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VMP1

Power PC-based CPU Board
for VME Applications

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The product described in this manual is in compliance with all applied CE standards.

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Revision History

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Explanation of Symbols



CE Conformity

This symbol indicates that the product described in this manual is in compliance with all applied CE standards. Please see also the section “Applied Standards” in this manual.



Caution!

This symbol and title warn you of hazards due to electrical shocks (> 60 V) when touching products or parts of them. Failure to observe the necessary precautions as described and/or prescribed by the law may result in damage to your product and/or endanger your life/health.

Please see also the section “High Voltage Safety Instructions”.



ESD-Sensitive Device!

This symbol and title highlight the fact that electronic boards and their components are sensitive to static electricity. Therefore, care must be taken during all handling operations and inspections of this product, in order to ensure product integrity at all times.

Please read also the section “Special Handling and Unpacking Instructions” on the following pageof this manual.



Attention!

This symbol and title emphasize aspects which, if not understood and taken into consideration by the reader, may result in hazards to health and/or material damage.



Note:

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PEP Advantage

This symbol and title accompany information highlighting positive aspects of a *PEP* product and/or procedure.



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For your safety

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High Voltage Safety Instructions



Warning!

All operations on this device must be carried out by sufficiently skilled personnel.



Caution!

The power supply must always be disconnected before installation, repair and maintenance operations are carried out on this product. Failure to comply with this basic precaution will subject the operator to serious electrical shock hazards. Always unplug the power cable before such operations.
Before installing your new *PEP* product into a system always ensure that your mains power is switched off. This applies also to the installation of piggybacks.

Special Handling and Unpacking Instructions



ESD Sensitive Device!

Electronic boards and their components are sensitive to static electricity. Care must therefore be exercised at all times during handling and inspection of the board, in order to ensure product integrity.

- Do not handle this product while it is outside its protective enclosure while it is not used for operational purposes, unless it is otherwise protected.
- Whenever possible, unpack or pack this product only at EOS/ESD safe work stations. Where safe work stations are not guaranteed, it is important for the user to be electrically discharged before touching the product with his/her hands or tools. This is most easily done by touching a metal part of your system housing.
- It is particularly important to observe standard anti-static precautions when changing piggybacks, ROM devices, jumper settings etc. If the product contains batteries for RTC or memory backup, ensure that the board is not placed on conductive surfaces, including anti-static plastics or sponges. They can cause short circuits and damage the batteries or tracks on the board.

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- In order to maintain *PEP's* product warranty, this product must not be altered or modified in any way. Changes or modifications to the device, which are not explicitly approved by *PEP Modular Computers* and described in this manual or received from *PEP* Technical Support as a special handling instruction, will void your warranty.
- This device should only be installed in or connected to systems that fulfill all necessary technical and specific environmental requirements. This applies also to the operational temperature range of the specific board version, which must not be exceeded. If batteries are present, their temperature restrictions must be taken into account.
- In performing all necessary installation and application operations, please, follow only the instructions supplied by the present manual.
- Keep all the original packaging material for future storage or warranty shipments. If it is necessary to store or ship the board please re-pack it as nearly as possible in the manner in which it was delivered.
- Special care is necessary when handling or unpacking the product. Please consult the special handling and unpacking instructions on the previous page of this manual.

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Chapter 1

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1. Introduction

The VMP1 is a comprehensive computing platform which brings togethor the latest advances in computing technology in a board designed for maximum performance, flexibility and versatility within a rugged compact format.

The design centered on realizing a board which addresses the need for increased computing capacity while at the same time reducing the size and number of system components in order to reduce space requirements and optimize power dissipation.

The VMP1 is based on the MPC8240, a highly integrated microprocessor containing a PowerPC MPC603e core. This is the 250 MHz version with a Floating Point Unit (FPU). One of the prime advantages of utilizing the established and proven MPC603e core is the associated broad infrastructure of support that has built up around it . All of the noteworthy third-party software tool vendors provide tools for the MPC8240.

An important feature of the board is the integration of a PCI bus within a VME-CPU board. This connects the MPC8240 with the Fast Ethernet controller and the Tundra Universe II PCI/VME bridge and also to the onboard 100-pin PCI expansion connector, enabling the connection of the full range of PCI peripherals.

The VMP1 employs an OS-independent boot loader that enables the loading of any operating system. This boot loader makes an update of the Flash contents and automatically downloads from Flash to SDRAM before booting the OS. For performance reasons the OS is started from the SDRAM.

The power of the board is greatly enhanced by means of the PCI expansion connector which makes it possible to cascade one or two additional IO1 modules onto the board resulting in a total package of either 8HP or 12HP. Both IO1 modules may be used to carry PMC modules. Given the wide range of PMC modules now available, this feature affords the user a very wide range of options. Additionally, one can substitute a module designed to provide an even greater range of PCI peripherals in place of either of the IO1 modules. These features enable, for example, the connection of the widest range of system I/O components such as various field busses, Fast Ethernet and Ultra 2 SCSI, to name just a few. The complete range of expansion possibilities is thus made available to the user by the VMP1.

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1.1 Board Introduction

The VMP1 is a VME PowerPC-based single-board computer specifically designed for use in highly integrated platforms with solid mechanical interfacing for a wide range of industrial environment applications.

Some of the VMP1's outstanding features are:

- PowerPC MPC8240 Kahlua (603E core with an integrated FPU, combined with PCI interface and memory controller)
- 16 kB data cache
- 16 kB instruction cache
- up to 128 MB SDRAM (100MHz) with optional ECC support
- up to 8 MB onboard Flash
- Fast Ethernet interface
- two serial I/O's (RS232 / ESD protected and EMI compliant)
- Memory Expansion Socket e.g. Flash memory (up to 144 MB) or SRAM
- onboard PCI bus with expansion connector
- four counter/timers
- programmable watchdog timer
- real-time clock
- double-width version for PCI expansion
- Tundra Universe II VME-to-PCI Bridge
- compliance with VITA VME-Specification ANSI / IEEE STD1014-1987 / IEC 821 and 297

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1.2 Board Overview

The VMP1 is a 3U VME CPU board featuring a powerful CPU (number cruncher). The design is based on the new highly integrated Motorola PowerPC processor MPC8240, which integrates a PCI interface and several peripherals inside one Chip.

Two standard memory configurations (32 MB or 64 MB SDRAM) are available, with 128 MB available on request. Flash memory for integrating the initial bootloader and ROMable operating systems are provided . Additionally, NV SRAM or a Disk-On-Chip (by M-Systems) can be placed on a DIL socket for special purposes.

The board controls the VMEbus through the Tundra UNIVERSE II PCI-VME bridge which is an industrial standard for connecting the PCI bus to the VME. Improved VME-bus master and VMEbus slave performance with an increase of FIFO depth and optimized DMA transfer are some of the outstanding features of this device.

The VMP1 is also able to communicate with the environment through a Fast Ethernet interface and two serial interfaces at the front side of the board. One of the serial interfaces is a RS232 full modem interface while the other is a software-configurable RS232/RS485 port. These UARTS support baud rates up to 1.5 Mbps and are software compatible with the 16550 UART from National Semiconductor. They contain 128 Byte Transmit FIFO and 128 Byte Receive FIFO for reducing the bandwidth requirement of the CPU.

The Ethernet is realized with the Intel 82559 with full duplex support at both 10/100 Mbps possible. This Fast Ethernet controller with an integrated 10/100 Mbps physical layer device is the foremost solution for PCI board LAN designs. It combines low power consumption with a small package design which is ideal for power and space constrained environments.

Anticipating the VMP1's use in data critical applications, the memory data path contains a selectable in-line ECC controller which can provide SDRAM single-bit error correct or double-bit error detect.

For mass data transmission a dual channel DMA controller is provided. It can be programmed directly or through the use of descriptor chains located in memory. Data can thus be moved from PCI to memory or vice versa, memory to memory, or PCI to PCI.

The MPC8240 supports processor control and visibility through the JTAG/COP (common on-chip processor) interface that is available on the VMP1. Utilizing third party tools, the developer can access and control the processor. It also has standard IEEE 1149.1a-1993 compliant boundary scan capability. The ECC data path has a mechanism to manually inject errors into memory for use with maintenance and diagnostic utilities. Furthermore a watch point and capture register on the internal bus and a set of address attributes on the external memory and PCI buses facilitate debugging analysis.

VME interface

In addition to the standard functionality required by a VME CPU, the VMEbus interface (Tundra Universe 2) provides:

- automatic First-Slot detection
- integral FIFO buffers for multiple transactions in both directions
- programmable DMA controller with linked list support.
- Mailbox

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1.3 VMP1 Main Specifications

Table 1-1: VMP1 Main Specifications

VMP1	Specifications
Operating System Support	Initial boot loader with capability to load VxWorks and other Real-time operating systems
VME Interface	ANSI/VITA 1-1994 for VME, approved April 10, 1995 Support for A24: D16/D8 master and A24: D16/D8 slave interface
Processor	Motorola MPC8240 with integrated PCI interface 250MHz
Boot Device	8 MB Flash for bootloader and ROMable OS / Socket
Main Memory	32 MB or 64 MB of onboard SDRAM with ECC support available as standard (128 MB available on request)
Cache Structure	16K, 32 byte line, 4-way set associative instruction cache 16K, 32 byte line, 4-way set associative data cache
Flash	8 MB on-board Flash (soldered)
DIL600 Socket	Socket for Flash extension by another 512 kB or addition of Flash disk (M-System) with up to 144 MB
PCI Expansion Connector	1 x Samtec SMT Board-to-Board connector 100-pin order number: FLE - 15 - 01 - G - DV
Ethernet	10Base-T / 100Base-TX
SRAM	256 or 512 kB NV SRAM on the DIL600 socket
Serial Port	16550 compatible Dual UART; 2 x RS-232 or 1 x RS232 + 1 x RS485
Watchdog	Watchdog generates Exception Condition / Reset or NMI (software configurable)
RTC	backed up with GoldCap / Data retention for about 5 days / backup battery possible
EEPROM	1 x 24LC16 for special purposes (8x256Byte)
LED's	6 LED's: red = general purpose yellow = watchdog active green = general purpose green = Ethernet Link Integrity, green = Ethernet Activity green = Ethernet Speed
Switches	Two push-buttons (Reset and Abort)

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Table 1-1: VMP1 Main Specifications

VMP1	Specifications
Debug Interface	JTAG/BDM
VME Connector	96-pin VME connector
Onboard Connectors	2 x RJ45 for RS232, 1 x RJ45 for Ethernet
PCI Expansion Modules	PMC carrier, future PCI based I/O board with VGA/SCSI/2nd Ethernet
Mechanical Conformance	Conforms with IEEE 1101.10
Power Supply	5V in accordance with the VME Specification, 1.79 Amp current
Temperature Range	–40°C to +85°C (operating) –55°C to +125°C (storage)
Humidity	0% to 95% non-condensing
Dimensions	100mm x 160mm single-height Eurocard
Board Weight	182 grams

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1.4 Applied Standards

1.4.1 CE Compliance

The *PEP Modular Computers'* VME systems comply with the requirements of the following CE-relevant standards:

- Emission EN50081-1
- Immission EN50082-2
- Electrical Safety EN60950

1.4.2 Mechanical Compliance

- Mechanical Dimensions IEEE 1101.10

1.4.3 Environmental Tests

- Vibration IEC68-2-6
  Random Vibration, Broadband IEC68-2-64 (3U boards)
- Permanent Shock IEC68-2-29
- Single Shock IEC68-2-27

1.5 Related Publications

1.5.1 VME Systems/Boards

VME Specification, ANSI/VITA 1-1994 for VME, approved April 10, 1995

1.5.2 PMC Add-on Modules/Carriers

- Draft Standard for a Common Mezzanine Card Family, P1386/Draft 2.0
- Draft Standard Physical and Environment Layers for PCI Mezzanine Cards, P1386.1/Draft 2.0

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Chapter 2

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Functional Description

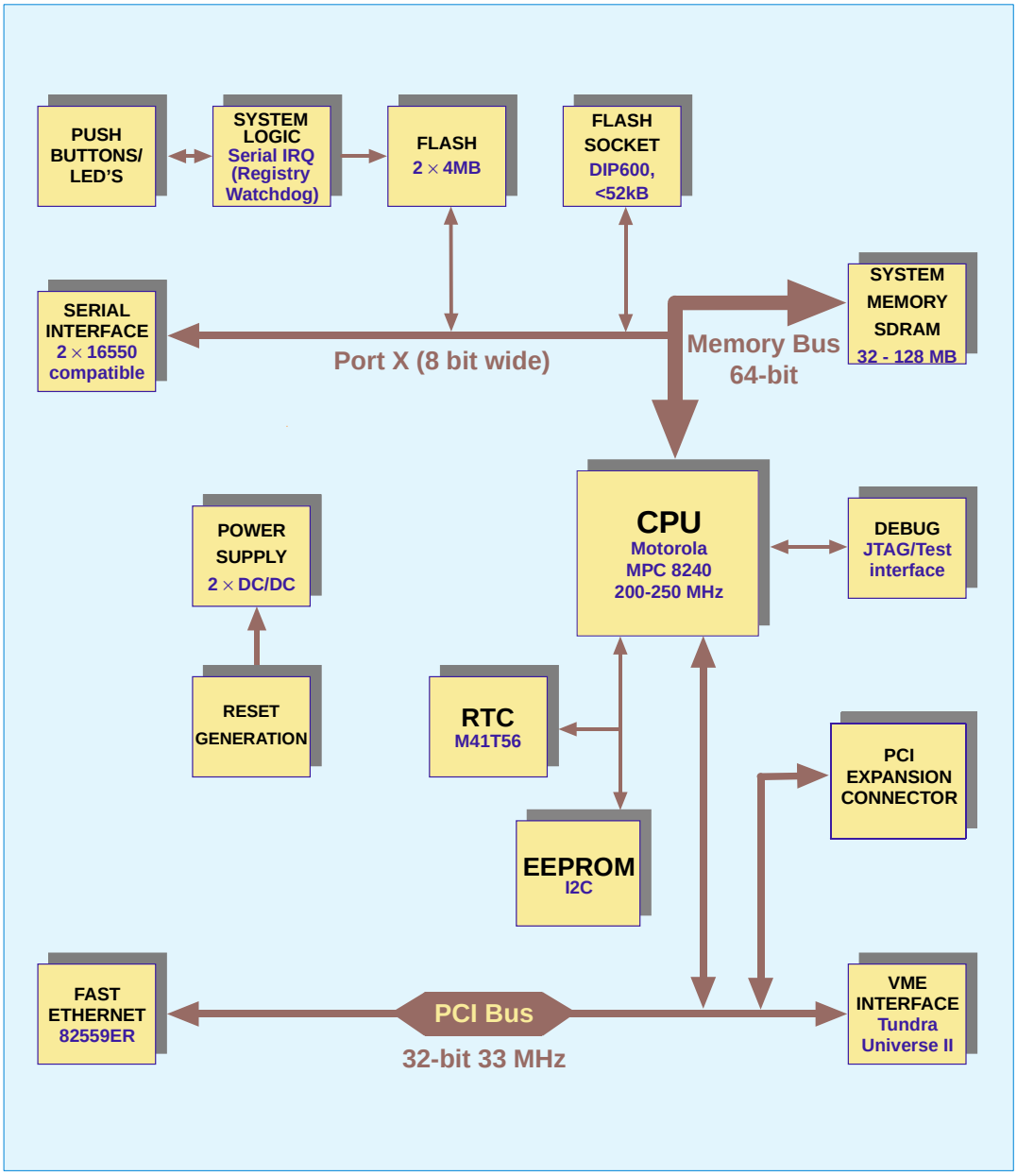
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2. Functional Description

2.1 Functional Block Diagram

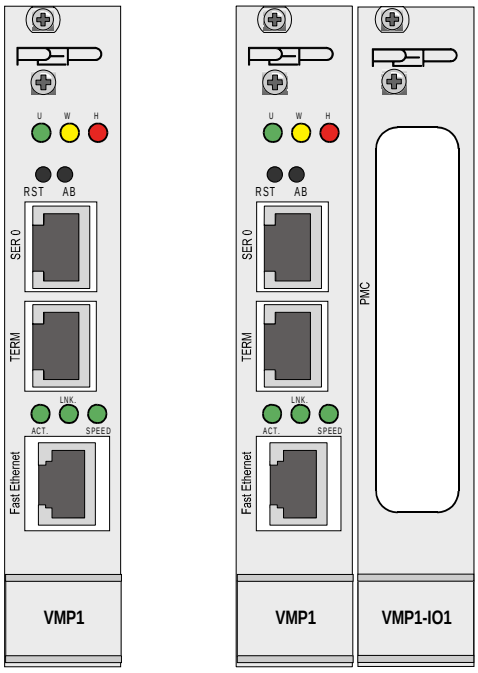
Figure 2-1: Functional Block Diagram



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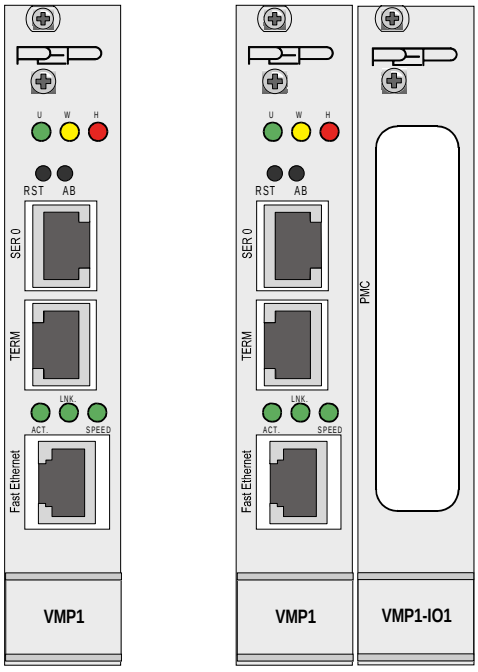
2.2 Front Panels

Figure 2-2: Front Panels



Standard VMP1 and Standard with IO1 Module

KEY
LED colors (for B&W monitors and printouts):
U = green
W = yellow
H = red



VMP1 Optoisolated version and Optoisolated version with IO1 Module - note the different position of the SER 0 connector

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2.3 Board Layout

Figure 2-3: VMP1 Board (Front View)

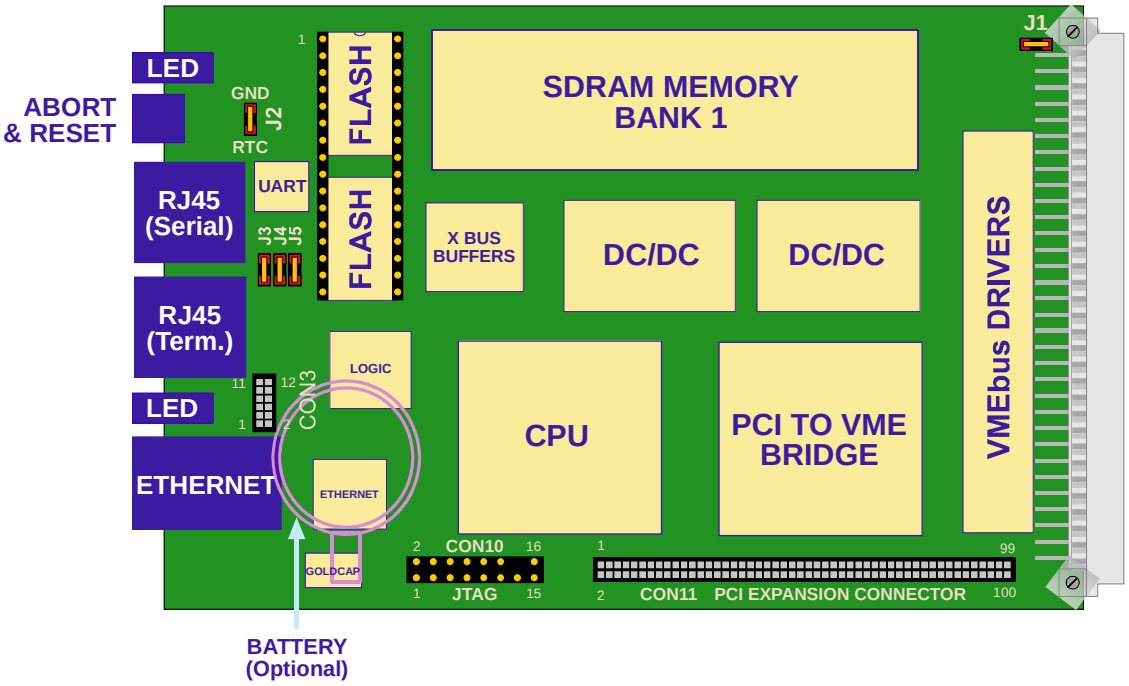
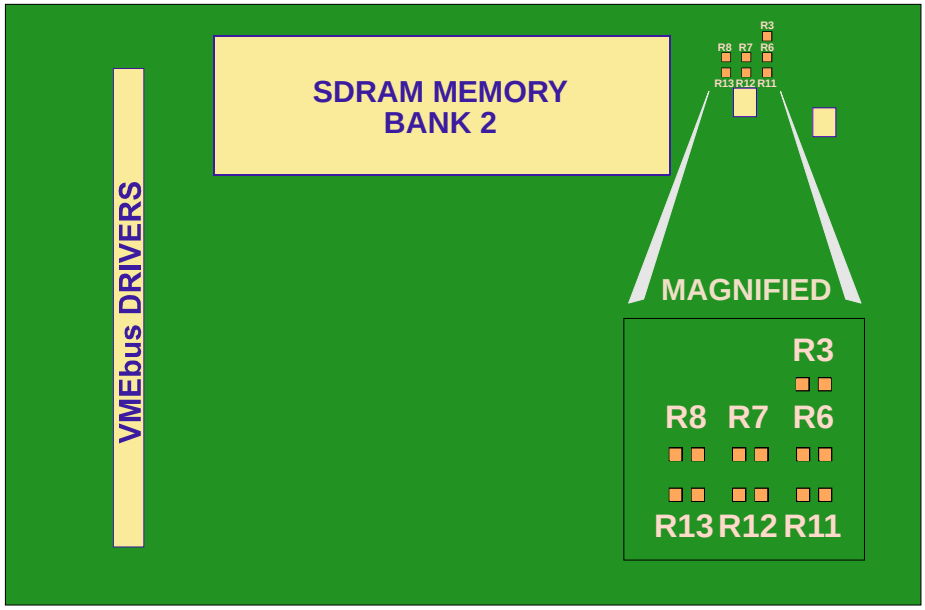


Figure 2-4: VMP1 Board (Reverse View)



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2.4 Main Features

The following descriptions provide an overview of the main features of the principal functional blocks of the VMP1.

2.4.1 CPU

The VMP1 is based on the Motorola PowerPC processor MPC8240 which integrates a large number of peripherals, such as a PCI interface, PCI arbiter, Interrupt Controller, Memory Controller and multiple Timers. CPU speed is 250 MHz.

2.4.1.1 MPC8240 (Kahlua) Features

Important features of the MPC8240 implemented on the VMP1 are as follows:

Peripheral logic

Memory interface

- Programmable timing supporting either FPM DRAM, EDO DRAM or SDRAM (The VMP1 uses SDRAM at 100 MHz)
- High bandwidth bus (64-bit data bus) to SDRAM
- 2 memory banks with up to 64 MB each (64 or 128 Mbit memory devices)
- Supports 32, 64, 96 and 128 MB SDRAM
- Contiguous memory mapping
- 8-bit ROM interface
- Write buffering for PCI and processor accesses
- Supports ECC
- SDRAM data path buffer
- Low voltage transistor-to-transistor logic (LVTTL)
- Port X: 8-bit general-purpose I/O port using ROM controller interface with address strobe

32-bit PCI interface operating up to 33 MHz on the VMP1

- PCI Specification Revision 2.1 compatible
- PCI 5.0-V tolerance
- Support for PCI-locked accesses to memory
- Support for accesses to all PCI address spaces
- Selectable big- or little-endian operation
- Store gathering of processor-to-PCI write and PCI-to-memory write accesses
- Memory prefetching of PCI read accesses
- Selectable hardware-enforced coherency
- PCI bus arbitration unit (five request/grant pairs)

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PCI agent mode capability

- Address translation unit
- Internal configuration registers accessible from PCI
- Two-channel integrated DMA controller
- Supports direct mode or chaining mode (automatic linking of DMA transfers)
- Supports scatter gathering - read or write discontinuous memory
- Interrupt on completed segment, chain, and error
- Local-to-local memory
- PCI-to-PCI memory
- PCI-to-local memory
- Local-to-PCI memory

Message unit

- I2O message controller
- Two door-bell registers
- In-bound and out-bound messaging registers

I2C controller with full master/slave support

Embedded programmable interrupt controller (EPIC)

- Five hardware interrupts (IRQs) or 16 serial interrupts
- Four programmable timers

Integrated PCI bus and SDRAM clock generation

Programmable memory and PCI bus output drivers

Debug features

- Watchpoint monitor
- Address attribute and PCI attribute signals
- JTAG/COP - common onboard processor for in-circuit hardware debugging
- Performance monitor

603e core

High performance, superscalar 603e core

SPECint95 = 6.2 / SPECfp95 = 5.2 / 352Dhrystone (2.1) MIPS

Integer unit (IU), floating point unit (FPU) (user enabled or disabled), load/store unit (LSU), system register unit (SRU), and a branch processing unit (BPU)

16 kB instruction cache

16 kB data cache

Lockable L1 cache - entire cache or on a per-way basis

Dynamic power management

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2.4.2 Memory

2.4.2.1 System Memory (DRAM)

The main memory of the VMP1 consists of 32 MB or 64 MB SDRAM (128 MB available on request) soldered onto the board for mechanical stability.

The VMP1 provides ECC support (optional) and a maximum memory speed of 100MHz.

2.4.2.2 Flash

4 or 8 MB of soldered Flash memory accommodate the bootstrap loader software and can be used to store ROMable operating systems or user data. This Flash memory is 8-bit wide and windowed with window sizes of 512 kB.

2.4.2.3 EEPROM

A serial EEPROM is provided, organised into 8 blocks with 256 bytes per block (24LC16). This EEPROM is connected to the I2C bus provided by the MPC8240.

2.4.2.4 Memory Expansion Socket (DIL600)

The VMP1 provides one 32-pin DIL socket on which to place SRAM, non-volatile SRAM or other DIL600 devices on the board. Access to this Memory is controlled by the onboard logic.

The following devices may be added to the VMP1 via the 32-pin DIL600 socket:

- Standard Flash memory of up to 512 kB, for example, the AMD29F010 and AMD29F040
- The NV SRAM from Dallas Semiconductor. These devices are available in the temperature range –40°C to +85°C for the industrial environment and guarantee a minimum data retention of 10 years (e.g. DS1250Y-100).
- Disk-on-chip Flash memory. In order to achieve flexibility with low cost, the VMP1 Flash disk is not soldered but connected via a special module from M-Systems (Disk-on-Chip 2000) which comes in the following sizes:

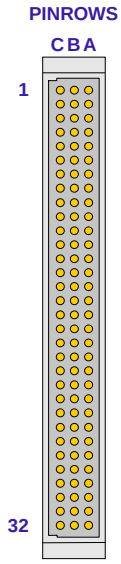
  2 - 24 MB (dimensions 41.7 x 17.9 x 5.6mm);

  4 - 144 MB (dimensions 42.0 x 18.3 x 11.8mm).

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2.4.3 Board Interfaces

2.4.3.1 VME Interface and Pinout



The VME interface is based on the TUNDRA UNIVERSE II Bridge, which includes the following features required for 3U VME systems:

- A24/A16 addressing modes capability
- D16/D8 data transfer capability
- Automatic First-Slot-Detection
- Single level BR3 arbitration release-when-done option
- FAIR VMEbus arbitration option
- ACFAIL NMI option
- SYSFAIL IRQ option
- System controller functions (SYSCLK, Bus monitor, Power monitor)
- Compatibility with PEP 3U VME system addressing schemes
- Compatibility with PEP VME backplane design and feature set
- Compatibility with PEP backplane transceiver logic

A table showing the pinout of the VME bus connector appears on the following page.

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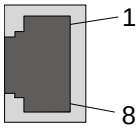
VME Bus Connector Pinout

Table 2-1: Pin Assignment J1/P1 VME

Pin Number	Pinrow A	Pinrow B	Pinrow C
1	D00	BBSY	D08
2	D01	BCLR	D09
3	D02	ACFAIL	D10
4	D03	BG0IN	D11
5	D04	BG0OUT	D12
6	D05	BG1IN	D13
7	D06	BG1OUT	D14
8	D07	BG2IN	D15
9	GND	BG2OUT	GND
10	SYSCLK	BG3IN	SYSFAIL
11	GND	BG3OUT	BERR
12	DS1	BR0	SYSRESET
13	DS0	BR1	LWORD
14	WRITE	BR2	AM5
15	GND	BR3	A23
16	DTACK	AM0	A22
17	GND	AM1	A21
18	AS	AM2	A20
19	GND	AM3	A19
20	IACK	GND	A18
21	IACKIN	SERA	A17
22	IACKOUT	SERB	A16
23	AM4	GND	A15
24	A07	IRQ7	A14
25	A06	IRQ6	A13
26	A05	IRQ5	A12
27	A04	IRQ4	A11
28	A03	IRQ3	A10
29	A02	IRQ2	A09
30	A01	IRQ1	A08
31	-12V	+5VSTDBY	+12V
32	+5V	+5V	+5V

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2.4.3.2 Ethernet Connector and Pinout



The Ethernet interface is based on a PCI device from Intel; the Ethernet Controller 82559ERS.

The main features of the Ethernet are as follows:

- integrated IEEE 802.3 10Base T and 100Base TX compatible PHY
- glueless 32-bit PCI master interface
- compatible with driver software of the 82558 and 82557
- full duplex support at both 10 and 100 Mbps
- IEEE 802.3u Auto-Negotiation support
- 4 kB transmit and 3 kB receive FIFO's

Ethernet Connector Pinout

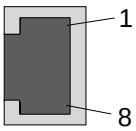
The connector used for the 100BaseTX Ethernet interface is an RJ45 connector. The signals on this connector are as follows

Table 2-2: Ethernet RJ45 Pin Assignment

Pin Number	Signal
1	TX+
2	TX-
3	RX+
4	nc
5	nc
6	RX-
7	nc
8	nc

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2.4.3.3 Serial Interfaces and Pinouts



Two serial ports (RS232) are provided by means of two 8-pin RJ45 connectors.

The RS232 serial interfaces named TERM and SER are 16C550 compliant and have 128-byte transmit and receive buffers. In addition to their other uses, the TERM port is used to interface with the bootstrap loader and the SER port is used to download software.

Electrically, the two serial ports are identical and they provide a complete set of handshaking and modem control signals, maskable interrupt generation and data transfer of up to 115.2 KBaud.

The upper serial interface (SER) can also be configured to act as an RS485 interface. The configuration of the interface is achieved by setting the RS_CTL bit in the Control Register. Please refer to Table 4-14 in chapter 4.

Additionally, a module is available from *PEP* which provides an optoisolated half/full duplex RS485 interface. For this reason the onboard SER connector on the VMP1 baseboard is not equipped. Please contact *PEP* Support department for more information.

Pinouts of Serial Ports (RJ45 Connectors)

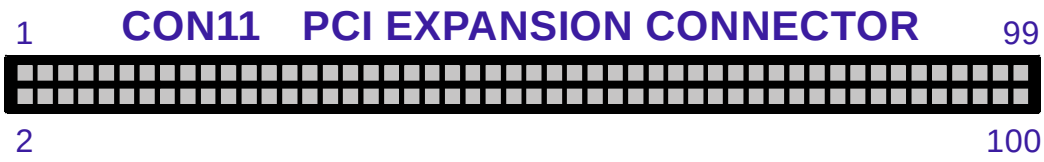
Table 2-3: Serial Port Pin Assignment

Pin Number	Signal	RS485	
		Signal Half-duplex	Signal Full-duplex
1	DSR	NC	-RxD
2	RTS	NC	NC
3	GND	GND	GND
4	TXD	+TRXD	-TxD
5	RXD	NC	NC
6	DCD	NC	+RxD
7	CTS	-TRXD	+TxD
8	DTR	NC	NC

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2.4.3.4 PCI Expansion Connector and Pinout

Figure 2-5: PCI Expansion Connector



The PCI Expansion Connector provides the possibility to mount several transition boards above the VMP1 for adding special functionality which is not provided on the VMP1 main board or on the VME bus. All the PCI signals of the onboard PCI bus will be routed to this connector, so that a complete PCI bus is provided on this connector. In addition, almost the same number of ground and power pins (3.3V and 5V) as are on a CPCI P1 or PMC connector are provided. Examples of transition boards are:

- PMC carrier
- PC-MIP carrier
- IO board with Graphic interface, second Ethernet interface, SCSI etc.

A table showing the pinout of the PCI Expansion Connector appears on the following page.

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PCI Expansion Connector (CON11) Pinout

Table 2-4: PCI Expansion Connector Pinout

Signal	Pin Number	Pin Number	Signal
GND 1)	1	2	SCL (I2C)
RST#	3	4	+3.3V 2)
+3.3V 2)	5	6	CLK2
CLK3	7	8	GND 1)
GND 1)	9	10	CLK4
INTB#	11	12	INTA#
INTD#	13	14	INTC#
+5V 3)	15	16	GNT#2
GNT#3	17	18	+5V 3)
+3.3V 2)	19	20	GNT#4
GND 1)	21	22	REQ#2
REQ#3	23	24	GND 1)
+5V 3)	25	26	REQ#4
AD31	27	28	AD30
AD29	29	30	+5V 3)
GND 1)	31	32	AD28
AD27	33	34	AD26
AD25	35	36	GND 1)
+3.3V 2)	37	38	AD24
C/BE3#	39	40	SDA (I2C)
AD23	41	42	+3.3V 2)
GND 1)	43	44	AD22
AD21	45	46	AD20
AD19	47	48	GND 1)
+5V 3)	49	50	AD18
AD17	51	52	AD16
C/BE2#	53	54	+5V 3)
GND 1)	55	56	FRAME#
IRDY#	57	58	GND 1)
+3.3V 2)	59	60	TRDY#
DEVSEL#	61	62	GND 1)
GND 1)	63	64	STOP#
LOCK#	65	66	+3.3V 2)

Table continued on following page

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Table 2-4: PCI Expansion Connector Pinout

Signal	Pin Number	Pin Number	Signal
PERR#	67	68	+5V 3)
SERR#	69	70	GND 1)
+5V 3)	71	72	PAR
C/BE1#	73	74	AD15
AD14	75	76	+3.3V 2)
GND 1)	77	78	AD13
AD12	79	80	AD11
AD10	81	82	GND 1)
GND 1)	83	84	AD9
AD8	85	86	C/BE0#
AD7	87	88	+5V 3)
+3.3V 2)	89	90	AD6
AD5	91	92	AD4
AD3	93	94	GND 1)
GND 1)	95	96	AD2
AD1	97	98	AD0
+12V 4)	99	100	-12V 5)

Key

1) Ground

2) +3.3V

3) +5V

4) +12V

5) -12V

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2.4.3.5 Serial Interface Expansion Connector and Pinout

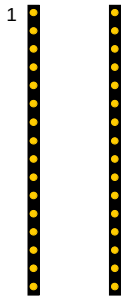
The serial interface expansion connector provides the capability to add different front end interfaces to the UART B signals. For example, an opto-isolated RS422/485 module (currently under development) may be plugged onto this connector.

Serial Interface Expansion Connector CON3 Pinout

Table 3-5: Serial Interface Expansion Connector (CON3) Pinout

Pin Number	Function	Function	Pin Number
1	GND	RTSB	2
3	RE	DE	4
5	RxD	TxD	6
7	CTS	DTR	8
9	SCL	SDA	10
11	+3.3V	VCC	12

2.4.3.6 Memory Expansion Connector



A 32-pin DIL600 socket is provided in order to make possible the addition of various memory expansion devices (with access time <120ns). The devices which have been tested and approved for this connector are as follows:-

DIL type Flash memory (up to 512 kB)

DIL SRAM (up to 512 kB) e.g. Samsung KM684000BLP-7

NVSRAM (up to 512 kB) e.g. DALLAS DS1250Y-100)

Eprom (up to 512 kB) e.g. 27C040

M-Systems DiskOnChip 2000 (up to 288 MB)

Note:

For the pinout of this connector please see Chapter 4, section 4.2.1

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2.4.3.7 DEBUG Interface and Pinout



A JTAG/BDM interface is provided on the VMP1 for software debugging. The pinout of this connector is in accordance with the pinout of the most commonly used emulator probes.

Note:

As shipped, only the Altera onboard logic may be detected by means of the JTAG interface. If the JTAG interface requires to be re-configured for software debugging, please contact Support at *PEP Modular Computers* for assistance.

Debug Connector Pinout

Table 2-6: Debug Interface Connector (CON10) Pinout

Signal	Pin Number	Pin Number	Signal
TDO	1	2	NC
TDI	3	4	TRST#
NC	5	6	3.3V
TCK	7	8	NC
TMS	9	10	NC
SRESET#	11	12	NC
HRESET#	13	14	KEY (no pin)
CHKSTP#	15	16	GND

2.4.4 Digital Temperature Sensor (LM75)

The VMP1 also provides an onboard digital temperature sensor with a thermal watch-dog functionality (National Semiconductor LM75). This has various uses including, for example, calibration of the onboard RTC over a wider temperature range.

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2.5 Special Board Features

2.5.1 Watchdog Timer

A watchdog timer is provided, which forces an NMI or Reset condition (configurable in the watchdog register). The watchdog time can be programmed in 4 steps with a resolution of 500 ms. If the watchdog timer is enabled, it cannot be stopped or reprogrammed.

Table 2-7: Watchdog Time Values

Watchdog Time Values
500 ms
1 s
1.5s
2 s

2.5.2 RTC (STC M41T56)

The Real Time Clock provides the following features:

- counters for seconds, minutes, hours, day, date, month and year.
- clock calibration by software
- low supply current for buffering with Gold Caps
- alternatively a battery may be placed on the board to buffer the RTC for a longer time
- it is also possible to buffer the power supply for the RTC via the VME-5V-Standby power line
- automatic leap year compensation
- precision: 35 ppm
- for greater precision or for temperature compensation the RTC can be adjusted in in steps of +4.068 or –2.034 ppm
- for temperature compensation, the onboard temperature sensor (LM75) may be used

2.5.3 Reset/Abort

There are also 2 push button switches with the function ABORT and RESET. The RESET button reinitializes the board via hardware.

The ABORT button initiates the NMI. In addition it is latched into a bit in the System Logic, the purpose of this is to differentiate between the NMI initiated from the ABORT Button and the NMI initiated from the watchdog. The positions of the Abort and Reset buttons on the Front Panel may be viewed in Figure 2-2.

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2.5.4 Front Panel LED's

Three LED's with the colors red, green and yellow are provided on the front panel (please see Figure 2-2 on page 2-4) to give a quick indication of several key operating conditions:

- The red LED (H) is general purpose.
- The yellow LED (W) indicates WATCHDOG ACTIVE
- The green LED (U) has been preset to light on initialisation of the board. Afterwards it is available for general purposes

The general purpose LED's are programmable via a register in the System Logic.

3 additional LED's, all green, are provided to indicate Ethernet working conditions:

- Ethernet Link Integrity
- Ethernet Activity
- Ethernet Speed

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Chapter 3

Installation

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3.1.1 Front Panel I/O Connectors ..... 3 - 4

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3. Installation

The VMP1 has been designed for easy installation. However, the following important-standard precautions must be observed. Some other important information is also set out below.

3.1 Board Installation

Slot Selection

The VMP1 is designed so that it may be used in any free slot of a 3U VME Backplane. It has an automatic first slot detection mechanism which configures it as a System Controller when placed in the far left slot.

When configured as the System Controller, it enables its system clock and arbiter in order to control the entire VME bus.

Default setting of the serial Interfaces: 9600 Baud, 8N1

On initial startup a message of greeting comes up.

When the VMP1 is invoked for the first time, a Bootstrap loader startup message comes up on the “term” serial port, which will provide you with some configuration information on the system and a command prompt for entering bootstrap loader commands. For a detailed description of these commands please see chapter 5 Bootstrap loader.



Caution!

Please switch off the VME system before installing the board in a free slot. Failure to do so could endanger your life/health and may damage your board or system.



Note:

Certain VME boards require bus master capability. If you are in doubt whether such features are required for the board you intend to install, please check your specific board and/or system documentation to make sure your system is provided with an appropriate free slot to insert the board.



ESD Equipment!

Your VMP1 board contains electrostatically sensitive devices. Please observe the necessary precautions to avoid damage to your board:

- Discharge your clothing before touching the assembly. Tools must be discharged before use.
- Do not touch components, connector-pins or traces.
- If working at an anti-static workbench with professional discharging equipment, please do not omit to use it.



PEP Advantage

The VMP1 is designed to be bootstrapped from the Flash device alone.

3.1.1 Front Panel I/O Connectors



Attention!

Due care should be exercised when connecting cabling in order to avoid damage to your connected device and/or the VMP1 board.

For pinouts of the Front Panel connectors, please see Chapter 2: Functional Description, sections 2.4.3.2 and 2.4.3.3

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Chapter 4

Configuration

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4. Configuration

4.1 Jumper Settings

Please see Figures 2-3 and 2-4 in Chapter 2 to view the positions of the jumpers and resistors on the board.

4.1.1 Bootstrap Loader / Socket Jumper J1

The Jumper J1 is used to select the memory position from which the VMP1 fetches its boot code. It determines the address position of the onboard Flash window and the Flash/SRAM expansion socket (DIL600, 32-pin).

Table 4-1: Bootstrap Loader / Socket Jumper J1 Settings

J1	Meaning	Address Assignment
Open	VMP1 fetches boot code from onboard Flash	Socket: 0xFFF8 0000 - 0xFFFF FFFF Onboard Flash window: 0xFFF0 0000 - 0xFFF7 FFFF
Closed	VMP1 fetches boot code from socket	Socket: 0xFFF0 0000 - 0xFFF7 FFFF Onboard Flash window: 0xFFF8 0000 - 0xFFFF FFFF

Note: The MPC8240 initially fetches its boot code from address 0xFFF0 0100!

4.1.2 RTC (Real-time clock) Calibration Output J2

Frequency test output is used for calibration of the onboard RTC. The RTC provides a 512 Hz frequency test signal for calibration purposes. Please refer to the datasheet of the ST M41T56 for detailed information (for position of J2 on the board please see figure 2-3).

Warning!

J2 must not be bridged.

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4.1.3 Resistor Setting for Non-standard Socket Devices

The default pinout of this socket is designed for use with standard DIL Flashes and M-Systems DiskOnChip. As some devices have a different pinout, resistors must be set accordingly (please see figure 2-4 for an illustration of these resistors on the board)

Table 4-2: Resistor Setting for Various Non-standard Socket Devices

Used Socket Devices	R3	R6	R7	R8	R11	R12	R13
Flash (default)	Open	Open	Open	Set	Set	Open	Set
DiskOnChip (default)	Open	Open	Open	Set	Set	Open	Set
NVSRAM	Open	Open	Set	Open	Set	Set	Open
4 Mbit EPROM	Set	Set	Open	Open	Open	Open	Set

Note: All resistors are 0 ohms

4.1.4 RS485 Termination (Onboard Interface Only)

When the VMP1 is using the onboard RS485 interface and is the last on the RS485 bus, then the RS485 interface must provide termination resistance. The purpose of J3 is to enable this line termination resistor (130 R).

Table 4-3: Jumper Settings for RS485 Termination

Termination	J3
ON	Set
OFF	Open

Additionally, the correct idle line potential must be provided at one location within the RS485 bus. J4 and J5 are used for this purpose. Pullup/Pulldown resistors are 380 Ohm each.



Note:

Ensure that the reference potential for the RS485 signals are set in one location only on the bus.

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4.2 Pinouts

4.2.1 Flash Socket Type Selection

4.2.1.1 Socket Device Selection (Memory Expansion Socket IC8)

A range of different memory devices may be used on the DIL32 socket (e.g. Flashes, NVSRAM, M-Systems Disk-On-Chip, EPROM etc.).

Table 4-4: DIL 32 Pinout for Various Devices

Pin	4Mbit Flash	Disk OnChip	NV SRAM	4Mbit Eprom		4Mbit Eprom	NV SRAM	Disk OnChip	4Mbit Flash	Pin
1	A18	NC	A18	VPP		VCC	VCC	VCC	VCC	32
2	A16	NC	A16	A16		A18	A15	WE_	WE	31
3	A15	NC	A14	A15		A17	A17	NC	A17	30
4	A12	A12	A12	A12		A14	WE	NC	A14	29
5	A7	A7	A7	A7		A13	A13	NC	A13	28
6	A6	A6	A6	A6		A8	A8	A8	A8	27
7	A5	A5	A5	A5		A9	A9	A9	A9	26
8	A4	A4	A4	A4		A11	A11	A11	A11	25
9	A3	A3	A3	A3		OE_	OE_	OE_	OE_	24
10	A2	A2	A2	A2		A10	A10	A10	A10	23
11	A1	A1	A1	A1		CE_	CE_	CE_	CE_	22
12	A0	A0	A0	A0		D7	D7	D7	D7	21
13	D0	D0	D0	D0		D6	D6	D6	D6	20
14	D1	D1	D1	D1		D5	D5	D5	D5	19
15	D2	D2	D2	D2		D4	D4	D4	D4	18
16	GND	GND	GND	GND		D3	D3	D3	D3	17

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4.2.2 Serial Interface Expansion Connector (CON3)

Table 4-5: RS Expansion Connector Pinout

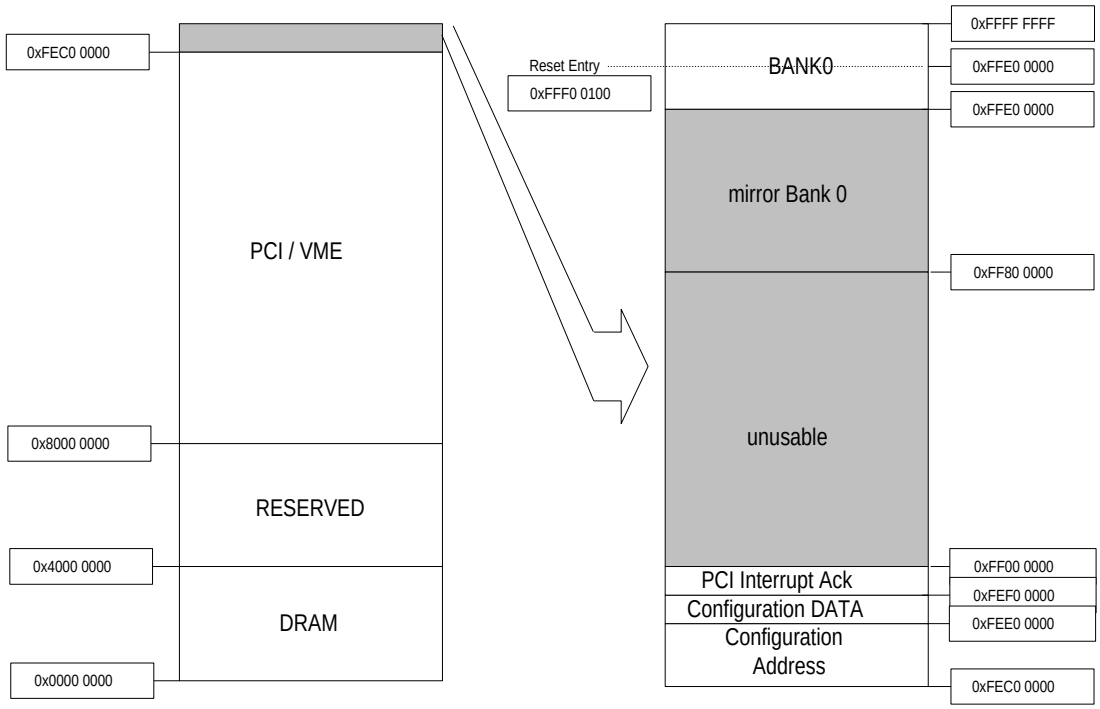
Pin Number	Function	Function	Pin Number
1	GND	RTSB	2
3	RE	DE	4
5	RxD	TxD	6
7	CTS	DTR	8
9	SCL	SDA	10
11	+3.3V	VCC	12

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4.3 Board Address Map

4.3.1 Address Map Overview

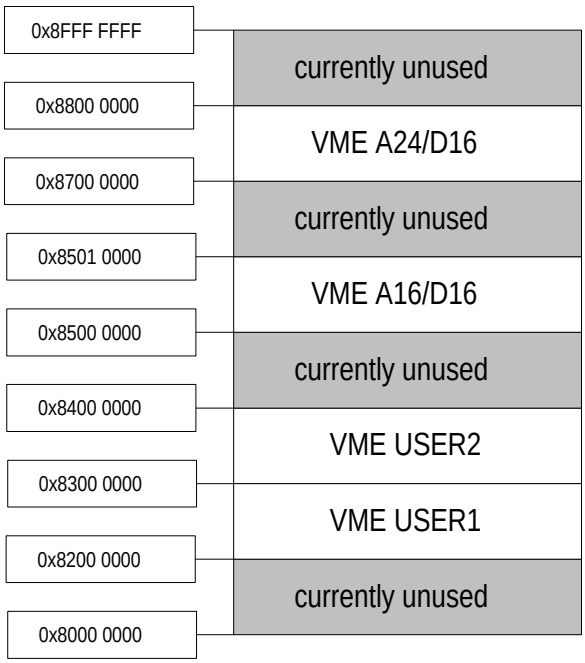
Figure 4-1: VMP1 Address Map, 2 MB 8-bit Bank



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4.3.2 VME Address Area

Figure 4-2: VME Address Area

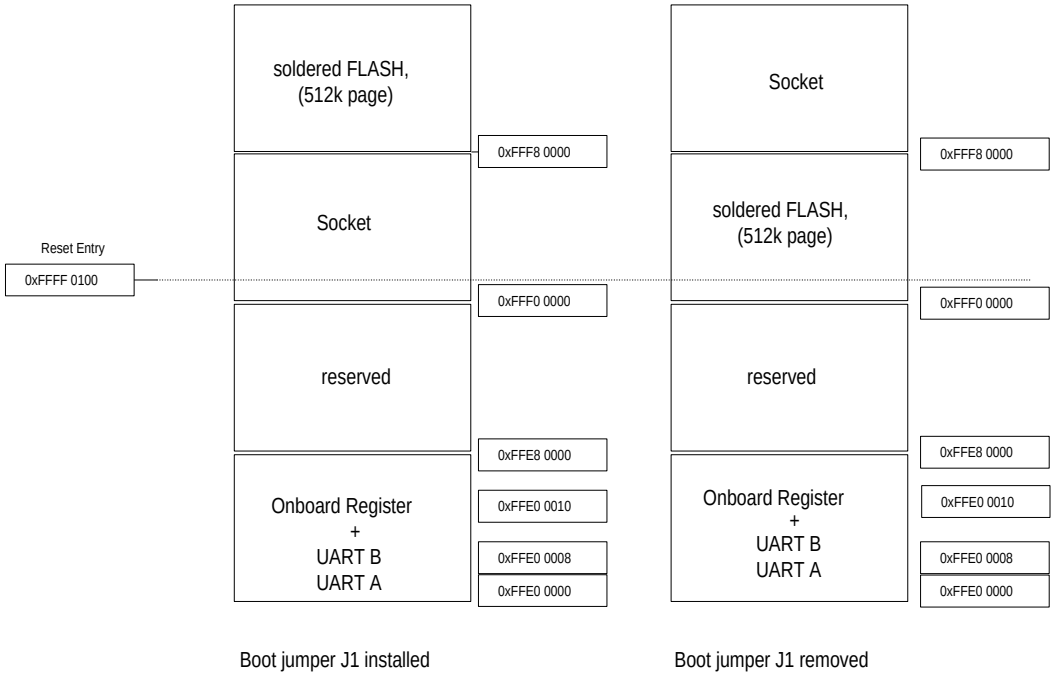


VME bus slave address and VME IRQ mask are programmable inside the TUNDRA UNIVERSE II. Please refer to the VME slave manual chapter in the TUNDRA UNIVERSE II manual and the BSP documentation.

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4.3.3 Onboard Device Addresses

Figure 4-3: VMP1 Device Address Map



Note:

- For write access to this address area (0xFFE0 0000-0xFFFF FFFF), it is only possible to use byte-wide write commands.
- When the memory expansion socket is used for NVSRAM, byte 0xFFF0 0000 (J1 installed) or byte 0xFFF8 0000 (J1 removed) is reserved for the output of post codes to the VMP1-Post. Data should not be stored at either of these locations.

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4.3.4 Special Registers Overview

The Special Registers may be attached through read and write operation to the address space FFe8 0000-FFF0 0000

4.3.4.1 Board Control Registers

Table 4-6: Board Control Registers

Register	Address	Read/Write
Board-ID	FFe0 0010	R
Software Compatibility ID	FFe0 0012	R
Memory Configuration	FFe0 0014	R
Flash Bank Select	FFe0 0016	R/W
Watchdog Control Register	FFe0 0018	R/W
Control Register	FFe0 001a	R/W
Event Register	FFe0 001c	R/W
Board/Logic Revision	FFe0 001e	R

4.3.4.2 Board ID Register

Table 4-7: Board ID Register

Register	Address	MSB	6	5	4	3	2	1	LSB
Board ID	FFe0 0010	BID7	BID6	BID5	BID4	BID3	BID2	BID1	BID0

The Board ID can be used to identify the VMP1 in a VME system. The value for the VMP1 is 00h.

- **This register is READ ONLY**

4.3.4.3 Software Compatibility ID

Table 4-8: Software Compatibility ID

Register	Address	MSB	6	5	4	3	2	1	LSB
Software Compatibility ID	FFe0 0012	SC7	SC6	SC5	SC4	SC3	SC2	SC1	SC0

The Software Compatibility ID will signal to the software when differences in hardware require different handling by the software. This register is READ ONLY. It starts with the value 0x00 and will be incremented with each change in hardware (software sensitive only).

4.3.4.4 Memory Configuration Register

Table 4-9: Memory Configuration Register

Register	Address	MSB	6	5	4	3	2	1	LSB
Memory Configuration	FFe0 0014	BJ	Res.	Res.	ECC	Res.	Res.	SZ1	SZ0

- Bits SZ0 and SZ1 are used to identify the soldered SDRAM size.
- Bit 2 and Bit 3 are reserved
- Bit 4 (ECC) is used to indicate that ECC is supported (1 = ECC enabled)
- Bit MSB (BJ) indicates the status of the BOOT JUMPER (jumper J1 for exchanging Socket and Flash Chip Select). 0 = boot jumper set, 1 = boot jumper removed

4.3.4.5 SDRAM Size

Table 4-10: SDRAM Size

SZ1	SZ0	Meaning
0	0	32 MB/1 Bank
0	1	64 MB/2 Banks
1	0	Reserved
1	1	Reserved

4.3.4.6 Flash Bank Select Register

Table 4-11: Flash Bank Select Register

Register	Address	MSB	6	5	4	3	2	1	LSB
Flash bank select	FFe0 0016	Res.	Res.	Res.	Res.	FB3	FB2	FB1	FB0

The Flash bank select register is used to select the appropriate Flash bank. As 8-bit wide Flash memory may only be accessed through a 512 kB window; this is the only way to address a larger size Flash memory. Using bits FB0..FB3, 16 Flash banks can be selected (16x512 kB = 8 MB). The default value on startup of the VMP1 is 0x00.

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4.3.4.7 Watchdog Control Register

Table 4-12: Watchdog Control Register

Register	Address	MSB	6	5	4	3	2	1	LSB
Watchdog control	FFe0 0018	WD_EN	WD_R	Res.	WD_TRG	Res.	Res.	WDT1	WDT0

4.3.4.8 Watchdog Timeout Time

Bits WDT0 and WDT1 are programmed to select the Watchdog timeout value.

Table 4-13: Watchdog Timeout Time

WDT1	WDT0	Time
0	0	0,5s
0	1	1s
1	0	1,5s
1	1	2s

- Bits 2 and 3 are reserved
- Bit WD_TRG retriggers the watchdog timer. A “1” written to this bit sets the watchdog back to its start condition.
- Bit 5 is reserved
- Bit WD_R (Watchdog Route). If set to 0 (default), then the watchdog timer causes a reset, If set to 1, the watchdog timer will generate the NMI
- Bit 7: WD_EN: A “1” written to this bit starts the Watchdog. Once it has been enabled it cannot later be disabled.

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4.3.4.9 Control Register

Table 4-14: Control Register

Register	Address	MSB	6	5	4	3	2	1	LSB
Control	FFe0 001a	RS_CTL	Res.	Res.	S_RST	Res.	Res.	LED2*	LED1*

- Bits 0 – 1: A “1” written to these bits lights the LED’s (LED1* is the green LED of the top set on the front panel and LED2* is the red one)
- Bits 2 – 3 are reserved
- Bit S_RST: A “1” written to this bit initiates a Software Reset
- Bits 5 – 6 are reserved
- Bit 7: A “0” written to this bit configures the onboard SER connector to act as an RS232 interface. A “1” written to this bit configures the onboard SER connector to act as an RS485 interface (not optoisolated/half duplex)(default = 0)



Warning:

When setting bit 7 the user must ensure that the corresponding interface is also an RS485. A mismatch will risk damage to the VMP1 and/or the application.

4.3.4.10 Event Register

Table 4-15: Event Register

Register	Address	MSB	6	5	4	3	2	1	LSB
Event	FFe0 001c	NLRST	Res.	Res.	Res.	Res.	PB2	Res.	WD

- Bit WD is used to indicate that a watchdog overrun has occurred (logic 1 if condition has occurred)
- Bit 1 is reserved
- Bit PB2 is used to indicate that the abort button has been pressed (logic 1 if this condition has occurred)
- Bits 3 - 6 are reserved
- Bit 7: ”NOT LRST” – this bit shows the status of the LRST pin of the TUNDRA UNIVERSE II (important for bootstrap loader).

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4.3.4.11 Board / Logic Revision Register

Table 4-16: Board / Logic Revision Register

Register	Address	MSB	6	5	4	3	2	1	LSB
Board revision	FFE0 001e	LR3	LR2	LR1	LR0	BR3	BR2	BR1	BR0

The Board Revision Register may be used to identify the hardware and logic status of the board by the software. It starts with the value 0x00 for the initial board prototypes and will be incremented with each redesign / logic release.

- **This register is READ ONLY.**

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4.3.4.12 UART A / Registers

For a detailed description please refer to the EXAR XR16C 2850 DUART manual.

The UART A occupies the following addresses:

Table 4-17: General Register Set (THR/RHR, IER/ISR, MCR/MSR, LCR/LSR, SPR)

Read Mode	Write Mode	Address
Receive Holding Register	Transmit Holding Register Interrupt Enable Register	FFe0 0000 FFe0 0001
Interrupt Status Register	FIFO Control Register Line Control Register (LCR) Modem Control Register	FFe0 0002 FFe0 0003 FFe0 0004
Line Status Register	--	FFe0 0005
Modem Status Register	--	FFe0 0006
Scratchpad Register	Scratchpad Register	FFe0 0007

Table 4-18: Baud Rate Register Set (DLL/DLM)

Read Mode	Write Mode	Address
LSB of divisor latch	LSB of divisor latch	FFe0 0000
MSB of divisor latch	MSB of divisor latch	FFe0 0001

Table 4-19: Enhanced Register Set

Read Mode	Write Mode	Address
Trigger Level Register	Trigger Level Register	FFe0 0000
Feature Control Register	Feature Control Register	FFe0 0001
Enhanced Feature Register	Enhanced Feature Register	FFe0 0002
Enhanced Mode Select Register	Enhanced Mode Select Register	FFe0 0007
Xon-1	Xon-1	FFe0 0004
Xon-2	Xon-2	FFe0 0005
Xoff-1	Xoff-1	FFe0 0006
Xoff-2	Xoff-2	FFe0 0007

4.3.4.13 UART B / Registers

For a detailed description please refer to the EXAR XR16C 2850 DUART manual

The UART B occupies the following addresses:.

Table 4-20: General Register Set (THR/RHR, IER/ISR, MCR/MSR, LCR/LSR, SPR)

Read Mode	Write Mode	Address
Receive Holding register	Transmit Holding Register	FFe0 0008
--	Interrupt Enable Register	FFe0 0009
Interrupt Status register	FIFO Control Register	FFe0 000a
--	Line Control Register	FFe0 000b
--	Modem Control Register	FFe0 000c
Line Status register	--	FFe0 000d
Modem Status register	--	FFe0 000e
Scratchpad register	Scratchpad Register	FFe0 000f

Table 4-21: Baud Rate Register Set (DLL/DLM)

Read Mode	Write Mode	Address
LSB of divisor latch	LSB of divisor latch	FFe0 0008
MSB of divisor latch	MSB of divisor latch	FFe0 0009

Table 4-22: Enhanced Register Set

Read Mode	Write Mode	Address
Trigger level register	Trigger level register	FFe0 0008
Feature Control register	Feature control register	FFe0 0009
Enhanced feature register	Enhanced feature register	FFe0 000a
Enhanced mode select register	Enhanced mode select register	FFe0 000f
Xon-1	Xon-1	FFe0 000c
Xon-2	Xon-2	FFe0 000d
Xoff-1	Xoff-1	FFe0 000e
Xoff-2	Xoff-2	FFe0 000f

4.3.5 IRQ Routing

Table 4-23: Serial IRQ's

IRQ Name	Source
S_IRQ0	Reserved
S_IRQ1	UART-A
S_IRQ2	UART-B
S_IRQ3	INTA# (PCI)
S_IRQ4	INTB# (PCI)
S_IRQ5	INTC# (PCI)
S_IRQ6	INTD# (PCI)
S_IRQ7	Temperature sensor interrupt
S_IRQ8	LINT0# / VME Interrupt level 1 and 2
S_IRQ9	LINT1# / unused
S_IRQ10	LINT2# / VME Interrupt level 3 and 4
S_IRQ11	LINT3# / VME Interrupt level 5 and 6
S_IRQ12	LINT4# / VME Interrupt level 7 + SYSFAIL
S_IRQ13	LINT5# / VME ACFAIL
S_IRQ14	LINT6# / 4 location monitors
S_IRQ15	LINT7# / 4 mailboxes

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4.3.6 Real-time Clock

Access to the RTC is effected via the I2C bus. The RTC uses address 0xD0

For more detailed information please refer to the manuals for the ST - Microelectronics M41T56 and the Motorola MPC 8240 (I2C - Bus).

Table 4-24: Register Map RTC M41T56

Address	D7	D6	D5	D4	D3	D2	D1	D0	Function/Range in BCD Format
0	ST	10 Seconds			Seconds				Seconds / 00-59
1	X	10 Minutes			Minutes				Minutes / 00-59
2	CEB	CB	10 Hours		Hours				Century 0-1/Hour 00-23
3	X	X	X	X	X	Day			Day / 00-07
4	X	X	10 Date		Date				Date / 01-31
5	X	X	X	10 M.	Month				Month / 01-12
6	10 Years				Years				Year / 00-99
7	OUT	FT	S	Calibraton					Control

Meanings of abbreviations in Table 4-24

CEB	= Century enable bit
CB	= Century bit
FT	= Frequency test bit
OUT	= Output level
ST	= Stop bit
S	= Sign bit

Note:

When the RTC has once been stopped due to low voltage, it is necessary to re-initialize the “Seconds” “Minutes” and “Hours” registers before it will run again.

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4.3.7 EEPROM

Access to the EEPROM is effected via the I2C bus of the MPC8240. The EEPROM uses the I2C address 0xA0.

For more detailed information please refer to the manuals for the MICROCHIP 24LC16B and the MOTOROLA MPC8240 (I2C bus).

4.3.8 Digital Temperature Sensor

Access to the onboard temperature sensor is effected via the I2C bus of the MPC8240. The EEPROM uses the I2C address 0x90.

For more detailed information please refer to the manuals for the National Semiconductor LM75 and the MOTOROLA MPC8240 (I2C bus).

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Chapter 5

NetBootLoader

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5. NetBootLoader

The CPU board is delivered with the NetBootLoader software already programmed into the on-board soldered Flash memory. The NetBootLoader itself is a software utility which initializes the CPU board for operation before turning control over to either an application or to an operator. This software also provides the capability to monitor and control the operation of the NetBoot-Loader itself, 01display system status information, to program executable code and data to the Flash memory, and to load and start application software.

To attain full operational capability, the NetBootLoader FLASH must be programmed by the user with application software. Once the application has been programmed to Flash memory, the NetBootLoader will support the complete boot operation. The following chapters describe the functioning of the NetBootLoader and how to program the Flash memory.

5.1 General Operation

Upon power on or a system reset, the NetBootLoader is started. The CPU board is configured for operation and control is either passed to an application or an operator. In the event a valid application has been programmed into the Flash memory and no operator intervention takes place, the application is copied from FLASH into SDRAM and control is passed to the application. If the NetBootLoader does not find a valid application or operator intervention has occurred, control is passed to the operator. The operator now has control to determine the system status, make configuration changes, read or program the Flash memory, or to restart or shut down the system.

The operator command interfacing with the NetBootLoader is accomplished either via the TERM serial port or the Ethernet port. During the boot operation a command interpreter is started which allows the operator to input commands to the NetBootLoader. Prior to interfacing via the Ethernet port the network must be configured. This is done via the TERM port.

5.2 NetBootLoader Interfaces

There are four possibilities to interface with the NetBootLoader:

- Via the ABT (Abort) switch
- Via the TERM serial interface
- Via the SER0 serial interface
- Via the Ethernet interface

Gaining access to the NetBootLoader is a function of the contents of the Flash memory and the “BootWaitTime” setting. If there is no valid application programmed into the Flash memory, the boot operation automatically terminates after the CPU board has been initialized and control is passed to the command interpreter. If there is a valid application in the Flash memory the boot operation is delayed according to the setting of the boot wait time. The green user LED (U) on the front panel flashes indicating that the boot operation is in a wait state. During this time the operator may intervene in the boot operation either by pressing the ABT (Abort) switch, entering the “abort” command via the TERM interface, or by performing a successful telnet login via the Ethernet interface. If the operator does not intervene, the boot operation is continued after the boot wait time has been exceeded.

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5.2.1 ABT (Abort) Switch

The ABT switch, located on the CPU board front panel, provides the operator with the ability to directly terminate the boot operation during the boot wait time which is indicated by the “U” LED blinking. This is the sole purpose of the ABT switch during the NetBootLoader operation.

5.2.2 TERM Serial Interface

The TERM serial port is used to provide direct operator interfacing to the NetBootLoader. As soon as the CPU board has been initialized this port is activated and the operator may input commands. During the boot wait time the operator may terminate the boot operation and take control of the NetBootLoader. Once the boot wait time is exceeded the command interpreter is deactivated and the operator no longer has access to the NetBootLoader.

The TERM serial interface may either be directly connected to a terminal device or may interface with a terminal emulator.

5.2.3 SER0 Serial Interface

The SER0 serial port is used to provide the NetBootLoader with the ability to access Motorola S-Records for programming an application to FLASH. No command interpreter is available for this interface.

5.2.4 Ethernet Interface

The Ethernet interface provides the capability of remotely interfacing with the NetBootLoader. Prior to using this interface it is necessary to configure the NetBootLoader network settings. This is accomplished via the TERM interface. Once the network settings have been made, the remote operator has the same capabilities as with the TERM interface. During the boot wait time the operator gains control of the NetBootLoader by logging into it via the Ethernet interface. This causes the boot operation to be terminated and gives control to the remote operator.

The Ethernet interface uses the telnet protocol for operator interfacing with the NetBootLoader. In addition to the operator interface via Ethernet, the NetBootLoader also uses the Ethernet interface for ftp server access.

5.3 NetBootLoader Functions

In addition to initializing the CPU board for operation and the loading and starting of applications, the NetBootLoader provides the following operator monitor and control functions:

- NetBootLoader control
- system status monitoring
- ftp server access
- FLASH reading and programming operations
- Motorola S-Record acquisition

These functions are described in detail in the following chapters.



NOTE ...

The command title (CMD TITLE) is expressed in capital letters and is not the same as the syntax of the command. The command syntax is always written using small letters

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5.3.1 NetBootLoader Control

The NetBootLoader provides various functions for controlling the operation of the NetBoot-Loader itself as well as the setting of operational parameters. The following table provides an overview of available NetBootLoader control functions.

Table 5-1: NetBootLoader Control Commands

CMD TITLE	ALIAS	FUNCTION	REMARKS
ABORT	-	Terminate boot wait	
BW	Boot Wait	Set or display BootWaitTime	
HELP or ?	-	Display online HELP pages	
LOGOUT	-	Terminate telnet session	
NET	-	Set network parameters	Must be set before attempting telnet login
PASSWD	Password	Set telnet password	
PF	Port Format	Set serial port parameters	Used for both TERM and SER0 ports
RS	Reset	Resets system	

5.3.2 System Status Monitoring

The NetBootLoader provides various functions for monitoring the overall status of the system during the operation of the NetBootLoader. The following table provides an overview of avail-able system status monitoring functions.

Table 5-2: System Status Monitoring Commands

CMD TITLE	ALIAS	FUNCTION	REMARKS
CHECK	-	Application validation	Verifies validity of user image programmed to FLASH
INFO	-	Display system information	
MD	Memory Display	Display memory contents	Applies to all visible memory
PCI	-	Display PCI device information	
PING	-	Verify network status	
VER	Version	Display version number of NetBootLoader	

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5.3.3 ftp Server Access

The NetBootLoader provides various functions for interfacing with an ftp server. The following table provides an overview of available ftp server functions.

Table 5-3: ftp Server Commands

CMD TITLE	ALIAS	FUNCTION	REMARKS
BYE	-	Terminate session with ftp server	
CD	Change Directory	Change ftp server directory	
GET	-	Download a file from ftp server	Only for executable applications. Data buffer is target.
LOGIN	-	Login to ftp server	
LS	List Directory	List ftp server directory	Lists contents of directory.
PUT	-	Upload a file to ftp server	Data buffer is source.
PWD	Print Working Directory	Display current ftp server directory	Lists name of directory

5.3.4 FLASH Operation

The NetBootLoader provides various functions for performing operations with Flash memory. The following table provides an overview of available FLASH operation functions.

Table 5-4: FLASH Operation Commands

CMD TITLE	ALIAS	FUNCTION	REMARKS
CLONE	-	Program NetBootLoader to FLASH	Uses data buffer or socket as source
LF	Load FLASH	Program application to FLASH	Uses data buffer as source
SF	Store FLASH	Reads FLASH to data buffer	Uses data buffer as target

5.3.5 Motorola S-Records

The NetBootLoader provides one function for acquiring Motorola S-Records. The following table provides an overview of this function.

Table 5-5: Motorola S-Records Commands

CMD TITLE	ALIAS	FUNCTION	REMARKS
SL	SLoad	Download Motorola S-Records	Uses data buffer as target

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5.4 Operating the NetBootLoader

5.4.1 Initial Setup

The CPU board is delivered with the NetBootLoader already installed in the onboard soldered FLASH and is ready for operation. However, in order for the CPU board to be used in a system, application software must be made available for use. This is accomplished by programming the application also to the onboard soldered Flash memory where the NetBootLoader is located.

Upon initial power up the NetBootLoader is started automatically. As soon as the NetBootLoader has completed initialization of the CPU board, it checks to see if there is a valid application programmed in FLASH and at the same time initiates a command interpreter which the operator can access either via the TERM or telnet interfaces. If there is no valid application in memory, the NetBootLoader terminates the boot operation, and waits for operator intervention. As this is the case when the CPU board is first powered up, the operator now has the opportunity to program an application.

Prior to programming an application it may be necessary to configure the NetBootLoader or perform other functions depending on the user's application development environment or application requirements. Once this has be accomplished and the application has been programmed, the CPU board is ready for operation.

The following chapters provide information on how to set up and operate the NetBootLoader itself, initiation of the telnet interface, and how to program an application to FLASH.

5.4.2 Accessing the NetBootLoader

Initial access to the NetBootLoader can only be achieved via the TERM interface. Prior to using the telnet interface, the Ethernet parameters must be set and this can only be accomplished initially via the TERM interface. Once valid Ethernet parameters and the telnet login password have be set, the telnet interface is available for operation.

Use of the TERM interface requires either a terminal or a terminal emulator. Use of the telnet interface requires a remote telnet login to the NetBootLoader.

Availability of the command interpreter depends on the system status. If there is no valid application programmed, the command interpreter is available as long as the operator requires it. If a valid application is programmed, the command interpreter is only available for the duration of the boot wait time. If the operator requires the command interpreter for a longer time he must terminate the boot operation before the boot wait time is exceeded.

Upon initiation of the command interpreter, a prompt is sent to the TERM interface and commands may be entered. To gain access to the NetBootLoader from a remote location via Ethernet a telnet login must be performed. If the boot wait time has not been exceeded, a telnet login automatically terminates the boot operation and a command prompt is sent to the telnet remote interface.

Once the operator has control of the NetBootLoader, he may perform any required action. To continue with the operation of the CPU board, the system must either be cold started or the operator must issue a "reset" command. In either event, the NetBootLoader is restarted and the boot operation begins anew.

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5.4.3 NetBootLoader Configuration

There are several NetBootLoader commands which provide the operator with the capability to configure specific parameters which are used by the NetBootLoader for interfacing operations. These commands are:

- BW (BootWait)
- NET
- PASSWD
- PF (Port Format)

Default settings are available for all the above commands except for “net” which is dependent on the application environment.

5.4.3.1 BW

This command is used to display or set the actual boot wait time used by the NetBootLoader to delay the boot operation before proceeding with the loading and starting of an application. If this time is set too short it may only be possible to gain access to the NetBootLoader via the “ABT” switch.

The BootWaitTime value is stored in the boot section of the serial EEPROM. This section is validated with a CRC code to avoid the setting of random parameters.



Note ...

If the CRC of the boot section is not valid, changing the BootWaitTime will have no effect because the “bw” command does not validate an invalid CRC. In this case, a default timing of 5 seconds is always used.

To validate an invalid CRC, an operating system utility must be used, or, alternatively, the “-f” option of the “bw” command must be issued.



Warning !!!

Using the “bw -f” command to validate invalid entries may adversely impact the operation of the operating system.

5.4.3.2 NET

This command is used to set or display the parameters for the configuration of the Ethernet interface of the CPU board. The Ethernet interface is only available after these settings have been made. Once these settings have been made, the system must be cold started or reset for them to take effect.

5.4.3.3 PASSWD

This command is used to set the password used by the NetBootLoader for the operation of the telnet interface. No password is required for access from the TERM interface.

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5.4.3.4 PF

This command is used to set the port parameters for the TERM and SER0 serial interfaces only for the current operator session. The next system restart will cause these settings to revert to the default settings of: 9600 Baud, 8 bits per character, 1 stop bit, and no parity. This is done to preclude a system lockout when restarting due to incompatible settings.

5.4.4 telnet Login

A telnet login to the NetBootLoader is only possible during the boot wait time and only after the Ethernet network parameters have been set.

To effect a telnet login the operator performs the standard telnet login procedure during the boot wait time. The NetBootLoader responds by suspending the boot wait and requests a login password. The operator then enters a password. If the password is valid, the boot wait is terminated and the operator can now access the NetBootLoader. If the password is invalid, the telnet login procedure is terminated and the boot operation continues.

In the case of an invalid password, the login procedure may be repeated as often as required within the boot wait time. Once the boot wait time is exceeded, a telnet login is no longer possible.

5.4.5 FLASH Operations

To achieve an operable system for an application, the application software must be programmed to FLASH. The NetBootLoader supports the programming of the application to FLASH. In addition to this, it also supports the updating of the NetBootLoader itself as well as data transfer from the FLASH to the data buffer and from the data buffer to an ftp server. The following chapters provide information on performing the various types of FLASH operations.

5.4.5.1 FLASH Offsets

All FLASH is treated as one uniform FLASH, regardless of the physical addresses of the devices involved. If a DIL FLASH is plugged in the Memory Expansion socket, it is added to the FLASH area as well. All offsets are based from the beginning of the FLASH area. This means that 0x0 is the beginning of the first FLASH bank. The NetBootLoader itself is located at the beginning of the FLASH area and for this reason this area cannot be used for application image programming. To display an overview of the current FLASH organization use the “info” command.

If the application image is an operating system (which is the default case), it must be programmed without an offset. When such an image is programmed to FLASH, the image length and CRC information is also programmed along with the image to FLASH. This information is used by the NetBootLoader to determine the validity of the image during the boot operation. During system startup, a valid image is copied to SDRAM address 0x0 and started at offset 0x100 after the boot wait time is exceeded.

If an offset is specified, the image will be programmed exactly at this offset without adding length or CRC information. This option is intended for the storing of configuration information which is required to be located in FLASH.

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5.4.5.2 Programming an Application

The application image itself must be compiled and linked to run from the SDRAM base address 0x0 of the CPU. The image must contain executable PPC code at offset 0x100 which is the usual case with ROM/Flash images.

Gaining access to the image for programming to FLASH depends on where it is located. The NetBootLoader can access three different sources for images:

- ftp server
- Motorola S-Records
- memory within the visible address range of the CPU board

The NetBootLoader uses a single data buffer for downloading an image from an ftp server or an image as Motorola S-Records. These images must first be downloaded to the data buffer prior to being programmed to FLASH. An image located within the visible address range of the CPU board is directly accessible for programming.

To access an image located on an ftp server, the “get” command is used. To perform Motorola S-Record acquisition, the “sl” (SLoad) command is used. Once the image is in the data buffer, the FLASH is programmed using the “lf” (Load Flash) command. For an image within visible memory, the “lf” (LoadFlash) command is used to program directly to FLASH.

5.4.5.3 ftp Server Access

To gain access to an application image file stored on an ftp server the Ethernet interface is used. Images are downloaded to the data buffer using the ftp protocol. To use this interface the Ethernet parameters must first be set and then the system must be restarted. During boot wait the operator must gain control of the NetBootLoader and perform an ftp server login. After a successful login, the operator then locates the image file required and downloads it to the data buffer. As with any type of server session, the operator should logout when the session is finished.



Note ...

The commands “get” and “ls” use the same data buffer. Therefore if an “ls” command is issued after a “get” command the data buffer will be overwritten. If an “lf” command follows the “ls” the NetBootLoader refuses to program the overwritten data buffer to the FLASH.

5.4.5.4 Motorola S-Records

The NetBootLoader will also accept Motorola S-Records as an application image. The “sl”’ command accepts S1, S2 and S3 records. Operation is terminated by the appropriate S9, S8 or S7 record. Other types of records are ignored.

The checksum of every record except end records is checked. Bad records are rejected by the NetBootLoader. The address range of every record is also checked. Records which fall outside of the internal buffer are rejected.

The records must be 0-based. This means that it’s address must correspond to the address where they will be loaded in the data buffer relative to its start. If necessary, the base address can be modified with the -o option of the “sl” command.

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Note ...

If the data buffer is programmed to FLASH without the -o option (program a startable image) the downloaded image is copied to RAM during startup and is executed there. For this reason application images which require to be programmed must start at the address 0x0.

The image must start at the absolute address 0x0 and must contain executable PPC code at the absolute address 0x100. If S1 or S2 record input is preferred, please note that these records only include 16 and 24-bit wide addresses. If no switch to another record type is included it must be ensured that the code is not larger than the address range covered.



Note ...

Neither the “sl” nor “lf” command can be used to program Motorola S-Records to RAM areas.

For accessing the Motorola S-Records, both the TERM and SER0 interfaces can be used. The user LED (“U”) flashes slowly while downloading indicating that the transfer is in progress. The transfer itself may take several minutes to complete.

Ensure that the XON/XOFF protocol is used on the host side. This is a fixed setting and cannot be changed. Additionally, ensure that the host does not stop transmission after a number of lines (e.g. OS-9: use the ‘nopause’ attribute).

The TERM and SER0 serial interface parameters can be modified with the “pf” command.

5.4.6 Updating the NetBootLoader

In addition to programming an application to FLASH, the NetBootLoader itself can be updated. The new version of the image can be made available in one of two ways:

- Via an ftp server
- Via a DIL FLASH device

5.4.6.1 Updating With an Image Loaded Via an ftp Server

The image is downloaded in the same way as an application image (refer to chapter 5.4.5.3). The new version of NetBootLoader image is then programmed using the “clone -n” command.

5.4.6.2 Updating Via a Separate DIL FLASH

The new version of the NetBootLoader image must be programmed to a separate DIL FLASH device (e.g. AM29F040) with an external programmer and then plugged on the Memory Expansion socket of the CPU board. The NetBootLoader must be started and operator must gain control of the NetBootLoader. Either the current NetBootLoader (Boot Jumper removed) or the new NetBootLoader version (BootJumper inserted) may be used for this operation.

The “clone” command is then used to program the new NetBootLoader version to FLASH.

If for some reason the NetBootLoader programmed in the soldered FLASH has been improperly modified (e.g. by a program which accidentally erases or overwrites the chips), this is the only method to reprogram the onboard soldered FLASH. In this case, the boot operation must be started with the Boot Jumper inserted (boot from DIL FLASH).

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5.4.7 Uploading a FLASH Area

The NetBootLoader also has the possibility to upload certain areas of the FLASH to a host using the Ethernet interface. To use this interface the Ethernet parameters must first be set and then the system must be restarted. During boot wait the operator must gain control of the NetBootLoader and perform an ftp server login. After a successful login, the operator then stores the FLASH area to be uploaded to the local data buffer using the “sf” command. Using the “put” command transfers the contents of the data buffer to the ftp server. As with any type of server session, the operator should logout when the session is finished.

5.5 Plug and Play

On the CPU board the NetBootLoader includes “Plug and Play” functionality. This ensures that the board is completely initialized and that all resources necessary for PCI devices (addresses, interrupts etc.) are assigned automatically. This important feature has the advantage that conflicts do not arise when PCI devices are added or removed. Furthermore, the operating system itself does not include the board initialization code.

5.6 Porting an Operating System to the CPU Board

The image for the absolute address 0x0 should be linked with an entry point at the absolute address 0x100.

One should not attempt to reassign the PCI BAR registers. The assigned values should be read back and these should always be used in the drivers.

The “interrupt line” field in the PCI configuration header is initialized with the IRQ line number to which the INTA of the device is routed.

It is not necessary to rewrite the “EUMBBAR” field in the KAHLUA (MPC 8240) configuration space as this has already been done by the NetBootLoader. The existing value should be used.

Downloaded images are never executed from the FLASH due to the fact that on the CPU board it is paged. The programmed image is always downloaded to SDRAM, the absolute address 0x0 being downloaded first. There is no configuration option available to amend this process. If it is necessary to relocate the image to another address after download, simply add a small assembly routine at the beginning of the code which will move the image to the correct address.

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5.7 Commands

The following commands are available with the NetBootLoader. Where an ellipsis (…) appears in the command syntax it means that the command is continued from the previous line. Observe any spaces that may be between the ellipsis and the remainder of the command.

ABORT

FUNCTION:	Terminate the NetBootLoader boot operation
SYNTAX:	**abort**
DESCRIPTION:	This command is used by the operator to to terminate the boot operation during the boot wait time to allow the operator to perform other NetBootLoader operations. To be asserted it must be issued during the boot wait time which is indicated by the flashing green user LED (U) on the CPU board front panel.

BW

FUNCTION:	Set or display the parameters of the boot wait function of the NetBootLoader
SYNTAX:	**bw [<time>| -f]** where: bw command <time> parameter: value: seconds 1, 2, 5, 10, 20, 50 -f option: force CRC update
DESCRIPTION:	The command “bw” displays the parameter “<time>” setting. The parameter “<time>” stipulates the waiting time in seconds that the boot operation is delayed before the application is loaded and started. No values other than these are supported. Bear in mind when setting the boot wait time that the green user LED (U) flashes at the rate of two times a second. Therefore, if the boot wait is set to 1 second the LED will only flash two times.

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BW

DESCRIPTION:	The option “-f” is used to force updating of the CRC value of boot section of the EEPROM. For further information refer to chapter 5.4.3.1.
USAGE:	Display setting of “<time>” parameter COMMAND / RESPONSE: **bw** **WaitTime: 20**
	Set boot wait time to 50 seconds COMMAND / RESPONSE (none): **bw 50**

BYE

FUNCTION:	Terminate an ftp server session
SYNTAX:	**bye**
DESCRIPTION:	An ftp server session which has been established with the command “login” is terminated with the command “bye”.

CD

FUNCTION:	Change the current ftp server directory
SYNTAX:	**cd <new-path>** where: cd command <new-path> parameter: string new directory path

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CD

DESCRIPTION:	If an ftp server session has been established with the “login” command, the command “cd” is used to change the current ftp server directory. The argument “<new-path>” may be an absolute or relative path. The format depends on what the server accepts. For example, UNIX hosts require that the directory names must be entered exactly in the same case.

CHECK

FUNCTION:	Verify validity of application programmed to FLASH
SYNTAX:	**check**
DESCRIPTION:	When an application is programmed to FLASH, a CRC is performed and the results are stored in FLASH along with the application. The “check” command is used to verify that the current application image in FLASH is valid.
USAGE:	Veriy valid application is stored in FLASH COMMAND / RESPONSE: **check** **Check userimage CRC: ok**

CLONE

FUNCTION:	Program the NetBootLoader to FLASH

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CLONE

SYNTAX:	**clone [-n]** where: clone command -n option: program from data buffer
DESCRIPTION:	To update the NetBootLoader itself, the command “clone” is used. The application image source for programming may either be the data buffer or a DIL FLASH installed in the Memory Expansion socket. If the source is the data buffer, the image must first be downloaded to the data buffer from an ftp server. If the image is in the
DESCRIPTION:	DIL FLASH it is programmed directly to the onboard soldered FLASH. To program directly from the DIL FLASH, the command “clone” is used without the “-n” option. The update will be programmed even if the CPU board has been initialized from the DIL FLASH (Boot jumper installed) with the new image. To program from the data buffer, the command “clone -n” is used. In both cases, the new image is checked for validity. If an image is invalid, the update is aborted. Additionally, the operation must be confirmed by typing the word “yes”. Any other or no input will cancel the operation.
USAGE:	Program NetBootLoader from DIL FLASH (normal operation) COMMAND / RESPONSE: **NetBtLd> clone** **clone: Fixup FLASH info from socket** **This will overwrite the current ...** **NetBootLoader, are you sure? [no] yes** **clone: System transferred; Start again, ...** **assure that Boot jumper is removed.** **NetBtLd>** Note: When responding to the overwrite query, “yes” must be spelled out. Any other response will terminate the cloning operation.

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CLONE

	Program NetBootLoader from DIL FLASH (image not valid) COMMAND / RESPONSE: **NetBtLd> clone** **clone: Fixup FLASH info from socket** **Image CRC invalid, image is damaged, abort.** **NetBtLd>**

GET

FUNCTION:	Download file from ftp server
SYNTAX:	**get <filename>** where: get command <filename> parameter: string name of image file to be downloaded, or path and name of image file to be downloaded
DESCRIPTION:	To download a file from the ftp server to the local data buffer, the command “get” is used. A successful ftp server login must be carried out before a file can be downloaded and the file must be in binary format. The argument “<filename>” must refer to an existing and accessible file on the server and the syntax must follow the requirements on the server, e.g. case sensitiveness. The argument may also include a path specification, if the server supports this.

HELP or ?

FUNCTION:	Display online help pages

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HELP or ?

SYNTAX:	**help** **?**
DESCRIPTION:	This command displays the online help pages. The display of the help text varies between the different CPU's reflecting their differences. The syntax of every command and a brief description is shown. The display output pauses after every page. The output can be continued with any key. Entering a "." (period) aborts the help function.

INFO

FUNCTION:	Display system information
SYNTAX:	**info**
DESCRIPTION:	The command "info" is used to display an information summary for the running system. The CPU type, the board type, and the detected FLASH layout are displayed.

LF

FUNCTION:	Load Flash

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LF

SYNTAX:	**`lf [-o[=]<offset> [-k]]`** **`… [-m[=]<adr> -l[=]<len>]`** where: lf command -o option: offset <offset> parameter: value: hexadecimal program to FLASH offset of ... -k option: keep retain surrounding contents -m option: memory (address) <adr> parameter: value: hexadecimal absolute address of image to be programmed -l option: length <len> parameter: value: hexadecimal length of image to be programmed
DESCRIPTION:	Without parameters, the FLASH is programmed using the contents of the data buffer. If no image is available in the data buffer, the FLASH programming is terminated.

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LF

DESCRIPTION:	If no offset option (“-o”) is specified the image is considered to be valid and is therefore added along with CRC and length information. If the CRC is determined to be valid during the next startup, the image is copied to the absolute address 0x0 and started at 0x100 after the boot wait time has been exceeded. Normally, the local data buffer holds the image to be programmed. However, if the “-m” and “-l” parameters are specified, the image is programmed from the absolute address specified. If “<offset>” is specified, the contents are programmed exactly at this offset in FLASH. No length and no CRC information is added. The “-k” option can be specified to prevent deletion of the surrounding FLASH contents. FLASH memory can only be erased sector-wise. If an image is programmed to a certain offset with the “-o” option, at least this sector (and maybe one or more of the following sectors depending on the size of the image) will be erased. The “-k” option can be used to retain the surrounding data, however, this slows down the operation significantly. To achieve fast programming of parameter images without destroying other FLASH contents, the data should be placed at a sector boundary and the sector(s) must not contain any other data or executable images. If organized this way, use of the “-k” option can be avoided. Note: The “lf” command cannot be used to program the NetBootLoader.
USAGE:	Program FLASH from data buffer and add CRC and image length COMMAND / RESPONSE (none): **`lf`**
	Program FLASH from data buffer to offset 0xF4240 COMMAND / RESPONSE (none): **`lf -o=f4240`**
	Program FLASH from visible address at 0x87000000 for length of 0x123456 COMMAND / RESPONSE (none): **`lf -m=87000000 -l=123456`**

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LF

USAGE:	Program FLASH from data buffer to offset 0xF4240 and retain adjacent FLASH contents COMMAND / RESPONSE (none): **`lf -o=f4240 -k`**

LOGIN

FUNCTION:	Initiate ftp server session
SYNTAX:	**`login <ip-of-host> <username> [<password>]`** where: login — command <ip-of-host> — parameter: value: numerical string IP address of host: nnn.nnn.nnn.nnn <username> — parameter: value: string ftp server “username” <password> — parameter: value: string user’s password
DESCRIPTION:	The command “login” is used to establish an ftp server session. The “<ip-of-host>” must be specified as four numbers separated by single dots. The “<password>” parameter is not necessary if the server does not request one.
USAGE:	Initiate ftp server session COMMAND / RESPONSE: **`login 192.168.47.12 johndoe mypassword`** (Response is dependent on the server accessed)

LOGOUT

FUNCTION:	Terminate telnet session with NetBootLoader

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LOGOUT

SYNTAX:	**logout**
DESCRIPTION:	A remote telnet session will be terminated with the command “logout”. No application is loaded and started if the session is terminated with “logout”. The NetBootLoader waits for a new session to be initiated or for a command entry from the serial console.

LS

FUNCTION:	Display listing of the current ftp server directory
SYNTAX:	**ls**
DESCRIPTION:	To display a listing of the current ftp server directory the command “ls” is used. This command downloads the listing to the data buffer and then the listing is displayed. Any previously loaded image in the data buffer is overwritten. If an attempt is then made to program the FLASH after the “ls” command has been issued it will fail.

MD

FUNCTION:	Display visible memory
SYNTAX:	**md [<adr>]** where: md command <adr> parameter: value: hexadecimal starting address of a visible memory area
DESCRIPTION:	To display a visible memory area the command “md” is used. The first time the command “md” is issued, visible memory contents starting at the address 0x0 are displayed if no “<adr>” parameter is used. If issued again without the “<adr>” parameter, the display starts with the end address of the previous display. Data is displayed as hexadecimal 32-bit words and as ASCII dump.

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NET

FUNCTION:	Set or display the parameters for the Ethernet interface
SYNTAX:	**net [<ip-addr>][-netmask <netmask>]** **…[-gw <gateway>][-f]** where: net — command <ip-addr> — parameter: value: numerical string IP address of CPU board: nnn.nnn.nnn.nnn -netmask — option: netmask <netmask> — parameter: value: numerical string netmask of CPU board: nnn.nnn.nnn.nnn -gw — option: gateway <gateway> — parameter: value: numerical string gateway address for network: nnn.nnn.nnn.nnn -f — option: force CRC update
DESCRIPTION:	To set or display the parameters of the Ethernet interface the command “net” is used. Initially the CPU board does not have a valid Ethernet interface configuration, and, therefore, this interface is inoperable. The initial configuration must be done from the TERM interface using the command “net ... -f”. Using the “-f” option forces a CRC to be performed and stored along with the other configuration parameters in the serial EEPROM. Once the initialization of the Ethernet interface is done, the CPU board must be restarted for the parameters to take effect. Later changes to the parameters do not require the use of the “-f” option to force a CRC. This is done automatically. Only in the event that the Ethernet interface does not properly initialize, may it be necessary to re-enter the parameters using the “-f” option.

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PASSWD

FUNCTION:	Set the telnet password
SYNTAX:	**passwd [-f | -d]** where: passwd command -f option: if password is not known -d option: disable disable telnet login (remote access)
DESCRIPTION:	To set the password for telnet sessions with the NetBootLoader the command “passwd” is used. This command is interactive, meaning that after it is issued, the NetBootLoader responds with an appropriate request to the operator which must be properly acknowledged or the operation fails (refer to USAGE below). To set the password in the event it is unknown, use the option “-f”. This is can only be accomplished from the TERM interface and not from the Ethernet interface. With the option “-d”, the remote telnet login can be disabled by invalidating the password.
USAGE:	Set password COMMAND / RESPONSE: **NetBtLd> passwd** **Old Password: ***** New Password: ***** Type again : ***** NetBtLd>** (The old password must be known)
	Set password when the old password is not known COMMAND / RESPONSE: **NetBtLd> passwd** **New Password: ***** Type again : ***** NetBtLd>**

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PCI

FUNCTION:	Display PCI information
SYNTAX:	**pci**
DESCRIPTION:	The command “pci” is used to display detailed information on all detected PCI devices. The bus number, device number, function number, vendor, and device ID’s are displayed together with the configured base addresses and the assigned IRQ number.

PF

FUNCTION:	Set or display the serial port parameters (format)
SYNTAX:	**pf [<port> [<baud>][/[<bitschar>]** **…[/[<parity>][/<stops>]]]]**

where:

pf	command
<port>	parameter: string: “term” or “ser0” defines serial port to be configured
<baud>	parameter: value: numeric: “50, 75, 110, 134.5, 150, 300, 600, 1200, 1800, 2000, 2400, 3600, 4800, 7200, 9600, 19200, 38400, 115200” defines the baud rate for the port
<bitschar>	parameter: value: numeric: “7” or “8” defines the number of bits per character
<parity>	parameter: string: “n” (none), “o” (odd), “e” (even) defines parity to be used
<stops>	parameter: value: number: “1”, “2” defines number of stop bits

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PF

DESCRIPTION:	To set or display the operational parameters for the available serial interfaces the command “pf” is used. At startup the settings for the “TERM” and “SER0” interfaces are always set to the default values (9600/8/n/1). This is to avoid a possible system lockout. If other settings are required during operation of the NetBootLoader they may be made. If changes are made, it must be ensured that corresponding parameters are used for the operator consle. Issuing this command without parameters being specified will display the current serial port settings. Syntax-wise, no spaces are permitted between the parameters and they must be separated with a slash. Not all parameters must be specified, but the “/” characters must be present to distinguish the different parameters from each other. The sequence can be aborted after every option.
USAGE:	Set “TERM” to 300 Baud, 7 Bits/char, odd parity, and 2 stop bits COMMAND / RESPONSE (none): **`pf term 300/7/o/2`**
	Set the bits per character parameter of “SER0” to 7 COMMAND / RESPONSE (none): **`pf ser0 //7`**
	Set the stop bits parameter of “SER0” to 2 COMMAND / RESPONSE (none): **`pf ser0 ///2`**

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PING

FUNCTION:	Verify operability of the Ethernet interface
SYNTAX:	**ping <ip_addr> [-c <count>] [-s <size>]** **… [-w <wait>]** where: ping — command <ip-addr> — parameter: value: numerical string IP address of target: nnn.nnn.nnn.nnn -c — option: count <count> — parameter: value: numeric: “[n ...]n” number of packets to send -s — option: size <size> — parameter: value: numeric: “[n ...]n”: bytes size of packet to send -w — option: wait <wait> — parameter: value: numeric: “[n ...]n”: seconds wait time between packets
DESCRIPTION:	To verify the operational status of the Ethernet interface the command “ping” is used. This command tests the network connection and target server’s ability to respond. If no other parameters are specified, four requests will be sent. This can be changed with the parameter “-c”. The typical size of a ping packet can be changed with the parameter “-s” and the time between requests, which is typically one second, can be changed with the parameter “-w”. Reponses to the “ping” command are dependent on the performance of the network.
USAGE:	Send four packets COMMAND / RESPONSE: **ping 192.192.158.7**
	Send ten packets, 100 bytes long, and wait two seconds between packets COMMAND / RESPONSE: **ping 192.192.158.7 -c 10 -s 100 -w 2**

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PUT

FUNCTION:	Upload contents of the data buffer to the ftp server.
SYNTAX:	**put <filename>** where: put command <filename> parameter: string file name to be used for contents of data buffer to be uploaded
DESCRIPTION:	To upload the contents of the data buffer to a file on an ftp server, the command “put” is used. The file indicated by the parameter “<filename>” is created on the server. In the event that a file with this name already exists, its contents will be overwritten.

PWD

FUNCTION:	Display the current ftp server directory.
SYNTAX:	**pwd**
DESCRIPTION:	If a ftp connection has been established with the “login” command, the command “pwd” is used to display the complete path of the current directory on the ftp server.

RS

FUNCTION:	Reset the system
SYNTAX:	**rs**

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RS

DESCRIPTION:	To permit the operator to force a restart of the system, the command “rs” is used. This command terminates the NetBootLoader command interpreter and resets the entire system, generating a system reset with the onboard watchdog. If this command is issued over a remote telnet connection, the telnet session is terminated prior to the generation of the reset.

SF

FUNCTION:	Store FLASH contents to data buffer
SYNTAX:	**sf -o[=]<offset> -l[=]<length>** where: sf — command -o — option: offset <offset> — parameter: value: hexadecimal relative offset to start of FLASH contents to be stored to the data buffer -l — option: length <length> — parameter: value: hexadecimal length of FLASH contents to be stored to the data buffer
DESCRIPTION:	With the command “sf” a selected portion of the FLASH contents may be copied to the local data buffer, e.g. for a subsequent upload to the ftp server with the “put” command. The “<offset>” parameter refers to the relative offset within the FLASH area similar to the “lf” command. The parameter “<length>” specifies the length to store.
USAGE:	Store 64 kB of FLASH contents to the data buffer beginning at an offset of 1 MB COMMAND / RESPONSE (none): **sf -o=100000 -l=10000**

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SL

FUNCTION:	Download Motorola S-Records to data buffer
SYNTAX:	**sl [-o[=]<offset>] [-u]** where: sl command -o option: offset <offset> parameter: value: hexadecimal: unsigned offset to be subtracted from each record's address -u option: upper
DESCRIPTION:	With the command “sl” Motorola S-Records are downloaded to the data buffer and the record addresses modified accordingly as required for SDRAM operation (for copying to 0x0). The “<offset>” parameter may be used to change the record base to 0x0. The “-u” option selects the SER0 interface as source for the S-Records.
USAGE:	Download S-Records to data buffer and reduce each record’s address by 0x10000. COMMAND / RESPONSE (none): **sl -o=10000**

VER

FUNCTION:	Display version number
SYNTAX:	**ver**
DESCRIPTION:	The command “ver” displays the actual version number of the NetBootLoader.

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Appendix A

VMP1-IO1 Module (Optional)

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VMP1-IO1 Module (Optional)

A Overview

The *PEP* VMP1-IO1 module has been designed to provide the VMP1 user with an effective gateway to the world of PMC modules. This additional capability opens up the broadest range of expansion possibilities.

PMC modules are renowned for their flexibility and versatility of use. They afford the user wide ranging system-independent solutions by means of easily interchanged or upgraded mezzanine add-on modules. The *PEP* VMP1-IO1 has been designed to maximize the advantages provided by PMC modules in a 3U environment.

A special feature of the VMP1 is the ability to cascade two of these IO1 modules on top of one another. This means that the VMP1 is able to carry any two PMC modules. Tremendous advantages in terms of expandability and flexibility are thus made available to the user as a result of the addition of this capability to the board's many outstanding features.

The VMP1-IO1 is a 3U non-intelligent, passive CPCI carrier board with one PMC slot.

Some of the Outstanding Features of the VMP1-IO1

- 32 Bit / 33MHz PCI Bus on the PMC side
- it supports the Interrupts INTA, INTB, INTC and INTD
- it supports all the signals of the PCI Bus on its connectors Jn1 (CON2), Jn2 (CON3)
- The connectors which connect the mezzanine board with the carrier include all the signals of a 33MHz, 32-bit, multi-master PCI bus, the power rails for 5V, 3.3V, V(I/O) and other specialised signals for Board Detection.

Features of the *PEP Modular Computers*' PMC modules

PEP Modular Computers' PMC modules are operable in both CompactPCI and VME systems. They offer all the key benefits of PC I/O technology, namely:

- low cost solutions
- high performance
- a processor independent local I/O bus
- a broad range of I/O peripheral devices

PEP Modular Computers' PMC modules may be installed on a variety of different carrier boards, including:

- CompactPCI 3U/6U: CPU CP302, CP600, CP602, CP610, CP611, CP612
- CompactPCI PMC carrier boards such as the CP390 and CP690
- VME 3U: VMP1 by means of the VMP1-IO1 module

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B Board Interfaces

PCI Expansion Connector

The PCI expansion connectors CON2/CON3 provides all the necessary signals for data transfer as defined by PCI Specification Rev. 2.1.

PMC Interface

The PMC interface provides an easy way to extend the VMP1 via the wide array of interfaces and functions which are available on PMC modules produced by the entire range of PMC vendors. PMC connectors provide a 32-bit wide PCI data path with a speed of up to 33MHz which is routed to the onboard connectors Jn1 and Jn2. These connectors also provide the power supply for the PMC module. The interface has been designed to comply with the IEEE 1386.1 specification which defines a PCI electrical interface for the CMC (Common Mezzanine Card) form factor.

Power Supply

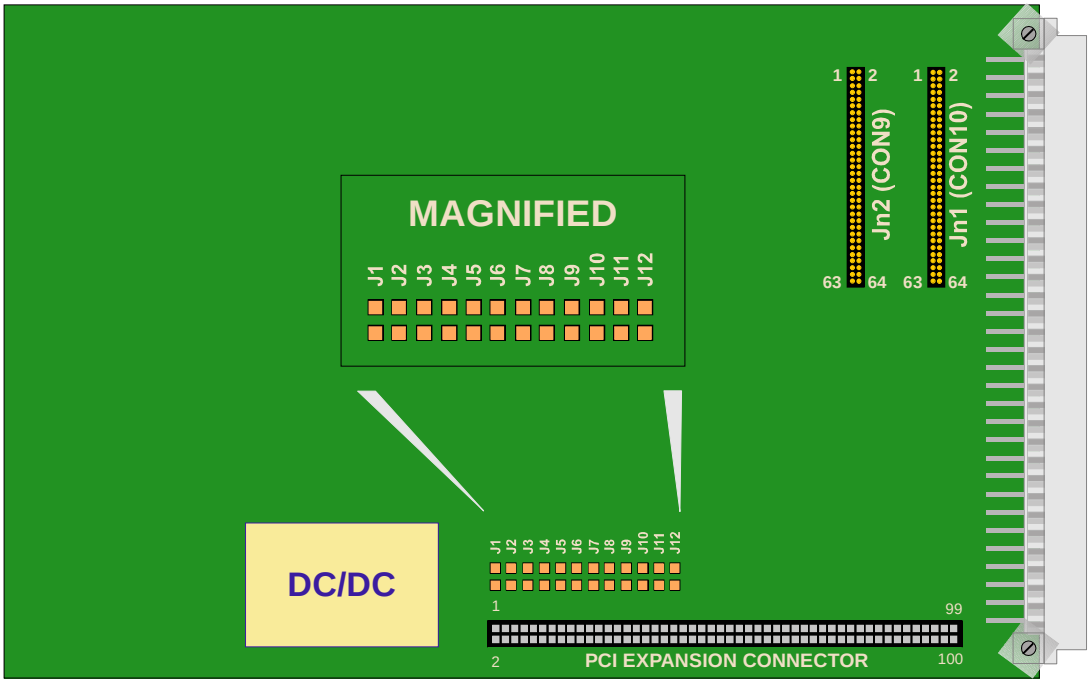
The onboard DC/DC converter of the VMP1-IO1 also produces 3.3V supply voltage from the 5V provided on the VME backplane. This is necessary in order to create compatibility with the PMC modules whose power consumption is in excess of what the baseboard (VMP1-IO1) can provide.

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C Board Layout

The VMP1-IO1 has two onboard connectors (CON9 and CON10) which provide all the PCI signals and the power supply for the PMC module.

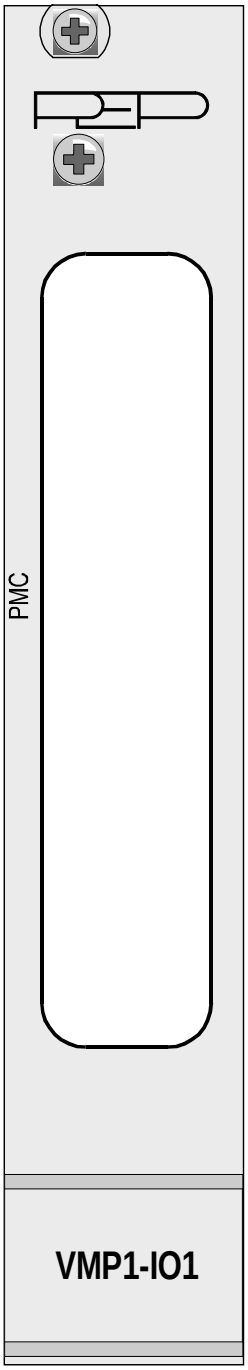
Figure A-1: Board Layout (Front View)



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D VMP1-IO1 Front Panel

Figure A-2: VMP1-IO1 Front Panel



The VMP1-IO1 front panel is provided with a window for the insertion of a PMC module bezel.

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E Technical Specifications

Table A-1: VMP1-IO1 Specifications

VMP1-IO1	Specifications
PCI-Standard	Compliant with PCI 2.1
Signaling Voltage	PMC-Side: 5V signaling
Connectors	PMC Jn1 (CON4) and Jn2 (CON5) connectors
Mechanical Compliance	IEEE 1101.10 CMC IEEE P1386/Draft 2.0 (with minor exceptions)
Temperature Range	Operation: • -40° to +85°C Storage: • -55° to +85°C
Operating Humidity	5 – 95% (non condensing)
Vibrations and Broad-Band Random Vibration	IEC68-2-6 compliant IEC68-2-64
Shocks: Permanent Shocks Single Shock	 IEC68-2-29 IEC68-2-27
Board Dimensions	Single-height Eurocard: 100 mm x 160 mm 1 x 4 HP slot
Board Weight	114 grams

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F Board Installation

In order to keep the installation process as simple and easy as possible please follow the recommended order of work:

1. Instal the PMC module on the VMP1-IO1
2. Instal the package, VMP1-IO1 plus PMC module, on the baseboard (in this case the VMP1)



ESD Equipment!

Your carrier board and PMC module contain electrostatically sensitive devices. Please observe the necessary precautions to avoid damage to your board:

- Discharge your clothing before touching the assembly. Tools must be discharged before use.
- Do not touch components, connector-pins or traces.
- If working at an anti-static workbench with professional discharging equipment, please do not omit to use it.

Installation of the VMP1-IO1 Module on the VMP1 Baseboard

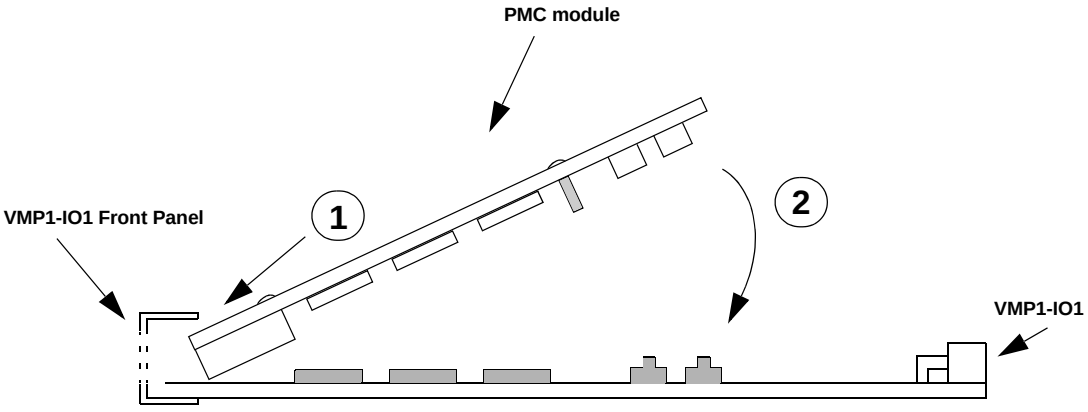
3. Place the VMP1-IO1 exactly above the VMP1
4. Plug them togethor
5. Use 4 screws (2.5 × 6 mm) to secure the board to the VMP1

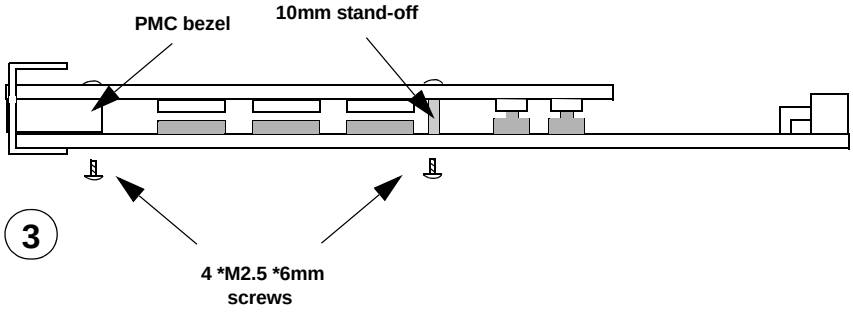
PMC Module Installation

6. Place the EMC gasket on the bezel of your PMC-Module
7. Push the PMC bezel into the window of the front-panel of the VMP1 and plug the connectors together.
8. Use three screws (M2.5 × 6mm) to secure the module to the board

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Figure A-3: Installation Diagrams





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G Pinouts

G1 Jn1 (CON4) Pin Assignment

Table A-2: Jn1, 32-bit PCI

Pin Number	Signal Name	Signal Name	Pin Number
1	TCK	-12V	2
3	Ground	INTA#	4
5	INTB#	INTC#	6
7	BUSMODE1#	+5V	8
9	INTD#	PCI-RSVD*	10
11	Ground	PCI-RSVD*	12
13	CLK	Ground	14
15	Ground	GNT#	16
17	REQ#	+5V	18
19	V(I/O)	AD[31]	20
21	AD[28]	AD[27]	22
23	AD[25]	Ground	24
25	Ground	C/BE[3]#	26
27	AD[22]	AD[21]	28
29	AD[19]	+5V	30
31	V(I/O)	AD[17]	32
33	FRAME#	Ground	34
35	Ground	IRDY#	36
37	DEVSEL#	+5V	38
39	Ground	LOCK#	40
41	SDONE#	SBO#	42
43	PAR	Ground	44
45	V(I/O)	AD[15]	46
47	AD[12]	AD[11]	48
49	AD[09]	+5V	50
51	Ground	C/BE[0]#	52
53	AD[06]	AD[05]	54
55	AD[04]	Ground	56
57	V(I/O)	AD[03]	58
59	AD[02]	AD[01]	60
61	AD[00]	+5V	62
63	Ground	REQ64#	64

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G2 Jn2 (CON5) Pin Assignment

Table A-3: Jn2, 32-bit PCI

Pin Number	Signal Name	Signal Name	Pin Number
1	+12V	TRST#	2
3	TMS	TDO	4
5	TDI	Ground	6
7	Ground	PCI-RSVD*	8
9	PCI-RSVD*	PCI-RSVD*	10
11	BUSMODE2#	+3.3V	12
13	RST#	BUSMODE3#	14
15	3.3V	BUSMODE4#	16
17	PCI-RSVD*	Ground	18
19	AD[30]	AD[29]	20
21	Ground	AD[26]	22
23	AD[24]	+3.3V	24
25	IDSEL	AD[23]	26
27	+3.3V	AD[20]	28
29	AD[18]	Ground	30
31	AD[16]	C/BE[2]#	32
33	Ground	PMC-RSVD	34
35	TRDY#	+3.3V	36
37	Ground	STOP#	38
39	PERR#	Ground	40
41	+3.3V	SERR#	42
43	C/BE[1]#	Ground	44
45	AD[14]	AD[13]	46
47	Ground	AD[10]	48
49	AD[08]	+3.3V	50
51	AD[07]	PMC-RSVD	52
53	+3.3V	PMC-RSVD	54
55	PMC-RSVD	Ground	56
57	PMC-RSVD	PMC-RSVD	58
59	Ground	PMC-RSVD	60
61	ACK64#	+3.3V	62
63	Ground	PMC-RSVD	64

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H Jumper Setting

The jumper settings of the IO1 module depend on the module's position relative to the VMP1 and other modules, if any (please see Figure A4 below).

Table A4: IO1 Jumper Settings for Different Module Positions

	IDSEL			Clock			GNT#			REQ#		
	J12	J11	J10	J1	J2	J3	J4	J5	J6	J7	J8	J9
Position 1	Set	Open	Open	Set	Open	Open	Set	Open	Open	Set	Open	Open
Position 2	Open	Set	Open	Open	Set	Open	Open	Set	Open	Open	Set	Open
Position 3	Open	open	Set	Open	Open	Set	Open	Open	Set	Open	Open	Set

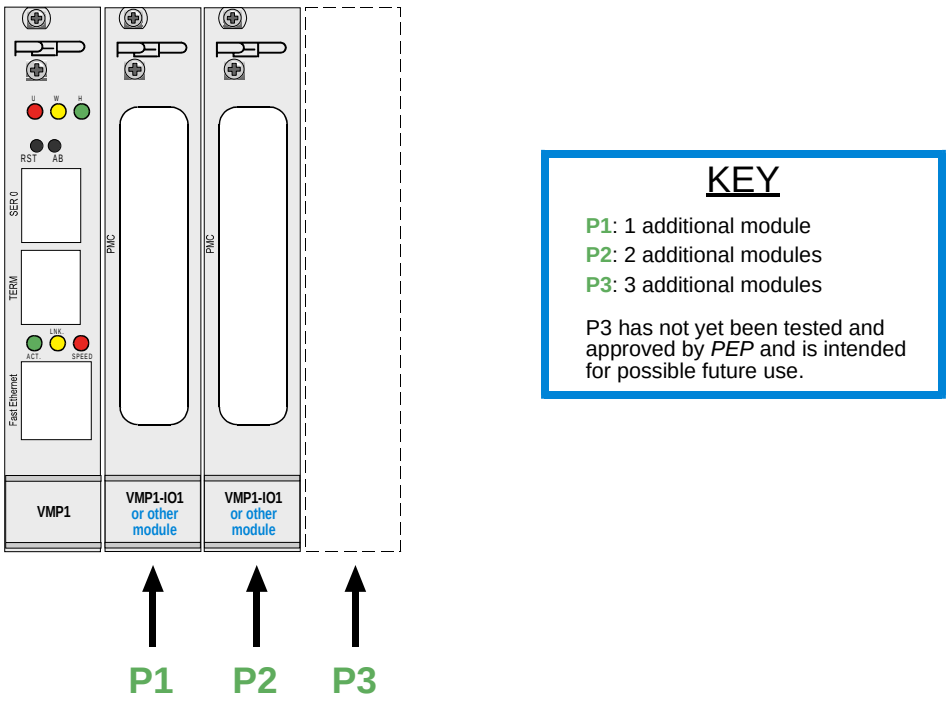
Note:

Position 1 refers to the settings applicable when 1 module (IO1 or other) is attatched to the VMP1.

Position 2 refers to the settings applicable when 2 modules (IO1 or other) are attatched to the VMP1.

Position 3 refers to the settings applicable when 3 modules (IO1 or other) are attatched to the VMP1.
Important!: Position 3 has not yet been tested and approved by *PEP* and is not recommended for use in this issue of the manual.

Figure A-4: Cascading of IO1 (or other) Modules onto the VMP1



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Appendix B

VMP1-Post (Optional)

VMP1-Post ..... B - 3

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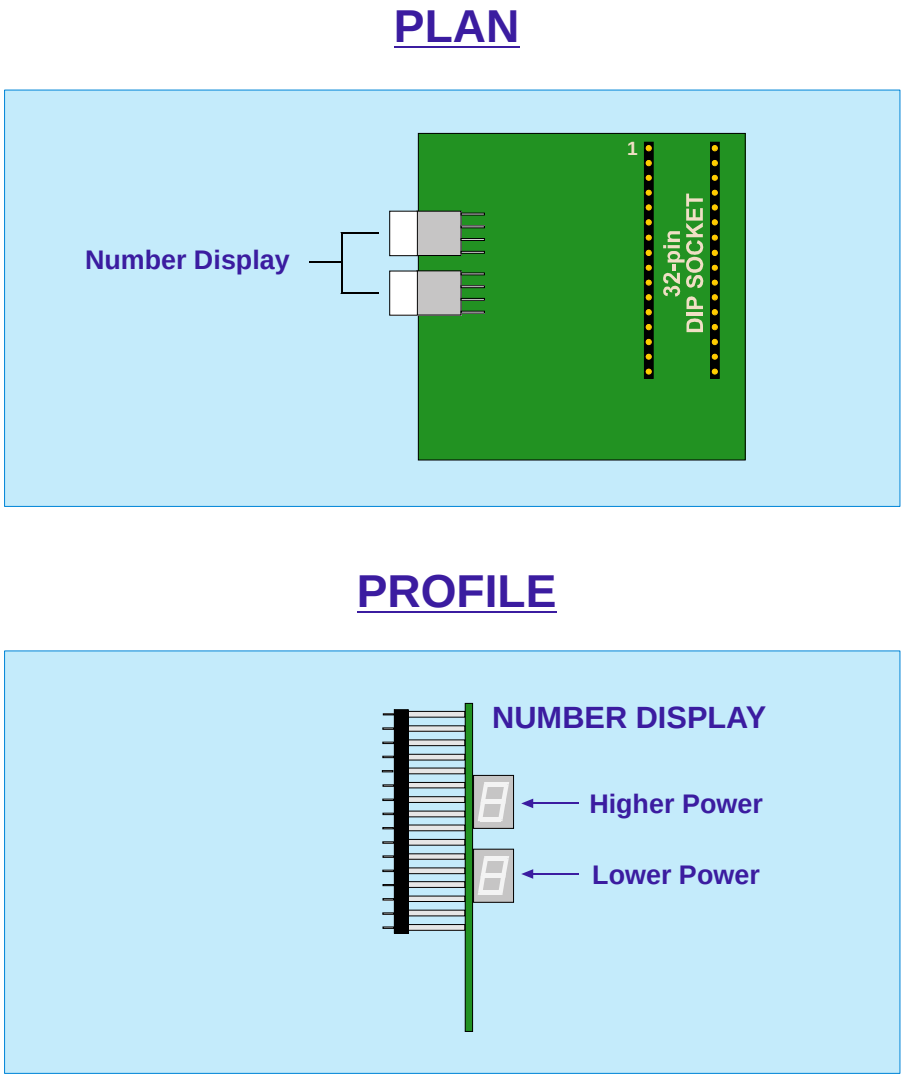
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VMP1-Post (Optional)

Board description

The VMP1-Post is an optionally available tool which is used for hardware and software debugging. During the startup process of the VMP1 it provides the user with information about the status of the boot process by means of a message code similar to the post codes on the Intel PC. ***Please note that a Postcode reference list setting out the meanings of the number codes is available from the local sales office .*** When the board has completed the startup process, the VMP1-Post may be used to provide debug information for software development. The programmer can, therefore, define his own debug code and send it to the VMP1 by making a byte write command to the first address of the socket memory area. This address is 0xFFF0 0000 when the boot jumper J1 of the VMP1 is set and 0xFFF8 0000 when the boot jumper is open.

Figure B-1: Plan and Profile Views of VMP1 POST Module



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Appendix C

Optoisolation RS485 Module (Optional)

Optoisolation Module .....C - 3

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Optoisolation RS485 Module (Optional)

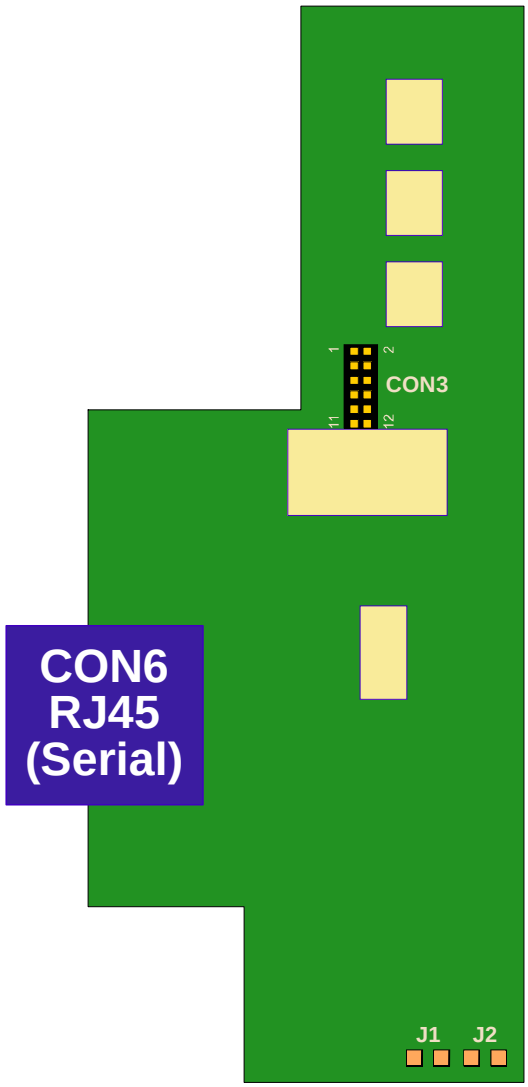
Board description

On the VMP1 it is possible to utilize a transition module which provides optoisolated RS485 functionality (half and full duplex).

Users who require an optoisolated version of the VMP1 are supplied with a customized VMP1 on which the standard RJ45 connector is omitted and also with this module which comes with a substitute RJ45 connector routed through optoisolation circuitry on the module.

The module has been designed so that it does not increase the board width, which remains unchanged at 4TE with the module in place.

Figure C-1: View of underside of RS485 Module



Please note that this diagram is not to scale with other board diagrams

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Appendix D

JTAG Subsystem

JTAG Chain .....D - 3

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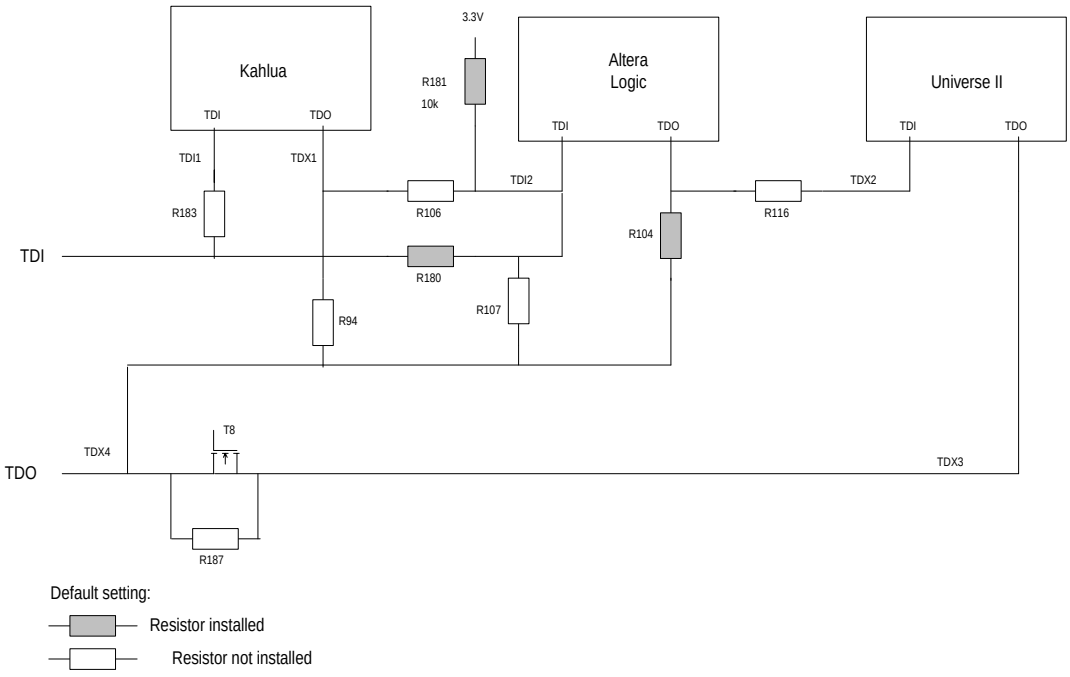
JTAG Subsystem

Description

All the JTAG capable devices on the VMP1 can be accessed through the onboard JTAG chain. The factory setting of the chain is such that only the onboard logic is in the chain. If it is required to access the Processor via the JTAG chain a different setting must be used (some resistors must be reset).

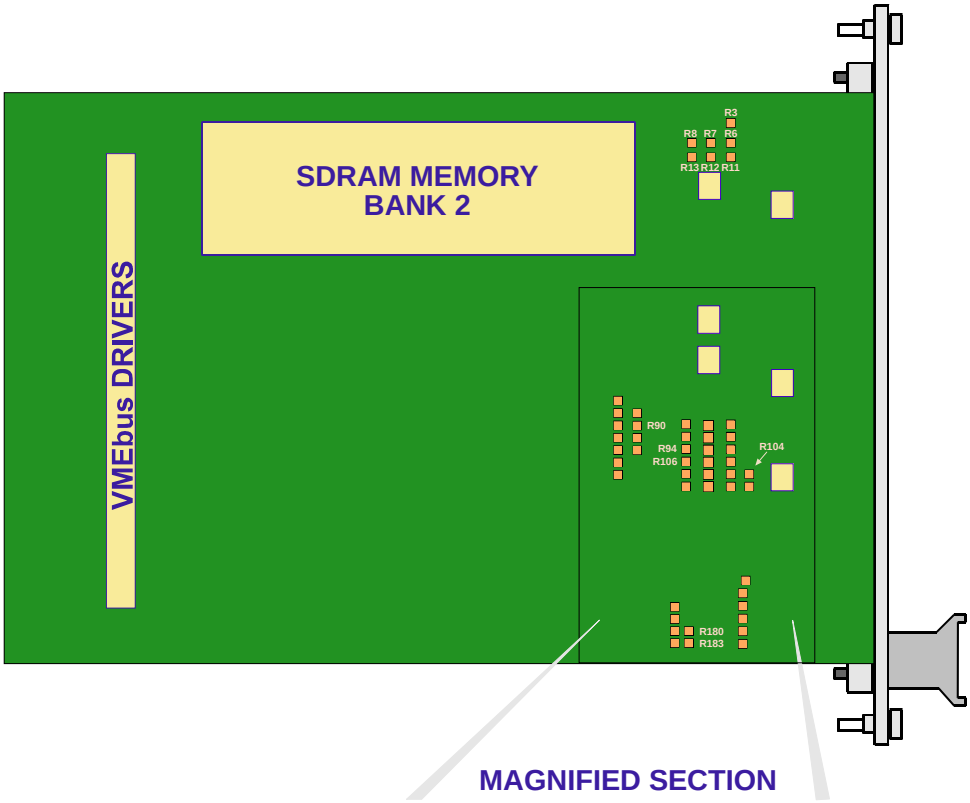
The following picture illustrates the construction of the JTAG chain.

Figure D-1: JTAG Chain Illustration

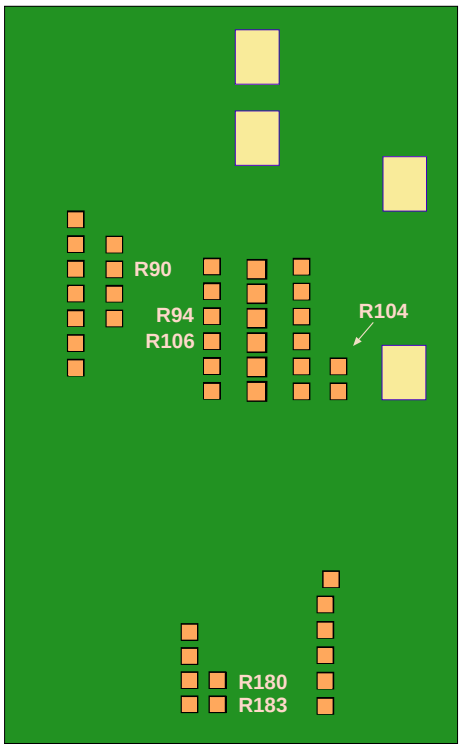


If EMULATOR access to the MPC8240 is required it must be ensured that R94 and R183 are set and also that R104 and R180 are removed (all resistors are 0R).

Figure D-2: Resistor Positions on Reverse of VMP1 Board



Resistors relevant to the JTAG Subsystem appear on the magnified section of the board



Please note that this diagram is not to scale with other board diagrams

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