Reference Manual

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EPM-14 (Cougar)

AMD LX 800 Based SBC with Ethernet, Video, and PC/104-*Plus* Interface

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Product Release Notes

Rev 3.03 Release

Updated DRAM specifications.

Rev 3 Release

Charlie release.

- Implemented several manufacturability improvements.
- See the EPM-14 support page for a list of BIOS and PLD changes.

Rev 2 Release

Beta release.

Rev 1 Release

Pre-production only. No customer shipments.

Support Page

The EPM-14 support page, at **http://www.versalogic.com/private/cougarsupport.asp**, contains additional information and resources for this product including:

- Reference Manual (PDF format)
- Operating system information and software drivers
- Data sheets and manufacturers' links for chips used in this product
- BIOS information and upgrades
- Utility routines and benchmark software

This is a private page for EPM-14 users that can be accessed only be entering this address directly. It cannot be reached from the VersaLogic homepage.

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1 Introduction

Description

The EPM-14 is a feature-packed single board computer designed for OEM control projects requiring fast processing and designed-in reliability and longevity (product lifespan). Its features include:

- AMD LX 800 microcontroller with CS5536 companion chip
- 256 MB system RAM, soldered on
- CompactFlash site
- 10/100 Ethernet interface (dual)
- Flat Panel Display support
- MMX™ + 3DNow!™ graphics
- PC/104-*Plus* expansion site
- IDE controller, one channel, ATA-5, UDMA33
- Four USB 2.0/1.1 ports
- TVS devices on user I/O connections (require connection to earth ground)
- Three COM ports (two RS-232, one RS-422/485)
- Watchdog timer
- V_{CC} sensing reset circuit (all rails monitored, interrupt on fault)
- PC/104-*Plus* compliant footprint
- Field upgradeable BIOS with OEM enhancements
- Friction latch I/O connectors
- Customizing available

The EPM-14 is compatible with popular operating systems such as Windows and Linux.

Most I/O ports are included on-board. Additional I/O expansion is available through the high-speed PCI-based PC/104-*Plus* expansion site (which supports both PC/104 and PC/104-*Plus* expansion modules).

The EPM-14 features high reliability design and construction, including friction latch I/O connectors. It also features a watchdog timer, voltage sensing reset circuits and self-resetting fuses on the 5V supply to user I/O, speaker, programmable LED, LVDS, and all USB ports.

All EPM-14 boards are subjected to functional testing and are backed by a limited two-year warranty. Careful parts sourcing and US-based technical support ensure the highest possible quality, reliability, service and product longevity for this exceptional SBC.

Technical Specifications

Specifications are typical at 25 °C with 5.0 V power supply unless otherwise noted.

Board Size:
4.250" x 3.775" (PC/104 compliant)
Storage Temperature: -40° C to 85° C
Free Air Operating Temperature:
-40° C to +85° C EPM-14h
Power Requirements: *(with 256 MB RAM, keyboard and mouse, running Windows XP)*
EPM-14h – AMD CPU +5.0V ± 5% @ 0.90A (4.5W) typ.
+3.3V or ±12V may be required by some expansion modules
System Reset:
V_{cc} sensing, resets when the 3.3V power rail varies by more than ± 10% of its optimal value.
Watchdog timeout
DRAM Interface:
256 MB soldered on DDR 366 MHz RAM
Video Interface:
Up to 1600 x 1200 (32 bits)
Standard analog output
MMX™ + 3DNow!™ graphics
LVDS output for TFT FPDs
IDE Interface:
One channel, 44-pin keyed 2 mm header.
Supports up to and including UDMA33.
Supports up to two IDE devices (hard drives, CD-ROM, CompactFlash, etc.).
Ethernet Interface:
Two Intel 82551ER based Fast Ethernet 10/100 Controllers
COM1–2 Interface:
RS-232, 16C550 compatible, 115k baud max.
COM3 Interface:
RS-422/RS-485, 16C550 compatible, 460k baud max.
USB:
Four ports USB 2.0/1.1 protocol.
Counter/Timers:
Internal companion chip (CS5536) timers only.
BIOS:
General Software Embedded BIOS© with OEM enhancements
Field-upgradeable with Flash BIOS Upgrade Utility
Bus Speed:
CPU Bus: 800 MHz (Celeron equiv.), 500 MHz actual
DRAM: DDR 366 MHz
PC/104-*Plus* (PCI): 33 MHz
PC/104 (ISA): 8 MHz
Compatibility:
PC/104 – full compliance
Embedded-PCI (PC/104-*Plus*) – full compliance, 3.3V signaling
Weight:
EPM-14h – 0.102 kg (0.226 lbs)
Generated Frequencies:
32 kHz, 8.25 MHz, 14.318 MHz, 33 MHz, 48 MHz, 66 MHz, 166.5 MHz

Specifications are subject to change without notice.

EPM-14 Block Diagram

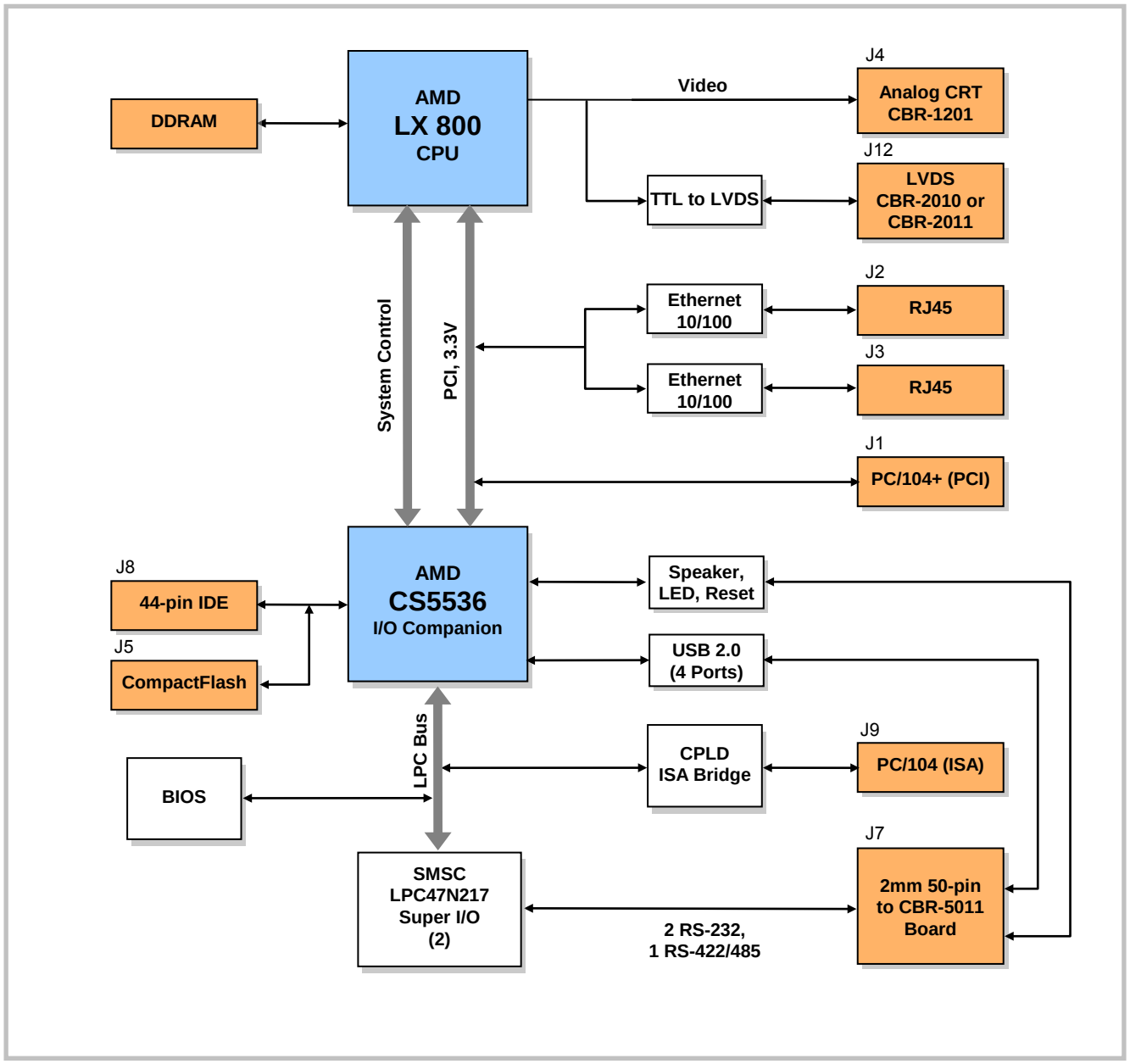

Figure 1. EPM-14 Block Diagram

RoHS-Compliance

The EPM-14 is RoHS-compliant.

About RoHS

In 2003, the European Union issued Directive 2002/95/EC regarding the Restriction of the use of certain Hazardous Substances (RoHS) in electrical and electronic equipment.

The RoHS directive requires producers of electrical and electronic equipment to reduce to acceptable levels the presence of six environmentally sensitive substances: lead, mercury, cadmium, hexavalent chromium, and the presence of polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE) flame retardants, in certain electrical and electronic products sold in the European Union (EU) beginning July 1, 2006.

VersaLogic Corporation is committed to supporting customers with high-quality products and services meeting the European Union's RoHS directive.

Warnings

Electrostatic Discharge

Electrostatic discharge (ESD) can damage boards, disk drives and other components. The circuit board must only be handled at an ESD workstation. If an approved station is not available, some measure of protection can be provided by wearing a grounded antistatic wrist strap. Keep all plastic away from the board, and do not slide the board over any surface.

After removing the board from its protective wrapper, place the board on a grounded, static-free surface, component side up. Use an antistatic foam pad if available.

The board should also be protected inside a closed metallic anti-static envelope during shipment or storage.

Note The exterior coating on some metallic antistatic bags is sufficiently conductive to cause excessive battery drain if the bag comes in contact with the bottom-side of the EPM-14.

Lithium Battery

To prevent shorting, premature failure or damage to the lithium battery, do not place the board on a conductive surface such as metal, black conductive foam or the outside surface of a metalized ESD protective pouch. The lithium battery may explode if mistreated. Do not recharge, disassemble or dispose of in fire. Dispose of depleted batteries promptly.

TRANSIENT VOLTAGE SUPPRESSION (TVS) DEVICES

The EPM-14 circuitry is protected from spike and surge damage by on-board transient voltage suppression (TVS) devices on the user I/O signals. Figure 2 shows a typical example of TVS circuitry. In order for the TVS devices to function properly, they must be connected to earth ground. This connection is made at the board's upper right mounting hole, as shown in Figure 3. All other mounting holes are floating. Use metal standoffs or a grounding strap to connect the lower right mounting hole to the enclosure chassis, which should be connected to earth ground.

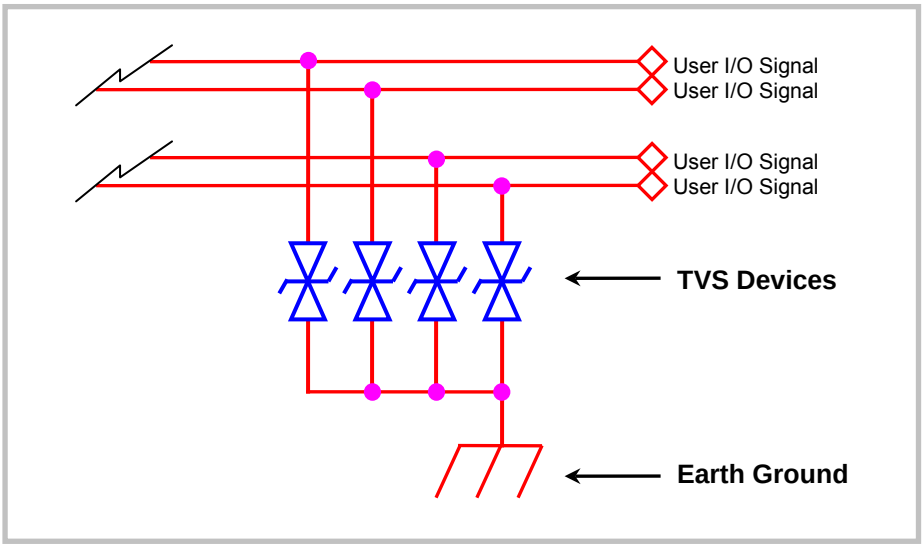

Figure 2. Schematic Showing Typical TVS Circuitry

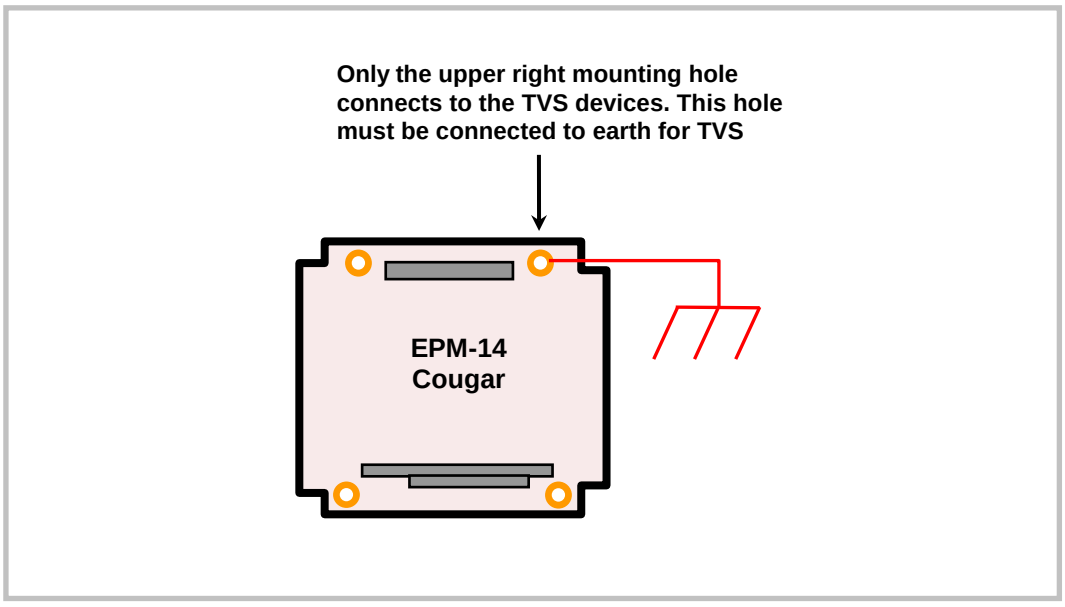

Figure 3. Attaching the EPM-14 to Earth Ground

Technical Support

If you are unable to solve a problem with this manual please visit the EPM-14 Product Support web page listed below. If you have further questions, contact VersaLogic technical support at (503) 747-2261. VersaLogic technical support engineers are also available via e-mail at Support@VersaLogic.com.

EPM-14 Support Website

http://www.versalogic.com/private/cougarsupport.asp

REPAIR SERVICE

If your product requires service, you must obtain a Returned Material Authorization (RMA) number by calling (503) 747-2261. VersaLogic's standard turn-around time for repairs is five working days after the product is received.

Please provide the following information:

- Your name, the name of your company and your phone number
- The name of a technician or engineer that can be contact if any questions arise.
- Quantity of items being returned
- The model and serial number (barcode) of each item
- A detailed description of the problem
- Steps you have taken to resolve or recreate the problem
- The return shipping address

Warranty Repair All parts and labor charges are covered, including return shipping charges for UPS Ground delivery to United States addresses.

Non-warranty Repair All non-warranty repairs are subject to diagnosis and labor charges, parts charges and return shipping fees. Please specify the shipping method you prefer and provide a purchase order number for invoicing the repair.

Note Please mark the RMA number clearly on the outside of the box before returning. Failure to do so can delay the processing of your return.

Configuration and Setup

2

Initial Configuration

The following components are recommended for a typical development system.

- EPM-14 single board computer
- ATX power supply with motherboard and drive connectors
- SVGA video monitor
- Keyboard with USB connector
- Mouse with USB connector
- IDE hard drive
- IDE CD-ROM drive

The following VersaLogic cables are recommended.

- Video adapter cable (CBR-1201)
- Utility I/O cable and board assembly (CBR-5011)
- IDE data cable (CBR-4406); may also require 2 mm to 0.1-inch adapter (CBR-4405)
- Power adapter cable (CBR-1008)

You will also need a Windows (or other OS) installation CD.

Basic Setup

The following steps outline the procedure for setting up a typical development system. The EPM-14 should be handled at an ESD workstation or while wearing a grounded antistatic wrist strap.

Before you begin, unpack the EPM-14 and accessories. Verify that you received all the items you ordered. Inspect the system visually for any damage that may have occurred in shipping. Contact Support@VersaLogic.com immediately if any items are damaged or missing.

Gather all the peripheral devices you plan to attach to the EPM-14 and their interface and power cables.

It is recommended that you attach standoffs to the board (see Hardware Assembly) to stabilize the board and make it easier to work with.

Figure 4 shows a typical start-up configuration.

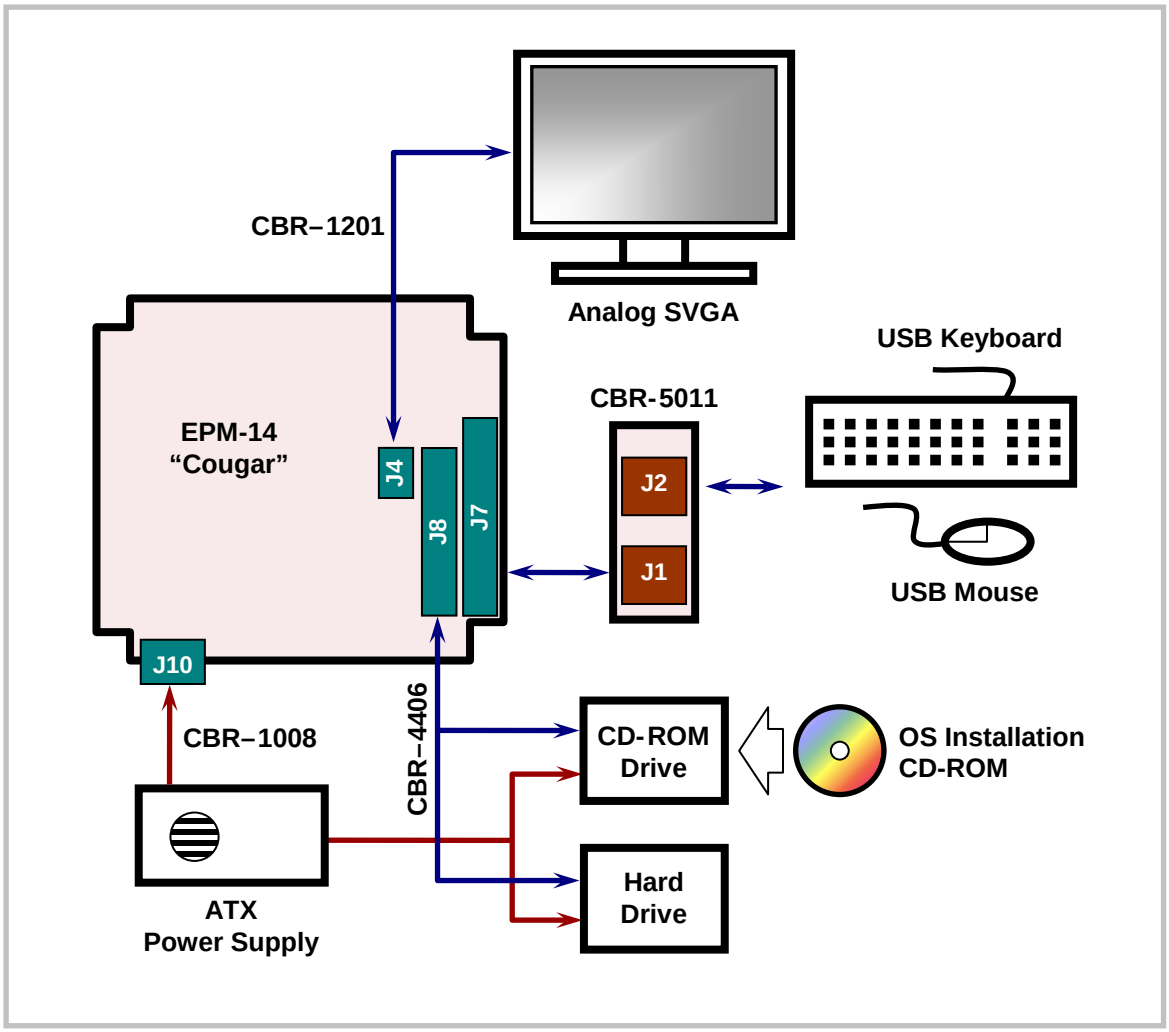

Figure 4. Typical Start-up Configuration

1. Attach Cables and Peripherals

- Plug the video adapter cable CBR-1201 into socket J4. Attach the video monitor interface cable to the video adapter.
- Plug the breakout board/cable CBR-5011 into socket J7. Plug the keyboard and mouse into any USB ports at J2 on the breakout board.
- Plug the hard drive data cable CBR-4406 into socket J8. Attach a hard drive and CD-ROM drive to the connectors on the cable. If the hard drive is 3.5 inch, use the 2 mm to 0.1-inch adapter CBR-4405 to attach the IDE cable.
- Attach an ATX power cable to any 3.5-inch drive (hard drive or CD-ROM drive).
- Set the hard drive jumper for master device operation and the CD-ROM drive jumper for slave device operation.

2. Attach Power

- Plug the power adapter cable CBR-1008 into connector J10. Attach the motherboard connector of the ATX power supply to the adapter.

3. Review Configuration

- Before you power up the system, double check all the connections. Make sure all cables are oriented correctly and that adequate power will be supplied to the EPM-14 and peripheral devices.

4. Power On

- Turn on the ATX power supply and the video monitor. If the system is correctly configured, a video signal should be present.

5. Change CMOS Setup Settings

- Enter CMOS Setup by pressing Delete during the early boot cycle.
- Select Basic Configuration and set or verify the following settings (see CMOS Setup for a complete list of default settings):

```
DRIVE ASSIGNMENT ORDER | Drive C: Ide 0/Pri Master

ATA DRV ASSIGNMENT | Ide 0: 3 = AUTOCONFIG, LBA
ATA DRV ASSIGNMENT | Ide 1: 5 = IDE CDROM

BOOT ORDER | Boot 1st: CDROM
BOOT ORDER | Boot 2nd: Drive C:
```

- Before saving the CMOS Setup settings, insert the Windows (or other OS) installation disk in the CD-ROM drive so it will be accessed when the system reboots.
- Press ESC and write the new parameters to CMOS RAM. The system will reboot.

6. Install Operating System

- Install the operating system according to the instructions provided by the OS manufacturer. (See Operating System Installation.)

Note If you intend to operate the EPM-14 under Windows XP or Windows XP Embedded, be sure to use Service Pack 2 (SP2) for full support of the latest CS5536 I/O hub and its USB 2.0 features.

CMOS Setup

The default CMOS Setup parameters for the EPM-14 are shown below.

Basic CMOS Configuration

```
+--------------------------------------------------------------------------+
|                System Bios Setup - Basic CMOS Configuration               |
|           (C) 2005 General Software, Inc. All rights reserved             |
+--------------------------+-------------------+---------------------------+
| DRIVE ASSIGNMENT ORDER:  | Date:>May 06, 2008 | Typematic Delay  : 250 ms  |
| Drive A: (None)          | Time: 00 : 00 : 00 | Typematic Rate   : 30 cps  |
| Drive B: (None)          | NumLock:  Disabled | Seek at Boot     : None    |
| Drive C: Ide 0/Pri Master +-------------------+ Show "Hit Del"   : Enabled |
| Drive D: (None)          | BOOT ORDER:        | Config Box       : Enabled |
| Drive E: (None)          | Boot 1st: Drive C: | F1 Error Wait    : Enabled |
| Drive F: (None)          | Boot 2nd: (None)   | Parity Checking  : (Unused)|
| Drive G: (None)          | Boot 3rd: (None)   | Memory Test Tick : Enabled |
| Drive H: (None)          | Boot 4th: (None)   | Debug Breakpoints: (Unused)|
| Drive I: (None)          | Boot 5th: (None)   | Debugger Hex Case: Upper   |
| Drive J: (None)          | Boot 6th: (None)   | Memory Test :StdLo FastHi  |
| Drive K: (None)          +-------------------+-----------------+-----------+
| Boot Method: Boot Sector | ATA DRV ASSIGNMENT:  Sect  Hds  Cyls | Memory    |
+--------------------------+ Ide 0: 3 = AUTOCONFIG, LBA           |  Base:    |
| FLOPPY DRIVE TYPES:      | Ide 1: 3 = AUTOCONFIG, LBA           |   633KB   |
| Floppy 0: Not installed  | Ide 2: 3 = AUTOCONFIG, LBA           |  Ext:     |
| Floppy 1: Not installed  | Ide 3: 3 = AUTOCONFIG, LBA           |   219MB   |
+--------------------------+--------------------------------------+-----------+
```

Features Configuration

```
+--------------------------------------------------------------------------+
|               System BIOS Setup - Advanced Configuration                 |
|           (C) 2005 General Software, Inc. All rights reserved             |
+-----------------------------------+--------------------------------------+
| System Management Mode    : Enabled   | POST Memory Manager       : Disabled |
| Splash Screen             : Disabled  | System Management BIOS    : Enabled  |
| Primary IDE UDMA          : Enabled   | Console Redirection       : Auto     |
| Firmbase Debug Console    : None      | UsbMassStorage            : Enabled  |
| Usb20                     : Enabled   |                                      |
+-----------------------------------+--------------------------------------+
```

Custom Configuration

```
+--------------------------------------------------------------------------+
|               System BIOS Setup - Custom Configuration                   |
|           (C) 2005 General Software, Inc. All rights reserved             |
+--------------------------------------+-----------------------------------+
| PCI INT A Assignment  : IRQ 11       | ISA IRQ 3             : Disabled  |
| PCI INT B Assignment  : IRQ 11       | ISA IRQ 4             : Disabled  |
| PCI INT C Assignment  : IRQ 11       | ISA IRQ 5             : Disabled  |
| PCI INT D Assignment  : IRQ 9        | ISA IRQ 6             : Disabled  |
| Write protect BIOS    : Enabled      | ISA IRQ 7             : Disabled  |
| Video buffer size     : 32 MB        | ISA IRQ 9             : Disabled  |
| Flat panel display    : Disabled     | ISA IRQ 10            : Disabled  |
| Video refresh rate    : 60 Hz        | COM 1 enable/IRQ      : IRQ4      |
| Video data width      : 1 pix/clk    | COM 2 enable/IRQ      : IRQ3      |
| Primary video device  : Auto         | COM 3 enable/IRQ      : Disabled  |
| Memory Timings        : Optimal      | COM 3 mode            : RS422     |
| CPU Temp threshold    : 80*C         | BIOS extension        : Disabled  |
| CPU overtemp IRQ      : Disabled     | Legacy USB support    : Enabled   |
| CPU/Memory speeds     : 500/366 MHz  | IDE cable type        : 40-Wire   |
+--------------------------------------+-----------------------------------+
```

Shadow Configuration

```
+---------------------------------------------------------------------------+
|               System BIOS Setup - Shadow/Cache Configuration              |
|           (C) 2005 General Software, Inc. All rights reserved             |
+-------------------------------------+-------------------------------------+
| Shadowing               : Chipset   | Shadow 16KB ROM at C000 : Enabled   |
| Shadow 16KB ROM at C400 : Enabled   | Shadow 16KB ROM at C800 : Disabled  |
| Shadow 16KB ROM at CC00 : Disabled  | Shadow 16KB ROM at D000 : Disabled  |
| Shadow 16KB ROM at D400 : Disabled  | Shadow 16KB ROM at D800 : Disabled  |
| Shadow 16KB ROM at DC00 : Enabled   | Shadow 16KB ROM at E000 : Enabled   |
| Shadow 16KB ROM at E400 : Enabled   | Shadow 16KB ROM at E800 : Enabled   |
| Shadow 16KB ROM at EC00 : Enabled   | Shadow 64KB ROM at F000 : Enabled   |
+-------------------------------------+-------------------------------------+
```

Note Due to changes and improvements in the system BIOS, the information on your monitor may differ from that shown above. The factory default date will correspond to the BIOS build date.

Operating System Installation

The standard PC architecture used on the EPM-14 makes the installation and use of most of the standard x86 processor-based operating systems very simple. The operating systems listed on the VersaLogic OS Compatibility Chart use the standard installation procedures provided by the maker of the OS. Special optimized hardware drivers for a particular operating system, or a link to the drivers, are available at the EPM-14 Product Support web page at **http://www.versalogic.com/private/cougarsupport.asp**.

Note An operating system installed on a different type of computer is not guaranteed to work on the EPM-14. This is referred to as a “foreign” installation. A hard disk that was used to boot a different computer cannot necessarily be moved to the EPM-14 and expected to boot. Even when porting an OS image from one revision of the EPM-14 to another, performance might fail or be impaired. For the best results, perform a fresh installation of the OS on each system. This restriction does not apply if you are producing multiple identical systems.

Dimensions and Mounting

The EPM-14 complies with all EBX standards which provide for specific mounting hole and PC/104-*Plus* stack locations as shown in Figure 5.

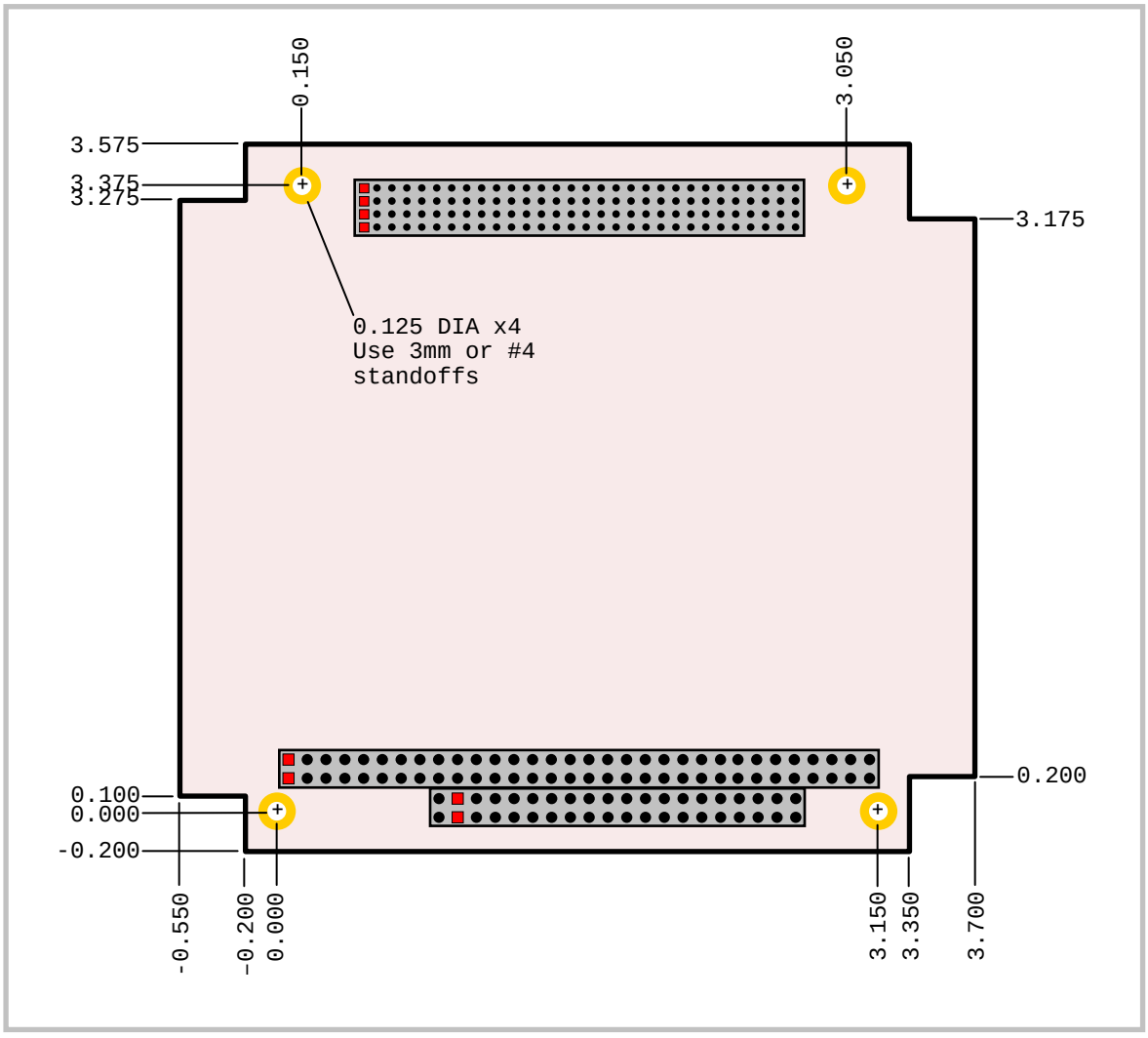

Figure 5. EPM-14 Dimensions and Mounting Holes

(Not to scale. All dimensions in inches.)

Caution The single board computer must be supported at all four mounting points to prevent excessive flexing when expansion modules are mated and detached. Flex damage caused by excessive force on an improperly mounted circuit board is not covered under the product warranty.

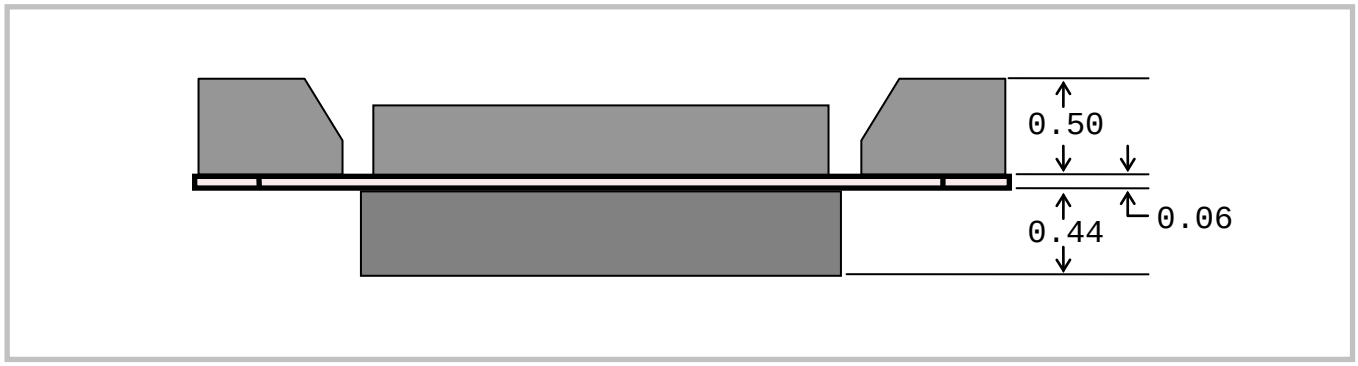

Figure 6. EPM-14 Height Dimensions

(Not to scale. All dimensions in inches.)

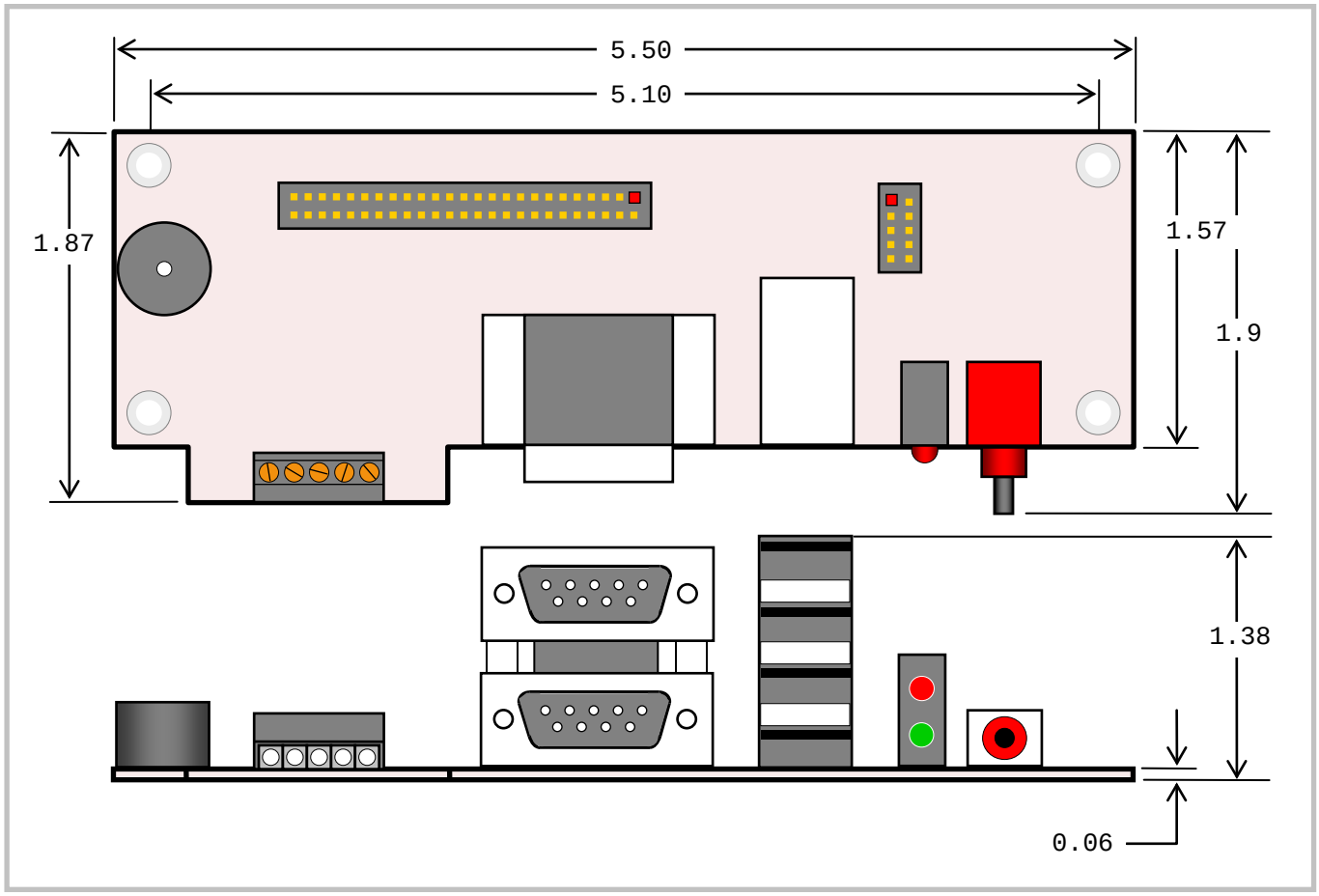

Figure 7. CBR-5011 Dimensions and Mounting Holes

HARDWARE ASSEMBLY

The EPM-14 uses PC/104 and PC/104-*Plus* connectors so that expansion modules can be added to the top of the stack. PC/104 (ISA) modules must not be positioned between the EPM-14 and any PC/104-*Plus* (PCI) modules on the stack.

The entire assembly can sit on a table top or be secured to a base plate. When bolting the unit down, make sure to secure all four standoffs to the mounting surface to prevent circuit board flexing. Standoffs are secured to the top circuit board using four pan head screws. Standoffs and screws are available as part number VL-HDW-101.

An extractor tool is available (part number VL-HDW-201) to separate the PC/104 modules from the stack. Use caution when using the extractor tool not to damage any board components.

STACK ARRANGEMENT EXAMPLE

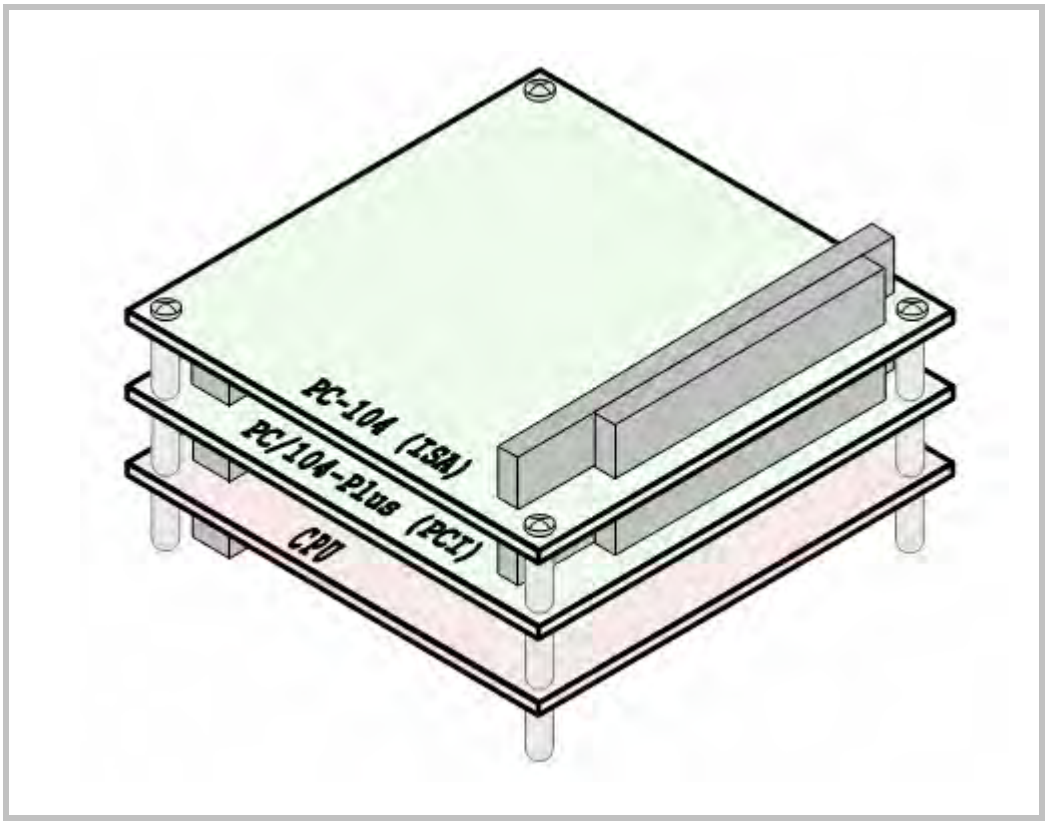

Figure 8. Stack Arrangement Example

External Connectors

EPM-14 CONNECTORS

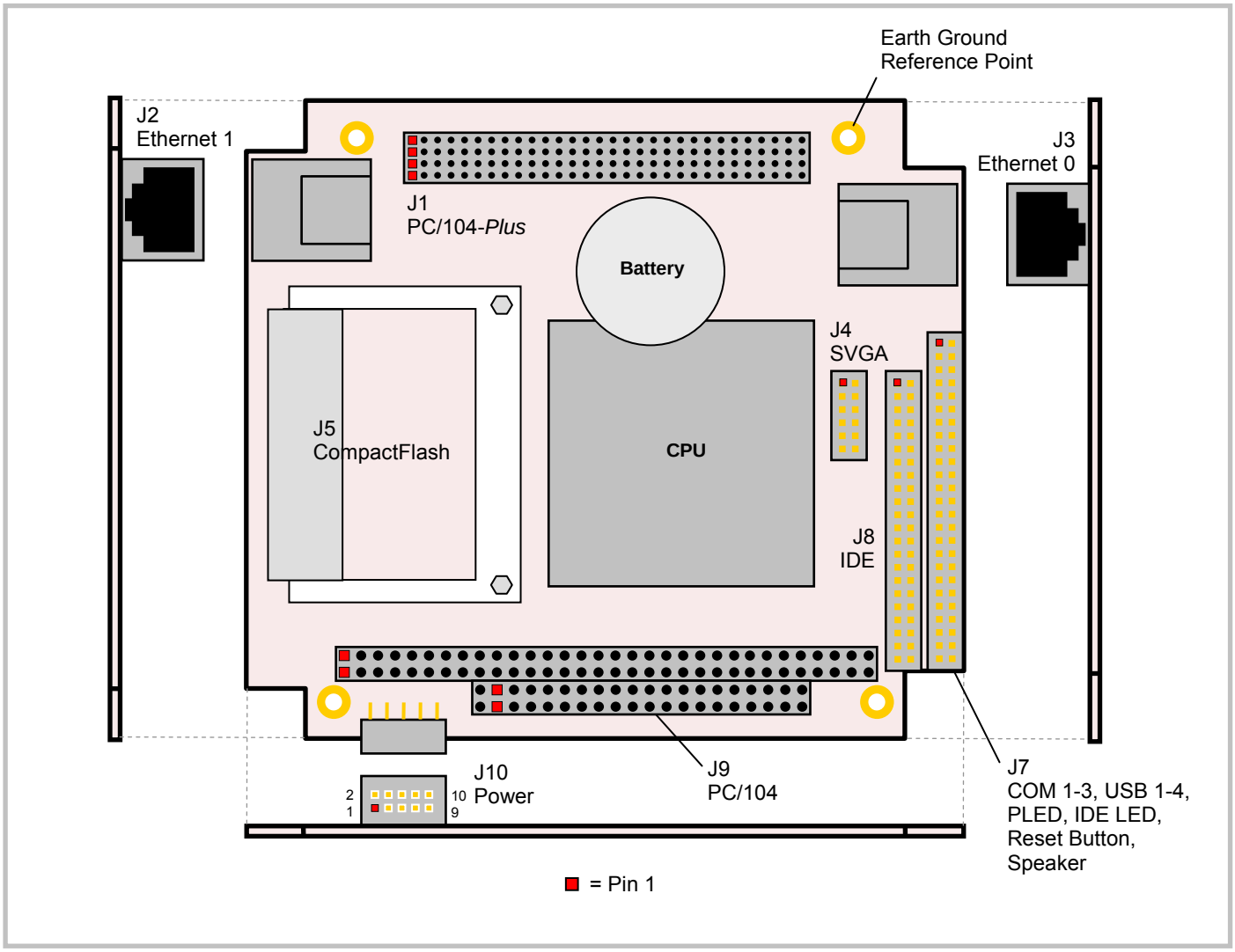

Figure 9. EPM-14 Connectors – Top Side

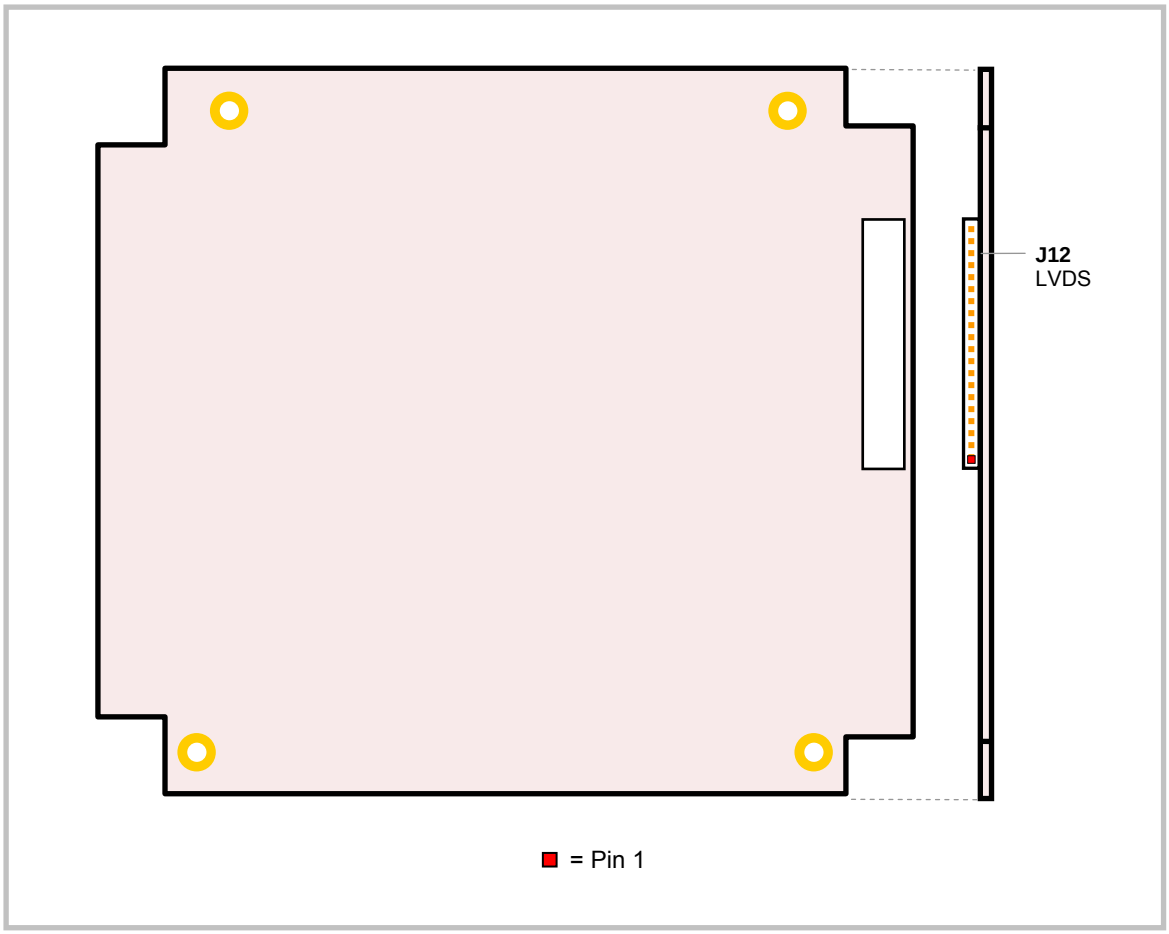

Figure 10. EPM-14 Connectors – Bottom Side

EPM-14 CONNECTOR FUNCTIONS AND INTERFACE CABLES

Table 1 lists the function of each connector, as well as mating connectors and cables, and the page where a detailed pinout or further information is available.

Table 1: Connector Functions and Interface Cables

Connector	Function	Mating Connector	Transition Cable	Cable Description	Pin 1 Location[1] x coord.	Pin 1 Location[1] y coord.	Page
J1	PC-104-*Plus*	AMP 1375799-1	–	–	0.450	3.138	36
J2	Ethernet 1	RJ45 Crimp-on Plug	–	–	0.055	3.115	35
J3	Ethernet 0	RJ45 Crimp-on Plug	–	–	3.100	2.637	35
J4	SVGA Video Output	FCI 89361-712LF or FCI 89947-712LF	CBR-1201	12-inch, 12-pin 2 mm IDC to 15-pin HD D-Sub VGA	2.957	1.937	32
J5	CompactFlash	Type I or Type II Compact Flash	–	–	1.100	2.172	30
J7	COM 1-3, USB 1-4, reset, PLED, IDE LED, speaker	FCI 89947-350LF	CBR-5009A to CBR-5011	12-inch, 2mm 50-pin to 50-pin	3.551	2.172	
J8	IDE Hard Drive, CD-ROM Drive	FCI 89947-144LF	CBR-4406 CBR-4405[2]	18” 2mm IDE cable 2mm to 0.1” adapter	3.303	1.937	26
J9	PC/104	AMP 1375795-2	–	–	0.050	0.200	36
J10	Main Power Input	Berg 69176-010 (housing) + Berg 47715-000 (pins)	CBR-1008	Interface from standard ATX power supply	0.205	-0.068	21
J12	LVDS	20-pin, PanelMate 1.25mm	CBR-2010 or CBR-2011	18-bit TFT FPD using 20-pin Hirose 18-bit TFT FPD using 20-pin JAE	-0.028	1.538	33

1. The PCB origin is the mounting hole to the lower left, as oriented in Figure 9.
2. CBR-4405 44-pin to 40-pin adapter required to connect to 3.5-inch IDE drives with 40-pin connectors.
3. Connectors J6 and J11 are for factory use only.

CBR-5011 CONNECTORS

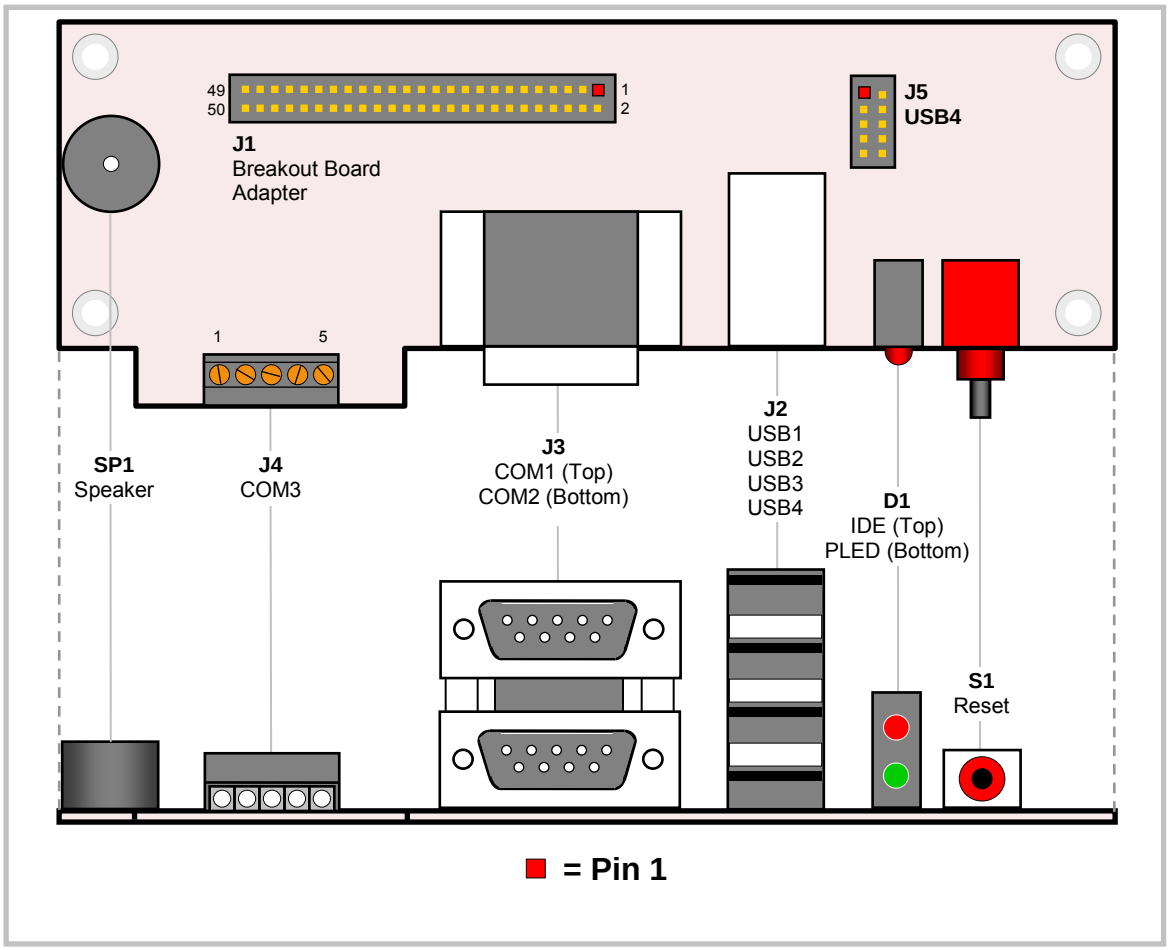

Figure 11. CBR-5011 Connectors

CBR-5011 CONNECTOR FUNCTIONS

Connector / Component	Function	Part Number	Description
D1	IDE and Programmable LEDs	Dialight 552-0211	LEDx2 T1 3/4 PC Mount Red/Green
J1	High Density Connector	FCI 98414-F06-50ULF	2mm, 50 pins, keyed, friction latch header
J2	USB 1-4	USB Type A	USB Type A
J3	COM1-2	Kycon K42X-E9P/P-A4N	Dual stacked DB-9 male
J4	COM3	Conta-Clip 10250.4	5 pin screw terminal
J5	USB 4	Molex 87758-1016	2mm, 10 pin header
S1	Reset Button	E-Switch 800SP9B7M6RE	Right angle momentary switch
SP1	Speaker	Challenge Elec. DBX05LF-PN	Miniature speaker

Jumper Blocks

JUMPERS AS-SHIPPED CONFIGURATION

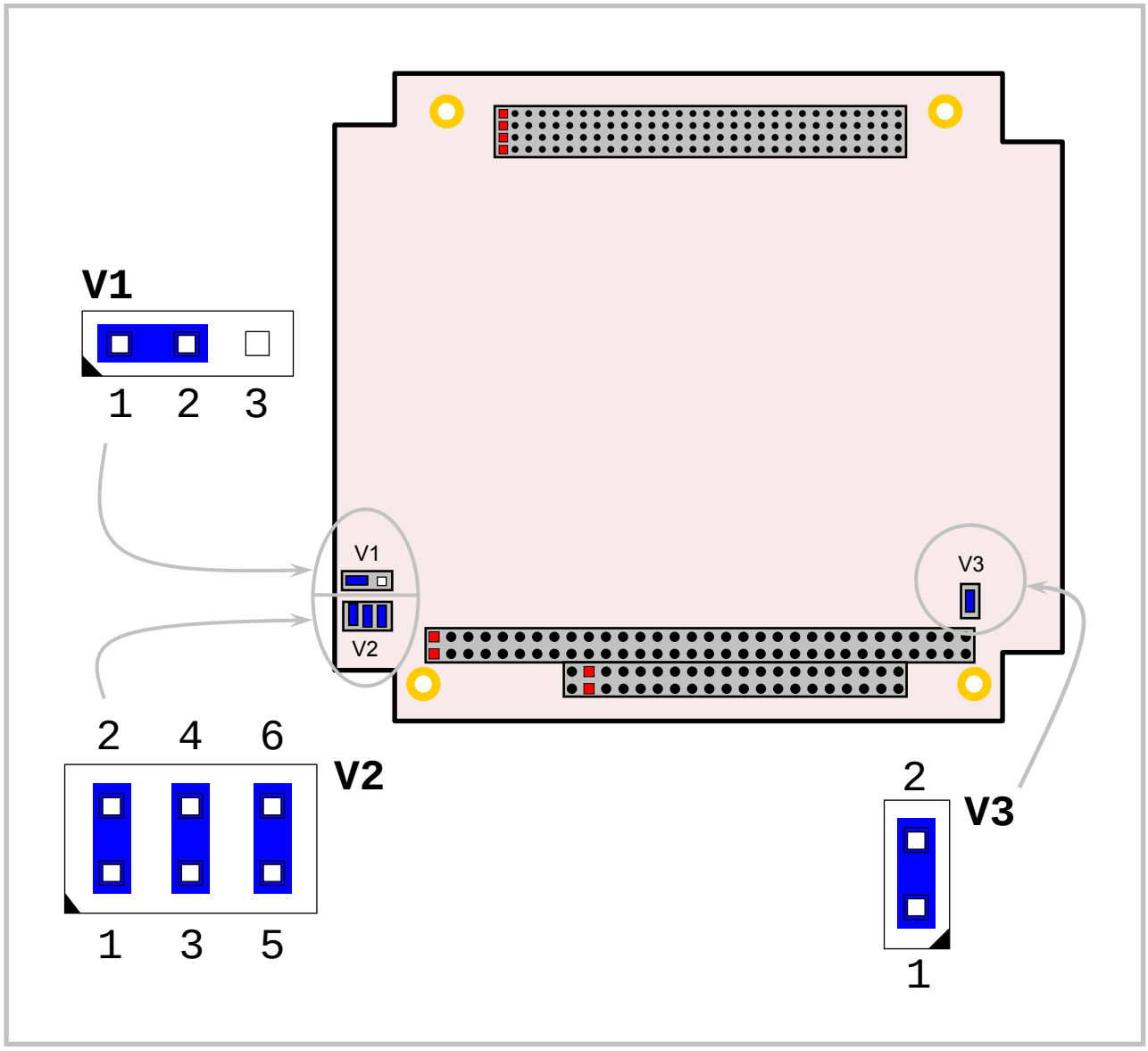

Figure 12. Jumper Block Locations – As Shipped Configuration

JUMPER SUMMARY

Table 2: Jumper Summary

Jumper Block	Description	As shipped	Page
V1	**CMOS RAM and Real Time Clock Erase** [1-2] – Normal [2-3] – Erase CMOS RAM and Real-Time Clock	[1-2]	23
V2[1-2]	**CompactFlash Master Selector** In – CompactFlash Module is IDE Master Out – CompactFlash Module is IDE Slave	In	30
V2[3-4]	**General Purpose Input** In – CPU reads bit as 1 Out – CPU reads bit as 0	In	40
V2[5-6]	**Video BIOS Selector** In – Primary Video BIOS selected Out – Secondary Video BIOS selected The secondary video BIOS is field-upgradeable using the BIOS upgrade utility. See www.versalogic.com/private/cougarsupport.asp for more information.	In	32
V3	**COM3 RS-422/485 Termination** In – 100 Ω Termination Active Out – COM3 Unterminated	In	27

Power Supply

POWER CONNECTORS

Main power is applied to the EPM-14 through a 10-pin polarized connector, with mating connector Berg 69176-010 (Housing) + Berg 47715-000 (Pins). Table 3 lists the connector pinout.

Warning! To prevent severe and possibly irreparable damage to the system, it is critical that the power connectors are wired correctly. Make sure to use both +5VDC pins and all ground pins to prevent excess voltage drop. Some manufacturers include a pin-1 indicator on the crimp housing that corresponds to pin-10 of the pinout shown in Figure 13.

Table 3: Main Power Connector Pinout

J10 Pin	Signal Name	Description
1	GND	Ground
2	+5VDC	Power Input
3	GND	Ground
4	+12VDC	Power Input
5	GND	Ground
6	-12VDC	Power Input
7	+3.3VDC	Power Input
8	+5VDC	Power Input
9	GND	Ground
10	+5VDC	Power Input

Figure 13 shows the VersaLogic standard pin numbering for this type of 10-pin power connector and the corresponding mating connector.

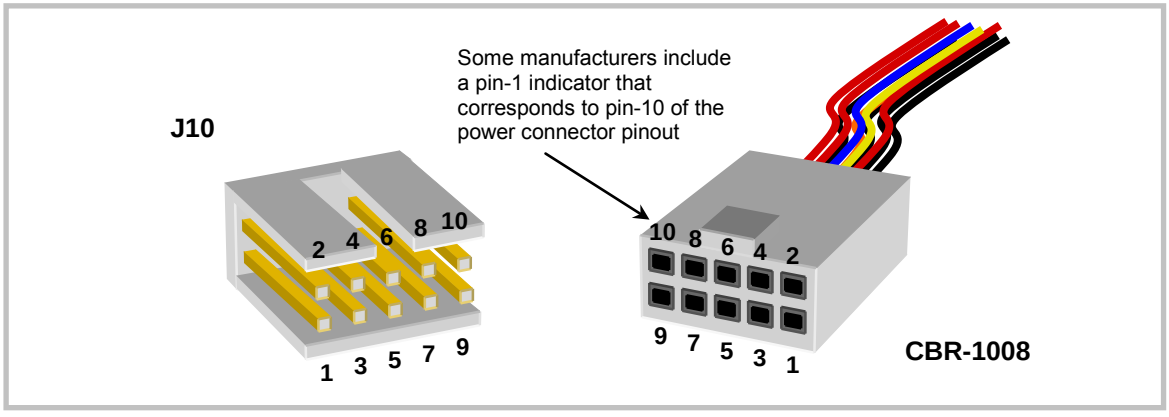

Figure 13. J10 and CBR-1008 Pin Numbering

Note: The +3.3VDC, +12VDC and -12VDC inputs are required only for expansion modules that require these voltages.

POWER REQUIREMENTS

The EPM-14 requires only +5 volts (±5%) for proper operation. The voltage required for the RS-232 ports are generated with a DC/DC converter. Low-voltage supply circuits provide power to the CPU and other on-board devices.

The exact power requirement of the EPM-14 depends on several factors, including peripheral connections, type and number of expansion modules, and attached devices. For example, driving long RS-232 lines at high speed can increase power demand.

LITHIUM BATTERY

Warning! To prevent shorting, premature failure or damage to the lithium battery, do not place the board on a conductive surface such as metal, black conductive foam or the outside surface of a metalized ESD protective pouch. The lithium battery may explode if mistreated. Do not recharge, disassemble or dispose of in fire. Dispose of used batteries promptly.

Nominal battery voltage is 3.0 V. If the voltage drops below 2.7 V, contact the factory for a replacement (part number HB3/0-1). The life expectancy under normal use is 10 years.

CPU

The Geode LX 800 microcontroller has a 32-bit, low-voltage AMD x86 microprocessor at its core. The maximum clock rate is 500 MHz actual, with 800 MHz (Celeron equivalent) performance. The LX 800 features 64 kb of L1 cache, 128 kb of L2 cache, DDR SDRAM support, and an integrated display controller. The CPU has a typical power consumption of 1.6W.

System RAM

The EPM-14 has one soldered-on DDR memory module with the following characteristics:

- Size 256 MB
- Voltage 2.6V
- Type DDR 366 MHz

Note CMOS settings default to DDR 366 MHz. Settings to DDR 400 MHz are available, but VersaLogic only guarantees operation at the default settings.

CMOS RAM

CLEARING CMOS RAM

A jumper may be installed into V1[2-3] to erase the contents of the CMOS RAM and the real-time clock. When clearing CMOS RAM: 1) Power off the EPM-14. 2) Remove the jumper from V1[1-2], install it on V1[2-3] and leave it for four seconds. 3) Move the jumper to back to V1[1-2]. 4) Power on the EPM-14.

CMOS Setup Defaults

The EPM-14 permits users to save custom CMOS defaults, which override factory defaults. This allows the system to boot with user-defined settings if CMOS RAM is cleared or corrupted. The factory defaults remain available for restoration in the main BIOS Setup screen. All CMOS Setup defaults can be customized, except the time and date. The CMOS Setup defaults can be updated with the Flash BIOS Update (FBU) Utility, available from the General BIOS Information page.

Warning! If the CMOS Setup default settings make the system unbootable and prevent the user from entering CMOS Setup, the EPM-14 needs to be serviced by the factory.

DEFAULT CMOS RAM SETUP VALUES

After the CMOS RAM is cleared, the system will load default CMOS RAM parameters the next time the board is powered on. The default CMOS RAM setup values will be used in order to boot the system whenever the main CMOS RAM values are blank, or when the system battery is dead or has been removed from the board.

SAVING CMOS SETUP PARAMETERS AS CUSTOM DEFAULTS

To save CMOS Setup parameters to custom defaults, you will need a DOS bootable floppy with the FBU utility on it.

1. Boot the EPM-14 and enter CMOS Setup by pressing Delete during the early boot cycle.
2. Change the CMOS parameters as desired and configure the floppy drive as the first boot device:
   ```
   DRIVE ASSIGNMENT ORDER | Drive A: USB Floppy
   Basic CMOS Configuration | BOOT ORDER | Boot 1st: Drive A:
   ```
3. Save the settings and exit CMOS Setup.
4. Reboot the system from the DOS boot floppy.
5. Run FBU and select **Save CMOS contents**. A file named CMOS.BIN is created and saved to the floppy.
6. Select the FBU option **Load Custom CMOS defaults**. A directory of the floppy is displayed.
7. Select the CMOS.BIN file and press the **P** key to program the new CMOS defaults.
8. Reboot the system from the hard disk. The custom CMOS parameters are now saved as defaults.

Real Time Clock

The EPM-14 features a battery-backed 146818-compatible real-time clock/calendar chip. Under normal battery conditions, the clock maintains accurate timekeeping functions when the board is powered off.

SETTING THE CLOCK

The CMOS Setup utility (accessed by pressing the Delete key during a system boot) can be used to set the time/date of the real-time clock.

Utility I/O Connector J7

A number of interfaces on the EPM-14 are grouped together and made accessible through utility I/O connector J7. A breakout cables and board combination, CBR-5011, is available from VersaLogic that provides discrete connectors for each of the interfaces; however, you may wish to create a custom cable that surfaces only the interfaces required by your application.

The 50-pin I/O connector incorporates the COM ports, and the reset button and speaker interfaces. Table 4 illustrates the function of each pin.

Table 4: J7 I/O Connector Pinout

J7 Pin	CBR-5011 Connector	Pin	Signal
1	**COM1**	1	Data Carrier Detect
2	**J3**	6	Data Set Ready
3	Top DB9	2	Receive Data
4		7	Request to Send
5		3	Transmit Data
6		8	Clear to Send
7		4	Data Terminal Ready
8		9	Ring Indicator
9		5	Ground
10	**COM2**	1	Data Carrier Detect
11	**J3**	6	Data Set Ready
12	Bottom DB9	2	Receive Data
13		7	Request to Send
14		3	Transmit Data
15		8	Clear to Send
16		4	Data Terminal Ready
17		9	Ring Indicator
18		5	Ground
19	**USB1**	T4	Ground
20	**J2**	T1	+5V Protected
21	Top	T3	Data +
22		T2	Data -
23	**USB2**	TM4	Ground
24	**J2**	TM1	+5V Protected
25	Top-Middle	TM3	Data +
26		TM2	Data -

J7 Pin	CBR-5011 Connector	Pin	Signal	
27	**USB3**	BM4	Ground	
28	**J2**	BM1	+5V Protected	
29	Bottom-Middle	BM3	Data +	
30		BM2	Data -	
31	**USB4**	B4	Ground	
32	**J2**	B1	+5V Protected	
33	Bottom	B3	Data +	
34		B2	Data -	
35	**(Reserved)**	–	Ground	
36		–	Not connected	
37	**PBRESET**	1	Pushbutton Reset	
38	**S1**	2	Ground	
	COM3		**RS-422**	**RS-485**
39	**J4**	5	TxD+	No connect
40		4	TxD-	No connect
41		1	Ground	No connect
42		3	RxD+	TRx3+
43		2	RxD-	TRx3-
44	**PLED**	3	Programmable LED	
45	**D1**	1	+5V Protected	
46	**IDE LED**	4	IDE LED	
47	**D1**	2	+5V Protected	
48	**Speaker**	–	Speaker Drive	
49	**SP1**	–	Ground	
50	**(Reserved)**	–	Ground	

IDE

One IDE interface is available to connect up to two IDE devices, such as hard disks and CD-ROM drives. If the on-board CompactFlash is configured for use, only one other IDE device can be attached to the IDE controller. Connector J8 provides the interface to the IDE controller. Jumper V2[1-2] determines if the CompactFlash plugged into J5 is the master device or slave. Use CMOS Setup to specify the drive parameters of the attached drives.

Warning! To maintain proper signal integrity, cable length must not exceed 18 inches.

Table 5: IDE Hard Drive Connector Pinout

Pin	Signal Name	Function
1	Reset-	Reset signal from CPU
2	Ground	Ground
3	DD7	Data bus bit 7
4	DD8	Data bus bit 8
5	DD6	Data bus bit 6
6	DD9	Data bus bit 9
7	DD5	Data bus bit 5
8	DD10	Data bus bit 10
9	DD4	Data bus bit 4
10	DD11	Data bus bit 11
11	DD3	Data bus bit 3
12	DD12	Data bus bit 12
13	DD2	Data bus bit 2
14	DD13	Data bus bit 13
15	DD1	Data bus bit 1
16	DD14	Data bus bit 14
17	DD0	Data bus bit 0
18	DD15	Data bus bit 15
19	Ground	Ground
20	NC	Key
21	DREQ	DMA request
22	Ground	Ground

Pin	Signal Name	Function
23	DIOW	I/O write
24	Ground	Ground
25	DIOR	I/O read
26	Ground	Ground
27	IORDY	I/O ready
28	Ground	Ground
29	DMACK-	DMA acknowledge
30	Ground	Ground
31	INTRQ	Interrupt request
32	NC	No connection
33	DA1	Device address bit 1
34	CBLID-	Cable type identifier
35	DA0	Device address bit 0
36	DA2	Device address bit 2
37	CS0	Chip select 0
38	CS1	Chip select 1
39	PDLED	IDE LED
40	Ground	Ground
41	Power	+5.0 V
42	Power	+5.0 V
43	Ground	Ground
44	NC	No connection

Serial Ports

The EPM-14 features three on-board 16550-based serial channels located at standard PC I/O addresses. COM1 and COM2 are RS-232 (115.2K baud) serial ports. IRQ lines are chosen in CMOS Setup. COM3 operates in RS-422 or RS-485 mode. IRQ lines are chosen in the CMOS Setup. Each COM port can be independently enabled or disabled in CMOS Setup.

For information on setting the COM ports to high-speed baud rates, see the AMD LX 800 Data Book (COM1 and COM2) or the AMD CS5536 Companion Device Data Book (COM3).

COM Port Configuration

There are no configuration jumpers for COM1 and COM2 because they only operate in RS-232 mode. Jumper V3 is used to enable the RS-422/485 termination resistor for COM3. The termination resistor should be enabled for RS-422/485 endpoint station. It should be disabled for the RS-485 intermediate station.

Serial Port Connectors

See the *Connector Location Diagrams* on pages 15 for connector and cable information. The pinouts of the DB9M connectors apply to the serial connectors on the VersaLogic breakout board CBR-5011.

These connectors use IEC 61000-4-2-rated TVS components to help protect against ESD damage.

Table 6: COM1-2 Pinout – CBR-5011 Connector J3

COM1	COM2	RS-232
Top DB9 J3 Pin	Bottom DB9 J3 Pin	
1	10	DCD
2	11	RXD*
3	12	TXD*
4	13	DTR
5	14	Ground
6	15	DSR
7	16	RTS
8	17	CTS
9	18	RI

Table 7: COM3 Pinout – CBR-5011 Connector J4

J4 Pin	RS-422	RS-485
1	Ground	No connect
2	RxD-	TRxD-
3	RxD+	TRxD+
4	TxD-	No connect
5	TxD+	No connect

COM3 RS-422/485 LINE DRIVER CONTROL

The COM3 line driver is controlled by manipulating the RS422/485 Transmit/Receive Control Register (1D3h). RS-485 support is provided but limited to manual flow control. COM3 is set to RS-485 receive mode when COM 3 Mode is set to RS485 ManuFC in CMOS. To enable RS-485 transmit mode, set bit D2. Clearing bit D2 will enable receive mode.

RS422/485 (Read/Write) 1D3h

D7	D6	D5	D4	D3	D2	D1	D0
Reserved	Reserved	Reserved	Reserved	Reserved	COM3TE485	COM3RE4XX	COM3TE422

Table 8: RS-422/485 Transmit/Receive Control Register Bit Assignments

Bit	Mnemonic	Description
D7-D3	–	**Reserved** – These bits have no function.
D2	COM3TE485	**COM3 RS-485 Transmit Enable** — Controls RS-485 transmit on COM3. 0 = Disable 1 = Enable
D1	COM3RE4XX	**COM3 RS-485/422 Receive Enable** — Controls RS-485/422 receive on COM3. 0 = Disable 1 = Enable
D0	COM3TE422	**COM3 RS-422 Transmit Enable** — Controls RS-422 transmit on COM3. 0 = Disable 1 = Enable

USB

The USB interface on the EPM-14 is OHCI (Open Host Controller Interface) and EHCI (Enhance Host Controller Interface) compatible, which provides a common industry software/hardware interface. The EHCI controller is still available for use by the operating system when the "Usb20" feature is disabled, but booting from USB 2.0 devices or using them in a DOS environment may be slower.

The USB controllers use PCI interrupt INTD#. CMOS Setup is used to select the IRQ line routed to each PCI interrupt line.

There are four USB ports, all connected through the utility I/O connector at J7. The CBR-5011 breakout board provides four USB type-A connectors at location J2, and an alternate 4-pin connection for USB4 at location J5.

Table 9: USB Pinout – CBR-5011 Connector J2

Pin	Signal Name	Function
1	USBPxPWR	+5V (Protected)
2	USBPx–	Data –
3	USBPx+	Data +
4	GND	Ground

Table 10: USB Pinout – CBR-5011 Connector J5

CBR-5011 J5 Pin	Signal Name	Function
1	USBP4PWR	+5V (Protected)
2	–	No connect
3	USBP4–	Channel 4 Data –
4	–	No connect
5	USBP4+	Channel 4 Data +
6	–	No connect
7	GND	Cable Shield
8	–	No connect
9	–	No connect
10	IDE_LED	IDE LED

These connectors use IEC 61000-4-2-rated TVS components to help protect against ESD damage.

CompactFlash

Connector J5 provides a socket for a Type I or Type II CompactFlash (CF) module. This IDE based interface operates on the same channel as the IDE interface. The CF interface supports operation in DMA mode.

Table 11 lists the CF modules tested and qualified as bootable devices by VersaLogic. Part numbers with a suffix of -3500 are RoHS-compliant.

Table 11. Qualified Bootable CF Modules

Manufacturer	Density	Manufacturer's Part Number
Hagiwara	1 GB	CF1-1GMDG(H00AA)
Hagiwara	512 MB	CF1-512MDG(H00AA)
Silicon Systems	128 MB	SSD-C12M-3012
Silicon Systems	128 MB	SSD-C12M-3500
Silicon Systems	256 MB	SSD-C25M-3012
Silicon Systems	256 MB	SSD-C25MI-3012
Silicon Systems	256 MB	SSD-C25M-3500
Silicon Systems	256 MB	SSD-C25MI-3500
Silicon Systems	512 MB	SSD-C51M-3012
Silicon Systems	512 MB	SSD-C51MI-3012
Silicon Systems	512 MB	SSD-C51M-3500
Silicon Systems	512 MB	SSD-C51MI-3500
Silicon Systems	1 GB	SSD-C01G-3012
Silicon Systems	1 GB	SSD-C01G-3500
Silicon Systems	2 GB	SSD-C02G-3012
Silicon Systems	2 GB	SSD-C02GI-3012
Silicon Systems	2 GB	SSD-C02G-3500
Silicon Systems	4 GB	SSD-C04GI-3012

Programmable LED

Connector J7 includes an output signal for attaching a software controlled LED. Connect the cathode of the LED to J7, pin 44; connect the anode to +5V. An on-board resistor limits the current to 15 mA when the circuit is turned on. A programmable LED is provided on the CBR-5011 breakout board.

To turn the LED on and off, set or clear bit D7 in I/O port 1D0h. When changing the register, make sure not to alter the value of the other bits.

The following code examples show how to turn the LED on and off. Refer to page 36 for additional information.

LED On

```
MOV   DX,1D0H
IN    AL,DX
OR    AL,80H
OUT   DX,AL
```

LED Off

```
MOV   DX,1D0H
IN    AL,DX
AND   AL,7FH
OUT   DX,AL
```

External Speaker

Connector J7 includes a speaker output signal at pin 48. The CBR-5011 breakout board provides a Piezo electric speaker.

Push-Button Reset

Connector J7 includes an input for a push-button reset switch. Shorting J7 pin 37 to ground causes the EPM-14 to reboot.

This connector uses IEC 61000-4-2-rated TVS components to help protect against ESD damage.

A reset button is provided on the CBR-5011 breakout board.

Video Interface

An on-board video controller integrated into the chipset provides high performance video output for the EPM-14.

CONFIGURATION

The video interface uses PCI interrupt INTA*. CMOS Setup is used to select the IRQ line routed to INTA*.

The EPM-14 uses shared memory architecture. This allows the video controller to use variable amounts of system DRAM for video RAM. The amount of RAM used for video is set with a CMOS Setup option.

The EPM-14 supports two types of video output, SVGA and LVDS Flat Panel Display. A CMOS Setup option is used to select which output is enabled after POST.

VIDEO BIOS SELECTION

Jumper V2[5-6] can be removed to allow the system to boot from the secondary video BIOS. Unlike the primary video BIOS, the secondary video BIOS can be reprogrammed in the field.

SVGA OUTPUT CONNECTOR

See the diagram on page 15 for the location of connector J4. An adapter cable, part number CBR-1201, is available to translate J4 into a standard 15-pin D-Sub SVGA connector.

This connector uses IEC 61000-4-2-rated TVS components to help protect against ESD damage.

Table 12: Video Output Pinout

J4 Pin	Signal Name	Function	Mini DB15 Pin
1	GND	Ground	6
2	RED	Red video	1
3	GND	Ground	7
4	GREEN	Green video	2
5	GND	Ground	8
6	BLUE	Blue video	3
7	GND	Ground	5
8	HSYNC	Horizontal sync	13
9	GND	Ground	10
10	VSYNC	Vertical sync	14
11	CRT_SCL	DDC data clock line	15
12	CRT_SDA	DDC serial data line	12

LVDS Flat Panel Display Connector

The integrated LVDS flat panel display in the EPM-14 is an ANSI/TIA/EIA-644-1995 specification-compliant interface. It can support up to 24 bits of RGB pixel data plus three bits of timing control (HSYNC/VSYNC/DE) on the four differential data output pairs. The LVDS clock frequency ranges from 25 MHz to 112 MHz.

CMOS Setup provides several options for standard LVDS flat panel types. If these options do not match the requirements of the panel you are attempting to use, contact Support@VersaLogic.com for a custom video BIOS.

The 3.3V power provided to pins 19 and 20 of J9 is protected by a 1 amp fuse.

See the connector location diagram on page 15 for pin and connector location information.

Table 13: LVDS Flat Panel Display Pinout

J12 Pin	Signal Name	Function
1	GND	Ground
2	NC	Not Connected
3	LVDSA3	Diff. Data (+)
4	LVDSA3#	Diff. Data 3 (-)
5	GND	Ground
6	LVFSCLK0	Differential Clock (+)
7	LVDSCLK0#	Differential Clock (-)
8	GND	Ground
9	LVDSA2	Diff. Data 2 (+)
10	LVDSA2#	Diff. Data 2 (-)
11	GND	Ground
12	LVDSA1	Diff. Data 1 (+)
13	LVDSA1#	Diff. Data 1 (-)
14	GND	Ground
15	LVDSA0	Diff. Data 0 (+)
16	LVDSA0#	Diff. Data 0 (-)
17	GND	Ground
18	GND	Ground
19	+3.3V	Protected Power Supply
20	+3.3V	Protected Power Supply

COMPATIBLE LVDS PANEL DISPLAYS

Table 14 provides a list of flat panel displays that are reported to work properly with the integrated graphics video controller chip used on the EPM-14.

Table 14: Compatible LVDS Interface TFT Technology Flat Panel Displays

Manufacturer	Model Number	Panel Size (Inches)	Resolution
eVision Displays	xxx084S01 series	8.4	800 x 600 18-bit
au Optronix	B084SN01	8.4	800 x 600 18-bit
eVision Displays	xxx104S01 series	10.4	800 x 600 18-bit
au Optronix	B104SN01	10.4	800 x 600 18-bit
eVision Displays	xxx141X01 series	14.1	1024 x 768 18-bit
Sharp	LQ121S1LG411	12.1	800 x 600 18-bit

CONSOLE REDIRECTION

The EPM-14 can be operated without using the on-board video output by redirecting the console to COM1. CMOS Setup and some operating systems such as DOS can use this console for user interaction.

In the Features Configuration screen, there is an option to control console redirection. This option can be set to Auto or Redirect. When set to Auto, the console will not be redirected to COM1 unless a signal is detected from the terminal by pressing <Ctrl>-<C> or <Enter>. When set to Redirect, the console will be directed to COM1.

Notes on console redirection:

- When console redirection is enabled, you can access CMOS Setup by typing<Ctrl><C>.
- The decision to redirect the console is made early in BIOS execution and cannot be changed later.
- The redirected console uses 115200 baud, 8 data bits, 1 stop bit, no parity, and no flow control.
- The default console redirection setting is Auto. The default can be reloaded without entering BIOS setup by discharging CMOS contents.

Null Modem:

The following diagram illustrates a typical DB9-to-DB9 RS-232 null modem adapter. Pins 7 and 8 are shorted together on each connector. Unlisted pins have no connection.

```
System 1  <-->  System 2
Name Pin        Pin Name
------------------------
TX    3   <-->   2  RX
RX    2   <-->   3  TX
RTS   7   <-->   1  DCD
CTS   8
DSR   6   <-->   4  DTR
DCD   1   <-->   7  RTS
                 8  CTS
DTR   4   <-->   6  DSR
```

Ethernet Interface

The EPM-14 features two Intel 82551ER Fast Ethernet controllers on-board. While these controllers are not NE2000-compatible, they are widely supported. Drivers are readily available to support a variety of operating systems. See VersaLogic website for latest OS support.

BIOS Configuration

Ethernet interface 0 (J3) uses PCI interrupt INTA# and Ethernet interface 1 (J2) uses PCI interrupt INTB#. CMOS Setup is used to select the IRQ line routed to each PCI interrupt line.

Status LED

Each Ethernet controller has a two-colored LED located next to its RJ-45 connector to provide an indication of the Ethernet status as follows:

Green LED (Link):

- ON — Active Ethernet cable plugged in
- OFF — Active cable not plugged in or cable not plugged into active hub

Yellow LED (Activity):

- ON — Activity detected on cable
- OFF — No Activity detected on cable

Ethernet Connector

Board-mounted RJ-45 connectors are provided to make connections with Category 5 Ethernet cables. The 82551ER Ethernet controller auto-detects 10BaseT/100Base-TX connectors.

These connectors use IEC 61000-4-2-rated TVS components to help protect against ESD damage.

Table 15: RJ45 Ethernet Connector

J2/J3 Pin	Signal Name	Function
1	T+	Transmit Data +
2	T-	Transmit Data -
3	R+	Receive Data +
4	IGND	Isolated Ground
5	IGND	Isolated Ground
6	R-	Receive Data -
7	IGND	Isolated Ground
8	IGND	Isolated Ground

CPU Temperature Monitor

A thermometer circuit constantly monitors the die temperature of the CPU. This circuit can be used to detect over-temperature conditions which can result from fan or heat sink failure or excessive ambient temperatures.

The system can be configured to generate an interrupt when the temperature exceeds the BIOS programmed threshold. Contact the factory for information on reading and writing to the thermometer circuits.

PC/104 Expansion Bus

EPM-14 has limited support of the PC/104 bus. Most PC/104 cards will work, but be sure to check the requirements of your PC/104 card against the list below.

PC/104 I/O Support

The ISA I/O ranges listed below are supported. The I/O ranges allocated to COM ports 1-3 are available to ISA when the on-board COM port function is disabled in CMOS Setup.

- 100h – 1CFh
  1DFh – 1EFh
  200h – 3AFh
  3E0h – 3F5h
  3F7h – 47Fh
  490h – 4CFh
  4D2h – 777h
  77Ch – AFFh
- When on-board COM ports are enabled in CMOS Setup: COM1 (0x3F8-0x3FF), COM2 (0x2F8-0x2FF), COM3 (0x3E8-0x3EF).

PC/104 Memory Support

Memory ranges supported:

- C8000h-DBFFFh

IRQ Support

The following IRQs are available on the PC/104 bus:

- IRQ 3, IRQ 4, IRQ 5, IRQ 6, IRQ 7, IRQ 9, and IRQ 10

Each of the seven IRQs must be enabled in CMOS Setup before they can be used on the ISA bus. Because ISA IRQ sharing is not supported, make sure that any IRQ channel used for an ISA device is not used elsewhere. For example, if ISA IRQ 4 is enabled, you must use a different IRQ for COM1. There are three mutually exclusive IRQ domains: PCI, ISA, and on-board COM ports.

DMA Support

The current revision of the board does not support PC/104 DMA.

6 System Resources and Maps

Memory Map

The lower 1 MB memory map of the EPM-14 is arranged as shown in Table 16.

Various blocks of memory space between C0000h and FFFFFh can be shadowed. CMOS Setup is used to enable or disable this feature.

Table 16: Memory Map

Start Address	End Address	Comment
E0000h	FFFFFh	System BIOS
DC000h	DFFFFh	Reserved
C8000h	DBFFFh	PC/104
C0000h	C7FFFh	Video BIOS
A0000h	BFFFFh	Video RAM
00000h	9FFFFh	System RAM

I/O Map

Table 17 lists the common I/O devices in the EPM-14 I/O map. User I/O devices should be added using care to avoid the devices already in the I/O map.

Table 17: I/O Map

I/O Device	Standard I/O Addresses
Special Control Register	1D0h
PLD Revision and Type Register	1D1h
Jumper and Status Register	1D2h
Reserved	1D4h – IDCh
COM/ISA IRQ Routing	1DDh – 1DEh
Primary Hard Drive Controller	1F0h – 1F7h
COM3 Serial Port	3E8h – 3EFh
COM2 Serial Port	2F8h – 2FFh
COM1 Serial Port	3F8h – 3FFh

Note The I/O ports occupied by on-board devices are freed up when the device is disabled in the CMOS setup. This does not apply to SPI and Reserved registers.

Interrupt Configuration

The EPM-14 has the standard complement of PC type interrupts. Four non-shared interrupts are routed to the PC/104 bus, and up to four IRQ lines can be allocated as needed to PCI devices. Table 18 and Table 19 show the default and allowed interrupt settings. There are no interrupt configuration jumpers. All configuration is handled through CMOS Setup. If your design needs to use interrupt lines on the PC/104 bus, IRQ5 and IRQ10 are recommended. (IRQ3 and IRQ4 are normally used by COM ports on the main board.)

Table 18: EPM-14 IRQ Settings

● = default setting O = allowed setting

Source	IRQ															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Timer 0	●															
Keyboard		●														
Slave PIC			●													
COM1				O	●	O		O		O	O					
COM2				●	O	O		O		O	O					
COM3				O	O	O		O		O	O					
RTC									●							
Mouse													●			
Math Chip														●		
IDE PATA															●	
IDE SATA																●
ISA IRQ10											O					
ISA IRQ3				O												
ISA IRQ4					O											
ISA IRQ5						O										
ISA IRQ6							O									
ISA IRQ7								O								
ISA IRQ9										O						
PCI INTA#						O				O	O	●				O
PCI INTB#						O				O	O	●				O
PCI INTC#						O				O	O	●				O
PCI INTD#						O				●	O	O				O

Table 19: PCI Interrupt Settings

● = default setting O = allowed setting

Source	PCI Interrupt			
	INTA#	INTB#	INTC#	INTD#
Video	●			
USB 2.0				●
USB 1.1				●
Ethernet 0	●			
Ethernet 1		●		

Special Control Register

SCR (Read/Write) 1D0h

D7	D6	D5	D4	D3	D2	D1	D0
PLED	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved

Table 20: Special Control Register Bit Assignments

Bit	Mnemonic	Description
D7	PLED	**Light Emitting Diode** – Controls the programmable LED on connector J7. 0 = Turns LED off 1 = Turns LED on
D6-D0	–	**Reserved** – These bits have no function.

PLD Revision and Type Register

REVTYP (Read-only) 1D1h

D7	D6	D5	D4	D3	D2	D1	D0
PLDREV4	PLDREV3	PLDREV2	PLDREV1	PLDREV0	Reserved	PLDCUST	PLDDEV

This register is used to indicate the PLD code revision level and model of the EPM-14.

Table 21: Revision and Type Register Bit Assignment

Bit	Mnemonic	Description
D7-D3	PLDREV	**PLD Revision Level** – Represents the EPM-14 PLD revision level. These bits are read-only. **Bit 4** **Bit 3** **Bit 2** **Bit 1** **Bit 0** **PLD Revision Level** 0 0 0 0 1 3.01
D2	–	**Reserved** – This bit has no function.
D1	PLDCUST	**Custom PLD** – Indicates whether the EPM-14 has a custom PLD. This bit is read-only. 0 = Standard PLD 1 = Custom PLD
D0	PLDDEV	**PLD in Development** – Indicates whether the EPM-14 PLD is in development. This bit is read-only. 0 = PLD not in development 1 = PLD in development

Jumper and Status Register

JSR (Read-only) 1D2h

D7	D6	D5	D4	D3	D2	D1	D0
Reserved	Reserved	Reserved	Reserved	Reserved	GPI	VB_SEL	Reserved

Table 22: Jumper and Status Register Bit Assignments

Bit	Mnemonic	Description
D7-D3	–	**Reserved** – These bits have no function.
D2	GPI	**General Purpose Input** – Indicates the status of V2[3-4]. This bit is read-only. 0 = Jumper out 1 = Jumper in
D1	VB_SEL	**Video BIOS Selection –** Indicates the status of jumper V2[5-6]. This bit is read-only. 0 = Jumper out, Secondary Video BIOS selected 1 = Jumper in, Primary Video BIOS selected
D0	–	**Reserved** – This bit has no function.

Appendix A – References

PC Chipset *AMD LX 800 Processor* *AMD CS5536 Companion Device*	Advanced Micro Devices (http://www.amd.com)
Ethernet Controller *Intel 82551ER*	Intel Corporation (http://developer.intel.com/sites/developer)
Super I/O *SMSC LPC47N217*	SMSC (http://www.smsc.com)
PC/104 Specification *PC/104 Resource Guide*	PC/104 Consortium (www.controlled.com/pc104)
PC/104-*Plus* Specification *PC/104 Resource Guide*	VersaLogic Corporation (www.versalogic.com)