intel®

LM440LX
Motherboard
Specification Update

The LM440LX 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.

CONTENTS

Specification Update for LM440LX Motherboards

REVISION HISTORY

Date of Revision	Version	Description
November 1997	-001	This document is the first Specification Update for the Intel® LM440LX motherboard.
January 1998	-002	Added Erratum 3.
February 1998	-003	Added Specification Change 1 and Errata 4-7.
March 1998	-004	Added Specification Change 2. Updated Specification Change 1 and Erratum 4.
April 1998	-005	Added Erratum 8 and Documentation Change 3.
June 1998	-006	Added Specification Clarificaton 1.
July 1998	-007	Added Erratum 9. Replaced Specification Clarification 1 with Specification Change 3.
August 1998	-008	Added Erratum 10 and Documentation Change 4.

PREFACE

This document is an update to the specifications contained in the *LM440LX Motherboard Technical Product Specification* (Order number 685521). 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 LM440LX 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 AGPsetSpecification 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 LM440LX 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 LM440LX 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 LM440LX 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
LM440LX Motherboards**

GENERAL INFORMATION

Basic LM440LX Motherboard Identification Information

AA Revision	PBA Revision	82440LX PCISet Stepping	BIOS Revision	Notes
677789-207	672406-207	A3	4L4ML0X0.86A. 0010.P02	1-5
677789-208	672406-208	A3	4L4ML0X0.86A. 0012.P04	1-5
677789-209	672406-209	A3	4L4ML0X0.86A. 0015.P06	1-5
677789-301	692770-301	A3	4L4ML0X0.86A. 0012.P04	1-5
693497-207	672406-207	A3	4L4ML0X0.86A. 0010.P02	1-5
693497-208	672406-208	A3	4L4ML0X0.86A. 0012.P04	1-5
692771-200	692770-200	A3	4L4ML0X0.86A. 0010.P02	1-5
692771-201	692770-201	A3	4L4ML0X0.86A. 0012.P04	1-5
692771-202	692770-202	A3	4L4ML0X0.86A. 0015.P06	1-5
695008-200	692770-200	A3	4L4ML0X0.86A. 0010.P02	1-5
695008-201	692770-201	A3	4L4ML0X0.86A. 0012.P04	1-5
695008-301	692770-301	A3	4L4ML0X0.86A. 0012.P04	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 three 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 LM440LX motherboard or have been worked-around in this PBA and/or BIOS revision: 3, 10-11, 17, 27-28, 32, 41, 50, 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 LM440LX motherboard or have been worked around in this PBA and/or BIOS revision: 1-2, 4-5. All other errata associated with the PCIset 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 LM440LX motherboard or have been worked around in this PBA and/or BIOS revision: 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 LM440LX 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	Support for 333 MHz Pentium® II processors
2	Doc	Change to description of bootable controllers
3	Doc	Support for the Intel® Celeron™ processor

NO.	PLANS	ERRATA
1	Fix	LS-120 drive does not work as expected in Windows* 95
2	Fix	Serial mouse activity does not wake system after APM shutdown
3	NoFix	System BIOS may corrupt audio add-in card EEPROM
4	Fixed	BIOS cannot disable L2 cache
5	NoFix	Advanced Power Management may suspend system during CD-ROM playback
6	Fix	System will not boot with network as first boot device
7	Fix	System BIOS does not recognize hard drives larger than 8.4 GB
8	Fixed	Voltage regulator may fail to reset at power-on
9	NoFix	The BIOS will not support the Advanced Configuration and Power Interface (ACPI)
10	Fix	System using 3-mode floppy drive cannot read XDF format diskettes

NO.	PLANS	SPECIFICATION CLARIFICATIONS
1	Doc	Replaced by Specification Change 3

NO.	PLANS	DOCUMENTATION CHANGES
1	Doc	Revision of Section 3.5, PCI IDE Support
2	Doc	Revision of Section 5.3, BIOS Beep Codes
3	Doc	Change to Section 1.7.3, Floppy Controller
4	Doc	Change to Section 3.8, Desktop Management Interface

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 to This Combination
672406-207	4L4ML0X0.86A.0010.P02	1-10
	4L4ML0X0.86A.0012.P04	1-3, 5-10
	4L4ML0X0.86A.0013.P05	1-3, 5-10
	4L4ML0X0.86A.0015.P06	1-3, 5-10
672406-208	4L4ML0X0.86A.0010.P02[‡]	1-7, 9-10
	4L4ML0X0.86A.0012.P04	1-3, 5-7, 9-10
	4L4ML0X0.86A.0013.P05	1-3, 5-7, 9-10
	4L4ML0X0.86A.0015.P06	1-3, 5-7, 9-10
692770-200	4L4ML0X0.86A.0010.P02	1-10
	4L4ML0X0.86A.0012.P04	1-3, 5-10
	4L4ML0X0.86A.0013.P05	1-3, 5-10
	4L4ML0X0.86A.0015.P06	1-3, 5-10
692770-201	4L4ML0X0.86A.0010.P02[‡]	1-7, 9-10
	4L4ML0X0.86A.0012.P04	1-3, 5-7, 9-10
	4L4ML0X0.86A.0013.P05	1-3, 5-7, 9-10
	4L4ML0X0.86A.0015.P06	1-3, 5-7, 9-10
692770-301	4L4ML0X0.86A.0010.P02[‡]	1-7, 9-10
	4L4ML0X0.86A.0012.P04	1-3, 5-7, 9-10
	4L4ML0X0.86A.0013.P05	1-3, 5-7, 9-10
	4L4ML0X0.86A.0015.P06	1-3, 5-7, 9-10

[‡] 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 *LM440LX Motherboard Technical Product Specification* (Order Number 685521). All Specification Changes will be incorporated into a future version of that specification.

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

The motherboard supports 333 MHz Pentium® II processors. Section 1.1, Overview and 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 20, Maintenance Menu, will be updated to include that speed.

BIOS revision 4L4ML0X0.86A.0013.P05.9801202012 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.

2.   *Change to Description of Bootable Controllers*

In Table 33 of Section 4.6.1, Hard Drive Submenu, the description "Bootable ISA Cards" will be changed to "Bootable Add-in Cards."

3.   *Support for the Intel® Celeron™ Processor*

The following will be added to Section 1.1, Overview:

• Supports the Celeron™ processor (see Section 1.4 for details of Celeron processor support)

The following will be added as the second paragraph of Section 1.4, Microprocessor:

The motherboard supports the Celeron processor at 266 MHz with BIOS version 4L4ML0X0.86A.0015.P06, or later. Earlier BIOS versions will identify the processor as a Pentium II processor and will not work reliably with a Celeron processor.

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 will be fixed in a future BIOS revision.

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. System BIOS May Corrupt Audio Add-In Card EEPROM

PROBLEM: Audio add-in cards using the Yamaha OPL3-SA2 or OPL3-SA3 audio codec have the same hardware identification number that is used by the Yamaha audio device integrated on the motherboard. This causes the system BIOS to inadvertently write information into the audio add-in card's serial EEPROM during system startup, thereby corrupting the audio add-in card's EEPROM contents.

IMPLICATION: The audio add-in card will not operate and no audio will be available.

WORKAROUND: Disable the onboard audio in BIOS Setup before installing an audio add-in card.

STATUS: This erratum will not be fixed.

4. BIOS Cannot Disable L2 Cache

PROBLEM: The option in the BIOS Setup program to disable L2 cache does not work.

IMPLICATION: Although the BIOS Setup program reports that L2 cache has been disabled, it will still be enabled.

WORKAROUND: None.

STATUS: This erratum was fixed in BIOS revision 4L4ML0X0.86A.0012.P04.

5. 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.

6. 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.

7. 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.

8. Voltage Regulator May Fail to Reset at Power-On

PROBLEM: If external system devices, such as monitors or printers, are already powered on at system power-on, they may provide an offset potential of greater than 400 mV DC between the Vcc power plane and the ground plane of the motherboard. This can cause the internal overvoltage protection latch of the linear voltage regulator to trip and shut down the regulator until it is reset by cycling system power.

IMPLICATION: The system will hang during the startup process. This failure has only been observed during system testing. No customer related failures have been reported to Intel.

WORKAROUND: Power down the system and all external devices connected to it. While all external devices are still turned off, power the system on again. Turning off all external devices reduces the offset potential to a low value that allows the voltage regulator to reset when power is turned on again.

STATUS: This erratum was fixed in PBA revisions 672406-208 and 692770-201.

9. The BIOS Will Not Support the Advanced Configuration and Power Interface (ACPI)

PROBLEM: BIOS support for the Advanced Configuration and Power Interface has not been added to the BIOS.

IMPLICATION: Users will not be able to use the ACPI configuration and power management options supported by an ACPI aware operating system. Plug and Play configuration of system resources and Advanced Power Management (APM) are supported by the BIOS.

WORKAROUND: None.

STATUS: This erratum will not be fixed.

10. System Using 3-Mode Floppy Drive Cannot Read XDF Format Diskettes

PROBLEM: The buffer area that stores floppy drive parameters does not have room to store the speed information to allow a 3-mode floppy drive to read a diskette in the XDF format.

IMPLICATION: A system that has a 3-mode floppy drive cannot be used to install a program or operating system, such as PC-DOS 7.0, that is distributed on XDF format diskettes.

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 *LM440LX Motherboard Technical Product Specification* (Order Number 685521). All Specification Clarifications will be incorporated into a future version of that specification.

1.   Replaced by Specification Change 3

DOCUMENTATION CHANGES

The Documentation Changes listed in this section apply to the *LM440LX Motherboard Technical Product Specification* (Order Number 685521). All Documentation Changes will be incorporated into a future version of that specification.

1.   *Revision of Section 3.5, PCI IDE Support*

Section 3.5, 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 17.

2.   *Revision of Section 5.3, BIOS Beep Codes*

Section 5.3, 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 38.   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

3.   Change to Section 1.7.3, Floppy Controller

In Section 1.7.3, Floppy Controller, the reference to 120 MB (LS-120) floppy drive capacity will be removed. LS-120 drives connect to the IDE interface.

4.   Change to Section 3.8, Desktop Management Interface

In Section 3.8, Desktop Management Interface (DMI), paragraph 2 will be replaced in its entirety as follows:

Intel can provide system manufacturers with a utility that programs system and chassis-related information into the DMI space in Flash memory. The utility is used to program the BIOS during system manufacturing, so that the BIOS can later report this information. Once written, this information cannot be overwritten by the end user.