

**Opal LX**  
486SLC2  
System Board

**OEM Manual**



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# Introduction

## Features

The Opal LX 486SLC2 System Board includes the following features:

- IBM 486SLC2 processor with 16KB internal cache
- Manufactured to the highest standards of excellence by IBM
- Three year limited warranty on parts and labor
- Optional math co-processor on board
- Minimum of 1MB of memory on the system board with fast page mode access
- Seven 16-bit ISA expansion slots
- 100% PC AT compatible BIOS with battery-backed CMOS setup and real time clock/calendar
- Hardware turbo clock switching
- Shadow RAM support for BIOS and peripheral ROM
- Mini-AT footprint - 8.55 inches x 6.0 inches

# Introduction

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- Hardware turbo clock switching.
- Shadow RAM support for BIOS and peripheral ROM.
- Mini-AT footprint - 8.66 inches x 9.0 inches.

## System Board Layout

Familiarize yourself with the components on the System Board.

## System Board

### Overview

Follow the instructions for your particular class in order to install the Opal LX 486SLC2 System Board.

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After installing the system board, you will need to perform the following to get your system up and running:

- Install ROM and optional devices.
- Install disk drives and peripherals.
- Run BIOS Setup to configure the system.

Chapter 2 describes how to install DPM and optional features. Chapter 3 describes how to run the BIOS Setup utility.

Procedures on how to install disk drives and peripherals are the responsibility of your computer manufacturer or your peripheral device manufacturer.

For reference on locations of system board features, Figure 1-1 on the next page is a diagram of the Opal LX 486SLC2 System Board Layout.



Figure 1-1 System Board Layout

# Chapter 1

## System Board

### Overview

Follow the instructions for your particular chassis in order to install the Opal LX 486SLC2 System Board.

After installing the system board, you will need to perform the following to get your system up and running:

- Install DRAM and optional features
- Install disk drives and peripherals
- Run BIOS Setup to configure the system

Chapter 2 describes how to install DRAM and optional features. Chapter 3 describes how to run the BIOS Setup utility. Procedures on how to install disk drives and peripherals are the responsibility of the particular manufacturer of each peripheral device.

For reference on locations of system board features, Figure 1-1 on the next page is a diagram of the Opal LX 486SLC2 System Board Layout.

## System Board Layout

Familiarize yourself with the components of the Opal LX 486SLC2 System Board.

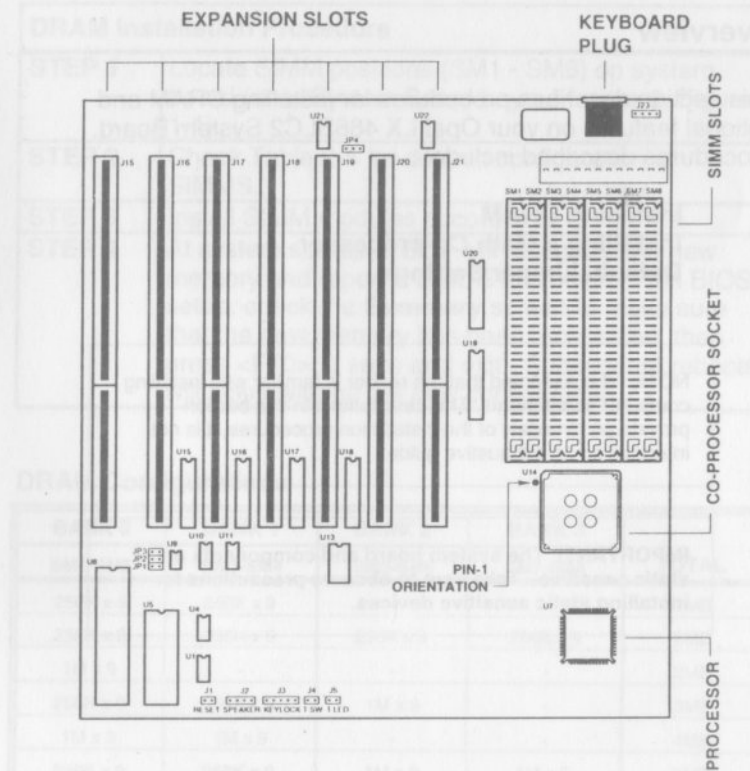


Figure 1-1 System Board Layout

Table 2-1 DRAM Configurations

## Chapter 2

# Installing DRAM and Optional Features

### Overview

This section describes procedures for installing DRAM and optional features on your Opal LX 486SLC2 System Board. Procedures described include:

Installing DRAM  
Installing a Math Co-processor  
Default Jumper Settings

NOTE: It is assumed that the reader is familiar with installing computer components. The descriptions in this section provide an overview of the installation procedures, it is not intended as an exhaustive guide.

**IMPORTANT!** The system board and components are static sensitive. Take care to observe precautions for installing static sensitive devices.

### Installing DRAM

The system board accommodates four 9-bit SIMM modules. DRAM speed must be 80ns or faster and must support fast-page mode. 256K x 9, 1M x 9, and 4M x 9, single density SIMM modules may be used. Table 2-1 shows all possible DRAM/SIMM configurations.

DRAM Installation Procedure	
<b>STEP 1</b>	Locate SIMM positions (SM1 - SM8) on system board (see "System Board Layout," page 6, Figure 1-1).
<b>STEP 2</b>	Check Table 2-1 for desired configuration of SIMMS.
<b>STEP 3</b>	Install SIMM modules accordingly.
<b>STEP 4</b>	At system startup, POST will recognize the new memory and report a CMOS mismatch. Run BIOS setup, check the <b>Summary</b> screen to make sure that the new memory has been recognized, then press <F10> to save and exit. Subsequent reboots will acknowledge the new configuration.

### DRAM Configurations

BANK 0	BANK 1	BANK 2	BANK 3	TOTAL
SM1-SM2	SM3-SM4	SM5-SM6	SM7-SM8	
256K x 9	256K x 9	-	-	1MB
256K x 9	256K x 9	256K x 9	256K x 9	2MB
1M x 9	-	-	-	2MB
256K x 9	256K x 9	1M x 9	-	3MB
1M x 9	1M x 9	-	-	4MB
256K x 9	256K x 9	1M x 9	1M x 9	5MB
1M x 9	1M x 9	1M x 9	1M x 9	8MB
256K x 9	256K x 9	4M x 9	-	9MB
1M x 9	4M x 9	-	-	10MB
4M x 9	4M x 9	-	-	16MB

Table 2-1 DRAM Configurations

### Installing a Math Co-processor

The Opal LX 486SLC2 System Board supports Intel's 80387SX or compatible co-processors.

Co-processor Installation Procedure	
<b>STEP 1</b>	Locate the co-processor socket on the system board at location U14. (see "System Board Layout," page 6, Figure 1-1).
<b>STEP 2</b>	Unpack the co-processor and orient pin-1 to match pin-1 on the system board socket.
<b>STEP 3</b>	Insert the co-processor into the socket. Press firmly to make sure that it is seated correctly in the socket.
<b>STEP 4</b>	At system startup, POST will recognize the addition of the co-processor and report a CMOS mismatch. Run BIOS setup, check the <b>Summary</b> screen to make sure that the co-processor has been recognized, then press <F10> to save and exit. Subsequent reboots will acknowledge the new configuration.

### Default Jumper Settings

LABEL	DEFAULT	DESCRIPTIONS
JP1	IN	Enables password protection (MR BIOS only)
JP2	OUT	Clock frequency operation
JP3	IN	Clock frequency operation
JP4	IN	Pins 2 & 3 for normal CMOS operation
	IN	Pins 1 & 2 clears CMOS setup

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# Chapter 3

## AMI BIOS Setup

### Introduction

A record of AMI BIOS system parameters (such as amount of memory, disk drives, video displays, and numeric co-processors) is stored in CMOS RAM. When the computer is turned off, a backup battery provides power to the CMOS RAM, thereby retaining the system configuration.

Each time the system is powered-on, it is configured with these values, unless CMOS RAM has been corrupted. The CMOS Setup resides in the ROM BIOS and is available each time the computer is turned on.

If, for some reason, CMOS RAM is corrupted, the system is configured with the default values stored in the ROM file. There are two sets of BIOS values stored in the ROM file: The BIOS Setup default values and the Power-On default values (See this section for more detailed information on BIOS defaults).

Setup is a program also stored in ROM that allows you to configure or re-configure your system appropriately.

**NOTE:** Your system should have been pre-configured prior to shipment. It is only necessary to execute the configuration program if:

- You have changed the hardware configuration (i.e. added memory, added or moved adapter boards, etc.).
- You have determined that your system backup battery has failed and have replaced it.
- Or the system itself has detected an error while booting up and requires you to re-configure CMOS RAM.

Users are not encouraged to run this program unless they are familiar with them. Improper use of this program can result in system failure.

### Running Setup

When the system power is switched on, the computer performs a series of device initializations and diagnostics tests. During this process, the system will allow you to interrupt the process and run Setup by pressing the <Del> key. When POST has completed, the following message appears:

Press the <DEL> key to enter the Setup program.

### Key Use - Setup

The table below describes special keys used to perform certain functions in the Setup program:

Keystroke	Action
<Esc>	Returns to previous screen.
Arrow keys	Move the cursor from one option to the next.
<PgUp> and <PgDn>; <Ctrl><PgUp> <Ctrl><PgDn>	Modify the default value of the options for the Highlighted parameter. If there are fewer than 10 options, <Ctrl> <PgUp> and <Ctrl> <PgDn> operate like <PgUp> and <PgDn>. <Ctrl> can also be used to increment a setting.
<F1>	Displays Help.
<F2>	Change background colors.
<F3>	Change foreground colors.
<F5>	Restores the values resident when the current Setup session began. These values are taken from CMOS RAM if CMOS RAM was uncorrupted at the start of the session. Otherwise they will be the BIOS Setup default values.
<F6>	Loads all features in the Advanced CMOS Setup/Advanced Chip Set Setup with the BIOS Setup defaults.
<F7>	Loads all features in the Advanced CMOS Setup/Advanced Chip Set Setup with the Power-On defaults.
<F10>	Saves all changes made to Setup and continues the boot process.



Table 3-1 Key Use - Setup

### Main Menu Setup Options

Below is the Setup Main Menu:



Setup is divided into ten menu options:

- Standard CMOS Setup
- Advanced CMOS Setup
- Advanced Chipset Setup
- Auto Configuration with BIOS defaults
- Auto Configuration with Power-On defaults
- Change Password
- Auto Detect Hard Disk
- Hard Disk Utility
- Write to CMOS and exit
- Do Not Write to CMOS and exit

The next pages describe the function of each of the ten menu options.

### Standard CMOS Setup

This option permits the user to configure and set system components such as time and date floppy drives, hard disk drives, monitor type, and keyboard. These options are discussed in next section of this chapter.

### Advanced CMOS Setup

This option configures more advanced parts of memory configuration, peripheral support, and power management support. These parameters have already been optimized for your system -- improper use of this utility could result in system failure. Consult your dealer before attempting to use this option.

### Advanced Chipset Setup

This option configures BIOS chipset-specific features. These parameters have already been optimized for your system -- improper use of this utility could result in system failure. Consult your dealer before attempting to use this option.

### Auto Configuration with BIOS defaults

This option uses default system values. The BIOS default values are the best-case values that should optimize system performance. If CMOS RAM is corrupted, the BIOS defaults will automatically be loaded.

To use the BIOS defaults, type <Y> and press <Enter>. The following message will appear:

Default values loaded. Press any key to continue.

### Auto Configuration with Power-On defaults

This option uses default Power-On values. Power-On values are worst-case values for system performance, but are the most stable values that can be chosen. Use this as a diagnostic aid if the system is behaving erratically.

Type <Y> and press <Enter> to use the Power-On defaults. The following message will appear:

Default values loaded. Press any key to continue.

## Change Password

A password can be stored in CMOS through the Advanced CMOS Setup option. Improper use of this option can result in system failure and system lockout. Consult your dealer if you need to run this setup option.

## Auto Detect Hard Disk

This option automatically detects the hard disk type in your system. Pressing <Y> will accept the detected hard disk parameters and update the information in the standard CMOS Setup Screen. Pressing <N> will ignore the information.

## Hard Disk Utility

This option allows low-level formatting of MFM hard disk drives. MFM hard disks were the predominant format in the past. They are not used in many computer systems sold today. If you are attempting to install a MFM hard disk in your system, you will need a compatible MFM hard disk controller as well. If you have not installed MFM hard drives before, consult your dealer for more information on how to use this setup option.

## Write to CMOS and exit

The features selected and configured in the Standard CMOS Setup, Advanced CMOS Setup, Advanced Chipset Setup, and the Change Password option are stored in CMOS RAM when this option is selected. A CMOS RAM checksum is calculated and written to CMOS RAM. Control is then passed to the ROM BIOS.

Press <N> and <Enter> to return to the Main Menu. Press <Y> and <Enter> to save the system parameters and continue the boot process. The BIOS either reboots the system (if any new settings change the memory map) or continues the boot process.

## Do Not Write to CMOS and exit

This option passes control to the BIOS without writing any changes to CMOS RAM.

Press <N> and <Enter> to return to the Main Menu. Press <Y> and <Enter> to continue the boot process without saving any altered system parameters.

## Standard CMOS Setup

**CAUTION!** Procedures for the Advanced CMOS Setup, Advanced Chipset Setup, Power Management BIOS Setup, Peripheral Setup, Change Password, and Hard Disk Utility have been excluded because improper use of these options can result in system failure. The user should check with their dealer before attempting to use these options.

This is the first option on the Setup main menu. Use the arrow keys to select **Standard CMOS Setup**, then press <Enter>. The following screen appears:

```
AMIBIOS SETUP PROGRAM - STANDARD CMOS SETUP
(C)1992 American Megatrends, Inc. All Rights Reserved

Date (mn/date/year): Fri, Jan 04 1992      Base memory : 640 KB
Time (hour/min/sec): 09 : 38 : 09          Ext. memory : 2816 KB
                                           Cyln Head WPCom LZone Sect Size
Harddisk C: type : 40                      820 6 820 820 17 40 MB
Harddisk D: type : Not Installed
Floppy drive A: : 1.2 MB. 5 1/4
Floppy drive B: : 1.4 MB. 3 1/2
Primary display : VGA/PGA/EGA
Keyboard        : Installed

Month : Jan, Feb, ..., Dec
Date   : 01, 02, 03, ..., 31
Year   : 1901, 1902, ..., 2099
```

Sun	Mon	Tue	Wed	Thu	Fri	Sat
30	31	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	1	2
3	4	5	6	7	8	9

ESC:Exit F1:Select F2/F3:Color F4/F5:Modify

Standard CMOS Setup Screen

Standard CMOS Setup is used to configure the following features:

**Date:** month, date, and year. Ranges for each value are shown in the lower left hand corner of the screen. Move the cursor to the Date field with the arrow keys and set the date using the <PgUp> and <PgDn> keys to change values.

**Time:** hour, minute, and second. Uses 24 hour clock format. For PM numbers, add 12 to the hour (4:30PM is 16:30:00). Move the cursor to the Time field with the arrow keys and set the time using the <PgUp> and <PgDn> keys to change values.

**Floppy Drives A: and B:** Supports 720KB, 1.44MB, and 2.88MB 3.5 inch drives; 360KB, and 1.2MB 5.25 inch drives. Move the cursor to either field with the arrow keys and set the appropriate floppy drive type using the <PgUp> and <PgDn> keys to toggle between supported formats. Use **Not Installed** for diskless workstations.

**Hard Disk C: and D:** Hard disk types from 1 to 46 are industry standard. Type 47 is user-definable and can be used for both drive C: and D:. If type 47 is selected, user must enter the hard drive parameters from the keyboard.

Move the cursor to the appropriate hard disk field with the arrow keys and set the drive type using the <PgUp> and <PgDn> keys to change values, or simply type in the selected drive type number.

Type 47 can be used for both hard disks C: and D:. The parameters for type 47 under hard disk C: and hard disk D: can be different, which allows two different user-definable hard disk drives in the system. **Not Installed** can be used for diskless workstations and SCSI based hard disks.

### Hard Disk Configuration

Hard disk drive types are identified by the following parameters:

Parameter	Description
Type	The number designation for a drive with certain identification parameters.
Cylinders	The number of cylinders in the disk drive.
Heads	The number of heads.
Write Precompensation	The size of a sector gets progressively smaller as the track diameter diminishes. Yet each sector must still hold 512 bytes. Write precompensation circuitry on the hard disk compensates for the physical difference in sector size by boosting the write current for sectors on inner tracks. This parameter is the track number where write precompensation begins.
Landing Zone	This number is the cylinder location where the heads will normally park when the system is shut down.
Sectors	The number of sectors per track. Hard drives that use MFM have 17 sectors per track. RLL drives have 26 sectors per track. RLL and ESDI drives have 34 sectors per track. SCSI and IDE drives may have even more sectors per track.
Capacity	The formatted capacity of the drive based on the following formula:  (Number of heads) X (Number of cylinders) X (Number of sectors per cylinder) X (512 bytes per sector)

**Table 3-2** Hard Drive Configurations

The following table describes the default hard drive parameters settings for each drive type:

Type	No. of Cyls.	No. of Hds.	Write Precomp	Landing Zone	Number of Sectors	Capacity
1	306	4	128	305	17	10 MB
2	615	4	300	615	17	20 MB
3	615	6	300	615	17	31 MB
4	940	8	512	940	17	62 MB
5	940	6	512	940	17	47 MB
6	615	4	65535	615	17	20 MB
7	462	8	256	511	17	31 MB
8	733	5	65535	733	17	30 MB
9	900	15	65535	901	17	112 MB
10	820	3	65535	820	17	20 MB
11	855	5	65535	855	17	35 MB
12	855	7	65535	855	17	50 MB
13	306	8	128	319	17	20 MB
14	733	7	65535	733	17	43 MB
16	612	4	0	663	17	20 MB
17	977	5	300	977	17	41 MB
18	977	7	65535	977	17	57 MB
19	1024	7	512	1023	17	60 MB
20	733	5	300	732	17	30 MB
21	733	7	300	732	17	43 MB
22	733	5	300	733	17	30 MB
23	306	4	0	336	17	10 MB
24	925	7	0	925	17	54 MB
25	925	9	65535	925	17	69 MB
26	754	7	754	754	17	44 MB
27	754	11	65535	754	17	69 MB
28	699	7	256	699	17	41 MB
29	823	10	65535	823	17	68 MB
30	918	7	918	918	17	53 MB
31	1024	11	65535	1024	17	94 MB
32	1024	15	65535	1024	17	128 MB
33	1024	5	1024	1024	17	43 MB
34	612	2	128	612	17	10 MB

Table 3-3 Default Hard Drive Parameters Settings

Type	No. of Cyls.	No. of Hds.	Write Precomp	Landing Zone	Number of Sectors	Capacity
35	1024	9	65535	1024	17	77 MB
36	1024	8	512	1024	17	68 MB
37	615	8	128	615	17	41 MB
38	987	3	987	987	17	25 MB
39	987	7	987	987	17	57 MB
40	820	6	820	820	17	41 MB
41	977	5	977	977	17	41 MB
42	981	5	981	981	17	41 MB
43	830	7	512	830	17	48 MB
44	830	10	65535	830	17	69 MB
45	917	15	65535	918	17	114 MB
46	1224	15	65535	1223	17	152 MB

Table 3-3 Default Hard Drive Parameters Settings (cont'd)

**Video Display:** Supports Monochrome, Color 40x25, VGA/CGA/EGA, and Color 80x25. Move the cursor to the Video Display field with the arrow keys and set the appropriate type using the <PgUp> and <PgDn> keys to toggle between supported values. Use **Not Installed** for file servers without video displays.

**Keyboard:** User can choose **Installed** or **Not Installed**. If **Not Installed** is selected, the BIOS does not test for the presence of a keyboard in the system, permitting keyboardless systems, such as workstations, to be configured. Move the cursor to the Keyboard field with the arrow keys and select the appropriate value using the <PgUp> and <PgDn> keys.

**Memory Display:** The memory display cannot be configured by the user. The System BIOS automatically detects all installed system memory. Memory is reported in 64KB increments. BIOS will report up to 640KB of Base Memory and 65,472KB of Extended Memory.

## Factory Recommended CMOS Settings

The Factory recommended settings are listed below. These settings should be used in the event CMOS RAM has been corrupted, or for some reason you wish to reset CMOS to the factory's recommended settings. However, if your hard disk does not have an operating system, change the setting at **System boot up sequence**, to **A:,C:**. For Adapter ROM shadowing, enable shadow whenever appropriate (i.e. adapter card has on-board BIOS).

**CAUTION!** Users are **not** encouraged to change Advanced CMOS settings unless they are familiar with doing so. Improper use of these utilities can result in system failure.

## Advanced CMOS Setup

Typematic Rate Programming	:Disabled	Adapter ROM Shadow C800,16K	:Disabled
Typematic Rate Delay (msec)	:500	Adapter ROM Shadow CC00,16K	:Disabled
Typematic Rate (Chars/sec)	:15	Adapter ROM Shadow D000,16K	:Disabled
Above 1M Memory Test	:Disabled	Adapter ROM Shadow D400,16K	:Disabled
Memory Test Tick Sound	:Enabled	Adapter ROM Shadow D800,16K	:Disabled
Memory Parity Error Check	:Enabled	Adapter ROM Shadow DC00,16K	:Disabled
Hit <DEL> Message Display	:Enabled	Adapter ROM Shadow E000,16K	:Disabled
Hard Disk Type 47 RAM area	:0:300	Adapter ROM Shadow E400,16K	:Disabled
Wait for <F1> if any error	:Enabled	Adapter ROM Shadow E800,16K	:Disabled
System Boot Up Num Lock	:On	Adapter ROM Shadow EC00,16K	:Disabled
Numeric Processor Test	:Enabled	System ROM Shadow F000,64K	:Enabled
Weitek Processor	:Absent	Video ROM Shadow	:Enabled
Floppy Drive Seek at Boot	:Disabled	Bootsector Virus Protection	:Disabled
System Boot Up Sequence	:C., A.		
System Boot Up CPU Speed	:High		
Internal Cache Memory	:Enabled		
Turbo Switch Function	:Disabled		
Password Checking Option	:Setup		

## Advanced Chipset Setup

For systems using a 486SLC2-50MHz CPU

Pipeline Mode	:Enabled
Dram Read Wait State	:0 W/S
Dram Write Wait State	:0 W/S
256K Memory Relocation	:Disabled
ATCLK Select*	:CLK2/6*
Slow Refresh Mode	:Disabled
B2C206 Access Wait State	:1 W/S
16 - Bit DMA Wait State	:1 W/S
8 - Bit DMA Wait State	:1 W/S
DMAMEMR Assertion Delay	:Enabled
DMA Clock	:SLCK/2

\* **ATCLK Select** should be set to **CLK2/6** for a 486SLC 50MHz CPU,. For a 66MHz CPU, it should be set to **CLK2N/8**.

NOTES

The Factory program is used to...  
 For systems using...  
 The Factory program is used to...  
 For systems using...  
 The Factory program is used to...  
 For systems using...

Advanced CMOS Setup

Item	Setting	Description	Default
System Time	01:00	System time	01:00
System Date	01/01/98	System date	01/01/98
Cache Size	256	Cache size	256
Cache Type	EDO	Cache type	EDO
Cache Parity	Off	Cache parity	Off
Cache Refresh	Off	Cache refresh	Off
Cache Bank	0	Cache bank	0
Cache Mode	Off	Cache mode	Off
Cache Bank 1	0	Cache bank 1	0
Cache Bank 2	0	Cache bank 2	0
Cache Bank 3	0	Cache bank 3	0
Cache Bank 4	0	Cache bank 4	0
Cache Bank 5	0	Cache bank 5	0
Cache Bank 6	0	Cache bank 6	0
Cache Bank 7	0	Cache bank 7	0
Cache Bank 8	0	Cache bank 8	0
Cache Bank 9	0	Cache bank 9	0
Cache Bank 10	0	Cache bank 10	0

NOTES

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