CODES

Whenever a recoverable error occurs during Power-On Self Test (POST), the BIOS displays an error message describing the problem. The BIOS also issues a beep code (one long tone followed by two short tones) during POST if the video configuration fails (no card installed or faulty) or if an external ROM module does not properly checksum to zero.

An external ROM module (e.g video BIOS) can also issue audible errors, usually consisting of one long tone followed by a series of short tones. For more information on the beep codes issued, check the documentation for that external device.

There are several POST routines that issue a POST Terminal Error and shut down the system if they fail. Before shutting down the system, the terminal-error handler issues a beep code signifying the test point error, writes the error to I/O port 80h, attempts to initialize the video and writes the error in the upper left corner of the screen (using both mono and color adapters).

If POST completes normally, the BIOS issues one short beep before passing control to the operating system.

Table 78. BIOS Beep Codes

Beeps	Port 80h Code	Explanation
1-2-2-3	16h	BIOS ROM checksum
1-3-1-1	20h	Test DRAM refresh
1-3-1-3	22h	Test 8742 Keyboard Controller
1-3-3-1	28h	Autosize DRAM
1-3-3-2	29h	Initialize POST Memory Manager
1-3-3-3	2Ah	Clear 512 KB base RAM
1-3-4-1	2Ch	RAM failure on address line xxxx
1-3-4-3	2Eh	RAM failure on data bits xxxx of low byte of memory bus
1-4-1-1	30h	RAM failure on data bits xxxx of high byte of memory bus
2-1-2-2	45h	POST device initialization
2-1-2-3	46h	Check ROM copy right notice
2-2-3-1	58h	Test for unexpected interrupts
2-2-4-1	5Ch	Test RAM between 512 and 640 KB
1-2	98h	Search for option ROMs. One long, two short beeps on checksum failure

2. *Change to Description of Manufacturing Options*

In Section 1.2, Manufacturing Subsystem Options, paragraph one will be replaced in its entirety as follows:

The following are manufacturing subsystem options. Not all manufacturing options are available in all marketing channels. Please contact your Intel representative to determine what manufacturing options are available to you.