EPC®-3305 Hardware Reference

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Before you begin

This guide provides the information you need to install the EPC-3305 and configure its BIOS. It contains detailed hardware reference information for OEMs, system integrators, and others who use the EPC-3305 as a component of their CompactPCI† bus systems.

In addition, this manual assumes that you are familiar with PC sytems based on the Intel x86 architecture and have some familiarity with CompactPCI bus architecture.

About this guide

Guide contents

Chapters

Chapter		Description
1	Overview	Introduces the EPC-3305, briefly describes its features, and lists specifications.
2	Configuration and installation	Explains how to install the EPC-3305 in a CompactPCI mainframe and how to install driver software.
3	BIOS configuration	Explains how to configure the BIOS using the built-in BIOS setup menus.
4	Theory of operation	Describes how EPC-3305 components provide a CompactPCI bus compatible embedded computer with standard PC peripherals and a PCI and ISA interfaces.

Appendices

Appendix		Description
A	Chipset and I/O map	Maps the addresses used for I/O and by the chipset registers.
B	Interrupts	Lists DMA channel and IRQ assignments to the peripherals supported by the EPC-3305.
C	Connectors	Details the location, form, and pin-outs of the connectors used in the EPC-3305.
D	Error messages	Provides explanations of common error messages and start-up codes.

Appendix		Description
E	Rear Transition module (RTM)	Describes how to install, configure, and use the Rear Transition Module (RTM).
F	Re-programming the flash chip	Details how to update or recover your system BIOS, Flash Boot Device (FBD), and Boot Block by re-programming all or part of the EPC-3305's flash chip

Notational conventions

This manual uses the following conventions:

- `Screen text and syntax strings appear in this font.`
- All numbers are decimal unless otherwise stated.
- Bit 0 is the low-order bit. If a bit is set to 1, the associated description is true unless otherwise stated.


Notes indicate important information about the product.


Tips indicate alternate techniques or procedures that you can use to save time or better understand the product.


The globe indicates a World Wide Web address.


Cautions indicate situations that may result in damage to data or the hardware.

This includes situations that *may* cause damage to hardware via electro-static discharge (ESD).


Warnings indicate situations that may result in physical harm to you or the hardware.

Where to get more information

About the EPC-3305

You can find out more about EPC-3305 from these sources:

- **World Wide Web:** RadiSys maintains an active site on the World Wide Web. The site contains current information about the company and locations of sales offices, new and existing products, contacts for sales, service, and technical support information. You can also send e-mail to RadiSys using the web site.

  
  When sending e-mail for technical support, please include information about both the hardware and software, plus a detailed description of the problem, including how to reproduce it.

  
  To access the RadiSys web site, enter this URL in your web browser:
  `http://www.radisys.com`

  Requests for sales, service, and technical support information receive prompt response.

- **Other**: If you purchased your RadiSys product from a third-party vendor, you can contact that vendor for service and support.

About related RadiSys products

EPC-3306: The EPC-3306 is a high-performance single-slot CompactPCI module that operates as system controller. It incorporates two PMC sites for flexibility using a variety of PMC modules such as SVGA, LAN adapter or WAN adapters. It offers a choice of three memory configurations to address different needs up to 512 MB.

For more information about the EPC-3306, see the RadiSys web site.

Contents

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Tables

1 Overview

The EPC-3305, a CompactPCI† Peripheral Processor Board, operates in a 6U peripheral slot of a CompactPCI system.

The EPC-3305 hardware is compatible with all major PC software environments including Microsoft† Windows† 95, Windows 98, and Windows NT† 4.0. It can also run other PC operating systems, including Linux†, Solaris†, and DOS.

The EPC-3305 includes these subsystems:

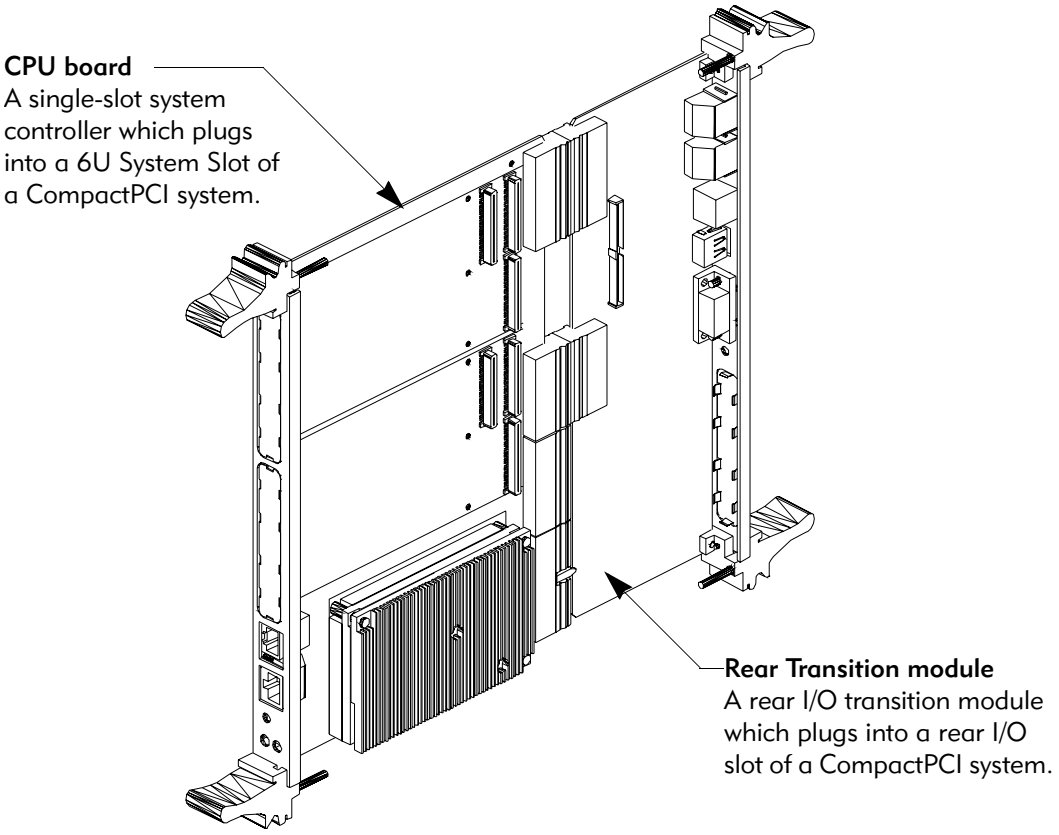


Figure 1-1. The EPC-3305

The EPC-3305 requires a backplane that supports the *CompactPCI Specification Revision 2.1* and the pinouts detailed in *Table E-1, Backplane connector J3* and *Table E-2, Backplane connector J5*.

Feature summary

This section describes CPU board features. For more information about RTM features, see *Appendix E, Rear Transition module (RTM).*

The EPC-3305 CPU board is a Pentium† III-based, PC-compatible, single slot CompactPCI computer designed for use with CompactPCI bus.

The EPC-3305 is an EMC2-based design that accepts a Pentium III based EMC2. To achieve this, the CPU board uses the Intel 21554 PCI-PCI bridge (Drawbridge), a non-transparent PCI-PCI bridge that allows the CPU board to interface to an intelligent host. The Intel Pentium III chipset (443BX and PIIX4E) provides the local PCI (bus-0) interface. Four integrated PCI peripherals provide cPCI, dual Ethernet, EIDE, and ISA interfaces. Of these, the PIIX4E provides the EIDE, and ISA interfaces.

The EPC-3305 CPU board includes:

- Intel EMC2: Pentium III with 100 MHz. Front Side Bus
- Intel North Bridge 443BX: Host Bus to PCI bridge Memory bus controller
- 64-bit CompactPCI interface on J1/J2 using Intel 21554 non-transparent PCI bridge with I/O slot compatibility
- Hot Swappable
- Two PMC sites with RTM Interface on Jn4
- On-board SDRAM operating at 100MHz; up to 512MB of ECC SDRAM on board. Build-time options allow for configurations of: 128M, 256M or 512M
- Optional Rear Transition Module provides:
  - COM 1 RS232 (DB9)
  - One USB connector
  - A header for secondary EIDE
  - PIM S17E
  - COM 1 RS232 (10 pin header)
  - Connectors for mouse and keyboard
  - Two Ethernet ports that support 10/100BASE-T
- Intel South Bridge PIIX4E:
  - PCI to ISA bridge
  - Battery-backed RTC
  - Two independent EIDE channels
- 4MByte Boot Block Flash memory, partitioned into eight 512Mbyte banks
- Onboard headers for:
  - Floppy
  - Mouse/Keyboard
  - Port 80 Header
  - ITP
  - RadiSys manufacturing Header
  - CPLD JTAG

- Front Panel Interface
  - Blue HS LED
  - RJ45 for Ethernet 1
  - RJ45 for COM-1
  - Reset Button
- National Semiconductor 87309 Super I/O
  - Two RS-232 serial ports
  - Floppy drive connection
  - Intel 82C42 compatible keyboard and mouse controller
- Programmable Watchdog timer with two programmable timeouts:
  - The first timeout can be set to provide NMI and/or INIT to CPU allowing for a “soft” reset.
  - The second timeout forces a “hard” reset.

CompactPCI bus

The CompactPCI bus is accessed from the EPC-3305’s PCI bus via an Intel 21554 PCI-to-PCI bridge. This bridge connects the onboard PCI bus (bus 0) with the CompactPCI bus (bus 1), which may have as many as seven additional CompactPCI devices connected to it.

The CompactPCI standard was developed by a consortium of manufacturers known as the PCI Industrial Computer Manufacturers Group (PICMG).

For more information about PICMG and the CompactPCI standard consult the PICMG website at this URL:
http://www.picmg.org

Specifications

Table 1-1. EPC-3305 environmental specifications

Characteristic	State	Value
Temperature	Operating	0°C to 60°C at point of entry of forced air derated 2°C per 1000 ft (300 m) over 6600 ft (2000m) with sufficient airflow to keep within the termperature specification.
	Storage	–40°C to 85°C
Humidity	Operating/storage	5% to 95% noncondensing 10% per hour maximum excursion gradient
Airflow	Operating	200 LFM (linear feet per minute)
Vibration	Operating	$0.04G^2$/Hz from 5–1000 Hz random, 10 min. per sweep cycle
	Storage	$0.06G^2$/Hz from 5–1000 Hz random, 10 min. per sweep cycle
Shock	Operating	30 G, 11 ms duration, half-sine shock pulse
	Storage	50G, 11ms, half-sine shock pulse
EMC	Operating	Designed to pass CE Mark and FCC Class B
ESD susceptibility[1]	Operating	4KV direct contact, 8KV air
Radiated susceptibility[1]	Operating	IEC 801-3:1984/EN50082-1 (1992): 3V/m (not tested) Performance criteria: A

[1] These are system-level tests. The EPC-3305's conformance to these specifications may be affected by the rest of the system's ability to conform.

2 Configuration and installation

This chapter explains how to install the EPC-3305 in a CompactPCI chassis.

When reading this file online, you can immediately view information about any installation topic by placing the mouse cursor over a connector name and clicking.

Avoid causing ESD (electrostatic discharge) damage:

- Remove modules from their antistatic bags only in a static-free environment.
- Perform the installation process (described later in this chapter) only in a static-free environment.
- During external cable installation, ensure that the cables are not active. The EPC-3305 is not designed for hot insertion of any interface.

The EPC-3305 modules, like most other electronic devices, are susceptible to ESD damage. ESD damage is not always immediately obvious. It can cause a partial breakdown in semiconductor devices that might not result in immediate failure.

Other setup is done by configuring BIOS options as described in *Chapter 3, BIOS configuration*.

Setting jumpers and headers

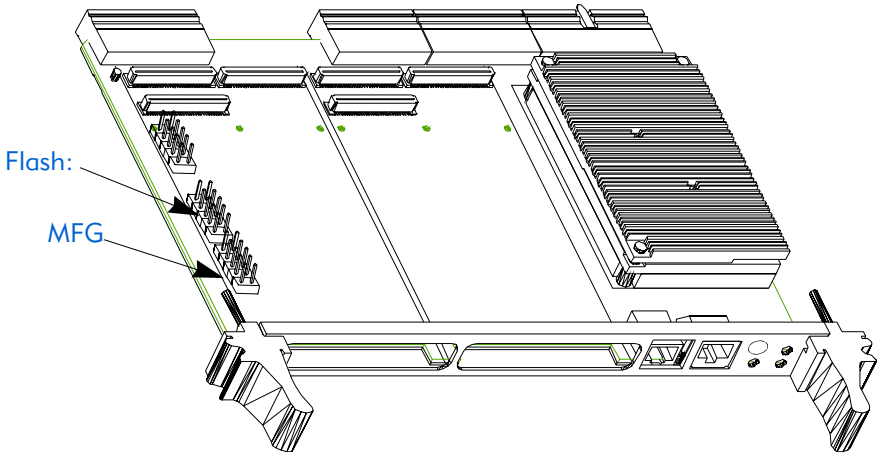


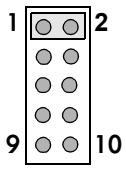
Figure 2-1. EPC-3305 CPU board: jumper locations

Jumper pins are labeled from the point of view of looking at the front of the connector.

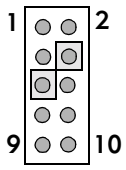
Flash

The CPU board provides a 2x5-pin header (H2) that you use to re-program the Flash chip. For detailed information about re-programming the flash chip, see *Appendix F, Re-programming the flash chip*.

Flash jumper settings are typically used during manufacturing for re-programming the BIOS in the Flash Boot Device (FBD) and are included here only for reference. There are no user-configurable jumpers on the test header for normal operation.



Pins 1 and 2:
Force BIOS Recovery



Pins 4 and 5:
Boot Block Enable

Figure 2-2. Flash header settings

Function	Pins	Description
Force BIOS Recovery	1, 2	To force recovery of the BIOS, connect pin 1 (~FRC_RCVR) to pin 2 (GND). This signal is connected to the P1.3 input of the keyboard controller. It is readable by the Boot Block BIOS code and forces the Boot Block to initiate a recovery sequence at power-up should other methods of initiating the sequence become inaccessible.

Function	Pins	Description
Boot Block Enable	4, 5	To enable re-programming of the Boot Block, connect pin 5 (BBEN) to pin 4 (VCC). The BBEN pins are separated to prevent accidental connections of these pins (i.e. they cannot be easily jumpered together). The Boot Block is typically NEVER re-programmed, even when the main and parameter blocks are re-programmed. However, the capability to program the Boot Block facilitates quick changes during manufacturing.

MFG

This jumper block is reserved by the board manufacturer for testing purposes.

Inserting the EPC-3305

You install the EPC-3305 CPU board on the CompactPCI bus backplane. Before installation, ensure that all options are installed on the EPC-3305 as described in *Maintaining and upgrading the EPC-3305* later in this chapter.

1. RadiSys recommends that power to your CompactPCI system is off.

   When handling or inserting the EPC-3305, avoid touching the circuit board and connector pins, and ensure that the environment is static-free.

2. Ensure that the ejector handles are in the normal (eject) position. (Push the top handle up and the bottom handle down so that the handles are now tilted.)
3. Slide the EPC-3305 module into the slot. Use firm pressure on the handles to mate the module with the connectors and snap connectors into normal position.
4. Tighten the retaining screws in the top and bottom of the front panel to ensure proper connector mating and prevent the module from loosening due to vibration.
5. Connect peripherals to the EPC-3305. Peripherals typically include a video display and keyboard, but also perhaps a mouse, modem, USB device, and so on. For information about connector pinouts, see *Appendix C, Connectors* and *Appendix E, Rear Transition module (RTM)*

   Observe the following while the system is powered up:
   - Do not plug cables or connectors into the front panel connectors. Because electronics equipment generally cannot withstand fluctuations in power, damage can arise from plugging in a device or board while power is on.
   - Do not plug in a serial or parallel device, keyboard, transceiver, monitor or other component. This applies to equipment at either end of an interface cable.

6. Complete remaining steps as required. Typical remaining steps include:

- BIOS configuration (For information about setting up the BIOS configuration, see *Chapter 3, BIOS configuration*)
- Driver software installation
- Application software installation

Your system may be preconfigured by your supplier or you may need to perform these tasks yourself.

Maintaining and upgrading the EPC-3305

Removing the EPC-3305

To remove the EPC-3305 from the CompactPCI chassis:

1. Press the latch part of the extractors inward until the extractor handle swings out and pivots freely.
2. Pull outward on the extractor handles until the EPC-3305 disengages from the rear connector.
3. Slide the EPC-3305 out of the CompactPCI chassis and place it in the anti-static bag that it came in.

Replacing the battery

1. Before you begin, write down all the CMOS setup parameters while the battery is still good, or save them, using the CMOS save and restore feature of the BIOS configuration as described in the Exit menu on page 40.
2. Turn off the power.

   If you leave the power on when removing the battery, setup values return to default conditions.

3. Remove the EPC-3305 from the CompactPCI chassis as described in *Removing the EPC-3305*.
4. Locate the battery on the main board, then lift the battery out.

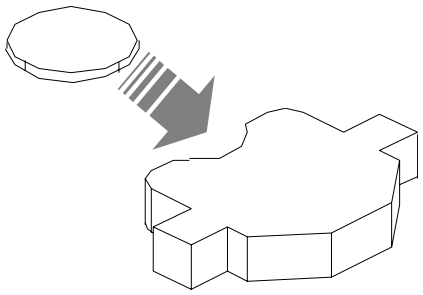


Figure 2-3. Replacing the battery

5. Press the new battery into place, positive (+) side up.

There is danger of explosion if battery is incorrectly replaced. Replace only with same or equivalent type recommended by RadiSys. Dispose of used batteries according to manufacturer's instructions.

6. Replace the EPC-3305 in the CompactPCI chassis as described in *Inserting the EPC-3305*.
7. Restore the CMOS settings as described in the CMOS Save and Restore sub-menu on page 42.

After replacing the battery, you may need to reset the system clock.

3 BIOS configuration

The EPC-3305 uses the Phoenix NuBIOS to configure and select various system options. This chapter details the various menus and sub-menus used to configure the system. This chapter is written as though you are setting up each field in sequence and for the first time. Your system may be correctly pre-configured and require very little setup.

To revert to the original BIOS settings, select Get Default Values from the Exit menu on page 40. This restores the original BIOS settings.

You may see some error messages during the execution of the BIOS initialization sequence. If errors occur during the POST (Power-On Self-Test), the BIOS displays the error on the appropriate line of the screen display and, depending on how your system is configured, either pauses or tries to continue. For information about error messages, see Appendix D, Error messages.

Pressing the Escape key during POST displays the Boot-First pop-up menu after POST completes. You can use this menu to override, for only this boot, the boot options. This menu includes the same options as the Boot Menu's top level. For information about the options, see Boot menu on page 39.

BIOS Setup Screens

The EPC-3305's BIOS includes a setup program that displays and modifies the system configuration. The EPC-3305's nonvolatile CMOS RAM stores configuration information, and the BIOS uses it to initialize the EPC-3305 hardware.

You can enter the BIOS Setup only during the system reset process, following a power-up, front panel reset, or equivalent. To enter Setup, press the F2 key when prompted.

Menu map

You set up the BIOS by making selections from the menus shown in the next table.

When reading this file online, you can immediately view information about any menu by placing the mouse cursor over menu name and clicking:

Menu	Sub-menu
Main Setup menu	Primary/Secondary Master/Slave sub-menus Keyboard Features sub-menu UBE Shadow Control sub-menu
Advanced menu	I/O Device Configuration sub-menu PCI Device Configuration sub-menu PCI/PNP ISA UMB Region Exclusion sub-menu PCI/PNP ISA IRQ Resource Exclusion sub-menu Cache Memory sub-menu
Boot menu	None
Exit menu	CMOS Save and Restore sub-menu

Navigation

To...	Do...
Display a menu	Press the left or right cursor (arrow) keys and press the Enter key. If you use the arrow keys to leave a menu and then return, your active field is always at the beginning of the menu.
Display a submenu (fields with a triangle at left)	Move the cursor to a field with a triangle and press the Enter key. If you select a sub-menu and then return to the main menu, the active field is that sub-menu heading.
Select a field	Press the up or down cursor (arrow) keys
Select an option	Do one of these: • Press the + and – keys to rotate through available options. • In certain numeric fields, simply enter the desired number.

The remainder of this chapter describes the fields in each menu and sub-menu. Additional help information is available in the help area on the Setup screen.

Main Setup menu

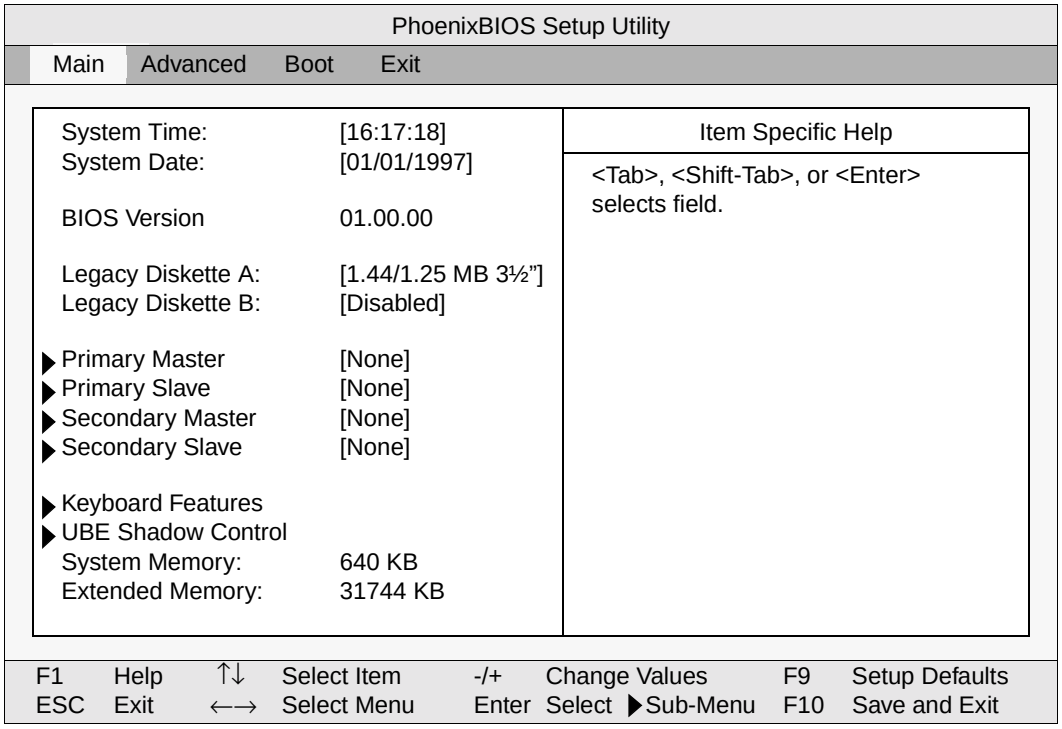


Figure 3-1. BIOS Main Setup menu

The far right menu in the menu bar is the Exit Menu. Use the options in the Exit menu to save your changes, re-load default BIOS settings, and so on. Press the ESC key to go immediately to the Exit Menu.

The fields in each menu and sub-menu are explained below. Additional help information is available in the help area on the BIOS setup screen.

Field	Description
System Time/System Date	Sets the system time and date. To change these values, go to each field and enter the desired value. Press the tab key to move from hour to minute to second, or from month to day to year. The default system time is 00:00; the default date is 01/01/1998.
BIOS Version	Identifies the BIOS version. This is the same BIOS version that displays during boot. This field is not editable; no user interaction is required.

Field	Description
LegacyDiskette A LegacyDiskette B	Identifies the type of floppy disk drive installed as the A: or B: drive. Possible settings include: • Disabled (default for the B: drive) • 1.44/1.25MB 31/2" (default for the A: drive) Note: The 1.25MB 31/2" diskette requires a 3-Mode floppy disk drive. • 1.2MB, 5¼" • 2.88 MB, 3½" • 360 KB, 5¼" • 720 KB, 3½"
Primary Master sub-menu	Displays a menu that you use to enter information for the master IDE drive connected to the primary IDE controller. For more information, see Primary/Secondary Master/Slave sub-menus on page 15.
Primary Slave sub-menu	Displays a menu that you use to enter information for the slave IDE drive connected to the primary IDE controller.For more information, see *Primary/Secondary Master/Slave sub-menus* on page 15.
Secondary Master sub-menu	Displays a menu that you use to enter information for the Master IDE drive connected to the secondary IDE controller. For more information, see *Primary/Secondary Master/Slave sub-menus* on page 15.
Secondary Slave sub-menu	Displays a menu that you use to enter information for the Master IDE drive connected to the secondary IDE controller. For more information, see *Primary/Secondary Master/Slave sub-menus* on page 15.
Boot Options sub-menu	Displays a menu that you use to specify the PC's behavior during the boot process. For more information, see *Boot menu on page 39*.
Keyboard Features sub-menu	Displays a menu that you use to enable or disable various keyboard features. For more information, see *Keyboard Features sub-menu on page 19*.
UBE Shadow Control sub-menu	Displays a menu that you use to specify BIOS shadow options. For more information, see *UBE Shadow Control sub-menu on page 21*.
System memory	Displays the amount of conventional memory (below 1MB). This field is not editable; no user interaction is required.
Extended memory	Displays the amount of extended memory (above 1MB). This field is not editable; no user interaction is required.

Primary/Secondary Master/Slave sub-menus

There are a total of four IDE adapter sub-menus for the primary and secondary hard disk controllers, each having a master and slave drive menu.

Access this screen to:

- See or reconfigure the detailed characteristics of the primary hard disk (select the IDE Adapter 0 Master item from the Main BIOS Setup).
- Set up new disks and allow the Setup program to determine the proper settings based on information on the disk. Note that the Setup program can detect these settings only on drives that comply with ANSI specifications.
- Set up existing (formatted) disks. Note that you must use the same parameters used when the disk originally was formatted. You must select an option for the Type field, then enter the specific cylinder, head, and sector information listed on the label attached to the drive at the factory.

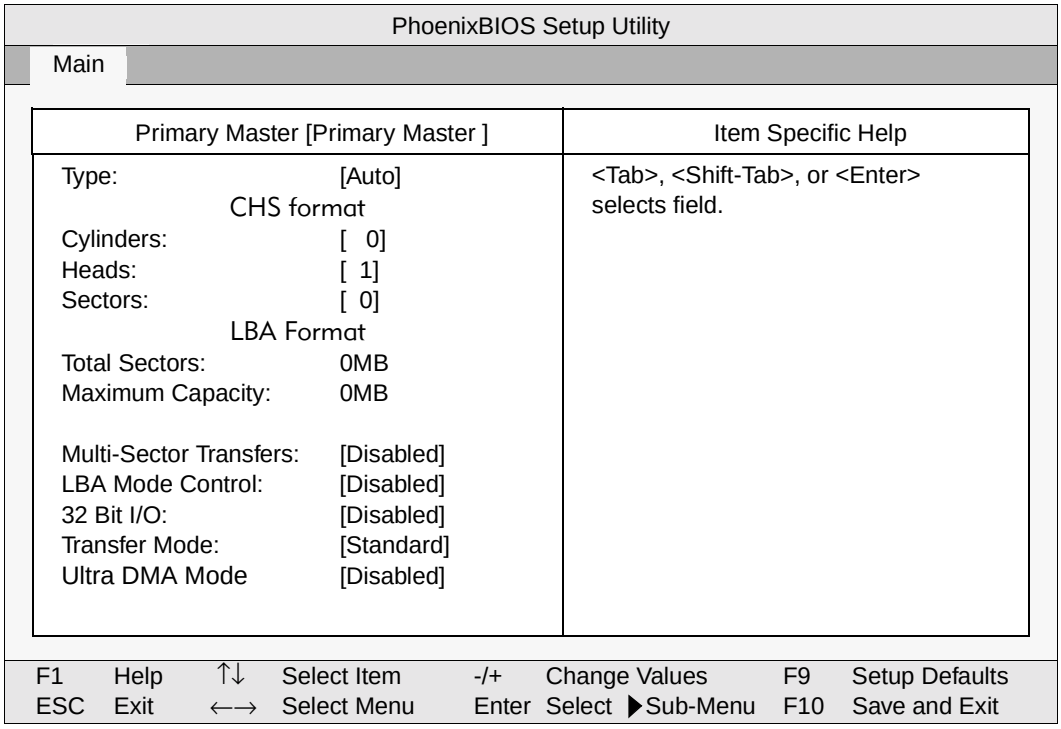


Figure 3-2. Primary/Secondary Master/Slave sub-menus

Field	Description
Type	Identifies the disk type. You can select one of these: **Note**: You must press + and - to change this field's values. • **Auto (default)**: Select this option when you want the POST to query the hard disk for its parameters whenever the POST runs. **Note**: If you set a hard disk to "Auto", but no hard disk is actually present, the BIOS queries the (non-existent) hard disk until it times out, slightly increasing the duration of the POST. • **None**: Select this option if yours is not an IDE hard disk drive. • **User**: Select this option if you have an IDE disk but cannot employ the "Autotype" feature. Then enter the correct drive values for cylinders, heads, sectors/track, and write precompensation. • **CD-ROM**: Select this option if you have a CD-ROM drive. **Note**: For disks not supplied, consult the product documentation. When finished, press the ESC key to return to the *Main Setup menu*.
Cylinders	Specifies the number of cylinders on this system. You can specify a number from 1 to 16. **Note**: You can edit this field only when the Type field contains a value of [User].
Heads	Specifies the number of heads on this system. **Note**: You can edit this field only when the Type field contains a value of [User].
Sectors	Specifies the number of sectors in each track on this system. **Note**: You can edit this field only when the Type field contains a value of [User].
Maximum Capacity	Displays the amount of disk space available on this system. This field is not editable; no user interaction is required. **Note**: This field displays in the Primary Master sub-menu only if the Type field contains a value of [Auto] or [User]. It displays in the Secondary Master, Primary Slave and Secondary Slave sub-menus only if the Type field contains a value of [Auto].

Field	Description
Multi-Sector Transfers	Allows the System BIOS to read ahead by the specified number of sectors during disk access. 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. You can select one of these: • Disabled (default if no drive is installed) • 2 Sectors • 4 Sectors • 8 Sectors • 16 Sectors (default if a drive is installed) **Note**: Autotyping may change this value if the hard disk reports that it supports block accesses.
LBA Mode Control	Determines how the System BIOS references hard disk data. You can use this option only if both the hard disk being configured and the operating system support Logical Block Addressing (LBA). Autotyping may change this value if the hard disk reports that it supports LBA. You can select one of these: • **Disabled (default if no drive is installed)**: Reference hard disk data using the Cylinders/Heads/Sectors (CHS) method. • **Enabled (default if a drive is installed)**: Reference hard disk data as logical blocks.
32-bit I/O	Determines how the System BIOS accesses the hard disk controller. Autotyping does not affect this option. Accesses with 32-bit I/O accesses. This option increases system performance. You can select one of these: • **Disabled**: Select this option if an ISAbus IDE controller is installed in the system. • **Enabled**: Select this option to maximize system performance when the onboard PCI IDE controller is used.

Field	Description
Transfer Mode	Selects the mode that the System BIOS uses to access the hard disk. You can select one of these: • Standard (default) • Fast PIO 1 • Fast PIO 2 • Fast PIO 3 • Fast PIO 4 • FPIO 3 / DMA 1 • FPIO 4 / DMA 2 Older hard disks only support "Standard". Newer hard disks adhering to "Fast ATA" or "Enhanced IDE" specifications may support the fast programmed I/O or DMA modes. Note that autotyping may change this value depending on the transfer modes that the hard disk reports it supports. The fast DMA modes take full advantage of the onboard bus mastering hard disk controller and should yield the highest performance when used in conjunction with multitasking operating systems that support it.
Ultra DMA Mode	Selects the Ultra DMA Mode that the System BIOS uses to access the hard disk. You can select one of these: • Mode 2 (default) • Mode 1 • Mode 0 • Disabled **Note**: Autotyping derives this value from information reported by the drive.

Keyboard Features sub-menu

Use this sub-menu to enable or disable various keyboard features.

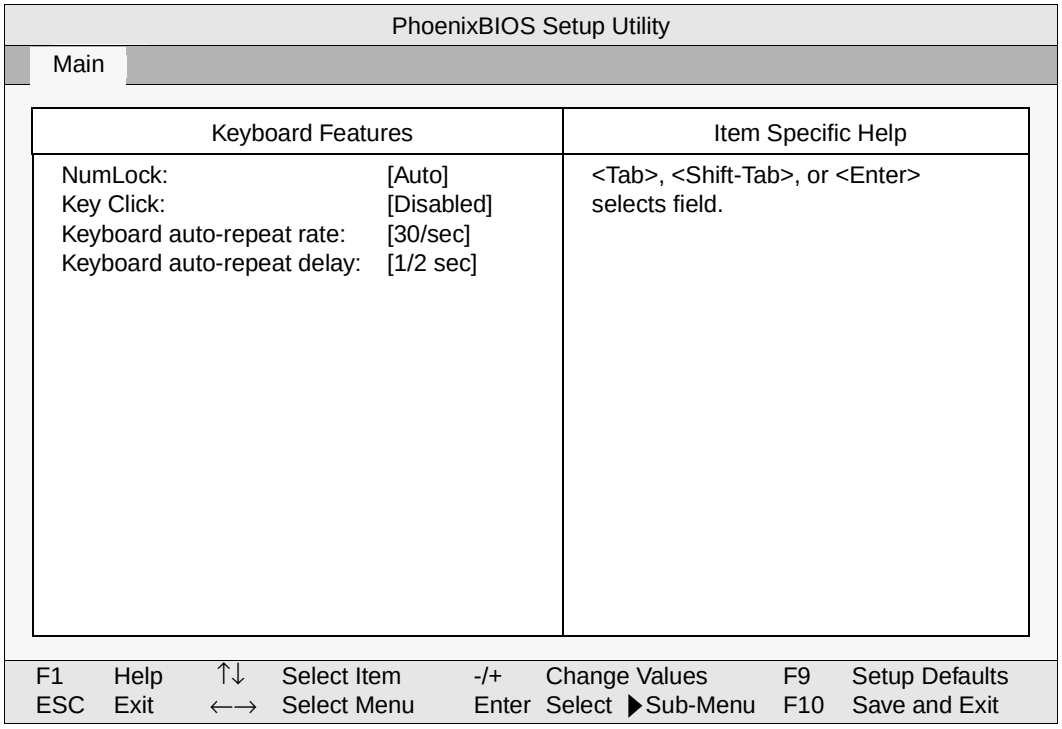


Figure 3-3. Keyboard Features sub-menu

Field	Description
Numlock	Determines whether the keypad keys (the Numlock feature) operates. You can select one of these: • **Auto (default)**: Engages the Numlock feature at boot. • **Off**: Disengages the Numlock feature at boot. • **On**: Engages the Numlock feature at boot.
Key Click	Determines whether the keyboard produces an audible click each time a key is pressed. You can select one of these: • **Disabled (default)**: The keyboard does not produce audible clicks when keys are pressed. • **Enabled**: The keyboard produces an audible click each time a key is pressed.

Field	Description
Keyboard auto-repeat rate	Sets the auto-repeat rate when holding a key down on the keyboard. You can select one of these: • 30/seconds (default) • 26.7/seconds • 21.8/seconds • 18.5/second • 13.3/seconds • 10/seconds • 6/seconds • 2/seconds
Keyboard auto-repeat delay	Sets the delay between when a key is pressed and when the auto-repeat feature begins. You can select one of these: • ¼ second • ½ second (default) • ¾ second • 1 second

UBE Shadow Control sub-menu

Use this menu to specify BIOS shadow options.

Shadowing refers to the technique of copying BIOS extensions from ROM into DRAM and accessing them from DRAM. This allows the CPU to access the BIOS extensions much more quickly and generally increases system performance if many calls to the BIOS extensions are made.

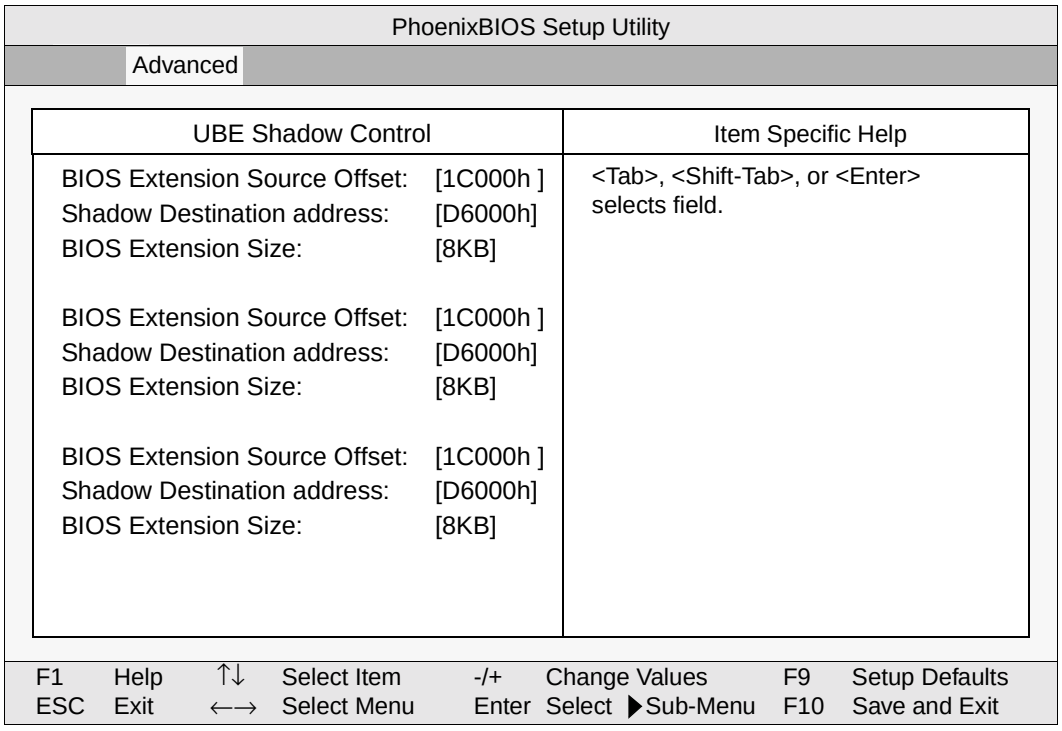


Figure 3-4. UBE Shadow Control sub-menu

About shadow memory regions

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 16KB in size. Multiple shadow regions may have to be enabled if the BIOS extension to be shadowed is larger than 16KB.

Field	Description
BIOS Extension Source Offset	Controls the location of the user BIOS extension to shadow. You can select one of these: • Disabled (default) • 0000h • 2000h • 4000h • 6000h • 8000h • A000h • C000h • E000h • 10000h • 12000h • 14000h • 16000h • 18000h • 1A000h • 1C000h
Shadow Destination Address	Controls the destination address of the BIOS extension in shadow memory. You can select one of these: • D0000h • D2000h • D4000h • D6000h (default) • D8000h • DA000h • DC009h • DE000h **Note**: This field displays only if the BIOS Extension Source field contains a value other than [Disabled].
BIOS Extension Size	Size of the extension in increments of 8KBytes. You can select one of these: • 8KBytes (default) • 16KBytes • 24KBytes • 32KBytes • 40KBytes • 48KBytes • 56KBytes • 64KBytes **Note**: This field displays only if the BIOS Extension Source field contains a value other than [Disabled].

Advanced menu

This menu contains settings for integrated peripherals, memory shadow, cache, and large disk access mode. You access this menu by selecting Advanced from the Main BIOS Setup menu.

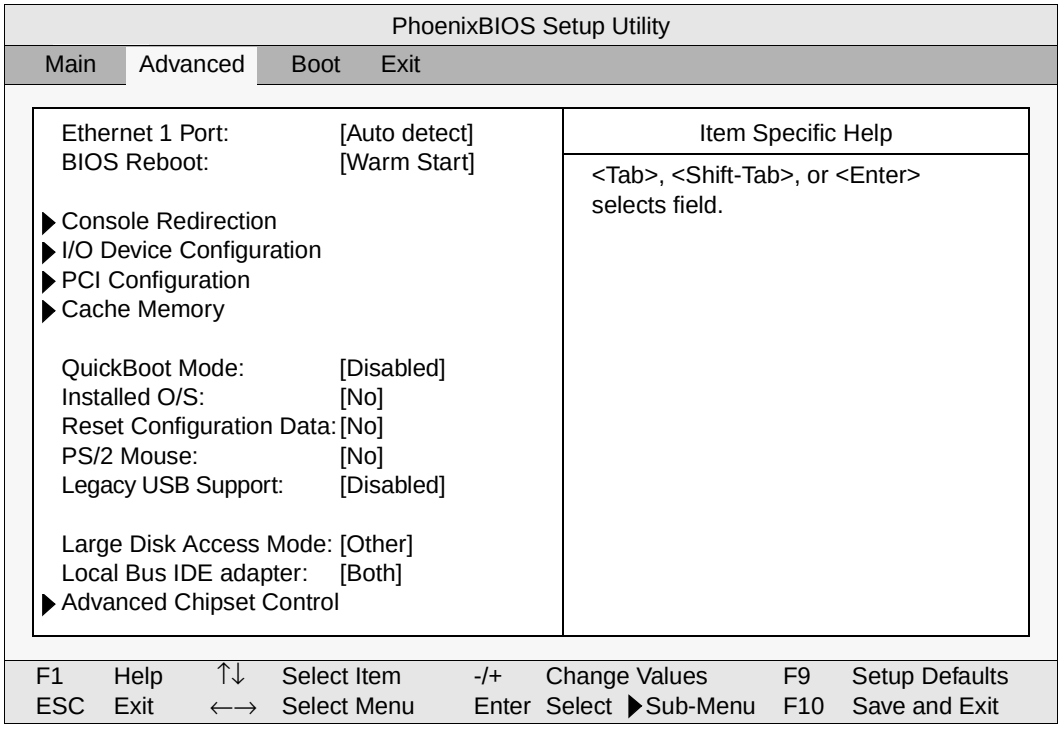


Figure 3-5. Advanced menu

Field	Description
Ethernet 1 Port	Determines whether the system checks for Ethernet connections. You can select one of these: • **Auto Detect (default)**: The system checks for Ethernet connections on both the front and rear panel connectors. • **Front Panel**: The system checks for Ethernet connections on the front panel connectors. • **Real Panel**: The system checks for Ethernet connections on the rear panel connectors.
BIOS Reboot	Determines the reboot type. You can select one of these: • **Warm Start (default)**: The system performs an abbreviated reboot and preserves DRAM memory contents. • **Cold Start**: The system reboots as if power was cycled.
Console Redirection sub-menu	Displays a menu that you use to redirect console output. For more information, see *Console Redirection sub-menu on page 26*.

Field	Description
I/O Device Configuration sub-menu	Displays a menu that you use to configure peripheral devices. For more information, see *I/O Device Configuration sub-menu on page 28*.
PCI Device Configuration sub-menu	Displays a menu that you use to configure PCI devices. For more information, see *PCI Device Configuration sub-menu on page 30*.
Cache Memory sub-menu	Displays a menu that you use to control the use of the CPU cache. For more information, see *Cache Memory sub-menu on page 33*.
Quick Boot Mode	Determines which tests run during boot. • **Disabled (default)**: Runs all tests. Select this option to ensure a robust boot. • **Enabled**: Skips some tests. Select this option to boot more quickly.
Installed OS	Identifies the OS you plan to use on this system. Identifying the OS determines how much initialization the BIOS performs. You can select one of these: • **Other (default)**: The Plug-and-Play BIOS completes PCI initialization. Select this option when you plan to use an OS other than Windows 95. • **Win95**: Only boot devices are initilized; the remainder of initialization is completed by the OS. Select this option when you plan to use Windows 95 as your OS. **Note**: Setting this to the incorrect value may produce unexpected results.
Reset Configuration Data	Determines whether to clear the Extended System Configuration Data (ESCD) block that resides in the Flash Boot Device (FBD). You can select one of these: • **No (default)**: Does not clear the ESCD block. • **Yes**: Clears the ESCD block. You must clear the block the first time a system is turned on or if the ESCD becomes corrupted. This option automatically resets to "No" after the block is cleared.
PS/2 Mouse	Determines whether a PS/2 mouse functions on this system. • **Auto Detect (default)**: Allows the system BIOS to determine whether a PS/2 mouse functions on this system. • **Enabled**: Sets the system to use a PS/2 mouse, if installed. • **Disabled**: Prevents any installed PS/2 mouse from functioning and frees IRQ 12.

Field	Description
Legacy USB Support	Determines whether the system supports the Legacy Universal Serial Bus (USB). You can select one of these: • **Enabled (default)**: The system supports the Legacy USB. Select this option only if you use a USB keyboard or mouse, and you use it with an OS that does not have USB drivers. This option reduces system performance due to frequent SMI interrupts (see note below). • **Disabled**: The system does not support the Legacy USB. USB is still functional during POST; it is disabled at INT19 (Boot Time). **Note**: USB is implemented using SMIs and, if enabled, consumes CPU, IRQ, and memory resources. Many current OSs such as Windows 98 or Windows 2000 include built-in USB support and do not rely on BIOS USB support.
Large Disk Access Mode	Specifies whether MS-DOS systems can use hard disks up to 8GB (1024C x 255H x 63S) without special drivers or LBA. If the drive fails while installing new software, change this setting and try again. You can select one of these: • **DOS (default)**: Causes the System BIOS to perform cylinder/head translation if the drive is configured in Setup to have more than 1024 cylinders. Select this option if your system uses a drive larger than 528 MB and runs DOS or MS-DOS†. • **Other**: Select this option if your system uses a drive larger than 528 MB and runs an OS other than DOS.
Local Bus IDE Adapter	Configures the integrated local bus IDE adapter. You can select one of these: • Both (default) • Disabled • Primary • Secondary
Advanced Chipset Control sub-menu	Displays a menu that you use to control chip behavior. For more information, see *Advanced Chipset Control sub-menu on page 38*.

Console Redirection sub-menu

Options in this menu configure console redirection.

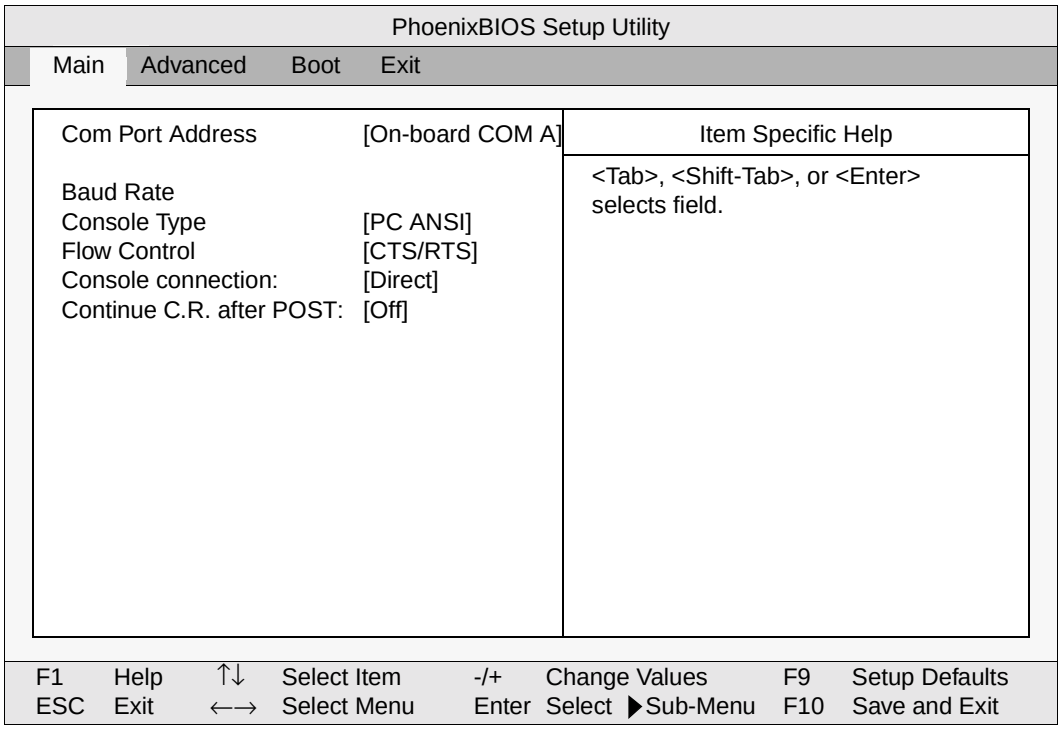


Figure 3-6. Console Redirection sub-menu

Field	Description
COM Port Address	Specifies the serial port to use for console redirection. You can select one of these: • **On-board COM A (default)**: The system uses COM A for redirection. • **On-board COM B**: The system uses COM B for redirection. • **Disabled**: The system does not redirect input.
Baud Rate	Specifies the baud rate at which the COM port operates. You can select one of these: • 600 • 1200 • 2400 • 4800 • 9600 • 19.2 • 38.4K • 115.2
Console Type	Identifies the console type. You can select one of these: • PC ANSI (default) • VT100

Field	Description
Flow Control	Specifies flow control. You can select one of these: • CTS/RTS (default) • XON/XOFF • None
Console connection	Specifies how the console connects to the system. You can select one of these: • **Direct (default)**: Connects the console directly to the system. • **Via modem**: Connects the console to the system via a modem.
Continue C.R. after POST	Determines whether console redirection occurs. You can select one of these: • **Off (default)**: Console redirection stops after the OS loads. • **On**: Console redirection continues after the OS loads.

I/O Device Configuration sub-menu

Use the options in this sub-menu to configure the onboard serial and parallel port and disk controllers.

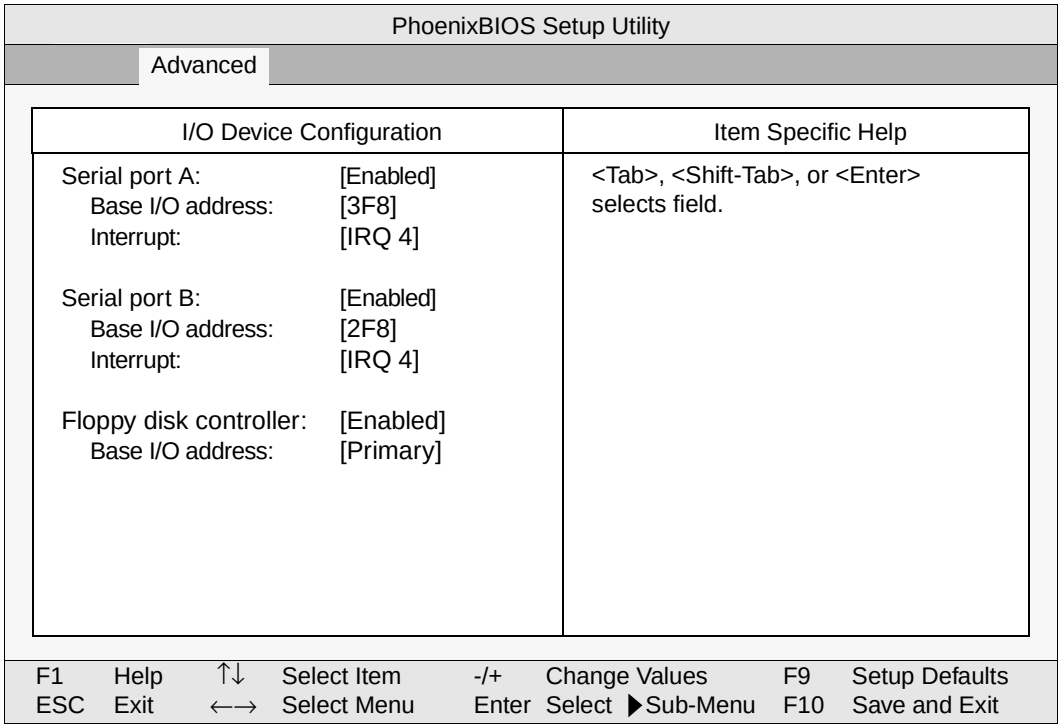


Figure 3-7. I/O Device Configuration sub-menu

Field	Description
Serial Port A/Serial Port B	Configures the selected serial port. You can select one of these: • **Enabled (default)**: The user configures the serial port. • **Auto**: Either the BIOS or OS configures the serial port. • **Disabled**: The serial port is not configured.
Base I/O Address	Configures the base address for the serial port. If you select a value already used by another serial port, an asterisk displays at the left side of the screen. You can select one of these: • 2F8 (default, Port B) • 2E8 • 3F8 (default, Port A) • 3E8 **Note**: This field displays only if the Serial Port field contains a value of [Enabled].

Field	Description
Interrupt	Configures the serial port interrupt. You can select one of these: • IRQ3 (default, Port B) • IRQ4 (default, Port A) **Note**: This field displays only if the Serial Port field contains a value of [Enabled].
Floppy Disk Controller	Determines whether the floppy disk controller is available for use. You can select one of these: • **Enabled (default)**: User configuration. • **Disabled**: No configuration. • **Auto**: Either the BIOS or OS configures the floppy disk.
Base I/O Address	Configures the base address for the parallel port. You can select one of these: • Primary (default) • Secondary

PCI Device Configuration sub-menu

Use the options in this sub-menu to control the exclusion of the UMB region for PCI or ISA and the exclusion of the IRQs for PCI or ISA.

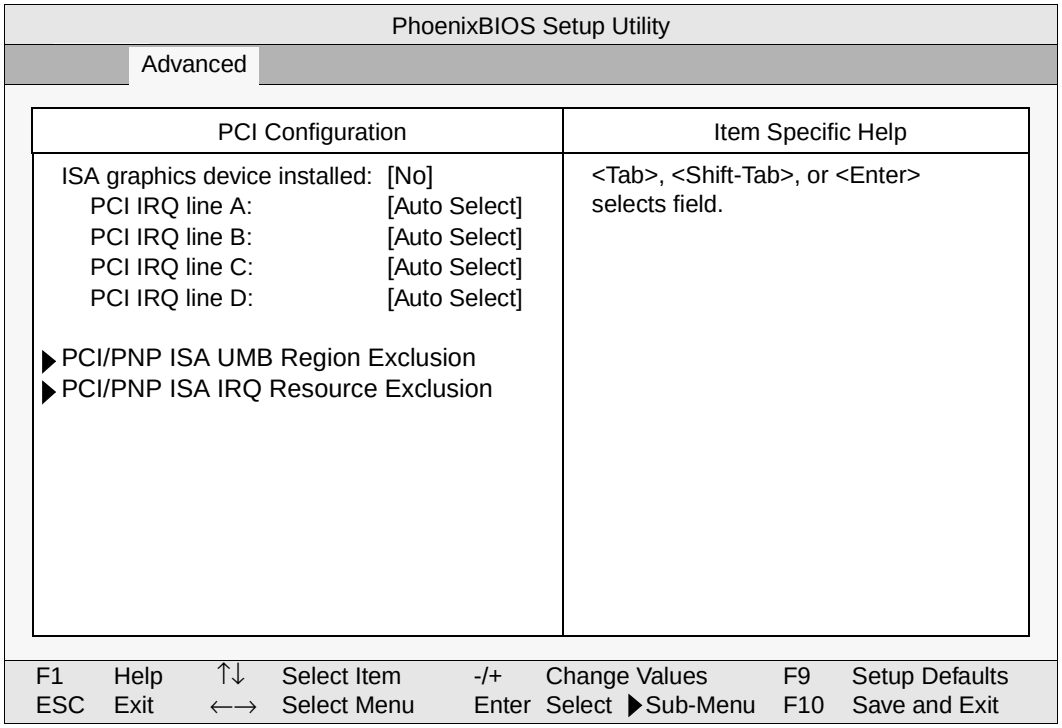


Figure 3-8. PCI Device Configuration sub-menu

Field	Description
ISA graphics device installed	Specifies whether an ISA graphics device is installed in the system. • **No (default)**: No ISA graphics device exists in this system. • **Yes**: An ISA graphics device exists in this system.
PCI IRQ Line A–D	Determines which IRQ is used by PCI IRQ (PIRQ) 1, 2, 3, and 4. You can select one of these: • Auto Select (default) • Disabled • 3 • 4 • 5 • 7 • 9 • 10 • 11 • 12 • 14 • 15
PCI/PNP ISA UMB Region Exclusion sub-menu	Displays a menu that you use to control the exclusion of PCI and ISA Upper Memory Block (UMB) regions. For more information, see *PCI/PNP ISA UMB Region Exclusion sub-menu on page 31*.

Field	Description
PCI/PNP ISA IRQ Resource Exclusion sub-menu	Displays a menu that you use to control the exclusion of PCI and ISA interrupt resources. For more information, see *PCI/PNP ISA IRQ Resource Exclusion sub-menu on page 32*.

PCI/PNP ISA UMB Region Exclusion sub-menu

The PCI/PNP ISA UMB Region Exclusion Sub-Menu controls the exclusion of PCI and ISA UMB regions.

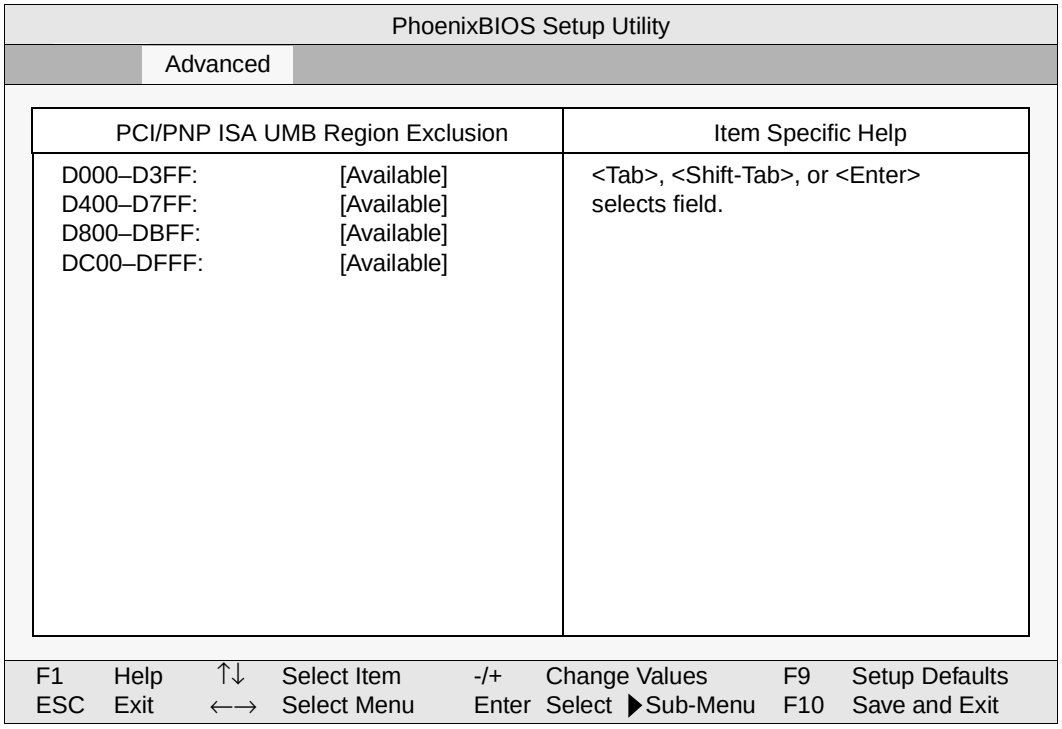


Figure 3-9. PCI/PNP ISA UMB Region Exclusion sub-menu

Field	Description
Memory Regions	Determines the use of each UMB region. You can select one of these: • **Available (default)**: Makes the regions available for PCI use. • **Reserved**: Reserves the specified block of upper memory regions for ISA use.

PCI/PNP ISA IRQ Resource Exclusion sub-menu

The PCI/PNP ISA IRQ Resource Exclusion Sub-Menu controls the exclusion of PCI and ISA interrupt regions.

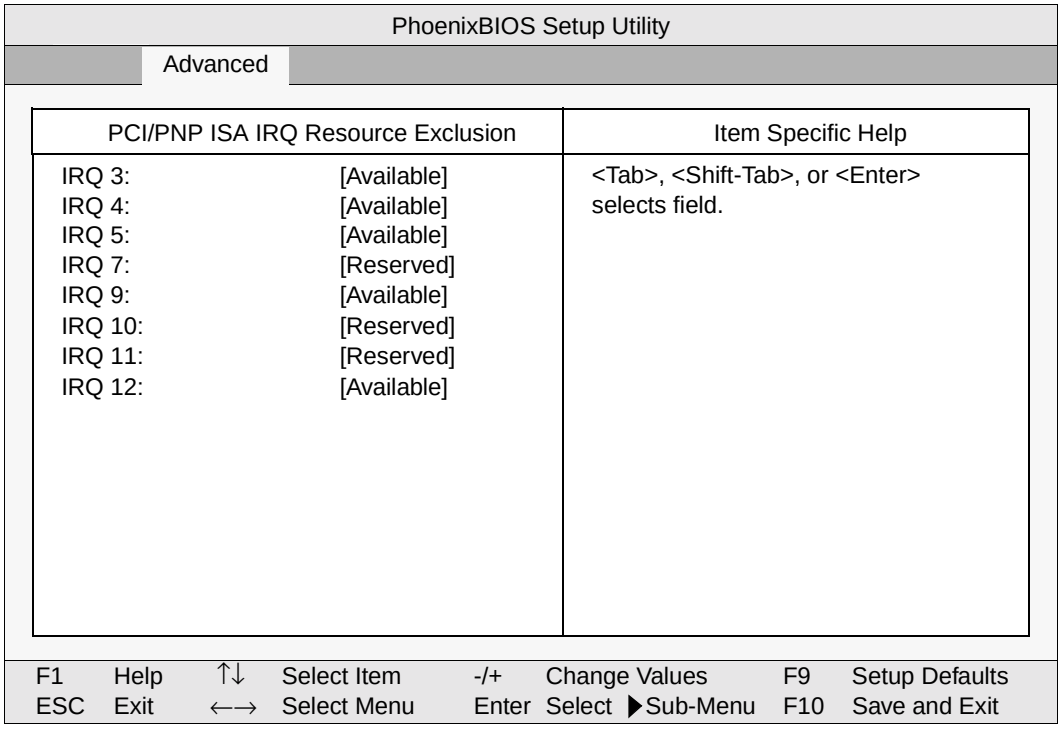


Figure 3-10. PCI/PNP ISA IRQ Resource Exclusion sub-menu

Field	Description
Interrupts	Determines the use of each interrupt. You can select one of these: • **Available (default for IRQs 3, 4, 5, 9, and 12)**: Makes the ISA IRQ available for PCI use. • **Reserved (default for IRQs 7, 10, and 11)**: Reserves the interrupt for ISA use. Select this option if the IRQ is required by an on-board ISA peripheral or an ISA card. **Note**: The following interrupts are reserved for the following purposes: IRQ7 Hot Swap / Enum IRQ10 Soft reset IRQ11 Hot Swap / Latch

Cache Memory sub-menu

The options in this sub-menu control the cacheability of certain memory regions and also the settings of the Level 2 (L2) cache.

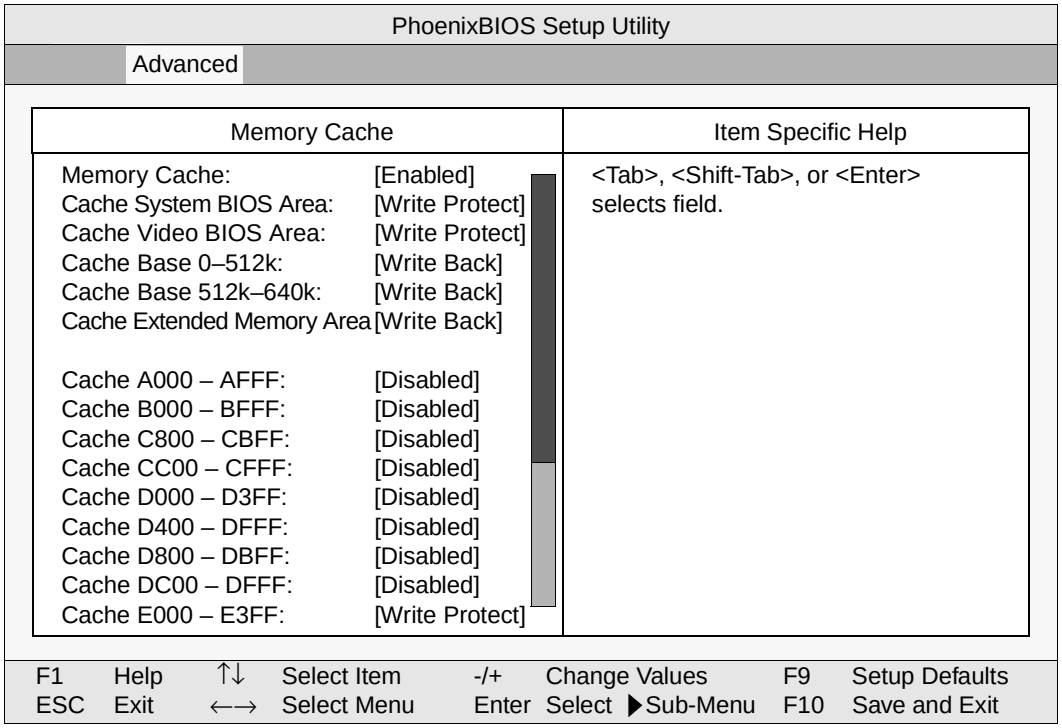


Figure 3-11. Cache Memory sub-menu

Field	Description
Memory Cache	Determines whether to use L1 and L2 memory caching. You can select one of these: • **Enable (default)**: L1 and L2 memory caching occurs. • **Disable**: L1 and L2 memory caching does not occur.
Cache System BIOS Area	Determines whether the System BIOS is cached in DRAM. You can select one of these: • **Write Protect (default)**: caches the System BIOS in the F0000h through FFFFFh DRAM area • **uncached**: Does not cache the system BIOS.
Cache Video BIOS Area	Determines whether the VGA BIOS is cached in a region. You can select one of these: • **Write Protect (default)**: caches the VGA BIOS in the C0000h through C7FFFh region. • **uncached**: Does not cache the VGA BIOS.

Field	Description
Cache Base 0–512k Cache Base 512–640k	Determines how the system caches base memory in the specified area: You can select one of these: • **Write Back (default)**: Writes and reads to and from system memory are cached, then written to system memory when you perform a write-back operation. Select this option to reduce bus traffic by eliminating unnecessary writes to system memory. This option provides the best performance, but requires that all devices that access system memory on the system bus be able to snoop memory accesses to ensure system memory and cache coherency. • **Write Through**: Writes and reads to and from system memory are cached. Select this option for frame buffers or when there are devices on the system bus that access system memory, but do not perform snooping of memory accesses. • **Write Protect**: Reads come from cache lines when possible, and read misses cause cache fills. Writes are propagated to the system bus and cause corresponding cache lines on all processors on the bus to be invalidated. Speculative reads are allowed. • **uncached**: The system does not cache memory.
Cache Extended Memory Area	Determines how the system caches extended memory. You can select one of these: • **Write Back (default)**: Writes and reads to and from system memory are cached, then written to system memory when you perform a write-back operation. Select this option to reduce bus traffic by eliminating unnecessary writes to system memory. This option provides the best performance, but requires that all devices that access system memory on the system bus be able to snoop memory accesses to ensure system memory and cache coherency. • **Write Through**: Writes and reads to and from system memory are cached. Select this option for frame buffers or when there are devices on the system bus that access system memory, but do not perform snooping of memory accesses. • **Write Protect**: Reads come from cache lines when possible, and read misses cause cache fills. Writes are propagated to the system bus and cause corresponding cache lines on all processors on the bus to be invalidated. Speculative reads are allowed. • **uncached**: The system does not cache memory.

Field	Description
Cache Memory Regions: A000–AFFF B000–BFFF	Determines how the system deals with specified memory blocks or shadow[1] memory. You can select one of these: • **Disabled (default)**: The system does not cache memory. • **USWC Caching**: System memory locations are not cached (as with uncacheable memory) and coherency is not enforced by the processor's bus coherency protocol. Speculative reads are allowed. Writes may be delayed and combined in the write buffer to reduce memory accesses. Select this option for video frame buffers, where the write order is unimportant as long as the writes update memory so they can be seen on the graphics display. • **Write Back**: Writes and reads to and from system memory are cached, then written to system memory when you perform a write-back operation. Select this option to reduce bus traffic by eliminating unnecessary writes to system memory. This option provides the best performance, but requires that all devices that access system memory on the system bus be able to snoop memory accesses to ensure system memory and cache coherency. • **Write Through**: Writes and reads to and from system memory are cached. Select this option for frame buffers or when there are devices on the system bus that access system memory, but do not perform snooping of memory accesses. • **Write Protect**: Reads come from cache lines when possible, and read misses cause cache fills. Writes propagate to the system bus and cause corresponding cache lines on all processors on the bus to be invalidated. Speculative reads are allowed. When BIOS extensions are present in these regions, enabling caching for that region increases performance

Field	Description
Cache Memory Regions: C800–CBFF CC00–CFFF D400–D7FF D800–DBFF DC00–DFFF	Memory regions. Determines how the system deals with specified memory blocks or shadow[1] memory. You can select one of these: • **Disabled (default)**: The system does not cache memory. • **Write Back**: Writes and reads to and from system memory are cached, then written to system memory when you perform a write-back operation. Select this option to reduce bus traffic by eliminating unnecessary writes to system memory. This option provides the best performance, but requires that all devices that access system memory on the system bus be able to snoop memory accesses to ensure system memory and cache coherency. • **Write Through**: Writes and reads to and from system memory are cached. Select this option for frame buffers or when there are devices on the system bus that access system memory, but do not perform snooping of memory accesses. • **Write Protect**: Reads come from cache lines when possible, and read misses cause cache fills. Writes propagate to the system bus and cause corresponding cache lines on all processors on the bus to be invalidated. Speculative reads are allowed. When BIOS extensions are present in these regions, enabling caching for that region increases performance

Field	Description
Cache Memory Regions: E000–E3FF E400–E7FF E800–EBFF EC00–EFFF	Memory used in the E0000h–EFFFFh DRAM region. Determines how the system deals with specified memory blocks or shadow[1] memory. You can select one of these: • **Disabled (default)**: The system does not cache memory. • **Write Back**: Writes and reads to and from system memory are cached, then written to system memory when you perform a write-back operation. Select this option to reduce bus traffic by eliminating unnecessary writes to system memory. This option provides the best performance, but requires that all devices that access system memory on the system bus be able to snoop memory accesses to ensure system memory and cache coherency. • **Write Through**: Writes and reads to and from system memory are cached. Select this option for frame buffers or when there are devices on the system bus that access system memory, but do not perform snooping of memory accesses. • **Write Protect**: Reads come from cache lines when possible, and read misses cause cache fills. Writes propagate to the system bus and cause corresponding cache lines on all processors on the bus to be invalidated. Speculative reads are allowed. When BIOS extensions are present in these regions, enabling caching for that region increases performance

[1] *Shadowing* refers to the technique of copying BIOS extensions from ROM into DRAM and accessing them from DRAM. This allows the CPU to access the BIOS extensions much more quickly and generally increases system performance if many calls to the BIOS extensions are made.

Advanced Chipset Control sub-menu

Options in this menu control ?.

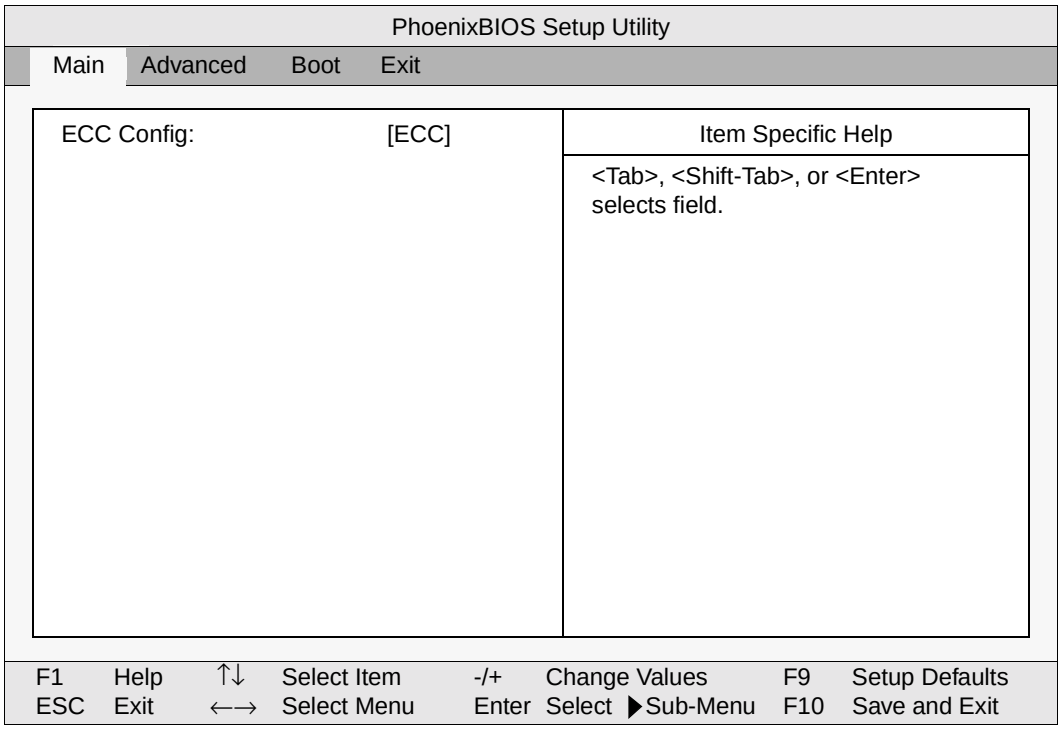


Figure 3-12. Advanced Chipset Control sub-menu

Field	Description
ECC Config	You can select one of these: • ECC (default) • EC • ECC Scrub • Disabled

Boot menu

The Boot menu:

- Specifies the order in which the system tries to boot from devices attached to the system.
- Specifies the boot order of devices in the same class, such as hard drives.

Boot order is assigned from top to bottom, with the uppermost enabled boot device in each class being the boot candidate from that device class.

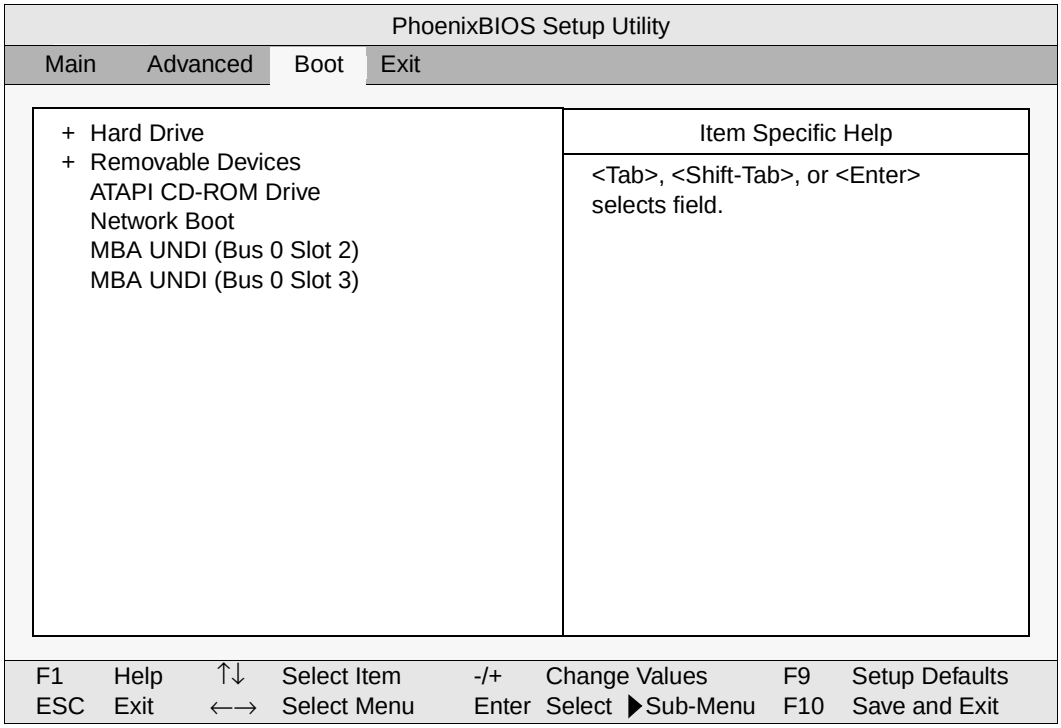


Figure 3-13. Boot menu

To move an item to a higher level in the list, highlight the item and then press the "+" key. To move an item to a lower level in the list, highlight the item and then press the "–" key.

To display all boot device sub-menus under all respective device types, press the Ctrl and Enter keys at the same time.

To display a sub-menu that lists all devices of a specified type available on the system, highlight the device type and press the Enter key. If more than one device of that type exists, use the "+" and "–" keys to change the boot order within the given device type

To enable a device, highlight the desired device and press the Shift and 1 keys. An exclamation point (!) displays to the left of enabled devices. To disable a device. highlight the device, then press the Shift and 1 keys again.

Field	Description
Boot order	Determines the boot order of boot devices. This is the default boot order: 1. Hard Drive 2. Removable Devices 3. ATAPI CD-ROM Drive 4. Network Boot 5. MBA UNDI (Bus 0 Slot 2) 6. MBA UNDI (Bus 0 Slot 3)

Exit menu

Use the options in this menu to save and exit, or abandon your changes and exit to the system.

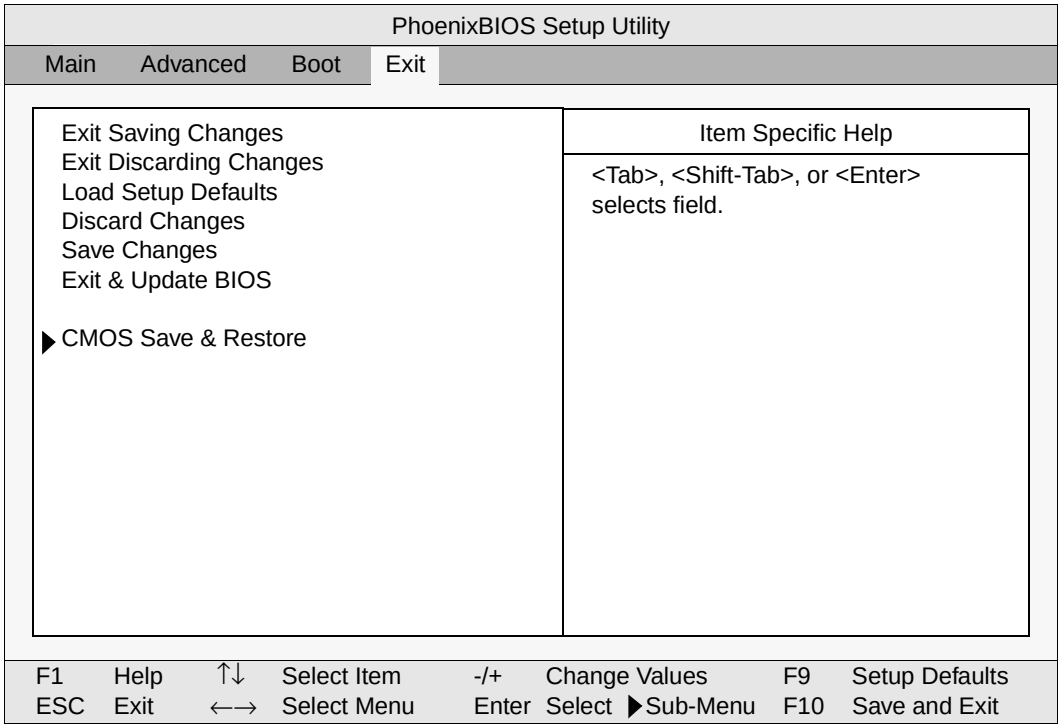


Figure 3-14. Exit menu

Field	Description
Exit Saving Changes	Saves into CMOS the values you just entered and exits the Setup program. The new values load, and the system reboots.
Exit Discarding Changes	Discards the changes you just made and reverts to the BIOS as it was before you entered the BIOS Setup program. The system boots with the old values.

Field	Description
Load Setup Values	Resets the BIOS values to the original, default values set at the factory, before any suppliers or other end users made changes.
Discard Changes	Loads the system with the values that existed before this editing session started. You do not exit.
Save Changes	Saves to CMOS the edits you made during this session but does not exit the Setup program.
Exit & Update BIOS	Updates the BIOS from a floppy disk. For detailed information about updating the BIOS from a floppy disk, see Appendix F, Re-programming the flash chip. **Note**: Select this exit option only if you obtained BIOS update replacement software from your supplier and reviewed the documentation and procedures provided with that distribution. This option changes the flash contents only if the vendor-supplied floppy is installed. If you select this option by mistake, changes made to the BIOS are lost unless already saved using the Save Current Values option. The system automatically seaches for the update program that should be on the floppy disk inserted in drive A. If no floppy exists, cycle power to reset the system to its previous state.
CMOS Save & Restore sub-menu	Displays a menu that controls how the system handles CMOS values. For more information, see *CMOS Save and Restore sub-menu* on page 42.

CMOS Save and Restore sub-menu

Use the options in this menu to save, restore, or erase CMOS settings in the FBD (Flash Boot Device).

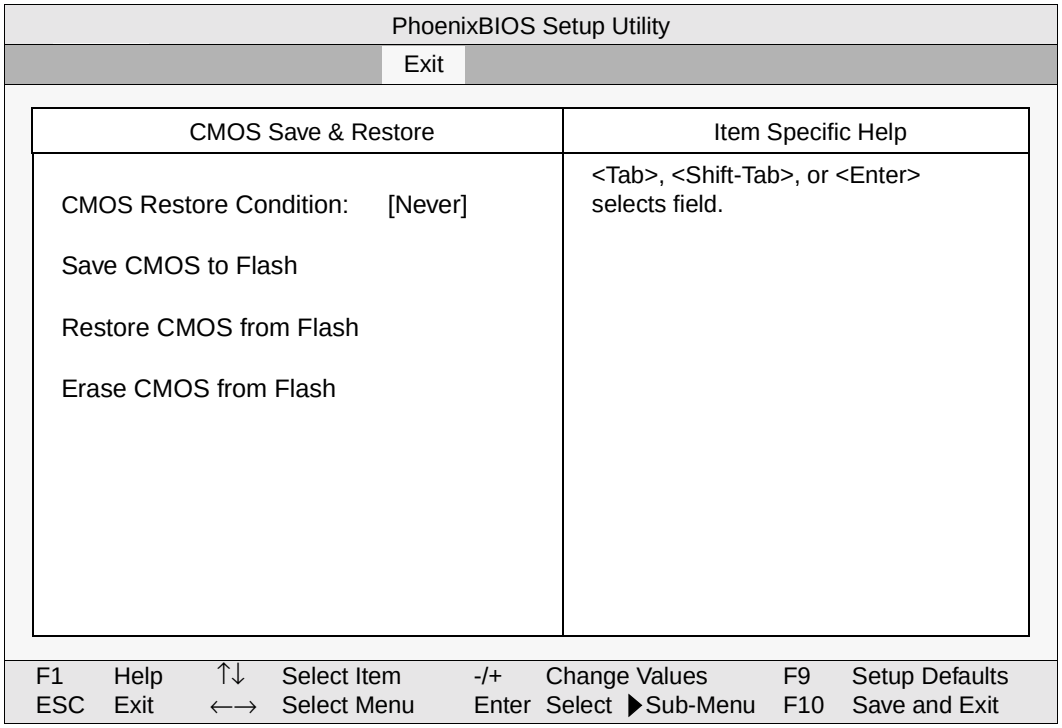


Figure 3-15. CMOS Save and Restore sub-menu

Field	Description
Restore Condition	Determines the conditions under which the BIOS restores CMOS RAM from the FBD when booting. You can select one of these: • Never (default) • CMOS Corruption • Always
Save CMOS to Flash	Immediately saves current settings in the Setup program to CMOS RAM and into the FBD. This process may take several seconds to complete. **Note**: Always select this option *before* restoring CMOS from Flash.
Restore CMOS from Flash	Immediately restores CMOS RAM and current settings in the Setup program from the FBD. **Note**: This option is available only if the CMOS was previously saved to the FBD.
Erase CMOS from Flash	Immediately erases the CMOS image stored in the FBD.

4 Theory of operation

Overview

The EPC-3305 includes these subsystems:

- **CPU board:** A single-slot peripheral CPU which plugs into a 6U peripheral slot of a CompactPCI system.
- **Rear Transition module (RTM):** A rear I/O transition module which plugs into a rear I/O slot of a CompactPCI system. For more information about the RTM, see *Appendix E, Rear Transition module (RTM).*

The EPC-3305's CPU board is a Pentium-III based, PC-compatible, single-slot CompactPCI computer designed for use with CompactPCI bus. The CPU board can pass hardware compatibility tests for Microsoft's Windows 95, Windows 98, and Windows NT 4.0. It can also run other PC operating systems, including Linux, Solaris, and DOS.

Organization

Block diagram

The next figure shows the division and interconnection of EPC-3305 functions. These are described below.

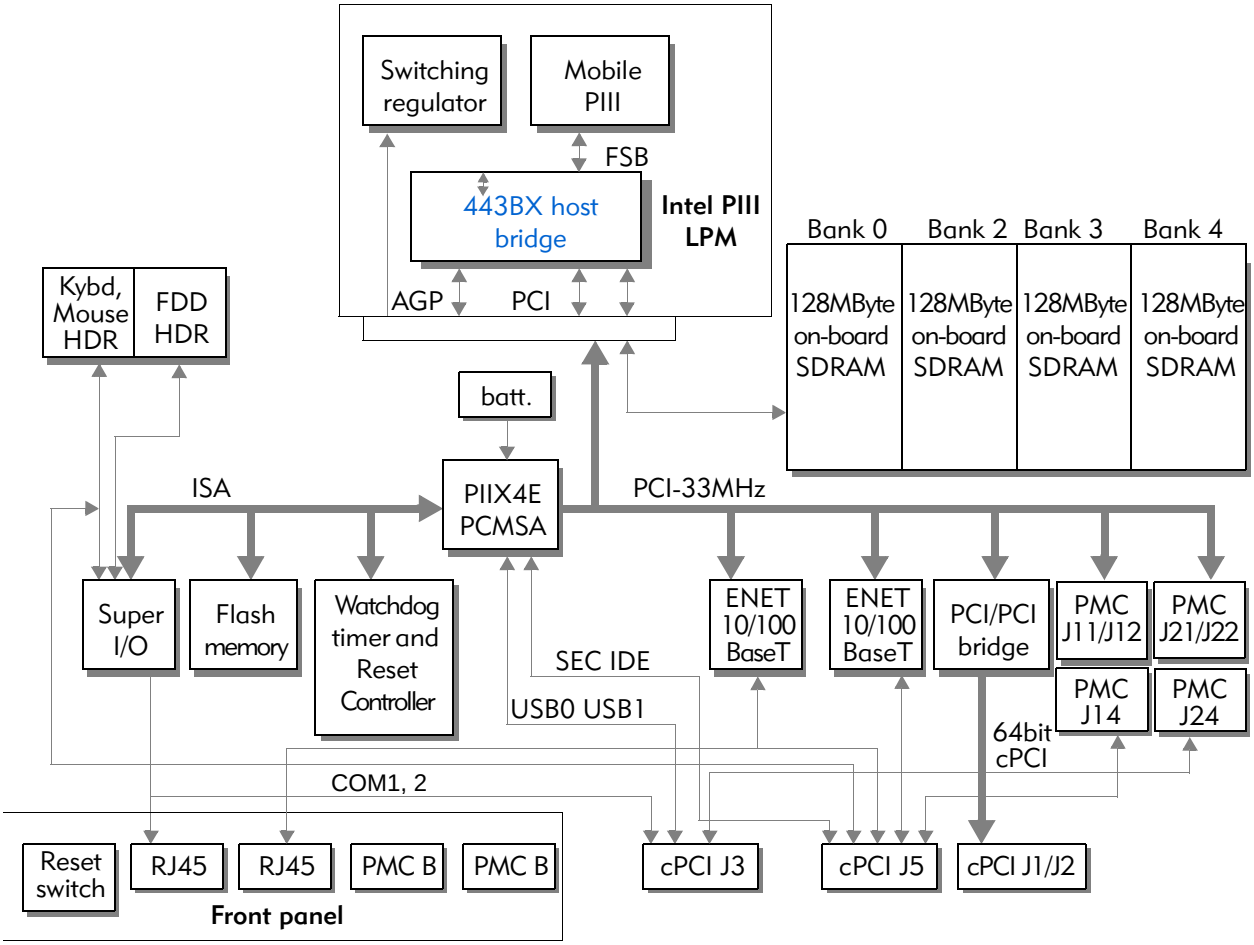


Figure 4-1. Block diagram of the EPC-3305

Features

CPU module

The design of the board centers on an Intel EMC2 (Embedded Mobile Cartridge). The EMC2 incorporates a 500MHz Pentium III processor. The 443BX Host Bridge and core voltage power supply are also included on the EMC2.

The module connects to the board by a 400-pin connector that routes the PCI and Memory bus to the system and power and ground pins to the module.

The CPU bus frequency is 100MHz.

Memory map

The 2^{32} byte physical address space seen by the Intel Pentium III occupies three areas:

1. From 0 to 1 MB is largely defined by the IBM PC/AT architecture.
2. From 1 to 256 MB depends on how much DRAM is installed in the EPC-3305.
3. Memory addresses from the Pentium between 0 and 4 MB (0FFFFFFFh) is mapped as follows:

Range		Content	Cacheable
0–640Kb	00000000–0009FFFF	First 640 KB of DRAM (DOS memory)	Yes
640Kb–1MB	000A0000–000BFFFF	VGA video DRAM, mapped to the Video Module	No
	000C0000–000CBFFF	Write-protected DRAM containing shadowed video BIOS (48 KB)	Yes
	000D0000–000DFFFF	BIOS extensions	Yes[1]
	000E0000–000FFFFF	System BIOS shadow	Yes
1MB–512MB	00100000–0FFFFFFF	DRAM (511 MB)	Yes[2]
512MB–top 1MB	10000000–FFEFFFFF	ISA bus (aliased)	No
Top 512Kb	FFF80000–FFFFFFFF	Flash memory	No

[1] If no BIOS extensions, ISA bus (aliased); not cacheable.

[2] If no DRAM, ISA bus (aliased); not cacheable.

Interrupt usage

For details about EPC-3305 PC-compatible interrupt usage, see *Appendix B, Interrupts*.

Flash boot device

A boot block Flash memory stores system start-up code for the CPU board. This is flash-updatable BIOS containing the boot, main, and parameter blocks shown in Figure 4-2. The Main and Parameter blocks of the BIOS are reprogrammed under program control. Registers contained within the 443BX protect these areas from inadvertent writes. The BIOS chip select signal asserts only when the chipset is to write within the range of the BIOS Flash boot device. This device is 1Mbyte and is controlled as having two pages of 512kBytes. A register in the CPLD controls the paging.

The Plug-and-Play ESCD is also stored in the Boot-Block FLASH device in the block addressed from FFFFA000h–FFFFBFFFh. This block is always accessible for re-programming.

Use extreme caution when re-programming the flash chip. The Boot Block rarely changes and should not require re-programming. For information about re-programming the Flash chip, see Appendix F, Re-programming the flash chip.

A “forced recovery” jumper is provided and is connected to the G-PI2O of the PIIX4. The Boot Block can read this jumper and can force a recovery sequence at power-up should other methods of initiating the sequence, such as crisis recovery, become inaccessible.

The Flash BIOS device is memory addressed and resides in the last 512 KB of system memory at address FFF80000h–FFFFFFFFh.

BIOS ROM and ROM shadowing

The EPC-3305 utilizes a Flash Boot Device (FBD) as its BIOS ROM. The BIOS ROM is mapped into the top of the processor's 32-bit address space. The BIOS consists of a 16 KByte boot block and the System BIOS in the 96KB Main block and both 8KB parameter blocks. The layout is described in the next figure.

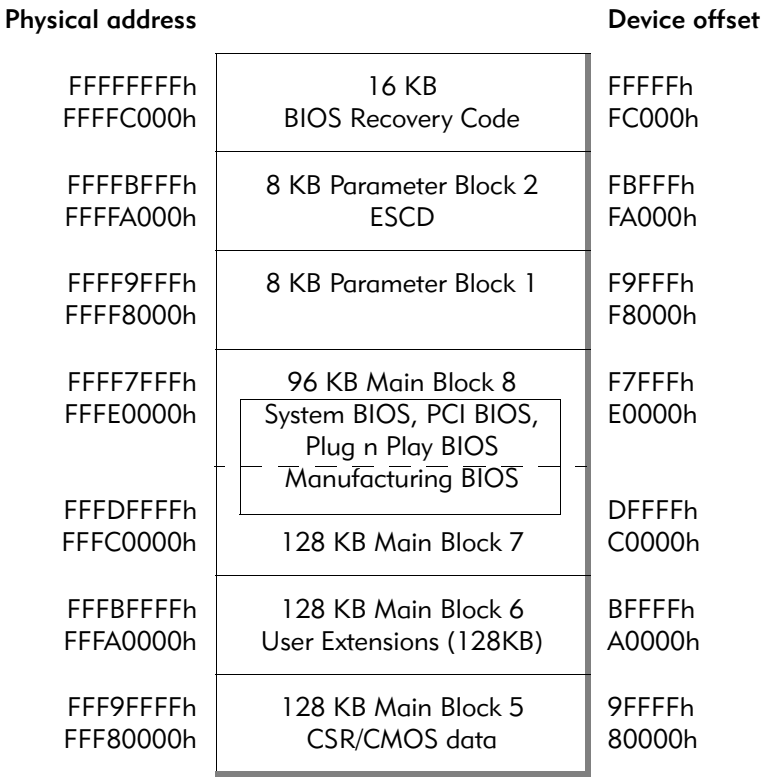


Figure 4-2. Flash boot device memory

The BIOS initialization software copies the ROM contents into DRAM (a process called *shadowing*) at addresses E0000h–FFFFFh. The VGA BIOS is copied into C0000h–C7FFFh of DRAM. After copying into these areas, the BIOS write-protects them. Subsequent writes to these areas complete successfully but do not alter the data in DRAM.

There are two parameter blocks, each 8KB in size, used for BIOS code.

443BX host bridge

The Intel 443BX is a 492 pin BGA running on 3.3V with mixed +5V, 3.3V, and GTL+ termination voltages. It dissipates a maximum of 3W if AGP is disabled. The 443BX contains support for a CPU-to-PCI bridge, a CPU-to-AGP bridge, a DRAM/SDRAM memory controller, and the central arbitration functions for the PCI bus. The 443BX supports concurrent CPU, AGP, and PCI transactions to main memory.

443BX PCI bus

The Intel 443BX supports CPU-to-PCI cycles. The 443BX and the PCI CLK run at 33 MHz. When acting as a PCI target, the 443BX does not respond to the cycles listed in the left column of Table 4-1. When acting as a bus master on behalf of the CPU, the 443BX does not issue PCI commands for the host bus commands listed in the right column of Table 4-1.

Table 4-1. 443BX unsupported commands

PCI target	Host bus
Interrupt acknowledge	Deferred reply
Special cycle	Branch trace message
I/O read	Memory read of 16 bytes
I/O write	Memory write of 16 bytes
Configuration read	EA memory access
Configuration write	
Dual address cycle	
Reserved commands	

PCI Bus features include:

- Fully synchronous, minimum latency 33 MHz PCI bus interface
- Zero wait state CPU-to-PCI write timings (no IRDY stall)
- PCI 2.1 compliant
- Data streaming support from PCI to DRAM
- Supports five PCI bus masters in addition to the Host and PCI to ISA bridge

DRAM/SDRAM memory controller

The 443BX supports 66 MHz or 100 MHz SDRAM memory. Memory is in a 16Mx8-bit format. The CPU includes four banks of nine chips, each bank capable of accommodating 128MB of memory with ECC. The CPU board may be purchased with 128MB, 256MB, or 512MB of soldered-down memory.

The 443BX generates all control signals (such as ~RAS, ~CAS, ~WE, ~CS, and ~DQM) and multiplexed addresses for the SDRAM array. The address and data flow through the 443BX for all SDRAM accesses.

PIIX4E PCI-ISA bridge

The Intel PIIX4E is a 324 pin BGA that runs on +3.3V with a reference voltage tied to +5V for +5V signal compatibility. It dissipates a maximum of 1 W. The PIIX4E provides support for a PCI-to-ISA bridge, an IDE controller, compatibility devices, a dual USB controller, SMBus, a real time clock (RTC), and power management logic. A detailed description of each of these follows.

PCI-ISA bridge

The PIIX4E is PCI 2.1 and IEEE996 compatible (ISA, AT bus). On PCI, the PIIX4E operates as a bus master for various internal modules, such as the USB controller, DMA controller, IDE bus master controller, distributed DMA masters, and on behalf of ISA masters. Internal registers or cycles passed to the ISA or EIO buses make the PIIX4E operate as a target. All internal registers are positively decoded.

The PIIX4E chip drives the ISA bus directly. The PIIX4E incorporates an ISA bus compatible master and CPU interface, and can drive five ISA slots without external data buffers. The ISA interface also provides byte swap logic, I/O recovery support, wait state generation, and SYSCLK generation. There are three devices on the CPU board connected to the ISA bus: SuperI/O, Flash ROM BIOS, and Watchdog CPLD.

IDE controller

The PIIX4E fast IDE interface supports up to four IDE devices through two independent IDE signal channels. The IDE interface supports PIO IDE transfers up to 14 MB/s and Bus Master IDE transfers up to 33 MB/s. It does not consume any ISA DMA resources and integrates eight 32-bit buffers for optimal transfers.

The PIIX4E chip supports Modes 1, 2, 3, and 4 as well as Bus Master (DMA) Modes 0, 1, and 2. There is no support for the obsolete IDE register at I/O address 0x3F7. The PIIX4E supports “Ultra DMA/33” Synchronous DMA Mode Transfers.

Only PCI Masters have access to the IDE port. ISA Bus masters cannot access the IDE I/O port addresses. The IDE data transfer command strobes, DMA request and grant signals, and IORDY signals interface directly to the PIIX4E chipset.

The primary IDE channel is connected to on-board Flash with an IDE interface. A header for the secondary IDE is available on the RTM.

Compatibility devices

The PIIX4E contains three compatibility devices:

- **DMA controller**: The DMA controller incorporates the logic of two 82C37 DMA controllers. The DMA controller has seven independently programmable channels. Channels [3:0] are hardwired to 8 bit, count-by-byte transfers. Channels [7:5] are hardwired to 16-bit, count by word transfers. Any two of the seven DMA channels can provide support for fast Type-F transfers. The DMA

controller also generates the ISA refresh cycles. The DMA controller supports two separate methods for handling legacy DMA via the PCI bus:

- **PC/PCI protocol**: Allows PCI-based peripherals to initiate DMA cycles by encoding requests and grants via three PC/PCI ~REQ/~GNT pairs.
- **Distributed DMA**: Allows PCI devices to receive reads and writes to 82C37 registers. The DMA controller also provides support for the serial interrupt scheme typically associated with Distributed DMA.

- **Timer/counters**: The timer/counter block contains three counters that are equivalent in function to those found in one 82C54 programmable interval timer. The timer/counter block provides the system timer function, refresh request, and speaker tone. The 14.31818 MHz oscillator input provides the clock source for these three counters.
- **Interrupt controller**: The ISA-compatible interrupt controller incorporates the functionality of two 82C59 interrupt controllers. Cascading of the interrupt controllers provides 14 external and two internal interrupts. Additionally, PIIX4E supports a serial interrupt scheme.

All registers in these modules can be read and restored. This allows saving and restoring the system state after removing power and restoring it to the circuit.

Enhanced USB controller

The PIIX4E USB controller provides enhanced support for the Universal Host Controller Interface (UHCI). This includes support that allows legacy software to use a USB-based keyboard and mouse. When enabled, the USB controller uses PIRQD. The USB ports are routed to CompactPCI Backplane connector J3.

SMBus interface and implementation

The PIIX4E SMBus interface allows the CPU to communicate via SMBus to other peripherals. The SMBus is a subset of the I2C protocol.

RTC

The real-time clock (RTC):

- Keeps track of time of day by counting seconds, minutes, hours, days, day of the week, date, month, and year with leap year compensation. Daylight savings compensation is optional.
- Provides a time-of-day alarm with once a second to once a month range, periodic rates of 122 ms to 500 ms, and end-of-update cycle notification.
- Stores system data including during a system power-down via battery backed-up operation.

The PIIX4E RTC is Motorola MC146818 RTC compatible with 256 bytes battery backed RAM in two banks:

- **Standard bank**: Contains 10 bytes indicating time and date information, 4 bytes used as four Control Register (A,B,C,D), and 114 bytes used as general purpose RAM.

- **Extended bank:** Contains 128 bytes used as general purpose RAM. Time, calendar, and alarm can be represented in either binary or BCD format. The format is determined by bit 2 of Control Register B. The hour is represented in 12- or 24-hour format, and the format is selected by bit 1 of Control Register B.

  When changing the format, the time registers must be reinitialized to the corresponding data format.

  The RTC operates on a 32.768 kHz crystal and a separate battery.

The RTC also supports two lockable memory ranges. Configuration space allows locking two 8 byte ranges to read and write accesses by setting specific bits. This prevents unauthorized reading of passwords or other system security information.

The RTC (as supported by the BIOS) is Y2K compliant.

Power management logic

The PIIX4E provides full support for the Advanced Configuration and Power Interface (ACPI) Specification. For detailed information, see the *82371AB PCI-to-ISA / IDE Xcelerator (PIIX4)* specification available from Intel's web page.

Intel 21154 PCI-PCI bridge

Do not disable this clock via the Chip Control Register (bit-11 at CD:CCh) in the 21554 PCI Configuration space.
The Secondary clock out from the 21554 is used by the CPU board. This clock output is enabled at POR by an external strapping option.

The 21554 performs PCI bridging functions for embedded and intelligent I/O applications. The 21554 is a non-transparent PCI-to-PCI bridge that acts as a gateway to an intelligent subsystem. The 21554 functions as a bridge between two PCI processor domains, the host domain and the local domain. Special features of the 21554 include:

- Support for independent primary and secondary PCI clocks
- Independent primary and secondary address spaces
- Address translation between the primary (host) and secondary (local) PCI buses (domains).

The 21554 creates a configuration barrier between the two PCI domains. Standard hierarchical PCI configuration methods using Type 1 configuration transactions cannot be used to access the configuration space of devices on the opposite side of the 21554. The 21554 uses a Type 0 configuration header, which presents the entire subsystem as a single "device" to the host processor.

The 21554 forwards transactions between the primary and secondary PCI buses as does a transparent PCI-to-PCI bridge. In contrast to a transparent PCI-to-PCI bridge, however, the 21554 can translate the address of a forwarded transaction from a system address to a local address, or vice versa. This mechanism allows the

21554 to hide subsystem resources from the host processor and to resolve any resource conflicts that may exist between the host and local subsystems.

The 21554 configuration space is divided into these parts:

- Primary interface configuration registers
- Secondary interface configuration registers
- Device-specific configuration registers

Both the primary and secondary interface configuration headers contain the 64-byte Type 0 configuration header that corresponds to that interface. The device-specific configuration registers are specific to the 21554, some of which apply to the primary interface, others to the secondary interface, and some to other 21554 functions.

Both the primary and secondary interfaces support access to the 21554 configuration registers. The serial ROM attached to the 21554 can pre-load some configuration parameters prior to initialization. This enables vendor-specific configuration parameters to load into the 21554 configuration registers, replacing default values specified by Intel. These vendor-specific parameters load before configuration of the 21554 by the local and/or host processors. Pre-loadable parameters include address mapping requirements, Class Code, Subsystem ID and Subsystem Vendor ID, and others. During the preload operation, all accesses to the 21554 configuration registers receive a target retry.

CPU board reset on host command over CompactPCI

The CPU board may be reset by the System Slot CPU. This is achieved by having the Host write to the Reset Control Register in the Drawbridge's PCI configuration space. The secondary reset out from the Drawbridge will force a hard reset of the CPU board. There are two bits the host can use, bit-0 and bit-1. If it is desired to hold the CPU board in rest the host should write a value of one to D8. The board will then stay in reset until the host clears that bit. If it is desired to only reset the board, the host should set D8 to a value of two. This will reset the board and is self clearing, requiring no further action by the host.

(21554 PCI-to-PCI Bridge for Embedded Applications User's Manual, page 7-39)

Reset Control register

Primary byte offset: DB:D8h

Secondary byte offset: DB:D8h

Bit	Name	R/W	Description
0	Secondary Reset	R/(WP)	Secondary bus reset. When 0: The 21554 deasserts s_rst_l. This bit must be cleared by a configuration write in the case when it is set by a configuration write. Otherwise, it clears automatically after 100 msec or when p_rst_l deasserts. When 1: The 21554 asserts s_rst_l. This bit is set automatically when the Chip Reset bit is written with a 1 or when p_rst_l is asserted, or is set with aconfiguration write. Reset value: 0 (disabled). 1 Chip Reset R/(WP)
1	Chip Reset	R/(WP)	Chip reset control. When 1: Causes the 21554 to perform a chip reset and to assert s_rst_l. Data buffers, configuration registers, and both the primary and secondary interfaces are reset to their initial state. The 21554 clears this bit once chip reset is complete. Reset value: 0

3.3V PMC site

The CPU Board supports a two PMC sites on the system board. Each PMC site uses three PMC connectors. Two connectors (denoted as J11 and J12 on slot A and J21 and J22 on slot B) carry the 32-bit PCI signals.The third connector (denoted as J14 on slot A and J24 on slot B) routes the PMC I/O signals. The I/O signals from slot A are routed to cPCI connector J5 while the I/O signals from slot B are routed to CompactPCI connector J3.

PMC A has a four 100ohm differential pairs that go to the J5 connector. These signal are paired as follows:

Pair 1:	PMCA	25 and 15
Pair 2:	PMCA	29 and 28
Pair 3:	PMCA	19 and 18
Pair 4:	PMCA	26 and 22

Both PMC sites provide power for 3.3V, 5V, 12V and –12V. The PCI interface uses 3.3V signaling and is keyed for 3.3V operation.

CompactPCI Hot Swap

The CPU Board can interrupt the local processor with IRQ10 on a hot swap switch event. The hot swap switch is indirectly connected to IRQ10. If enabled, this IRQ line will be asserted as long as the ejector handles are open. The local processes may use this interrupt to perform and orderly shut down. For details of software control for the hot swap interrupt, see Special features on page 56.

PCI bus implementation and devices

The CPU board implements a +3.3V, 32-bit local PCI bus. The bus runs at 33 MHz and has the 443BX as the central resource. The local PCI bus has these peripherals connected to it:

- Host/PCI bus bridge (described in 443BX host bridge on page 47)
- PCI/ISA bridge
- Two Ethernet controllers
- PCI-to-PCI bridge chip
- Two PMC sites

Table 4-2 describes the on-board devices PCI configuration space. The IDSEL pin on each device connects to the listed PCI address pin. To select the configuration registers of a given device, a PCI Configuration Space access must be made with the device's corresponding IDSEL address bit set.

Table 4-2. PCI device configuration

Peripheral	IDSEL	Device	Function	I~INTx	Arbitration signals REQ/GNT
Intel BX443 North Bridge PCI	AD11	0	0	–	–
Intel BX443 North Bridge AGP[1]	*AD12*	*1*	*0*	–	–
Intel 82559 Ethernet 1	AD13	2	0	C	0
Intel 82559 Ethernet 2	AD14	3	0	D	1
PMC site A	A15	4	0	A,B,C,D	3
PMC site B	A16	5	0	A,B,C,D	4
Intel 21154 PCI-PCI bridge	AD19	8	0	A	2
PCI/ISA bus bridge (PIIX4E)	AD19	10			~PHLD/~PHLDA
PCI/ISA bridge			0	–	directly from the BX443
IDE interface			1	–	
USB (if enabled)			2		

[1] This device is disabled, but consumes a logical device space as indicated.

PCI Ethernet controllers

Two Intel 82559 fast Ethernet controllers incorporate internal MAC and PHY interfaces, providing support for 10/100BASE-T connections. The two Ethernet controllers route their RX/TX pairs to CompactPCI Backplane connector J5. One of the controllers also routes its RX/TX pair to an RJ45 connector on the front

panel. For the Ethernet channel routed to both the front panel and J5 there is an auto detect circuit, which routes the signal to the appropriate RJ45. Once the auto-detect circuit has routed the signal, only a loss of link can cause the auto-detect circuit to re-activated.

The Ethernet controllers use PCI interrupts and REQ/GNT signals shown in Table 4-2. PCI Device Configuration. The 82559s have a standard PCI 2.1 compliant configuration space allowing easy system identification and configuration.

The PHY enables direct connection to the network media using a 25 MHz, 25 ppm crystal to derive its internal transmit digital clocks. In 100BASE-TX mode, the analog subsection of the PHY does the following:

- Takes received analog data from the RD pair and converts it into a digital 125 Mbps stream, recovering both clock and data.
- Converts a digital 125 Mbps stream into the proper format and drive it through the TD pair into the physical medium.

The 82559 defines a maximum distance of 25.4 mm between itself and the associated magnetics and another 25.4 mm distance between the magnetics and the RJ45.

The Intel specification for distance from the PHY to the magnetics must be violated in this design since the magnetics reside on the RTM near the RJ45.

Ejector handle switch

Two ejector handles with built-in switches are provided on the front panel of the CPU Board. Releasing the ejector handles from the lock position to the eject position sets a switch which is connected to the LID input of the PIIX4E. When asserted, the LID input sets a bit in the general purpose status register (see the PIIX4E datasheet for more details). Assertion of this bit can generate an SMI if this response is enabled.

The BIOS does not enable the SMI feature. The OS/application software must enable the SMI feature and have a SMI handler in place to respond to this type of event.

Battery

The 3.0V lithium battery supplied with the EPC-3305 and mounted on the CPU board is a Renata CR2032 “coin cell” or equivalent. Should the battery fail, you may obtain and install a replacement. For information about replacing the battery, see *Replacing the battery on page 8*.

Write down all CMOS setup parameters while the battery is still good, or save them using the options available on the BIOS configuration’s CMOS Save and Restore sub-menu.

The battery powers the CMOS RAM and TOD clock when system power is not present. If system power is present, the +5V voltage also powers the CMOS RAM and TOD clock. This is done with the +3.3V isolation diodes, so that either the

onboard battery or the +3.3V power supply voltage can supply power and neither power source affects the other.

The battery has an expected battery life of 2 years on continuous battery power. In a system that is powered on much of the time and where the ambient power-off temperature is less than 60°C, the battery is estimated to have a life of 10 years.

Super I/O

The National PC87309 SuperI/O controller provides a floppy controller, parallel port, serial port, and a keyboard and mouse controller. It interfaces through the ISA bus and requires external decoding of the high-orer address bits for full 16-bit decoding required by PC95/PC97. It uses a 48MHz clock. This design does not use the chip's parallel port features.

Floppy disk

The floppy controller device resides inside the Super I/O chip and is accessed at the standard PC I/O addresses 3F0–3F7h. Floppy interrupts are signaled on IRQ6.

The floppy signals connect to a header on the CPU board allowing ribbon cable connection of a floppy disk drive. Power is provided to the floppy disk drive via a jumper that allows user selection of powered or non-powered connection.

COM ports

The Super I/O includes two RS-232 compatible serial ports. The Super I/O chip includes 16C550 compatible UARTs with separate send and receive 16-byte FIFOs.

- **COM 1**: Configured at I/O addresses 3F8–3FFh and uses IRQ4, COM 1 signals pass through a RS232 transceiver IC and out the front panel via an RJ45 connector. This transceiver's I/O pins meet the electrical portion of the EIA/TIA-232-E specification as well as EIA/TIA-574-E. COM 1 signals also go out CompactPCI Backplane connector J3.

  Do not use both the front and rear connections to COM 1 at the same time. Only one connection to COM 1 may be used at a time.

- **COM 2**: Configured at I/O addresses 2F8–2FFh and uses IRQ3, COM 2 signals pass through a RS232 transceiver IC and out Backplane connector J3. The COM 2 connector can only be accessed by the use of an RTM.

The Super I/O chip allows relocation of these ports to the COM 3 and/or COM 4 standard I/O addresses, respectively. If so configured, COM 3 and COM 4 use I/O addresses 3E8–3EFh and 2E8–2EFh respectively. If not needed, you can disable these serial ports in the BIOS setup program's I/O Device Configuration sub-menu to free the I/O address and interrupt for usage by other expansion products.

Keyboard and mouse controller

The Super I/O provides an integrated keyboard and mouse controller. The Super I/O keyboard controller, located at I/O locations 60–64h, is functionally equivalent to the industry standard 8042A controller.

The keyboard interrupt connects to IRQ1. If enabled, the mouse interrupt utilizes IRQ12. The keyboard and mouse connectors are located on the RTM.

Special features

The EPC-3305 includes these features:

- Watchdog timer
- Three reset modes
- Software access to CompactPCI Geographical Address and ~SYSEN pin
- Interrupt routing to allow all CompactPCI interrupts to be routed to the local PIIX4E
- Multiple BIOS flash pages
- Local interrupt on a Hot Swap event

The CPU board uses a CLPD to implement the unique features.

CPLD ISA interface

The CPLD provides an ISA interface to control feature parameters. The default values of the CPLD registers shown are for a Power on Reset (POR).

The ISA interface uses an I/O address each for data, an index register, and the kick watchdog bit. The base address is 0x0180 and is implemented with ~PCS1 of the PIIX4. If ~PCS1 is asserted, data can be written into either register or read from the data register. Note that the index register is write-only. The PIIX ~PCS1 is configured by the BIOS to decode an I/O range from 0180 to 018F. The register offsets are defined as follows:

Table 4-3. CPLD I/O ports

Name	Base (Set by ~PCS1 in the PIIX)	Default	Function
Index	0x0185	0x00	Points to register inside CPLD for reading or writing
Kickdog	0x0186	N/A	Kicks watchdog to prevent a watchdog timeout
Data	0x0187	0x00	Data to be read or written

Table 4-4. CPLD indexes for function registers

Name	Index value	R/W	Function
Reserved	0x00	—	—
Watchdog control	0x01	R/W	Kick watchdog, enable watchdog
Unused	0x02	N/A	None
Front panel LED	0x03	—	Controls R/G LED on front panel

Table 4-4. CPLD indexes for function registers

Name	Index value	R/W	Function
Reset event register	0x04	R	Identifies reset source
Local interrupt enables	0x05	R/W	Enables/disables various interrupts from the CPLD
Reset control	0x06	R/W	Assigns Hard or Soft reset attribute to various reset sources
Unused	0x07	N/A	None
BIOS control	0x08	R/W	Selects which BIOS banks are active, enables/diables WP.
CompactPCI features	0x09	R/ W bit-5 only	CompactPCI geographical addres, ~SYSGEN, CompactPCI interrupt route, RTM present.
Unused	0x0A–0xFE	—	—
CPLD revision	0xFF	R	Indicates PLD revision

Software must first write to the index register before reading or writing to the data register.

Reset controller

The EPC-3305 implements three types of resets: POR, Hard Reset, and Soft Reset. A POR and Hard Reset are identical: all registers are set to their initial value (with the exception of the Reset Event Register which retains the source of the hard reset). A soft reset only resets the processor through an INIT. The INIT, in conjunction with the BIOS, preserves memory contents on a soft reset.

There are two stages to a soft reset:

1. The CPU is issued an NMI or IRQ10 (if enabled) then, 62 ms after the NMI, an INIT is issued to the CPU.
2. A timer starts in the CPLD. If the BIOS fails to write to the KickDog register after four seconds during boot, the timer times out and produces a hard reset. This prevents a hang condition if the soft reset fails.

The CPU board can also be reset individually by the host CPU through CompactPCI configuration space.

Reset control

Each of the reset sources can be independently configured to generate a soft or a hard reset. This attribute is controlled by the Assign Reset Type register. The default

(POR) value is zero, indication hard reset. A value of one causes that reset source to generate a soft reset sequence.

Table 4-5. Reset control register

R/W	Index	Default	D7	D6	D5	D4	D3	D2	D1	D0
R/W	0x05	0x00	—	—	—	—	FP_RST	RTM_RST	—	WD_RST

FP_RST Selects one of these hard or soft reset attributes for the Front Panel reset switch:

0 (zero) Hard reset.

1 Soft reset.

RTM_RST Selects one of these hard or soft reset attribute for the RTM reset switch:

0 (zero) Hard reset.

1 Soft reset.

WD_RST Selects one of these hard or soft reset attribute for the Watchdog timer:

0 (zero) Hard reset.

1 Soft reset.

The Reset Event register determines the source of the last reset.

Table 4-6. Reset event register

R/W	Index	Default	D7	D6	D5	D4	D3	D2	D1	D0
R/W	0x04	0x20	FAIL_SOFT	—	POR	—	FP	RTM	cPCI	WD

FAIL_SOFT

Indicates that the soft reset attempt failed, and was therefore followed by a hard reset.

POR Identifies the last reset as a Power on Reset, active high

FP Identifies the last reset as from the Front Panel Switch, active high

RTM Indicates that the last reset was from the RTM, active high

WD Indicates that the last reset was from the Watchdog timer, active high

Watchdog timer

The watchdog timer is a counter that can be programmed to time out and produce a hard or soft reset. The timeout has six selections ranging from 0.5s to 4 minutes. The type of reset generated is selected by the Reset Control Register, bit 0. Application software can prevent the watchdog event from occurring by a dummy write (data written is irrelevant) to the Kickdog Register.

When exiting a CPU reset condition, the BIOS or application software can check the Reset Event Register to determine the source of the reset.

Table 4-7. Watchdog control register

R/W	Index	Default	D7	D6	D5	D4	D3	D2	D1	D0
R/W	0x01	0x00	WD_EN	—	—	—	FP	SEL2	SEL1	SEL0

WD_EN Enables watchdog timer.

0 (zero) Disables the watchdog timer.

1 Enables the watchdog timer.

SEL0, 1, 2 Selects watchdog timeout value:

Timeout	SEL2	SEL1	SEL0
0.5s	0	0	0
1s	0	0	1
8s	0	1	0
32s	0	1	1
64s (1 min)	1	0	0
258s (4min)	1	0	1
rsvd	1	1	0
rsvd	1	1	1

Front panel red/green LED

The CPU has one dual-color, user-controllable LED on the front panel. The colors are red and green. A one written to this register illuminates the LED. Both colors can be illuminated simultaneously.

Table 4-8. Front panel user LED control

R/W	Index	Default	D7	D6	D5	D4	D3	D2	D1	D0
R/W	0x03	0x00	—	—	—	—	—	—	G_LED	R_LED

G_LED Determines the green LED's state:

0 (zero) The LED remains unlit.

1 Illuminates the LED.

R_LED Determines the red LED's state:

0 (zero) The LED remains unlit.

1 Illuminates the LED.

Local interrupt control register

The EPC205 Special Features CPLD controls several interrupts and the CPU INIT signal. The Local Interrupt Control register enables or disables these signals. The

next table defines the bit position to control these features. All bits are active high, with the exception of the ENUM bit.

Table 4-9. Local interrupt enables

R/W	Index	Default	D7	D6	D5	D4	D3	D2	D1	D0
R/W	0x05	0x04	—	IRQ7	—	IRQ 11	—	INIT	IRQ 10	NMI

IRQ_7 Enables an interrupt on ENUM from the 21554 drawbridge or CompactPCI backplane. If set to one, an interrupt occurs when ENUM asserts.

IRQ_11 Enables IRQ 11 when the CPU ejector latch opens. If set to one, IRQ 11 asserts as long as the latch remains in the open position.

INIT Enables an INIT on a soft reset. If set to one, the INIT line to the processor is strobed on a soft reset. You can use these values:

- Disabled — A reset source programmed to generate a soft reset does not reset (INIT) the processor.
- Enabled — (POR default) Resets (INIT) the processor. Use this to produce a timed interrupt with no processor reset.

IRQ_10 Enables IRQ_10 on a soft reset. If set to one, IRQ 10 asserts for 63 ms before the INIT signal to the processor is strobed.

NMI Enables an NMI on a soft reset. If set to one, the NMI line asserts for 63 ms before the INIT signal to the processor is strobed.

CompactPCI features register

The CompactPCI Features register provides a means for software to read:

- CompactPCI geographic address
- CompactPCI SYSEN bit
- RTM present

This register allows software to route CompactPCI interrupts to the local processor. Note that the CompactPCI backplanes rotate the interrupts from slot to slot. It is up to software to de-rotate (if required) the source of the interrupts. Slot position can be determined by reading the Geographical Address from the CPLD.

Plug the EPC-3305 into a system slot only if the system is specifically designed around the EPC-3305 feature set. The EPC-3305 is not designed as a system card.

Table 4-10. CompactPCI features register

R/W	Index	D7	D6	D5	D4	D3	D2	D1	D0
R (D5 R/W)	0x09	SYSEN	#RTM _P	INTS_ IN	GA4	GA3	GA2	GA1	GA0

SYSEN The SYSEN signal from the CompactPCI backplane. This is an active low signal. If zero it indicated that the CPU card is plugged into the System

Slot of the CompactPCI chassis.

RTM_P — Indicates that a Rear Transition Module is installed. It is an active low signal. If zero it indicates that the RTM for the CPU is present in the system.

INTS_IN — Routes CompactPCI interrupts to the processor. If set to one the CPU receives ~INTA , ~INTB, ~INTC, and ~INTD from the CompactPCI backplane.

GA4:0 — The CompactPCI Geographical Address pins from the CompactPCI backplane. They are used to determined which CompactPCI slot the CPU is in.

Table 4-11. CompactPCI geographical address

Slot number	GA4	GA3	GA2	GA1	GA0
0	0	0	0	0	0
1	0	0	0	0	1
2	0	0	0	1	0
3	0	0	0	1	1
4	0	0	1	0	0
5	0	0	1	0	1
6	0	0	1	1	0
7	0	0	1	1	1
8	0	1	0	0	0
9	0	1	0	0	1
10	0	1	0	1	0
11	0	1	0	1	1
12	0	1	1	0	0
13	0	1	1	0	1
14	0	1	1	1	0
15	0	1	1	1	1

BIOS bank switching

The CPU Board has eight pages of Flash at the top of memory. Each page is 512k bytes, in an 8-bit format. One of the pages, the PC BIOS page, has a boot block architecture. The remaining seven pages are made from an Intel Strata Flash. The BIOS control Register in the CPLD controls which page is active. On initial power-up, the BIOS Control Register will be set to point at the top of the boot block flash, where the PC BIOS resides. At some time later, software can select one of the other seven banks to execute from. The BIOS Control Register will be reset on all reset

types (hard, Soft, and POR). Figure 4-2 shows the memory overlay at the top of memory space.

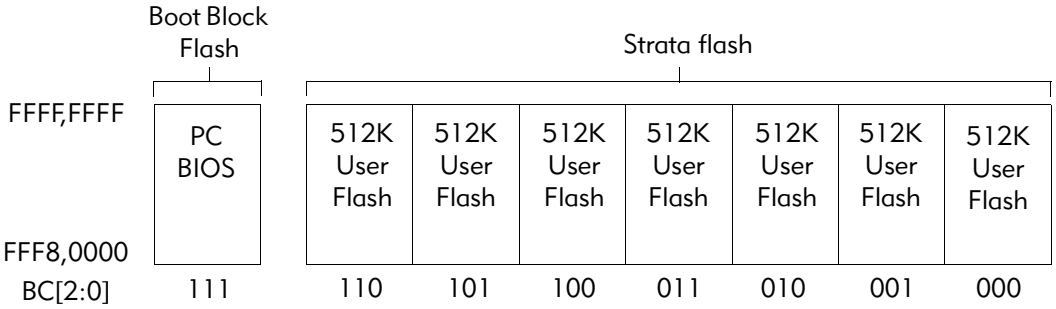


Figure 4-2. BIOS paging

Each Flash device has its own write protect mechanism. The Boot Block of the PC BIOS can only be re-written if the write-protect jumper is installed on the board. The Strata Flash part is write protected by bit-7 in the BIOS Control Register. A one in this position (D7) disables write protection of the device. disabled. The next table shows the page select mapping.

Table 4-12. BIOS control register

R/W	Index	Default	D7	D6	D5	D4	D3	D2	D1	D0
R/W	0x08	0x00	WP	—	—	—	—	BC2	BC1	BC0

WP — Write-protects user Flash banks (Not the PC BIOS Boot block). If set to zero the user Flash banks are write protected. When set to one the user my update any of the seven user banks of the Flash.

BC2:0 — Selects one of eight Flash banks.

Table 4-13. Flash banks

BC2	BC1	BC0	Bank
1	1	1	PC BIOS (POR default)
1	1	0	512k user space
1	0	1	512k user space
1	0	0	512k user space
0	1	1	512k user space
0	1	0	512k user space
0	0	1	512k user space
0	0	0	512k user space

Power monitoring, consumption, and reset generation

The CPU board has power conditioning, monitors for board input voltages, and generates a local reset. The power conditioning provides live insertion and removal without damage. Monitoring of input voltages ensures operation within a legal

voltage range. The global system reset provides a clean system restart whenever the system becomes unstable due to power.

A Linear Technology 1643L Hot Swap power controller provides controlled powering up and down of the CPU board. With its internal FETs for ±12V and external FET gate control for 3.3V and 5V, the power controller ramps power up and down for the CPU board upon insertion or extraction. It also provides microsecond rate response to over current conditions that may exist on any of these voltages.

A precision voltage reference in conjunction with a voltage comparator provides monitoring of 3.3V, 5V, and the EMC2 module power good signal. All devices are kept in reset for at least 100ms after all voltages are stable.

The CPU board will properly operate with power voltages that comply with the tolerances in the *PICMG 2.1 Hot Swap Revision 1.0* specification. The input DC power levels pass through hot swap controller circuitry reducing the amplitude of these signals slightly, based on how much current is being drawn. The 5V signal passes through a single sense resistor and FET, while the 3.3V signal passes through parallel sense resistors and FET switches. Each sense resistor is 7 milliohms while the FET resistance is 13.5 milliohms.

Using this circuitry with 5A, the voltage drop for 5V due to the hot swap circuitry is 103mV. Similarly, with 10A, the voltage drop for 3.3V is 138mV. The +12V and –12V signals only pass through the hot swap power controller creating a 600mV drop for +12V (at 500mA) and a 250mV drop for –12V (at 100mA).

The following table represents a compilation of power estimates. It represents worst case total power consumption.

Table 4-14. Power estimates

Voltage	Maximum power, watts
3.3V	12W
5V	11S
12V	1W
–12V	0[1]
Total power:	24W

[1] The only power consumed by –12V on the CPU board is in the loss due to hot swap controller switching.

A Chipset and I/O map

This appendix contains the port I/O addresses for the address-mapped devices in the EPC-3305. As is standard for the ISA bus, the A[15:0] bits are decoded for the 0200h–03FFh range and A[15] and A[9:0] are decoded for addresses above 8000h.

Table A-1. First (8-bit) DMA controller

I/O Addr	Functional group	R/W	Usage
0000	DMA Controller 1	R/W	DMA 1 channel 0 address
0001		R/W	DMA 1 channel 0 count
0002		R/W	DMA 1 channel 1 address
0003		R/W	DMA 1 channel 1 count
0004		R/W	DMA 1 channel 2 address
0005		R/W	DMA 1 channel 2 count
0006		R/W	DMA 1 channel 3 address
0007		R/W	DMA 1 channel 3 count
0008		R W	DMA 1 command DMA 1 status
0009		W	DMA 1 write request
000A		W	DMA 1 single mask bit
000B		W	DMA 1 Write mode
000C		W	DMA 1 clear byte pointer
000D		W	DMA 1 master clear
000E		W	DMA 1 clear mask
000F		R/W	DMA 1 read/write all mask register bits

Table A-2. First interrupt controller

I/O Addr	Functional group	R/W	Usage
0020	Interrupt Controller 1	R/W	INT 1 control
0021		R/W	INT 1 mask

Table A-3. PCI arbiter control

I/O Addr	Functional group	R/W	Usage
0022	PCI arbiter control	R/W	433BX PCI arbiter control

Table A-4. Time/counter functions

I/O Addr	Functional group	R/W	Usage
0040	Timer/counter	R/W	Counter 0 count
0041		R/W	Counter 1 count
0042		R/W	Counter 2 count
0043		W	Command mode

Table A-5. Keyboard controller

I/O Addr	Functional group	R/W	Usage
0060	Keyboard controller	R/W R	Data I/O register Reset Xbus IRQ12/M and IRQ1
0061	NMI status and control	R W	NMI status NMI control
0064	Keyboard controller	R W	Status register Command register

Table A-6. Real-time clock

I/O Addr	Functional group	R/W	Usage	
0070	Real-time clock, NMI	W	RTC index register = bits 6–0 NMI enable = bit 7	
0071		R/W	RTC data register	
			0	seconds
			1	seconds alarm
			2	minutes
			3	minutes alarm
			4	hours
			5	hours alarm
			6	day of week
			7	date of month
			8	month
			9	year
			A	status A
			B	status B
			C	status C
			D	status D
			E...3F	NVRAM

Table A-7. POST checkpoint

I/O Addr	Functional group	R/W	Usage
0080	POST checkpoint	W	Phoenix BIOS status information

Table A-8. DMA page registers: Intel EX 82371EB of PC/AT

I/O Addr	Functional group	R/W	Usage
0080	DMA	R	DMA page (reserved)
0081		R/W	DMA channel 2 page register
0082		R/W	DMA channel 3 page register
0083		R/W	DMA channel 1 page register
0084		R/W	DMA page (reserved)
0085		R/W	DMA page (reserved)
0086		R/W	DMA page (reserved)
0087		R/W	DMA channel 0 page register
0089		R/W	DMA channel 6 page register
008A		R/W	DMA channel 7 page register
008B		R/W	DMA channel 5 page register
008C		R/W	DMA page (reserved)
008D		R/W	DMA page (reserved)
008E		R/W	DMA page (reserved)
008F		R/W	DMA low page register refresh

Table A-9. Port A

I/O Addr	Functional group	R/W	Usage
0092	Port A	R/W	Fast A20 and reset control

Table A-10. VGA controller

I/O Addr	Functional group	R/W	Usage
x094	VGA controller	R/W	POS102 access control

Table A-11. Second interrupt controller

I/O Addr	Functional group	R/W	Usage
00A0	Interrupt controller 2	R/W	INT 2 control
00A1		R/W	INT 2 mask

Table A-12. Power management controller

I/O Addr	Functional group	R/W	Usage
00B2	Power management	R/W	Control
00B3		R/W	Status

Table A-13. Second (16-bit) DMA controller

I/O Addr	Functional group	R/W	Usage
00C0	DMA controller 2	R/W	DMA 2 channel 4 address
00C2		R/W	DMA 2 channel 4 count
00C4		R/W	DMA 2 channel 5 address
00C6		R/W	DMA 2 channel 5 count
00C8		R/W	DMA 2 channel 6 address
00CA		R/W	DMA 2 channel 6 count
00CC		R/W	DMA 2 channel 7 address
00CE		R/W	DMA 2 channel 7 count
00D0		R W	DMA 2 status DMA 2 command
00D2		W	DMA 2 write request
00D4		W	DMA 2 write single mask bit
00D6		W	DMA 2 write mode
00D8		W	DMA 2 clear byte pointer
00DA		W	DMA 2 master clear
00DC		W	DMA 2 clear mask
00DE		R/W	DMA 2 read/write all register mask bits

Table A-14. Coprocessor interface

I/O Addr	Functional group	R/W	Usage
00F0	Coprocessor	W	Coprocessor error

Table A-15. VGA controller

I/O Addr	Functional group	R/W	Usage
x102	VGA controller	R/W	POS102 register

Table A-16. Secondary IDE

I/O Addr	Functional group	R/W	Usage
0170	Secondary IDE	R/W	Data
0171		R/W	Error/features
0172		R/W	Sector count
0173		R/W	Sector number
0174		R/W	Cylinder low
0175		R/W	Cylinder high
0176		R/W	Drive/head
0177		R/W	Status/command

Table A-17. CPLD

I/O Addr	Functional group	R/W	Usage
0180–018F	CPLD	R/W	See *Table 4-3*, *CPLD I/O ports* on page 56.

Table A-18. Primary IDE

I/O Addr	Functional group	R/W	Usage
01F0	Primary IDE	R/W	Data
01F1		R/W	Error/features
01F2		R/W	Sector count
01F3		R/W	Sector number
01F4		R/W	Cylinder Low
01F5		R/W	Cylinder high
01F6		R/W	Drive/head
01F7		R/W	Status/command

Table A-19. ISA Plug and Play

I/O Addr	Functional group	R/W	Usage
x279	ISA Plug and Play	R/W	(Undocumented source?)

Table A-20. EGA

I/O Addr	Functional group	R/W	Usage
x2B0–x2DF	EGA	R/W	(For compatibility reasons)

Table A-21. Serial I/O (COM 4) port

I/O Addr	Functional group	R/W	Usage
02E8–02EF	COM 4 serial port	R/W	COM 2 moved to COM 4 (see register description at COM 2)

Table A-22. Serial I/O (COM 2) port

I/O Addr	Functional group	R/W	Usage
x2F8	COM 2 serial port	R W R/W	Receiver buffer Transmitter buffer Baud rate divisor latch (LSB)
x2F9		R/W R/W	Interrupt enable register Baud rate divisor latch (MSB)
x2FA		R W	Interrupt ID register FIFO control register
x2FB		R/W	Line control register

Table A-22. Serial I/O (COM 2) port

I/O Addr	Functional group	R/W	Usage
x2FC		R/W	Modem control register
x2FD		R	Line status register
x2FE		R/W	Modem status register

Table A-23. Secondary IDE

I/O Addr	Functional group	R/W	Usage
0374	Secondary IDE		Reserved
0375			Reserved
0376		R/W	Alt status/device control

Table A-24. Parallel I/O (LPT1) port

I/O Addr	Functional group	R/W	Usage
x378	LPT1 parallel port	R/W	Printer data register
x379		R W	Printer status register Printer status register (EPP only)
x37A		R/W	Printer control register

Table A-25. EPP port

I/O Addr	Functional group	R/W	Usage
x37B	EPP	R/W	EPP address port
x37C		R/W	EPP data port 0
x37D		R/W	EPP data port 1
x37E		R/W	EPP data port 2
x37F		R/W	EPP data port 3

Table A-26. VGA controller

I/O Addr	Functional group	R/W	Usage
x3B4	VGA controller	R/W	CRT controller index (mono)
x3B5		R/W	CRT controller data (mono)
x3BA		R W	Input status register 1 (mono) Feature control output (mono)

Table A-27. EGA controller

I/O Addr	Functional group	R/W	Usage
x3C0	EGA controller	W	Attribute controller index/data
x3C1		R	Attribute controller index/data
x3C2		R W	Input status register 0 Miscellaneous output
x3C3		R/W	Motherboard sleep

Table A-27. EGA controller

I/O Addr	Functional group	R/W	Usage
x3C4		R/W	Sequencer index
x3C5		R/W	Sequencer data
x3C6		R/W R/W	Video DAC pixel mask Hidden DAC register
x3C7		R W	DAC state Pixel address read mode
x3C8		R/W	Pixel mask write mode
x3C9		R/W	Pixel data
x3CA		R	Feature control readback
x3CC		R	Miscellaneous output readback
x3CE		R/W	Graphics controller index
x3CF		R/W	Graphics controller data

Table A-28. CGA controller

I/O Addr	Functional group	R/W	Usage
x3D4	CGA controller	R/W	CRT controller index (color)
x3D5		R/W	CRT controller data (color)
x3DA		R W	Input status register 1 (color Feature control (color)

Table A-29. COM 3 serial poert

I/O Addr	Functional group	R/W	Usage
x3E8- x3EF	COM 3 serial port	R/W	COM 1 moved to COM 3 (see register description in *Table A-32, Serial I/O (COM 1) port* on page 72

Table A-30. Floppy disk controller

I/O Addr	Functional group	R/W	Usage
x3F0	Floppy disk controller	R	Status register A
x3F1		R	Status register B
x3F2		R/W	Digital output register
x3F3		R/W	Tape driver register
x3F4		R W	Main status register Data rate select register
x3F5		R/W	Data register

Table A-31. Primary IDE

I/O Addr	Functional group	R/W	Usage
x3F6	Primary IDE	R/W	Alternate status/device control
x3F7		R W	Digital input register Configuration control register

Table A-32. Serial I/O (COM 1) port

I/O Addr	Functional group	R/W	Usage
3F8	COM 1 serial port	R W	Receiver buffer Transmitter buffer
		R/W	Baud rate divisor latch (LSB)
3F9		R/W	Interrupt enable register
		R/W	Baud rate divisor latch (MSB)
3FA		R W	Interrupt ID register FIFO control register
3FB		R/W	Line control register
3FC		R/W	Modem control register
3FD		R	Line status register
3FE		R/W	Modem status register

Table A-33. Interrupts

I/O Addr	Functional group	R/W	Usage
04D0	Interrupts	R/W	INT1 Edge/level control
04D1		R/W	INT2 Edge/level control

Table A-34. ECP registers

I/O Addr	Functional group	R/W	Usage
x778	ECP registers	R/W	FIFO
x779		R/W	Configuration register B
x77A		R/W	Extended control register

Table A-35. ISA Plug and Play

I/O Addr	Functional group	R/W	Usage
0A79	ISA Plug and Play	R/W	Data register

Table A-36. 443BX configuration address register

I/O Addr	Functional group	R/W	Usage
0CF8–0CFB (DWORD only)	443BX configuration address register	R/W	Configuration address register

Table A-37. PIIX4E

I/O Addr	Functional group	R/W	Usage
0CF9	PIIX4E	R/W	Turbo reset control register

Table A-38. 443BX configuration data register

I/O Addr	Functional group	R/W	Usage
0CFC–0CFF (DWORD only)	443BX configuration data register[1]	R/W	Configuration data register

[1] This I/O location is only active when bit 31 of the 443BX configuration address register is 1.

B Interrupts

The following table shows interrupt assignments for the EPC-3305.

Table B-1. Interrupts

Interrupt	Description
IRQ0	System timer (internal PIIX4E connection)
IRQ1	Keyboard controller
IRQ2	Cascade interrupt input (internal PIIX4E connection)
IRQ3	COM 1
IRQ4	COM 2
IRQ5	Unused
IRQ6	Floppy (if enabled)
IRQ7	CompactPCI Hot Swap interrupt (if enabled)
IRQ8	Real time clock
IRQ9	Unused
IRQ10	Hot Swap event
IRQ11	Watchdog first stage timeout
IRQ12	PS/2 mouse (if enabled)
IRQ13	Numeric coprocessor ~FERR (internal PIIX4E connection)
IRQ14	Primary IDE
IRQ15	Unused
NMI	PIIX4E when ~SERR or ~IOCHK is asserted (software controlled)
SMI	Power management
PIRQA	PMC A, PMC B, CompactPCI ~INTA if receive CompactPCI interrupts is enabled
PIRQB	Drawbridge, PMC A, PMC B, CompactPCI ~INTB if receive CompactPCI interrupts is enabled
PIRQC	ENET 1, PMC A, PMC B, CompactPCI ~INTC if receive CompactPCI interrupts is enabled
PIRQD	ENET 2, PMC A, PMC B, CompactPCI ~INTD if receive CompactPCI interrupts is enabled

Note that PIRQ[A–D] correspond directly to the PCI interrupts INT[A–D]. The software may steer these interrupts to any of the 11 interrupts (IRQ[15, 14, 12–9, 7–3]) using the Interrupt Route Control register.

C Connectors

This appendix details the connectors on the EPC-3305 CPU board and gives the signal pinout of each connector.

For more information about connectors on the RTM, see *Appendix E, Rear Transition module (RTM).*

This product includes the connectors listed in the table below. When reading this file online, you can immediately view information about any connector by placing the mouse cursor over a connector name and clicking.

Connector locations

Figure C-1 shows the locations of the connectors on the EPC-3305's CPU board.

For information about installing peripherals and jumper settings, see *Chapter 2, Configuration and installation*.

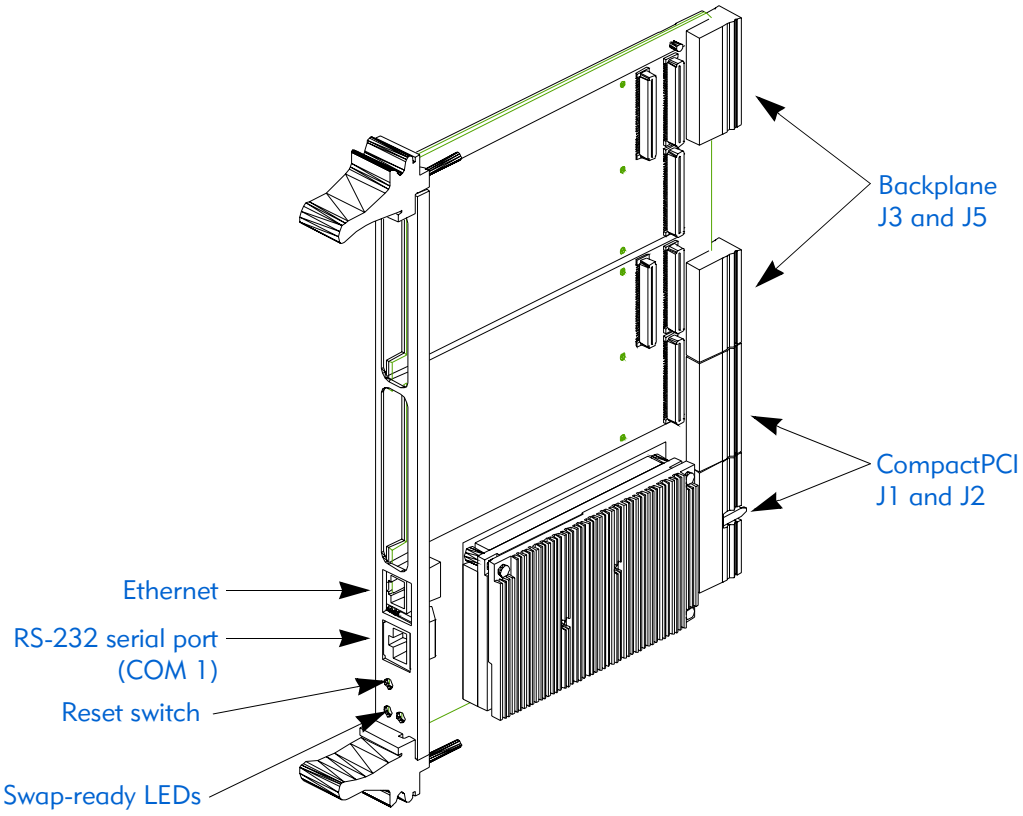


Figure C-1. EPC-3305 Main board: connectors

Backplane J3 and J5

The J3 connector specified in CompactPCI is a female 2mm-pitch 6 column by 19 row right angle Hard Metric (HM) connector. The signals on this connector are proprietary and include the USB port, COM1 and COM2 ports, and PMC socket B I/O signals. The next table shows this connector's pinout.

Table C-1. Backplane connector J3

Pin	A	B	C	D	E	F
1	GND	PMCBIO64	PMCBIO63	PMCBIO62	PMCBIO61	GND
2	PMCBIO60	PMCBIO59	PMCBIO58	PMCBIO57	PMCBIO56	GND
3	PMCBIO55	PMCBIO54	PMCBIO53	PMCBIO52	PMCBIO51	GND
4	PMCBIO50	PMCBIO49	PMCBIO48	PMCBIO47	PMCBIO46	GND
5	PMCBIO45	PMCBIO44	PMCBIO43	PMCBIO42	PMCBIO41	GND
6	PMCBIO40	PMCBIO39	PMCBIO38	PMCBIO37	PMCBIO36	GND
7	PMCBIO35	PMCBIO34	PMCBIO33	PMCBIO32	PMCBIO31	GND
8	PMCBIO30	PMCBIO29	PMCBIO28	PMCBIO27	PMCBIO26	GND
9	PMCBIO25	PMCBIO24	PMCBIO23	PMCBIO22	PMCBIO21	GND
10	PMCBIO20	PMCBIO19	PMCBIO18	PMCBIO17	PMCBIO16	GND
11	PMCBIO15	PMCBIO14	PMCBIO13	PMCBIO12	PMCBIO11	GND
12	PMCBIO10	PMCBIO9	PMCBIO8	PMCBIO7	PMCBIO6	GND
13	PMCBIO5	PMCBIO4	PMCBIO3	PMCBIO2	PMCBIO1	GND
14	+3.3V	+3.3V	+3.3V	+5V	+5V	GND
15	~COM1_RTS	COM1_RXD	~COM2_RTS	COM2_RXD	NC	GND
16	~COM1_CTS	COM1_TXD	~COM2_CTS	COM2_TXD	NC	GND
17	~COM1_DSR	~COM1_DCD	~COM2_DSR	~COM2_DCD	NC	GND
18	~COM1_DTR	COM1_RI	~COM2_DTR	COM2_RI	NC	GND
19	USB1_DAT+	USB1_DAT–	USB0_DAT+	USB0_DAT–	NC	GND

The back plane connector J5 routes both Ethernet channels, keybard and mouse, secondary EIDE, and PMC socket A I/O signals to the CompactPCI backplane. The next table shows this connector's pinout.

Table C-2. Backplane connector J5

Pin	A	B	C	D	E	F
1	~TM_PRNT	PMCAIO64	PMCAIO63	PMCAIO62	PMCAIO61	GND
2	PMCAIO60	PMCAIO59	PMCAIO58	PMCAIO57	PMCAIO56	GND
3	PMCAIO55	PMCAIO54	PMCAIO53	PMCAIO52	PMCAIO51	GND
4	PMCAIO50	PMCAIO49	PMCAIO48	PMCAIO47	PMCAIO46	GND
5	PMCAIO45	PMCAIO44	PMCAIO43	PMCAIO42	PMCAIO41	GND
6	PMCAIO40	PMCAIO39	PMCAIO38	PMCAIO37	PMCAIO36	GND
7	PMCAIO35	PMCAIO34	PMCAIO33	PMCAIO32	PMCAIO31	GND

Table C-2. Backplane connector J5

Pin	A	B	C	D	E	F
8	PMCAIO30	PMCAIO292	PMCAIO28	PMCAIO27	PMCAIO26	GND
9	PMCAIO25	PMCAIO24	PMCAIO23	PMCAIO22	PMCAIO21	GND
10	PMCAIO20	PMCAIO19	PMCAIO18	PMCAIO17	PMCAIO16	GND
11	PMCAIO15	PMCAIO14	PMCAIO13	PMCAIO12	PMCAIO11	GND
12	PMCAIO10	PMCAIO9	PMCAIO8	PMCAIO7	PMCAIO6	GND
13	PMCAIO5	PMCAIO4	PMCAIO3	PMCAIO2	PMCAIO1	GND
14	IDE_D0	IDE_D1	IDE_D2	IDE_D3	IDE_D4	GND
15	IDE_D5	IDE_D6	IDE_D7	IDE_D8	IDE_D9	GND
16	IDE_D10	IDE_D11	IDE_D12	IDE_D13	IDE_D14	GND
17	gnd	AUXVCC	IDE_D15	IDE_A0	IDE_A1	GND
18	ETH1_TX–	ETH1_RX–	AUX_CLK	~IDE_IOR	IDE_A2	GND
19	ETH1_TX+	ETH1_RX+	AUX_DAT	~IDE_IOW	IDE_DREQ	GND
20	GND	AUXVCC	~RESET_IN	IDE_ORDY	~IDE_CS3	GND
21	ETH0_TX–	ETH0_RX–	KBD_CLK	~IDE_DACK	~IDE_CS1	GND
22	ETH0_TX+	ETH0_RX+	KBD_DAT	IDE_INTR	!IDE_RSTDRV	GND

CompactPCI J1 and J2

The CompactPCI J1connector is a female 2mm-pitch 6 column by 25 row right angle Hard Metric (HM) connector with a guide lug in the center. The CompactPCI J2 connector is exactly the same as the J1 connector except there are only 22 rows numbered 1–22, and the center guide lug is eliminated. All these signals have the standard CompactPCI revision 2.1 bus definitions.

Table C-3. Compact PCI J1 connector

Pin	A	B	C	D	E	F[8]
1	5V	–12V	~TRST[13]	+12V	5V	GND
2	TCK[13]	5V	TMS[14]	TDO[14]	TDI[14]	GND
3	~INTA	~INTB	~INTC	5V	~INTD	GND
4	NC	GND	V(I/O)	INTP	INTS	GND
5	BRSV[11]	BRSV[11]	~RST	GND	~GNT	GND
6	~REQ	GND	3.3V	CLK	AD[31]	GND
7	AD[30]	AD[29]	AD[28]	GND	AD[27]	GND
8	AD[26]	GND	V(I/O)	AD[25]	AD[24]	GND
9	~C/BE[3]	IDSEL	AD[23]	GND	AD[22]	GND
10	AD[21]	GND	3.3V	AD[20]	AD[19]	GND
11	AD[18]	AD[17]	AD[16]	GND	C/~BE[2]	GND
12–14			Key Area			
15	3.3V	~FRAME	~IRDY	~BD_SEL[7]	~TRDY	GND

Table C-3. Compact PCI J1 connector

Pin	A	B	C	D	E	F[8]
16	~DEVSEL	GND	V(I/O)[2][6]	~STOP	~LOCK	GND
17	3.3V	NC	NC	GND	~PERR	GND
18	~SERR	GND	3.3V	PAR	C/~BE[1]	GND
19	3.3V	AD[15]	AD[14]	GND	AD[13]	GND
20	AD[12]	GND	V(I/O)[2]	AD[11]	AD[10]	GND
21	3.3V	AD[9]	AD[8]	M66EN[5]	C/~BE[0]	GND
22	AD[7]	GND	3.3V	AD[6]	AD[5]	GND
23	3.3V	AD[4]	AD[3]	5V	AD[2]	GND
24	AD[1]	5V	V(I/O)[2]	AD[0]	~ACK64	GND
25	5V	~REQ64	~ENUM	3.3V	5V	GND

Table C-4. Compact PCI J2 connector

Pin	A	B	C	D	E	F[8]
1[3]	RSV	GND	RSV	RSV	RSV	GND
2[3]	RSV	RSV	UNC[4]	RSV	RSV	GND
3[3]	RSV	GND	RSV	RSV	RSV	GND
4	V(I/O)	BRSV	C/~BE[7]	GND	C/~BE[6]	GND
5	C/~BE[5]	GND	V(I/O)[2]	C/~BE[4]	PAR64	GND
6	AD[63]	AD[62]	AD[61]	GND	AD[60]	GND
7	AD[59]	GND	V(I/O)[2]	AD[58]	AD[57]	GND
8	AD[56]	AD[55]	AD[54]	GND	AD[53]	GND
9	AD[52]	GND	V(I/O)[2]	AD[51]	AD[50]	GND
10	AD[49]	AD[48]	AD[47]	GND	AD[46]	GND
11	AD[45]	GND	V(I/O)[2]	AD[44]	AD[43]	GND
12	AD[42]	AD[41]	AD[40]	GND	AD[39]	GND
13	AD[38]	GND	V(I/O)[2]	AD[37]	AD[36]	GND
14	AD[35]	AD[34]	AD[33]	GND	AD[32]	GND
15	BRSV	GND	RSV	RSV	RSV	GND
16	BRSV	BRSV	RSV	GND	BRSV	GND
17	BRSV	GND	RSV	RSV	RSV	GND
18	BRSV	BRSV	BRSV	GND	BRSV	GND
19	RSV	RSV	RSV	RSV	RSV	GND
20	RSV	RSV	RSV	GND(	RSV	GND
21	RSV	RSV	RSV	RSV	RSV	GND
22	GA4[12]	GA3[12]	GA2[12]	GA1[12]	GA0[12]	GND

Notes:

1 This diagram defines the pin assignments from the front of the system chassis. All pins are medium length (level 2) except connector J1 pins C16 and D15, which are long (level 3) and short (level 1), respectively.

2 The V(I/O) signals are either 5V or 3.3V, depending on the system implementation.

3 The following positions in rows 1-3 of connector P2 are implemented on the System Slot board: A1-3, B2, C1-3, and E1-3. Additionally, the following positions in rows 15-17 and 19-21 of connector P2 are also implemented only on the System Slot board: C15, C16, D17, E15, E17, A19, A21, B19, B20 and B21.

4 Connector P2 pin C2 is grounded at the System Slot only. Remaining slots leave C2 unconnected. Boards that use this signal (e.g., CPU boards that may be used in the System Slot or Peripheral Slot) shall provide a local pullup to V(I/O). System Slot only boards should tie this pin directly to the ground plane.

5 Connector P1 pin D21 (M66EN)is defined as GND for 33MHz backplanes. Use of this signal in 66MHz systems will be as a bussed signal to all slots.

6 Connector P1 pin C16 (long, level 3) was originally used for early power to hot swap capable boards for controlling the buffer logic. The PICMG Hot Swap Subcommittee no longer considers this method viable, and other alternatives are under consideration.

7 Connector P1 pin D15 (short, level 1) was originally used as a board select for hot swap capable boards. The PICMG Hot Swap Subcommittee no longer considers this method viable, and other alternatives are under consideration.

8 Observation: Some manufacturers of top shields utilize every other ground pin while some use every ground pin.

Note: Shield connections mate at approximately the same timer as medium length pins.

9 CompactPCI connector pin numbering is intentionally different from the connector manufacturer's pin numbering. This was done to allow the connectors to start at the bottom of the board and "grow" upward from J1/P1 through J5/P5.

10 P1 and P2 connector tail lengths are defined to be "short" tail connectors with 4.5mm tails.

11 BRSV signals accommodate PCI reserved signals. Bus segments shall bus these signals even though the PCI specification defines these pins as no connects.

12 GA[4..0] shall be used for geographic addressing on the backplane. Each backplane connector in a CompactPCI system has a unique encoding for GA[4..0].

13 Boards designed to CompactPCI Specification R1.0 are not required to connect these grounds and may claim compatibility.

14 Use of JTAG signals is discouraged. Their usage will be redefined in future revisions of the CompactPCI specification.

Ethernet

The DTE RJ-45 phone jack provides support for one 10/100BASE-T Ethernet channel.

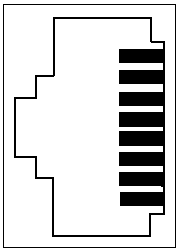


Table C-5. RJ45 phone jack pin-out

Pin	Signal	Pin	Signal
1	Transmit+	5	Center tap transmit
2	Transmit–	6	Receive–
3	Receive+	7	Center tap receive
4	Center tap transmit	8	Center tap receive

RS-232 serial port (COM 1)

The RS-232 serial port is an RJ-45 phone jack.

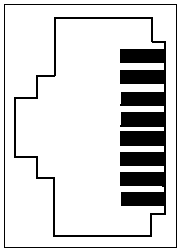


Table C-6. DB-9 pin-out

Pin	Signal	Pin	Signal
1	Data carrier detect IN/CD	6	Receive data IN/RxD
2	Request to send OUT/RTS	7	Signal ground
3	Signal ground	8	Clear to send IN/CTS
4	Transmit data OUT/TxD	9	Data terminal ready OUT/ DTR

Front panel

LEDs

LED	Color	Description
Swap-ready	Blue	Indicates that it is safe to eject the CPU board. The ejector handle switch must be activated first then, after the OS has been notified, the OS illuminates the LED, indicating it is safe to pull the CPU board out from the chassis.
User configurable	Red/green	You can configure this dual-color LED to indicate an event of your choosing. For information about configuring these LEDs, see Front panel red/green LED on page 59.

Reset switch

The front panel includes a push-button reset switch which, when pressed, initiates a “soft” reset sequence.

D Error messages

Boot failures

The System BIOS attempts to display an error message on the VGA and halts when it encounters the following error conditions:

1. Fixed disk error
   - No drive connected
   - Configured for 0 cylinders
   - Controller reset failed
   - Drive not ready
   - Track 0 seek timed out
   - Drive initialization failed
   - Drive recalibration failed
   - Last track seek failed
2. Video error
   - Color/Mono switch not set correctly
3. Timer error
   - System timer (0) failed
4. Diskette error
   - Floppy type does not match setup
5. I/O chip error
   - I/O conflicts exist for serial and parallel ports, floppy, hard disk (any or all)
6. Other error
   - IRQ conflict, unsupported COM port configuration, keyboard locked
   - Pentium cooling fan has failed
   - The System BIOS *prints* an error message *but does not halt* when it encounters the following error conditions:
     - Configuration error
     - Previous POST execution was incomplete
   - User BIOS Extension Region X exceeds DFFFFh

E Rear Transition module (RTM)

This appendix describes the Rear Transition module (RTM), a single slot rear I/O module which connects to the backside of the J3 and J5 connectors, directly behind the CPU board.

This appendix includes the topics listed in the table below. When reading this file online, you can immediately view information about any topic by placing the mouse cursor over a connector name and clicking.

Features

The RTM includes:

- Two Ethernet 10/100BASE-TX RJ-45 connectors via the backplane J4 connector interface.
- A PC-compatible RS-232 serial port (16550C Compatible) via backplane J3 and J4 connectors.
- PS/2-style keyboard and mouse connectors.
- A USB connector.

CPU board I/O

The following I/O ports are routed from the backplane connectors to the rear panel connectors:

- Ethernet (2x)
- Serial
- Mouse
- Keyboard
- USB (2x)

Installing and configuring the RTM

This explains how to install the EPC-3305 in a CompactPCI chassis.

Inserting the RTM

To insert the EPC-3305 RTM on the PCIbus backplane.

1. Ensure that power to your CompactPCI system is off, or that the CPU card is removed from the front of the chassis.

   When handling or inserting the EPC-3305, avoid touching the circuit board and connector pins, and ensure that the environment is static-free.

2. Ensure that the ejector handles are in the normal (non-eject) position. (Push the top handle down and the bottom handle up so that the handles are not tilted.)
3. Slide the RTM into the slot. Use firm pressure on the handles to mate the module with the connectors.
4. Tighten the retaining screws in the top and bottom of the front panel to ensure proper connector mating and prevent the module from loosening due to vibration.
5. Connect peripherals to the RTM, if needed. Peripherals typically include a keyboard, but also perhaps a mouse, modem, printer, and so on. For information about front-panel connector pinouts, see Appendix C, Connectors.

   Observe the following while the system is powered up:

   Do not plug cables or connectors into the front panel connectors. Because electronics equipment generally cannot withstand fluctuations in power, damage can arise from plugging in a device or board while power is on.

   Do not plug in a serial or parallel device, keyboard, transceiver, monitor or other component. This applies to equipment at either end of an interface cable.

6. Complete remaining steps as required. Typical remaining steps include:
   - BIOS configuration (For information about setting up the BIOS configuration, see *Chapter 3, BIOS configuration*)
   - Driver software installation
   - Application software installation

   Your system may be preconfigured by your supplier or you may be required to perform these tasks yourself.

Removing the RTM

Occasionally you may need to remove the RTM to perform maintenance tasks such as replacing the battery.

To remove the RTM from the CompactPCI chassis:

1. Press the latch part of the extractors inward until the extractor handle swings out and pivots freely.
2. Pull outward on the extractor handles until the RTM disengages from the rear connector.
3. Slide the RTM out of the CompactPCI chassis.

When finished with the tasks at hand, follow the instructions in Inserting the RTM on page 88 to re-install the RTM.

Connectors

This details the connectors used by the EPC-3305 RTM and gives the signal pinout of each connector.

Connector locations

Figure E-1 shows the locations of connectors on the EPC-3305 RTM

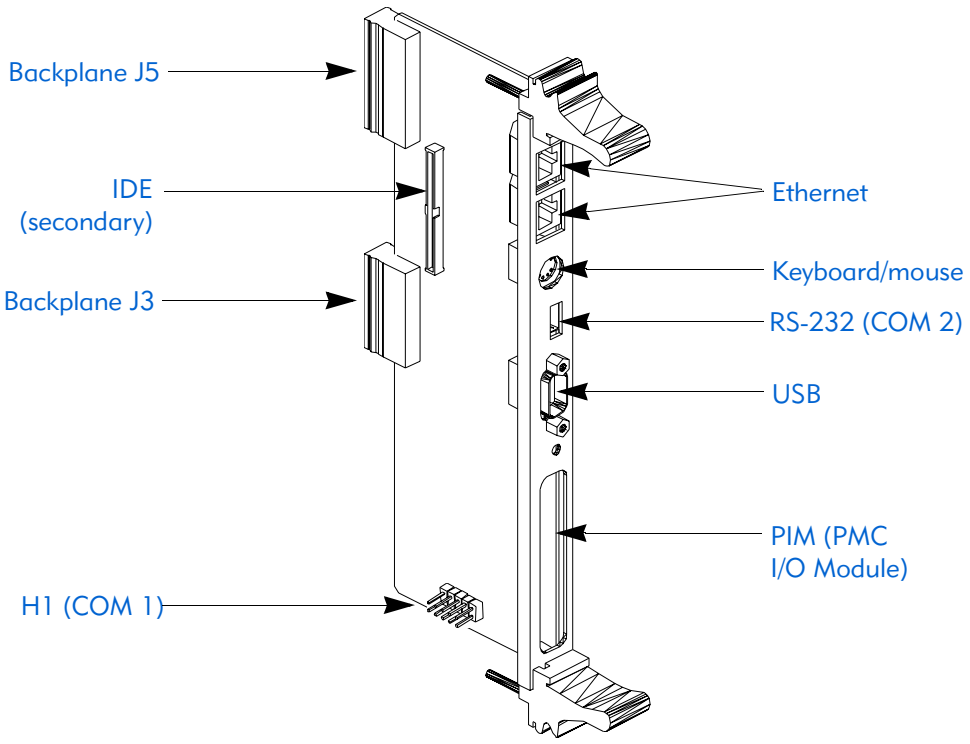


Figure E-1. EPC-3305 Rear Transition module: connectors

Backplane J3

The J3 connector specified in CompactPCI is a female 2mm-pitch 6 column by 19 row right angle Hard Metric (HM) connector. The signals on this connector are proprietary and include the USB port, COM 1 and COM 2 ports, and PMC socket B I/O signals. The next table shows this connector's pinout.

Table E-1. Backplane connector J3

Pin	A	B	C	D	E	F
1	GND	PMCBIO64	PMCBIO63	PMCBIO62	PMCBIO61	GND
2	PMCBIO60	PMCBIO59	PMCBIO58	PMCBIO57	PMCBIO56	GND
3	PMCBIO55	PMCBIO54	PMCBIO53	PMCBIO52	PMCBIO51	GND
4	PMCBIO50	PMCBIO49	PMCBIO48	PMCBIO47	PMCBIO46	GND
5	PMCBIO45	PMCBIO44	PMCBIO43	PMCBIO42	PMCBIO41	GND
6	PMCBIO40	PMCBIO39	PMCBIO38	PMCBIO37	PMCBIO36	GND
7	PMCBIO35	PMCBIO34	PMCBIO33	PMCBIO32	PMCBIO31	GND
8	PMCBIO30	PMCBIO29	PMCBIO28	PMCBIO27	PMCBIO26	GND
9	PMCBIO25	PMCBIO24	PMCBIO23	PMCBIO22	PMCBIO21	GND
10	PMCBIO20	PMCBIO19	PMCBIO18	PMCBIO17	PMCBIO16	GND
11	PMCBIO15	PMCBIO14	PMCBIO13	PMCBIO12	PMCBIO11	GND
12	PMCBIO10	PMCBIO9	PMCBIO8	PMCBIO7	PMCBIO6	GND
13	PMCBIO5	PMCBIO4	PMCBIO3	PMCBIO2	PMCBIO1	GND
14	+3.3V	+3.3V	+3.3V	+5V	+5V	GND
15	~COM1_RTS	COM1_RXD	~COM2_RTS	COM2_RXD	NC	GND
16	~COM1_CTS	COM1_TXD	~COM2_CTS	COM2_TXD	NC	GND
17	~COM1_DSR	~COM1_DCD	~COM2_DSR	~COM2_DCD	NC	GND
18	~COM1_DTR	COM1_RI	~COM2_DTR	COM2_RI	NC	GND
19	USB1_DAT+	USB1_DAT–	USB0_DAT+	USB0_DAT–	NC	GND

Backplane J5

The back plane connector J5 routes both Ethernet channels, keybard and mouse, secondary EIDE, and PMC socket A I/O signals to the CompactPCI backplane. The next table shows this connector's pinout.

Table E-2. Backplane connector J5

Pin	A	B	C	D	E	F
1	~TM_PRNT	PMCAIO64	PMCAIO63	PMCAIO62	PMCAIO61	GND
2	PMCAIO60	PMCAIO59	PMCA7O58	PMCAIO57	PMCAIO56	GND
3	PMCAIO55	PMCAIO54	PMCAIO53	PMCAIO52	PMCAIO51	GND
4	PMCAIO50	PMCAIO49	PMCAIO48	PMCAIO47	PMCAIO46	GND
5	PMCAIO45	PMCAIO44	PMCAIO43	PMCAIO42	PMCAIO41	GND
6	PMCAIO40	PMCAIO39	PMCAIO38	PMCAIO37	PMCAIO36	GND
7	PMCAIO35	PMCAIO34	PMCAIO33	PMCAIO32	PMCAIO31	GND
8	PMCAIO30	PMCAIO292	PMCAIO28	PMCAIO27	PMCAIO26	GND
9	PMCAIO25	PMCAIO24	PMCAIO23	PMCAIO22	PMCAIO21	GND
10	PMCAIO20	PMCAIO19	PMCAIO18	PMCAIO17	PMCAIO16	GND
11	PMCAIO15	PMCAIO14	PMCAIO13	PMCAIO12	PMCAIO11	GND
12	PMCAIO10	PMCAIO9	PMCAIO8	PMCAIO7	PMCAIO6	GND
13	PMCAIO5	PMCAIO4	PMCAIO3	PMCAIO2	PMCAIO1	GND
14	IDE_D0	IDE_D1	IDE_D2	IDE_D3	IDE_D4	GND
15	IDE_D5	IDE_D6	IDE_D7	IDE_D8	IDE_D9	GND
16	IDE_D10	IDE_D11	IDE_D12	IDE_D13	IDE_D14	GND
17	gnd	AUXVCC	IDE_D15	IDE_A0	IDE_A1	GND
18	ETH1_TX–	ETH1_RX–	AUX_CLK	~IDE_IOR	IDE_A2	GND
19	ETH1_TX+	ETH1_RX+	AUX_DAT	~IDE_IOW	IDE_DREQ	GND
20	GND	AUXVCC	~RESET_IN	IDE_ORDY	~IDE_CS3	GND
21	ETH0_TX–	ETH0_RX–	KBD_CLK	~IDE_DACK	~IDE_CS1	GND
22	ETH0_TX+	ETH0_RX+	KBD_DAT	IDE_INTR	!IDE_RSTDRV	GND

Ethernet

Two RJ45-style connectors provide 10/100BASE-T Ethernet ports. Both ports are mounted on the RTM and are accessible on the rear panel.

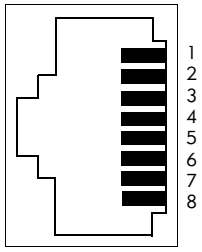


Table E-3. RJ45 phone jack pin-out

Pin	Signal	Pin	Signal
1	Transmit+	5	Center tap transmit
2	Transmit–	6	Receive–
3	Receive+	7	Center tap receive
4	Center tap transmit	8	Center tap receive

H1 (COM 1)

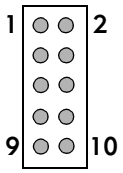


Table E-4. H1 (COM 2) pin-out

Pin	Signal	Pin	Signal
1	Carrier detect	2	Data set ready
3	Receive data	4	Request to send
5	Transmit data	6	Clear to send
7	Data terminal ready	8	Ring indicator
9	Ground	10	N.C.

IDE (secondary)

The secondary IDE connector is a male 44-pin right-angle header located on the RTM. The pins and signals are defined as:

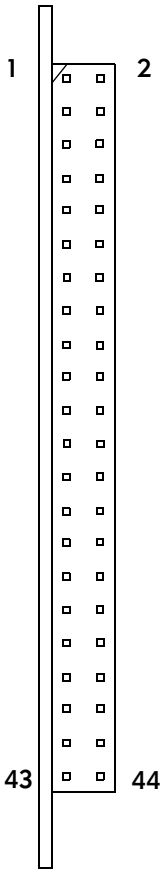


Table E-5. Secondary IDE connector

Pin	Signal	Pin	Signal
1	~RST	2	GND
3	D7	4	D8
5	D6	6	D9
7	D5	8	D10
9	D4	10	D11
11	D3	12	D12
13	D2	14	D13
15	D1	16	D14
17	D0	18	D15
19	GND	20	N.C.
21	DRQ	22	GND
23	~IOW	24	GND
25	~IOR	26	GND
27	IORDY	28	PPU
29	~DAK	30	GND
31	IRQ	32	N.C.
33	A1	34	N.C.
35	A0	36	A2
37	~CS0	38	~CS1
39	ACT	40	GND
41	Vcc	42	Vcc
43	GND	44	GND

Keyboard/mouse

The keyboard and mouse connector, located on the RTM's rear panel, is a 6-pin mini-DIN defined as:

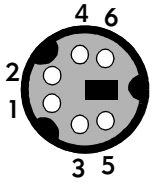


Table E-6. Keyboard/mouse pin-out

Pin	Signal	Pin	Signal
1	Keyboard data	4	+5V
2	Mouse data	5	Keyboard clock
3	Ground	6	Mouse clock

The EPC-3305 keyboard and mouse pins are opposite the laptop industry standard. This allows a keyboard to plug in directly without the pigtail.

PIM (PMC I/O Module)

The PIM connector, located on the RTM's rear panel, accepts a PIM that receives rear I/O from PMC site B, connector J24. The pinout has a one-to-one mapping from PMC site J24 to PIM J24.

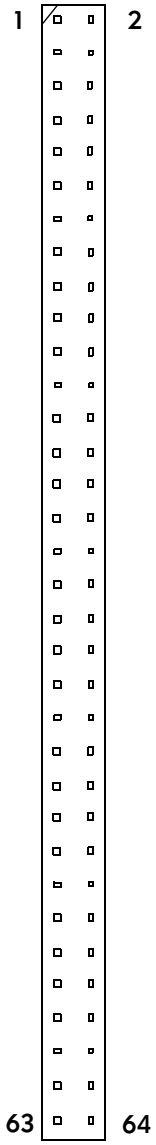


Table E-7. PIM connector pin-out: J20

Pin	Signal	Pin	Signal
1	N.C.	2	+12V
3	N.C.	4	N.C.
5	+5V	6	N.C.
7	N.C.	8	N.C.
9	N.C.	10	+3.3V
11	N.C.	12	N.C.
13	GND	14	N.C.
15	N.C.	16	N.C.
17	N.C.	18	GND
19	N.C.	20	N.C.
21	+5V	22	N.C.
23	N.C.	24	N.C.
25	N.C.	26	+3.3V
27	N.C.	28	N.C.
29	GND	30	N.C.
31	N.C.	32	N.C.
33	N.C.	34	GND
35	N.C.	36	N.C.
37	+5V	38	N.C.
39	N.C.	40	N.C.
41	N.C.	42	+3.3V
43	N.C.	44	N.C.
45	GND	46	N.C.
47	N.C.	48	N.C.
49	N.C.	50	GND
51	N.C.	52	N.C.
53	+5V	54	N.C.
55	N.C.	56	N.C.
57	N.C.	58	+3.3V
59	N.C.	60	N.C.
61	–12V	62	N.C.
63	N.C.	64	N.C.

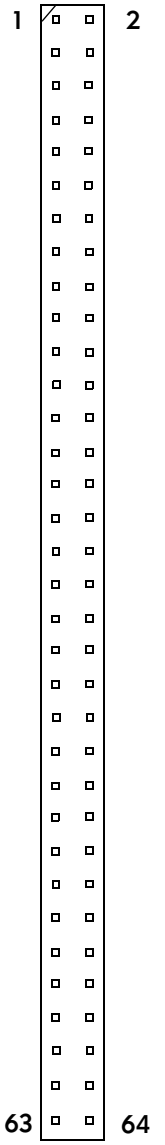


Table E-8. PIM connector pin-out: J24

Pin	Signal	Pin	Signal
1	I/O	2	I/O
3	I/O	4	I/O
5	I/O	6	I/O
7	I/O	8	I/O
9	I/O	10	I/O
11	I/O	12	I/O
13	I/O	14	I/O
15	I/O	16	I/O
17	I/O	18	I/O
19	I/O	20	I/O
21	I/O	22	I/O
23	I/O	24	I/O
25	I/O	26	I/O
27	I/O	28	I/O
29	I/O	30	I/O
31	I/O	32	I/O
33	I/O	34	I/O
35	I/O	36	I/O
37	I/O	38	I/O
39	I/O	40	I/O
41	I/O	42	I/O
43	I/O	44	I/O
45	I/O	46	I/O
47	I/O	48	I/O
49	I/O	50	I/O
51	I/O	52	I/O
53	I/O	54	I/O
55	I/O	56	I/O
57	I/O	58	I/O
59	I/O	60	I/O
61	I/O	62	I/O
63	I/O	64	I/O

RS-232 (COM 2)

The RS-232 serial port is a male DB-9 DTE. The port is mounted on the RTM and is accessible on the rear panel

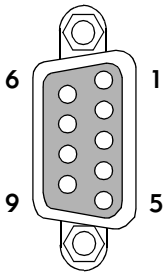


Table E-9. DB-9 pin-out

Pin	Signal	Pin	Signal
1	Carrier detect	6	Data set ready
2	Receive data	7	Request to send
3	Transmit data	8	Clear to send
4	Data terminal ready	9	Ring indicator
5	Signal ground		

USB

One externally accessible USB (Universal Serial Bus) connector, located on the RTM's rear panel, is a 4-pin single height connector defined as follows:

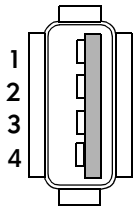


Table E-10. USB connector pin-out

Pin	Signal
Mechanical Solder Lug	Shield Ground
1	+5V
2	DATA–
3	DATA+
4	Ground
Mechanical Solder Lug	Shield Ground

F Re-programming the flash chip

This appendix details how to update or recover your system BIOS, Flash Boot Device (FBD), and Boot Block. You accomplish this by re-programming all or part of the EPC-3305's flash chip.

When reading this file online, you can immediately view information about any topic by placing the mouse cursor over a task and clicking.

About the flash chip

The EPC-3305 flash chip contains these major sections:

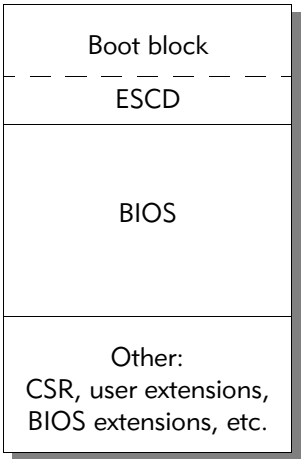


Figure F-1. Flash chip configuration

- **Boot block:** A 16 KB, hardware-write-protected area that contains the Boot Block program. This program:
  - Completes minimal hardware setup, including checking for conditions that require re-programming the flash chip.
  - Initiates a re-flash if conditions warrant. When initiating a re-flash, this program looks for the file necessary to re-flash (described in Creating a Flash Boot diskette on page 103) in a floppy diskette drive.
  - Passes control to the BIOS program.
- **BIOS:** Initializes the hardware and finds a device from which to bootload. The BIOS menus enable you to change the system's behavior and configuration. For details about the EPC-3305 BIOS, see *Chapter 3, BIOS configuration*.
- **Other:** The remaining reprogrammable area contains various BIOS data structures.

About re-programming the flash chip

On rare occasions, part or all of the flash chip contents may require replacement.

Use extreme caution when re-programming the flash chip. The Boot Block rarely changes and should not require re-programming.

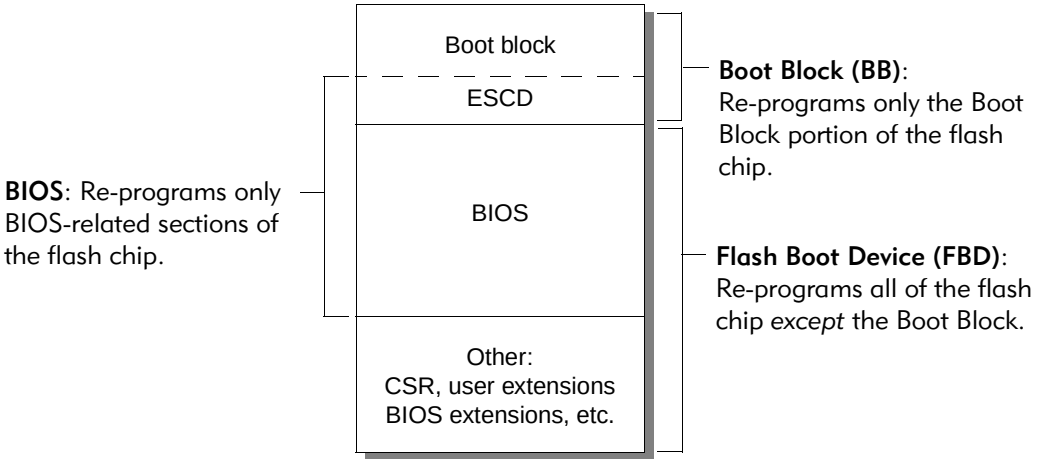


Figure F-2. Flash chip re-programming coverage

You can set options that force re-programming upon reboot via one of these:

- **phflash program:** Re-programs the flash chip from a DOS command prompt.
- **BIOS configuration program options:** This is the easiest and fastest way to re-program the flash chip, provided your system is connected to a floppy drive.
- **Force recovery jumper:** This technique is useful if a keyboard and monitor are not available.

When re-programming the flash chip, follow this process. The rest of this chapter includes detailed instructions for each task:

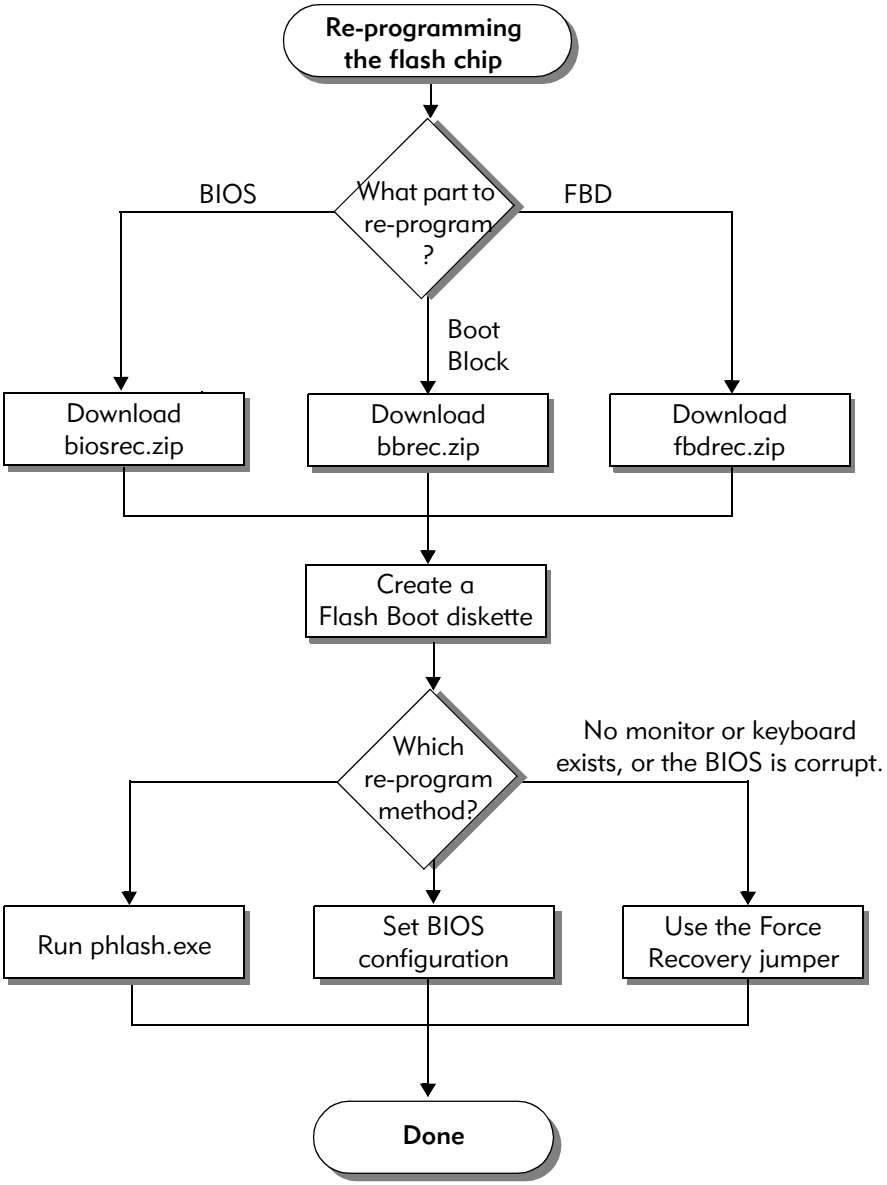


Figure F-3. Flash chip re-programming process flow

Before you begin

- Ensure that you have the following:
  - Minimum 2 MB of DRAM to run the re-flash program
  - A 3.5" 1.44 MB floppy diskette drive attached to or installed in the system
  - A floppy diskette
  - Access to the RadiSys web site.

    To access the RadiSys web site, enter this URL in your web browser: `http://www.radisys.com`

- Decide which portion of your flash chip to re-program:
  - **BIOS**: Re-program the BIOS to fix bugs, add new features, and replace a corrupted BIOS. This is the portion of the flash chip most frequently updated. You can perform this update whether or not the BIOS can boot the system.
  - **FBD**: Re-program the FBD when you need to re-program all of the flash chip except the Boot Block. Your flash chip may require this type of update if code or data structures outside the BIOS area require an update. You can perform this update whether or not the BIOS or FBD can boot the system.
  - **Boot Block**: Re-program only the Boot Block. You will perform this type of update rarely, if ever.

    If the Boot Block is corrupt and not executable, return the EPC-3305 to the factory for repair. For information about returning items to RadiSys, see the RadiSys web site.

- Decide which re-programming process to use:
  - **phlash program**: Use this method to re-program the BIOS or FBD from the DOS command line. RadiSys recommends this as the method that provides the most feedback during the re-programming process.

    This process cannot be performed in a non-DOS OS (for example: Windows NT, QNX, or LINUX).

  - **BIOS configuration program options**: Use this method if the existing BIOS runs. RadiSys recommends this as the simplest method.

    Select this process if your system runs a non-DOS OS (for example: Windows NT, QNX, or LINUX).

  - **Force recovery jumper**: Use this method when you have physical access to the board, but no keyboard or monitor, or when the BIOS is corrupt.

Creating a Flash Boot diskette

Re-programming the flash chip requires a Flash Boot diskette that contains both code to perform the task and data to place in the chip.

To create the Flash Boot diskette:

1. Locate the appropriate file from the RadiSys web site and download it to your computer:
   - **biosrec.zip**: Select this file when you want to re-program only the BIOS-related files.
   - **fbdrec.zip**: Select this file when you want to re-program all of the flash chip except the Boot Block.
   - **bbrec.zip**: Select this file when you plan to re-program only the Boot Block.

   Use extreme caution when re-programming the Boot Block. A BIOS boot block rarely changes and should not require re-programming.

2. Unzip the contents to a directory on your hard drive.

   When unzipped, verify that these files required to re-program the flash chip are copied successfully to your hard drive:

Filename	Description
readme.txt	Describes the transmittal and includes instructions and issues that arose too late to include in other documentation
bios.rom	A binary file that contains the BIOS image and Boot Block.
crisboot.bin	The boot sector image.
crisdisk.bat	A batch file that creates the Flash Boot diskette.
makeboot.exe	Creates the custom boot sector on the diskette.
phlash.exe	The program that re-programs the flash chip using data from the other files.
platform.bin	A file that describes the flash chip configuration, and identifies which blocks to erase and re-program.
minidos.sys	A file that takes the place of DOS on the flash boot diskette.

3. Run crisdisk.bat. This program runs on MS-DOS, Windows 95, Windows 98, or Windows NT. Select this program if your system runs only MS-DOS or if you prefer to respond to command line prompts.

   If your Flash Diskette contains only one of these programs, you must use that program to create the Flash Boot diskette.

   Insert a blank, formatted, 1.44MB floppy diskette into the system drive, then complete tasks as prompted by the program.

Now that you have created a Flash Boot diskette, re-flash your system using the directions for the re-flash method you want to use:

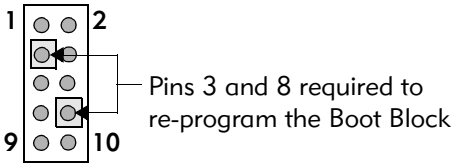
Using phlash.exe to re-program the flash chip

1. If you plan to include the Boot Block when re-programming the flash chip, connect the Boot Block Write Enable pins:

   Do not install this jumper unless a Boot Block update is required. A BIOS boot block rarely changes and seldom, if ever, requires re-programming.

   A. Turn system power off, then remove the EPC-3305 from the CompactPCI chassis.

   B. Connect these pins:



2. Boot system into MS-DOS with no memory managers running.

   If your system runs Windows 95, or Windows 98, press the F8 key during boot to enter DOS.

3. Insert the Flash Boot diskette into the floppy drive.

   For detailed information about creating a Flash Boot diskette, see Before you begin on page 102

4. Start the re-programming process by entering the drive the floppy disk is in followed by the phlash command. For example:

   ```
   a:\phlash
   ```

   When finished, the phlash program displays a message.

5. Remove the Flash Boot diskette from the drive when the drive stops accessing the disk.

   Determining when disk access has stopped is difficult. Typically, the disk drive makes anywhere from 15–30 accesses, then stops making access sounds for about 5 seconds. At this time you should remove the disk.

   If disk access sounds resume, the re-program process is repeating. Wait until disk access again stops, then remove the disk.

6. If you re-programmed the Boot Block, remove the Boot Block write enable jumper and return the system to normal operation:

   A. Turn system power off.

   B. Locate the BIOS configuration jumper block and disconnect the Boot Block Write Enable pins.

   C. Replace the EPC-3305 in the CompactPCI chassis.

   D. Power up the EPC-3305.

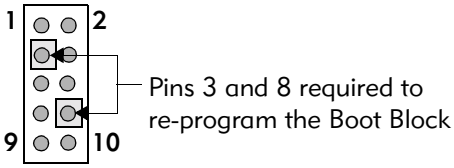
Using BIOS configuration options to re-program the flash chip

1. If you plan to re-program the Boot Block, connect the Boot Block Write Enable pins:

   Do not install this jumper unless a Boot Block update is required. A BIOS boot block rarely changes and seldom, if ever, requires re-programming.

   A. Turn system power off, then remove the EPC-3305 from the CompactPCI chassis.

   B. Connect these pins:

   C. Power up the EPC-3305 and run the BIOS configuration program.

2. Select the Exit and Update BIOS option in the BIOS configuration program's Exit menu. The BIOS configuration program instructs the BIOS to run an update (re-program the flash chip) upon reboot, then terminates and reboots the system.

3. Re-program the flash chip:

   A. Insert the Flash Boot diskette into the floppy drive.

   The phlash.exe program automatically runs and re-programs the flash chip.

   No video displays during this type of update.

   A. Remove the Flash Boot diskette from the drive when the drive stops accessing the disk.

4. If you re-programmed the Boot Block, remove the Boot Block write enable jumper and return the system to normal operation:

   A. Turn system power off.

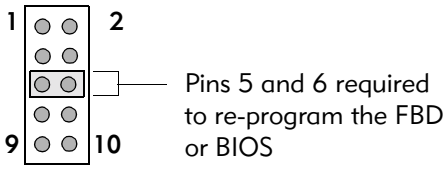
   B. Locate the BIOS configuration jumper block and disconnect the Boot Block Write Enable pins.

   C. Replace the EPC-3305 in the CompactPCI chassis.

   D. Power up the EPC-3305.

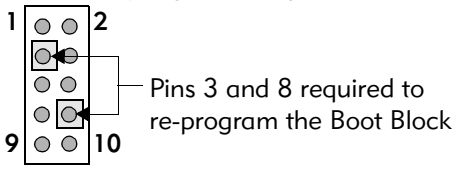
Using jumpers to re-program the flash chip

1. Install the force recovery jumper:
   A. Turn system power off, then remove the EPC-3305 from the CompactPCI chassis.
   B. Locate the BIOS configuration jumper block and connect the appropriate pins:
      i. To re-program the BIOS or the FBD, connect the Force BIOS Recovery pins:



      ii. To re-program the Boot Block, you must also connect the Boot Block Write Enable pins:

Do not install this jumper unless a Boot Block update is required. A BIOS boot block rarely changes and seldom, if ever, requires re-programming.



2. Re-program the flash chip:
   A. Insert the Flash Boot diskette into the floppy drive.
   B. Power up the EPC-3305. The phlash.exe program automatically runs and re-programs the flash chip.
   C. Remove the Flash Boot diskette from the drive when the drive stops accessing the disk.

Determining when disk access has stopped is difficult. Typically, the disk drive makes anywhere from 15–30 accesses, then stops making access sounds for about 5 seconds. At this time you should remove the disk.

If disk access sounds resume, the re-program process is repeating. Wait until disk access again stops, then remove the disk.

3. Remove the force recovery jumper and return the system to normal operation:
   A. Turn system power off.
   B. Locate the BIOS configuration jumper block and disconnect the Force BIOS Recovery pins and, if you connected them, the Boot Block Write Enable pins.
   C. Replace the EPC-3305 in the CompactPCI chassis.
   D. Power up the EPC-3305.

Glossary

Access Time — A factor in measurement of a memory storage device's operating speed. It is the amount of time required to perform a read operation. More specifically, it is the period of time between which the memory receives a read command signal and the time when the requested data becomes available to the system data bus.

Address — A number that identifies the location of a word in memory. Each word in a memory storage device or system has a unique address. Addresses are always specified as a binary number, although octal, hexadecimal, and decimal numbers are often used for convenience.

APM 1.1 — (Advanced Power Management) A software interface specification that allows operating system device drivers to control the power management functionality of a PC.

ANSI — (American National Standards Institute) An organization dedicated to advancement of national standards related to product manufacturing.

ATA — (AT Bus Attachment) An interface definition for PC peripherals. See *IDE*.

Autotype — A convenient method of IDE device detection whereby the system BIOS queries the IDE device to obtain operational parameters. If the device supports autotype, this information is passed to the BIOS where it is used to automatically configure the drive controller.

BIOS — (Basic Input/Output System) Firmware in a PC-compatible computer that runs when the computer is powered up. The BIOS initializes the computer hardware, allows the user to configure the hardware, boots the operating system, and provides standard mechanisms that the operating system can use to access the PC's peripheral devices.

BDA — (BIOS Data Area) BIOS Data Area. A 256 byte block of DRAM starting at address 400H that contains data initialized and used by the System BIOS detailing the system configuration and errors encountered during POST.

BIOS Extension — An object code module that is typically integrated into the FBD or placed into a ROM that is accessible on the peripheral bus (PCI, ISA, etc.) in the address range 0C0000h through 0DFFFFh. BIOS extensions have a pre-defined header format and contain code that is used to extend the capabilities of the System BIOS.

BIOS Image — Information contained in the flash boot device in binary file format consisting of initialzation data, setup configuration data, diagnostic sequences, and other instructions necessary to start up a computer and prepare it to load an operating system.

BIOS Recovery — A process whereby an existing, corrupt BIOS image in the flash boot device is overwritten with a new image. Also referred to as a flash recovery.

BIOS Update	A process whereby an existing, uncorrupted BIOS image in the flash boot device is overwritten with a new image. Also referred to as a flash update.
Bit	A binary digit.
Boot	The process of starting a computer and loading the operating system from a powered down state (cold boot) or after a computer reset (warm boot). Before the operating system loads, the computer performs a general hardware initialization and resets internal registers.
Boot Block	A write-protected 16KB section of the flash boot device located at physical address FFFFC000h to FFFFFFFFh which contains code to perform rudimentary hardware intitialization at system power up. The boot block also contains code to recover the BIOS via floppy disk.
Boot Device	The storage device from which the computer boots the operating system.
Boot Sequence	The order in which a computer searches external storage devices for an operating system to boot. The boot device must be the first in the boot sequence.
Byte	A group of 8 bits.
CPU	(Central Processing Unit) A semiconductor device which performs the processing of data in a computer. The CPU, also referred to as the microprocessor, consists of an arithmetic/logic unit to perform the data processing, and a control unit which provides timing and control signals necessary to execute instructions in a program.
Chipset	One or more integrated circuits that, along with a CPU, memory, and other peripherals, implements an IBM PC-AT compatible computer. The chipset typically implements a DRAM controller, bus, interface logic, and PC peripheral devices.
CAS	(Column Address Strobe) An input signal from the DRAM controller to an internal DRAM latch register specifying the column at which to read or write data. The DRAM requires a column address and a row address to define a memory address. Since both parts of the address are applied at the same DRAM inputs, use of column addresses and row addresses in a multiplexed array allows use of half as many pins to define an address location in a DRAM device as would otherwise be required.
COM Port	A bi-directional serial communication port which implements the RS-232 specification.
CMOS	(Complimentary Metal Oxide Semiconductor) A fast, low power semiconductor RAM used to store system configuration data.
Conventional Memory	The first 640 KB of a computer's total memory capacity. If a computer has no extended memory, conventional memory equals the total memory capacity. In typical computer systems, conventional memory can contain BIOS data, the operating system, applications, application data, and terminate and stay resident (TSR) programs. Also called system memory.
CSR	(CMOS Save and Restore) A System BIOS feature that allows the user to backup the contents of CMOS RAM (contained within the real time clock) to the BIOS Flash device to be restored later if necessary (such as when the real time clock battery dies).

CHS	(Cylinders/Heads/Sectors) A specification of disk drive operating parameters consisting of the number of disk cylinders, disk drive read/write heads, and disk sectors.
Default	The state of all user-changeable hardware and software settings as they are originally configured before any changes are made.
DOS	(Disk Operating System) One or more programs which allow a computer to use a disk drive as an external storage device. These programs manage storage and retrieval of data to and from the disk and interpret commands from the computer operator.
Driver	A software component of the operating system which directs the computer interface with a hardware device. The software interface to the driver is standardized such that application software calling the driver requires no specific operational information about the hardware device.
DIP	(Dual In-Line Package) A semiconductor package configuration consisting of a rectangular plastic case with two rows of pins, one row on each lengthwise side.
DRAM.	(Dynamic Random Access Memory) Semiconductor RAM memory devices in which the stored data does not remain permanently stored, even with the power applied, unless the data are periodically rewritten into memory during a refresh operation.
EEPROM	(Electrically Erasable Programmable ROM) Specifically, those EPROMs which may be erased electrically as compared to other erasing methods.
Error Checking and Correction	A feature of the T2 chipset that enables it to detect single or multi-bit errors in DRAM reads and correct single bit errors. This feature requires that all banks of DRAM use x36 (parity) SO DIMMs.
ECP	(Extended Capabilities Port) An enhancement of the standard PC parallel port that allows high speed bi-directional data transfers and other features.
EDO	(Extended Data Out) A type of DRAM that allows higher memory system performance since the data pins are still driven when CAS# is de-asserted. This allows the next DRAM address to be presented to the device sooner than with Fast Page Mode DRAM.
Extended Memory	The RAM address space, in a computer so equipped, above the 1 MB level.
ESCD	(Extended System Configuration Data) A block of nonvolatile memory that stores information on the devices found and configured by the Plug and Play BIOS.
External Device	A peripheral or other device connected to the computer from an external location via an interface cable.
FPM	(Fast Page Mode) A “standard” type of DRAM that is lower performance than EDO.
Fixed Disk	A hard disk drive or other data storage device having no removable storage medium. Fixed disk storage devices use inflexible disk media and are sealed to prevent data loss due to media surface contamination. Fixed disks generally provide the most storage space for a given cost when compared to semiconductor, tape, and other popular mass storage technologies.

FPGA	(Field Programmable Gate Array) A large, general-purpose logic device that is programmed at power-up to perform specific logic functions.
FBD	(Flash Boot Device) A flash memory device containing the computer's BIOS. In the NY1210, a 1 MByte Intel 28F800B5 semiconductor flash memory containing the system and video BIOS images, the BIOS initializing code and the recovery code which allows self hosted reflashing.
Flash Memory	A fast EEPROM semiconductor memory typically used to store firmware such as the computer BIOS. Flash memory also finds general application where a semiconductor non-volatile storage device is required.
Flash Recovery	See *BIOS Recovery*.
Flash Update	See *BIOS Update*.
Force Update	See *BIOS Recovery*.
GB or GByte	(Gigabyte) Approximately one billion (US) or one thousand million (Great Britain) bytes. 2^30 = 1,073,741,824 bytes exactly.
Hang	A condition where the system microprocessor suspends processing operations due to an anomaly in the data or an illegal instruction.
Header	A mechanical pin and sleeve style connector on a circuit board. The header may exist in either a male or female configuration. For example, a male header has a number and pattern of pins which corresponds to the number and pattern of sleeves on a female header plug.
h	(Hexadecimal) A base-16 numbering system using numeric symbols 0 through 9 plus alpha characters A, B, C, D, E, and F as the 16 digit symbols. Digits A through F are equivalent to the decimal values 10 through 15.
Host Bus	The address/data bus that connects the CPU and the chipset.
ISA	(Industry Standard Architecture) A popular microcomputer expansion bus architecture standard. The ISA standard originated with the IBM PC when the system bus was expanded to accept peripheral cards.
I/O	(Input/Output) The communication interface between system components and between the system and connected peripherals.
IDE	(Integrated Drive Electronics) A hard disk drive/controller interface standard. IDE drives contain the controller circuitry at the drive itself, as compared to the location of this circuitry on the computer motherboard in non-IDE systems. IDE drives typically connect to the system bus with a simple adapter card containing a minimum of on-board logic.
IRDA or IrDA	(Infra-red Data Association) A specification for high-speed data communication using infrared drivers and receivers for short-range wireless data transmission.
INT	(Interrupt Request) A software-generated interrupt request.
IRQ	(Interrupt Request) In ISAbus systems, a microprocessor input from the control bus used by I/O devices to interrupt execution of the current program and cause the

	microprocessor to jump to a special program called the interrupt service routine. The microprocessor executes this special program, which normally involves servicing the interrupting device. When the interrupt service routine is completed, the microprocessor resumes execution of the program it was working on before the interruption occurred.
ISR	(Interrupt Service Routine) A program executed by the microprocessor upon receipt of an interrupt request from an I/O device and containing instructions for servicing of the device.
Jumper	A set of male connector pins on a circuit board over which can be placed coupling devices to electrically connect pairs of the pins. By electrically connecting different pins, a circuit board can be configured to function in predictable ways to suit different applications.
KB or KByte	(Kilobyte) Approximately one thousand bytes. 2^{10} = 1024 bytes exactly.
Logical Address	The memory-mapped location of a segment after application of the address offset to the physical address.
LBA	(Logical Block Addressing) A method the system BIOS uses to reference hard disk data as logical blocks, with each block having a specific location on the disk. LBA differs from the CHS reference method in that the BIOS requires no information relating to disk cylinders, heads, or sectors. LBA can be used only on hard disk drives designed to support it.
MB or MByte	(Megabyte) Approximately one million bytes. 2^20 = 1,048,576 bytes exactly.
Memory	A designated system area to which data can be stored and from which data can be retrieved. A typical computer system has more than one memory area. See *Conventional Memory* and *Extended Memory*.
Memory shadowing	Copying information from an extension ROM into DRAM and accessing it in this alternate memory location.
Offset	The difference in location of memory-mapped data between the physical address and the logical address.
Operating System	See *DOS*.
PMC	(PCI Mezzanine Card) A new standard form factor for PCI add-in modules. PMCs mate with their respective connectors on the motherboard and are secured with screws.
PCI	(Peripheral Connect Interface) A popular microcomputer bus architecture standard.
Peripheral Device	An external device connected to the system for the purpose of transferring data into or out of the system.
PC/AT	(Personal Computer/Advanced Technology) A popular computer design first introduced by IBM in the early 1980s.
PS/2	(Personal System 2) Computers designed with IBM's proprietary bus architecture known as Micro Channel.

PLL	(Phase-Locked Loop) A semiconductor device which functions as an electronic feedback control system to maintain a closely regulated output frequency from an unregulated input frequency. The typical PLL consists of an internal phase comparator or detector, a low pass filter, and a voltage controlled oscillator which function together to capture and lock onto an input frequency. When locked onto the input frequency, the PLL can maintain a stable, regulated output frequency (within bounds) despite frequency variance at the input.
Physical Address	The address or location in memory where data is stored before it is moved as memory remapping occurs. The physical address is that which appears on the computer's address bus when the CPU requests data from a memory address. When remapping occurs, the data can be moved to a different memory location or logical address.
Pinout	A diagram or table describing the location and function of pins on an electrical connector.
PQFP	(Plastic Quad Flat Pack) A popular package design for integrated circuits of high complexity.
POST	(Power On Self Test) A diagnostic routine which a computer runs at power up. Along with other testing functions, this comprehensive test initializes the system chipset and hardware, resets registers and flags, performs ROM checksums, and checks disk drive devices and the keyboard interface.
Program	A set of instructions a computer follows to perform specific functions relative to user need or system requirements. In a broad sense, a program is also referred to as a software application, which can actually contain many related, individual programs.
PAL	(Programmable Array Logic) A semiconductor programmable ROM which accepts customized logic gate programming to produce a desired sum-of-products output function.
RAM	(Random Access Memory) Memory in which the actual physical location of a memory word has no effect on how long it takes to read from or write to that location. In other words, the access time is the same for any address in memory. Most semiconductor memories are RAM.
ROM	(Read Only Memory) A broad class of semiconductor memories designed for applications where the ratio of read operations to write operations is very high. Technically, a ROM can be written to (programmed) only once, and this operation is normally performed at the factory. Thereafter, information can be read from the memory indefinitely.
Real Mode	The operational mode of Intelx86 CPUs that uses a segmented, offset memory addressing method. These CPUs can address 1 MB of memory using real mode.
Real Mode Address	A memory address composed of two 16-bit values: a segment address and an offset quantity. A real mode address is constructed by shifting a segment address 4 bits to the left and then adding the offset value. A real mode address is a physical address.
RTC	(Real Time Clock) Peripheral circuitry on a computer motherboard which provides a nonvolatile time-of-day clock, an alarm, calendar, programmable interrupt, square wave generator, and a small amount of SRAM. In the NY1210, the RTC operates independently of the system PLL which generates the internal system clocks. The

	RTC is typically receives power from a small battery to retain the current time of day when the computer is powered down.
Reflashing	The process of replacing a BIOS image, in binary format, in the flash boot device.
Register	An area typically inside the microprocessor where data, addresses, instruction codes, and information on the status on various microprocessor operations are stored. Different types of registers store different types of information.
Reset	A signal delivered to the microprocessor by the control bus, which causes a halt to internal processing and resets most CPU registers to 0. The CPU then jumps to a starting address vector to begin the boot process.
RFA	(Resident Flash Array) The RFA represents flash memory that is resident on the hardware platform that is utilized for OS or application purposes.
RS-232	A popular asynchronous bi-directional serial communication protocol. Among other things, the RS-232 standard defines the interface cabling and electrical characteristics, and the pin arrangement for cable connectors.
RAS	(Row Address Strobe) An input signal to an internal DRAM latch register specifying the row at which to read or write data. The DRAM requires a row address and a column address to define a memory address. Since both parts of the address are applied at the same DRAM inputs, use of row addresses and column addresses in a multiplexed array allows use of half as many pins to define an address location in a DRAM device as would otherwise be required.
Segment	A section or portion of addressable memory serving to hold code, data, stack, or other information allowing more efficient memory usage in a computer system. A segment is the portion of a real mode address which specifies the fixed base address to which the offset is applied.
Serial Port	A physical connection with a computer for the purpose of serial data exchange with a peripheral device. The port requires an I/O address, a dedicated IRQ line, and a name to identify the physical connection and establish serial communication between the computer and a connected hardware device. A serial port is often referred to as a COM port.
Shadow Memory	RAM in the address range 0xC000h through 0xFFFFFh used for shadowing. Shadowing is the process of copying BIOS extensions from ROM into DRAM for the purpose of faster CPU access to the extensions when the system requires frequent BIOS calls. Typically, system and video BIOS extensions are shadowed in DRAM to increase system performance.
SIMM	(Single In-Line Memory Module) A small, rectangular circuit board on which is mounted semiconductor memory ICs.
SO DIMM	(Small Outline Dual Inline Memory Module) A new form factor for memory modules that is smaller and denser than SIMMs.
Standoff	A mechanical device, typically constructed of an electrically non-conductive material, used to fasten a circuit board to the bottom, top, or side of a protective enclosure.

SRAM	(Static Random Access Memory) A semiconductor RAM device in which the data remains permanently stored as long as power is applied, without the need for periodically rewriting the data into memory.
Symmetrically Addressable SIMM	A SIMM, the memory content of which is configured as two independent banks. Each 16-bit wide bank contains an equal number of rows and columns and is independently addressable by the CPU via twin row address strobe registers in the DRAM controller.
SYSCLK	(ISAbus System Clock) The ~8.33MHz clock signal present on the ISAbus to which all bus transactions are synchronized.
System Memory	See *Conventional Memory*.
TB or TByte	(Terabyte) Approximately one thousand billion (US) or one billion (Great Britain) bytes. 2^40 = 1,099,511,627,776 bytes exactly.
USB	(Universal Serial Bus) A new serial data bus that is intended to eliminate the need for separate serial, parallel, mouse, keyboard, joystick, etc. ports on a PC-compatible. These ports can be conceivably replaced by a few, daisy-chained USB ports, all with identical connectors but capable of much higher throughput, upwards of 12Mbs.
UED	(User Editable Drive) A feature of the NY1210's Phoenix NuBIOS. When a "User" type hard disk drive setting shows in the IDE Adapter Sub-Menu the BIOS queries the hard disk drive for the purpose of retrieving disk geometry. If the hard disk drive is capable of providing this information, the BIOS uses it to automatically set up the drive for use with the system.
VESA	(Video Electronics Standards Association) A group of hardware and software vendors that define specifications for hardware and software interfaces for a variety of devices.
VGA	(Video Graphics Adapter) A popular PC graphics controller and display adapter standard developed by IBM. The standard specifies, among other things, the resolution capabilities of the display device. Display devices meeting the VGA standard must be capable of displaying a minimum resolution of 640 horizontal pixels by 480 vertical pixels with at least 16 screen colors.
Wait State	A period of one or more microprocessor clock pulses during which the CPU suspends processing while waiting for data to be transferred to or from the system data or address buses.

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