

R400EX Evaluation Board

Hardware Reference

Manual

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Chapter 1 - Introduction

1

1

Purpose

This manual contains information about the R400EX evaluation board. The R400EX evaluation board is intended as a comprehensive evaluation and reference kit for system designers and engineers. The purpose of this manual is to fully explain the standard software and hardware that ships with each evaluation board.

About This Manual

This manual assumes that the reader possesses a good working knowledge of microcomputer system architectures and peripheral devices. Use this manual to install and set up the evaluation board to suit your application.

This manual consists of the following chapters and information:

- Chapter 1** *Introduction.* This chapter provides an overview of the product and includes electrical and environmental specifications.
- Chapter 2** *Getting Started.* Provides information about how to install the evaluation board, set jumpers on the board, set up the Phoenix BIOS, power up the board, and boot an operating system.
- Chapter 3** *Theory of Operation.* Contains detailed information about the on-board processor, memory, chipset, and peripheral interfaces.
- Chapter 4** *Connectors.* Provides pinout diagrams and other information about the connectors and headers on the board.
- Chapter 5** *Troubleshooting and Error Messages.* Provides a list of error messages you may encounter and how to resolve error causes.

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Chapter 6	<i>Support and Service.</i> Provides information about how to contact technical support engineers regarding this product.
Appendix A	<i>Chipset and I/O Map.</i> Provides data for registers and the I/O map.
Appendix B	<i>IRQ Map.</i> Lists the IRQs used by the evaluation board.
Appendix C	<i>VGA Interface.</i> Describes the Cirrus Logic software and drivers.
Appendix D	<i>Reflashing the Flash Boot Device.</i> Provides in-depth information about the reflashing the BIOS.
Appendix E	<i>LCD Flat Panel Interface.</i> Describes how to build cables for flat panels supported by the Cirrus Logic VGA chip.
Appendix F	<i>PC Card Interface.</i> Defines supported PC card interfaces.
Appendix G	<i>Glossary.</i> Defines terms used in this manual.

Notational Conventions

The following notational conventions are used throughout this manual.

FFh	Hexadecimal numbers are indicated by an “h” suffix.
*	In signal definitions, the asterisk (*) following a signal name indicates an active low signal; for example IOCHECK*.
	Note Notes are used to provide the reader with important information or explanatory information.
	CAUTION Cautions are used to indicate the potential for equipment damage, software failure, or minor personal injury.
	WARNING Warnings are used to indicate potential risk of serious physical harm or injury.

Overview

The R400EX Validation Board is a reference design platform showcasing the Intel486 processor working with the RadiSys R400EX Embedded System Controller. The board supports both the standard version of the Intel486 and the ULP version of the Intel486. It also supports both the “minimum” and “maximum” modes of the R400EX (see R400EX specification) as build-time options. The evaluation version of this board will be built with a 100Mhz IntelDX4 and with the R400EX configured to its maximum mode (full ISA bus support). The following is a detailed design specification for the R400EX Validation Board.

The R400EX Validation Board contains the following features:

- Socket for PGA package, SL-enhanced Intel486 processor, as well as SMT pad pattern for the Intel486ULP processor
- R400EX Embedded System Controller featuring:
 - ◊ DRAM controller (1MB to 128MB of EDO or FPM supported) with parity support
 - ◊ Integrated 82C206 that includes a PC compatible real-time clock, DMA controllers, interrupt controllers, and timer/counter
 - ◊ Keyboard and mouse controller
 - ◊ Enhanced IDE interface
 - ◊ BIOS shadowing
 - ◊ Power management
 - ◊ SMM support
 - ◊ PC-compatible DMA and Interrupt controllers
 - ◊ Two 16C550-compatible serial ports
 - ◊ IrDA controller
 - ◊ Watchdog timer
 - ◊ Programmable chip selects
- 4Mb Intel SmartVoltage boot-block Flash EPROM containing BIOS.
- Two 72-pin SIMM sockets providing the capability for 1MB to 128MB of DRAM.
- IC Works W48C54A-59 Clock Generator chip with jumpers for 33/40/50/66MHz CLK2 selection (2-pins).
- One Resident Flash Array (RFA) site populated with a 2MB part, pin compatible with a 4MB part.
- PCMCIA controller on ISA bus with Type III carrier socket (Cirrus Logic PD6710 PCMCIA).
- LCD VGA controller on 486 local bus (Cirrus Logic GD6245 with 512K RAM).

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- Standard VGA connector
- LCD connector with four panel-select jumpers.
- Four RS232C serial ports available through two standard DB9 connectors and two 10-pin headers (using the “commonly available” pinout rather than the “IDC connector cable” pinout). Two channels from R400EX and two from the Super I/O chip.
- PS/2 compatible keyboard and mouse interface via two 6-pin mini-DIN connectors.
- PC-compatible floppy drive controller that is accessed through a standard header connector.
- Parallel printer port (LPT1) that is available through a standard female DB-25 connector.
- Two Standard IDE interface connectors, a 40 pin, supporting 3.5” drives and an unpopulated 44 pin supporting 2.5” drives (IDE interface from R400EX).
- Two standard ISA bus card connectors and one PC/104 socket.
- Battery switch-over and power-on reset generator.
- Reset switch.
- Keyed PC motherboard type power connector.
- Port 80h POST LED display circuitry.
- Battery with switch over/Reset controller for use with R400EX’s RTC.
- Unpopulated sites for a 146818A-compatible Real Time Clock chip and external 8042 controller and PS/2 style connectors.
- Unpopulated site for an Intel 82C42PE keyboard/mouse controller.
- Two linear regulators, for +3.3V CPU power and for ULP core CPU voltage.
- Logic analyzer headers.
- R400EX Power-on configuration switch bank (MA0-MA11).
- Mounting holes for feet.



CAUTION

Many of the connectors on this board provide power for peripheral devices through different pins. Making incorrect connections can damage the unit and may damage the device being connected. Use extreme caution when preparing to connect cables to this product. Refer to Chapter 4 for connector locations and pinout information.

Introduction

Specifications

Tables 1-1 through 1-3 define environmental, electrical, and physical specifications of the evaluation board.

Characteristic		Value
Environmental		
Temperature	operating	0°C to 60°C, derated 2°C per 1,000 feet (300 meters) over 10,000 feet (3,000 meters) 2°C per minute maximum excursion gradient
	storage	-40° to 85°C, 5°C per minute maximum excursion gradient
Humidity	operating	5% to 95% non-condensing
	storage	5% to 95% non-condensing
Altitude	operating	0 to 10,000 feet (3,000 meters)
	storage	0 to 40,000 feet (12,000 meters)
Vibration	operating	0.015 inch (0.38 mm) P-P displacement with 2.5 g peak (maximum) acceleration over 5 to 2000 Hz
	storage	0.030 inch (0.76 mm) P-P displacement with 5.0 g peak (maximum) acceleration over 5 to 2000 Hz.
Shock	operating	30 g, 11 ms duration, half-sine shock pulse
	storage	50 g, 11 ms duration, half-sine shock pulse

Table 1-1. Environmental Specifications.

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Table 1-2 shows electrical specifications of the evaluation board equipped with a 4 MB SIMM, and no keyboard, disk drive, or PC card.

Characteristic		Value
Electrical		
Current	+5 VDC	2 A max., 1.5 A typical
	+12 VDC	40 mA maximum
	-12 VDC	Not used

Table 1-2. Electrical Specifications.

Table 1-3 shows physical specifications of the evaluation board equipped with a 4 MB SIMM, and no keyboard, disk drive, or PC card.

Characteristic		Value
Physical		
Length		10 inches (25.4 cm)
Width		10 inches (25.4 cm)
Height		Less than 2 inches (5.08 cm), including SIMM and mounting standoffs

Table 1-3. Physical Specifications.

Additional References

CL-GD6245 Advanced Data Book, Cirrus Logic Corporation, Version 1.1, September, 1994.

CL-GD624X Applications Book, Cirrus Logic Corporation, Revision 1.0, June 17, 1994.

Memory Products Data Manual, Intel Corporation, 1995.

RadiSys R400EX High Integration 486 System Controller, RadiSys Corp.

RadiSys R400EX Memory/Bus Controller Data Sheet, RadiSys Corporation, 1996.

Technical Reference, Personal Computer AT, International Business Machines Corporation, 1985.

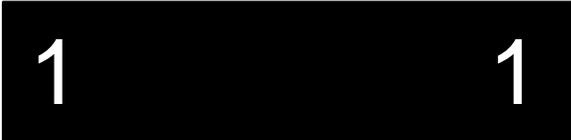
FDC37C665/FDC37C666 Advanced High-Performance Multi-mode Parallel Port Super I/O Floppy Disk Controllers, Standard Microsystems Corporation (SMC).

PhoenixBIOS 4.05 Developer's Reference, Phoenix Technologies, Ltd., October 11, 1995 (**NOTE: This document cannot be distributed to customers without the explicit permission of Phoenix Technologies, Ltd.**)

NoteBIOS 4.0 Power Management System Developer's Reference, Phoenix Technologies, Ltd., June 6, 1995 (**NOTE: This document cannot be distributed to customers without the explicit permission of Phoenix Technologies, Ltd.**)

RadiSys R400 Product Development Specification, Revision 3.23, RadiSys Corporation, July 29, 1996.

Advanced Power Management (APM) BIOS Interface Specification, Revision 1.1, Intel Corporation and Microsoft Corporation, September 1993.



NOTES

Chapter 2 - Getting Started

2

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This chapter contains step-by-step instructions to help you install and set up the R400EX Evaluation Board for operation. The chapter includes instructions explaining how to set jumpers on the board, configure the board for external peripherals, apply power, and use the menu-driven software to set up the BIOS.

Before You Begin

Before you begin, have the following equipment ready to use:

- Video device (VGA or better monitor or flat panel display)
- Power supply (PC or portable power supply)
- PC/AT PS/2 style keyboard to enter BIOS setup information

And optionally, you'll need a mass storage device:

- IDE hard disk
- Flash (TFFS or FTL), SRAM, or ATA PC-card (optional)

2

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Supplied Equipment

Each R400EX Evaluation Board includes the following:

- 4 MB SIMM
- Small plastic bag of jumpers
- This manual
- Software diskettes
- Four 1/2" nylon standoff legs with attached rubber feet allow use of the evaluation board on a workbench surface.

Optional Parts

The following parts are available as options from your dealer or RadiSys:

- 8 MB SIMM
- 16 MB SIMM

SIMMs should be gold-plated for optimal performance, and can be FPM or EDO. However, you cannot mix EDO and FPM SIMMs.

Diskettes

The utilities diskette set contains the following software:

- Reflash and all BIOS images
- Phoenix BIOS images and utilities
- Cirrus Logic VGA utilities
- schematics

Unpack and Inspect the Evaluation Board

Unpack and visually inspect the board for damage which may have occurred in shipment. Retain all packing material and shipping documentation in case reshipment becomes necessary.



CAUTION

Do not remove any modules from their anti-static bags unless you are in a static-free environment. This board, like most other electronic devices, is susceptible to ESD damage. ESD damage is not always immediately obvious – it can cause a partial breakdown in semiconductor devices that might not immediately result in failure.

If damage has occurred in shipment, notify the carrier at once to initiate a damage claim. Contact your dealer or RadiSys customer service for replacement of damaged products. The RadiSys customer service telephone number appears on the front cover of this manual.

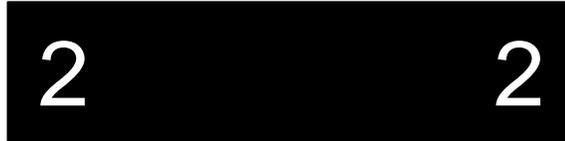
Mounting and Installation

Install the evaluation board in a suitable enclosure using mounting holes, or desktop fashion using standoffs through the mounting holes. Ensure that environmental conditions in the enclosure consistently meet the conditions shown in the product specifications in Chapter 1. Figure 2-1 should be used only to determine the board dimensions and mounting hole locations. (Chip and connector depictions are “stylized” or generic and do not reflect the layout of the R400EX evaluation board.)



Note

If the installation location provides limited accessibility, check the jumper settings on the board before you install it. Refer to the next section for information on how to set jumpers on the board.



2 2

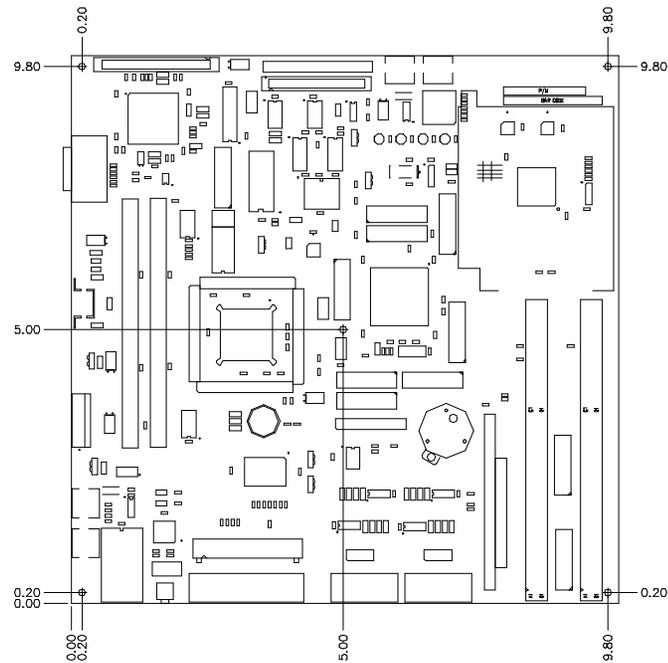


Figure 2-1. Mounting Hole Locations.

Setting the Jumpers & DIP Switches

Before you install the evaluation board, familiarize yourself with the locations and functions of jumpers on the board. Under normal circumstances, you should not need to change the factory-installed jumper settings with the exception of the Flash access jumpers.

Jumpers and switches

There are a number of jumpers located on the board used for the following functions. Jumpers denoted with a letter (e.g., JP1A) signify a single jumper within a larger block.

Getting Started

On-board Jumper usage			
Ref	Function	Description	Default setting
JP1 A,B,C	Flat Panel Select	3-bit selection for panel type. Install jumpers for all '0' bits.	none installed (CRT)
JP2A,B	2X Clock Frequency Select	Select 33/40/50/66 MHz CLK2 frequency	JP2A installed (66Mhz)
JP2C	8-bit RFA access	Force 8-bit operation of the RFA	installed
JP2D	BIOS boot block write enable	Install this jumper to enable writes to the boot block in the BIOS	not installed
JP2E	IO RFA addressing	Jumper for selecting IO mapped page register RFA addressing	installed
JP2F	MEM RFA addressing	Jumper for selecting linear memory mapped RFA addressing	not installed
JP3	CPU clock multiply jumper	Installed for clock doubled CPU, removed for clock tripled	installed = clock doubled
JP4	CPU power select	Jumper for selecting between 5V and 3.3V for PGA CPU power	2-3 installed
JP5A	AT.REFRESH function	Install this jumper for AT.REFRESH signal; remove JP5B	not installed
JP5B	CSRFA function	Install this jumper for RFA function; remove JP5A	installed
JP5C	Writeback/write through	Jumper for selecting write-through (if installed) or write-back cache	not installed
JP6	VCC select jumper	This jumper selects between 3.3V and 5V VCC (if installed)	unpopulated
JP7	VPP select jumper	This jumper selects between 12V and 5V VCC (if installed)	unpopulated
JP8A	Ext. Keyboard boot	Install this jumper for boot option with external keyboard controller installed	unpopulated
JP8B	Ext. Keyboard loop	Install this jumper for post loop with external keyboard controller installed	unpopulated
JP9A	COM3: IRQ select	Select between IRQ4 and IRQ5 as the COM3: IRQ	IRQ4
JP9B	COM4: IRQ select	Select between IRQ3 and IRQ9 as the COM4: IRQ	IRQ3
JP10 A-D	R400EX COM2: function	Install all four jumpers for COM2: operation from the R400EX; remove for full 8-wire COM1: operation	not installed
JP11 A-D	R400EX COM1: 8-wire function	Install all four jumpers for full 8-wire COM1: support; remove for COM2: support from R400EX	installed

Table 2-1. Jumper Settings.

The following table enumerates the power-up configuration options. These options are set in DIP switches SW1 and SW2. Default is for all switches set to off, except switch 2 position 1 is on. Defaults are indicated in bold type.

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Configuration DIP switches		
SW1 #1 (MA0)	0 (off) 1 (on)	<i>R400EX operating voltage.</i> 3.0 or 3.3 volt VCC operation. 'ttl in' pins have CMOS input thresholds. 5.0 volt VCC operation. 'ttl in' pins have TTL input thresholds.
SW1 #2 (MA1)	0 (off) 1 (on)	<i>Internal Real Time Clock megacell. This bit is also written into bit 3 (EXRTC bit) of the Output register at powerup.</i> Enabled. Disabled. Mouse pins are enabled when internal keyboard/mouse controller is enabled. CS_KB# and CS_USR0# are enabled to RTC_AS/MO_DATA and the RTC_DS/MO_CLK pins, respectively, when internal keyboard is also disabled.
SW1 #3 (MA2)	0 (off) 1 (on)	<i>Internal keyboard and mouse controller megacell .</i> Enabled. Disabled.
SW1 #4 (MA3)	0 (off) 1 (on)	<i>Select between 8-bit or 16-bit BIOS on the ISA bus</i> 8-bit BIOS is on the ISA bus. 16-bit BIOS is on the ISA bus (Not supported on EVAL board.)
SW1 #5 (MA4)	0 (off) 1 (on)	<i>Select between full or two channel DMA support</i> Two channel DMA support only. The four DMA pins are configured as DRQA,DRQB, DACKA#, and DACKB#. (Not supported on EVAL board.) Seven channel support. The four DMA pins are configured as MUXDRQ, DAKENC2-0. This disables IRQ3 & IRQ4 pins and enables CLKS2 & CLKS0.
SW1 #6 (MA5)	0 (off) 1 (on)	<i>Select between EIDE/DRAM parity or demultiplexed IRQ support.</i> Demultiplexed IRQ support. IRQ3 and IRQ4 (unless MA4 is set) and IRQ5,6,7,9,11,and 14 are directly connected to the R400EX. EIDE/DRAM parity support. The MUXIRQ, CLKS2,BCLK, and CLKS0 pins input all IRQ inputs through external multiplexer and the IRQ5,6,7,9,11, and 14 pins are redefined to perform either EIDE or DRAM parity support.
SW1 #7 (MA6)	0 (off) 1 (on)	<i>Select between EIDE or DRAM parity functions. This bit is ignored if MA5=0</i> EIDE support. DRAM parity support. (Not supported on EVAL board.)
SW1 #8 (MA7)	0 (off) 1 (on)	<i>Select between REFRESH# and CS_USR1# pin functions.</i> REFRESH# CS_USR1#
SW2 #1 (MA8)	0 (off) 1 (on)	COM port pin partitioning. Enable COM1 to all 8 pins Enable 6-pin COM1 and 2-pin COM2 ports. This setting should also be used for 4/4 pin COM1/COM2 pin partitioning and the 6-pin COM1 and 2-pin IRDA compatible COM2 partitioning, but the COMCLK control register must be updated after powerup and before using the COM port pins to use these options.
SW2 #2 (MA9)	0 (off) 1 (on)	<i>Enable COMCLK</i> IRQ10 input enabled. COMCLK input is enabled.
SW2 #3 (MA10)	0 (off) 1 (on)	<i>Force BIOS recovery</i> Normal operation Force serial-hosted BIOS reflash operation
SW2 #4 (MA11)	0 (off) 1 (on)	<i>Manufacturing loop</i> Not used.

Table 2-2. DIP Switch Settings.

Getting Started

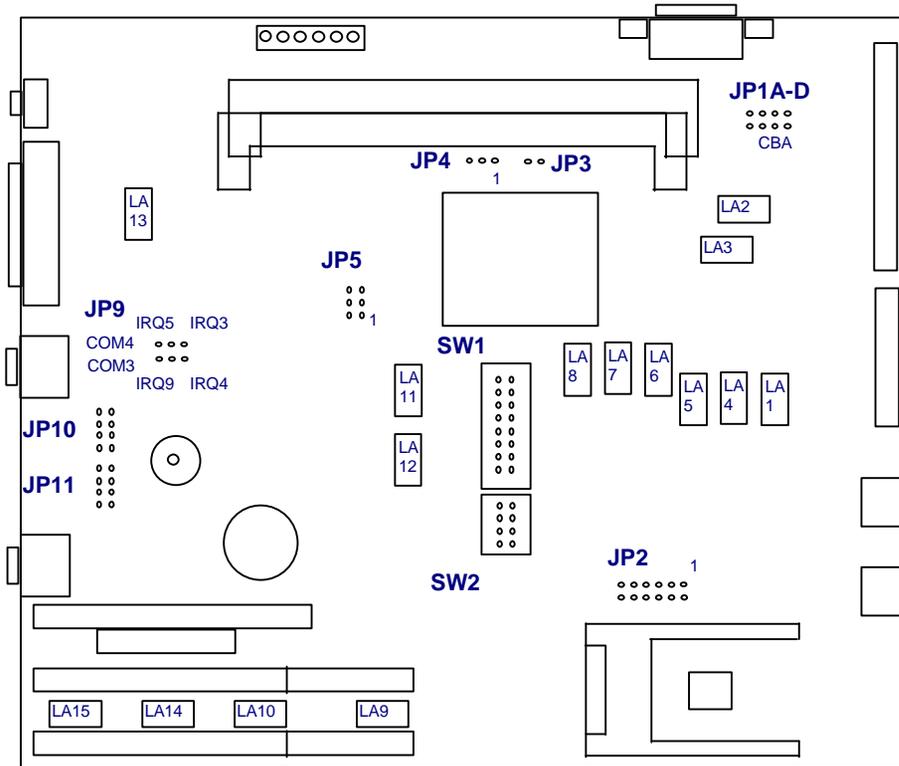


Figure 2-2. Jumpers.

NOTE: The JP9 switch settings are silkscreened incorrectly on the first version of the evaluation board. Use this diagram for the correct serial port settings.



2 2

Connecting the Peripherals

The evaluation board supports several standard PC-compatible I/O peripherals, including a PS/2-compatible mouse, PS/2-compatible keyboard, IDE hard disk drive, and VGA monitor or LCD flat panel display. Figure 2-3 shows connector locations for these devices. Refer to Chapter 4 for connector descriptions and pinout diagrams.

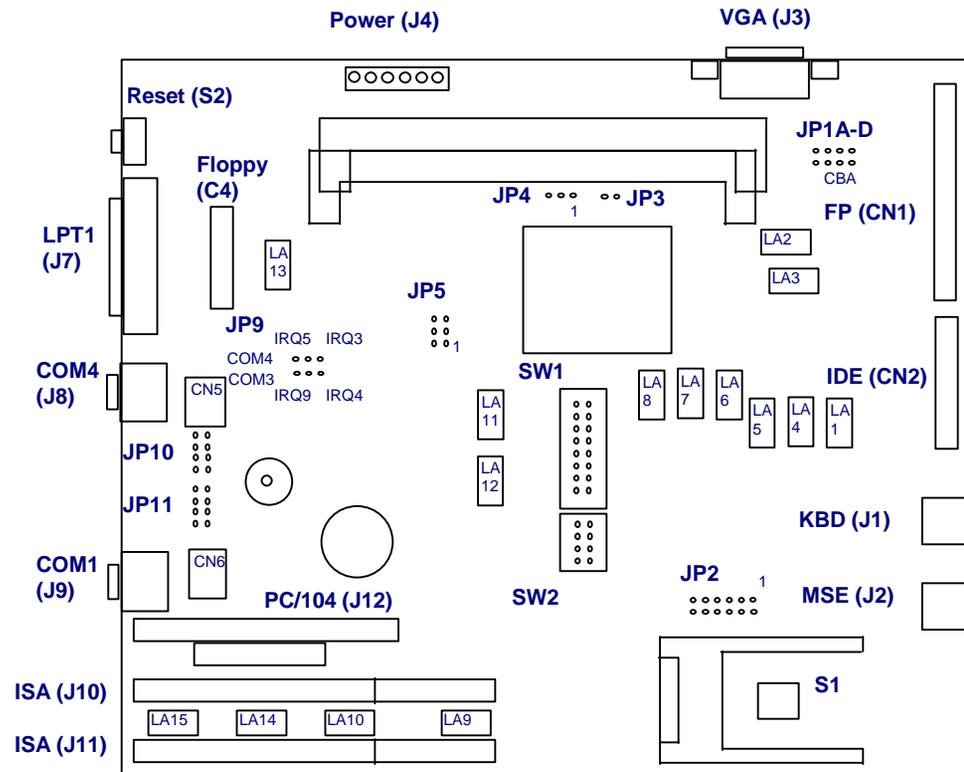


Figure 2-3. Peripheral Connectors.

Getting Started

Before you power up the evaluation board, connect the peripherals as the following steps describe. You can connect the peripherals in any order.

1. Connect a PS/2 keyboard or compatible (6-pin mini DIN connector) to J1.
2. Connect a VGA monitor (15-pin D-sub connector) to J3.
3. Connect a boot device. Use a bootable IDE hard disk drive to CN2, a floppy drive to CN6, or a Flash disk to PCMCIA header S1. Through the PC card slot, you can also establish a bootable interface with an optional ATA or Flash PC card when you set up the evaluation board as this chapter later describes. You need an ATA BIOS extension to boot from a read-only file system on a flash card.
4. OPTIONAL - Connect an LCD flat panel display to header CN1 if you will not use a VGA monitor. Set jumpers as Appendix E describes. Note that software is required to run both a VGA monitor and a flat panel display, as the hardware can sense the load on the VGA connector and then disables the flat panel interface.
5. OPTIONAL - Connect a PS/2 mouse or compatible (6-pin mini DIN connector) to J2. If you will use a serial mouse, connect it to serial port COM1 (J10).

2

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Power Supply Requirements

You can power the evaluation board using the P8 connector found on any standard PC/AT compatible +5 VDC/+12 VDC power supply such as that normally used with a PC motherboard. The evaluation board requires +5 VDC power to operate and +12 VDC power to erase or program flash devices, including the flash boot device. Note: +12V is also supplied to the PCMCIA connector S1. Figure 2-3 shows the location of the power connector on the board.

Powering Up the Evaluation Board



CAUTION

Do not power up the board until you make all connections.

2

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Before you power up the evaluation board, complete the following steps.

1. Inspect the board, noting the location of the connectors, jumpers, and major components. Refer to Figures 2-2 and 2-3.
2. Check the jumper settings to make sure they are correct. In most cases the jumper defaults should be adequate for your needs.
3. Connect all peripherals (mouse, keyboard, disk drives, monitor) to the board.
4. Connect the power supply to the board.

The evaluation board is now ready for power up.

Supported Disk Drive/PC Card Interfaces

The evaluation board supports operating interfaces with external hard disk drives and PC cards through selections you make when setting up the BIOS. This section identifies supported interfaces and boot devices, and provides a brief BIOS setup description for each interface configuration. You should carefully consider your particular requirements before performing the BIOS setup and configuring the board for use. Once you decide on a particular configuration, refer to *Setting Up the BIOS* later in this chapter for complete instructions on setting up each BIOS option.

The evaluation board does not include optional hardware such as disk drives or PC cards. If you plan to use a PC card, the utilities diskettes contain Phoenix PicoCard software drivers. This software works with many popular PC cards.

The default configuration from the factory contains PC card and RFA options in the flash boot device (FBD). To activate these configurations, BIOS extensions must be loaded by selecting them through the BIOS Setup Screen. More information about BIOS extensions is found later in this chapter.

It is not necessary to use either a disk drive or a PC card with the evaluation board.

Setting Up the BIOS

This section details the various menus and sub-menus you can use to configure the BIOS. The section presents each field in sequence as you would encounter it for the first time. Help is available in the “Item Specific Help” area of each menu.

Nonvolatile CMOS RAM on the board maintains the BIOS settings you save. The BIOS uses these settings to initialize the hardware.

You can access the BIOS setup menus only during the system reset process. Chapter 3 fully describes ways you can reset the evaluation board; you can use CTRL-ALT-DEL or the reset switch, for example. To access the BIOS setup menus, press the F2 key as the system boots.

Use the up and down cursor (arrow) keys to move from field to field on a menu. Use the right and left cursor keys to move from menu to menu, as noted in the menu bar at the top of the screen. If you leave a menu and then return, the active field is always at the top of the menu. If you select a sub-menu and then return to the main menu, you return to that sub-menu heading. For System Time and Date, press the TAB key to move between the date and time fields.

Fields with a triangle to the left represent sub-menu headings. Press the ENTER key when the cursor rests on one of these headings to reach the respective sub-menu. For most fields, position the cursor at the field, and from the numeric keypad, press the + and - keys to scroll through available choices. You can also enter certain numeric fields by using number keys on the keyboard. Once you change an entry to the desired value, use the up and down cursor keys to move to the next field.

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Main BIOS Setup Menu

Figure 2-4 shows the BIOS setup Main Menu.

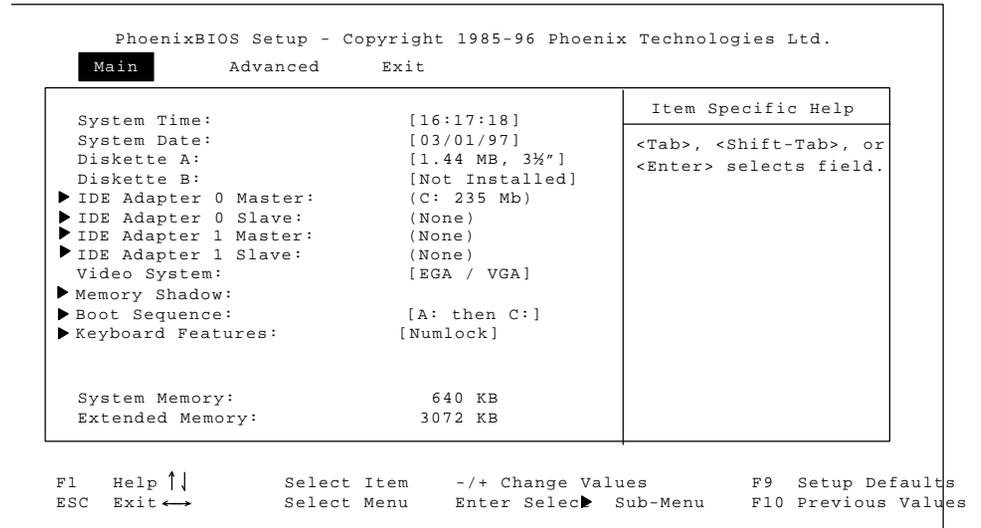


Figure 2-4. Main Menu.

This section explains the fields in each menu and sub-menu. If you need help with the settings, refer to the “Item Specific Help” area of the menu.

System Time/System Date:

You can change these values by moving to each field and typing the desired entry. Press the TAB key to move from hour to minute to second, or from month to day to year.

Diskette A/Diskette B

Select the proper setting for your floppy disk drive by choosing one of the following:

- for 5-1/4” drives 360K or 1.2 MB
- for 3-1/2” drives 720K or 1.44 MB or 2.88 MB

You can set up an A drive and a B drive using the proper cable. The BIOS defaults to 1.44 MB, 3.5” for drive A: and Not Installed for drive B:.

Getting Started

> IDE Adapter 0/1 Master/Slave Sub-menus

These fields are headings for sub-menus which allow you to enter complete disk drive information. Once you enter drive information, the Main Menu shows the drive designation and size. For more information, refer to the description of the IDE Adapter 0/Adapter 1 Sub-menus later in this chapter.

Video System

Select the video output you are using. In the majority of cases, you will select EGA/VGA. Other options include CGA 80x25 and monochrome. The default is EGA/VGA.

>Memory Shadow Sub-menu

The Memory Shadow Sub-menu allows you to copy information from ROM (on the ISA bus) into RAM and access the information in this alternate location. For more information, refer to the section which explains the Memory Shadow Sub-menu.

>Boot Options Sub-menu

The Boot Options Sub-menu allows changing the boot delay, boot sequence, and disable several displays during the boot process, such as the SETUP prompt, POST errors, floppy drive check, and summary screen. Once the boot sequence has been set, it displays in this entry in the Main menu. For more information, refer to the section which explains the Boot Options Sub-menu.

System Memory

You cannot edit this field and it is not necessary to do so. The field shows the amount of conventional memory (that below 1 MB) available.

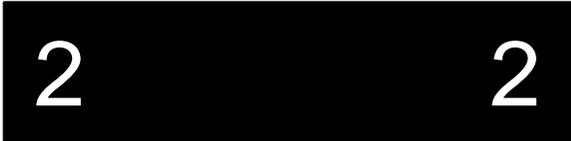


Note

The amount of conventional memory is actually less than 640 KB, as the extended BIOS data area uses some of this memory to support the PS/2 mouse interface.

Extended Memory

You cannot edit this field and it is not necessary to do so. The field shows the amount of extended memory (that above 1 MB) available.



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>IDE Adapter 0/1 Sub-menus



There are four IDE Adapter Sub-menus: one each for Adapter 0 master drive (bootable) and slave drive (not bootable) and one each for Adapter 1. The evaluation board supports a maximum of four hard disk drives. To see detailed characteristics of the device set up as the master drive or to change the configuration of the drive, choose the IDE Adapter 0 Master Sub-menu. Choose the IDE Adapter 0 Slave Sub-menu to configure or change additional drives. Figure 2-5 shows the IDE Adapter Master 0 Sub-menu.

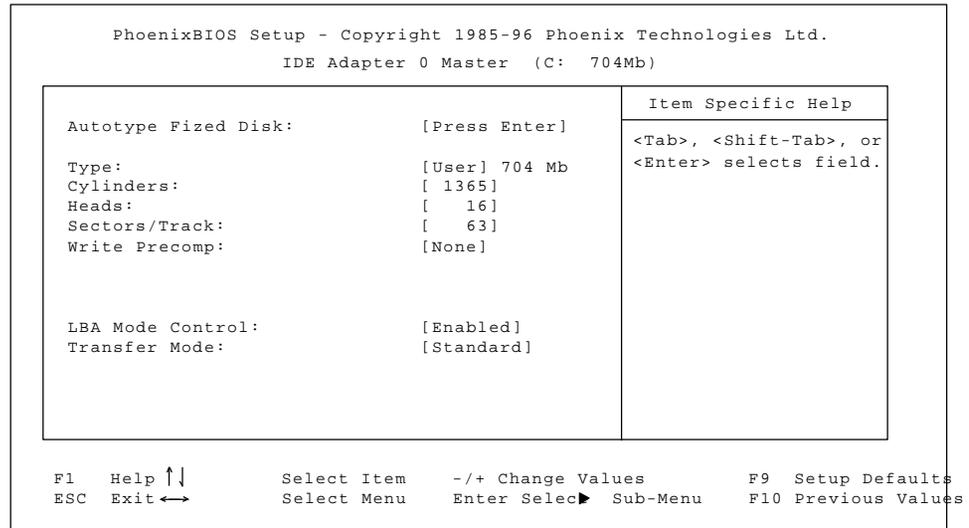


Figure 2-5. IDE Adapter Sub-menu

Autotype Fixed Disk

Use this option when setting up a new disk drive. Press ENTER to start the process; the BIOS will change each setting it has information for. This option ensures that the BIOS determines the proper settings of the drive, based on the manufacturer's information. You can use this option with any IDE drive that complies with ANSI specifications.

Getting Started

When you manually enter information for a pre-formatted disk drive, take care to use the same parameters that were used originally when the disk was formatted. If the specific cylinder, head, and sector information used was different than the manufacturer's settings, autotyping the disk will supply the wrong configuration. Most likely you will be unable to boot an operating system under such circumstances.

Type

In most cases, the IDE interface involves a hard disk drive but the interface can involve other devices. If you are not using an IDE hard disk drive, select 'None.' Also select 'None' if you use an SRAM PC card. If you use a disk drive device not conforming to ANSI standards and cannot employ the Autotype feature, select 'User' for the type and enter the correct values for disk cylinders, heads, etc. from the drive's documentation or label.

There are some restrictions when setting up devices on the evaluation board. Booting from an ATA card can only be accomplished using a ROM extension such as the PhoenixPICO PCMBOOT.BIN file. The ROM extension reads the Card Information Structure (CIS) from the PCMCIA card and reads the geometry of the card.

Once you complete the setup for the IDE Master, you can choose the IDE Adapter 0 Slave Sub-menu to set up a second hard disk drive. When the setup is complete, press the ESC key to return to the Main Menu.

LBA Mode Control

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

Transfer Mode

This option selects the mode that the System BIOS uses to access the hard disk. The selection available is Standard (default).

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Note that autotyping may change this value depending on the transfer modes that the hard disk reports it supports.

Once you have set up the IDE Adapter 0 Master, if necessary you can set up an IDE Adapter 0 Slave, then IDE Adapter 1 Master/Slave. The default setting for each is None.

When you complete entries to the IDE Adapter Sub-menus, exit to the Main BIOS Setup Menu using the ESC key.

Memory Shadow Sub-menu

The term “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.

The Memory Shadow Sub-menu is shown below.

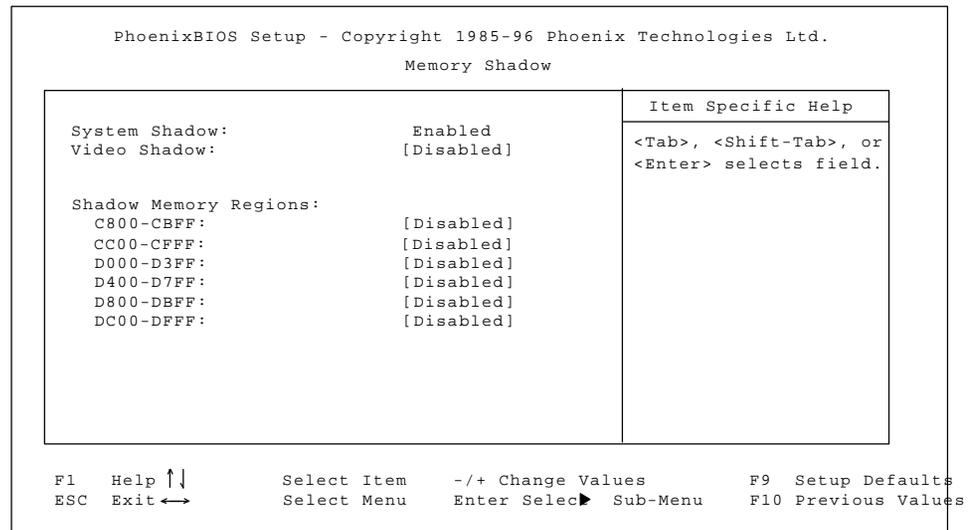


Figure 2-6. Memory Shadow Sub-menu.

Getting Started

The shadow regions should be used only if an ISABus card is installed in the system that contains a BIOS extension (ROM). There is no great effect on the system if a region is shadowed that does not contain a BIOS extension (a small amount of memory is consumed). 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.

Note: when shadowing a BIOS extension contained in the FBD, the user must ensure that the same region is not shadowed in this menu. The region selected in the BIOS extension shadowing menu supersedes the region selected in this menu.

System Shadow

This option is not editable since the System BIOS is always shadowed.

Video Shadow

This option determines whether the VGA BIOS is shadowed. Shadowing greatly improves system performance. The default is disabled.

Shadow Memory Regions

These options enable or disable shadowing for the associated memory region. The default is disabled for each region.



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>Boot Options Sub-menu

The Boot Options Sub-menu allows you to change boot options.

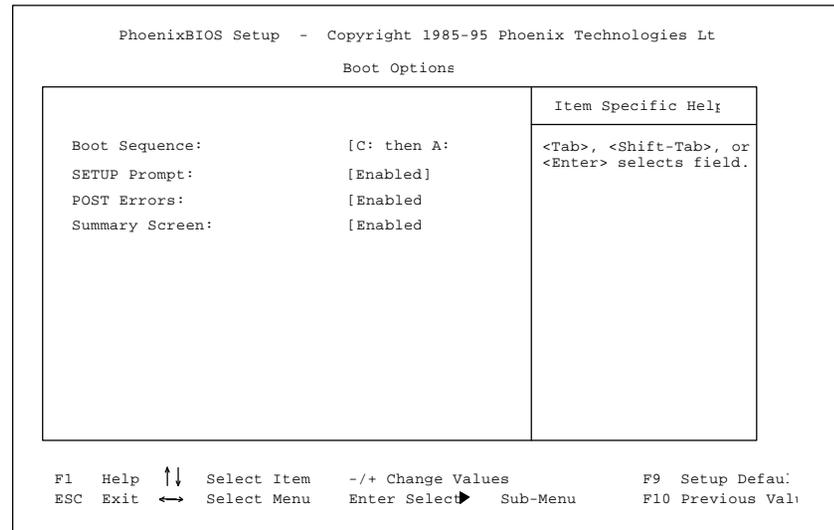


Figure 2-7. Boot Options Sub-menu.

Boot Sequence

Use this option to set the system boot sequence. You can select a boot from ‘C only’ to slightly speed the booting process when the system boots from an external hard disk drive. To boot from the A: drive, change the sequence to ‘A then C.’

About Drive Letter Assignment

If you specify an IDE Adapter 0 Master drive, it becomes drive ‘C’ and serves as the boot drive. If you specify an IDE Adapter Slave 0 drive, it becomes drive ‘D.’ If you use an ATA PC card, it carries the drive ‘C’ designation and replaces the IDE hard disk drive. An exception occurs if you use Card and Socket Services software drivers to access the ATA PC card. In this case, the hard disk drive retains the ‘C’ drive designation and the software driver controls the PC card interface. Any activated BIOS extension supersedes the C: drive setup in the BIOS. The BIOS extension with the highest destination address becomes drive C:. It does not matter where the extension is located in the RFA – only where it is shadowed to. If you activate multiple BIOS extensions, you can push an IDE drive set up as C: all the way to E:, which would not be visible to the system.

Getting Started

Setup Prompt

Use this option to enable or disable the message 'Press F2 to enter Setup.' The default is enabled. Even if you disable the message, you can always press F2 during the boot process to enter the Setup Menu.

POST Errors

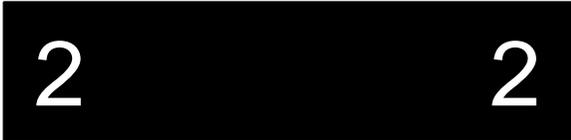
Use this option to stop the boot if, during the process, the system encounters boot failure errors. Otherwise, the system will continue to attempt to boot despite most startup error messages that display. The default is enabled. The following errors halt the system when the POST Errors option is enabled:

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 (not applicable to this board)
3. Timer error
 - System timer (0) failed
4. I/O chip error
 - I/O conflicts exist for serial and parallel ports, hard disk (any or all)
5. Other error
 - Embedded Shadowed region exceeded DFFFF
 - IRQ conflict, unsupported COM port configuration, keyboard locked

The system displays an error message but does not halt if it encounters keyboard, RTC, CMOS, or configuration errors from the previous POST.

Summary Screen

Use this option to enable or disable a summary of the system configuration, which displays before the operating system begins to load. To save booting time, or to preserve POST data, you can disable the summary screen. The default is enabled. When you complete entries to the Boot Options Sub-menu, exit to the Main BIOS Setup Menu using the ESC key.



2 2

Advanced Menu

The Advanced Menu contains settings for integrated peripherals, advanced chipset control, and to set the large disk access mode. The figure below shows this menu.

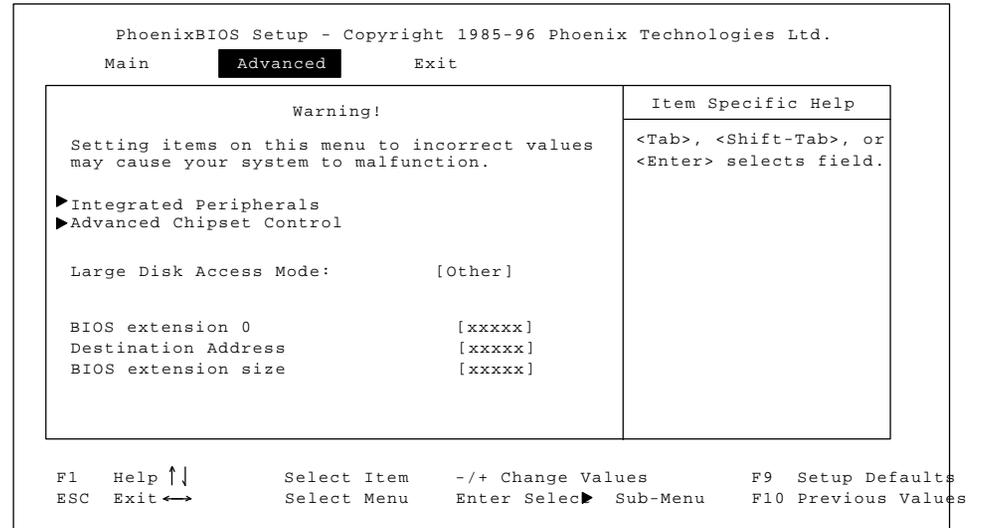


Figure 2-8. Advanced Menu.

>Integrated Peripherals Sub-menu

This option is used to select the Integrated Peripherals sub-menu in order to configure the onboard COM ports, the parallel port, and the diskette controller. Refer to the Integrated Peripherals Sub-menu section for more information.

>Advanced Chipset Control Sub-menu

This option is used to fully configure the R400EX chip. Configurable features include DMA, the Flash Boot Device, ISA bus, parity, L1 cache, local bus, DRAM timing, internal serial ports, and clock/reset characteristics. Refer to the Advanced Chipset Control Sub-menu section for more information.

Getting Started

Large Disk Access Mode

If you use a drive larger than 528 MB and you run DOS, set the Large Disk Access Mode to 'DOS.' This is the default setting. If you use a different operating system, set it to 'Other.' The 'DOS' setting causes the system BIOS to store in its two hard disk tables (located in the extended BIOS data area) the number of cylinders divided by two and the number of heads multiplied by two (if the drive is configured in setup to have more than 1024 cylinders). This allows MS-DOS systems to use hard disks of up to 8 GB in size, or 1024 C x 255 H x 63 S, without special drivers or LBA.

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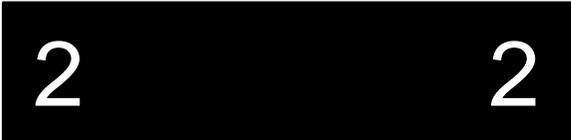
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BIOS Extensions

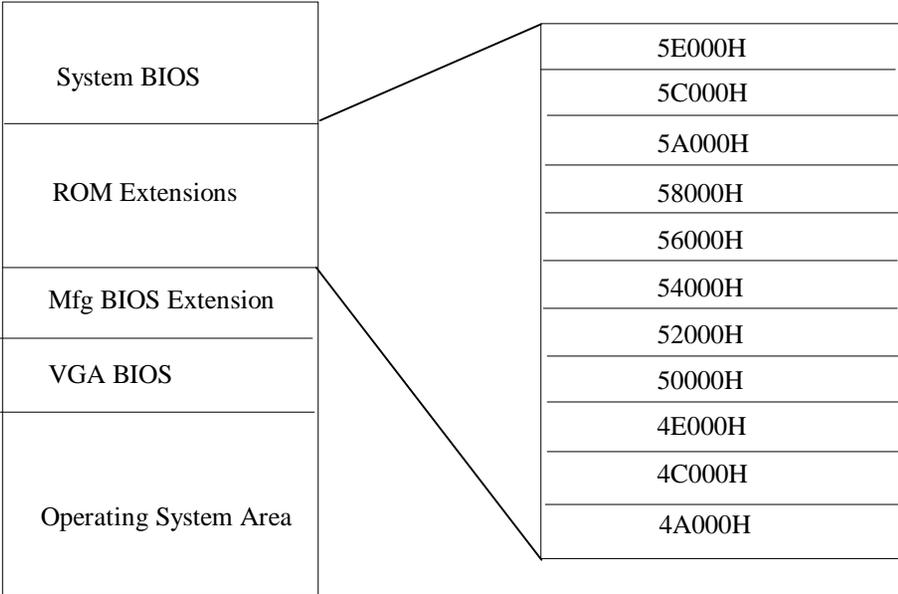
It is through this menu that you control booting from BIOS extensions. The use of BIOS extensions is a general mechanism for executing ROM extensions. The ROM extensions are flashed into the FBD using REFLASH.EXE. This screen controls the loading (copying) of BIOS extensions contained in Block 3 of the FBD. This block is 128KB in size and can contain up to eleven 8KB BIOS extensions, or one 88KB extension, or any combination. These extensions can be shadowed into 11 possible real memory locations in the C8000h ~ DFFFFh range. Note that the granularity of the extension in ROM can be as small as 8KB, and can be copied down on 8KB boundaries. However, the granularity of the shadow is 16KB. The following is a list of the BIOS extensions that are resident in the FBD:

<u>Offset</u>	<u>Size</u>	<u>Description</u>
48000	16K	PicoFA FTL/FFS Driver for R400 Eval Board
4C000	8K	PicoCard PCM Extension for a PCMCIA/ATA device
4E000	8K	Manufacturing BIOS

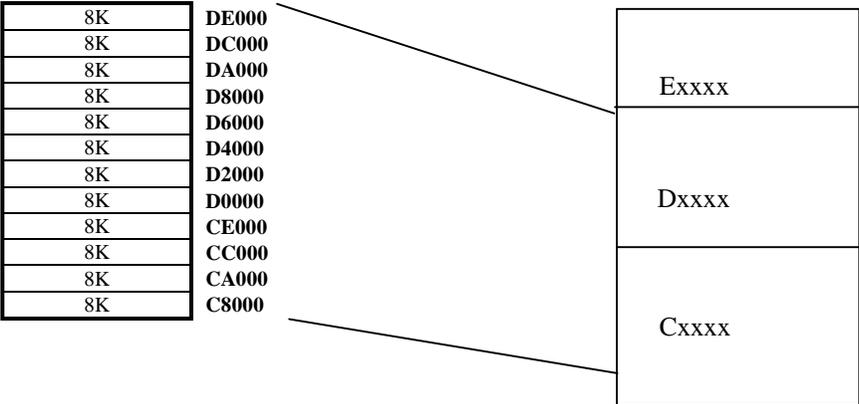
Thus to execute the Manufacturing BIOS, you just need to set one of the user extension shadowing entries to load 8K (2000h bytes) from 4E000h.



Flash Boot Device



The three regions selectable in the Embedded Features Menu require you to enter a source base address and the size of the extension. Then the extension is copied into a specified area:



Getting Started

Offset of BIOS Extension in FBD:

This field identifies the source offset of the ROM extension in the Flash Boot Device (FBD). There are eleven 8KB (2000H) sectors to choose from.

Destination Address:

This field identifies where in conventional memory the BIOS extension will be copied. Although the boundaries are 8KB in the FBD, the target area has 16KB granularity. If only a single 8KB region is copied, it consumes 16KB in the target.

BIOS Extension Size:

This field checks for the number of bytes to copy. Anything copied in this menu will supersede all ISA shadowing setups. Check to make sure you are not locating an embedded BIOS extension in the same address as an ISA BIOS extension.



Integrated Peripherals Sub-menu

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

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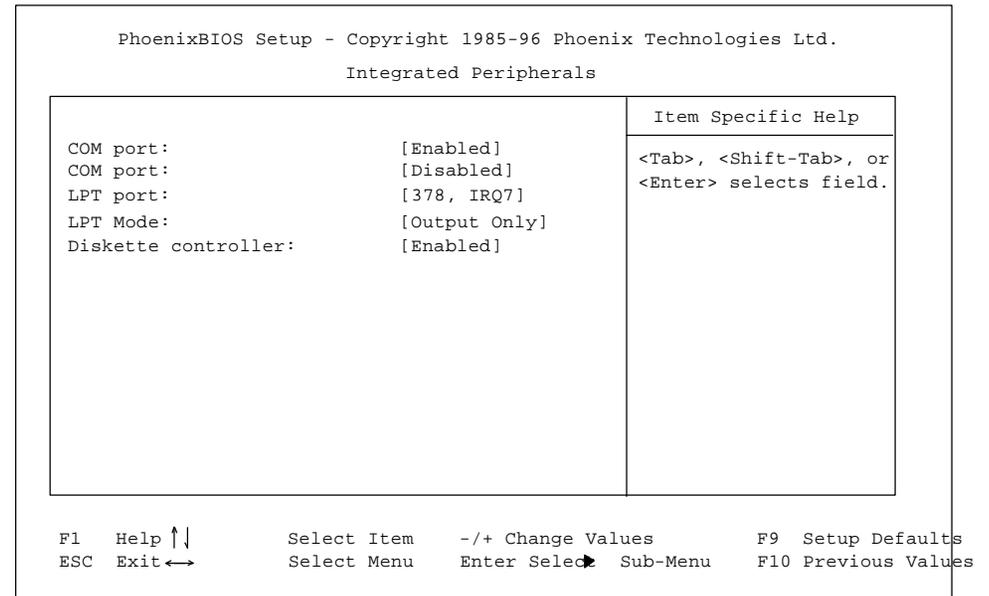


Figure 2-9. Integrated Peripherals Menu.

COM Port(s)

These options are used to configure the serial ports COM1 and COM2. The ports are provided by the R400. The default is COM1 configured at 3F8 and IRQ4. COM2 port is not enabled by default but can be configured.

Either port is configurable for either IRQ3/IRQ5 or IRQ4/IRQ9 and Base address 3F8h, 2F8h, 3E8h or 2E8h.

LPT port

This option is used to configure the parallel port labeled on the front panel as “LPT”. The defaults for this LPT port are I/O base 378h and IRQ7.

Getting Started

LPT Mode

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

Output only (the default)

Bi-directional (accepts inputs as well as standard output)

ECP (extended capabilities protocol as per IEEE 1284)

Diskette Controller

This option enables or disables the onboard floppy disk controller. The default is enabled. The floppy diskette controller is discussed in more detail in Chapter 3, *Theory of Operations*.

Integrated IDE Controller

This option is used to enable or disable the onboard IDE controller. This option will not be available in production units.



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Advanced Chipset Control Sub-menu

This menu is used to configure a wide variety of options. Please note that extreme care should be used when adjusting the default settings in this menu. System performance can be degraded substantially if the wrong selections are made.

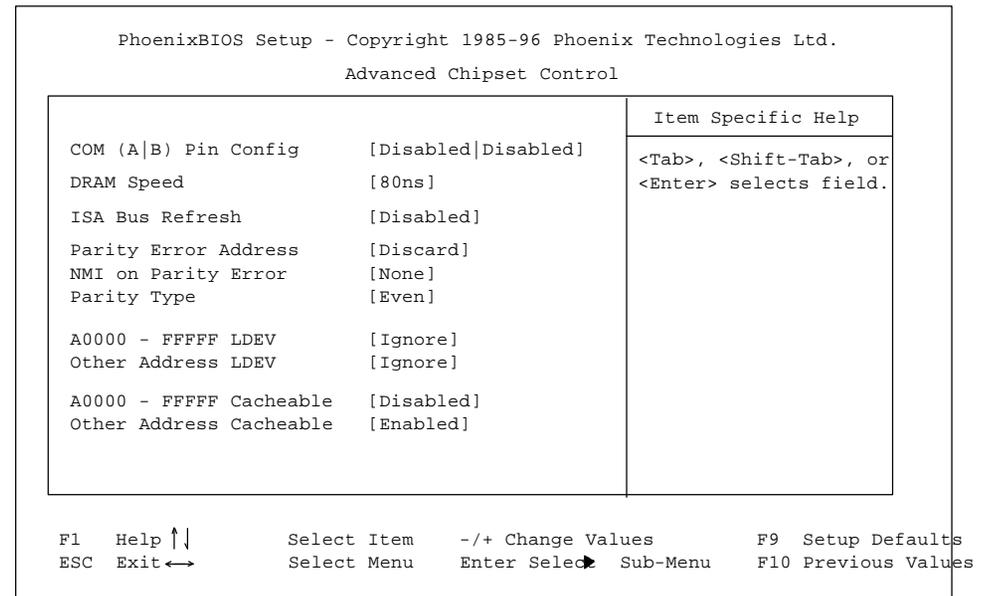


Figure 2-10. Advanced Chipset Control Sub-menu.

COM (A:B) Pin Config

Use this option to configure the settings for the first two COM ports. Options are:

COMA	COMB
Disabled	Disabled
Disabled	4-pin
Disabled	IrDA
Disabled	2-pin
8-pin	Disabled
4-pin	4-pin
6-pin	IrDA
6-pin	2-pin

Getting Started

IrDA refers to the Infra-red port.

8-pin port: RxD, TxD, CTS, RTS, DTR, DSR, DCD, RI plus GND

6-pin port: RxD, TxD, CTS, RTS, DTR, DSR

4-pin port: RxD, TxD, CTS, RTS

2-pin port: RxD, TxD

Default is Disabled | Disabled.

DRAM Speed

Use this option to set the speed of the DRAM. The options are 50 ns, 60 ns, 70 ns, and 80 ns. The default is the slow setting, 80 ns.

ISA bus Refresh

Use this option to enable or disable ISA bus refresh cycles. These refresh cycles may be needed for memory. The default is Disabled.

OPTIONAL MENU ITEM: The ISA bus Refresh entry is an optional entry in the Advanced Chipset Control menu. It appears only if the MA[7] switch is configured to the REFRESH vs CS1 pin strapping on the R400. Use this setting to enable ISA refresh if the chip is strapped and wired appropriately; otherwise the menu choice will not appear.

Parity Error Address

Use this option to specify whether to save or discard the address of a parity error. The default is to Discard the address.

NMI on Parity Error

Use this option specify whether to assert an NMI on receiving a parity error. Options are None and Assert. The default is None. After the first parity error, the NMI handler disables this feature so that the first address is saved in the Parity Address High and Parity Address Low registers.

Parity Type

Use this option to set the parity type as Even or Odd. The default is Even.

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A0000 - FFFFF LDEV

Use this option to recognize devices on the ISA bus using the A0000 - FFFFF address space. LDEV allows handling of bus cycles by a device other than DRAM on the ISA bus. The default is to Ignore.

Other Address LDEV

Use this option to recognize devices on the ISA bus using addresses other than the A0000 - FFFFF address space. The default is to Ignore.

A0000 - FFFFF Cacheable

Use this option to cache the A0000 - FFFFF address space. The default is to Ignore.

Other Address Cacheable

Use this option to cache addresses other than the A0000 - FFFFF address space. The default is to Ignore.

When you complete the entries in the Advanced Chipset Control Sub-menu, exit to the Advanced Chipset menu using the ESC key.

Exit Menu

Use the options in this menu to save the BIOS setup into CMOS and exit to the operating system, or to abandon your changes and exit to the system. Figure 2-11 shows the Exit Menu.

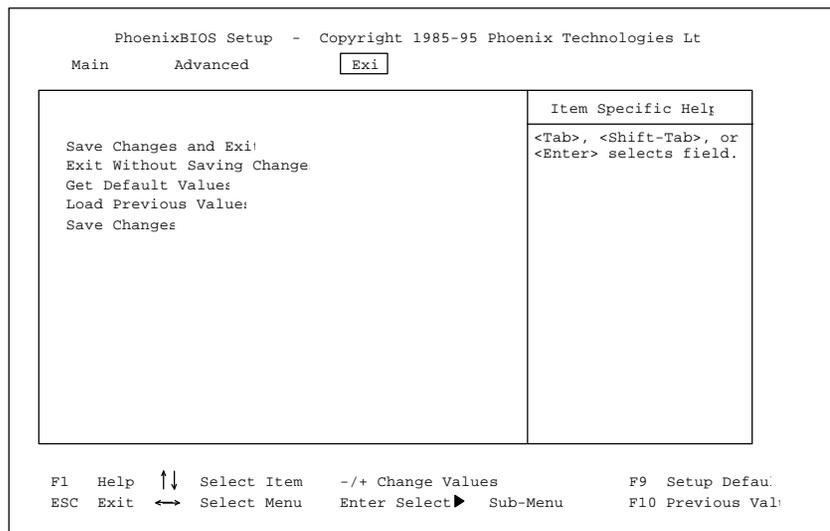


Figure 2-11. Exit Menu.

Save Changes and Exit

Use this option if you want to save your entered values into CMOS and exit to load the operating system. The evaluation board saves the new values, exits the BIOS setup mode, and reboots using the new values.

Exit Without Saving Changes

Use this option if you want to discard the changes you made and revert to the BIOS setup as it was before you began making changes. The evaluation board reboots with the old setup values.

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Get default values

Use this option if you need to reset the BIOS setup values to those that were set at the factory as default values before any changes were made. The evaluation board does not exit from the BIOS setup mode and you can continue to edit.

Load previous values

Use this option if you wish to load the system with the previous BIOS setup values, or those values that existed before you began making changes. The evaluation board does not exit from the BIOS setup mode and you can continue to edit.

Save Changes

Use this option to save changes you made during the editing session. The evaluation board does not exit from the BIOS setup mode and you can continue to edit.

Chapter 3 - Theory of Operation

3

3

This chapter contains information about the following components, functions, and aspects of the evaluation board:

- Overview
- Processor
- Functional Unit Summary
- DRAM Interface/Bus Control
- Memory
- BIOS Flash EPROM
- Super VGA/Flat Panel Controller Subsystem
- Flash Disk Subsystem
- Hard Drive and Floppy Disk Drive Controller
- Miscellaneous Functions
- Unpopulated Features
- Signal Probing Headers
- Power Requirements
- Mechanical Specifications
- Resetting the evaluation board

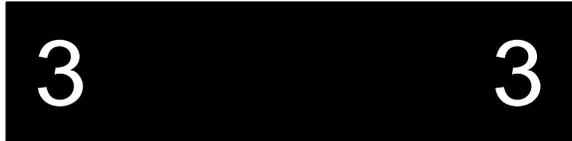
CPU subsystem

The R400EX Evaluation Board uses the IntelDX4 SMI-enhanced processor in a 168-pin PGA package. It also includes an unpopulated SMT pad pattern for the Intel 486ULP processor.

Chip Set

The board design uses the RadiSys R400EX to interface the Intel 486 to the AT bus and to DRAM memory. This chip contains the features found in the following list.

R400EX System Functional Unit Summary



Functional Unit	Description
Interrupt Controllers (2)	8259A-Compatible Peripheral Interrupt controller with support of up to 8 channels
Timer/Counters (3)	82C54-Compatible Programmable Interval Timer
Asynchronous Serial Ports (2)	NS16C550 Compatible UART.
DMA Controller	8237A-compatible DMA controllers, with support of up to 8 channels
Clock & Power Management Unit	Provides a programmable clock signal for EX core and for peripherals. Power management capability provides idle (stops CPU clock; peripheral clock runs) and powerdown (both CPU and peripheral clocks stopped) modes.
Watchdog Timer	12-bit timer
Real Time Clock	Provides Motorola 146818A-compatible real time clock and alarm with 114 bytes of battery-backed CMOS memory. The RTC also generates a periodic interrupt. Access to the CMOS memory is through registers 070h and 071h in an index/data fashion. The Real-time clock is enabled or disabled by bootstrap pins on the R400EX.
Keyboard/Mouse Controller	Implements a 8042-Compatible keyboard controller with extensions to support a PS/2 mouse. The controller is enabled or disabled by bootstrap pins on the R400EX.
PC Speaker/"Port B" /"PortA" Functionality	Port B register is located at 061h. PortA is located at 092h
DRAM Controller	Supports two banks of SIMMs as Fast Page Mode (FPM) or Extended Data Out (EDO). DRAM parity is also supported.
Power Management Support	Supports Power Management with Halt detection logic, SMI generation logic, and glitchless clock switching.
Programmable Chip Select Units	Control for ISA or local Bus peripheral devices
IDE Interface	Supports EIDE transfer modes (PIO4). Located at address 01F0h.

Table 3-1. R400EX System Functional Unit Summary.

DRAM subsystem

The R400EX Evaluation Board supports two modules (a module is a single- or double-sided SIMM) of 70ns fast page mode (FPM) or extended data out (EDO) DRAM installed in 72 pin SIMM sockets. SIMM memory may be installed to support from 1 MB up to 128MB (32Mx32 non-parity) of DRAM.

After power on reset, the BIOS finds and sizes memory present in the system.

R400EX Evaluation Board Hardware Reference

To improve the performance of the BIOS that is initially contained in a 8-bit wide flash EPROM, the main BIOS and, optionally, the video BIOS is shadowed in the DRAM .

The R400EX Evaluation Board can optionally support parity DRAM, as a build-time option, with the loss of the built-in IDE interface.

BIOS Flash EPROM

The main IBM compatible BIOS and video BIOS resides in a single 4Mb boot-block flash EPROM (Intel 28F004BV-T or equivalent). It is based on the Phoenix PicoBIOS. It includes the video BIOS, supplied by Cirrus, and support for flat panel displays. The BIOS includes support for a set of different displays. The selection of displays is determined based on customer requirements. Three types of displays were tested with the R400EX Evaluation Board: Monochrome, Passive Color, and TFT Color.

The boot-block flash EPROM allows BIOS changes and upgrades to be loaded and programmed into the flash BIOS after the board leaves the factory. It is anticipated that this feature may be required to support different flat-panel displays, without requiring that a flash device be replaced.

The R400EX Evaluation Board has a DIP switch position that, when activated, forces an update of the BIOS. This is used in cases where the BIOS is corrupted such that MS-DOS does not boot. The BIOS is updated from the serial port using a crisis diskette.

A jumper is provided to enable programming of the boot block.

VGA / flat panel controller subsystem

A VGA-compatible video and flat-panel display controller is provided on the CPU board. The video subsystem is implemented with a Cirrus CL-GD6245 along with 512KB of video memory implemented with one 256Kx16 DRAM device..

The 6245 supports a variety of 640x480 LCDs along with simultaneous CRT and LCD operation. CRT resolutions of 1024x768 with 16 colors or 800x600 with 256 colors and up to 64 gray shades (at 640x480) with monochrome STN and TFT LCDs may be obtained. A complete IBM VGA compatible sub-system is created with the addition of a single 256k x 16 DRAM. The 6245 is also capable of Standby and Suspend modes for reduced power consumption.

3

3

Theory of Operation

The R400EX Evaluation Board provides a standard VGA connector. A 50-pin high-density header is provided to interface to flat panels. The pinout for the LCD header is described in the pinout table.

The VGA controller resides on the 486 local bus.

The VGA controller provides the following set of output connectors:

1. A standard 15-pin high-density D-sub connector used to connect to a standard VGA monitor.
2. A 50-pin 2.0mm pitch shrouded header to provide connection for flat panel displays. The pinout and function is identical to that of the EXPLR1 board.

The ROM BIOS code for the VGA controller is included in the same BIOS flash EPROM that the main system BIOS resides in. Since it is contained in a boot-block flash device, it is possible to upgrade the video BIOS to include different flat-panel displays after the board has left the factory.

The BIOS includes space for six different types of panels to be supported. At power-up, a set of jumpers are read by the VGA controller to select which of the six options should be used.

Support is included in the standard BIOS for the following flat panels:

Sharp LM64C08P Passive Color LCD

Sharp LM64P80 Monochrome LCD

If you use the Sharp LM64C08P passive color flat panel, connect a jumper across pins 1 and 2, and a jumper across pins 5 and 6. If you use the Sharp LM64P80 monochrome flat panel, connect a jumper across pins 3 and 4, and a jumper across pins 5 and 6.

LCD Contrast Control

No circuitry is included on the R400EX Evaluation Board for this function.

LCD Backlight Control

No circuitry is included on the R400EX Evaluation Board for this function.

Flash disk subsystem

The R400EX Evaluation Board implements a Resident Flash Array (RFA). The design provides a full read/write flash file system. The system can also be booted from the flash disk. The RFA site is compatible with 2MB (28F016) and 4MB (28F032) devices.

The interface to the RFA may be accomplished one of two ways, depending on the setting of a jumper.

The RFA access may be implemented through a 16K memory window in the processors address space. The programmable chip select 1 (PCS1) from the R400EX is used in addressing the RFA along with additional address bits from an upper address register. A 10-bit upper address register resides on the ISA data bus which is accessed using a fixed register at IO address 380. To access the RFA in this manner, a jumper needs to be set to select IO mapped page operation of the RFA.

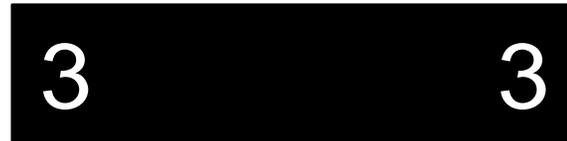
The RFA may also be mapped as linear high memory. In this mode of operation, the R400EX PCS1 chip select is used alone to select the device in it's entirety. To select this method of operation, the jumper needs to be set to select linear memory addressing for the RFA.

A jumper must be installed at JP2C to force the RFA to operate in a byte-wide mode (as opposed to 16-bit operation).

Hard drive and Floppy Disk Drive controller

A floppy disk drive controller is contained in a Super-IO chip, the FDC37C665GT, manufactured by Standard Microsystems Corp. For details of the operation of these functions, refer to the SMC datasheet for this device. Note that this device also contains the two serial ports and one parallel port; see below.

The floppy disk controller is fully PC-compatible, supporting one or two 5.25" 360KB and 1.2MB as well as 3.5" 720KB, 1.44MB, and 2.88MB drives and media. It occupies I/O addresses 0x3F2, 0x3F4, 0x3F5, and 0x3F7. It uses the AT bus interrupt IRQ6 and the 8-bit DMA channel DRQ2 and ~DACK2. Connection to a floppy disk drive is made via a standard 34-pin ribbon cable header mounted on the PCB.



Theory of Operation

The IDE hard disk interface is provided by the R400EX. The IDE hard disk is mapped to I/O addresses 0x1F0 - 0x1F7, 0x3F6, and 0x3F7. Note that I/O address 0x3F7 is shared with the floppy disk controller as required for PC compatibility. The IDE interface chip selects \sim HCS0 and \sim HCS1 are generated by the R400EX.

The IDE hard disk uses AT-bus interrupt IRQ14. Connection to an IDE hard disk is made through a standard 40 -pin ribbon cable header mounted on the PCB. A second, unpopulated, site is included for a 2mm pitch 44 pin connector with is designed to support 2.5' drives. Up to two drives are supported by the IDE interface.

Serial and parallel ports

The R400EX Evaluation Board contains 1 PC-compatible parallel printer port and up to four PC-compatible serial ports (two from the R400EX and two from the Super I/O. All serial ports include NS16C550 compatible UARTs to support high-speed operation (including 16-byte FIFO). In addition, one of the R400EX serial ports supports 115kBPS IRDa operation (with an external IR transceiver).

The COM1: serial port is provided by the first UART in the R400EX , and is located in the I/O address range 0x3F8-0x3FF. COM1: serial port interrupts are signaled using the interrupt IRQ4. Connection to COM1: is provided by a standard right angle male DB-9 connector.

The COM2: serial port is provided by the second UART in the R400EXEX, and is located in the I/O address range 0x2F8-0x2FF. COM2: serial port interrupts are signaled using IRQ3. Connection to COM2: is made via a standard 10 pin header connector configured to match readily available pig-tails.

The COM3: serial port is provided by the first UART in the Super I/O chip, and is located in the I/O address range 0x3E8-0x3EF. COM3: serial port interrupts are signaled using either IRQ4 or IRQ5, selected by a jumper. Connection to COM3: is made via a standard 10 pin header connector configured to match readily available pig-tails.

The COM4: serial port is provided by the second UART in the Super I/O chip, and is located in the I/O address range 0x2E8-0x2EF. COM4: serial port interrupts are signaled using the interrupt IRQ3 or IRQ9, selected by a jumper. Connection to COM4: is provided by a standard right angle male DB-9 connector.

R400EX Evaluation Board Hardware Reference

Note that the arrangement of IRQ's allows the super IO ports to be mapped as COM1: (instead of COM3) and COM2: (instead of COM4) if the R400EX internal UART's are disabled.

The LPT1: parallel port is located in the I/O address range 0x378-0x37F. LPT1: parallel port interrupts are signaled using the AT bus interrupt IRQ7. Connection to this port is made via a 25-pin female D-sub connector. This is a multi-mode IBM PC/XT, PC/AT and PS/2 Compatible Bi-directional Parallel Port. It also supports enhanced modes including: Enhanced Parallel Port (EPP) versions 1.7 and 1.9, and Extended Capabilities Port (ECP). These enhanced features are IEEE 1284-1 Compliant.

PCMCIA controller

The R400EX Evaluation Board includes a PCMCIA controller, using the Cirrus Logic CL-PD6710 device. This device is compatible with the popular Intel 82365SL interface.

The connector employed accepts type I, type II, or type III cards. 12V VPP is supplied to the memory card as required, as is 5V and 3.3V.

Refer to the software specification for details of the software support of the PCMCIA controller.

Watchdog timer

A watchdog timer function is included as part of the functionality of the R400EX processor and is connected to provide either a RESET signal to the CPU and ISA bus connector, or a programmable interrupt, in the event that software loses control of the system.

ISA-bus

Connection is made to the ISA-bus through two alternate connector schemes. The first is a standard PC/AT-style card edge connector. This connector includes two sections; one is a 31 position connector, and the second an 18-position connector. Each position has one contact on each side of the board.



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3

Theory of Operation

The second ISA-bus connection may be made via two standard 0.100" [2.54 mm] square-pin type sockets arranged to meet the PC/104 standard. The header corresponding to the 31-position card edge is a 32x2 position socket, and the header corresponding to the 18 position card edge is a 20x2 position socket. "Extra" pins on these header connectors is connected to ground. These sockets allow topside mounting of PC/104 cards.

The ISA-bus signals (with the exception of the address bus, which is buffered directly from the CPU address bus) are provided by the R400EX devices. The buffer strengths, Iol and Ioh, on the bus are 8mA, and are slew rate limited.

The clock speed of the ISA-bus is a function of the divide ratio programmed in the R400EX and is set to approximately 8 MHz.

Terminations contained on the R400EX Evaluation Board are as follows:

Address lines:

SA0 - SA19, and LA17 - LA24: always driven by buffers from CPU bus

Data lines

SD0 - SD15: 10K pull-up to VCC

Control strobes:

~IOR, ~IOW, ~MEMR, ~MEMW, ~SMEMR, ~SMEMW:
always driven by R400EX

Xfer response signals:

~MEMCS16, ~0WS 500 ohm pull-up to VCC
~IOCS16, IOCHRDY 1K pull-up to VCC
DRQ inputs: 10K pull-down to GND
IRQ inputs: 10K pull-up to VCC
RESETDRV, OSC, BALE, AEN, SYSCLK, TC

No termination

~SBHE output: always driven by R400EX

~IOCHCK input: 4.7K pull-up to VCC

Signals Not Supported:

~IOCHCK, ~MASTER, -5V (not powered)

Miscellaneous functions

Keyboard controller

A PC-compatible keyboard controller is provided as part of the R400EX. Connection to it is made with a 6-pin mini-DIN circular connector, the type used in PS/2 designs and in other RadiSys CPU designs.

There is also a site for an external keyboard controller (S82C42PE) and connector which are unpopulated.

Power to the keyboard is fused to meet safety agency requirements (e.g., UL1950).

Battery

A built-in socketed coin cell is provided for backup of the real-time clock and CMOS RAM which is part of the R400EX. This cell is installed at the factory, and is user-replaceable. The cell used is a 3V lithium coin cell, Panasonic part number BR2330 (250mA-hour) or equivalent.

Speaker

A small speaker is installed on the PCB and connected to the standard PC "beep" generation circuit. The speaker is directly driven by the R400EX. The R400EX includes a routing feature which allows combining of the normal PC speaker signal with the PCMCIA speaker signal, thus eliminating the need for a second speaker.

LED's

The following LED's are provided on the board:

HDD access LED - an LED connected to the hard drive ~HACT signal, that illuminates when the drive is accessed

Power on LED - an LED to indicate that power is applied to the system

Reset Switch

An SPST-NO switch is provided on the board to provide a reset input to the system.



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Unpopulated Features

There are several feature capabilities of the R400EX Evaluation Board which are not populated. By installing the associated components and, in some cases, changing option selection resistors, these additional features can be tested.

External RTC

A site is included for an external DS12887 compatible real time clock. If this is installed, then the RTCIRQ/IRQ8 selection resistor would need to be moved from the default position

External Keyboard/Mouse Controller

A site is included for an external S82C42PC compatible keyboard/mouse controller chip. If this is installed, the 74ACT05 chip also needs to be installed, and the IRQ1/KBIRQ and IRQ12/MSIRQ selection resistors need to be removed.

Logic Analyzer headers

The R400EX Evaluation Board includes headers arranged for the convenient connection of a logic analyzer (HP 165xx or equivalent) to all pins of the R400EX.

The tables describing the signals on the logic analyzer headers are included in the connector section.

Power requirements

In most applications, the R400EX Evaluation Board operates on 5V DC power only. The voltage supplied must be between 4.75 volts and 5.25 volts. +12V must be supplied to erase or program the FLASH devices, including the BIOS, if 5V-only components are not installed on the board. The +12V and -12V supplies from the power input connector are connected to the ISA and PC/104 connectors. Regulators are provided onboard to deliver a 3.3V supply from the 5V supply where necessary. Normally, -5V is also supplied by the PC power supply, but it is only connected to the ISA and PC/104 connectors, and is seldom used by any board. This design does not make provisions for supplying or connecting to the -5V supply.

A linear regulator is provided to generate the 3.3V CPU power needed by some versions of the PGA-packaged Intel486 CPU. 5V or 3.3V may be selectively jumpered to the Intel486 PGA socket. A location is provided for the installation of a second regulator for the generation of a 2.6 - 3.3V CPU core voltage for the optional 486ULP processor.

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R400EX Evaluation Board Hardware Reference

The current consumption of a diskless R400EX Evaluation Board is 2 amps or less, using a 100Mhz INTEL DX4 processor, with a base memory configuration of 4 MB, in an idle state (DOS prompt).

This current draw does not include current drawn for the keyboard, or any daughter cards that might be installed on the ISA-bus or PC/104 sockets.

Mechanical specifications

Mechanically, the R400EX Evaluation Board is 10.0" x 10.0" square.

Mounting holes are positioned on the PCB to allow for mounting the R400EX Evaluation Board. Four of these holes are located near the corners of the board, and one located near the center.

The R400EX Evaluation Board also meets the PC/104 specification for mounting topside-mounted PC/104 cards.

A complete mechanical drawing of the board with detailed dimensions and the positions of connectors and mounting holes is available.

The R400EX Evaluation Board is designed to meet the standard RadiSys environmental specifications. This includes operation at temperatures from 0 to +60 degrees C. It is anticipated that the R400EX Evaluation Board meets this specification in still air, with no forced cooling required.

For details of the environmental specifications, refer to the standard RadiSys environmental specification.

EMC and Safety specifications and considerations

The R400EX Evaluation Board is designed to be used in a laboratory environment. As such, it does not contain circuitry that would be required to make it comply with EMC regulations. It also does not contain ESD suppression components that would be needed in a typical design.

Information is provided in the schematics and applications notes that show typical circuitry that would be used to implement ESD and EMC control circuitry.



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Theory of Operation

Since the R400EX Evaluation Board does not have any hazardous voltages nor energy or physical hazards and is intended to be operated in a laboratory environment by technically astute personnel, no effort has been made to make the design comply with safety standards such as UL1950.

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Chapter 4 - Connectors

This chapter describes the connectors on the R400EX Evaluation Board. These connectors adhere to existing standards. This chapter shows illustrations of each connector with pins oriented as they appear when you view the front of the connector.

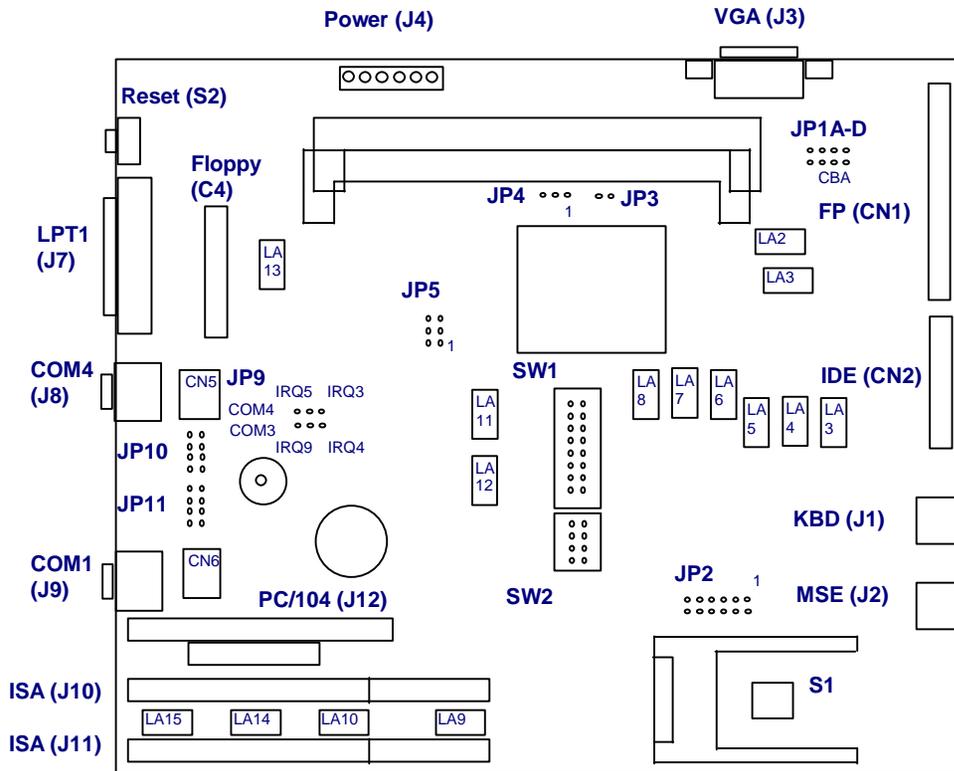


Figure 4-1. Connector Locations.

4 4

Connectors

Serial Ports

There are two 10-pin header COM ports on the evaluation board. Table 4-1 defines serial ports COM2/COM3, while Table 4-2 defines serial port COM1/COM4.

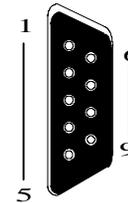
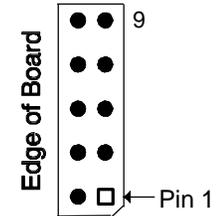
COM2/COM3 pinout (CN5, CN6): 5x2, 0.100" [2.54 mm] pitch header			
1	DCD *	RXD	2
3	TXD	DTR *	4
5	GND	DSR *	6
7	RTS	CTS	8
9	RI *		10

Table 4-1. COM2/COM3 Connector Pinout.

* These signals are not present on COM2.

COM1/COM4: pinout: (J8/J9) 9-pin male D-sub	
1	DCD
2	RXD
3	TXD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI

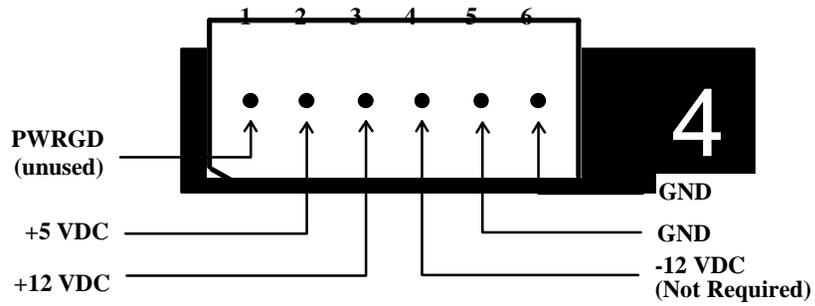
Table 4-2. COM1/COM4 Connector Pinout.



Power

POWER (J4):	
1	N/C
2	+5
3	+12
4	-12
5	GND
6	GND

Table 4-3. Power Connector Pinout.



VGA Connector

Table 4-4 defines the 15-pin D-sub VGA connector.

VGA pinout (J3)	
15-pin female high-density D-sub JST KSEY-15S-1A3F19-13 or equiv.	
Pin	Signal
1	RED
2	GREEN
3	BLUE
4	N/C
5	GND
6	ANALOG GND (RED)
7	ANALOG GND (GREEN)
8	ANALOG GND (BLUE)
9	N/C (plug)
10	GND
11	N/C
12	N/C
13	H SYNC
14	V SYNC
15	N/C

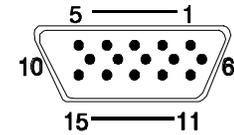


Table 4-4. VGA Connector Pinout.

IDE Header

Note: The IDE interface has a 40-pin (20 x2, 0.100" [2.54mm] pitch header which is populated, and the 44-pin header below which is unpopulated. The pinout for the 40 pin connector is identical for pins 1-40 of this connector.

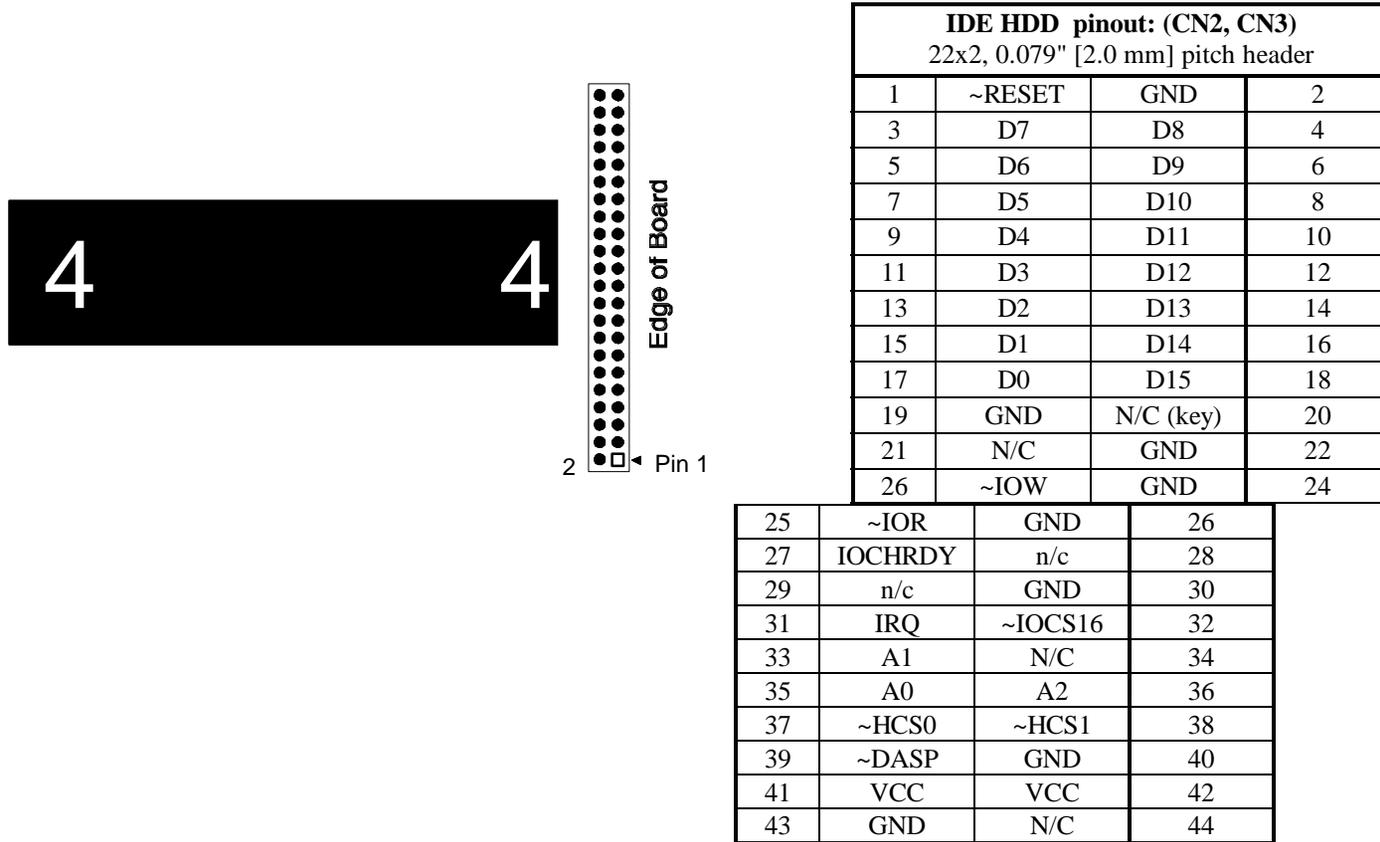


Table 4-5. IDE Header Pinout.

Floppy Drive Pinout

FDD pinout: (CN4)			
17x2, 0.100" [2.54 mm] pitch header			
1	GND	~DENS	2
3	N/C	N/C	4
5	N/C	N/C	6
7	N/C	~INDEX	8
9	Fused Vcc	~MTR1	10
11	Fused Vcc	~DS0	12
13	Fused Vcc	~DS1	14
15	GND	~MTR0	16
17	GND	~DIR	18
19	GND	~STEP	20
21	GND	~WDATA	22
23	GND	~WGATE	24
25	GND	~TRK0	26
27	GND	~WRPRT	28
29	GND	~RDATA	30
31	GND	~HDSEL	32
33	GND	~DSKCH	34

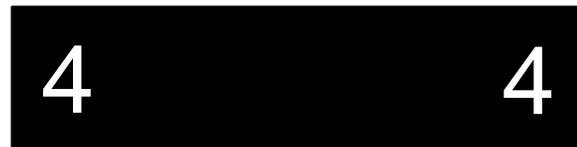
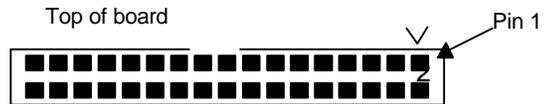


Table 4-6. Floppy Drive Connector Pinout.



CN6

Keyboard Connector

Table 4-7 defines the 6-pin DIN keyboard connector.

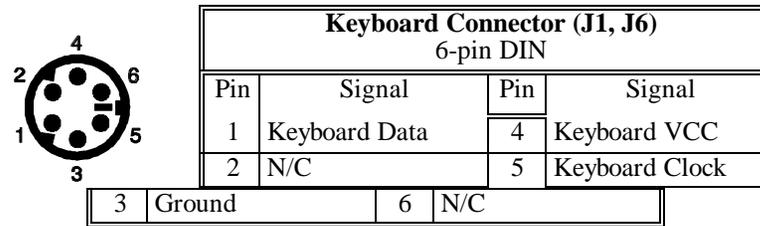


Table 4-7. Keyboard Connector Pinout.

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Mouse Connector

Table 4-8 defines the 6-pin DIN mouse connector.

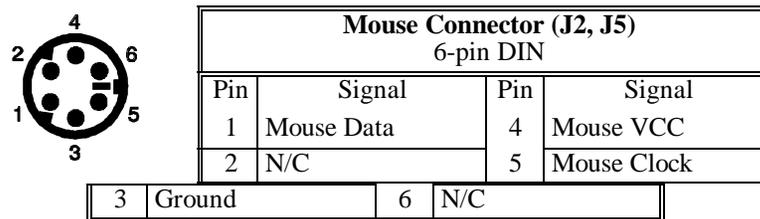


Table 4-8. Mouse Connector Pinout.

Connectors

Flat Panel Header

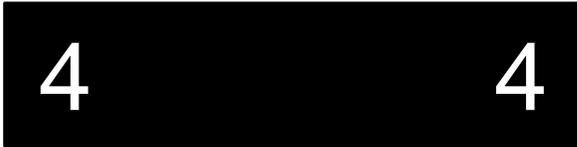
Table 4-9 defines the 50-pin flat panel header.

Flat Panel Header (CN1) 25x2 0.079" (2.0 mm) pitch header							
Pin	Signal	Type	Description	Pin	Signal	Type	Description
1	PVCC	PWR	VCC for flat panel	2	VSS	GND	Ground
3	NC			4	LD0	O	Lower Data0 for Mono, Lower Data0 for STN
5	FPBACKEN	O	Flat Panel Backlight Enable	6	LD1	O	Lower Data1 for Mono, Lower Data1 for STN
7	FPVCCEN	O	Flat Panel VCC Enable	8	VSS	GND	Ground
9	FPVEEEN	O	Flat Panel VEE Enable	10	LD2	O	Lower Data2 for Mono, Lower Data2 for STN
11	VSS	GND	Ground	12	LD3	O	Lower Data3 for Mono, Lower Data3 for STN
13	MOD	O	Modulation	14	VSS	GND	Ground
15	FLM	O	LCD VSYNC (LFS)	16	LD4	O	Lower Data4 for STN
17	VSS	GND	Ground	18	LD5	O	Lower Data5 for STN
19	LP	O	LCD HSYNC (LLCLK)	20	VSS	GND	Ground
21	FPDEN	O	Flat Panel Display Enable	22	LD6	O	Lower Data6 for STN
23	VSS	GND	Ground	24	LD7	O	Lower Data7 for STN
25	SCLK	O	Shift Clock (FPVDCLK)	26	VSS	GND	Ground
27	VSS	GND	Ground	28	R4	O	R4 for TFT
29	SUD0	O	Upper Data0 for Mono, Upper Data0 for STN	30	R5	O	R5 for TFT
31	SUD1	O	Upper Data1 for Mono, Upper Data1 for STN	32	VSS	GND	Ground
33	VSS	GND	Ground	34	NC		
35	SUD2	O	Upper Data2 for Mono, Upper Data2 for STN	36	NC		
37	SUD3	O	Upper Data3 for Mono, Upper Data3 for STN	38	VSS	GND	Ground
39	VSS	GND	Ground	40	NC		
41	SUD4	O	Upper Data4 for STN	42	NC		
43	SUD5	O	Upper Data5 for STN	44	VSS	GND	Ground
45	VSS	GND	Ground	46	NC		
47	SUD6	O	Upper Data6 for STN	48	NC		
49	SUD7	O	Upper Data7 for STN	50	VSS	GND	Ground

Table 4-9. Connection List for Flat Panel Header.



AT Bus Pinout



AT-bus pinout (XT side):					
P1	Signal	Signal Name	Signal Name	Signal	P1
A1	Vcc	~IOCHCK		GND	B1
A2	SD7			RESETDRV	B2
A3	SD6			VCC	B3
A4	SD5			IRQ9	B4
A5	SD4		-5V	n/c	B5
A6	SD3			DRQ2	B6
A7	SD2			-12V	B7
A8	SD1			~0WS	B8
A9	SD0			+12V	B9
A10	IOCHRDY			GND	B10
A11	AEN			~SMEMW	B11
A12	SA19			~SMEMR	B12
A13	SA18			~IOW	B13
A14	SA17			~IOR	B14
A15	SA16			~DACK3	B15
A16	SA15			DRQ3	B16
A17	SA14			~DACK1	B17
A18	SA13			DRQ1	B18
A19	SA12			~REFRESH	B19
A20	SA11			SYSCLK	B20
A21	SA10			IRQ7	B21
A22	SA9			IRQ6	B22
A23	SA8			IRQ5	B23
A24	SA7			IRQ4	B24
A25	SA6			IRQ3	B25
A26	SA5			~DACK2	B26
A27	SA4			TC	B27
A28	SA3			BALE	B28
A29	SA2			VCC	B29
A30	SA1			OSC	B30
A31	SA0			GND	B31

Table 4-10. ISA Bus Connector Pinout (XT side).

Connectors

AT-bus pinout (AT side):					
P2	Signal	Signal Name	Signal Name	Signal	P2
C1	~SBHE			~MEMCS16	D1
C2	LA23			~IOCS16	D2
C3	LA22			IRQ10	D3
C4	LA21			IRQ11	D4
C5	LA20			IRQ12	D5
C6	LA19			IRQ15	D6
C7	LA18			IRQ14	D7
C8	LA17			~DACK0	D8
C9	~MEMR			DRQ0	D9
C10	~MEMW		~DACK5	Pull Up	D10
C11	SD8		DRQ5	n/c	D11
C12	SD9		~DACK6	Pull Up	D12
C13	SD10		DRQ6	n/c	D13
C14	SD11		~DACK7	Pull Up	D14
C15	SD12		DRQ7	n/c	D15
C16	SD13			VCC	D16
C17	SD14		~MASTER	Pull Up	D17
C18	SD15			GND	D18

Table 4-11. ISA Bus Connector Pinout (AT side).



PC/104 Connector



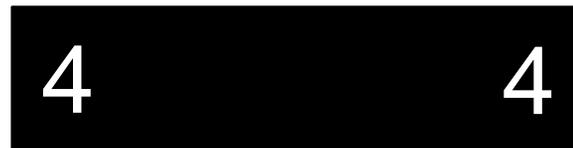
PC/104 pinout (J4): 32x2, 0.100" [2.54 mm] pitch socket					
CN9	Signal	Signal Name	Signal Name	Signal	CN9
A1	~IOCHCK			GND	B1
A2	SD7			RESETDRV	B2
A3	SD6			VCC	B3
A4	SD5			IRQ9	B4
A5	SD4			N/C	B5
A6	SD3			DRQ2	B6
A7	SD2			-12V	B7
A8	SD1			~0WS	B8
A9	SD0			+12V	B9
A10	IOCHRDY		KEY	N/C	B10
A11	AEN			~SMEMW	B11
A12	SA19			~SMEMR	B12
A13	SA18			~IOW	B13
A14	SA17			~IOR	B14
A15	SA16			~DACK3	B15
A16	SA15			DRQ3	B16
A17	SA14			~DACK1	B17
A18	SA13			DRQ1	B18
A19	SA12			~REFRESH	B19
A20	SA11			SYSCLK	B20
A21	SA10			IRQ7	B21
A22	SA9			IRQ6	B22
A23	SA8			IRQ5	B23
A24	SA7			IRQ4	B24
A25	SA6			IRQ3	B25
A26	SA5			~DACK2	B26
A27	SA4			TC	B27
A28	SA3			BALE	B28
A29	SA2			VCC	B29
A30	SA1			OSC	B30
A31	SA0			GND	B31
A32	GND			GND	B32

Table 4-12. PC/104 Connector Pinout (1 of 2).

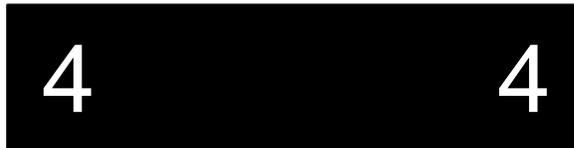
Connectors

PC/104 pinout (CN9): 20x2, 0.100" [2.54 mm] pitch socket					
CN9	Signal	Signal Name	Signal Name	Signal	CN9
C0	GND			GND	D0
C1	~SBHE			~MEMCS16	D1
C2	LA23			~IOCS16	D2
C3	LA22			IRQ10	D3
C4	LA21			IRQ11	D4
C5	LA20			IRQ12	D5
C6	LA19			IRQ15	D6
C7	LA18			IRQ14	D7
C8	LA17			~DACK0	D8
C9	~MEMR			DRQ0	D9
C10	~MEMW			~DACK5	D10
C11	SD8			DRQ5	D11
C12	SD9			~DACK6	D12
C13	SD10			DRQ6	D13
C14	SD11			~DACK7	D14
C15	SD12			DRQ7	D15
C16	SD13			VCC	D16
C17	SD14		~MASTER	Pull up	D17
C18	SD15			GND	D18
C19	GND			GND	D19

Table 4-13. PC/104 Connector Pinout (continued).

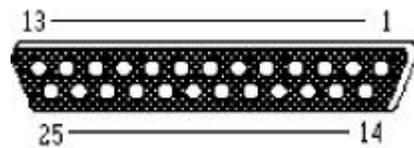


Parallel Port



LPT1: (J7) pinout:	
1	~STB
2	D0
3	D1
4	D2
5	D3
6	D4
7	D5
8	D6
9	D7
10	~ACK
11	BUSY
12	PE
13	SLCT
14	Autofeed XT
15	~ERROR
16	~INIT
17	~SLCT IN
18	GND
19	GND
20	GND
21	GND
22	GND
23	GND
25	GND
25	GND

Table 4-14. Parallel Port Connector Pinout.



Emulator and Logic Analyzer Header Pinouts

LA14

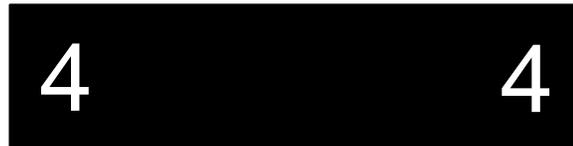
1	n/c	SA8	11
2	GND	SA7	12
3	SYSCLK	SA6	13
4	SA15	SA5	14
5	SA14	SA4	15
6	SA13	SA3	16
7	SA12	SA2	17
8	SA11	SA1	18
9	SA10	SA0	19
10	SA9	GND	20

LA15

1	N/C	AEN	11
2	GND	SA23	12
3	N/C	SA22	13
4	SBHE#	SA21	14
5	SMEMW#	SA20	15
6	SMEMR#	SA19	16
7	MEMW#	SA18	17
8	MEMR#	SA17	18
9	IOW	SA16	19
10	IOR	GND	20

LA9

1	N/C	SD8	11
2	GND	SD7	12
3	N/C	SD6	13
4	SD15	SD5	14
5	SD14	SD4	15
6	SD13	SD3	16
7	SD12	SD2	17
8	SD11	SD1	18
9	SD10	SD0	19
10	SD9	GND	20



4 4

LA10

1	N/C	IDEWR#	11
2	GND	TC	12
3	14.318MHz	BALE	13
4	N/C	RFRSH#	14
5	N/C	RSTDRV	15
6	N/C	0WS#	16
7	N/C	MEMCS16#	17
8	IDECS1#	IOCS16#	18
9	IDECS0#	IOCHRDY	19
10	IDERD#	GND	20

LA2

1	N/C	KBDATA	11
2	GND	N/C	12
3	N/C	N/C	13
4	N/C	N/C	14
5	CLKS2	RAMWE#	15
6	CLKS0	CAS3#	16
7	OSCOFF#	CAS2#	17
8	MSCLK	CAS1#	18
9	MSDATA	CAS0#	19
10	KBCLK	GND	20

LA3

1	N/C	A8	11
2	GND	A7	12
3	CLK_R400	A6	13
4	A15	A5	14
5	A14	A4	15
6	A13	A3	16
7	A12	A2	17
8	A11	GND	18
9	A10	GND	19
10	A9	GND	20

Connectors

LA11

1	N/C	A24	11
2	GND	A23	12
3	A31	A22	13
4	ADS	A21	14
5	W/R#	A20	15
6	D/C#	A19	16
7	M/IO#	A18	17
8	READY#	A17	18
9	A26	A16	19
10	A25	GND	20

LA7

1	N/C	D8	11
2	GND	D7	12
3	N/C	D6	13
4	D15	D5	14
5	D14	D4	15
6	D13	D3	16
7	D12	D2	17
8	D11	D1	18
9	D10	D0	19
10	D9	GND	20

LA6

1	N/C	D24	11
2	GND	D23	12
3	N/C	D22	13
4	D31	D21	14
5	D30	D20	15
6	D29	D19	16
7	D28	D18	17
8	D27	D17	18
9	D26	D16	19
10	D25	GND	20

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LA8

1	N/C	MA8	11
2	GND	MA7	12
3	N/C	MA6	13
4	RAS3#	MA5	14
5	RAS2#	MA4	15
6	RAS1#	MA3	16
7	RAS0#	MA2	17
8	MA11	MA1	18
9	MA10	MA0	19
10	MA9	GND	20

LA1

1	N/C	IRQ10	11
2	GND	IRQ9	12
3	N/C	IRQ8	13
4	N/C	IRQ7	14
5	N/C	IRQ6	15
6	N/C	IRQ5	16
7	IRQ15	IRQ4	17
8	IRQ14	IRQ3	18
9	IRQ12	IRQ1	19
10	IRQ11	GND	20

LA5

1	N/C	DACK0#	11
2	GND	N/C	12
3	N/C	DRQ7	13
4	N/C	DRQ6	14
5	DACK7#	DRQ5	15
6	DACK6#	DRQ3	16
7	DACK5#	DRQ2	17
8	DACK3#	DRQ1	18
9	DACK2#	DRQ0	19
10	DACK1#	GND	20

Connectors

LA13

1	N/C	BLAST#	11
2	GND	SRESET	12
3	N/C	STPCLK#	13
4	BRDY#	HOLDA	14
5	KEN#	HOLD	15
6	HITM#	BE3#	16
7	EADS#	BE2#	17
8	A20M#	BE1#	18
9	FERR#	BE0#	19
10	IGNNE#	GND	20

LA4

1	N/C	LDEV#	11
2	GND	N/C	12
3	N/C	N/C	13
4	N/C	N/C	14
5	N/C	NMI	15
6	RTCRD#	SMIINP	16
7	RTCAS#	SMIACT#	17
8	CSBIOS#	SMI#	18
9	SPKR	INTR	19
10	PWRGOOD	GND	20

LA12

1	N/C	DP0	11
2	GND	COM2.CTS#	12
3	TCK	COM2.RTS#	13
4	TMS	COM2.RXD#	14
5	TDI	COM2.TXD#	15
6	TDO	COM1.CTS#	16
7	N/C	COM1.RTS#	17
8	DP3	COM1.RXD#	18
9	DP2	COM1.TXD#	19
10	DP1	GND	20

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Chapter 5 - Troubleshooting and Error Messages

Troubleshooting

This section deals with problems that you may encounter that do not provide an error message. Table 5-1 lists general problems and their solutions. If an error message displays, see the next section of this chapter, *Common Error Messages*.

Symptoms	Possible Cause(s)	Solution
System appears to boot (evidenced by being on and hard disk being accessed) but provides no video.	Monitor or cable problem.	Verify that the cable pins are not bent and the cable is fully seated in the VGA connector. If necessary, try the monitor on another system to verify that the monitor is good.
System fails at power-up -will not run power-on self-test.	The system is not getting power.	Verify that +5 VDC power is good and that the connector on the power supply is fully seated. in the power connector on the board.
	Reset switch is in.	Check switch.
	Hardware failure.	Replace the unit.

Table 5-1. Troubleshooting General Problems.

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R400EX Evaluation Board Hardware Reference



Symptoms	Possible Cause(s)	Solution
Mouse or keyboard does not work.	Interrupt conflicts.	COM ports are incorrectly jumpered. Check all COM jumpers and make sure the interrupts and I/O address selected are free for use.
Serial ports do not work.	Interrupt conflicts. Serial ports not enabled in CMOS setup. Jumpers incorrectly set. Port hardware failure.	An external peripheral may be using the same interrupts as COM1 and/or COMA/B. Verify that no other device is using IRQ3 or IRQ4. Check BIOS settings. Re-check all COM jumper settings. Replace the unit.
System hangs either before or after operating system boot.	System clock signal degradation.	Noise entering the system through the connection of a peripheral device may be degrading the CPU clock. Disconnect the peripheral device and reboot the system to verify system clock integrity.
Floppy problems - can't read floppy drive.	Cable has a twist.	Use a straight-through cable.

Table 5-1. Troubleshooting General Problems (cont.)

Common Error Messages

This section contains a summary of error and warning messages in alphabetical order by the message text. The BIOS or MS-DOS generates these messages, which typically relate to your hardware configuration. If you experience a system failure after you make changes in the BIOS setup menus, you may be able to correct the problem by entering setup and restoring the original values.

Note that QNX error messages are fully explained in the QNX documentation, found on the QNX floppy diskettes.

BAD OR MISSING COMMAND INTERPRETER

DOS

Problem: DOS cannot find the command line interpreter.

Solution(s): Either **COMMAND.COM** is not present at the specified (or default) directory level of the boot disk or the "SHELL=" statement in your **CONFIG.SYS** lists the file incorrectly (wrong directory or misspelled).

DISK BOOT FAILURE, INSERT SYSTEM DISK AND PRESS ENTER

BIOS

Problem: No boot disk could be found. Your hard disk may not have been partitioned into logical drive(s). PCs look for logical drives from which to boot. Hard disks are physical drives; partitions are logical drives.

Solution(s): If your BIOS setup screen has all disks disabled, or if your hard disk is disabled, run the BIOS setup program and verify that all disk parameters are correct. If a hard disk is present, verify that it is properly partitioned and formatted as a system disk and that one partition is set active.

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FAILURE FIXED DISK 0

BIOS

Problem: The IDE disk controller for drive 'C' cannot be initialized.

Solution(s): Ensure that the +5 VDC power to the controller and hard disk are good and, if used, the ribbon cable to the hard disk is fully seated.

If you are not using an IDE drive, enter the BIOS setup program. Access the IDE Adapter Sub-menu menu as Section 2 describes. Change the drive type to match the device being used. If the drive conforms to ANSI specifications, you can use the Autotype feature to automatically configure the controller for the drive.

If you install Pico Card and attempt to boot off an ATA card, make sure the IDE drive is set to NONE.

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GENERAL FAILURE READING DRIVE ...

DOS

Problem: This almost always indicates the presence of an unformatted hard disk partition or diskette.

Solution(s): Format the partition or diskette using the utilities your operating system provides.

INVALID DRIVE SPECIFICATION

DOS

Problem: You are trying to access a logical drive (e.g., 'C,' 'D,' ...) that is not known to the operating system.

Solution(s): Select a different logical drive. If you are trying to access a hard disk, you may need to create the logical partition.

Troubleshooting and Error Messages

KEYBOARD ERROR

BIOS

Problem: This message indicates that the system did not recognize a keyboard at power-up or you pressed a key during the power-on self test.

Solution(s): Check the integrity of the keyboard connector.

If you think you pressed a key during power-up, reboot the system using the external reset switch.

Some keyboards are designed with a switch (or jumper) to allow the user to configure the keyboard for use with an AT machine or an XT machine. If this is the case with your keyboard, verify that the switch is in the AT position.

The keyboard may not be a valid PC/AT keyboard (e.g., it is a PC/XT-only or PS/2 keyboard). If this is the case, replace the keyboard with a PC/AT style keyboard.

MISSING OPERATING SYSTEM

BIOS

Problem: Although the system could read the hard disk and find the active partition, the operating system files could not be found.

Solution(s): This can be caused by using a drive type number in the BIOS setup menu that does not match the type number used to format the hard disk. Run the BIOS setup program. Enter the IDE Adapter Sub-menu. Select the correct drive type to match the type used to format the disk originally. If the drive conforms to ANSI specifications, you may use the Autotype feature to automatically configure the controller for the drive being used. Save the changes and reboot the system.

This problem can also occur if the hard disk is partitioned and one partition is set active, but the partition is not formatted. Format the partition using the utilities your operating system provides.

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PARITY ERROR IN SEGMENT ...**DOS**

Problem: This could be a software error (reading a nonexistent memory area) or a true hardware failure.

Solution(s): Attempt to repeat the error. If the error occurs during the execution of your own proprietary software, verify that the memory location your software specifies is valid.

PRESS A KEY TO REBOOT**BIOS**

Problem: A drive assigned as drive 'C' exists but is not set active.

Solution(s): Run your operating system disk partitioning program (like FDISK) and set the primary partition active.

REAL TIME CLOCK ERROR - RUN SETUP**BIOS**

Problem: The battery-backed TOD clock is incorrect.

Solution(s): Run the BIOS setup program to determine what is wrong, and make corrections. If the error occurs repeatedly, the CMOS battery has failed.

SYSTEM CMOS CHECKSUM BAD -- RUN SETUP**CMOS**

Problem: One of the entries in the CMOS RAM is incorrect.

Solution(s): Run the BIOS setup program to determine what is wrong, and make correction. If the error occurs repeatedly, the CMOS battery has failed.

5**5**

BIOS Checkpoints

The Phoenix PicoBIOS in the R400EX Evaluation Board writes a number of POST checkpoint codes to I/O port 80h just before each checkpoint executes. Table 5-2 describes these checkpoint codes and instructions.

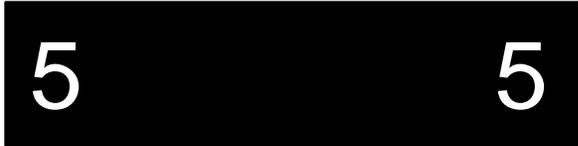
NOTE: The POST checkpoint codes generally execute in the order the table shows. The codes may not execute in the *exact* order in the table.

Beep Code	POST CODE	Checkpoint Description
	02h	Verify Real Mode
	04h	Get CPU type
	06h	Initialize system hardware
	08h	Initialize chipset registers with initial POST values
	09h	Set in POST flag
	0Ah	Initialize CPU registers
	0Ch	Initialize cache to initial POST values
	0Eh	Initialize I/O
	10h	Initialize Power Management
	11h	Load alternate registers with initial POST values
	12h	Jump to UserPatch0
	14h	Initialize keyboard controller
1-2-2-3	16h	BIOS ROM checksum
	18h	8254 timer initialization
	1Ah	8237 DMA controller initialization
	1Ch	Reset Programmable Interrupt Controller
1-3-1-1	20h	Test DRAM refresh
1-3-1-3	22h	Test 8742 Keyboard Controller
	24h	Set ES segment register to 4 GB
	28h	Autosize DRAM
	2Ah	Clear 512 KB base RAM
1-3-4-1	2Ch	Test 512 KB base address lines
1-3-4-3	2Eh	Test 512 KB base memory
	32h	Test CPU bus-clock frequency
	37h	Reinitialize the chipset
	38h	Shadow system BIOS ROM
	39h	Reinitialize the cache
	3Ah	Autosize cache

Table 5-2. POST Checkpoint Codes.



R400EX Evaluation Board Hardware Reference



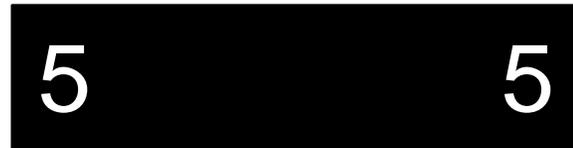
Beep Code	POST Code	Checkpoint Description
	3Ch	Configure advanced chipset registers
	3Dh	Load alternate registers with CMOS values
	40h	Set initial CPU speed
	42h	Initialize interrupt vectors
	44h	Initialize BIOS interrupts
2-1-2-3	46h	Check ROM copyright notice
	47h	Initialize manager for PCI Option ROMs
	48h	Check video configuration against CMOS
	49h	Initialize PCI bus and devices
	4Ah	Initialize all video adapters in system
	4Ch	Shadow video BIOS ROM
	4Eh	Display copyright notice
	50h	Display CPU type and speed
	52h	Test keyboard
	54h	Set key click if enabled
	56h	Enable keyboard
2-2-3-1	58h	Test for unexpected interrupts
	5Ah	Display prompt "Press F2 to enter SETUP"
	5Ch	Test RAM between 512 KB and 640 KB
	60h	Test extended memory
	62h	Test extended memory address
	64h	Jump to UserPatch1
	66h	Configure advanced cache registers
	68h	Enable external and CPU caches
	6Ah	Display external cache size
	6Ch	Display shadow message
	6Eh	Display non-disposable segments
	70h	Display error messages
	72h	Check for configuration errors
	74h	Test real-time clock
	76h	Check for keyboard errors
	7Ch	Set up hardware interrupt vectors
	7Eh	Test coprocessor if present
	80h	Disable onboard I/O ports
	82h	Detect and install external RS232 ports

Table 5-2. POST Checkpoint Codes (cont.)

Troubleshooting and Error Messages

Beep Code	POST CODE	Checkpoint Description
	84h	Detect and install external parallel ports
	86h	Re-initialize onboard I/O ports
	88h	Initialize BIOS Data Area
	8Ah	Initialize Extended BIOS Data Area
	8Ch	Initialize floppy controller
	90h	Initialize hard disk controller
	91h	Initialize local bus hard disk controller
	92h	Jump to UserPatch2
	94h	Disable A20 address line
	96h	Clear huge ES segment register
	98h	Search for option ROMs
	9Ah	Shadow option ROMs
	9Eh	Enable hardware interrupts
	A0h	Set time of day
	A2h	Check keylock
	A8h	Erase F2 prompt
	AAh	Scan for F2 keystroke
	ACh	Enter SETUP
	AEh	Clear in-POST flag
	B0h	Check for errors
	B2h	POST done - prepare to boot operating system
	B4h	One beep
	B6h	Check password (optional)
	B8h	Clear global descriptor table
	BCh	Clear parity checkers
	BEh	Clear screen (optional)
	BFh	Check virus and backup reminders
	C0h	Try to boot with INT19

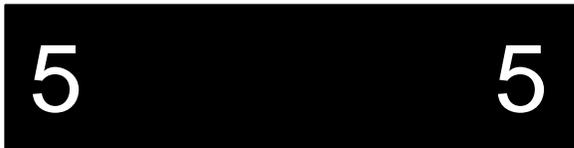
Table 5-2. POST Checkpoint Codes (cont.)



R400EX Evaluation Board Hardware Reference

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

Table 5-3. Auxiliary POST Checkpoint Codes.



Beep Code	Post Code	Checkpoint Description
	E2H	Initialize the chipset
	E3H	Initialize refresh counter
	E4H	Check for Forced Flash
	E5H	Check HW status of ROM
	E6H	BIOS ROM is OK
	E7H	Do a complete RAM test
	E8H	Do OEM initialization
	E9H	Initialize interrupt controller
	EAH	Read in bootstrap code
	EBH	Initialize all vectors
	ECH	Boot the Flash program
	EDH	Initialize the boot device
	EEH	Boot code was read OK

Table 5-4. Phoenix PicoBIOS Boot Block Checkpoint Codes

PhoenixBIOS Messages

The following is an explanation of each of the Phoenix BIOS messages.

Diskette drive A error or
Diskette drive B error

Floppy disk drive A: or B: is present but fails the BIOS POST diskette tests. Check to see that the drive is defined with the proper diskette type in Setup and that the diskette drive is attached correctly. The evaluation board does not require a twisted cable.

Embedded Region 0-2 Shadowed The system successfully copied the BIOS extension.

Embedded Region 0-2 Failed to Shadow Check the BIOS settings in the Embedded Features Sub-menu to make sure the settings are correct.

Entering SETUP ... This message signals that the system is starting the BIOS Setup program

Extended RAM Failed at offset: *nnnn* Extended memory is not working or is not configured properly at offset *nnnn*.

nnnn **Extended RAM Passed** Where *nnnn* is the amount of RAM in kilobytes successfully tested.

Failing Bits: *nnnn* The hex number *nnnn* is a map of the bits at the RAM address (in System, Extended, or Shadow memory) which failed the memory test. Each 1 (one) in the map indicates a failed bit.

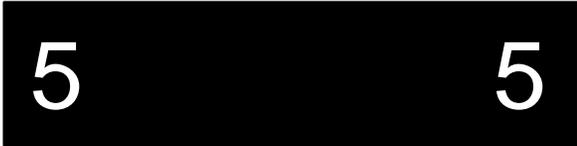
Fixed Disk 0 Failure or
Fixed Disk 1 Failure or

Fixed Disk Controller Failure The fixed disk is not working or is not configured properly. Check to see if the fixed disk is attached properly and has power. Run Setup to be sure the fixed-disk type is correctly identified.

Incorrect Drive A type - run SETUP Type of floppy drive A: not correctly identified in Setup.

Incorrect Drive B type - run SETUP Type of floppy drive B: not correctly identified in Setup.

Invalid NVRAM media type There is a problem with NVRAM (CMOS) access.

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Keyboard controller error The keyboard controller failed its test. You may have to replace the keyboard or the controller.

Keyboard error The keyboard is not working, but the controller is operating.

Keyboard error *nn* The BIOS discovered a stuck key and displays the scan code *nn* for the stuck key.

Keyboard locked - Unlock key switch Unlock the system to proceed.

Monitor type does not match CMOS - Run SETUP Monitor type not correctly identified in Setup

Operating system not found Operating system cannot be located on either drive A: or drive C:. Enter Setup and see if the fixed disk or drive A: are properly identified.

Parity Check 1 Parity error found in the system bus. BIOS attempts to locate the address and display it on the screen. If it cannot locate the address, it displays **????**.

Parity Check 2 Parity error found in the I/O bus. BIOS attempts to locate the address and display it on the screen. If it cannot locate the address, it displays **????**.

Press <F1> to resume, <F2> to Setup Displayed after any recoverable error message. Press <F1> to start the boot process or <F2> to enter Setup and change any settings.

Press <F2> to enter SETUP Optional message displayed during POST. Can be turned off in Setup.

Previous boot incomplete - Default configuration used

Previous POST did not complete successfully. POST loads default values and offers to run Setup. If the failure was caused by incorrect values and they are not corrected, the next boot will likely fail. On systems with control of wait states, improper Setup settings can also terminate POST and cause this error on the next boot. Run Setup and verify that the wait-state configuration is correct. This error is cleared the next time the system is booted.

Real time clock error Real-time clock fails BIOS test. May require board repair.

Shadow Ram Failed at offset: *nnnn* Shadow RAM failed at offset *nnnn* of the 64k block at which the error was detected.

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Troubleshooting and Error Messages

nnnn* Shadow RAM Passed** Where ***nnnn is the amount of shadow RAM in kilobytes successfully tested.

System battery is dead - Replace and run SETUP The CMOS clock battery indicator shows the battery is dead. Replace the battery and run Setup to reconfigure the system.

System BIOS shadowed System BIOS copied to shadow RAM.

System cache error - Cache disabled RAM cache failed the BIOS test. BIOS disabled the cache.

System CMOS checksum bad - run SETUP System CMOS has been corrupted or modified incorrectly, perhaps by an application program that changes data stored in CMOS. Run Setup and reconfigure the system either by getting the Default Values and/or making your own selections.

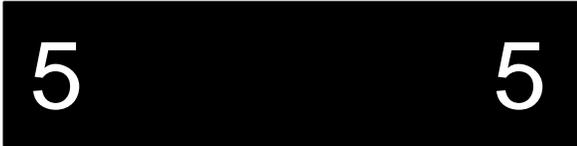
System RAM Failed at offset: *nnnn* System RAM failed at offset ***nnnn*** of in the 64k block at which the error was detected.

nnnn* System RAM Passed** Where ***nnnn is the amount of system RAM in kilobytes successfully tested.

System timer error The timer test failed. Requires repair of system board.

UMB upper limit segment address: *nnnn* Displays the address ***nnnn*** of the upper limit of Upper Memory Blocks, indicating released segments of the BIOS which may be reclaimed by a virtual memory manager.

Video BIOS shadowed Video BIOS successfully copied to shadow RAM.



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NOTES

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Chapter 6 - Support and Service

In North America

Technical Support

RadiSys maintains a technical support phone line that is staffed weekdays (except holidays) between 8 AM and 5 PM Pacific time. The telephone number is listed on the cover of this manual. If you have a problem outside these hours, you can leave a message on voice-mail using the same phone number. You can also request help via electronic mail or by FAX addressed to RadiSys Technical Support. The RadiSys FAX number is listed on the cover of this manual. The RadiSys E-mail address on the Internet is *support@radisys.com*. If you are sending E-mail or a FAX, please include information on both the hardware and software being used and a detailed description of the problem, specifically how the problem can be reproduced. We will respond by E-mail, phone or FAX by the next business day.

Technical Support Services are designed for customers who have purchased their products from RadiSys or a sales representative. If your RadiSys product is part of a piece of OEM equipment, or was integrated by someone else as part of a system, support will be better provided by the OEM or system vendor that did the integration and understands the final product and environment.

World Wide Web

RadiSys maintains an active site on the world wide web. The home-page URL is *http://www.radisys.com*. 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. Requests for sales, service, and technical support information receive prompt response.

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Repair Services

Factory Repair Service is provided for all RadiSys products. Standard service for all RadiSys products covers factory repair with customers paying shipping to the factory and RadiSys paying for return shipment. Overnight return shipment is available at customer expense. Normal turn-around time for repair and re-certification is five working days.

Quick Exchange services (immediate shipment of a loaner unit while the failed product is being repaired) or other extra-cost services can be arranged, but need to be negotiated in advance to allow RadiSys to pool the correct product configurations. RadiSys does not maintain a general "loaner" pool: units are available only for customers that have negotiated this service in advance.

RadiSys does not provide a fixed-price "swap-out" repair service, as customers have indicated that issues of serial number tracking and version control make it more convenient to receive their original products back after repair.

Warranty Repairs

Products under warranty (see warranty information in the front of this manual) will have manufacturing defects repaired at no charge. Products sent in for warranty repair that have no faults will be subject to a recertification charge. Extended Warranties are available and can be purchased at a standard price for any product still under warranty. RadiSys will gladly quote prices for Extended Warranties on products whose warranties have lapsed; contact the factory if this applies.

Customer induced damage (resulting from misuse, abuse, or exceeding the product specifications) is not covered by the standard product warranty.

Non-Warranty Services

There are several classes of non-warranty service. These include repair of customer induced problems, repairs of failures for products outside the warranty period, recertification (functional testing) of a product either in or out of warranty, and procurement of spare parts.

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Support and Service

All non-warranty repairs are subject to service charges. RadiSys has determined that pricing repairs based on time and materials is more cost-effective for the customer than a flat-rate repair charge. When product is received, it will be analyzed and, if appropriate, a cost estimate will be communicated to the customer for authorization. After the customer authorizes the repair and billing arrangements have been made, the product will be repaired and returned to the customer.

A recertification service is provided for products either in or out of warranty. This service will verify correct operation of a product by inspection and testing of the product with standard manufacturing tests. There is a product-dependent charge for recertification.

There are only a few components that are generally considered field-repairable, but, because RadiSys understands that some customers want or need the option of repairing their own equipment, all components are available in a spares program. There is a minimum billing charge associated with this program.

Arranging Service

To schedule service for a product, please call the RadiSys RMA Dispatcher. The telephone number is (800) 256-5917. The FAX number is (503) 615-1117. Have the product model and serial numbers available, along with a description of the problem. The RMA Dispatcher will issue a Returned Materials Authorization (RMA) number, a code number by which RadiSys tracks the product while it is being processed. Once you receive the RMA number, follow the instructions of the technical support representative and return the product to RadiSys, freight prepaid. Mark the RMA number clearly on the exterior of the package. If possible, re-use original shipping containers and packaging. In any case, be sure you follow good ESD-control practices when handling the product. Use anti-static bags and packing materials with adequate padding and shock-absorbing properties.

6

6

R400EX Evaluation Board Hardware Reference

When shipping the product, include the following information: return address, contact names and phone numbers in purchasing and engineering, and a description of the suspected problem. Any ancillary information that might be helpful with the debugging process will be appreciated.

Other Countries

Contact the sales organization from which you purchased your RadiSys product for service and support.

6

6

Appendix A - I/O & Memory Maps

A

A

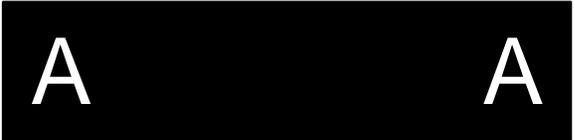
This appendix defines the I/O address map, memory chip selections, and memory map for the R400EX evaluation board.

I/O address map

The following defines the I/O addresses decoded by the R400EX evaluation board.

R400EX

There are two types of internal registers in the R400EX. The first are PC compatible registers. These registers are defined by the PC architecture and are addressable at standard I/O addresses. This includes the RTC registers, the keyboard controller registers, PortA and the PortB registers, the 8259 registers, the 8254 registers, the 8237 registers, and the 74LS612 DMA page registers. The table below shows all of the fixed I/O addresses that are decoded internally by the R400EX. Please refer to the respective data sheets for more information on the 8259A, 8237A, and 8254 megafunctions.



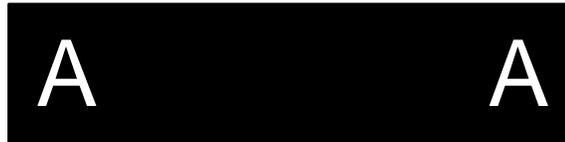
R400EX Evaluation Board Hardware Reference

I/O address (hex)	Register(s)
000-00F	DMA controller 1 - 8237A
020-021	Master 8259A
022-023	Internal 82C206 configuration register: index and data
024-025	R400EX index register
026-027	R400EX data register
040-043	8254Atimer/counter
060,064	Keyboard controller data and control registers
061	PortB
070-071	146818 RTC - NMI mask
080-08F	74LS612 style DMA page registers
092	PortA
0A0-0A1	Slave 8259A
0C0-0DF	DMA controller 2 - 8237A
0F0	Clear math coprocessor busy
0F1	Reset math coprocessor
2F8-2FF	COM2 registers
3F8-3FF	COM1 registers

The second type of register is specific to the R400EX. These registers are referenced with an index and data register. There are two sets of these registers. The first set configures the internal 82C206 and the second set configures the remainder of the R400EX. All defined registers (PortB, 0x60, 0x64, 0x70, 0x71, 0x92, etc.) and I/O chip select docodes (IDE strobes, KB_CS, etc.) use full 16-bit I/O address decoding to prevent aliasing from occurring. Refer to the R400EX specification for details of these registers.

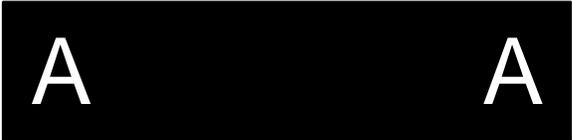
Peripherals

Following are tables describing the IO addresses that the on-board peripherals use. Refer to the appropriate data sheets for further details.



Serial I/O (COM3:) Port: SMC 37C665 emulates 8250 of PC/AT		
I/O Addr	Functional group	Usage
3E8	COM1: serial port	Receiver/transmitter buffer
		Baud rate divisor latch (LSB)
3E9		Interrupt enable register
		Baud rate divisor latch (MSB)
3EA		Interrupt ID register
		FIFO Control
3EB		Line control register
3EC		Modem control register
3ED		Line status register
3EE		Modem status register

Serial I/O (COM4:) Port: SMC FDC37C665 emulates 8250 of PC/AT		
I/O Addr	Functional group	Usage
2E8	COM2: serial port	Receiver/transmitter buffer
		Baud rate divisor latch (LSB)
2E9		Interrupt enable register
		Baud rate divisor latch (MSB)
2EA		Interrupt ID register
		FIFO Control
2EB		Line control register
2EC		Modem control register
2ED		Line status register
2EE		Modem status register



R400EX Evaluation Board Hardware Reference

Super I/O controller: SMC FDC37C665		
I/O Addr	Functional group	Usage
3F0, 3F1	Super I/O controller	Configuration

Floppy disk drive controller: SMC FDC37C665		
I/O Addr	Functional group	Usage
3F2	Floppy disk controller	Digital output register
3F4		Main status register
3F5		Data, status 0-3 registers
3F7		Configuration / digital input registers

Parallel I/O (LPT1:) Port: SMC FDC37C665		
I/O Addr	Functional group	Usage
378	LPT1: parallel port	Data port
379		Status port
37A		Control port
37B		EPP address port
37C		EPP data port 0
37D		EPP data port 1
37E		EPP data port 2
37F		EPP data port 3
778		Parallel port FIFO
778		Configuration register A
779		Configuration register B
77A		Extended control register

I/O and Memory Maps

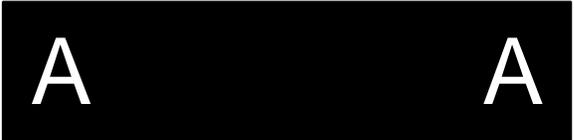
IDE hard disk drive: (Included in R400EX)		
I/O Addr	Functional group	Usage
1F0	IDE hard disk drive	Task file registers
1F1		
1F2		
1F3		
1F4		
1F5		
1F6		
1F7		
3F6		Misc. AT registers
3F7		

PCMCIA controller: Cirrus PD6710		
I/O Addr	Functional group	Usage
3E0		Index
3E1		Data

SVGA controller: Cirrus CL-GD6245		
I/O Addr	Functional group	Usage
	See 6245 Documentation	

A

A



Memory Map

Physical addresses are mapped into memory in the following manner. This table assumes 1Mx32 DRAM is installed. The BIOS extension regions and windows may change depending on requirements.

Physical Address Range	Physical Address Range	Region Description
00000000 - 0009FFFF	0 - 640K	DRAM
000A0000 - 000BFFFF	640K - 768K	VGA
000C0000 - 000C7FFF	768K - 800K	Shadowed VGA BIOS
000C8000 - 000DFFFF	808K - 896K	BIOS Extension area (QNX, PicoFlash/Card, etc.) *
000C8000 - 000DFFFF	808K - 896K	PicoFlash 16K window *
000C8000 - 000DFFFF	808K - 896K	PCMCIA Window *
000D4000 - 000D8000	864K- 896 K	PicoFlash Window
000E0000 - 000FFFFFF	896K - 1M	Shadowed System BIOS
00100000 - 003FFFFFF	1M - 4M	DRAM
00400000 - 00FFFFFF	4M - 16 M	ISA or DRAM
FFF00000 - FFFFFFFF	4023M - 4024M	Flash Boot Device

Table A-3. Memory Map.

* Signifies range of possible locations

Appendix B - IRQ Map

B

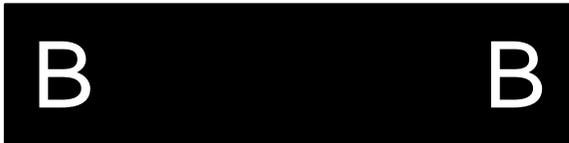
B

This appendix defines interrupt requests which the R400EX Evaluation Board decodes.

IRQ map

On-board Interrupt usage	
IRQ1	Keyboard controller
IRQ2	8259 Expansion int.
IRQ3	COM2/4: serial port/PCMCIA
IRQ4	COM1/3: serial port/PCMCIA
IRQ5	COM3: alternate/PCMCIA
IRQ6	Floppy Disk Controller
IRQ7	LPT1: parallel port/PCMCIA
IRQ8	Real-time-clock
IRQ9	COM4: alternate/PCMCIA
IRQ10	Watchdog timer/PCMCIA
IRQ11	PCMCIA
IRQ12	Mouse controller
IRQ13	FPU error
IRQ14	IDE hard disk/PCMCIA
IRQ15	PCMCIA
NMI	DRAM parity (if config)

DMA Map



On-board DMA channel usage	
DRQ0/~DACK0	
DRQ1/~DACK1	
DRQ2/~DACK2	Floppy disk
DRQ3/~DACK3	
DRQ4/~DACK4	
DRQ5/~DACK5	
DRQ6/~DACK6	
DRQ7/~DACK7	

Appendix C - VGA Interface

Video Controller Hardware

The R400EX Evaluation Board contains the Cirrus Logic CL-GD6245 Super VGA (SVGA) graphics controller. The controller's connection with the local bus, yields the best possible graphics performance. SVGA memory is 512 KB, using one 256 Kb x 16 DRAM. This provides standard VGA modes on a CRT or flat panel display. With the appropriate display drivers, the SVGA chip can provide SVGA modes up to 800 x 600 on flat panel displays, CRT displays of up to 800 x 600 in 65,536 (64K) colors, and up to 1024 x 768 in 256 colors (non-interlaced).

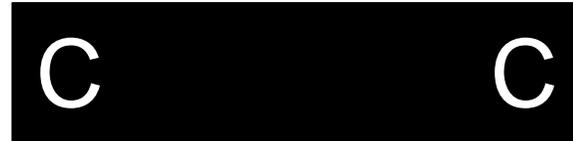
Display Drivers and Optional Utilities Software

Cirrus Logic supplies the SVGA Driver and optional utilities software. The VGA display driver diskette is made available by Cirrus Logic for DOS and for Windows 3.1x. Contact Cirrus Logic as this Appendix later describes or contact your dealer to obtain additional software support. The Cirrus Logic utilities diskette includes display drivers for 640 x 480 and 800 x 600 in both 16 and 256 colors, and 1024 x 768 in 16 colors. These drivers are suitable for use with CRT monitors and LCD flat panel displays. An included utility allows use of both display devices simultaneously. Be sure to check for **READ.ME** files on the diskette before you begin to install any utility. Cirrus Logic, Inc. copyrights portions of this Appendix.

NOTE: The Cirrus Logic display driver for Windows 3.1x should work with Windows 95, although RadiSys has not validated this configuration with the R400EX Evaluation Board.

For DOS users, the CLMODE utility program configures flat panel options, defines the type of monitor attached, and sets the video modes supported by the Cirrus Logic chipset. The Cirrus Logic SVGA software includes CLMODE. The following section describes these utilities and how to use them.

For Windows users, the WINMODE utility configures Windows for use with the Cirrus Logic chipset, just as CLMODE works for DOS.



Before You Begin

The following instructions assume that you are familiar with DOS and common DOS commands. You may wish to review the associated DOS commands before installing the software.



Installation

The installation utility facilitates smooth installation of the display drivers and utility software. The menu-driven installation program allows you to select and install only those display drivers for software and applications currently in use.

NOTE: Some display drivers require that the driver vendor's application program be installed on the system prior to loading the Cirrus Logic SVGA display drivers. In other cases, you load the display driver during the vendor's product installation process. Please review the driver product section below for specific instructions before you run the installation program.

This appendix assumes that you will use your floppy disk drive carrying the drive 'A' designation.

DOS Installation

The diskette labeled **VGA Disk** contains the DOS installation utility. To install the desired display drivers and utilities, insert the diskette into the 'A' drive, then type the following:

A:
INSTALL

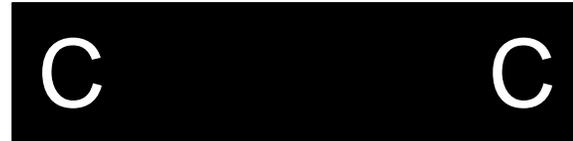
This begins the installation for the English version of the software. Follow the instructions on the screen to install the listed display drivers and Cirrus Logic software. The installation process asks you the destination directory, then gives you the option to install the Cirrus Logic GD624x utilities, as well as several other application drivers. You need only to choose the utilities. Press the space bar to toggle the selection field to 'Yes.' At any time, you can press ESC to abort the installation process and return to DOS.

Contacting Cirrus Logic

If there are any newer versions of the software, they will be available on the Cirrus Logic BBS or web site.

Cirrus Logic's BBS is a WILDCAT! BBS. The phone number is (510) 440-9080. The BBS can handle modems running up to 28.8K baud. The modem should be set to NO parity, 8 data bits, 1 stop bit. Before you are able to download software, you must join the conference(s) for the product(s) that you are interested in.

The URL for the Cirrus Logic web site is <http://www.cirrus.com>.



CLMODE

The CLMODE utility allows you to configure the panel options, define the type of monitor you use, and set the video modes which the Cirrus Logic chipset supports.

Using the CLMODE Menu-driven Interface

At the DOS prompt, type: **CLMODE** to invoke the utility.

The main pop-up window consists of a number of buttons. Each button represents a different option or menu. The underlined letter of a button name specifies the hot key combination for that item. For example, press the [ALT] and the underlined letter keys simultaneously or just the underlined letter key to select an option.

NOTE: It is convenient to install a mouse driver prior to running CLMODE in order to use the mouse pointer to select buttons.

Configuring the Attached Monitor

Selecting the proper monitor brand and model allows the Cirrus Logic chipset to display the highest quality output that it is capable of with the monitor you use. The monitor type determines which video modes will be available to your system. It also determines the available vertical refresh rates. Generally, the higher the refresh rate, the better the screen looks.

R400EX Evaluation Board Hardware Reference

Configuration. You can select from several options, including reverse video setup, bold fonts, panel expanded mode, font load in display switch, panel power, black and white enhancement, CRT high refresh, display, graphics shading, text shading, and vertical position.

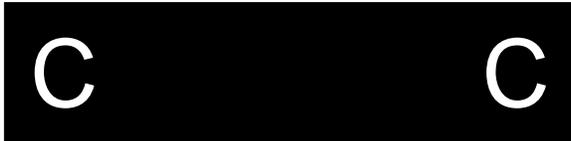
Monitor Type. There are eight possible choices for the type of monitor, ranging from straight VGA to extended and super VGA multi-frequency monitors. You can test your selection using the Verify button.

Video Modes. Based on the monitor type you select, you can preview various video modes to determine which one your system can support. Most systems can support 800 x 600 in 256 colors, or 1024 x 768 in 16 colors.

About. Use this button to view the version number of the CLMODE utility program.

Exit. When you exit the program, you are given the option to have CLMODE append your AUTOEXEC.BAT file with an entry containing the resolution and vertical refresh settings you have selected. You should allow CLMODE to append AUTOEXEC.BAT. This way, your system will load the correct VGA modes each time you boot it.

NOTE: There is on-line help available in this screen for the Configuration, Monitor Type, and Video Mode main choices.



Using the CLMODE Command Line Options

When you issue command line options for **CLMODE.EXE** at the DOS prompt, the menu-driven windows do not display. You can set the configuration, monitor type, video mode and refresh rate from the DOS prompt using command line options. The command line options for **CLMODE.EXE** are:

CLMODE {modenum} {m{montype} | {s n} }

Where:

{modenum} mode number

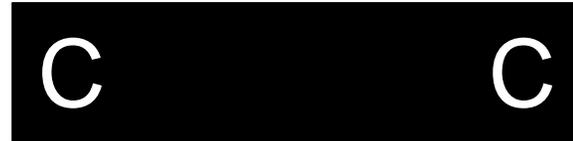
{montype} monitor type

Valid monitor types:

- 0 VGA
- 1 8514
- 2 SVGA
- 3 Extended Super VGA
- 4 Multifrequency
- 5 Extended Multifrequency
- 6 Super Multifrequency
- 7 Extended Super Multifrequency

{montype} monitor type

t6=x(Hz) 640 x 480 @ (0 = 60, 1 = 72)
t8=x(Hz) 800 x 600 @ (0 = 56, 1 = 60, 2 = 72)
t1=x(Hz) 1024 x 768 @ (0 = 87i, 1 = 60, 2 = 70)
t2=x(Hz) 1280 x 1024 @ (0 = 87i, 1 = Not available)
s List status information.



For example, to set video mode 3, type:

CLMODE 3

For example, to select custom monitor timings with 640 x 480 at 60 Hz and 800 x 600 at 72 Hz refresh, type:

CLMODE t6=0 t8=2

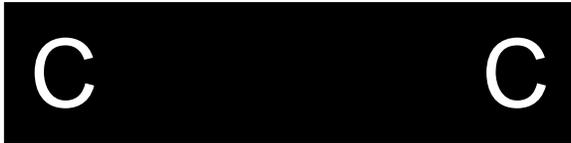
Typing an invalid option causes the command line help text to display. Typing [S] as a command line option displays the current CLMODE settings.

Other Utilities On the Diskette

There are six additional utility programs on the Cirrus Logic Utilities diskette. These utilities control the Cirrus Logic CL-GD6245 graphics controller operation modes. The additional utilities are:

CRT.EXE	resets CRT mode
PANEL.EXE	starts PANEL mode
SIMUL.EXE	simultaneous mode
SWITCHER.COM	switches from CRT to PANEL
BOLD_DRV.COM	uses bold font for driver
TSRFONT.COM	a TSR for font display

It is beyond the scope of this appendix to describe the installation and use of each utility. For additional information about these utilities, contact Cirrus Logic. See *Contacting Cirrus Logic* earlier in this appendix.



WINMODE

The WINMODE utility runs under Windows 3.1 and allows you to change the screen resolution, number of available colors, and select either large or normal size fonts and system resources.

This application assumes that the basic Windows VGA drivers are currently installed and set up using Windows Setup.

If you are unsure about the resolution and color options which are available, refer to the previous section of this appendix which contains information on how to determine available resolutions using CLMODE.

The WINMODE icon runs WINMODE. The first time that you run WINMODE, the settings for the current driver will not be correct. You must make the correct settings, which the system will retain until you change them.

You can make the following selections in WINMODE:

Resolution. If you are unsure, select a safe setting to start, such as 800 x 600.

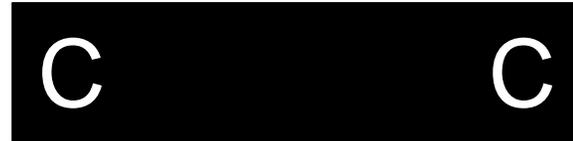
Colors. If you are unsure, select a safe setting to start, such as 16 or 256.

Font Size. You can choose between large and small fonts. With smaller monitors, larger fonts are more readable. Small fonts are for large monitors which display higher resolutions.

Monitor Refresh Rates. Once you select the brand and model, WINMODE displays several options for refresh rates at various settings. For some settings, there may be only one refresh rate option available. Settings for some of the higher resolutions may not be available.

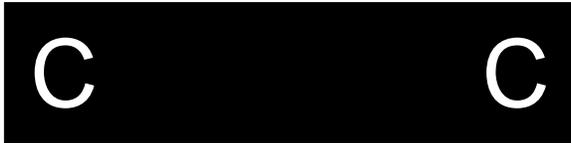
Font Cache Size. You can increase or decrease the font cache size, depending on your needs. The font cache is memory available for saving bitmaps of frequently used fonts. WINMODE tries to set the optimum cache size for you, but you can adjust the setting.

Operating System. Choose between DOS-Windows and OS/2-Windows, depending on your system.



After you finish selecting options, click the OK button. WINMODE asks if you are ready to restart Windows in order for your changes to take effect. If you choose 'No', WINMODE discards the changes you made.

For help on the WINMODE utility, select Help from the program menu.



Display drivers

The Cirrus Logic video controller is 100% VGA compatible. The display drivers improve the resolution for software application packages that the controller supports.

Cirrus Logic supplies the SVGA driver and optional utilities software. The installation instructions for each display driver follow an introduction. Follow the instructions carefully to be sure that each display driver installs correctly. The installation instructions assume that the VGA diskette is located in drive 'A.' If you use drive 'B,' change the instructions appropriately.

Before You Begin

Not all video modes will be available on all systems. If you install an extended mode driver for a video mode that is not available, the application program will not function properly. A number of things determine the list of available video modes, including the current monitor type, the amount of installed memory, and the revision of the controller. To determine which modes are available before installing the driver, run the CLMODE program and examine the list of available video modes.

Microsoft Windows 3.1

Before Upgrading From a Previous Release

Cirrus Logic supplies the SVGA driver and optional utilities software. Before installing the new drivers, use Windows Setup to select the VGA or SVGA video driver so that when you begin the installation, there is no chance of overwriting the driver that Windows uses to control the display.

Change to the system directory, and find a file named **OEM?.INF** (where the question mark is a number). There may be more than one of these files. The question marked files are different OEMSETUP.INF files that have been used to configure Windows for different devices. Using a text editor, such as Notepad or Edit, look at the file names until you find the file for the previous version of the Cirrus Logic video driver. Delete the file. This is not absolutely necessary, but if you don't delete old files, the drop down box for Setup soon becomes cluttered with different versions of the same files. In many cases, the old files may have been overwritten by newer ones and no longer exist.

Installing Windows 3.1 Display Drivers

If you haven't already installed WINMODE, these instructions will help you install a single driver for a single resolution. If you want to be able to easily switch between different resolutions, install WINMODE before following this procedure.

To install the Windows 3.1 drivers from the DOS prompt, proceed as follows:

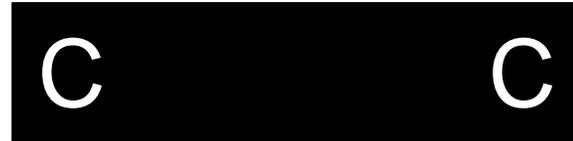
1. Check that Windows 3.1 is already installed on your computer.
2. From the Windows directory, at the DOS prompt, type SETUP to run the Windows SETUP.EXE program. Follow the instructions on the screen. When you see the screen listing hardware and software components (such as the display adapter, keyboard type, mouse type, etc.), go to the Display selection by using cursor keys to move the highlighted bar. Then press [Enter].
3. The next menu lists display options. Scroll to the bottom of the list, and highlight the following text:

Other (Requires disk provided by a hardware manufacturer)

Press [Enter] and when the prompt displays, insert the Windows Display Driver diskette into drive 'A' or 'B' and type 'A:\' or 'B:\.' Then press [Enter].

4. You will see a list of drivers and their associated resolutions, such as:

CIRRUS 624X V1.0, 1280X1024X16
CIRRUS 624X V1.0, 1024X768X16
CIRRUS 624X V1.0, 640X480X16
CIRRUS 624X V1.0, 640X480X256
CIRRUS 624X V1.0, 800X600X16
CIRRUS 624X V1.0, 800X600X256

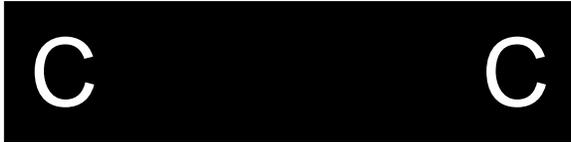


5. Move the cursor to highlight the correct driver. Then press [Enter].
6. Continue with the remainder of the setup procedure.

To install the Windows 3.1 drivers from within Windows, proceed as follows:

1. Ensure that Windows 3.1 is already installed on your computer. Start Windows.
2. From the Main window of the Program Manager, run the Windows 3.1 Setup program.
3. Select 'Change Systems Settings...' from the Options menu.
4. Click on the down arrow at the right side of the Display: line. Scroll to the end of the list of available display drivers and select 'Other display (Requires disk from OEM).'
5. Insert the Windows display driver diskette into drive 'A' and type 'A:\' as the pathname. Then click on 'OK.'
6. You will see a list of available drivers with their associated resolutions, such as:
 - CIRRUS 624x v1.0, 1024x768x16
 - CIRRUS 624x v1.0, 640x480x16
 - CIRRUS 624x v1.0, 640x480x256
 - CIRRUS 624x v1.0, 640x480x64K
 - CIRRUS 624x v1.0, 800x600x16
 - CIRRUS 624x v1.0, 800x600x256
7. Move the cursor to highlight the correct driver. Then click on 'OK.'
8. Continue with the remainder of the setup procedure. Changes you make will not take effect until you restart Windows.

This completes Cirrus Logic video driver installation. For additional information about the driver software, contact Cirrus Logic.



Appendix D - Reflashing the FBD

This appendix describes how to reflash the Intel Flash Boot Device (FBD) which contains the R400EX Evaluation Board System BIOS and, optionally, ROM BIOS extensions. Appendix D first presents information about the BIOS structure, then defines the reflashing processes and describes how to accomplish them.

About the Flash Boot Device

The R400EX Evaluation Board employs Phoenix PicoBIOS version 4.05 implemented as a flash BIOS using the 4 Mb (512 KB) Intel PA28F400BV-T SmartVoltage Boot Block Flash Device. The Flash Boot Device (FBD) contains a 16 KB boot block which holds the BIOS initializing and recovery code.

Main Block #1 and #2 are unused and available to the operating system.

Main block #3 contains a Cirrus Logic video BIOS extension, an 8KB RadiSys manufacturing BIOS, the QNX boot loader BIOS extension, the PicoCard BIOS extension, and the PicoFlash BIOS extension.

The system BIOS code image resides in main block 4.

Parameter block 1 contains the System BIOS.

Parameter block 2 is unused.

See Figure D-1.



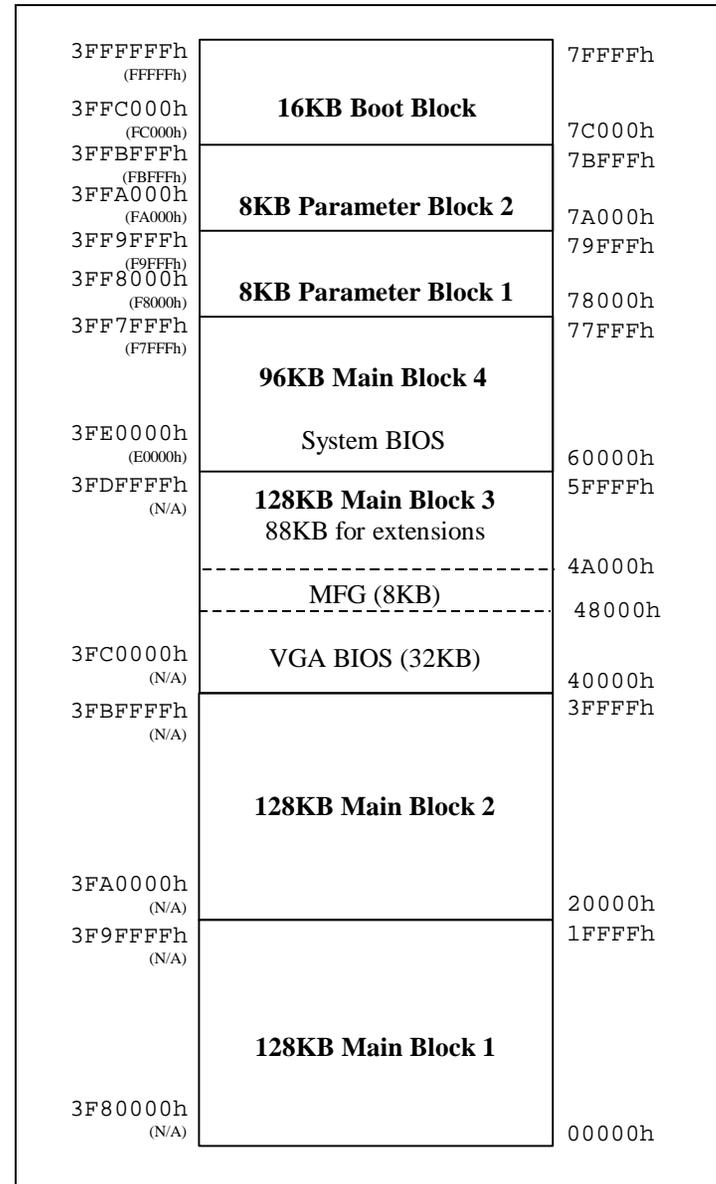


Figure D-1. FBD Memory Map.

Reflashing the Flash Boot Device

The FBD is memory addressed and resides in the last 512KB of physical address space at addresses 3F80000h through 3FFFFFFh. The System BIOS is shadowed and write-protected at 0E0000h through 0FFFFFFh (128KB) upon any system reset (warm boot, shutdown, power-up or "reset button" reset).

The boot block, main blocks, and parameter blocks are protected against accidental writes. The boot block is protected by a jumper which must also be in place before writes to the boot block can take place.

A "force recovery" jumper is provided which is readable by the boot block and can force the boot block to initiate a BIOS recovery sequence. This jumper is readable by the boot block and can force the boot block to initiate a recovery sequence should the other methods of initiating the sequence become inaccessible (for example, the System BIOS becomes corrupted such that the system cannot boot to the OS).

The following table describes the exact sizes and placement of the various code and data objects present in the FBD:

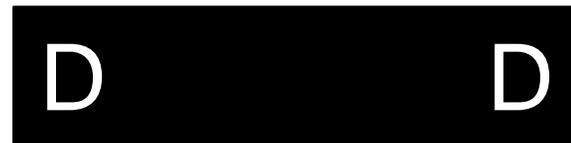
Object Name	FBD Offset	Object Size	Write Enable
Boot and Recovery Code	7C000h	16KB	BB write enable jumper
System BIOS	60000h	96KB	In chipset
3rd Party BIOS Extensions	4A000h	88KB	In chipset
VGA BIOS Extension	40000h	32KB	In chipset

Table D-1. FBD Object Placement

Sections of the FBD can be reflashed if a user requests it or the System BIOS image becomes corrupted. The process of reflashing is defined as an *update* if the System BIOS is not corrupt and can be executed. The process of reflashing is defined as a *recovery* if the System BIOS is corrupt or the force recovery jumper is installed.

The *recovery* process occurs because the boot block detects corrupt a BIOS or the force recovery jumper is installed. System BIOS corruption is detected by calculating an 8-bit checksum over the area occupied by System BIOS code.

The recovery is performed by using any Serial Communication Package (SCP) which supports the XModem/CRC protocol. The SCP speed is determined automatically.



To determine the baud rate that the SCP is running at, the user repeatedly presses the space bar. The autobaud mechanism should determine the baud rate that the SCP is running at. If the baud rate is not determined before a predetermined timeout value, the baud rate is defaulted to 9600 baud. The recovery module autobaud mechanism then detects one of the following supported baud rates: 9600, 19200, 38400, 56800 or 115200.

The SCP is executed on an external host computer and establishes a communication link with the R400EX Evaluation Board via the recovery serial port. The recovery mechanism supports the recovery of:

1. Bootblock
2. Video and System BIOSes Main Blocks 3-4, Parameter block 1
3. FBD, the entire 512K (minus the 16K bootblock) device is reflash, no attempt is made to reprogram the bootblock.
4. RFA

Images suitable for *update* or *recovery* use absolute binary format (8-bit data, little endian byte ordering).

The boot block XModem serial communication requires a straight-through serial connection to the external host computer and operates at the auto-detected baud rate with no parity, eight data bits, and 1 stop bit. Cabling between the host and the R400EX Evaluation Board may be dictated by the SCP. However, the only RS-232 signals required by the evaluation board are Tx, Rx, and Gnd.

When to Reflash the FBD

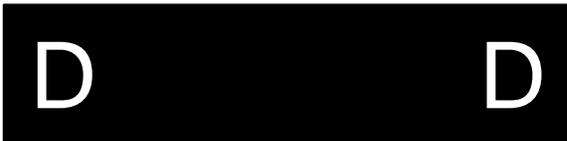
Reflashing the FBD is necessary in only two instances:

1. To accomplish a flash update

This instance assumes that the system can successfully boot to an operating system, such as DOS. This instance also assumes a valid and executable FBD structure.

2. To accomplish a flash recovery

This instance assumes a corrupt FBD structure, resulting in an unsuccessful attempt to boot to an operating system. This instance further assumes that the boot block, containing the recovery code, is not corrupt.



Reflashing the Flash Boot Device

Before You Begin

USE EXTREME CAUTION WHILE REFLASHING THE FBD. POWERING DOWN OR RESETTING THE BOARD DURING A REFLASHING PROCESS WILL CORRUPT THE FBD. POWERING DOWN OR RESETTING THE BOARD DURING BOOT BLOCK REFLASHING WILL REQUIRE FACTORY REPAIRS.

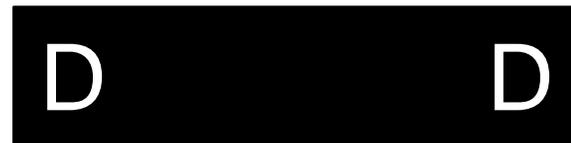
Before you update the FBD, you should have the following items ready for use:

- Utilities Diskette, containing reflashing programs **REFLASH.EXE** and **READ.ME** files containing current information about the reflashing software. The diskette also includes video and system BIOS images. If you believe there may be updated software, check the RadiSys Web site or contact RadiSys Technical Support using the information shown on the cover of this manual for the most current BIOS images.
- Any other images to flash. These can be optional BIOS/ROM extensions or ROMable DOS images.

NOTE: The R400EX Evaluation Board must be equipped with at least 2 MB of DRAM in order to run the **REFLASH.EXE** reflashing program.

Before you begin an FBD force update flash recovery, have the following items ready for use:

- External host computer with an installed Xmodem serial communication program, such as PROCOMM.
- Null modem cable.
- The new images for the FBD. Contact the RadiSys Web site at the URL shown on the cover of this manual for the most current BIOS.



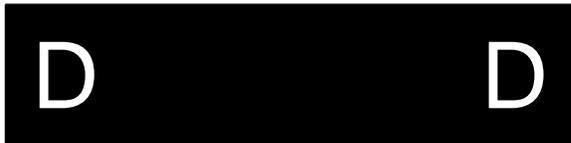
Reflashing Processes

- You must set MA9 on the second switch bank to “ON”.

Newly flashed images are not immediately effective; you must reboot the system as soon as reflashing is completed.

*The R400EX Evaluation Board must be equipped with at least 2 MB of DRAM in order to perform the flash update process.

USE EXTREME CAUTION WHILE REFLASHING THE FBD. PAY CLOSE ATTENTION WHEN ENTERING OFFSET VALUES TO ENSURE THAT THE CORRECT IMAGE FILES AND BLOCKS IN THE FBD WILL ERASED AND OVERWRITTEN WHEN YOU BEGIN THE FLASH UPDATE.



Flash Update Process

You can perform the flash update process only if the evaluation board is capable of booting DOS and is equipped with at least 2 MB of DRAM. Use the RadiSys reflashing software consisting of the program **REFLASH.EXE**. The **REFLASH.EXE** program manages this self-hosted reflashing process.

Copy the **REFLASH.EXE** program from the utilities diskette set to a bootable floppy disk. You must also copy to the disk the BIOS image files you will use to reflash the FBD. These image files must be in absolute binary format (.BIN). Connect the floppy disk drive to the evaluation board at the CN6 header. Set up the evaluation board for booting from the floppy disk drive as Chapter 2 describes.

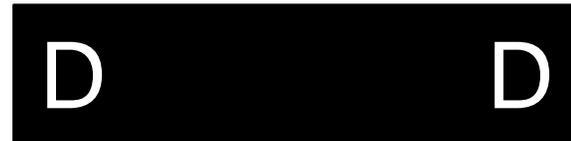
NOTE: The **REFLASH.EXE** program uses protected mode access routines. Run this program from DOS only.

Using **REFLASH.EXE** is the preferred method for installing BIOS extensions. **REFLASH.EXE** erases and updates the blocks of the FBD specified on the command line. Specify the file to flash by using the **/F=<filename>** and the FBD offset at which to begin flashing by using the **/O=<offset>** command line parameters. Figure D-1 shows each FBD segment address. For example, **REFLASH.EXE /F=[filename] /O=0** begins the flash update process without an address offset. The program requires both of the command line parameters. To view the command line parameters on the screen, type **REFLASH.EXE** with *no* parameters.

Command line parameters are:

Reflashing the Flash Boot Device

- /F**=<filename> File (in absolute binary format) to be flashed into the device.
- /O** Offset (in HEX) at which to begin flashing; offsets are relative to the lowest address of the device; **these are not physical memory addresses**. See the offset values in Figure D-1. An offset of zero specifies that flashing is to begin at the very first byte of the device.
- /S** Suppress reboot. Suppresses the automatic reboot at completion of the reflashing process. **Use this option with care. New images you flash into the FBD are not immediately effective as the evaluation board supports BIOS shadowing.**
- /C** Clear CMOS setup information stored in the FBD. Some RadiSys products allow you to store CMOS setup information in the FBD. This information, when stored, resides in Parameter Block 2. See Figure D-1. Invoking **/C** option clears Parameter Block 2, clearing the stored CMOS setup information from the FBD. **The board does not allow you to store CMOS setup information in the FBD.**
- /P** Physical base address of device being reflashed.



When the flash update is complete and the binary images you specified are written into the FBD, the system reboots with the updated BIOS images. No reboot occurs if you used the /S command line parameter. If you suppressed the automatic reboot for any reason, power down the system at the earliest opportunity. Be sure to remove the 386EX Write Enable jumper at JP3 if you performed a boot block update. Then power up the system and resume operation. The system boots with the updated BIOS images.

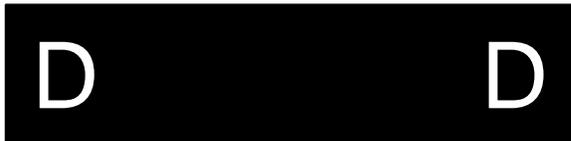
Force Update Flash (Crisis Recovery) Process

The force update (crisis recovery) process occurs because the boot block detects a corrupt system or video BIOS image (i.e. a bad checksum for main block 2) or because you installed the force update jumper (JP8A) at power up. A force update is necessary only to:

- replace a system or video BIOS image damaged by power failure during an earlier flash update process
- recover from accidental writes to the FBD
- enable FBD recovery when the system cannot boot to a DOS-compatible operating system

System BIOS crisis recovery operates as follows:

1. The boot block prepares the system hardware (DMA and interrupt controllers, DRAM, etc.) to boot the recovery floppy.
2. The boot block loads the special boot sector on the recovery diskette (written to the diskette by MAKEBOOT.EXE - a special Phoenix-supplied MS-DOS tool) and jumps into it.
3. The boot sector loads MINIDOS.SYS from the floppy and jumps into it. This file implements a very small set of MS-DOS functions that allow reading and writing the FAT file system on the recovery diskette.
4. MINIDOS.SYS then loads PHLASH.EXE, which in turn reads PLATFORM.BIN and BIOS.ROM from the floppy.
5. PHLASH.EXE uses the information and code in PLATFORM.BIN to properly erase and program the FBD with the FBD data in BIOS.ROM.



Appendix E - LCD Flat Panel Interface

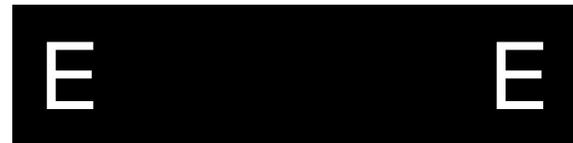
This Appendix describes how to interface LCD flat panel displays with the R400EX Evaluation Board. The Cirrus Logic CL-GD6245 VGA driver supports several different flat panel displays. RadiSys has tested the evaluation board with the following flat panels:

Sharp LM64P89 Monochrome LCD

Information in this Appendix includes instructions to configure the evaluation board for use with either of these flat panel displays. To do this, you must properly set jumpers at JP1. Then, construct a cable to interface with the display using pinout information shown in the tables. Last, connect the flat panel display cable to the flat panel header (CN1).

Constructing Interface Cables

The following tables describe how to construct cables for the Sharp LM64P80 monochrome flat panel display. The cable connects to the flat panel header (CN1).



Sharp LM64P80 Monochrome LCD

Eval Bd Pin#	Signal Name	LM64C08P Pin#	Signal Name
1	S	15	FLM (HYSNC)
2	CP1	19	LP (VSYNC)
3	CP2	25	SCLK
4	DISP	9	Vee ENABLE
5	VDD	1	PVCC
6	GND	8	GND
7	-18V (extern)		N/C
8	DU0	16	LD4
9	DU1	18	LD5
10	DU2	22	LD6
11	DU3	24	LD7
12	DL0	4	LD0
13	DL1	6	LD1
14	DL2	10	LD2
15	DL3	12	LD3

Table E-1. Sharp LM64P89 Flat Panel Interface.

Refer to Chapter 4, *Connectors*, for information about the LCD/Flat Panel connector.

Refer to documentation from the flat panel manufacturer for additional configuration information.

JP1 Jumper Settings for the LM64P89:

- A off
- B on
- C on

About LCD Flat Panels

LCD flat panel displays fall into two general categories, based upon the method the manufacturer uses to drive the display pixels. The two categories are active matrix displays and passive matrix displays. Each display category suits itself to particular applications and has unique advantages and disadvantages. Application data for each display category is available from flat panel manufacturers.

Active Matrix Displays

In an active matrix flat panel display, each pixel receives output from an attached transistor to precisely control the display. The transistors connect in an X, Y grid located on the same substrate as the pixels. Switching signals drive the transistors in the X grid, while video signals drive the transistors in the Y grid.

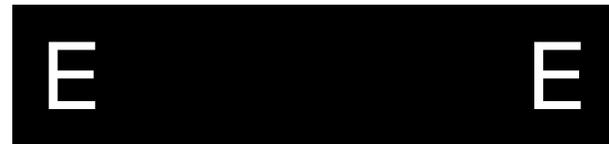
A popular active matrix flat panel display type is the Thin Film Transistor (TFT). In this display type, a layer of liquid crystal lies sandwiched between a pair of electrodes and a pair of polarizing filters positioned at a 90 degree phase difference from each other. The liquid crystal molecules align naturally in a twisted state with no particular order or direction. Light entering the display “twists” as it passes through the layer of liquid crystal and the polarizing filters. After striking a reflective layer at the back of the display, the light passes back through the front of the display. A pixel in this state is not visible from the front of the display.

When current is applied to the liquid crystal molecules, they align in a single direction, changing the light’s path through the display. Without the twisting effect provided by the natural state of the liquid crystal molecules, the polarizing filters, placed at the 90 degree phase difference from each other, block the passage of light through the display. A pixel in this state is visible from the front of the display.

Passive Matrix Displays

Technical improvements by leading manufacturers of passive matrix displays, such as the Super Twist Nematic (STN) type, have made this type of display an attractive choice for a broadening variety of applications. These improvements include higher contrast and brightness, and faster video signal response than was available with the earlier Twisted Nematic (TN) type displays.

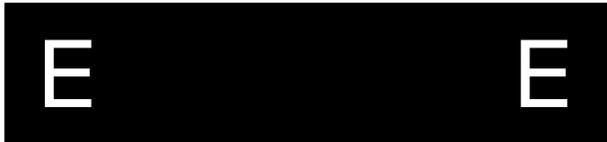
As with active matrix displays, a layer of liquid crystal lies sandwiched between a pair of electrodes and a pair of polarizing filters positioned at a 90 degree phase difference from each other. The liquid crystal molecules, depending on their alignment, control passage of light through the display. However, in a passive matrix flat panel display, X grid conductors connect to the lower display substrate, while Y grid conductors connect to the upper substrate. Applying an electrical signal to both conductors at the location of a pixel causes that pixel to be visible from the front of the display.



Driving the Flat Panel Display

Several methods exist to drive the flat panel display. One method involves use of a single scan in one pass of the display pixels to provide display drive. A faster method which provides better response and display contrast involves splitting the screen into two equal parts (upper and lower) and scanning each separately, thus reducing the time required to complete each scan cycle. This method is known as dual scanning. Pixel information in monochrome displays shifts into the matrix at each controller clock pulse. This information can be shifted into the matrix by the controller at up to eight pixels per clock pulse.

In color displays, bits of color data can be shifted into the display matrix at a rate of up to six bits per color per pixel during one clock pulse. New technology promises to increase this rate to eight bits per color per pixel. During dual scans of the display, the controller can deliver four data bits to the upper area and four data bits to the lower area simultaneously.



LCD Contrast/Backlight Control

Flat Panel Contrast and Backlight Control

Although the R400EX Evaluation Board does not support flat panel display contrast or backlight control, these functions are supported by the Cirrus Logic CL-GD6245 display driver IC. You must use an external power supply which provides the correct control voltages to enable these functions. Refer to documentation from the flat panel manufacturer for additional information.

LCD Contrast Control

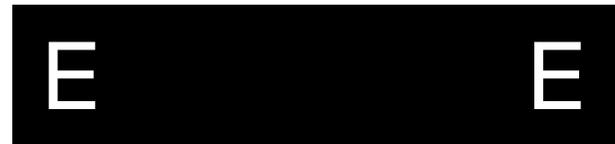
An adjustable power supply and associated circuitry are necessary to allow control of the contrast setting of an LCD flat panel. This device should provide two variable voltages, positive and negative, to the flat panel at the appropriate cable pins. Varying these voltages (positive and negative values changing together) causes contrast change in the flat panel.

LCD Backlight Control

In typical applications, use of a software addressable on/off FET switch allows application software control of the LCD backlight. The output from the FET switch triggers power sequencing in the flat panel driver, effecting backlight control at the flat panel. In a simpler application, direct application of backlight power to the flat

LCD Flat Panel Interface

panel provides direct backlight control. Refer to documentation from the flat panel manufacturer for recommended voltages and control methods.



Appendix F - PC Card Interface

The R400EX Evaluation Board supports use of flash or ATA PC cards as Chapter 2 discusses. Many of the supported PC card configurations require the use of appropriate card and socket services software to provide PC card slot drivers and a suitable format for the card. This appendix briefly describes the PCM+ Card and Socket Services software from Phoenix Technologies, Ltd. and provides a summary of PC card interfaces. RadiSys has tested the interface with ATA PC cards using this software.

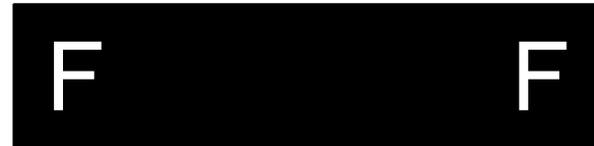
A read/write interface between the R400EX Evaluation Board and a flash PC card requires optional Flash File System software. The PCM+ utilities can configure only I/O PC cards. This does not include flash PC cards. RadiSys has tested the flash PC card interface using Flash File System software from M-Systems Flash Disk Pioneers, Ltd. and Cardsoft, Inc.

For more information, refer to the documentation from Phoenix included with the diskettes.

The following is a description of how to bring the RFA up using the PICOFA driver.

Contents of the distribution diskette:

CONFIG.SYS	-A sample configuration.
PICOFA.SYS	-The device driver.
TESTRFA.EXE	-A test utility. (must be run after the device or BIOS extension is loaded).
PFORMAT.EXE	-The format utility. DOS format utility will not work for the RFA.
PICOFA.BIN	-The BIOS extension.



REFLASH.EXE -Utility to flash the BIOS extension.

Step 1: Load the driver (This can be done either as a BIOS extension or as a device driver).

Step 1A (Load as device driver)

Add the line "**DEVICE=PICOFA.SYS**" to your **Config.Sys** file.

The jumpers on the board for linear/paged mode and byte/word access to the RFA should be set to byte mode and paged I/O.

Reboot the system. If the jumpers were set correctly, the driver will load and echo out a message that says which DOS device has been assigned to the RFA. If the jumpers were not right, the driver will echo a message stating the required jumper settings.

Step 1B (Load as BIOS extension)

Note that if the driver is loaded as a BIOS extension, the system will attempt to boot from the device. This means that the RFA must be formatted and sys'ed before the driver can be successfully loaded as a BIOS extension.

Flash the device driver into the BIOS:

Using the **REFLASH.EXE** (version 2.0) utility provided on the diskette, issue the following command:

REFLASH /F=PICOFA.BIN /0=4C000

When this process successfully completes, the Picoflash device driver is transferred into the 16KB area of memory from 0x4c000 - 0x50000.



PC Card Interface

Inform the setup menu of how to load the extension:

Now reboot the machine and go into setup (by hitting the F2 key at boot time), and enter the 'Embedded Features' menu. In this menu, one of the three Embedded Shadow Regions, specify the "Offset of BIOS extension in FBD" as 04c000, and the BIOS extension size as 04000.

Next, the "Destination Address" needs to be specified. Depending on your particular system configuration, this address may vary. The BIOS extension uses a 16KB I/O window from D4000 to D8000. If there are no other extensions installed, use D8000 as your "Destination Address" which will load the BIOS extension into the 16KB window from D8000 to DC000.

Final reboot:

Finally, now that the BIOS extension is properly flashed, and the BIOS setup menu knows how to position it, reboot the machine one more time. During this next boot cycle, the BIOS extension for the Picoflash should be loaded at D8000.

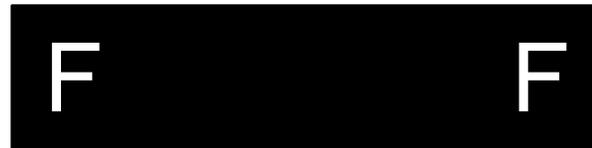
Step 2: Format the drive

Assuming that the driver loaded successfully (either as a device driver or as a BIOS extension), run the **PFORMAT.EXE** utility as follows:

PFORMAT D: /C /V

The **/C** confirms the format, and the **/V** switch says to put a volume label on the drive. When the format completes, give the drive a volume label. This should complete the process of making the RFA into a Flash File System. If you use the RFA as a bootable device, the system must be transferred to the RFA device. This can be done by using the DOS '**SYS**' command.

The RFA should now be set up for use as a DOS Flash File System. The standard DOS copy, delete, and other utilities for file creation/modification should function correctly.



NOTES



Appendix G - Glossary

¾ A ¾

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.

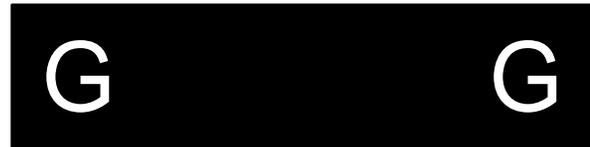
American National Standards Institute (ANSI): An organization dedicated to advancement of national standards related to product manufacturing.

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.

¾ B ¾

Basic Input/Output System (BIOS): 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.

BIOS Data Area (BDA): 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 initialization 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.

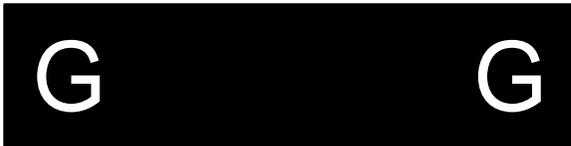
Boot: The process of starting a computer and loading the operating system from a powered down state (cold boot) or after a computer reset (warm boot). Before the operating system loads, the computer performs a general hardware initialization and resets internal registers.

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 initialization at system power up. The boot block also contains code to establish an Xmodem serial communication link with a host PC when reflashing the BIOS.

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.



Glossary

¾ C ¾

Central Processing Unit (CPU): 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.

Complimentary Hi-performance Metal Oxide Semiconductor (CHMOS): A proprietary CMOS technology used by Intel Corporation in the 386EX CPU and other Intel microprocessor ICs.

Column Address Strobe (CAS): 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.

Complimentary Metal Oxide Semiconductor (CMOS): A fast, low power semiconductor RAM used to store system configuration data.

Configuration Byte: A set up value in the BIOS enabling it to establish a pointer to an ATA PC card configuration register. Once the pointer has been established, the BIOS requires a *register location* to successfully complete an AT PC card interface.

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*.



Cylinders/Heads/Sectors (CHS): A specification of disk drive operating parameters consisting of the number of disk cylinders, disk drive read/write heads, and disk sectors.

¾ D ¾

Default: The state of all user-changeable hardware and software settings as they are originally configured before any changes are made.

Disk Operating System (DOS): 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.

Dual In-Line Package (DIP): A semiconductor package configuration consisting of a rectangular plastic case with two rows of pins, one row on each lengthwise side.

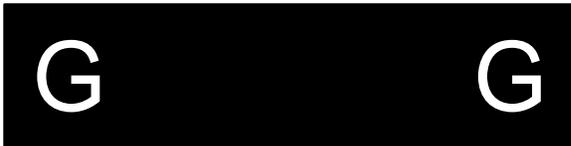
Dynamic Bus Sizing: The ability of the Intel386EX microprocessor, via a dedicated signal from the memory/bus controller, to engage 16-bit to 8-bit conversion cycles and adjust wait states when accessing an 8-bit device.

Dynamic Random Access Memory (DRAM): Semiconductor RAM memory devices in which the stored data will not remain permanently stored, even with the power applied, unless the data are periodically rewritten into memory during a *refresh* operation.

¾ E ¾

Electrically Erasable Programmable ROM (EEPROM): Specifically, those EPROMs which may be erased electrically as compared to other erasing methods.

Erasable Programmable ROM (EPROM): A semiconductor ROM device capable of being erased and reprogrammed by the user as often as desired. Once programmed, the EPROM is a nonvolatile memory that will hold its stored data indefinitely.



Glossary

Extended Data Out (EDO): 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.

External Device: A peripheral or other device connected to the computer from an external location via an interface cable.

¾ F ¾

Fast Page Mode (FPM): A “standard” type of DRAM that is lower performance than EDO but is less expensive.

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.

Flash Boot Device (FBD): A flash memory device containing the computer’s BIOS. In the R400EX Evaluation Board, a 512 KB Intel 28F400BV-T semiconductor flash memory containing the system and video BIOS images, the BIOS initializing code and the recovery code which allows self hosted reflashing.

Flash Card: A removable read/write flash storage device closely resembling a credit card in size and able to hold several megabytes of data.

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.

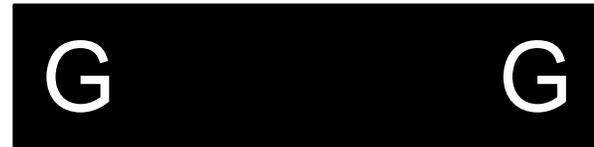
Flash Recovery: See *BIOS Recovery*.

Flash Update: See *BIOS Update*.

Force Update: See *BIOS Recovery*.

¾ G ¾

Gigabyte (GB): One billion bytes.



¾ H ¾

Hang: A condition where the system microprocessor suspends processing operations due to an anomaly in the data or an illegal command in the instruction set.

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.

Hexadecimal (h): 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.

¾ I ¾

Industry Standard Architecture (ISA): 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.

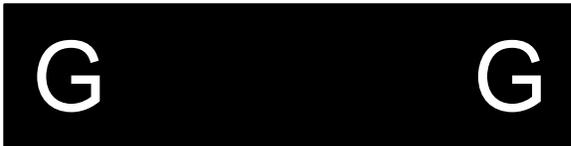
Input/Output (I/O): The communication interface between system components and between the system and connected peripherals.

Integrated Drive Electronics (IDE): 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.

Interrupt Request (INT): A software-generated interrupt request.

Interrupt Request (IRQ): In ISA bus 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.

Interrupt Service Routine (ISR): 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.



Glossary

¼ J ¼

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.

¼ K ¼

Kilobyte (KB): One thousand bytes.

¼ L ¼

Liquid Crystal Display (LCD): A device containing a series or matrix of liquid crystal diodes. Each diode consists of a sandwich of transparent electrodes, between which is a layer of liquid crystal. Behind the sandwich is a reflective layer. In an unpowered state, light is reflected through the electrodes and liquid crystal to the reflective layer and back. When current is applied to the liquid crystal, its molecular structure changes in such a way as to prevent light from passing back from the reflective layer.

Logical Address: The memory-mapped location of a segment after application of the address offset to the physical address.

Logical Block Addressing (LBA): 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.

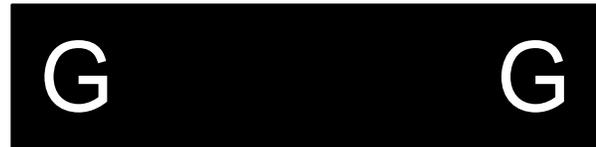
¼ M - N ¼

Megabyte (MB): One million bytes.

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*.

¼ O ¼

Offset: The difference in location of memory-mapped data between the physical address and the logical address.



Operating System: See *Disk Operating System*.

¾ P - Q ¾

Peripheral Connect Interface (PCI): 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.

Personal Computer/Advanced Technology (PC/AT): A popular computer design first introduced by IBM in the early 1980s.

Personal Computer Memory AT Attachment (PCM ATA): A popular standard for interfacing flash memory cards in computer systems.

Personal Computer Memory Card International Association (PCMCIA): The group of computer hardware designers responsible for development of standards for use and application of flash memory cards in computer systems.

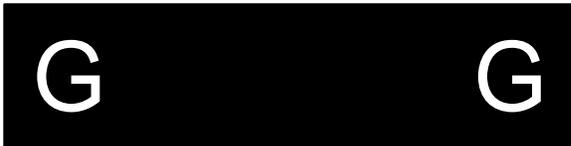
Personal System 2 (PS/2): Computers designed with IBM's proprietary bus architecture known as Micro Channel.

Phase-Locked Loop (PLL): 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.

Plastic Quad Flat Pack (PQFP): A popular package design for integrated circuits of high complexity.



Glossary

Power On Self Test (POST): 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.

Programmable Array Logic (PAL): A semiconductor programmable ROM which accepts customized logic gate programming to produce a desired sum-of-products output function.

¾ R ¾

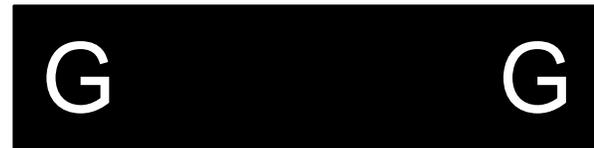
Random Access Memory (RAM): Memory in which the actual physical location of a memory word has no effect on how long it takes to read from or write to that location. In other words, the access time is the same for any address in memory. Most semiconductor memories are RAM.

Read Only Memory (ROM): A broad class on 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*.

Real Time Clock (RTC): 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 R400EX Evaluation Board, 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.

Register Location: A set up value in the BIOS which defines the base location at which the configuration register block in an ATA PC card may be found.

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.

Resident Flash Array (RFA): The RFA represents flash memory that is resident on the hardware platform that is utilized for OS or application purposes.

ROMDOS: A special DOS designed specifically to load into and operate from semiconductor ROM. ROMDOS consumes much less memory space than DOS, and because it resides in ROM, boots much more quickly than DOS.

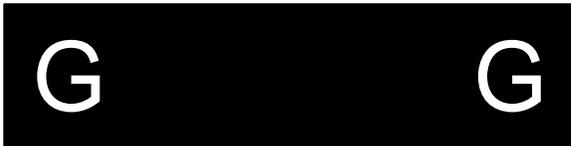
ROM/RAM Disk: A feature of the Phoenix PicoBIOS allowing the use of RAM, ROM, a PC card or other semiconductor memory storage devices to be accessed by the CPU like a fixed disk in the same manner as a fixed disk.

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.

Row Address Strobe (RAS): 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.

¾ S - T ¾

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.



Glossary

Serial Host: A computer connected to another through a serial interface. Connected together this way, one computer can execute a program remotely on the other “host” computer.

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 0xFFFFh 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.

Single In-Line Memory Module (SIMM): A small, rectangular circuit board on which is mounted semiconductor memory ICs.

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.

Static Random Access Memory (SRAM): A semiconductor RAM device in which the data will remain 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.

Synchronous Expansion Bus (SEB): An extension of the local bus provided for the purpose of convenient interface with a user-designed peripheral board. The SEB operates at the speed of the CPU and provides an ISA-like interface to the SVGA, PCM ATA, keyboard/mouse, and IDE controllers.

System Memory: See *Conventional Memory*.



¾ U ¾

User Editable Drive (UED): A feature of the Phoenix PicoBIOS. 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.

¾ V ¾

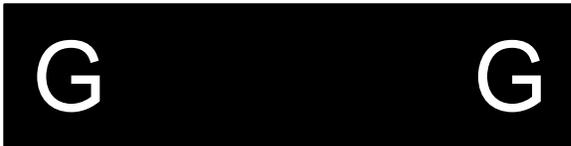
Video Graphics Adapter (VGA): A popular PC graphics controller and display adapter standard developed by IBM. The standard specifies, among other things, the resolution capabilities of the display device. Display devices meeting the VGA standard must be capable of displaying a resolution of 640 horizontal pixels by 480 vertical pixels with 16 screen colors.

¾ W ¾

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.

¾ X - Y - Z ¾

Xmodem: A popular serial communication protocol which specifies, among other things, the size of data packets to be transmitted or received, and error correction methodology.



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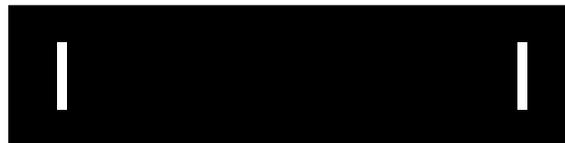
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