Chipsmall

Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

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Reference Manual

EPM-4 (Lynx)

AMD ÉlanSC520 processor module with 10/100 Ethernet, and PC/104-*Plus* interface.

VERSALOGIC
CORPORATION

EPM-4

AMD ÉlanSC520 processor
module with 10/100 Ethernet,
and PC/104-*Plus* interface

Product Release Notes

> This page includes recent changes or improvements that have been made to this product. These changes may affect its operation or physical installation in your application. Please read the following information.

Rev 5 Release

- EPM-4h model release – RoHS extended temperature version.

Rev 4 Release

- PC/104 (ISA) connector keyed to better comply with standard. PC/104 connector soldered instead of press-fit.
- Physically smaller fuse at F1 with same protection value.
- 3.0V battery.

Rev 3 Release

- EPM-4g model release – Initial RoHS version.

Rev 2 Release

- Initial public release.

Support Page

The **EPM-4 Support Page**, at **http://www.VersaLogic.com/private/lynxsupport.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

Note: This is a private page for EPM-4 users only. It cannot be reached through our web site. You must enter this address directly to find the support page.

Model EPM-4
AMD Élan processor module with 10/100 Ethernet,
and PC/104-*Plus* interface

REFERENCE MANUAL

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Notice:

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Introduction 1

Description

The EPM-4 (Lynx) is a 486-based processor board in a compact PC/104-*Plus* format. It is specifically designed for OEM control projects requiring compact size, high reliability, and long product lifespan / availability. Its features include:

- AMD ÉlanSC520 microcontroller
  - 133 MHz
- 64 MB system RAM
- 10/100 dual-speed Ethernet
- Battery Backed SRAM Option
- Real time clock
- PC/104, PC/104-*Plus* expansion interface
- IDE controller
- Two general purpose timer inputs
- Watchdog timer
- Reconfigurable BIOS defaults
- Console redirected to COM port if no VGA
- Keyboard, mouse, AT motherboard peripherals

- CompactFlash Socket
- Four COM ports
  - Two RS-232
  - Two RS-422/485
- Parallel Port/Floppy Interface
- Vcc sensing reset circuit
- Flash BIOS with OEM enhancements
- Ethernet Remote boot capability
  - 3rd party boot code not included
- Single supply (+5V) operation
- Customizing available
- Batteryless operation (possible)
- Extended temperature options (100MHz)
- Transient Voltage Suppressor Devices
- RoHS-compliant version available

The EPM-4 is a complete computer system in one board. It may be used alone or with expansion modules. It features a PC/104-*Plus* expansion interface for fast PCI-based interface to a wide variety of PC/104 and PC/104-*Plus* stacking modules. This card is designed to be used primarily as an Ethernet node processor card.

It is fully compatible with popular operating systems including Windows 95/98/NT/NTE/, CE, QNX, Linux, RT-Linux, and other Real Time Operating Systems (see the VersaLogic OS Compatibility Chart).

On-board I/O includes 10/100 Mbit Ethernet, IDE, four COM ports, floppy and two general-purpose timer inputs.

This exceptional processor card was designed from the ground up for OEM applications with longevity and reliability as the main focus. It is fully supported by the VersaLogic design team. Both hardware and software (BIOS) customization are available in quantities as low as 25 pieces. Each board is subjected to 100% functional testing and is backed by a limited two-year warranty.

Technical Specifications

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

Board Size:
> 3.55" x 3.775" (PC/104 standard).

Storage Temperature:
> –40° C to 85° C

Operating Temperature:
> EPM-4c, g 0° C to +60° C (100 FPM airflow)
> EPM-4e, h -40° C to +85° C (free air, extended temperature versions)

Power Requirements: (with keyboard, mouse, and hard drive running DOS)
> EPM-4c, g 133 MHz +5V ±5% @ 0.94A
> EPM-4e, h 100 MHz +5V ±5% @ 0.84A, extended temperature versions
> +3.3V or ±12V may be required by some expansion modules

System Reset:
> V_{cc} sensing, resets below 4.70V typ.
>
> Watchdog timeout

BBSRAM Interface:
> 2 MB option mapped into high memory

IDE Interface:
> Industry standard 2mm 44-pin non-latching style, CompactFlash socket.

LPT/Floppy Interface:
> Supports one floppy drive or parallel port.

Ethernet Interface:
> Autodetect 10BaseT/100BaseTX based on Intel 82551ER. 12K transmit/receive buffer.

COM1 and COM2 Interface:
> RS-232, 16C550 compatible, 115K baud max.

COM3 and COM4 Interface:
> RS-422/485, 16C550 compatible, 460K baud max.

Connectors:

Utility:	2mm 50-pin shrouded
IDE:	2mm 44-pin
Floppy/LPT:	2mm 20-pin shrouded
Ethernet:	RJ45
Power:	0.1" 10-pin
CompactFlash	Type II socket

BIOS: General Software embedded BIOS with OEM enhancements
> Field upgradeable with Flash BIOS Upgrade Utility

Bus Speed:
> PCI, PC/104-*Plus*:   33 MHz, Revision 2.0
> PC/104:   8 MHz, Revision 2.5

Compatibility:
> PC/104 – Fully functional with most PC/104 devices. See the Expansion Bus section for details.
> Embedded-PCI (PC/104-*Plus*) – Full compliance, 3.3V or 5V modules
> RoHS: EPM-4g, h – Full compliance

Weight:
> EPM-4c, g – 0.117 kg (0.275 lbs)
> EPM-4e, h – 0.116 kg (0.255 lbs)

Specifications are subject to change without notice.

EPM-4 Block Diagram
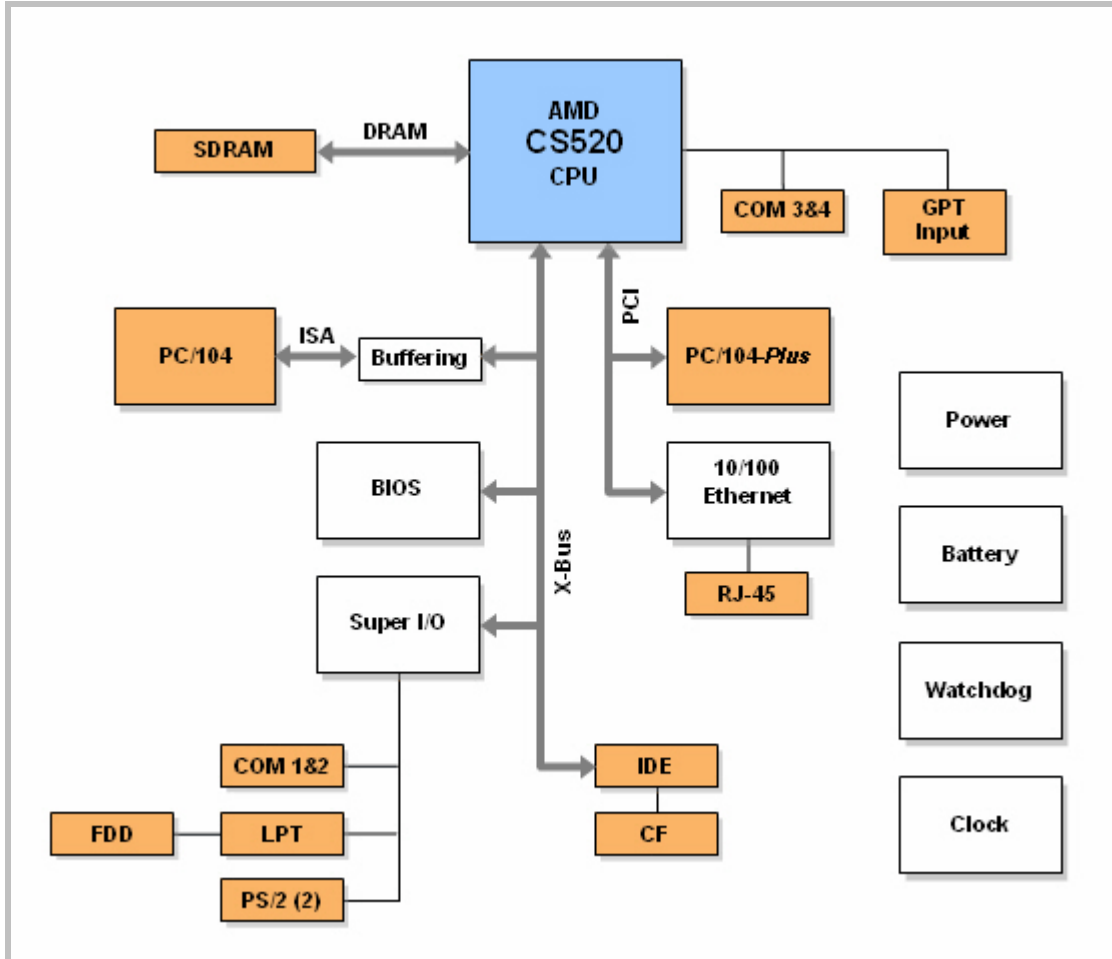
RoHS-Compliant Version

The EPM-4g and EPM-4h are RoHS-compliant. These models are functionally identical to the non-RoHS version of the boards.

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.

ROHS COMPLIANT CABLES

Adapter cables for the EPM-4 are available in RoHS compliant and RoHS noncompliant versions. Compliance or noncompliance is indicated by the part number prefix. "CBR" indicates RoHS compliance. "CBL" indicates RoHS noncompliance. For applications that require RoHS compliance, use only the RoHS compliant ("CBR" version) cables. Availability of RoHS noncompliant cables may be limited.

Technical Support

If you have problems that this manual can't help you solve, first visit the EPM-4 Product Support web page below. If you have further questions, contact VersaLogic for technical support at (541) 485-8575. You can also reach our technical support engineers via e-mail at Support@VersaLogic.com.

EPM-4 Support Website

http://www.VersaLogic.com/private/lynxsupport.asp

REPAIR SERVICE

If your product requires service, you must obtain a Returned Material Authorization (RMA) number by calling (541) 485-8575.

Please provide the following information:

- Your name, the name of your company, and your phone number
- The name of a technician or engineer who we can contact if we have questions
- Quantity of items being returned
- The model and serial number (bar code) of each item.
- A description of the problem
- Steps you have taken to resolve or repeat 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. We will need to know what shipping method you prefer for return back to your facility, and we will need to secure 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 / Operation

2

Overview

ELECTROSTATIC DISCHARGE

Warning!   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 anti-static 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 anti-static foam pad if available.

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

Note: The exterior coating on some metallic anti-static bags is sufficiently conductive to cause excessive battery drain if the bag comes in contact with the bottom side of the EPM-4.

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.

Initial Configuration and Setup

The following list describes the components recommended for setting up a typical development system.

RECOMMENDED COMPONENTS

- EPM-4 Board and cable kit
- ATX Power Supply
- EPM-VID-3 for video support
- Keyboard with PS/2 connector, mouse
- Ethernet Network
- IDE Hard Drive
- Floppy Drive

CMOS Setup / Boot Procedure

- Turn power on.
- Press the DEL key the instant that video is displayed (during the memory test).
- Verify default CMOS Setup information as shown below.
- Insert bootable floppy disk into floppy drive.
- Reset computer using push button reset.
- See VersaLogic KnowledgeBase article VT1476 – EPM-4 CMOS Setup Reference for more information about these parameters.

Basic CMOS Configuration

```
+------------------------------------------------------------------------+
|              System Bios Setup - Basic CMOS Configuration              |
|           (C) 2002 General Software, Inc. All rights reserved          |
+-----------------------------+-------------------------+----------------+
| DRIVE ASSIGNMENT ORDER:     | Date:>JAN 1, 1980       | Typematic Delay  : 250 ms |
| Drive A: Floppy 0           | 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 A:      | F1 Error Wait    : Enabled |
| Drive F: (None)             | Boot 2nd: Drive C:      | 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)             +-------------------------+----------------+
| (Loader): (Unused)          | ATA DRV ASSIGNMENT:  Sect  Hds  Cyls | Memory |
+-----------------------------+ Ide 0: 3 = AUTOCONFIG, LBA           | Base:  |
| FLOPPY DRIVE TYPES:         | Ide 1: 3 = AUTOCONFIG, LBA           |  633KB |
| Floppy 0: 1.44 MB, 3.5"     | Ide 2: Not installed                 | Ext:   |
| Floppy 1: Not installed     | Ide 3: Not installed                 |  63MB  |
+-----------------------------+--------------------------------------+--------+
```

Custom Configuration

```
+------------------------------------------------------------------------+
|              System BIOS Setup - Custom Configuration                  |
|           (C) 2002 General Software, Inc. All rights reserved          |
+-----------------------------------+------------------------------------+
| D0000h 64k page function : ISA bus | COM1 (3F8h) RS-232       : IRQ4   |
| PLD register base I/O     : 0E0h   | COM2 (2F8h) RS-232       : IRQ3   |
| Force Ethernet 10-BaseT   : Disabled | COM3 (3E8h) RS-422/485 : Disabled |
| PS/2 Mouse (IRQ12)        : Enabled | COM4 (2E8h) RS-422/485  : Disabled |
| LPT1 (378h)               : Disabled | GP Timer 0             : Disabled |
| Parallel Port Mode        : FDD    | GP Timer 1               : Disabled |
| CPU Speed                 : 133 MHz | Watchdog Timer          : Disabled |
| Cache Mode                : Wr-back | PCI Int A               : IRQ11  |
| Write Buffer              : Enabled | PCI Int B               : IRQ11  |
| GP Bus Timings            : Normal | PCI Int C (Ethernet)     : IRQ11  |
| Console Redirection       : Auto   | PCI Int D                : IRQ11  |
+-----------------------------------+------------------------------------+
```

Note: Due to changes and improvements in the system BIOS, the information on your monitor may differ from that shown above.

Console Redirection

If there is no video device detected during boot up, BIOS keyboard and screen I/O can be redirected to the COM2 RS-232 serial port. CMOS configuration can be modified over this redirected console. ANSI or VT102 terminal emulation is recommended.

When console redirection is enabled, press CTRL-C on the terminal emulator to enter CMOS Setup; the BIOS ignores DEL from a PS/2 keyboard. This is normal operation of the Lynx.

COM2 is configured for standard serial port communication:

- 9600 Baud

- Parity: None

- Flow Control: None

- Data Bits: 8

- Stop Bits: 1

Console redirection remains active when POST completes and the operating system boots. Text-based operating systems such as DOS and Linux can be controlled over this connection.

To enable console redirection, there must be no video device detected, the console redirection option in Custom Configuration must be set to Auto, and there must be a terminal (such as Windows HyperTerm) detected at COM2.

CMOS Setup / IDE Configuration

IDE

The Lynx has a single IDE channel to connect up to two hard disks, CompactFlash modules or CD-ROM drives. This basic IDE interface operates using PIO mode 0, resides on the ISA bus, and does not support the drive address register at I/O address 3F7h. It has been tested successfully on a wide variety of operating systems.

IDE SETUP

IDE devices include hard disk drives, CD-ROM drives, and some CompactFlash modules.

There are 3 fields in the Basic CMOS Configuration screen that are relevant to IDE setup: IDE Drive Geometry, Drive Assignment Order, and Boot Order.

IDE Drive Geometry

Most desktop PCs have two IDE channels, each capable of supporting two IDE devices in a slave/master configuration or a single IDE device in a single (or master only) configuration.

In the IDE Drive Geometry list:

> IDE 0 corresponds to primary channel, master/single drive.
> IDE 1 corresponds to primary channel, slave drive.
> IDE 2 corresponds to secondary channel, master/single drive.
> IDE 3 corresponds to secondary channel, slave drive.

The Lynx uses the first IDE channel only. IDE 2 and IDE 3 are unused

All modern IDE devices use LBA mode. When setting up an IDE device, leave the drive geometry set to LBA mode unless your hard drive requires a different mode.

CD-ROM drives that will be used as boot devices should be set accordingly in the Drive Geometry list.

Drive Assignment Order

After a hard drive has been declared in the IDE Drive Geometry field, it must be assigned a DOS drive letter, even if you are not using the DOS operating system. Normally, "Drive C:" will be assigned to the IDE device that you wish to boot from.

Do not attempt to assign a drive letter to a CD-ROM drive. The drivers required to use these devices will automatically assign a drive letter to the device when loaded.

Boot Order

This field allows you to specify the order in which the BIOS looks for boot devices.

Usually, the drive you specify here corresponds to the declaration in the Drive Assignment Order field.

A CD-ROM drive can be inserted into the boot order by selecting "CDROM" at the desired boot order position.

CMOS Setup / Advanced Configuration

D0000H 64K PAGE FUNCTION

Default: ISA bus

ISA bus

Memory accesses to the D0000h page will be sent to the ISA bus for use by PC/104 expansion modules. This setting is required when flashing the BIOS with the FBU utility.

BIOS Ext

The D0000h page is mapped to sector 1 in the flash chip, which may contain 3rd party Ethernet boot code or any other BIOS extension (not included). If there is a such an extension present, it will be called by the BIOS. The BIOS extension can be programmed into the flash chip with the FBU utility. For remote booting via Ethernet, the recommended boot ROM is Managed PC Boot Agent from Argon Technology Corporation.

RAM

System RAM is exposed in the D0000h page.

PLD REGISTER BASE I/O

Default: 0E0h

Specifies the location of the PLD register in I/O space. It can be moved to 1E0h in case of an address conflict within add-in module.

FORCE ETHERNET 10-BASET

Default: Disabled

When enabled, this will disable the Ethernet media data rate auto-negotiation and force it to 10-BaseT mode.

Note: Some drivers will put the Ethernet back into auto-negotiation mode.

PS/2 MOUSE (IRQ12)

Default: Enabled

When disabled, IRQ12 is freed for other devices.

LPT1 (0378H)

Default: IRQ7

Allows you to disable or specify the IRQ used by LPT1 on the SMSC FDC37B727 Super I/O. When disabled, the IRQ and I/O space are freed.

PARALLEL PORT MODE

Default: SPP

This option allows the user to change the communication mode of the parallel port. The options are: SPP, SPP/EPP1.9, ECP, ECP/EPP1.9, Printer, SPP/EPP1.7, ECP/EPP1.7, and FDD. The FDD option must be set if a floppy drive is used.

CPU SPEED

Default: 133 MHz

The maximum clock rate for the ÉlanSC520 Microcontroller is 133 MHz. It can optionally be set to 100 MHz for a slight power savings. If an extended temperature board version is detected, the default will change to 100 MHz.

CACHE MODE

Default: Write-Back

The 16 kb L1 cache can be configured for either write-through or write-back mode. This option controls the CACHE_WR_MODE in the CPUCTL register (MMCR offset 02h).

WRITE BUFFER

Default: Enabled

When the write buffer is enabled, it buffers all write activity from the CPU, PCI bus, or GP bus. This option controls the WB_ENB bit in the DBCTL register (MMCR offset 40h).

GP BUS TIMINGS

Default: Normal

The GP (ISA) bus timings may need to be slowed to accommodate ISA Plug-n-Play cards. This option modifies registers in the GP Bus Controller, MMCR offsets C08h through C10h.

COM1 (03F8H) RS-232

Default: IRQ4

Allows you to disable or specify the IRQ used by internal UART1 on the ÉlanSC520 Microcontroller. When disabled, the IRQ and I/O space are freed.

COM2 (02F8H) RS-232

Default: IRQ3

Allows you to disable or specify the IRQ used by internal UART2 on the ÉlanSC520 Microcontroller. When disabled, the IRQ and I/O space are freed.

COM3 (03E8H) RS-422/485

Default: Disabled

Allows you to disable or specify the IRQ used by UART1 on the SMSC FDC37B727 Super I/O. When disabled, the IRQ and I/O space are freed.

COM4 (02E8H) RS-422/485

Default: Disabled

Allows you to disable or specify the IRQ used by UART2 on the SMSC FDC37B727 Super I/O. When disabled, the IRQ and I/O space are freed.

GP TIMER 0, GP TIMER 1, WATCHDOG TIMER

Default: Disabled

These internal SC520 devices can be disabled or enabled by assigning an IRQ. Enabling these devices only sets up the IRQ assignment; it is up to the user to set up device operation. Refer to the ÉlanSC520 Microcontroller User's Manual for details.

PCI INTERRUPT A, B, C, AND D

Default: IRQ11

These options allow manual IRQ routing of PCI devices.

Note: PCI devices can share an interrupt. In most cases, the cost of doing this is slightly decreased system performance and slightly increased interrupt response time.

Using Custom CMOS Defaults

The Lynx BIOS has the capability to store CMOS defaults in the on-board flash chip. This storage area is non-volatile, enabling the Lynx to run with user-specified CMOS defaults without a battery installed.

If custom defaults are specified, they will be used instead of the factory defaults any time CMOS memory needs to be reset. CMOS is reset when any of the following occur:

- CMOS memory is found to be corrupt or uninitialized at boot time

- CMOS contents are erased by FBU during a BIOS upgrade

- The Lynx was powered on without a battery, or without a sufficiently charged battery

There are 4 options on the main BIOS setup screen that control CMOS defaults.

- *Save CMOS as custom defaults*

    Saves the current CMOS settings to the custom defaults. These settings will be used any time CMOS is reset. If there are already custom defaults specified, they will be overwritten.

- *Reset CMOS to custom defaults*

    Discards the current CMOS settings and uses the saved custom defaults. This operation will fail if no custom defaults have been previously saved.

- *Clear custom defaults (use factory defaults)*

    Deletes custom CMOS settings stored in flash. Factory default settings will be used any time CMOS is reset.

- *Reset CMOS to factory defaults*

    Discards the current CMOS settings and uses factory defaults, even if custom defaults have been specified. If CMOS is later reset, custom defaults will be used if available.

Warning!   Take care in saving custom CMOS defaults, as you must be able to get back to the main BIOS setup screen to undo any mistakes. For example, it would be a mistake to disable a COM port that is required for console redirection when there is no video device available.

Physical Dimensions

The EPM-4 complies with all PC/104-*Plus* standards. Dimensions are given below to help with pre-production planning and layout.
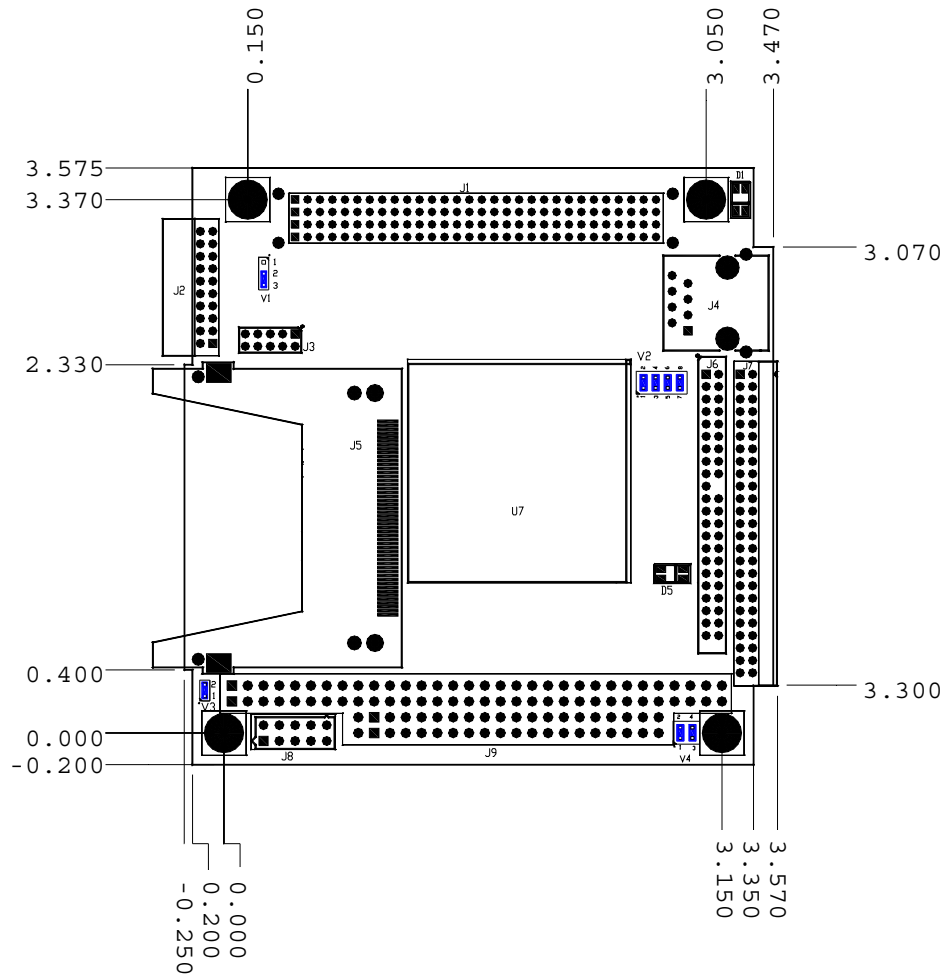

Figure 1. Dimensions
(Not to scale. All dimensions in inches.)