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HP E6237A
VXI Pentium® Real-Time Controller

User's Guide for Real-Time Controller

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About This Manual

This manual describes the HP E6237A VXI Pentium Real-Time Controller development system, and helps you get started using it. First, you should install the controller as explained in the manual, *VXI Pentium Controller: Hardware Installation and Configuration Guide*. After installing the controller, refer to this manual for information about completing the system configuration, the documentation, troubleshooting aid, getting technical support, and basic hardware layout and configuration. The following chapters and appendixes contain the information:

- **Chapter 1 - Getting Started** helps you complete the system setup, tells how to get started using the system, describes the Hewlett-Packard and LynxOS documentation sets, and explains how to get technical support.
- **Chapter 2 - Troubleshooting** provides troubleshooting information such as front-panel LED indications, and BIOS error messages.
- **Chapter 3 - Using the BIOS Setup Utility** explains how to configure the system BIOS.
- **Chapter 4 - Re-Installing the System Software** explains how to re-install the system software if files are corrupted or other system changes are required.
- **Appendix A - LEDs on the Front Panel** describes the controller's front panel LEDs.
- **Appendix B - I/O, Memory, and IRQ Details** describes I/O, Memory, and IRQ details about the controller.
- **Appendix C - POST Beep Codes** lists the Power On Self Test (POST) beep codes which are used for troubleshooting purposes.
- **Appendix D - Specifications** lists the controller hardware's environmental and electrical specifications.

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Conventions Used in This Manual

This manual uses the following typographical conventions:

Getting Started	Italicized text is used for book titles and for emphasis.
Dialog Box	Bold text is used for the first instance of a word that is defined in the glossary.
`File`	Computer font represents text that you will see on the screen, including menu names, features, buttons, or text that you have to enter.
`dir` *filename*	In this context, the text in computer font represents an argument that you type exactly as shown, and the italicized text represents an argument that you must replace with an actual value.
`File` ⇒ `Open`	The "⇒" is used in a shorthand notation to show the location of features in the menu. For example, "`File` ⇒ `Open`" means to select the `File` menu and then select `Open`.
`Sml | Med | Lrg`	Choices in computer font, separated with bars (|), indicate that you should choose one of the options.
Press **Enter**	In this context, bold represents a key to press on the keyboard.
Press **Ctrl + O**	Represents a combination of keys on the keyboard that you should press at the same time.

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1

Getting Started

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Getting Started

This chapter will help you complete the development system setup and tell you how to get started using the HP E6237A VXI Pentium Real-Time Controller. It also describes the Hewlett-Packard and LynxOS documentation sets, and explains how to get technical support. The following list describes the system's major components:

- **HP E6237A VXI Pentium Controller and VXI mainframe**: The controller should already be installed and configured as explained in the *Hardware Installation and Configuration Guide.*

  The controller arrives from the factory with all system software pre-installed and configured. The system software includes the LynxOS operating system, the HP Standard Instrument Control Library (HP SICL), the HP Compiled Standard Commands for Programmable Instruments (HP C-SCPI), and software from the Free Software Foundation. The next section explains how to complete the system setup, and start using the controller.

- **Documentation**: Hewlett-Packard and Lynx documentation will help you develop applications. The documentation is available as printed manuals and as online files. Later sections in this chapter describe the documentation.

- **Installation Media**: The development system includes one CD-ROM labeled "E6237A Development System", and one 3.5-inch floppy disk labeled "E6237A Installation Disk". Use these disks if you ever need to re-install the system software. The CD-ROM contains an image of the system software, as well as a copy the entire LynxOS file system, the source code from the Free Software Foundation, and online documentation files. The floppy disk is the LynxOS boot disk. See Chapter 4, "Re-Installing the System Software", for details about using the installation media.

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Starting the System

After the controller hardware is installed and configured, and you have completed the system setup, you are ready to start using the development system. For information about starting and stopping the system, and other introductory information about using LynxOS, see the LynxOS *Quick Start Guide*. However, before you begin doing any real work, you must complete some final setup tasks.

Note

See the file `/README` for information about system software installation and configuration that was not included in this manual.

Verifying the System Software Configuration

You should verify the system software configuration now. You may need to change some configuration settings. The controller arrives from the factory with LynxOS and the I/O libraries (HP SICL and HP C-SCPI) pre-installed with default configurations. These installations are done according to procedures typically used to install the system software components as individual products. For configuration information about the I/O libraries, see the HP SICL *User's Guide for LynxOS* and the HP C-SCPI *User's Guide*. The remainder of this section will help you verify the LynxOS configuration settings, and change those that are incorrect for your environment. Also, it is useful for you to know how LynxOS is installed.

Caution

LynxOS is shipped from the factory *without* password protection on the `root` or `setup` accounts.

Changing LynxOS Configuration

Some of the configuration settings depend on the specific user environment and must be configured by the user. The following list identifies the configuration tasks to complete, and the settings to verify. Be sure to change settings as needed. See the *LynxOS Installation Guide* and the *LynxOS User's Guide* for details about these topics.

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- Verify operating system settings:
  - ❑ Create user accounts as explained in the *LynxOS User's Guide*.
  - ❑ Set the date and time using the `/bin/date` command, or the `setup` login.
  - ❑ Set the time zone in the file `/bin/rc`, or use the `setup` login.
  - ❑ Set the X Window and Motif configurations as explained in the *LynxOS Installation Guide*.
  - ❑ The installed LynxOS system includes X and Motif, including PosixWorks Desk. In order to remain backward compatible with previous offerings from HP, PosixWorks Desk is disabled from running automatically at bootup. To run PosixWorks Desk manually after bootup, execute the following command at the command prompt:

    ```
    startx
    ```

    To run PosixWorks Desk automatically at bootup, edit the file `/etc/ttys`. In the line beginning with `/dev/atc2`, change the `0` to `1`. The resulting line should look like the following example:

    ```
    /dev/atc2:1:default:vt100at:/bin/runx
    ```

- Verify network settings:
  - ❑ Set the host name in `/net/rc.network`.
  - ❑ Correct the host table in `/etc/hosts`.
  - ❑ Set NFS mounts in `/etc/fstab`.

Factory-Installation Procedure

The factory installation of LynxOS on the HP VXI Pentium Controller follows the installation and configuration procedure described in the *LynxOS Installation Guide*. The following list outlines the main steps in the factory-installation procedure. This can be useful information if you contact Lynx for technical support. The installation media supplied with your system by

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Hewlett-Packard duplicates the factory-installation procedure, and should be used only if you need to re-install the system software; see Chapter 4, “Re-Installing the System Software”, for more information.

- Load LynxOS:
  - ❑ Load on IDE, first partition (`hd0a`).
  - ❑ Choose “Development System Values”.
  - ❑ Enable virtual memory on IDE, second partition (`hd0b`).
  - ❑ Configure networking on AMD AM79C970A.
    - TCP/IP: yes
    - Hostname / IP: lynxdemo / 10.0.0.1
    - NFS: all yes
    - STREAMS: all yes
- Configure LynxOS:
  - ❑ In `/sys/lynx.os/uparam.h`, increase `USR_PPSMEMS` from 16 to 32, and `SMEMS` from 10 to 20.
  - ❑ Enable two virtual consoles: `atc0` and `atc1`.
  - ❑ Install various LynxOS patches. (See `/README` for details.)
  - ❑ Install PS/2 mouse driver.
- Load and configure X and Motif:
  - ❑ Install all products with default settings.
  - ❑ Configure for Microsoft®-compatible PS/2 mouse.
- Load PosixWorks Desk tools:
  - ❑ Load TotalView Multi-Process Debugger.
  - ❑ Load TimeScan Performance Analyzer.
- Load and configure HP I/O Libraries:
  - ❑ Load and configure HP SICL.
  - ❑ Load and configure HP C-SCPI.

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Guide to Hewlett-Packard Documentation

The HP E6237A includes documentation describing the hardware and software components supplied by Hewlett-Packard. This chapter describes the following Hewlett-Packard documentation sets.

- HP E6237A VXI Pentium Controller Documentation
  Hardware Installation and Configuration Guide
  User's Guide for Real-Time Controller (this manual)
  User's Guide for Run-Only System (included with run-only system option)

- HP SICL Documentation
  User's Guide for LynxOS
  Reference Manual
  Quick Reference Guide for C Programmers

- HP Compiled SCPI for LynxOS Documentation
  User's Guide
  HP C-SCPI Quick Reference Guide

The printed HP manuals are also available as PDF documents readable online by the Adobe™ Acrobat Reader. To view these documents, you must acquire a copy of the Acrobat Reader application, and install it on a PC running Microsoft® Windows® 95 or Windows NT®. The PDF documents are on the "HP E6237A Development System" CD-ROM in the `/pdf_doc` directory. The Acrobat Reader is available for free, as a downloadable file, from the Adobe web site at `www.adobe.com`. After downloading the reader, its online instructions explain how to view PDF documents.

HP E6237A VXI Pentium Controller Documentation

The Pentium controller documentation explains how to install and configure the controller hardware, and provides general information about using the real-time controller system.

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Hardware Installation and Configuration Guide explains how to install the VXI Pentium Controller hardware, including any peripherals you wish to connect to the controller. This guide then explains how to power up the controller and customize the controller's configuration if the default, factory-set configuration is not sufficient for your controller's specific hardware setup.

User's Guide for Real-Time Controller is this manual. It explains how to use your system by describing the documentation, basic installation/ configuration procedures, troubleshooting aid, and support information.

User's Guide for Run-Only System is included with the run-only system option. It describes the run-only system, explains how to move your application from the development system to the run-only system, and how to re-install the run-only system software if necessary.

HP SICL Documentation

Use the HP SICL (Standard Instrument Control Library) documentation when including the library in your applications that control instruments. SICL provides program portability across a variety of computer architectures, I/O interfaces, and operating systems. SICL also provides commands to take advantage of the unique features of each type of interface, thus giving the programmer complete control over I/O communications.

User's Guide for LynxOS describes how to configure and use SICL on LynxOS.

The SICL *Reference Manual* provides the function syntax and description of each SICL function.

Quick Reference Guide for C Programmers helps you find SICL function syntax information quickly if you are programming in C/C++.

All commands are documented online as `man` pages in text format. Use the `man` command to view this information:

`man` *`cmd_name`*

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HP Compiled SCPI for LynxOS Documentation

Use the HP C-SCPI (Compiled Standard Commands for Programmable Instruments) documentation when you include SCPI commands in your programs. Compiled SCPI lets you achieve the high throughput of register-based VXI devices with the ease of high-level programming.

User's Guide provides detailed information about how to use Compiled SCPI. Example C-SCPI programs and troubleshooting information are provided as well.

HP C-SCPI Quick Reference Guide summarizes command syntax and descriptions, presents commands in their functional groups, and explains the process for you to include C-SCPI commands in a program.

All commands and instrument drivers are documented online as `man` pages in text format. Use the `man` command as shown in this example to view the information:

`man` *`cmd_name`*

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Guide to LynxOS Documentation

The HP E6237A includes a complete set of programmer and reference documentation detailing the utilities and tools available with the LynxOS Real-Time Operating System. Use this documentation when you work directly with LynxOS. This chapter describes the LynxOS documentation set listed in the following table.

LynxOS Base Document Set	Additional Documentation
LynxOS Installation Guide	*Lynx Real-Time Systems Datasheets*
LynxOS User's Guide	*TotalView Release Notes*
Quick Start Guide	*TimeScan Release Notes*
LynxOS Reference Manual Set	*LynxOS 2.5.0 Release Notes*
Utility Programs (A-F)	*ELOG Library Programmer's Guide*
Utility Programs (G-O)	*TimeScan Viewer User's Guide*
Utility Programs (P-Z)	*TotalView User's Guide*
System Calls	*TotalView Supplement for LynxOS Users*
Library Functions (A-M)	*Writing Device Drivers for LynxOS*
Library Functions (N-Z)	*X Window System User's Guide, Vol. 3, OSF/Motif 1.2 Edition*
Device Facilities, File Formats Driver Service Calls	*Programmer's Supplement for Release 6 of the X Window System*
GNU C/C++ Tools Set	*POSIX Programmer's Guide*
Using GNU CC	*POSIX.4: Programming for the Real World*
Debugging with GDB	
Development Support Tools	
GNU Make	
DejaGNU Testing Framework	

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Base Documentation Set

The base documentation set explains how to install and use LynxOS.

LynxOS Installation Guide explains how to install and configure LynxOS and the X Window® System. It also tells how to use X Window on LynxOS and describes some platform-specific details of booting LynxOS.

Note

You cannot use the installation procedures described in the LynxOS documentation with your HP E6237A system. To install the system software, see Chapter 4, “Re-Installing the System Software”.

LynxOS User’s Guide explains basic system administration and kernel-level specifics of LynxOS. This includes topics such as tuning system performance, booting LynxOS over a network, and creating kernel images for embedded applications.

Quick Start Guide provides a quick overview of the steps needed to develop, compile, link, debug, and execute your applications using LynxOS.

LynxOS Reference Set

The *LynxOS Reference* contains many volumes, organized into the following functional sections:

- Section 1, Utility Programs (three volumes)
- Section 2, System Calls (one volume)
- Section 3, Library Functions (two volumes)
- Section 4, Device Facilities; Section 5, File Formats; Section 9, Driver Service Calls (combined into one volume)

All commands and utilities described in the *LynxOS Reference* and its supplements are available online in text format. Use the `man` command as shown in this example to view the information:

```
man gcc
```


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GNU C/C++ Tools Set

This set describes the GNU C/C++ compilers and tools.

Using GNU CC explains how to use the GNU C compiler to compile programs written in C, C++, or Objective C.

Debugging with GDB explains how to debug C and C++ programs using the GNU debugger GDB.

Development Support Tools contains six sections that explain how to use various GNU support tools:

- CPP, the GNU C Preprocessor
- AS, the GNU Assemble
- GASP, the GNU Assembler Preprocessor
- LD, the GNU Linker
- The GNU Binary Utilities
- Comparing and Merging Files

GNU Make describes `make` and `makefile`, and how to use the GNU `make` utility.

DejaGNU Testing Framework describes DejaGNU as a framework for testing other programs, and explains how to set up a testing framework and test suites.

Additional Documentation

Release Notes for LynxOS, TimeScan, and TotalView contains late-breaking information about the latest release of these products.

TimeScan Viewer User's Guide describes how to use the TimeScan Viewer, the graphical user interface to the TimeScan Performance Analyzer.

ELOG Library Programmer's Guide covers the general use of the Event Logging (ELOG) Library, a component of the TimeScan Performance Analyzer.

TotalView User's Guide describes how to use the TotalView Multi-Process Debugger, a source-level and machine-level debugger.

TotalView Supplement for LynxOS Users provides additional information about using the TotalView debugger on controllers running LynxOS.

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Writing Device Drivers for LynxOS describes LynxOS device drivers and gives numerous examples to help you write custom device drivers for many different situations.

POSIX Programmer's Guide explains the POSIX standard and is a reference for the POSIX.1 programming library to help you write more portable programs. This guide is especially helpful if you are writing programs that must run on multiple UNIX® platforms.

POSIX.4: Programming for the Real World covers the POSIX.4 standard for portable real-time programming, and includes a general introduction to real-time programming with problem descriptions and associated solutions.

X Window System User's Guide, vol. 3, OSF/Motif 1.2 Edition orients the new user to window system concepts and provides detailed tutorials for many client programs, including the xterm terminal emulator and window managers. Later chapters explain how to customize the X environment and provide sample configurations.

Programmer's Supplement for Release 6 of the X Window System is for programmers who are familiar with Release 5 and want to know how to use the new Release 6 features including complete tutorial and reference information for all new Xlib and Xt functions. This is an update to the Release 5 editions of volumes 1, 2, 4, and 5.

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Getting Technical Support

Your HP E6237A VXI Pentium Real-Time Controller contains components from two companies, Hewlett-Packard Company and LynxOS Real-Time Systems, Inc. If you should ever need technical support, it is important that you call the right company to get the quickest response to your concerns.

HP Support

For issues related to the controller hardware, the mainframe, configuration, or programming using SICL or C-SCPI, call for HP support and services at your local HP DIRECT office in the following list:

Austria	0660 8004
Belgium	02 778 3417
Canada	800-387-3154
France	(1) 69.82.60.20
Germany	(0 70 31) 14 63 33
Ireland	01 2844 633
Italy	02.92.122.241
Netherlands	020 547 6222
Norway	22 73 57 59
Spain	(91) 631 13 23
Sweden	08 444 2525
Switzerland	01-735 72 00
United Kingdom	01344-366666
United States	800-452-4844

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Countries without an HP DIRECT office should use the following phone numbers:

Asia Pacific	(852) 2599 7070
Australia New Zealand	131 347 ext.2902
Japan	(81) 426 48 3860
Latin America	(305) 267 4245/4220

Lynx Support

For issues related to the LynxOS operating system, GNU tools set, TotalView and TimeScan operation, POSIX and X Window programming, contact Lynx Real-Time Systems. Use the technical support phone numbers listed in the front section of the following LynxOS manuals:

LynxOS Installation Guide
LynxOS User's Guide
Quick Start Guide

Access the Lynx web site at www.lynx.com for information about training and support, the user's group, and other offerings.

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Troubleshooting

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Troubleshooting

This chapter helps you resolve error messages or other problems you may encounter while using the VXI Pentium Real-Time Controller. If you cannot resolve a problem, and you need to call for technical support, this chapter includes information that can help you describe symptoms to support personnel. This chapter contains the following sections:

- Front Panel LED Indications
- BIOS Error Messages
- Problems After Configuring the BIOS
- System Appears Hung Up

Note

For information on the meaning of the LED indicators on the front panel of the controller, please see Appendix A, “LEDs on the Front Panel”.

If you need to use the BIOS setup utility, please see Chapter 3, “Using the BIOS Setup Utility”.

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Front Panel LED Indications

If the controller is not operating correctly after powering it up, check the status of the front panel LEDs listed in the following table. They can help indicate the controller's condition. At power-on, these LEDs should be lit. It is normal for the TEST LED to go out part way through the boot; the SCSI and IDE LEDs should go out after the boot. The following conditions may exist, depending on the LED indications.

Table 2-1. LED Indications

LED State	Condition
RUN is not lit	The CPU has halted.
TEST stays lit	The controller did not pass its power-on self-test (POST).
SCSI stays lit	SCSI port operation has failed.
IDE stays lit	IDE disk error.

Cycle the power to the controller to see if the problem rectifies itself. If the LED indicators are still not lit correctly, then please contact your HP Service and Support Center for assistance. See the appendix in this manual, "POST Beep Codes", for additional information that may be useful to service personnel.

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BIOS Error Messages

The following table lists the BIOS error messages you may encounter when powering up and using the VXI Pentium Controller, and describes possible causes and fixes for the errors.

Note If a possible fix that is suggested in the following table requires you to run BIOS Setup, please see Chapter 3, “Using the BIOS Setup Utility”, for more information.

Table 2-2. BIOS Error Messages

Error Message	Description
`Diskette drive A error` or `Diskette drive B error`	Drive A: or B: is present but fails the BIOS power-on self-test (POST) for the particular 3.5-inch disk drive. Check to see that the drive is defined with the proper disk type in BIOS Setup. Also, if the disk drive is an external drive (rather than the internal drive), ensure that the disk drive is correctly connected.
EXM Configuration error	The EXM module is not configured properly, or the BIOS cannot locate the module. Run BIOS Setup to correct the configuration.
`Extended RAM Failed at offset:` *nnnn*	The extended memory is not working or is not configured properly at offset *nnnn*. Contact your HP Service and Support Center for assistance.
`Failing Bits:` *nnnn*	The hexadecimal number *nnnn* is a map of the bits at the RAM address (in System, Extended, or Shadow memory) which failed the memory test. Each 1 (one) in the map indicates a failed bit. Contact your HP Service and Support Center for assistance.
`Fixed Disk 0 Failure` or `Fixed Disk 1 Failure` or `Fixed Disk Controller Failure`	The fixed disk (internal hard disk drive) is not working or is not configured properly. Run BIOS Setup to ensure the disk type is correctly identified. If this does not fix the problem, contact your HP Service and Support Center for assistance.
`Incorrect Drive A type - run SETUP` or `Incorrect Drive B type - run SETUP`	The disk type for drive A: or B: is not correctly identified in BIOS Setup. Run BIOS Setup to set the correct disk type.
`Invalid NVRAM media type`	There is a problem with NVRAM (CMOS) access. Contact your HP Service and Support Center for assistance.

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Table 2-2. BIOS Error Messages (Continued)

Error Message	Description
`Keyboard controller error`	The keyboard controller failed a system test. You may have to replace either the keyboard or the keyboard controller. Contact your HP Service and Support Center for assistance.
`Keyboard error - Keyboard not working` `Keyboard error` *nn*	The system BIOS discovered a stuck key and displays the scan code *nn* for the stuck key.
`Keyboard locked - Unlock key switch`	Unlock the system to proceed.
`Monitor type does not match CMOS - Run SETUP`	The monitor type is not correctly identified in BIOS Setup. Run BIOS Setup to set the correct monitor type.
`Operating system not found`	The Windows operating system cannot be located on either drive C: or drive A:. Run BIOS Setup to ensure drive C: (fixed disk/internal hard disk drive) and/or drive A: (the 3.5-inch disk drive) are properly identified.
`Parity Check 1`	A parity error was found in the system bus. If the system BIOS located the address where the parity error occurred, it will also display that address on the screen. Contact your HP Service and Support Center for assistance.
`Parity Check 2`	A parity error was found in the I/O bus. If the system BIOS located the address where the parity error occurred, it will also display it on the screen. Contact your HP Service and Support Center for assistance.
`Press <F1> to resume, <F2> to Setup`	This is displayed after any recoverable error message. Press the **F1** function key to start the boot process or the **F2** function key to enter BIOS Setup and change any settings.
`Press <F2> to enter SETUP`	This is not an error message. Instead, it is an optional, informational message that is displayed during the controller's power-on self-test (POST). Note that the display of this message can be turned off in BIOS Setup.
`Previous boot incomplete -` `Default configuration used`	The previous power-on self-test (POST) did not complete successfully. The POST then loads the default BIOS configuration values and offers to run BIOS Setup. If the failure was caused by incorrect BIOS values that were set and they are not corrected, the next boot will also likely fail. Therefore, ensure that all configuration values are re-set correctly in BIOS Setup. This error should then be cleared the next time the controller is booted.

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Table 2-2. BIOS Error Messages (Continued)

Error Message	Description
`Real time clock error`	The real-time clock failed the system BIOS test. This may require repair of the board. Contact your HP Service and Support Center for assistance.
`Shadow Ram Failed at offset:` *nnnn*	The shadow RAM failed at offset *nnnn* of the 64 KB block at which the error was detected. Contact your HP Service and Support Center for assistance.
`System battery is dead - Replace and run SETUP`	The CMOS clock battery indicator shows the battery is dead. Have the battery replaced (contact your HP Service and Support Center for assistance). Then run BIOS Setup to reconfigure the controller.
`System cache error - Cache disabled`	The RAM cache failed the system BIOS test, and BIOS then disabled the cache. Contact your HP Service and Support Center for assistance.
`System CMOS checksum bad - run SETUP`	The system CMOS has been corrupted or modified incorrectly, perhaps by an application program that changes data stored in CMOS. Run BIOS Setup and reconfigure the controller either by restoring the default values or the previous values and/or making your own selections.
`System RAM Failed at offset:` *nnnn*	The system RAM failed at offset *nnnn* of the 64 KB block at which the error was detected. Contact your HP Service and Support Center for assistance.
`System timer error`	The timer test failed. This requires repair of the system board. Contact your HP Service and Support Center for assistance.

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Problems After Configuring the BIOS

If your controller either fails, does not work properly, or displays error messages after you make configuration changes in BIOS Setup, you may be able to correct the problem by entering BIOS Setup again and restoring either the original, default BIOS configuration values, or the previous values. This can be done via either the “Get Default Values” or the “Load Previous Values” selection in the Exit Menu of BIOS Setup. For more information, see the “Exit Menu” section of Chapter 3, “Using the BIOS Setup Utility”.

If after restoring the default or previous BIOS configuration values, your controller is still not functioning properly, attempt to re-set the BIOS configuration values for your controller’s hardware setup by following the appropriate information in Chapter 3, “Using the BIOS Setup Utility”. If this still does not fix the problem, please contact your HP Service and Support Center for assistance.

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System Appears Hung Up

If the system appears to hang up after running normally, check the following conditions:

- Try switching the virtual consoles by using the **Page Up** and **Page Down** keys. The display should switch between the virtual consoles.
- If the controller has been running normally on a network, check if the controller answers a “ping” from another controller on the network.

If one condition works correctly, the other one should, too. If these conditions do not work; that is, if the consoles don’t switch, and the controller does not respond to a “ping” over the network, it is likely that the problem is not in the user’s code. Neither of these checks will correct any problem; however, the results do provide information about the system’s condition for troubleshooting purposes.

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3

Using the BIOS Setup Utility

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Using the BIOS Setup Utility

This chapter explains the various menus, sub-menus, and fields in the BIOS (Basic Input/Output System) Setup utility that you can use to configure the HP VXI Pentium Controller hardware. Since the controller is shipped with all BIOS Setup values pre-configured, you only need to use this chapter if you want to make changes to the pre-configured, default BIOS value settings.

This chapter presents each configuration menu, sub-menu, and field in the sequence that you would encounter it for the first time. Note that on-line help is also available in the `Item Specific Help` area of each menu and sub-menu.

Accessing BIOS Setup

Nonvolatile CMOS RAM in the controller maintains the BIOS settings that you save. The BIOS uses these settings to initialize the hardware. You can access BIOS Setup only during the system reset process. To access BIOS Setup, press the **F2** function key as the system boots.

Navigating BIOS Setup Menus

Within BIOS Setup, use the cursor (arrow) keys to navigate from menu to menu and to move between fields in a menu. Use the up and down cursor keys to move from field to field in a menu. Use the right and left cursor keys to move from menu to menu, as listed in the menu bar at the top of the BIOS Setup screen. If you leave a menu and then return, the active field is always at the top of the menu. If you select a sub-menu and then return to the main menu, note that you return to that sub-menu heading.

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Main BIOS Setup Menu

The Main BIOS Setup Menu is shown below.

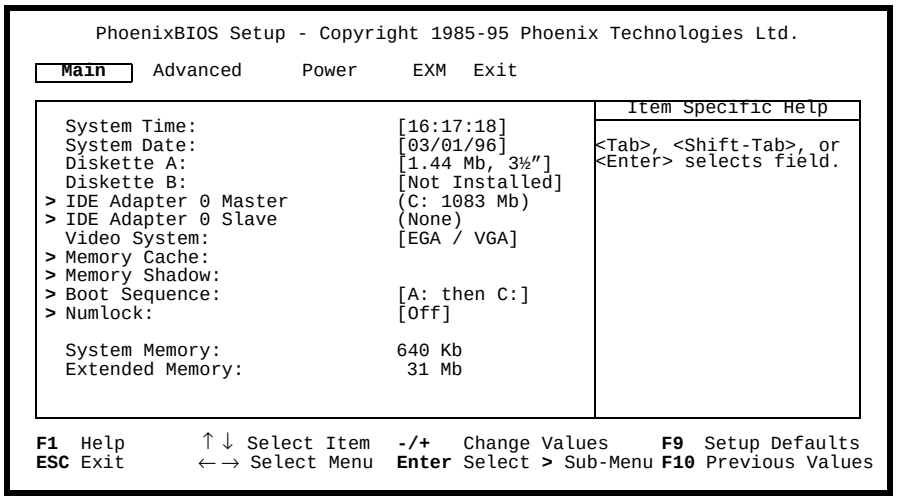


Figure 3-1. Main BIOS Setup Menu

The fields in this menu and its various sub-menus are as follows.

System Time: and System Date:

To change the values for these fields, simply move to each field and type in the desired entry. Use the **Tab** key to move from hour to minutes to seconds, or from month to day to year.

Diskette A: and Diskette B:

These fields identify the type of 3.5-inch disk drive installed as the A: and B: drives. The BIOS defaults to `1.44 Mb, 3 ½"` for drive A:, and `Not Installed` for drive B:. Other possible values are: `360 Kb`, `720 Kb`, `1.2 Mb`, and `2.88 Mb`.

IDE Adapter 0 Master: and IDE Adapter 0 Slave: Sub-Menus

These fields are headings for sub-menus that allow you to enter complete disk drive information. Once the information is entered for the drive, the entry in the Main Menu shows the drive selected. For more information, see the “IDE Adapter 0 Sub-Menus” subsection later in this chapter.

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Video System: This field identifies the type of CRT monitor attached to the system. The possible values are:

```
EGA / VGA (default)
CGA 80x25
Monochrome
```

Memory Cache Sub-Menu: For more information, see the “Memory Cache Sub-Menu” subsection later in this chapter.

Memory Shadow Sub-Menu: The term “Memory Shadow” refers to the technique of copying information from an extension ROM into DRAM and accessing it in this alternate memory location. The controller restricts what memory is available for shadowing because of the special requirements for SCSI and the Universe™ PCI/VME bridge. For more information, see the “Memory Shadow Sub-Menu” subsection later in this chapter.

Boot Sequence: Sub-Menu: The Boot Sequence Sub-Menu allows you to change the boot delay and boot sequence, and to disable several displays during the boot process, such as the SETUP prompt, POST (power-on self-test) errors, floppy drive check, and summary screen. Once the boot sequence has been set, it is displayed in this field of the Main Menu. For more information, see the “Boot Sequence Sub-Menu” subsection later in this chapter.

Numlock: Sub-Menu (Keyboard Features): This sub-menu enables or disables various keyboard features, including enabling the **Num Lock** key, enabling the key click, and setting the keyboard’s auto-repeat rate and delay. The Numlock setting is displayed in this field in the Main BIOS Setup Menu. For more information, see the “Keyboard Features Sub-Menu” subsection later in this chapter.

System Memory: This field is read-only (not editable) and displays the amount of conventional memory (below 1 MB). No user interaction is required. Note that the amount is actually less than 640 KB since some memory is used for the Extended BIOS Data Area, which is required for PS/2 mouse usage.

Extended Memory: This field is also read-only and displays the amount of extended memory (above 1 MB). No user interaction is required.

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IDE Adapter 0 Sub-Menus

There are two IDE Adapter 0 Sub-Menus for the primary and secondary hard disk controllers, each having a master and slave drive screen. The detailed characteristics of the drive connected to the adapter is available in the IDE Adapter 0 Sub-Menu, which is shown below.

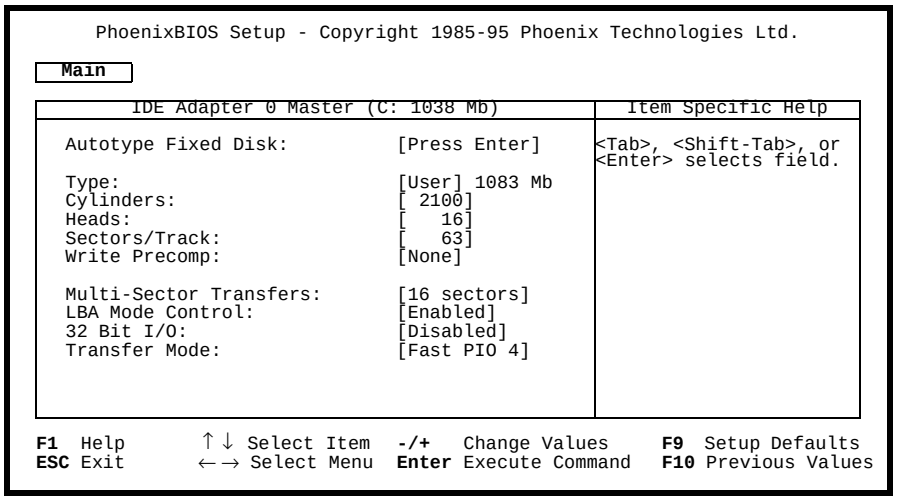


Figure 3-2. IDE Adapter 0 Sub-Menus

Note

You must disable the IDE hard drive if you want to boot LynxOS using a SCSI drive.

Autotype Fixed Disk:

This is a function which is used when setting up new disks. It allows BIOS Setup to determine the proper settings of the disk based on information on the disk. This information is detected by Setup for drives that comply with ANSI specifications. Press the **Enter** key to invoke this function.

Existing (formatted) disks must be set up using the same parameters that were used originally when the disk was formatted. If necessary, the specific Cylinder, Head, and Sectors/Track information, as listed on the label attached to the drive at the factory, must be entered manually on this sub-menu using the `User` Type, which is described below.

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Type: Select `None` if there is no IDE hard disk drive for this adapter. In the case where there is an IDE disk but the `Autotype` function (above) cannot be employed, then select the `User` type and enter the correct drive values for Cylinders, Heads, Sectors/Track, and Write Precomp (precompensation) for the drive.

Multi-Sector Transfers: This field allows you to configure the System BIOS to read ahead by the specified number of sectors whenever a disk access is performed. This has the effect of reading more data at once to reduce the absolute number of discrete disk reads performed by the operating system, which may increase system performance. The possible values are: `Disabled`, or `2`, `4`, `8`, or `16 sectors` (default). Note that autotyping may change this value if the hard disk reports that it supports block accesses.

LBA Mode Control: When enabled, this field allows the System BIOS to reference hard disk data as logical blocks instead of using the traditional Cylinders/Heads/Sectors (CHS) method. The `Enabled` value can only be used if both the hard disk being configured and the operating system support Logical Block Addressing (LBA). If disabled, then CHS mode is used. Note that autotyping may change this value if the hard disk reports that it supports LBA. The default is `Enabled`.

32-bit I/O: When enabled, this field allows the System BIOS to access the hard disk controller with 32-bit I/O accesses, increasing system performance. This field is not affected by autotyping. The default is `Disabled`.

Transfer Mode: This field sets the mode that the System BIOS uses to access the hard disk. The possible values are:

```
Standard
Fast PIO 1
Fast PIO 2
Fast PIO 3
Fast PIO 4 (default)
Fast DMA
```

Older hard disks only support the `Standard` setting. Newer hard disks adhering to Fast ATA or Enhanced IDE specifications may support the `Fast PIO` (programmed I/O) modes. The `Fast DMA` mode makes full use

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of the onboard bus mastering hard disk controller and should yield the highest performance when used in conjunction with multi-tasking operating systems that support it. Note that autotyping may change this value depending on the transfer modes that the hard disk reports it supports.

Memory Cache Sub-Menu

This sub-menu controls the cachability of certain memory regions, as well as the settings of the Level 2 (L2) cache. The Memory Cache Sub-Menu is shown below.

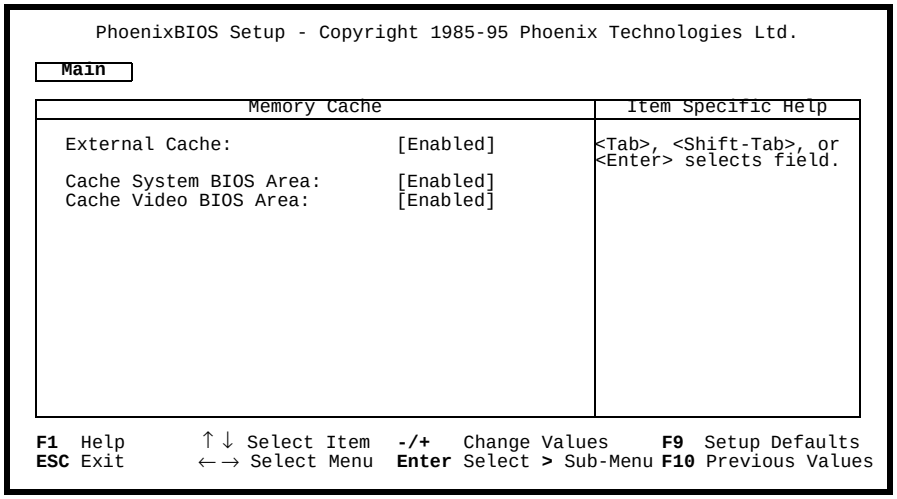


Figure 3-3. Memory Cache Sub-Menu

External Cache: This field enables or disables the Level 2 (L2) cache. If this cache is disabled, system performance will suffer. The default is `Enabled`.

Cache System BIOS Area: This field enables or disables caching of the System BIOS area in the 0E4000H through 0FFFFFH DRAM area. If this cache is disabled, system performance will suffer. The default is `Enabled`.

Cache Video BIOS Area: This field enables or disables caching of the VGA BIOS area in the 0C0000H through 0C7FFFH region. If this cache is disabled, system performance will suffer. The default is `Enabled`.

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Memory Shadow Sub-Menu

The term “shadowing” refers to the technique of copying code, such as BIOS extensions, from ROM into DRAM and accessing them from DRAM. This allows the CPU to access the BIOS extensions faster and generally increases system performance if many calls to the BIOS extensions are made. The Memory Shadow Sub-Menu is shown below.

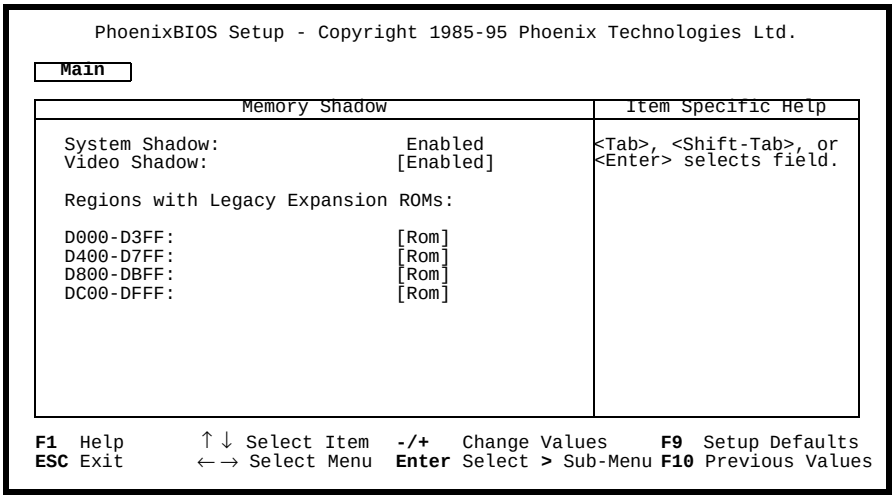


Figure 3-4. Memory Shadow Sub-Menu

System Shadow: This field is read-only (not editable) since the System BIOS is always shadowed.

Video Shadow: While it is advisable to leave video shadowing enabled, it is possible to disable video shadowing for system performance reasons. The default is `Enabled`.

Regions with Legacy Expansion ROMs: These fields enable a ROM or disable shadowing for the associated memory region. There are four 16 KB areas where expansion ROMs can be shadowed:

```
D000 - D3FF
D400 - D7FF
D800 - DBFF
DC00 - DFFF
```


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The default for each of these is `ROM`.

The shadow regions should be used only if an EXMbus card is installed in the system that contains a BIOS extension (ROM), although there is no effect on the system if a region is shadowed that does not contain a BIOS extension. Note that each shadow region in the Setup menu is 16 KB in size. Multiple shadow regions may have to be enabled if the BIOS extension to be shadowed is larger than 16 KB.

Boot Sequence Sub-Menu

The Boot Sequence Sub-Menu allows you to change options for the boot sequence. This sub-menu is shown below.

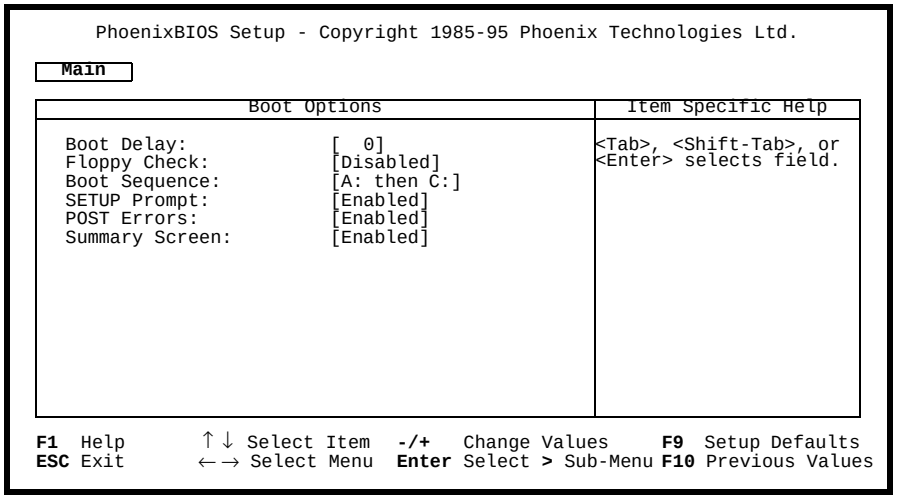


Figure 3-5. Boot Sequence Sub-Menu

Boot Delay: This field sets the system to delay booting for a time period in seconds. This allows for long start-up times on boot devices that spin up slowly. The default is `0` (zero) seconds.

Floppy Check: This field enables or disables the floppy (3.5-inch disk) drive search during the boot. To speed up booting, the floppy check should be disabled. It is still possible to boot from the A: drive even with the floppy check disabled. The default is `Disabled`.

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Boot Sequence: This field defines how the system treats the floppy A: drive when booting. Booting can occur either from a floppy disk in the A: drive, or directly from the C: fixed disk drive. To reduce the amount of time required to boot, set the boot sequence to `C: only`. Note that the C: drive may be either an IDE or SCSI drive. The possible values are:

`A: then C:` (default)	Used to boot from the floppy drive or, if no floppy disk is present in the A: drive, to boot from the C: drive. This is useful for troubleshooting the operating system if a boot disk is in drive A:.
`C: then A:`	Used to boot from the C: drive or, if not present, to boot from the A: drive.
`C: only`	Used to boot from the C: drive without searching for an A: drive.

SETUP Prompt: This field enables or disables the message `Press F2 to enter Setup`. Even if the message is disabled, you can still press the **F2** function key at the appropriate time to enter the Main BIOS Setup Menu. To speed up booting, disable the SETUP Prompt. The default is `Enabled`.

POST Errors: When enabled, this field is used to stop progress during the boot process if the POST (power-on self-test) encounters errors. Otherwise, the system continues to attempt to boot despite any start-up error messages that are displayed. Note that this field only affects those errors that are configured at build-time to halt the system. The default is `Enabled`.

Summary Screen: This field is used to enable or disable a summary of the system configuration, which is displayed before the operating system starts to load. To speed up booting, disable the Summary Screen. The default is `Enabled`.

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Keyboard Features Sub-Menu

This sub-menu, which is accessed from the Numlock: field in the Main BIOS Setup Menu, enables or disables various keyboard features. The Keyboard Features Sub-Menu is shown below.

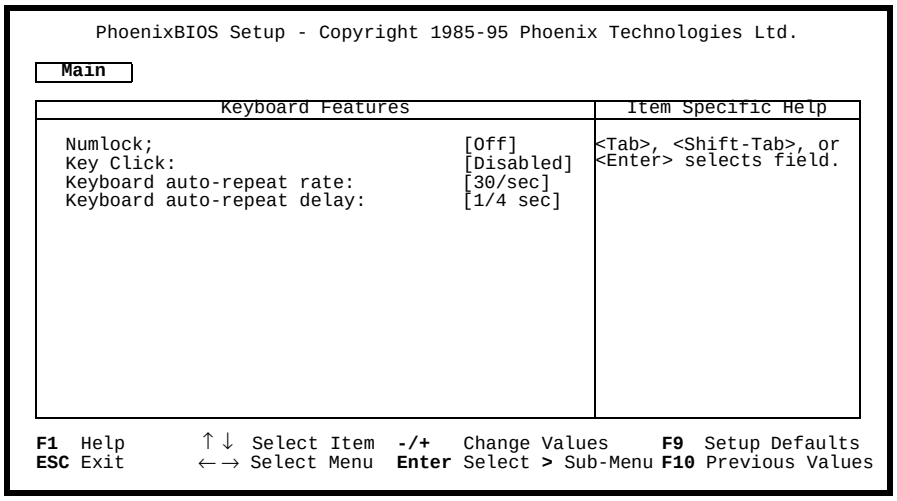


Figure 3-6. Keyboard Features Sub-Menu

Numlock: This field enables or disables the Numlock feature of the keyboard at boot time. When enabled, Numlock permits the use of the keypad numbers on the keyboard. The default is `Off`, which disables the Numlock key at boot time.

Key Click: This field enables or disables the key click feature on the keyboard. When enabled, the system produces an audible click each time a key is pressed. The default is `Disabled`.

Keyboard auto-repeat rate: This field sets the auto-repeat rate when a key is held down on the keyboard. The rates range from 2-30 per second. The default rate is `30/sec`.

Keyboard auto-repeat delay: This field sets the delay between when a key is pressed and when the auto-repeat feature begins. Options are `1/4`, `1/2`, `3/4`, and `1` (one) second. The default delay is `1/4 sec`.

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Advanced Menu

The Advanced Menu contains settings for integrated peripherals, memory shadow, cache, and large disk access mode. The Advanced Menu is shown below.

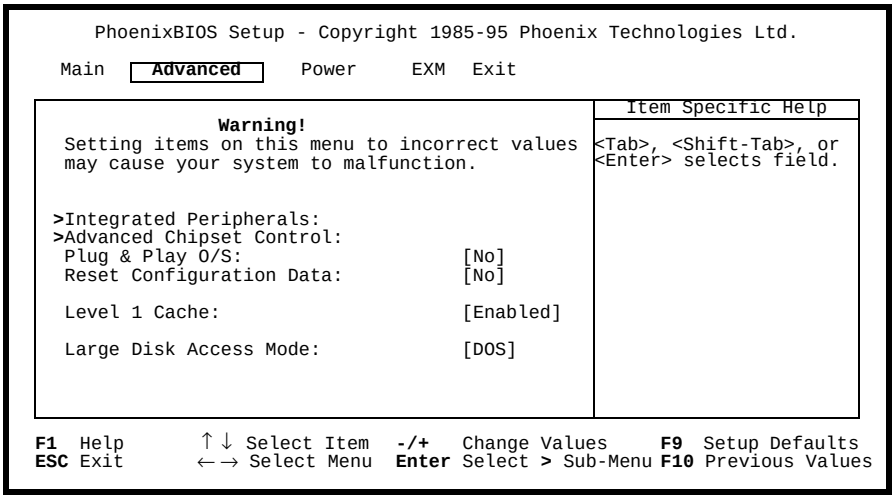


Figure 3-7. Advanced Menu

Integrated Peripherals Sub-Menu

This sub-menu is used to configure the onboard serial (COM) and parallel (LPT) ports, as well as the onboard disk controllers. For more information, see the "Integrated Peripherals Sub-Menu" subsection later in this chapter.

Advanced Chipset Control Sub-Menu

This sub-menu is used to configure the chipset. For more information, see the "Advanced Chipset Control Sub-Menu" subsection later in this chapter.

Plug & Play O/S:

If enabled, this field informs the System BIOS that the operating system which is booted supports Plug and Play. This forces the Plug and Play portion of the System BIOS to only configure motherboard devices and those peripherals that are necessary for booting (display, hard disk, and so forth), the rest being left to the operating system to configure. The default is No (disabled).

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Reset Configuration Data: If enabled, this field updates the Extended System Configuration Data (ESCD) block residing in FBD main block #2. This is necessary the first time a system is turned on or if the ESCD becomes corrupted. The default is `No` (disabled). This field is automatically reset to `No` after the ESCD is updated.

Level 1 Cache: When enabled, this field speeds up the processor by enabling the Level 1 (L1) cache. If the L1 cache is disabled, system performance will suffer. The default is `Enabled`.

Large Disk Access Mode: If a hard disk larger than 528 MB is being used, this field should be set either to `DOS` (the default) if running MS-DOS®, or to `Other` if using a different operating system. Setting this field to `DOS` causes the system BIOS to perform cylinder/head translation if the drive is configured in BIOS Setup to have more than 1024 cylinders. This allows MS-DOS systems to use hard disks up to 8 GB (1024C X 255H X 63S) in size without special drivers or LBA.

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Integrated Peripherals Sub-Menu

This sub-menu is used to configure the onboard serial (COM) and parallel (LPT) ports, as well as the onboard disk controllers. The Integrated Peripherals Sub-Menu is shown below.

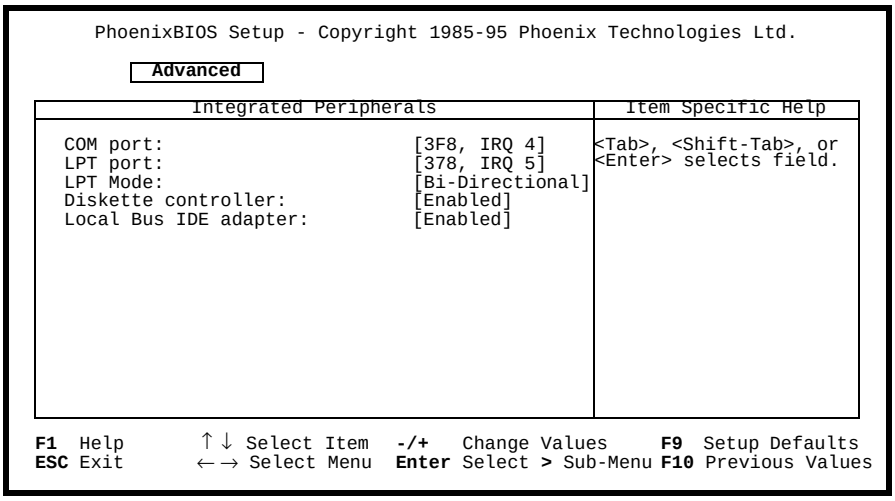


Figure 3-8. Integrated Peripherals Sub-Menu

COM port: This field configures the serial port labeled "COM1" on the front panel. The defaults for this COM port are I/O base `3F8H` and `IRQ4`.

LPT port: This field configures the parallel port labeled "LPT" on the front panel. The defaults for this LPT port are I/O base `378H` and `IRQ5`.

LPT Mode: This field sets the mode under which the LPT port operates. The selections are:

```
Output only
Bi-Directional (default)
ECP
```

Diskette Controller: This field enables or disables the onboard 3.5-inch disk (floppy) drive controller. The default is `Enabled`.

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Local Bus IDE adapter:

This field enables or disables the onboard PCIbus IDE hard disk controller. The default is `Enabled`.

Advanced Chipset Control Sub-Menu

This sub-menu allows you to control selected settings for the chipset that affect performance or function. The Advanced Chipset Control Sub-Menu is shown below.

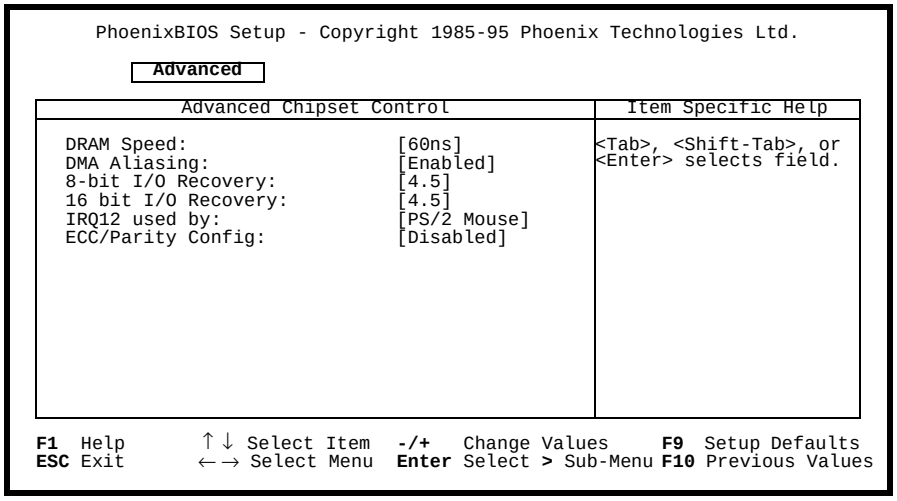


Figure 3-9. Advanced Chipset Control Sub-Menu

DRAM Speed:

This field sets the speed of the installed DRAM SODIMMs. Selecting 70 ns for 60 ns SODIMMs decreases performance. Selecting 60 ns for 70 ns SODIMMs is invalid. The default is `60ns`.

DMA Aliasing:

This field allows I/O accesses to the range 90-9FH (except 92H) to alias to 80-8FH. If an ISAbus device uses the address range 90-9FH, then this field must be disabled to access the device. The default is `Enabled`.

8-bit I/O Recovery:

This field selects the number of ISAbus SYSCLKs to be inserted by the chipset between 8-bit back-to-back I/O accesses. Increasing the number of clocks decreases I/O performance but may allow slow devices to be accessed properly. Values can range from `3.5` through `11.5` SYSCLKs, in 1 SYSCLK increments. The default is `4.5` SYSCLKs.

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16-bit I/O Recovery: This field selects the number of ISAbus SYSCLKs to be inserted by the chipset between 16-bit back-to-back I/O accesses. Increasing the number of clocks decreases I/O performance but may allow slow devices to be accessed properly. Values can range from `3.5` through `7.5` SYSCLKs, in 1 SYSCLK increments. The default is `4.5` SYSCLKs.

IRQ 12 used by: This field selects the routing of IRQ12. For systems without a PS/2 mouse, this field may be set to `ISA bus` to allow an ISAbus peripheral to use this interrupt line. Systems using a PS/2 mouse must have this field set to `PS/2 Mouse` (the default) for the mouse to operate correctly.

ECC/Parity Config: This field configures the DRAM controller to use no parity (`Disabled`), parity (`Parity`), or Error Checking and Correction (`ECC`) when accessing DRAM. Use of parity or ECC may improve system reliability since DRAM errors are likely to be detected by the chipset. Use of ECC allows for the detection of single and dual bit errors and the correction of single bit errors during DRAM reads. The parity and ECC selections require that all SODIMMs be x36 instead of x32. The no parity (disabled) selection can use either x32 or x36 SODIMMs. The default is `Disabled`. (Note that the VXI Pentium Controller is shipped with non-parity x32 DRAM.)

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Power Management Menu

This menu provides control over the power management facilities. As shown below, only about one-half of the Power Management Menu fields are visible at any one time; however, for completeness, all of the menu fields are listed and explained in this section. Use the **Page Up** and **Page Down** keys to display the other page of fields.

Note that the supported states for system BIOS Power Management are: Fully On, Standby Mode (partial power reduction), and Suspend Mode (maximum power reduction). Also note that the Power Management features are not implemented in the default setups.

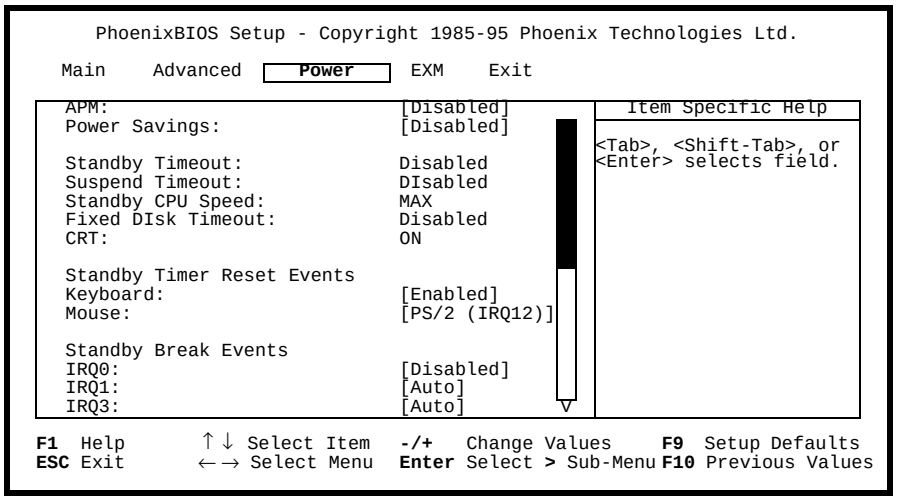


Figure 3-10. Power Management Menu

APM: This field enables or disables Advanced Power Management (APM). The default is `Disabled`.

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Power Savings: This field enables and selects the kind of power management, or it disables power management. The possible values are:

```
Disabled (default)
Customize
Maximum
Medium
Minimum
```

Standby Timeout: This field enables and sets the inactivity duration required to elapse before the system is placed into Standby Mode, or it disables the Standby Timeout. The possible values are:

```
Disabled (default)
2 minutes
15 minutes
30 minutes
1 hour
2 hours
3 hours
4 hours
```

Suspend Timeout: This field enables and sets the inactivity duration required to elapse before the system is placed into Suspend Mode from Standby Mode, or it disables the Suspend Timeout. The values are the same as for the Standby Timeout, listed above. The default is `Disabled`.

Standby CPU Speed: This field enables or disables the changing of the CPU speed based upon the current power management state. The possible values are:

```
Disabled
LOW
MEDIUM
HIGH
MAX (default)
```

Fixed Disk Timeout: This field enables and sets the inactivity duration of fixed disk accesses required to elapse before the system shuts off the disk drive, or it disables the Fixed Disk Timeout. The possible values are: `Disabled` (default), or `1`, `2`, `3`, `4`, `5`, `10`, or `16` minutes.

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CRT:

This field enables or disables power management of the CRT during system entry or exit into or from Standby Mode. The possible values are: `OFF in Standby` and `ON in Standby`. The default is `ON`.

Standby Timer Reset Events

This group of fields enables or disables whether or not activity from the specified device causes the Standby Timer to be reset or not. The default is `Enabled`.

Keyboard: This field enables or disables keyboard activity to reset the Standby Timer or not. The possible values are: `Enabled` (default) and `Disabled`.

Mouse: This field enables or disables mouse activity to reset the Standby Timer or not. The possible values are:

```
Disabled
PS/2 (IRQ12) (default)
COM1 (IRQ4)
COM2 (IRQ3)
```

Standby Break Events

This group of fields enables or disables a Standby Break Event for the specified IRQ. A Standby Break Event allows the system to run at full speed for the duration of the specified IRQ. Note that no such event is associated with IRQ2.

IRQ0-15:

Each of these fields enables or disables the Standby Break Event for each IRQ. The possible values are: `Disabled` and `Auto`. The default setting for IRQ 1, 3, 4, and 12 is `Auto`. The default setting for all other IRQs is `Disabled`.

Standby Wakeup Events

This group of fields enables or disables the keyboard or mouse to cause a Standby Wakeup Event -- that is, these fields allow keyboard or mouse activity to return the system to full speed.

Keyboard: This field enables or disables the Standby Wakeup Event for the keyboard. The possible values are: `Enabled` (default) and `Disabled`.

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Mouse: This field enables and selects the IRQ that the mouse is bound to for the purposes of mouse activity detection for power management, or disables the Standby Wakeup Event for the mouse. The possible values are:

```
PS/2 (IRQ12) (default)
COM1 (IRQ4)
COM2 (IRQ3)
Disabled
```


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EXM Menu

The fields in this menu allow you to change the settings for the EXM module in the system. The VXI Pentium Controller comes with an HP-22 GPIB interface module installed in EXM Slot 1 by default. The EXM Menu is shown below.

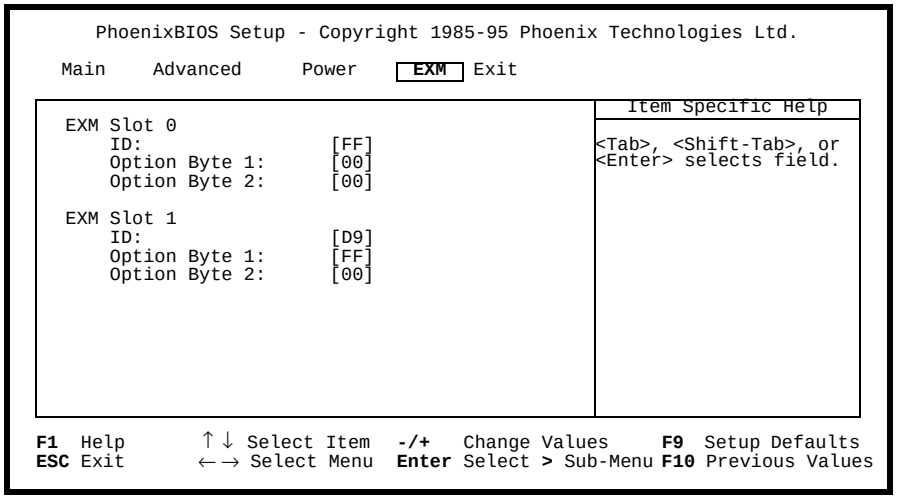


Figure 3-11. EXM Menu

ID: This field selects the EXM-ID for the HP-22 GPIB expansion module. The default is FF for Slot 0 and D9 for Slot 1.

Option Byte 1: This field selects the I/O address selection for the HP-22. The default is FF, which corresponds to the I/O address 370-377, 770-777, B70-B77, and F70-F77. Other possible values are:

F9	250-257, 650-657, A50-A57 and E50-E57
FB	270-277, 670-677, A70-A77, and E70-E77
FD	350-357, 750-757, B50-B57, and F50-F57

To disable the HP-22, enter 00.

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Option Byte 2: This field is set to `00` (disabled/unused).

Caution To configure a second HP-22 card in EXM Slot 0, make sure that it is not sharing the same I/O address as the first card pre-installed in EXM Slot 1. For information on configuring a second card, see the hardware reference manual shipped with the card.

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Exit Menu

The fields in this menu allow you to save value settings and exit BIOS Setup, or abandon value changes and exit. The Exit Menu is shown below.

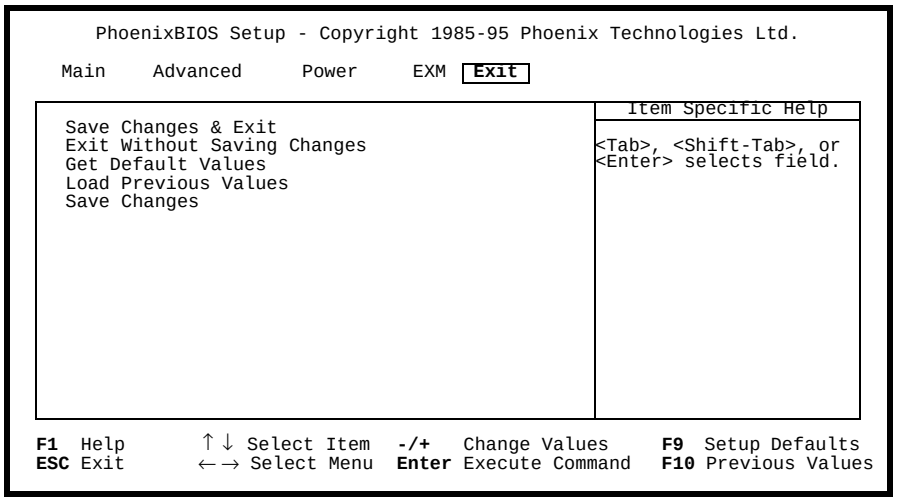


Figure 3-12. Exit Menu

Save Changes & Exit

This field is used to save into CMOS the values that have been entered. The system then immediately reboots with the new values.

Exit Without Saving Changes

This field is used to discard the changes just made and revert to the state when BIOS Setup was first entered. The system reboots with the old values.

Get Default Values

This field is used to reset the BIOS Setup values to the original, default values that were set at the factory, before any suppliers or other end-users made changes. This is useful if you are having problems with the system and suspect changes made to the BIOS are the cause.

Load Previous Values

This field is used to load the system with the previous values before an editing session started. This is useful if you lose track of edits and want to revert to the previous editing session, but not all the way back to the defaults.

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Save Changes

This field is used to save the edits made during a session. You do not exit, and you can continue to make changes.

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4

Re-Installing the System Software

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Re-Installing the System Software

The HP E6237A VXI Pentium Real-Time Controller arrives from the factory with the entire system software installed and configured. The system software includes the LynxOS real-time operating system, HP SICL for LynxOS, HP C-SCPI for LynxOS, and software from the Free Software Foundation. This chapter explains the process you should follow if you need to re-install the system software for any reason.

To complete the installation, locate the required installation media, then run the installation program and follow the instructions displayed on the system monitor. The entire procedure will take about 30 minutes. When the installation is done, your system will contain the same software and be configured as it was when it arrived from the factory. After you finish the re-installation, see Chapter 1, “Getting Started,” for information about changing LynxOS configuration settings.

Caution

All data on the controller hard drive will be *destroyed* when you re-install the system software. Be sure to back up data you want to keep onto other media before starting this procedure.

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To Prepare for the Re-Installation

Locate the following materials that were packed with the HP E6237A VXI Pentium Real-Time Controller.

- The CD-ROM labeled “E6237A Development System”. This contains the system software.
- The 3.5-inch floppy disk labeled “E6237A Installation Disk”. This is the LynxOS boot disk.
- The booklet, *HP E6237A Development System Software License Terms*, containing the license terms for the system software. The installation program will ask if you have accepted the terms before it will install the software.

Continue to the next section.

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To Re-Install the System Software

1. If the controller is running, enter the following command to shutdown the controller before turning off the power (you must have root privileges to reboot):

   ```
   reboot -h
   ```

   After the disk activity has stopped, and you see the following message, turn off the power using the switch on the VXI mainframe:

   ```
   **** LynxOS is down ****
   ```

2. Attach a CD-ROM drive to the SCSI connector on the controller's faceplate.

3. Insert the CD-ROM into the CD-ROM drive.

4. Insert the LynxOS boot disk into the controller's disk drive.

5. Turn on the controller's power using the switch on the VXI mainframe. The controller will boot the LynxOS preboot program from the floppy disk, then load and run the kernel. When this is done, the installation program will prompt you for responses to questions.

6. Follow the prompts displayed on the system monitor. Type your responses using the keyboard. Press **Enter** at the end of each response. At each prompt you can quit the installation process if you need to start over. The final prompt will tell you when the software is installed, and how to reboot the controller.

Note

The boot disk also contains the LynxOS file system. At the final prompt, please do not remove the disk until you see the following message

```
**** LynxOS is down ****
```


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A

LEDs on the Front Panel

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LEDs on the Front Panel

There are seven LED indicators on the front panel of the VXI Pentium Controller which provide information about the state of the controller. The following table lists the label, color, and meaning of each LED indicator.

Table A-1. LED Indicators

Label	Color	Meaning
RUN	Green	Lit whenever a write access is made to DRAM. If not lit, either the CPU is executing entirely out of the on-chip cache, or the CPU is halted.
SYSFAIL	Red	Lit whenever the VME SYSFAIL line is asserted.
TEST	Yellow	Reflects the state of the PASS bit in the VXI registers. TEST is lit when controller boots, then goes out during boot after controller passes self-test. If not lit during boot, or remains lit after boot, then controller failed self-test.
MASTER	Green	Lit when a VME access is made by this device as a master.
SLAVE	Green	Lit when another VME device accesses the memory of this controller.
SCSI	Green	Lit when the SCSI port is busy.
IDE	Green	Lit when the IDE disk is busy.

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B

I/O, Memory, and IRQ Details

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I/O, Memory, and IRQ Details

This appendix provides more detailed technical descriptions of the following for the VXI Pentium Controller:

- VGA video controller, including its BIOS extension
- SCSI controller, including its BIOS extension
- Ethernet controller
- Memory map
- IRQs (interrupts)

VGA Video Controller

The VXI Pentium Controller contains the Cirrus CL-GD5436 or CL-GD5446, PCI-based, super-VGA compatible video graphics controller with 2 MB of display memory. The VGA video controller resides on the PCIbus and is PCI device number 1.

The Video BIOS extension is shadowed and write-protected in the region 0x0C0000 to 0x0C7FFF (32 KB) on any system reset or power-up. The features of the Video BIOS include:

- Standard VGA modes up to 640 X 480 resolution with 16.8 million colors.
- Super-VGA modes up to 800 X 600 resolution with 16.8 million colors.
- Extended video modes up to 1280 X 1024 resolution with 256 colors (non-interlaced).

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SCSI Controller

An AMD53C974A is used to implement the SCSI controller in the VXI Pentium Controller. The SCSI BIOS extension is automatically shadowed in system DRAM at memory location 0x0C8000 to 0x0CFFFF. In the BIOS setup utility, SCSI hard disk enumeration begins with the logical drive C:, continuing with drives A: and B: if there are two 3.5-inch disk drives connected to the IDEbus. However, after LynxOS boots, these drive enumerations are meaningless; LynxOS uses LynxOS-specific device names. The *LynxOS User's Guide* describes the device naming convention. Using this convention, the name for a SCSI hard drive attached to the VXI Pentium Controller at SCSI address 0 is:

```
/dev/sd974.0
```

The SCSI device resides on the PCIbus and is mapped as PCI device number 3. The SCSI controller uses PCIbus interrupt INTC. The default I/O base address and interrupt is 0xC180 and IRQ11, respectively.

The SCSI BIOS extension supports booting LynxOS from the SCSI controller. However, this is not a typical configuration since LynxOS is usually installed on the built-in IDE drive.

Ethernet Controller

The Ethernet controller is implemented using the AMD79C970A. The Ethernet controller resides on the PCIbus and is mapped as PCI device number 2. It uses PCIbus interrupt INTB. The Ethernet ID is stored in a PROM (8-pin serial data) that is connected to the AMD79C970A. The I/O base address, interrupt, and DMA channel are at 0x0300, IRQ15, and DMA5, respectively.

Network booting is *not* supported.

The Ethernet port supports only a 10-base-T interface.

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Memory Map

The following table summarizes the VXI Pentium Controller memory map.

Table B-1. Memory Map

Pentium Address Range[a]	Region	Cached
00000000-0009FFFF	DRAM	Yes
000A0000-000BFFFF	VGA Memory	No
000C0000-000C7FFF	Shadowed VGA BIOS	Yes
000C8000-000CFFFF	Shadowed SCSI BIOS	Yes
000D0000-000DFFFF	On-board EXMbus	No
000E0000-000E3FFF	VXI Interface Chip	No
00100000-07FFFFFF	DRAM	Yes
08000000-0FFFFFFF	EXMbus	No
10000000-1FFFFFFF	Reserved	No
20000000-3FFFFFFF	Reserved	No
40000000-7FFFFFFF	Reserved	No
80000000-83FFFFFF	VXI Interface Chip Image 0	No
84000000-87FFFFFF	VXI Interface Chip Image 1	No
88000000-8BFFFFFF	VXI Interface Chip Image 2	No
8C000000-8FFFFFFF	VXI Interface Chip Image 3	No
90000000-93FFFFFF	VXI Interface Chip Image 4	No
94000000-EFFFFFFF	Reserved	No
F0000000-FFF7FFFF	EXMbus	No
FFF80000-FFFFFFFF	Flash Boot Device	No

a. All addresses are hexadecimal.

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IRQs (Interrupt Request Lines)

The following table lists the IRQs for the VXI Pentium Controller.

Table B-2. IRQs (Interrupt Request Lines)

Interrupt	Source
IRQ0	Timer
IRQ1	Keyboard Controller
IRQ2	Cascade Interrupt Input
IRQ3	COM2 (Not externally available) Use for second HP-22 on Lynx, or for a different EXM card.
IRQ4	COM1
IRQ5	ECP Printer Port (LPT1)
IRQ6	3.5-inch Disk Drive
IRQ7	HP-22
IRQ8	Real-time Clock
IRQ9	VXI Interface Chip
IRQ10	VXI Interface Chip
IRQ11	SCSI
IRQ12	Mouse
IRQ13	Numeric Co-processor
IRQ14	IDE
IRQ15	Ethernet
NMI	EXMbus I/O Channel Check Asserted
SMI	Power Management
INTA	VGA (not mapped)
INTB	Ethernet (mapped to IRQ15)
INTC	SCSI (mapped to IRQ11)
INTD	VXI Interface Chip (mapped to IRQ9)

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C

POST Beep Codes

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POST Beep Codes

This appendix lists the codes that are written to the diagnostic port of the HP VXI Pentium Controller during the power-on self-test (POST) phase of the system boot.

The POST Codes listed in the tables below are viewable only by HP service personnel with the proper diagnostic equipment.

The audible Beep Codes listed in the tables below will be issued only when the associated self-test detects a failure. This information, if available, is useful to the HP Service and Support Center when you report a problem.

Phoenix NuBIOS Checkpoints

The Phoenix NuBIOS writes a number of checkpoints to I/O port 80h just before each self-test is executed. Note that the execution order of the POST tests generally follows the order listed in the tables below, but not exactly.

Table C-1. Phoenix NuBIOS Checkpoint Codes

Beep Code	POST Code	Checkpoint Description
	02h	Verify Real Mode
	04h	Get CPU type
	06h	Initialize system hardware
	08h	Initialize chipset registers with initial POST values
	09h	Set in POST flag
	0Ah	Initialize CPU registers
	0Ch	Initialize cache to initial POST values
	0Eh	Initialize I/O
	10h	Initialize Power Management
	11h	Load alternate registers with initial POST values
	12h	Jump to UserPatch0

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Table C-1. Phoenix NuBIOS Checkpoint Codes (Continued)

Beep Code	POST Code	Checkpoint Description
	14h	Initialize keyboard controller
1-2-2-3	16h	BIOS ROM checksum
	18h	8254 timer initialization
	1Ah	8237 DMA controller initialization
	1Ch	Reset Programmable Interrupt Controller
1-3-1-1	20h	Test DRAM refresh
1-3-1-3	22h	Test 8742 Keyboard Controller
	24h	Set ES segment to register to 4GB
	28h	Autosize DRAM
	2Ah	Clear 512KB base RAM
1-3-4-1	2Ch	Test 512KB base address lines
1-3-4-3	2Eh	Test 512KB base memory
	32h	Test CPU bus-clock frequency
	37h	Reinitialize the chipset
	38h	Shadow system BIOS ROM
	39h	Reinitialize the cache
	3Ah	Autosize cache
	3Ch	Configure advanced chipset registers
	3Dh	Load alternate registers with CMOS values
	40h	Set Initial CPU speed
	42h	Initialize interrupt vectors
	44h	Initialize BIOS interrupts
2-1-2-3	46h	Check ROM copyright notice
	47h	Initialize manager for PCI Option ROMs
	48h	Check video configuration against CMOS

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Table C-1. Phoenix NuBIOS Checkpoint Codes (Continued)

Beep Code	POST Code	Checkpoint Description
	49h	Initialize PCI bus and devices
	4Ah	Initialize all video adapters in system
	4Ch	Shadow video BIOS ROM
	4Eh	Display copyright notice
	50h	Display CPU type and speed
	52h	Test keyboard
	54h	Set key click if enabled
	56h	Enable keyboard
2-2-3-1	58h	Test for unexpected interrupts
	5Ah	Display prompt “Press F2 to enter SETUP”
	5Ch	Test RAM between 512KB and 640KB
	60h	Test extended memory
	62h	Test extended memory address lines
	64h	Jump to UserPatch1
	66h	Configure advanced cache registers
	68h	Enable external and CPU caches
	6Ah	Display external cache size
	6Ch	Display shadow message
	6Eh	Display non-disposable segments
	70h	Display error messages
	72h	Check for configuration errors
	74h	Test real-time clock
	76h	Check for keyboard errors
	7Ch	Set up hardware interrupts vectors
	7Eh	Test coprocessor if present

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Table C-1. Phoenix NuBIOS Checkpoint Codes (Continued)

Beep Code	POST Code	Checkpoint Description
	80h	Disable onboard I/O ports
	82h	Detect and install external RS232 ports
	84h	Detect and install external parallel ports
	86h	Re-initialize onboard I/O ports
	88h	Initialize BIOS Data Area
	8Ah	Initialize Extended BIOS Data Area
	8Ch	Initialize floppy controller
	90h	Initialize hard disk controller
	91h	Initialize localbus hard disk controller
	92h	Jump to UserPatch2
	94h	Disable A20 address line
	96h	Clear huge ES segment register
	98h	Search for option ROMs
	9Ah	Shadow option ROMs
	9Ch	Set up Power Management
	9Eh	Enable hardware interrupts
	A0h	Set time of day
	A2h	Check keylock
	A8h	Erase F2 prompt
	AAh	Scan for F2 keystroke
	ACh	Enter SETUP
	AEh	Clear in-POST flag
	B0h	Check for errors
	B2h	POST done--prepare to boot operating system
	B4h	One beep

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Table C-1. Phoenix NuBIOS Checkpoint Codes (Continued)

Beep Code	POST Code	Checkpoint Description
	B6h	Check password (optional)
	B8h	Clear global descriptor table
	BCh	Clear parity checkers
	BEh	Clear screen (optional)
	BFh	Check virus and backup reminders
	C0h	Try to boot with INT19

Table C-2. Phoenix NuBIOS Auxiliary Checkpoint Codes

Beep Code	POST Code	Checkpoint Description
	D0h	Interrupt handler error
	D2h	Unknown interrupt error
	D4h	Pending interrupt error
	D6h	Initialize option ROM error
	D8h	Shutdown error
	DAh	Extended Block Move
	DCh	Shutdown 10 error

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Table C-3. Phoenix NuBIOS Boot Block Checkpoint Codes

Beep Code	POST Code	Checkpoint Description
	E2h	Initialize the chipset
	E3h	Initialize refresh counter
	E4h	Check for Forced Flash
	E5h	Check HW status of ROM
	E6h	BIOS ROM is OK
	E7h	Do a complete RAM test
	E8h	Do OEM initialization
	E9h	Initialize interrupt controller
	EAh	Read in bootstrap code
	EBh	Initialize all vectors
	ECh	Boot the Flash program
	EDh	Initialize the boot device
	EEh	Boot code was read OK

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POST Beep Codes

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D

Specifications

This appendix lists the environmental and electrical specifications for the HP VXI Pentium Controller.

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Environmental

The following table defines the environmental specifications for the I/O base board in the VXI Pentium Controller.

Table D-1. Environmental Specifications

Characteristic	Operating Value	Non-Operating (Storage) Value
Temperature	5°C to 45°C, derated 2°C per 1,000 feet (300 meters) over 10,000 feet (3,000 meters); 2°C per minute maximum excursion gradient	-40°C to +65°C, 5°C per minute maximum excursion gradient
Humidity	8% to 90% non-condensing	5% to 95% non-condensing
Altitude	0 to 10,000 feet (3,000 meters)	0 to 40,000 feet (12,000 meters)
Vibration	0.015 inch (0.38 mm) P-P displacement with 2.5 g peak (maximum) acceleration over 5 to 300 Hz	0.030 inch (0.76 mm) P-P displacement with 5.0 g peak (maximum) acceleration over 5 to 300 Hz
Shock	30 g, 11 ms duration, half-sine shock pulse	50 g, 11 ms duration, half-sine shock pulse

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Electrical

The following table defines the electrical specifications for the controller's I/O base board.

Table D-2. VXI Pentium Controller Power Requirements

Voltage	DC Current	Dynamic Current
+5 V dc	11 A	0.31 A
+12 V dc	40.2 mA	0.08 A
-12 V dc	2.4 mA	0.03 A
-2 V dc	120 mA	0.08 A
-5.2 V dc	335 mA	0.192 mA

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