

**MVME6100**  
**Single-Board Computer**

**Installation and Use**

**V6100A/IH1**

June 2004 Edition

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## Safety Summary

The following general safety precautions must be observed during all phases of operation, service, and repair of this equipment. Failure to comply with these precautions or with specific warnings elsewhere in this manual could result in personal injury or damage to the equipment.

The safety precautions listed below represent warnings of certain dangers of which Motorola is aware. You, as the user of the product, should follow these warnings and all other safety precautions necessary for the safe operation of the equipment in your operating environment.

### **Ground the Instrument.**

To minimize shock hazard, the equipment chassis and enclosure must be connected to an electrical ground. If the equipment is supplied with a three-conductor AC power cable, the power cable must be plugged into an approved three-contact electrical outlet, with the grounding wire (green/yellow) reliably connected to an electrical ground (safety ground) at the power outlet. The power jack and mating plug of the power cable meet International Electrotechnical Commission (IEC) safety standards and local electrical regulatory codes.

### **Do Not Operate in an Explosive Atmosphere.**

Do not operate the equipment in any explosive atmosphere such as in the presence of flammable gases or fumes. Operation of any electrical equipment in such an environment could result in an explosion and cause injury or damage.

### **Keep Away From Live Circuits Inside the Equipment.**

Operating personnel must not remove equipment covers. Only Factory Authorized Service Personnel or other qualified service personnel may remove equipment covers for internal subassembly or component replacement or any internal adjustment. Service personnel should not replace components with power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, such personnel should always disconnect power and discharge circuits before touching components.

### **Use Caution When Exposing or Handling a CRT.**

Breakage of a Cathode-Ray Tube (CRT) causes a high-velocity scattering of glass fragments (implosion). To prevent CRT implosion, do not handle the CRT and avoid rough handling or jarring of the equipment. Handling of a CRT should be done only by qualified service personnel using approved safety mask and gloves.

### **Do Not Substitute Parts or Modify Equipment.**

Do not install substitute parts or perform any unauthorized modification of the equipment. Contact your local Motorola representative for service and repair to ensure that all safety features are maintained.

### **Observe Warnings in Manual.**

Warnings, such as the example below, precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed. You should also employ all other safety precautions which you deem necessary for the operation of the equipment in your operating environment.



To prevent serious injury or death from dangerous voltages, use extreme caution when handling, testing, and adjusting this equipment and its components.

## Flammability

All Motorola PWBs (printed wiring boards) are manufactured with a flammability rating of 94V-0 by UL-recognized manufacturers.

## EMI Caution



This equipment generates, uses and can radiate electromagnetic energy. It may cause or be susceptible to electromagnetic interference (EMI) if not installed and used with adequate EMI protection.

## Lithium Battery Caution

This product contains a lithium battery to power the clock and calendar circuitry.



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



Il y a danger d'explosion s'il y a remplacement incorrect de la batterie. Remplacer uniquement avec une batterie du même type ou d'un type équivalent recommandé par le constructeur. Mettre au rebut les batteries usagées conformément aux instructions du fabricant.



Explosionsgefahr bei unsachgemäßem Austausch der Batterie. Ersatz nur durch denselben oder einen vom Hersteller empfohlenen Typ. Entsorgung gebrauchter Batterien nach Angaben des Herstellers.

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Motorola Computer Group products with the CE marking comply with the EMC Directive (89/336/EEC). Compliance with this directive implies conformity to the following European Norms:

EN55022 “Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment”; this product tested to Equipment Class A

EN55024 “Information technology equipment—Immunity characteristics—Limits and methods of measurement”

Board products are tested in a representative system to show compliance with the above mentioned requirements. A proper installation in a CE-marked system will maintain the required EMC performance.

In accordance with European Community directives, a “Declaration of Conformity” has been made and is available on request. Please contact your sales representative.

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Motorola, Inc.  
Computer Group  
2900 South Diablo Way  
Tempe, Arizona 85282

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# About This Manual

The *MVME6100 Single-Board Computer Installation and Use* manual provides the information you will need to install and configure your MVME6100 single-board computer. It provides specific preparation and installation information, and data applicable to the board.

As of the printing date of this manual, the MVME6100 supports the models listed below.

| <b>Model Number</b> | <b>Description</b>   |
|---------------------|--|
| MVME6100-0161       | 1.267 GHz MPC7457 processor, 512MB DDR memory, 128MB Flash, Scanbe handles |
| MVME6100-0163       | 1.267 GHz MPC7457 processor, 512MB DDR memory, 128MB Flash, IEEE handles   |
| MVME6100-0171       | 1.267 GHz MPC7457 processor, 1GB DDR memory, 128MB Flash, Scanbe handles   |
| MVME6100-0173       | 1.267 GHz MPC7457 processor, 1GB DDR memory, 128MB Flash, IEEE handles     |

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# Overview of Contents

This manual is divided into the following chapters and appendices:

[Chapter 1, \*Hardware Preparation and Installation\*](#), provides MVME6100 board preparation and installation instructions, as well as ESD precautionary notes.

[Chapter 2, \*Startup and Operation\*](#), provides the power-up procedure and identifies the switches and indicators on the MVMEM6100.

[Chapter 3, \*MOTLoad Firmware\*](#), describes the basic features of the MOTLoad firmware product.

[Chapter 4, \*Functional Description\*](#), describes the MVME6100 on a block diagram level.

[Chapter 5, \*Pin Assignments\*](#), provides pin assignments for various headers and connectors on the MMVE6100 single-board computer.

[Appendix A, \*Specifications\*](#), provides power requirements and environmental specifications.

[Appendix B, \*Thermal Validation\*](#), provides information to conduct thermal evaluations and identifies thermally significant components along with their maximum allowable operating temperatures.

[Appendix C, \*Related Documentation\*](#), provides a listing of related Motorola manuals, vendor documentation, and industry specifications.

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In all your correspondence, please list your name, position, and company. Be sure to include the title and part number of the manual and tell how you used it. Then tell us your feelings about its strengths and weaknesses and any recommendations for improvements.

## Conventions Used in This Manual

The following typographical conventions are used in this document:

### **bold**

is used for user input that you type just as it appears; it is also used for commands, options and arguments to commands, and names of programs, directories and files.

### *italic*

is used for names of variables to which you assign values, for function parameters, and for structure names and fields. Italic is also used for comments in screen displays and examples, and to introduce new terms.

### `courier`

is used for system output (for example, screen displays, reports), examples, and system prompts.



---

**<Enter>, <Return> or <CR>**

represents the carriage return or Enter key.

**Ctrl**

represents the Control key. Execute control characters by pressing the Ctrl key and the letter simultaneously, for example, Ctrl-d.

# Hardware Preparation and Installation

# 1

---

## Introduction

This chapter contains the following information:

- ❑ Board preparation and installation instructions
- ❑ ESD precautionary notes

## Description

The MVME6100 is a single-slot, single-board computer based on the MPC7457 processor, the MV64360 system controller, the Tsi148 VME Bridge ASIC, up to 1 GB of ECC-protected DDR DRAM, up to 128MB of flash memory, and a dual Gigabit Ethernet interface.

Front panel connectors on the MVME6100 board include: two RJ-45 connectors for the Gigabit Ethernet, one RJ-45 connector for the asynchronous serial port with integrated LEDs for BRDFAIL and CPU run indication, and a combined reset and abort switch.

The MVME6100 is shipped with one additional asynchronous serial port routed to an on-board header.

The MVME6100 contains two IEEE1386.1 PCI, PCI-X capable mezzanine card slots. The PMC slots are 64-bit capable and support both front and rear I/O. All I/O pins of PMC slot 1 and 46 I/O pins of PMC slot 2 are routed to the 5-row DIN, P2 connector. I/O pins 1 through 64 from J14 of PMC slot 1 are routed to row C and row A of P2. I/O pins 1 through 46 from J24 of PMC slot 2 are routed to row D and row Z of P2.

The MVME6100 has two planar PCI buses (PCI0 and PCI1). In order to support a more generic PCI bus hierarchy nomenclature, the MV64360 PCI buses will be referred to in this document as PCI bus 0 (root bridge instance 0, bus 0) and PCI bus 1 (root bridge instance 1, bus 0). PCI bus 1 connects to PMC slots 1 and 2 of the board. PCI bus 0 connects to the Tsi148 VME Bridge ASIC and PMCspan bridge (PCI6520). This interface

operates at PCI-X (133 MHz) speed. Both PCI planar buses are controlled by the MV64360 system controller.

Voltage Input/Output (VIO) for PCI bus 1 is set by the location of the PMC keying pins; both pins should be set to designate the same VIO, either +3.3V or +5V.

The MVME6100 board interfaces to the VMEbus via the P1 and P2 connectors, which use 5-row 160-pin connectors as specified in the VME64 Extension Standard. It also draws +12V and +5V power from the VMEbus backplane through these two connectors. The +3.3V, +2.5V, +1.8V, and processor core supplies are regulated on-board from the +5V power.

**Note** For maximum VMEbus performance, the MVME6100 should be mounted in a VME64x compatible backplane (5-row). 2eSST transfers are not supported when a 3-row backplane is used.

The MVME6100 supports multiple modes of I/O operation. By default, the board is configured for Ethernet port 2 to the front panel (non-specific transition module), and PMC slot 1 in IPMC mode. The board can be configured to route Ethernet port 2 to P2 and support MVME712M or MVME761 transition modules. The front/rear Ethernet and transition module options are configured by jumper block J30.

Selection of PMC slot 1 in PMC or IPMC mode is done by the jumper blocks J10, J15-J18, and J25-J28 (see [Table 1-2 on page 1-6](#)). IPMC mode is selected when an IPMC712 or IPMC761 module is used. If an IPMC is used, J30 should be configured for the appropriate transition module (see J30 configuration options as illustrated in [Front/Rear Ethernet and Transition Module Options Header \(J30\) on page 1-9](#)).

The IPMC712 and IPMC761 use AD11 as the IDSEL line for the Winbond PCI-ISA bridge device. This device supplies the four serial and one parallel port of the IPMC7xx module. The Discovery II PHB (MV64360) does not recognize address lines below AD16. For this reason, although an IPMC7xx module may be used on an MVME6100, the serial and parallel ports are not available, nor addressable. This issue will be resolved by MCG at a later date.

**Note** Other functions, such as Ethernet and SCSI interfaces, are function independent of the Winbond IDSEL line. The wide SCSI interface can only be supported through IPMC connector J3.

PMC mode is backwards compatible with the MVME5100 and MVME5500 and is accomplished by configuring the on-board jumpers.

## Getting Started

This section provides an overview of the steps necessary to install and power up the MVME6100 and a brief section on unpacking and ESD precautions.

### Overview of Startup Procedures

The following table lists the things you will need to do before you can use this board and tells where to find the information you need to perform each step. Be sure to read this entire chapter, including all Caution and Warning notes, before you begin.

**Table 1-1. Startup Overview**

| What you need to do...                                  | Refer to...  |
|---|--|
| Unpack the hardware.                                    | <i>Unpacking Guidelines on page 1-4</i>                    |
| Configure the hardware by setting jumpers on the board. | <i>MVME6100 Preparation on page 1-5</i>                    |
| Install the MVME6100 board in a chassis.                | <i>Installing the MVME6100 into a Chassis on page 1-12</i> |
| Connect any other equipment you will be using           | <i>Connection to Peripherals on page 1-13</i>              |
| Verify the hardware is installed.                       | <i>Completing the Installation on page 1-14</i>            |

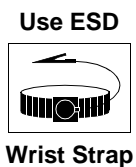
## Unpacking Guidelines

Unpack the equipment from the shipping carton. Refer to the packing list and verify that all items are present. Save the packing material for storing and reshipping of equipment.

**Note** If the shipping carton is damaged upon receipt, request that the carrier's agent be present during the unpacking and inspection of the equipment.



Avoid touching areas of integrated circuitry; static discharge can damage circuits.



Motorola strongly recommends that you use an antistatic wrist strap and a conductive foam pad when installing or upgrading a system. Electronic components, such as disk drives, computer boards, and memory modules can be extremely sensitive to electrostatic discharge (ESD). After removing the component from its protective wrapper or from the system, place the component flat on a grounded, static-free surface (and, in the case of a board, component side up). Do not slide the component over any surface.

If an ESD station is not available, you can avoid damage resulting from ESD by wearing an antistatic wrist strap (available at electronics stores) that is attached to an active electrical ground. Note that a system chassis may not be grounded if it is unplugged.



Inserting or removing modules with power applied may result in damage to module components.



Dangerous voltages, capable of causing death, are present in this equipment. Use extreme caution when handling, testing, and adjusting.

# Hardware Configuration

This section discusses certain hardware and software tasks that may need to be performed prior to installing the board in a chassis.

To produce the desired configuration and ensure proper operation of the MVME6100, you may need to carry out certain hardware modifications before installing the module.

Most options on the MVME6100 are software configurable. Configuration changes are made by setting bits in control registers after the board is installed in a system.

Jumpers/switches are used to control those options that are not software configurable. These jumper settings are described further on in this section. If you are resetting the board jumpers from their default settings, it is important to verify that all settings are reset properly.

## MVME6100 Preparation

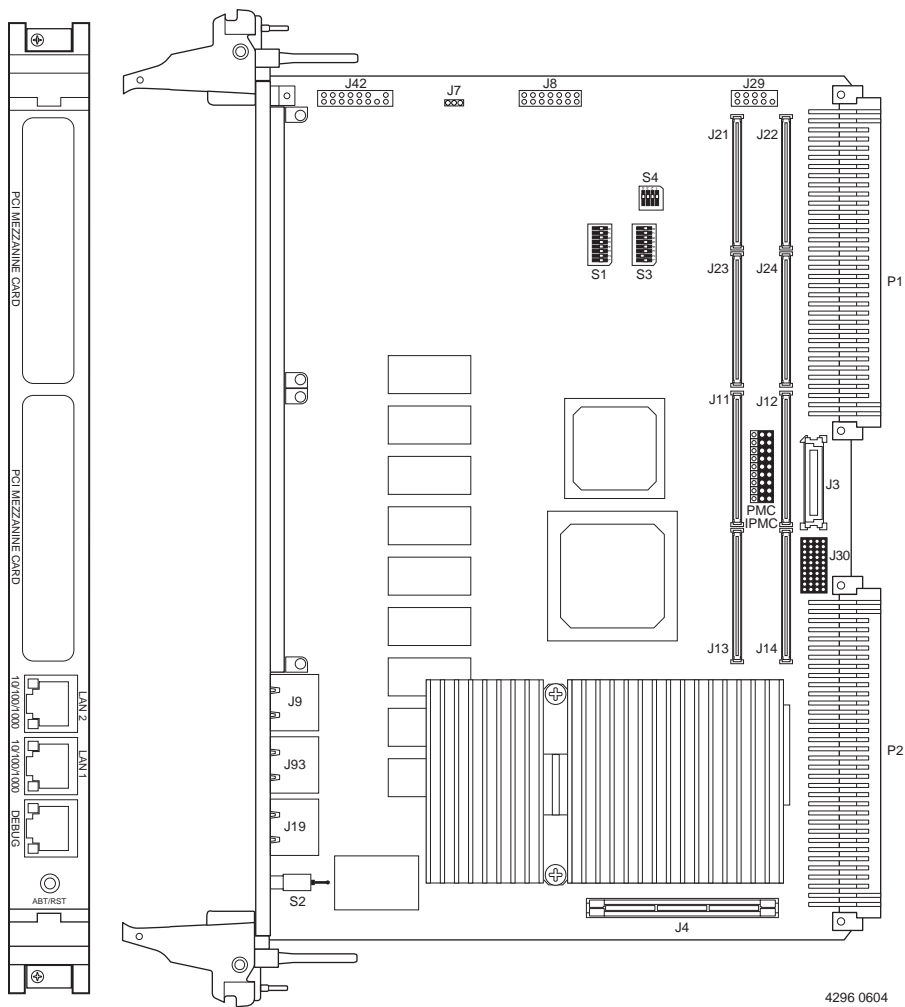
[Figure 1-1](#) illustrates the placement of the jumpers, headers, connectors, switches, and various other components on the MVME6100. There are several manually configurable headers on the MVME6100 and their settings are shown in [Table 1-2](#). Each header's default setting is enclosed in brackets. For pin assignments on the MVME6100, refer to [Chapter 5, Pin Assignments](#).

**Table 1-2. MVME6100 Jumper and Switch Settings**

| <b>Jumper/<br/>Switch</b>   | <b>Function</b>  | <b>Settings</b>  |  |
|-----------------------------|--|--|--|
| J7                          | SCON Header  | [No jumper installed]<br>1-2<br>2-3  | Auto-SCON<br>Always SCON<br>No SCON                  |
| J10,<br>J15–J18,<br>J25–J28 | PMC/IPMC Selection<br>Headers  | [Jumper installed]<br>1-2<br>[2-3]   | PMC I/O<br>IPMC I/O for IPMC7xx<br>support (default) |
| J30                         | Front/Rear Ethernet and<br>Transition Module Options<br>Header   | Refer to <i>Front/Rear Ethernet and Transition<br/>Module Options Header (J30)</i> on page 1-9 for<br>details. |  |
| S3                          | SRAM Configuration Switch,<br>sets board Geographical<br>Address   | Refer to <i>SRAM Configuration Switch (S3)</i> on page<br>1-10 for details.                                    |  |
| S4                          | Flash Boot Bank Select<br>Configuration Switch, sets<br>Write Protect A, Write Protect<br>B, Boot Bank Select, and Safe<br>Start | Refer to <i>Flash Boot Bank Select Configuration<br/>Switch (S4)</i> on page 1-11 for details.                 |  |

**Note** Items in brackets are factory default settings.

The MVME6100 is factory tested and shipped with the configuration described in the following sections.



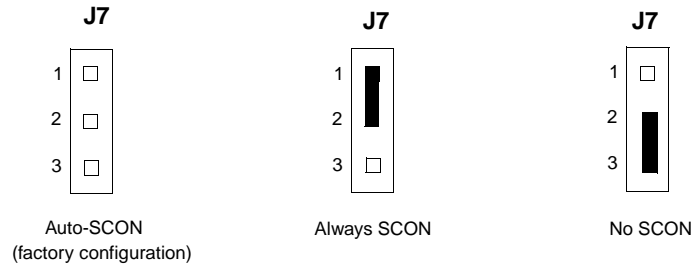
4296 0604

Figure 1-1. MVME6100 Layout



## SCON Header (J7)

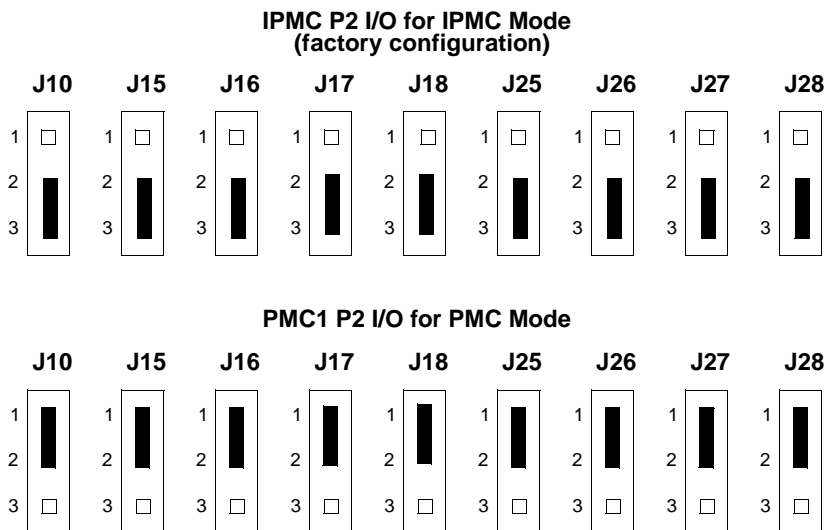
A 3-pin planar header allows the choice for auto/enable/disable SCON VME configuration. A jumper installed across pins 1 and 2 configures for SCON always enabled. A jumper installed across pins 2 and 3 configures for SCON disabled. No jumper installed configures for auto SCON.



## PMC/IPMC Selection Headers (J10, J15 – J18, J25 – J28)

Nine 3-pin planar headers are for PMC/IPMC mode I/O selection for PMC slot 1. These nine headers can also be combined into one single header block where a block shunt can be used as a jumper.

A jumper installed across pins 1 and 2 on all nine headers selects PMC1 for PMC I/O mode. A jumper across pins 2 and 3 on all nine headers selects IPMC I/O mode.



## Front/Rear Ethernet and Transition Module Options Header (J30)

A 40-pin planar header allows for selecting P2 options. Jumpers installed across Row A pins 3-10 and Row B pins 3-10 enable front Ethernet access. Jumpers installed across Row B pins 3-10 and Row C pins 3-10 enable P2 (rear) Gigabit Ethernet. Only when front Ethernet is enabled can the jumpers be installed across Row C and Row D on pins 1-10 to enable P2 (rear) PMC I/O. Note that all jumpers must be installed across the same two rows (all between Row A and Row B and/or Row C and Row D, or all between Row B and Row C).

The following illustration shows jumper setting options for J30. The factory default is shown where applicable:



Refer to [Front/Rear Ethernet and Transition Module Options Header \(J30\)](#) on page 5-29 for connector pin assignments.

## SROM Configuration Switch (S3)

A part of the 8-position SMT switch, S3 enables/disables the MV64360 SROM initialization and all I<sup>2</sup>C EEPROM write protection.

The SROM Init switch is OFF to disable the MV64360 device initialization via the I<sup>2</sup>C SROM. The switch is ON to enable this sequence.

The SROM WP switch is OFF to enable write protection on all I<sup>2</sup>C. The switch is ON to disable the I<sup>2</sup>C EEPROM write protection.

**Table 1-3. SROM Configuration Switch (S3)**

| POSITION      | 2       | 1            |
|---------------|---------|--------------|
| FUNCTION      | SROM WP | SROM_INIT    |
| DEFAULT (OFF) | WP      | No SROM_INIT |

S3 position 3-8 defines the VME Geographical Address if the MVME6100 is installed in a 3-row backplane. The following is the pinout:

| Position | Function |
|----------|----------|
| 3        | VMEGAP_L |
| 4        | VMEGA4_L |
| 5        | VMEGA3_L |
| 6        | VMEGA2_L |
| 7        | VMEGA1_L |
| 8        | VMEGA0_L |

Setting the individual position to ON forces the corresponding signal to zero. If the board is installed in a 5-row backplane, the geographical address is defined by the backplane and positions 3-8 of S3 should be set to OFF. The default setting is OFF.

## Flash Boot Bank Select Configuration Switch (S4)

A 4-position SMT configuration switch is located on the board to control Flash Bank B Boot block write-protect and Flash Bank A write-protect. Select the Flash Boot bank and the programmed/safe start ENV settings.

**Note** It is recommended that Bank B Write Protect *always* be enabled.

The Bank B Boot WP switch is OFF to indicate that the Flash Bank B Boot block is write-protected. The switch is ON to indicate no write-protection of Bank B Boot block.

The Bank A WP switch is OFF to indicate that the entire Flash Bank A is write-protected. The switch is ON to indicate no write-protection of Bank A Boot block.

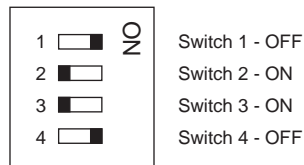
When the Boot Bank Sel Switch is ON, the board boots from Bank B, when OFF, the board boots from Bank A. Default is ON (boot from Bank B).

When the Safe Start switch is set OFF, normal boot sequence should be followed by MOTLoad. When ON, MOTLoad executes Safe Start, during which the user can select the Alternate Boot Image.

**Table 1-4. Configuration Switch (S4)**

| POSITION        | 4              | 3           | 2             | 1               |
|-----------------|----------------|-------------|---------------|-----------------|
| FUNCTION        | BANK B BOOT WP | BANK A WP   | BOOT BANK SEL | SAFE START      |
| FACTORY DEFAULT | OFF<br>WP      | ON<br>No WP | ON<br>Bank B  | OFF<br>Norm ENV |

The S4 Configuration Switch is set with the following default settings:



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## Hardware Installation

### Installing the MVME6100 into a Chassis

Use the following steps to install the MVME6100 into your computer chassis.

1. Attach an ESD strap to your wrist. Attach the other end of the ESD strap to an electrical ground (refer to [Unpacking Guidelines](#)). The ESD

strap must be secured to your wrist and to ground throughout the procedure.

2. Remove any filler panel that might fill that slot.
3. Install the top and bottom edge of the MVME6100 into the guides of the chassis.



Only use injector handles for board insertion to avoid damage/deformation to the front panel and/or PCB. Deformation of the front panel can cause an electrical short or other board malfunction.

4. Ensure that the levers of the two injector/ejectors are in the outward position.
5. Slide the MVME6100 into the chassis until resistance is felt.
6. Simultaneously move the injector/ejector levers in an inward direction.
7. Verify that the MVME6100 is properly seated and secure it to the chassis using the two screws located adjacent to the injector/ejector levers.
8. Connect the appropriate cables to the MVME6100.

To remove the board from the chassis, press the red locking tabs (IEEE handles only) and reverse the procedure.

## Connection to Peripherals

When the MVME6100 is installed in a chassis, you are ready to connect peripherals and apply power to the board.

Figure 1-1 on page 1-7 shows the locations of the various connectors while Table 1-5 lists them for you. Refer to Chapter 5, *Pin Assignments* for the pin assignments of the connectors listed below.

**Table 1-5. MVME6100 Connectors**

| Connector          | Function                                  |
|--------------------|---|
| J3                 | IPMC761/712 connector                     |
| J4                 | PMC expansion connector                   |
| J9, J93            | Gigabit Ethernet connectors               |
| J11, J12, J13, J14 | PCI mezzanine card (PMC) slot 1 connector |
| J19                | COM1 connector                            |
| J21, J22, J23, J24 | PCI mezzanine card (PMC) slot 2 connector |
| J29                | COM2 planar connector                     |
| P1, P2             | VME rear panel connectors                 |

## Completing the Installation

Verify that hardware is installed and the power/peripheral cables connected are appropriate for your system configuration.

Replace the chassis or system cover, reconnect the system to the AC or DC power source, and turn the equipment power on.

---

## Introduction

This chapter gives you information about the:

- Power-up procedure
- Switches and indicators

## Applying Power

After you verify that all necessary hardware preparation is complete and all connections are made correctly, you can apply power to the system.

When you are ready to apply power to the MVME6100:

- Verify that the chassis power supply voltage setting matches the voltage present in the country of use (if the power supply in your system is not auto-sensing)
- On powering up, the MVME6100 brings up the MOTLoad prompt, `MVME6100>`

## Switches and Indicators

The MVME6100 board provides a single pushbutton switch that provides both abort and reset (ABT/RST) functions. When the switch is depressed for less than three seconds, an abort interrupt is generated to the processor. If the switch is held for more than three seconds, a board hard reset is generated. The board hard reset will reset the MPC7457, MV64360, Tsi148 VME Bridge ASIC, PCI6520, PMC1/2 slots, both Ethernet PHYs, serial ports, PMCspan slot, both flash banks, and the device bus control PLD. If the MVME6100 is enabled for VME system controller, the VME bus will be reset and local reset input is sent to the Tsi148 VME controller.



The MVME6100 has two front-panel indicators:

- ❑ BDFAIL, software controlled and asserted by firmware (or other software) to indicate a configuration problem (or other failure)
- ❑ CPU, connected to a CPU bus control signal to indicate bus transfer activity

The following table describes these indicators:

**Table 2-1. Front-Panel LED Status Indicators**

| <b>Function</b>  | <b>Label</b> | <b>Color</b> | <b>Description</b>  |
|------------------|--------------|--------------|---------------------|
| CPU Bus Activity | CPU          | Green        | CPU bus is busy     |
| Board Fail       | BDFAIL       | Yellow       | Board has a failure |

---

## Introduction

This chapter describes the basic features of the MOTLoad firmware product, designed by Motorola as the next generation initialization, debugger, and diagnostic tool for high-performance embedded board products using state-of-the-art system memory controllers and bridge chips, such as the MV64360.

In addition to an overview of the product, this chapter includes a list of standard MOTLoad commands, the default VME and firmware settings that are changeable by the user, remote start, and the alternate boot procedure.

## Overview

The MOTLoad firmware package serves as a board power-up and initialization package, as well as a vehicle from which user applications can be booted. A secondary function of the MOTLoad firmware is to serve in some respects as a test suite providing individual tests for certain devices.

MOTLoad is controlled through an easy-to-use, UNIX-like, command line interface. The MOTLoad software package is similar to many end-user applications designed for the embedded market, such as the real time operating systems currently available.

Refer to the *MOTLoad Firmware Package User's Manual*, listed in [Appendix C, Related Documentation](#), for more details.

## MOTLoad Implementation and Memory Requirements

The implementation of MOTLoad and its memory requirements are product specific. The MVME6100 single-board computer (SBC) is offered with a wide range of memory (for example, DRAM, external cache, flash). Typically, the smallest amount of on-board DRAM that a Motorola SBC

has is 32MB. Each supported Motorola product line has its own unique MOTLoad binary image(s). Currently the largest MOTLoad compressed image is less than 1MB in size.

## MOTLoad Commands

MOTLoad supports two types of commands (applications): utilities and tests. Both types of commands are invoked from the MOTLoad command line in a similar fashion. Beyond that, MOTLoad utilities and MOTLoad tests are distinctly different.

## MOTLoad Utility Applications

The definition of a MOTLoad utility application is very broad. Simply stated, it is considered a MOTLoad command, if it is not a MOTLoad test. Typically, MOTLoad utility applications are applications that aid the user in some way (that is, they do something useful). From the perspective of MOTLoad, examples of utility applications are: configuration, data/status displays, data manipulation, help routines, data/status monitors, etc.

Operationally, MOTLoad utility applications differ from MOTLoad test applications in several ways:

- ❑ Only one utility application operates at any given time (that is, multiple utility applications cannot be executing concurrently)
- ❑ Utility applications may interact with the user. Most test applications do not.

## MOTLoad Tests

A MOTLoad test application determines whether or not the hardware meets a given standard. Test applications are validation tests. Validation is conformance to a specification. Most MOTLoad tests are designed to directly validate the functionality of a specific SBC subsystem or component. These tests validate the operation of such SBC modules as: dynamic memory, external cache, NVRAM, real time clock, etc.

All MOTLoad tests are designed to validate functionality with minimum user interaction. Once launched, most MOTLoad tests operate automatically without any user interaction. There are a few tests where the functionality being validated requires user interaction (that is, switch tests, interactive plug-in hardware modules, etc.). Most MOTLoad test results (error-data/status-data) are logged, not printed. All MOTLoad tests/commands have complete and separate descriptions (refer to the *MOTLoad Firmware Package User's Manual* for this information).

All devices that are available to MOTLoad for validation/verification testing are represented by a unique device path string. Most MOTLoad tests require the operator to specify a test device at the MOTLoad command line when invoking the test.

A listing of all device path strings can be displayed through the **devShow** command. If an SBC device does not have a device path string, it is not supported by MOTLoad and can not be directly tested. There are a few exceptions to the device path string requirement, like testing RAM, which is not considered a true device and can be directly tested without a device path string. Refer to the **devShow** command description page in the *MOTLoad Firmware Package User's Manual*.

Most MOTLoad tests can be organized to execute as a group of related tests (a testSuite) through the use of the **testSuite** command. The expert operator can customize their testing by defining and creating a custom testSuite(s). The list of built-in and user-defined MOTLoad testSuites, and their test contents, can be obtained by entering **testSuite -d** at the MOTLoad prompt. All testSuites that are included as part of a product specific MOTLoad firmware package are product specific. For more information, refer to the **testSuite** command description page in the *MOTLoad Firmware Package User's Manual*.

Test results and test status are obtained through the **testStatus**, **errorDisplay**, and **taskActive** commands. Refer to the appropriate command description page in the *MOTLoad Firmware Package User's Manual* for more information.

## Using MOTLoad

Interaction with MOTLoad is performed via a command line interface through a serial port on the SBC, which is connected to a terminal or terminal emulator (for example, Window's Hypercomm). The default MOTLoad serial port settings are: 9600 baud, 8 bits, no parity.

### Command Line Interface

The MOTLoad command line interface is similar to a UNIX command line shell interface. Commands are initiated by entering a valid MOTLoad command (a text string) at the MOTLoad command line prompt and pressing the carriage-return key to signify the end of input. MOTLoad then performs the specified action. An example of a MOTLoad command line prompt is shown below. The MOTLoad prompt changes according to what product it is used on (for example, MVME5500, MVME6100).

Example:

```
MVME6100>
```

If an invalid MOTLoad command is entered at the MOTLoad command line prompt, MOTLoad displays a message that the command was not found.

Example:

```
MVME6100> mytest
```

```
"mytest" not found  
MVME6100>
```

If the user enters a partial MOTLoad command string that can be resolved to a unique valid MOTLoad command and presses the carriage-return key, the command will be executed as if the entire command string had been entered. This feature is a user-input shortcut that minimizes the required amount of command line input. MOTLoad is an ever changing firmware package, so user-input shortcuts may change as command additions are made.

Example:

```
MVME6100> version
```

```
Copyright: Motorola Inc.1999-2002, All Rights Reserved  
MOTLoad RTOS Version 2.0  
PAL Version 0.1 (Motorola MVME6100)
```

Example:

```
MVME6100> ver
```

```
Copyright: Motorola Inc. 1999-2002, All Rights Reserved  
MOTLoad RTOS Version 2.0  
PAL Version 0.1 (Motorola MVME6100)
```

If the partial command string cannot be resolved to a single unique command, MOTLoad will inform the user that the command was ambiguous.

Example:

```
MVME6100> te
```

```
"te" ambiguous  
MVME6100>
```

## Command Line Help

Each MOTLoad firmware package has an extensive, product-specific help facility that can be accessed through the **help** command. The user can enter **help** at the MOTLoad command line to display a complete listing of all available tests and utilities.

Example

```
MVME6100> help
```

For help with a specific test or utility the user can enter the following at the MOTLoad prompt:

```
help <command_name>
```

The **help** command also supports a limited form of pattern matching. Refer to the **help** command page.

### Example

```
MVME6100> help testRam
```

```
Usage: testRam [-aPh] [-bPh] [-iPd] [-nPh] [-tPd] [-v]
Description: RAM Test [Directory]
Argument/Option Description
-a Ph: Address to Start (Default = Dynamic Allocation)
-b Ph: Block Size (Default = 16KB)
-i Pd: Iterations (Default = 1)
-n Ph: Number of Bytes (Default = 1MB)
-t Ph: Time Delay Between Blocks in OS Ticks (Default = 1)
-v O : Verbose Output
MVME6100>
```

## Command Line Rules

There are a few things to remember when entering a MOTLoad command:

- ❑ Multiple commands are permitted on a single command line, provided they are separated by a single semicolon (;)
- ❑ Spaces separate the various fields on the command line (command/arguments/options)
- ❑ The argument/option identifier character is always preceded by a hyphen (-) character
- ❑ Options are identified by a single character
- ❑ Option arguments immediately follow (no spaces) the option
- ❑ All commands, command options, and device tree strings are case sensitive

Example:

```
MVME6100> flashProgram -d/dev/flash0 -n00100000
```

For more information on MOTLoad operation and function, refer to the *MOTLoad Firmware Package User's Manual*.

# MOTLoad Command List

The following table provides a list of all current MOTLoad commands. Products supported by MOTLoad may or may not employ the full command set. Typing **help** at the MOTLoad command prompt will display all commands supported by MOTLoad for a given product.

**Table 3-1. MOTLoad Commands**

| Command              | Description   |
|----------------------|---|
| <b>as</b>            | One-Line Instruction Assembler                          |
| <b>bc b bch bcw</b>  | Block Compare Byte/Halfword/Word                        |
| <b>bdTempShow</b>    | Display Current Board Temperature                       |
| <b>bfb bfh bfw</b>   | Block Fill Byte/Halfword/Word                           |
| <b>blkCp</b>         | Block Copy  |
| <b>blkFmt</b>        | Block Format  |
| <b>blkRd</b>         | Block Read  |
| <b>blkShow</b>       | Block Show Device Configuration Data                    |
| <b>blkVe</b>         | Block Verify  |
| <b>blkWr</b>         | Block Write   |
| <b>bmb bmh bmw</b>   | Block Move Byte/Halfword/Word                           |
| <b>br</b>            | Assign/Delete/Display User-Program Break-Points         |
| <b>bsb bsh bsw</b>   | Block Search Byte/Halfword/Word                         |
| <b>bvb bv h bv w</b> | Block Verify Byte/Halfword/Word                         |
| <b>cdDir</b>         | ISO9660 File System Directory Listing                   |
| <b>cdGet</b>         | ISO9660 File System File Load                           |
| <b>clear</b>         | Clear the Specified Status/History Table(s)             |
| <b>cm</b>            | Turns on Concurrent Mode                                |
| <b>csb csh csw</b>   | Calculates a Checksum Specified by Command-line Options |
| <b>devShow</b>       | Display (Show) Device/Node Table                        |



**Table 3-1. MOTLoad Commands (continued)**

| <b>Command</b>      | <b>Description</b>   |
|---------------------|--|
| <b>diskBoot</b>     | Disk Boot (Direct-Access Mass-Storage Device)              |
| <b>downLoad</b>     | Down Load S-Record from Host                               |
| <b>ds</b>           | One-Line Instruction Disassembler                          |
| <b>echo</b>         | Echo a Line of Text  |
| <b>elfLoader</b>    | ELF Object File Loader                                     |
| <b>errorDisplay</b> | Display the Contents of the Test Error Status Table        |
| <b>eval</b>         | Evaluate Expression  |
| <b>execProgram</b>  | Execute Program  |
| <b>fatDir</b>       | FAT File System Directory Listing                          |
| <b>fatGet</b>       | FAT File System File Load                                  |
| <b>fdShow</b>       | Display (Show) File Descriptor                             |
| <b>flashProgram</b> | Flash Memory Program                                       |
| <b>flashShow</b>    | Display Flash Memory Device Configuration Data             |
| <b>gd</b>           | Go Execute User-Program Direct (Ignore Break-Points)       |
| <b>gevDelete</b>    | Global Environment Variable Delete                         |
| <b>gevDump</b>      | Global Environment Variable(s) Dump (NVRAM Header + Data)  |
| <b>gevEdit</b>      | Global Environment Variable Edit                           |
| <b>gevInit</b>      | Global Environment Variable Area Initialize (NVRAM Header) |
| <b>gevList</b>      | Global Environment Variable Labels (Names) Listing         |
| <b>gevShow</b>      | Global Environment Variable Show                           |
| <b>gn</b>           | Go Execute User-Program to Next Instruction                |
| <b>go</b>           | Go Execute User-Program                                    |
| <b>gt</b>           | Go Execute User-Program to Temporary Break-Point           |
| <b>hbd</b>          | Display History Buffer                                     |
| <b>hbx</b>          | Execute History Buffer Entry                               |

**Table 3-1. MOTLoad Commands (continued)**

| <b>Command</b>     | <b>Description</b>                                   |
|--------------------|--|
| <b>help</b>        | Display Command/Test Help Strings                    |
| <b>l2CacheShow</b> | Display state of L2 Cache and L2CR register contents |
| <b>l3CacheShow</b> | Display state of L3 Cache and L3CR register contents |
| <b>mdb mdh mdw</b> | Memory Display Bytes/Halfwords/Words                 |
| <b>memShow</b>     | Display Memory Allocation                            |
| <b>mmb mmh mmw</b> | Memory Modify Bytes/Halfwords/Words                  |
| <b>netBoot</b>     | Network Boot (BOOT/TFTP)                             |
| <b>netShow</b>     | Display Network Interface Configuration Data         |
| <b>netShut</b>     | Disable (Shutdown) Network Interface                 |
| <b>netStats</b>    | Display Network Interface Statistics Data            |
| <b>noCm</b>        | Turns off Concurrent Mode                            |
| <b>pciDataRd</b>   | Read PCI Device Configuration Header Register        |
| <b>pciDataWr</b>   | Write PCI Device Configuration Header Register       |
| <b>pciDump</b>     | Dump PCI Device Configuration Header Register        |
| <b>pciShow</b>     | Display PCI Device Configuration Header Register     |
| <b>pciSpace</b>    | Display PCI Device Address Space Allocation          |
| <b>ping</b>        | Ping Network Host                                    |
| <b>portSet</b>     | Port Set   |
| <b>portShow</b>    | Display Port Device Configuration Data               |
| <b>rd</b>          | User Program Register Display                        |
| <b>reset</b>       | Reset System   |
| <b>rs</b>          | User Program Register Set                            |
| <b>set</b>         | Set Date and Time                                    |
| <b>sromRead</b>    | SROM Read  |
| <b>sromWrite</b>   | SROM Write   |

**Table 3-1. MOTLoad Commands (continued)**

| <b>Command</b>           | <b>Description</b>                            |
|--------------------------|---|
| <b>sta</b>               | Symbol Table Attach                           |
| <b>stl</b>               | Symbol Table Lookup                           |
| <b>stop</b>              | Stop Date and Time (Power-Save Mode)          |
| <b>taskActive</b>        | Display the Contents of the Active Task Table |
| <b>tc</b>                | Trace (Single-Step) User Program              |
| <b>td</b>                | Trace (Single-Step) User Program to Address   |
| <b>testDisk</b>          | Test Disk                                     |
| <b>testEnetPtP</b>       | Ethernet Point-to-Point                       |
| <b>testNvramRd</b>       | NVRAM Read                                    |
| <b>testNvramRdWr</b>     | NVRAM Read/Write (Destructive)                |
| <b>testRam</b>           | RAM Test (Directory)                          |
| <b>testRamAddr</b>       | RAM Addressing                                |
| <b>testRamAlt</b>        | RAM Alternating                               |
| <b>testRamBitToggle</b>  | RAM Bit Toggle                                |
| <b>testRamBounce</b>     | RAM Bounce                                    |
| <b>testRamCodeCopy</b>   | RAM Code Copy and Execute                     |
| <b>testRamEccMonitor</b> | Monitor for ECC Errors                        |
| <b>testRamMarch</b>      | RAM March                                     |
| <b>testRamPatterns</b>   | RAM Patterns                                  |
| <b>testRamPerm</b>       | RAM Permutations                              |
| <b>testRamQuick</b>      | RAM Quick                                     |
| <b>testRamRandom</b>     | RAM Random Data Patterns                      |
| <b>testRtcAlarm</b>      | RTC Alarm                                     |
| <b>testRtcReset</b>      | RTC Reset                                     |
| <b>testRtcRollOver</b>   | RTC Rollover                                  |

**Table 3-1. MOTLoad Commands (continued)**

| <b>Command</b>           | <b>Description</b>                                  |
|--------------------------|---|
| <b>testRtcTick</b>       | RTC Tick  |
| <b>testSerialExtLoop</b> | Serial External Loopback                            |
| <b>testSerialIntLoop</b> | Serial Internal Loopback                            |
| <b>testStatus</b>        | Display the Contents of the Test Status Table       |
| <b>testSuite</b>         | Execute Test Suite                                  |
| <b>testSuiteMake</b>     | Make (Create) Test Suite                            |
| <b>testThermoOp</b>      | Thermometer Temp Limit Operational Test             |
| <b>testThermoQ</b>       | Thermometer Temp Limit Quick Test                   |
| <b>testThermoRange</b>   | Tests That Board Thermometer is Within Range        |
| <b>testWatchdogTimer</b> | Tests the Accuracy of the Watchdog Timer Device     |
| <b>tftpGet</b>           | TFTP Get  |
| <b>tftpPut</b>           | TFTP Put  |
| <b>time</b>              | Display Date and Time                               |
| <b>transparentMode</b>   | Transparent Mode (Connect to Host)                  |
| <b>tsShow</b>            | Display Task Status                                 |
| <b>upLoad</b>            | Up Load Binary Data from Target                     |
| <b>version</b>           | Display Version String(s)                           |
| <b>vmeCfg</b>            | Manages user specified VME configuration parameters |
| <b>vpdDisplay</b>        | VPD Display   |
| <b>vpdEdit</b>           | VPD Edit  |
| <b>waitProbe</b>         | Wait for I/O Probe to Complete                      |

## Default VME Settings

As shipped from the factory, the MVME6100 has the following VME configuration programmed via Global Environment Variables (GEVs) for the Tsi148 VME controller. The firmware allows certain VME settings to be changed in order for the user to customize the environment. The following is a description of the default VME settings that are changeable by the user. For more information, refer to the *MOTLoad User's Manual* and Tundra's *Tsi148 User Manual*, listed in [Appendix C, Related Documentation](#).

❑ MVME6100> **vmeCfg -s -m**

```
Displaying the selected Default VME Setting
- interpreted as follows:
VME PCI Master Enable [Y/N] = Y
MVME6100>
```

The PCI Master is enabled.

❑ MVME6100> **vmeCfg -s -r234**

```
Displaying the selected Default VME Setting
- interpreted as follows:
VMEbus Master Control Register = 00000003
MVME6100>
```

The VMEbus Master Control Register is set to the default (RESET) condition.

❑ MVME6100> **vmeCfg -s -r238**

```
Displaying the selected Default VME Setting
- interpreted as follows:
VMEbus Control Register = 00000008
MVME6100>
```

The VMEbus Control Register is set to a Global Timeout of 2048  $\mu$ seconds.

❑ MVME6100> **vmeCfg -s -r414**

```
Displaying the selected Default VME Setting
- interpreted as follows:
CRG Attribute Register = 00000000
CRG Base Address Upper Register = 00000000
```

```
CRG Base Address Lower Register = 00000000
MVME6100>
```

The CRG Attribute Register is set to the default (RESET) condition.

```
❑ MVME6100> vmeCfg -s -i0
```

```
Displaying the selected Default VME Setting
- interpreted as follows:
Inbound Image 0 Attribute Register = 000227AF
Inbound Image 0 Starting Address Upper Register = 00000000
Inbound Image 0 Starting Address Lower Register = 00000000
Inbound Image 0 Ending Address Upper Register = 00000000
Inbound Image 0 Ending Address Lower Register = 1FFF0000
Inbound Image 0 Translation Offset Upper Register = 00000000
Inbound Image 0 Translation Offset Lower Register = 00000000
MVME6100>
```

Inbound window 0 (ITAT0) is not enabled; Virtual FIFO at 256 bytes, 2eSST timing at SST320, respond to 2eSST, 2eVME, MBLT, and BLT cycles, A32 address space, respond to Supervisor, User, Program, and Data cycles. Image maps from 0x00000000 to 0x1FFF0000 on the VMBus, translates 1x1 to the PCI-X bus (thus 1x1 to local memory). To enable this window, set bit 31 of ITAT0 to 1.

**Note** For Inbound Translations, the Upper Translation Offset Register needs to be set to 0xFFFFFFFF to ensure proper translations to the PCI-X Local Bus.

```
❑ MVME6100> vmeCfg -s -o1
```

```
Displaying the selected Default VME Setting
- interpreted as follows:
Outbound Image 1 Attribute Register = 80001462
Outbound Image 1 Starting Address Upper Register = 00000000
Outbound Image 1 Starting Address Lower Register = 91000000
Outbound Image 1 Ending Address Upper Register = 00000000
Outbound Image 1 Ending Address Lower Register = AFFF0000
Outbound Image 1 Translation Offset Upper Register = 00000000
Outbound Image 1 Translation Offset Lower Register = 70000000
Outbound Image 1 2eSST Broadcast Select Register = 00000000
MVME6100>
```

Outbound window 1 (OTAT1) is enabled, 2eSST timing at SST320, transfer mode of 2eSST, A32/D32 Supervisory access. The window accepts transfers on the PCI-X Local Bus from 0x91000000-0xAFFF0000 and translates them onto the VMEbus using an offset of 0x70000000, thus an access to 0x91000000 on the PCI-X Local Bus becomes an access to 0x01000000 on the VMEbus.

```
❑ MVME6100> vmeCfg -s -o2
```

```
Displaying the selected Default VME Setting
```

```
- interpreted as follows:
```

```
Outbound Image 2 Attribute Register = 80001061
```

```
Outbound Image 2 Starting Address Upper Register = 00000000
```

```
Outbound Image 2 Starting Address Lower Register = B0000000
```

```
Outbound Image 2 Ending Address Upper Register = 00000000
```

```
Outbound Image 2 Ending Address Lower Register = B0FF0000
```

```
Outbound Image 2 Translation Offset Upper Register = 00000000
```

```
Outbound Image 2 Translation Offset Lower Register = 40000000
```

```
Outbound Image 2 2eSST Broadcast Select Register = 00000000
```

```
MVME6100>
```

Outbound window 2 (OTAT2) is enabled, 2eSST timing at SST320, transfer mode of SCT, A24/D32 Supervisory access. The window accepts transfers on the PCI-X Local Bus from 0xB0000000-0xB0FF0000 and translates them onto the VMEbus using an offset of 0x40000000, thus an access to 0xB0000000 on the PCI-X Local Bus becomes an access to 0xF0000000 on the VMEbus.

```
❑ MVME6100> vmeCfg -s -o3
```

```
Displaying the selected Default VME Setting
```

```
- interpreted as follows:
```

```
Outbound Image 3 Attribute Register = 80001061
```

```
Outbound Image 3 Starting Address Upper Register = 00000000
```

```
Outbound Image 3 Starting Address Lower Register = B3FF0000
```

```
Outbound Image 3 Ending Address Upper Register = 00000000
```

```
Outbound Image 3 Ending Address Lower Register = B3FF0000
```

```
Outbound Image 3 Translation Offset Upper Register = 00000000
```

```
Outbound Image 3 Translation Offset Lower Register = 4C000000
```

```
Outbound Image 3 2eSST Broadcast Select Register = 00000000
```

```
MVME6100>
```

Outbound window 3 (OTAT3) is enabled, 2eSST timing at SST320, transfer mode of SCT, A16/D32 Supervisory access. The window accepts transfers on the PCI-X Local Bus from 0xB3FF0000-0xB3FF0000 and translates them onto the VMEbus using an offset of 0x4C000000, thus an access to 0xB3FF0000 on the PCI-X Local Bus becomes an access to 0xFFFF0000 on the VMEbus.

```
❑ MVME6100> vmeCfg -s -o7
```

```
Displaying the selected Default VME Setting  
- interpreted as follows:
```

```
Outbound Image 7 Attribute Register = 80001065  
Outbound Image 7 Starting Address Upper Register = 00000000  
Outbound Image 7 Starting Address Lower Register = B1000000  
Outbound Image 7 Ending Address Upper Register = 00000000  
Outbound Image 7 Ending Address Lower Register = B1FF0000  
Outbound Image 7 Translation Offset Upper Register = 00000000  
Outbound Image 7 Translation Offset Lower Register = 4F000000  
Outbound Image 7 2eSST Broadcast Select Register = 00000000  
MVME6100>
```

Outbound window 7 (OTAT7) is enabled, 2eSST timing at SST320, transfer mode of SCT, CR/CSR Supervisory access. The window accepts transfers on the PCI-X Local Bus from 0xB1000000-0xB1FF0000 and translates them onto the VMEbus using an offset of 0x4F000000, thus an access to 0xB1000000 on the PCI-X Local Bus becomes an access to 0x00000000 on the VMEbus.



## Firmware Settings

The following sections provide additional information pertaining to the VME firmware settings of the MVME6100. A few VME settings are controlled by hardware jumpers while the majority of the VME settings are managed by the firmware command utility **vmeCfg**.

### CR/CSR Settings

The CR/CSR base address is initialized to the appropriate setting based on the Geographical address; that is, the VME slot number. See the VME64 Specification and the VME64 Extensions for details. As a result, a 512K byte CR/CSR area can be accessed from the VMEbus using the CR/CSR AM code.

### Displaying VME Settings

To display the changeable VME setting, type the following at the firmware prompt:

- vmeCfg -s -m**  
Displays Master Enable state
- vmeCfg -s -i(0 - 7)**  
Displays selected Inbound Window state
- vmeCfg -s -o(0 - 7)**  
Displays selected Outbound Window state
- vmeCfg -s -r184**  
Displays PCI Miscellaneous Register state
- vmeCfg -s -r188**  
Displays Special PCI Target Image Register state
- vmeCfg -s -r400**  
Displays Master Control Register state

- vmeCfg -s -r404**  
Displays Miscellaneous Control Register state
- vmeCfg -s -r40C**  
Displays User AM Codes Register state
- vmeCfg -s -rF70**  
Displays VMEbus Register Access Image Control Register state

## Editing VME Settings

To edit the changeable VME setting, type the following at the firmware prompt:

- vmeCfg -e -m**  
Edits Master Enable state
- vmeCfg -e -i(0 - 7)**  
Edits selected Inbound Window state
- vmeCfg -e -o(0 - 7)**  
Edits selected Outbound Window state
- vmeCfg -e -r184**  
Edits PCI Miscellaneous Register state
- vmeCfg -e -r188**  
Edits Special PCI Target Image Register state
- vmeCfg -e -r400**  
Edits Master Control Register state
- vmeCfg -e -r404**  
Edits Miscellaneous Control Register state
- vmeCfg -e -r40C**  
Edits User AM Codes Register state
- vmeCfg -e -rF70**  
Edits VMEbus Register Access Image Control Register state

## Deleting VME Settings

To delete the changeable VME setting (restore default value), type the following at the firmware prompt:

- vmeCfg -d -m**  
Deletes Master Enable state
- vmeCfg -d -i(0 - 7)**  
Deletes selected Inbound Window state
- vmeCfg -d -o(0 - 7)**  
Deletes selected Outbound Window state
- vmeCfg -d -r184**  
Deletes PCI Miscellaneous Register state
- vmeCfg -d -r188**  
Deletes Special PCI Target Image Register state
- vmeCfg -d -r400**  
Deletes Master Control Register state
- vmeCfg -d -r404**  
Deletes Miscellaneous Control Register state
- vmeCfg -d -r40C**  
Deletes User AM Codes Register state
- vmeCfg -d -rF70**  
Deletes VMEbus Register Access Image Control Register state

## Restoring Default VME Settings

To restore all of the changeable VME setting back to their default settings, type the following at the firmware prompt:

**vmeCfg -z**

## Remote Start

As described in the *MOTLoad Firmware Package User's Manual*, listed in [Appendix C, Related Documentation](#), remote start allows the user to obtain information about the target board, download code and/or data, modify memory on the target, and execute a downloaded program. These transactions occur across the VMEbus in the case of the MVME6100. MOTLoad uses one of four mailboxes in the Tsi148 VME controller as the inter-board communication address (IBCA) between the host and the target.

CR/CSR slave addresses configured by MOTLoad are assigned according to the installation slot in the backplane, as indicated by the *VME64 Specification*. For reference, the following values are provided:

| Slot Position | CS/CSR Starting Address |
|---------------|-------------------------|
| 1             | 0x0008.0000             |
| 2             | 0x0010.0000             |
| 3             | 0x0018.0000             |
| 4             | 0x0020.0000             |
| 5             | 0x0028.0000             |
| 6             | 0x0030.0000             |
| 7             | 0x0038.0000             |
| 8             | 0x0040.0000             |
| 9             | 0x0048.0000             |
| A             | 0x0050.0000             |
| B             | 0x0058.0000             |
| C             | 0x0060.0000             |

For further details on CR/CSR space, please refer to the *VME64 Specification*, listed in [Appendix C, Related Documentation](#).

The MVME6100 uses a Discovery II for its VME bridge. The offsets of the mailboxes in the Discovery II are defined in the *Discovery II User Manual*,

listed in [Appendix C, Related Documentation](#), but are noted here for reference:

Mailbox 0 is at offset 7f348 in the CR/CSR space  
Mailbox 1 is at offset 7f34C in the CR/CSR space  
Mailbox 2 is at offset 7f350 in the CR/CSR space  
Mailbox 3 is at offset 7f354 in the CR/CSR space

The selection of the mailbox used by remote start on an individual MVME6100 is determined by the setting of a global environment variable (GEV). The default mailbox is zero. Another GEV controls whether remote start is enabled (default) or disabled. Refer to the *Remote Start* appendix in the *MOTLoad Firmware Package User's Manual* for remote start GEV definitions.

The MVME6100's IBCA needs to be mapped appropriately through the master's VMEbus bridge. For example, to use remote start using mailbox 0 on an MVME6100 installed in slot 5, the master would need a mapping to support reads and writes of address 0x002ff348 in VME CR/CSR space (0x280000 + 0x7f348).

## Alternate Boot Images and Safe Start

Some later versions of MOTLoad support Alternate Boot Images and a Safe Start recovery procedure. If Safe Start is available on the MVME6100, Alternate Boot Images are supported. With Alternate Boot Image support, the bootloader code in the boot block examines the upper 8MB of the flash bank for Alternate Boot images. If an image is found, control is passed to the image.

## Firmware Startup Sequence Following Reset

The firmware startup sequence following reset of MOTLoad is to:

- Initialize cache, MMU, FPU, and other CPU internal items
- Initialize the memory controller

- ❑ Search the active flash bank, possibly interactively, for a valid POST image. If found, the POST image executes. Once completed, the POST image returns and startup continues.
- ❑ Search the active flash bank, possibly interactively, for a valid USER boot image. If found, the USER boot image executes. A return to the boot block code is not anticipated.
- ❑ If a valid USER boot image is not found, search the active flash bank, possibly interactively, for a valid MCG boot image; anticipated to be upgrade of MCG firmware. If found, the image is executed. A return to the boot block code is not anticipated.
- ❑ Execute the recovery image of the firmware in the boot block if no valid USER or MCG image is found

During startup, interactive mode may be entered by either setting the Safe Start jumper/switch or by sending an <ESC> to the console serial port within five seconds of the board reset. During interactive mode, the user has the option to display locations at which valid boot images were discovered, specify which discovered image is to be executed, or specify that the recovery image in the boot block of the active Flash bank is to be executed.

## Firmware Scan for Boot Image

The scan is performed by examining each 1MB boundary for a defined set of flags that identify the image as being Power On Self Test (POST), USER, or MCG. MOTLoad is an MCG image. POST is a user-developed Power On Self Test that would perform a set of diagnostics and then return to the bootloader image. User would be a boot image, such as the VxWorks bootrom, which would perform board initialization. A bootable VxWorks kernel would also be a USER image. Boot images are not restricted to being MB or less in size; however, they must begin on a 1MB boundary within the 8MB of the scanned flash bank. The Flash Bank Structure is shown below:

| Address   | Usage   |
|---|---|
| 0xFFFF0000 to 0xFFFFFFFF                            | Boot block. Recovery code                                   |
| 0xFFE00000 to 0xFFFFFFFF                            | Reserved for MCG use.<br>(MOTLoad update image)             |
| 0xFFD00000 to 0xFFDFFFFFF<br>(FBD00000 or F7D00000) | First possible alternate image<br>(Bank B / Bank A actual)  |
| 0xFFC00000 to 0xFFCFFFFFF<br>(FBC00000 or F7C00000) | Second possible alternate image<br>(Bank B / Bank A actual) |
| ....  | Alternate boot images                                       |
| 0xFF899999 to 0xFF8FFFFFF<br>(Fb800000 or F3800000) | Last possible alternate image<br>(Bank B / Bank A actual)   |

The scan is performed downwards from boot block image and searches first for POST, then USER, and finally MCG images. In the case of multiple images of the same type, control is passed to the first image encountered in the scan.

Safe Start, whether invoked by hitting **ESC** on the console within the first five seconds following power-on reset or by setting the Safe Start jumper, interrupts the scan process. The user may then display the available boot images and select the desired image. The feature is provided to enable recovery in cases when the programmed Alternate Boot Image is no longer desired. The following output is an example of an interactive Safe Start:

```

ABCDEInteractive Boot Mode Entered
boot> ?
Interactive boot commands:
'd':show directory of alternate boot images
'c':continue with normal startup
'q':quit without executing any alternate boot image
'r [address]':execute specified (or default) alternate image
'p [address]':execute specified (or default) POST image
'?:this help screen
'h':this help screen
boot> d
Addr FFE00000 Size 00100000 Flags 00000003 Name: MOTLoad

```

```

Addr FFD00000 Size 00100000 Flags 00000003 Name: MOTLoad
boot> c
NOPQRSTUVWXYZabcdefghijklmnopqrsstuvwxyzWXYZ
Copyright Motorola Inc. 1999-2004, All Rights Reserved
MOTLoad RTOS Version 2.0, PAL Version 0.b EA02

...

MVME6100>

```

## Valid Boot Images

Valid boot images whether POST, USER, or MCG, are located on 1MB boundaries within flash. The image may exceed 1MB in size. An image is determined valid through the presence of two "valid image keys" and other sanity checks. A valid boot image begins with a structure as defined in the following table:

| Name            | Type               | Size | Notes  |
|-----------------|--------------------|------|--|
| UserDefined     | unsigned integer   | 8    | User defined                                     |
| ImageKey 1      | unsigned integer   | 1    | 0x414c5420                                       |
| ImageKey 2      | unsigned integer   | 1    | 0x424f4f54                                       |
| ImageChecksum   | unsigned integer   | 1    | Image checksum                                   |
| ImageSize       | unsigned integer   | 1    | Must be a multiple of 4                          |
| ImageName       | unsigned character | 20   | User defined                                     |
| ImageRamAddress | unsigned integer   | 1    | RAM address                                      |
| ImageOffset     | unsigned integer   | 1    | Offset from header start to entry                |
| ImageFlags      | unsigned integer   | 1    | Refer to <i>MOTLoad Image Flags</i> on page 3-24 |
| ImageVersion    | unsigned integer   | 1    | User defined                                     |
| Reserved        | unsigned integer   | 8    | Reserved for expansion                           |



## Checksum Algorithm

The checksum algorithm is a simple unsigned word add of each word (4 byte) location in the image. The image must be a multiple of 4 bytes in length (word-aligned). The content of the checksum location in the header is not part of the checksum calculation. The calculation assumes the location to be zero. The algorithm is implemented using the following code:

```
Unsigned int checksum(
    Unsigned int *startPtr, /* starting address */
    Unsigned int endPtr    /* ending address */
) {
    unsigned int checksum=0;
    while (startPtr < endPtr) {
        checksum += *startPtr;
        startPtr++;
    }
    return(checksum);
}
```

## MOTLoad Image Flags

The image flags of the header define various bit options that control how the image will be executed.

**Table 3-2. MOTLoad Image Flags**

| Name          | Value      | Interpretation   |
|---------------|------------|--|
| COPY_TO_RAM   | 0x00000001 | Copy image to RAM at <b>ImageRamAddress</b> before execution |
| IMAGE_MCG     | 0x00000002 | MCG-specific image   |
| IMAGE_POST    | 0x00000004 | POST image   |
| DONT_AUTO_RUN | 0x00000008 | Image <i>not</i> to be executed                              |

### **COPY\_TO\_RAM**

If set, this flag indicates that the image is to be copied to RAM at the address specified in the header before control is passed. If not set, the image will be executed in Flash. In both instances, control will be passed at the image offset specified in the header from the base of the image.

### **IMAGE\_MCG**

If set, this flag defines the image as being an MCG, as opposed to USER, image. This bit should not be set by developers of alternate boot images.

### **IMAGE\_POST**

If set, this flag defines the image as being a power-on self-test image. This bit flag is used to indicate that the image is a diagnostic and should be run prior to running either USER or MCG boot images. POST images are expected, but not required, to return to the boot block code upon completion.

### **DONT\_AUTO\_RUN**

If set, this flag indicates that the image is not to be selected for automatic execution. A user, through the interactive command facility, may specify the image to be executed.

## **USER Images**

These images are user-developer boot code; for example, a VxWorks bootrom image. Such images may expect the system software state to be as follows upon entry:

- The MMU is disabled.
- L1 instruction cache has been initialized and is enabled.
- L1 data cache has been initialized (invalidated) and is disabled.
- L2 cache is disabled.
- L3 cache is disabled.

- ❑ RAM has been initialized and is mapped starting at CPU address 0.
- ❑ If RAM ECC or parity is supported, RAM has been scrubbed of ECC or parity errors.
- ❑ The active Flash bank (boot) is mapped from the upper end of the address space.
- ❑ If specified by COPY\_TO\_RAM, the image has been copied to RAM at the address specified by **ImageRamAddress**.
- ❑ CPU register R1 (the stack pointer) has been initialized to a value near the end of RAM.
- ❑ CPU register R3 is added to the following structure:

```
typedef struct altBootData {
    unsigned int ramSize;    /* board's RAM size in MB */
    void flashPtr;         /* ptr to this image in flash */
    char boardType[16];    /* name string, eg MVME6100 */
    void globalData;      /* 16K, zeroed, user defined */
    unsigned int reserved[12];
} altBootData_t;
```

## Alternate Boot Data Structure

The globalData field of the alternate boot data structure points to an area of RAM which was initialized to zeroes by the boot loader. This area of RAM is not cleared by the boot loader after execution of a POST image, or other alternate boot image, is executed. It is intended to provide a user a mechanism to pass POST image results to subsequent boot images.

The boot loader performs no other initialization of the board than that specified prior to the transfer of control to either a POST, USER, or MCG image. Alternate boot images need to initialize the board to whatever state the image may further require for its execution.

POST images are expected, but not required, to return to the boot loader. Upon return, the boot loader proceeds with the scan for an executable alternate boot image. POST images that return control to the boot loader must ensure that upon return, the state of the board is consistent with the

state that the board was in at POST entry. USER images should not return control to the boot loader.

This chapter describes the MVME6100 on a block diagram level.

## Features

The following table lists the features of the MVME6100.

**Table 4-1. MVME6100 Features Summary**

| Feature  | Description  |
|--|--|
| Processor  | <ul style="list-style-type: none"><li>– Single 1.267 GHz MPC7457 processor</li><li>– Bus clock frequency at 133 MHz</li><li>– 36-bit address, 64-bit data buses</li><li>– Integrated L1 and L2 cache</li></ul>   |
| L3 Cache   | <ul style="list-style-type: none"><li>– Bus clock frequency at 211 MHz (when supported by processor)</li><li>– Up to 2MB using DDR SRAM</li></ul>  |
| Flash  | <ul style="list-style-type: none"><li>– Two banks (A &amp; B) of soldered Intel StrataFlash devices</li><li>– 8 to 64MB supported on each bank</li><li>– Boot bank is switch selectable between banks</li><li>– Bank A has combination of software and hardware write-protect scheme</li><li>– Bank B top 1MB block can be write-protected through software/hardware write-protect control</li></ul> |
| System Memory  | <ul style="list-style-type: none"><li>– Two banks on board for up to 1Gb using 256Mb or 512Mb devices</li><li>– Bus clock frequency at 133 MHz</li></ul>   |
| Memory Controller<br>PCI Host Bridge<br>Dual 10/100/1000 Ethernet<br>Interrupt Controller<br>PCI Interface<br>I <sup>2</sup> C Interface | <ul style="list-style-type: none"><li>– Provided by Marvell MV64360 system controller</li></ul>  |

**Table 4-1. MVME6100 Features Summary (continued)**

| <b>Feature</b>                             | <b>Description</b>  |
|--|---|
| NVRAM<br>Real-Time Clock<br>Watchdog Timer | – 32KB provided by MK48T37 with SnapHat battery backup  |
| On-board Peripheral Support                | – Dual 10/100/1000 Ethernet ports routed to front panel RJ-45 connectors, one optionally routed to P2 backplane<br>– Two asynchronous serial ports provided by an ST16C554D; one serial port is routed to a front panel RJ-45 connector and the second serial port is routed to an on-board header (J29, as factory default build configuration).   |
| PCI/PMC                                    | – Two 32/64-bit PMC slots with front-panel I/O plus P2 rear I/O as specified by IEEE P1386<br>– 33/66 MHz PCI or 66/100 MHz PCI-X   |
| VME Interface                              | – Tsi148 VME 2eSST ASIC provides: <ul style="list-style-type: none"> <li><input type="checkbox"/> Eight programmable VMEbus map decoders</li> <li><input type="checkbox"/> A16, A24, A32, and A64 address</li> <li><input type="checkbox"/> 8-bit, 16-bit, and 32-bit single cycle data transfers</li> <li><input type="checkbox"/> 8-bit, 16-bit, 32-bit, and 64-bit block transfers</li> <li><input type="checkbox"/> Supports SCT, BLT, MBLT, 2eVME, and 2eSST protocols</li> <li><input type="checkbox"/> 8 entry command and 4KB data write post buffer</li> <li><input type="checkbox"/> 4KB read ahead buffer</li> </ul> |
| PMCspan Support                            | – One PMCspan slot<br>– Supports 33/66 MHz, 32/64-bit PCI bus<br>– Access through PCI6520 bridge to PMCspan   |
| Form Factor                                | – Standard 6U VME   |
| Miscellaneous                              | – Combined reset and abort switch<br>– Status LEDs<br>– 8-bit software-readable switch (S1)<br>– VME geographical address switch (S3)<br>– Boundary Scan header (J8)<br>– CPU RISCWatch COP header (J42)  |

# Block Diagram

Figure 4-1 shows a block diagram of the overall board architecture.

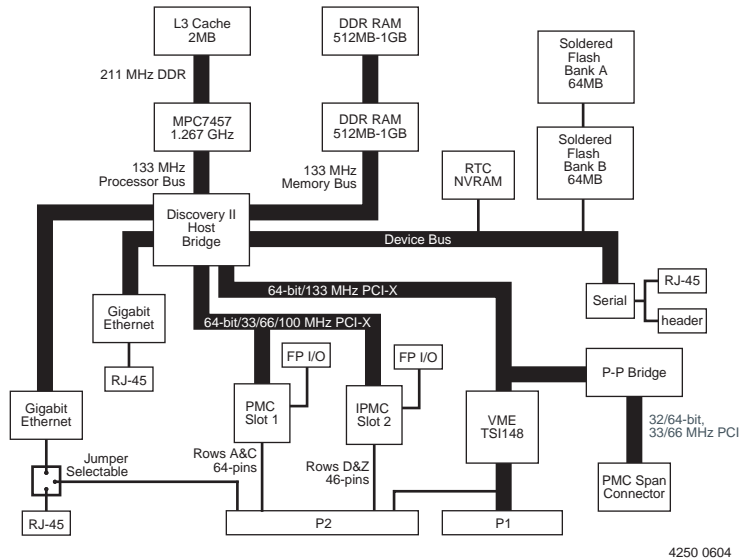


Figure 4-1. MVME6100 Block Diagram

## Processor

The MVME6100 supports the MPC7457 with adjustable core voltage supply. The maximum external processor bus speed is 133 MHz. The processor core frequency runs at 1.267 GHz or the highest speed MPC7457 can support, which is determined by the processor core voltage, the external speed, and the internal VCO frequency. MPX bus protocols are supported on the board. The MPC7457 has integrated L1 and L2 caches (as the factory build configuration) and supports an L3 cache interface with on-chip tags to support up to 2MB of off-chip cache. +2.5V signal levels are used on the processor bus.

## L3 Cache

The MVME6100 external L3 cache is implemented using two 8Mb DDR SRAM devices. The L3 cache bus is 72-bits wide (64 bits of data and 8 bits of parity) and operates at 211 MHz. The L3 cache interface is implemented with an on-chip, 8-way, set-associative tag memory. The external SRAMs are accessed through a dedicated L3 cache port that supports one bank of SRAM. The L3 cache normally operates in copyback mode and supports system cache coherency through snooping. Parity generation and checking may be disabled by programming the L3CR register. Refer to the *PowerPC Apollo Microprocessor Implementation Definition Book IV* listed in [Appendix C, Related Documentation](#).

## System Controller

The MV64360 is an integrated system controller for high performance embedded control applications. The following features of the MV64360 are supported by the MVME6100:

The MV64360 has a five-bus architecture comprised of:

- ❑ A 72-bit interface to the CPU bus (includes parity)
- ❑ A 72-bit interface to DDR SDRAM (double data rate-synchronous DRAM) with ECC
- ❑ A 32-bit interface to devices
- ❑ Two 64-bit PCI/PCI-X interfaces

In addition to the above, the MV64360 integrates:

- ❑ Three Gigabit Ethernet MACs (only two are used on the MVME6100)
- ❑ 2Mb SRAM
- ❑ Interrupt controller
- ❑ Four general-purpose 32-bit timers/counters
- ❑ I<sup>2</sup>C interface
- ❑ Four channel independent DMA controller



All of the above interfaces are connected through a cross bar fabric. The cross bar enables concurrent transactions between units. For example, the cross bar can simultaneously control:

- ❑ A Gigabit Ethernet MAC fetching a descriptor from the integrated SRAM
- ❑ The CPU reading from the DRAM
- ❑ The DMA moving data from the device bus to the PCI bus

## CPU Bus Interface

The CPU interface (master and slave) operates at 133 MHz and +2.5V signal levels using MPX bus modes. The CPU bus has a 36-bit address and 64-bit data buses. The MV64360 supports up to eight pipelined transactions per processor. There are 21 address windows supported in the CPU interface:

- ❑ Four for SDRAM chip selects
- ❑ Five for device chip selects
- ❑ Five for the PCI\_0 interface (four memory + one I/O)
- ❑ Five for the PCI\_1 interface (four memory + one I/O)
- ❑ One for the MV64360 integrated SRAM
- ❑ One for the MV64360 internal registers space

Each window is defined by base and size registers and can decode up to 4GB space (except for the integrated SRAM, which is fixed to 256KB). Refer to the *MV64360 Data Sheet*, listed in [Appendix C, Related Documentation](#), for additional information and programming details.

## Memory Controller Interface

The MVME6100 supports two banks of DDR SDRAM using 256Mb/512Mb DDR SDRAM devices on-board. 1Gb DDR non-stacked SDRAM devices may be used when available. 133 MHz operation should be used for all memory options. The SDRAM supports ECC and the MV64360

supports single-bit and double-bit error detection and single-bit error correction of all SDRAM reads and writes.

The SDRAM controller supports a wide range of SDRAM timing parameters. These parameters can be configured through the SDRAM Mode register and the SDRAM Timing Parameters register. Refer to the *MV64360 Data Sheet*, listed in [Appendix C, Related Documentation](#), for additional information and programming details.

The DRAM controller contains four transaction queues—two write buffers and two read buffers. The DRAM controller does not necessarily issue DRAM transactions in the same order that it receives the transactions. The MV64360 is targeted to support full PowerPC cache coherency between CPU L1/L2 caches and DRAM.

## Device Controller Interface

The device controller supports up to five banks of devices, three of which are used for Flash Banks A and B, NVRAM/RTC. Each bank supports up to 512MB of address space, resulting in total device space of 1.5GB. Serial ports are the fourth and fifth devices on the MVME6100. Each bank has its own parameters register as shown in the following table.

**Table 4-2. Device Bus Parameters**

|  |                      |                                    |
|--|----------------------|------------------------------------|
| <b>Flash Bank A</b>  | Device Bus Bank 0    | Bank width 32-bit, parity disabled |
| <b>Flash Bank B</b>  | Device Bus Boot Bank | Bank width 32-bit, parity disabled |
| <b>Real-Time Clock<br/>Serial Ports<br/>Board Specific Registers</b> | Device Bus Bank 1    | Bank width 8-bit, parity disabled  |

## PCI/PCI-X Interfaces

The MVME6100 provides two 32/64-bit PCI/PCI-X buses, operating at a maximum frequency of 100 MHz when configured to PCI-X mode, and run at 33 or 66 MHz when running conventional PCI mode. PCI bus 1 is connected to the PMC slots 1 and 2.

The maximum PCI-X frequency of 100 MHz supported by PCI bus 1 may be reduced depending on the number and/or type of PMC/PrPMC installed. If PCI bus 1 is set to +5V VIO, it runs at 33 MHz. VIO is set by the keying pins (they are both a keying pin and jumper). Both pins must be set for the same VIO on the PCI-X bus.

PCI bus 0 is connected to the Tsi148 device and PMCspan bridge. PCI bus 0 is configured for 133 MHz PCI-X mode.

The MV64360 PCI interfaces are fully PCI rev. 2.2 and PCI-X rev 1.0 compliant and support both address and data parity checking. The MV64360 contains all of the required PCI configuration registers. All internal registers, including the PCI configuration registers, are accessible from the CPU bus or the PCI buses.

## Gigabit Ethernet MACs

The MVME6100 supports two 10/100/1000Mb/s full duplex Ethernet ports connected to the front panel via the MV64360 system controller. Ethernet access is provided by front panel RJ-45 connectors with integrated magnetics and LEDs. Port 1 is a dedicated Gigabit Ethernet port while a configuration header is provided for port 2 front or rear P2 access. Refer to *Front/Rear Ethernet and Transition Module Options Header (J30)* for more information.

Each Ethernet interface is assigned an Ethernet Station Address. The address is unique for each device. The Ethernet Station Addresses are displayed on labels attached to the PMC front-panel keep-out area.

The MV64360 is not integrated with a PHY for the Ethernet interfaces. External PHY is the Broadcom BCM5421S (51NW9663B83 117BGA) 10/100/1000BaseT Gigabit transceiver with SERDES interface. Refer to *Appendix C, Related Documentation* for more information.

## SRAM

The MV64360 integrates 2Mb of general-purpose SRAM. It is accessible from the CPU or any of the other interfaces. It can be used as fast CPU access memory (6 cycles latency) and for off loading DRAM traffic. A

typical usage of the SRAM can be a descriptor RAM for the Gigabit Ethernet ports.

## General-Purpose Timers/Counters

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There are four 32-bit wide timers/counters on the MV64360. Each timer/counter can be selected to operate as a timer or as a counter. The timing reference is based on the MV64360 Tclk input, which is set at 133 MHz. Each timer/counter is capable of generating an interrupt. Refer to the *MV64360 Data Sheet*, listed in [Appendix C, Related Documentation](#), for additional information and programming details.

## Watchdog Timer

The MV64360 internal watchdog timer is a 32-bit count-down counter that can be used to generate a non-maskable interrupt or reset the system in the event of unpredictable software behavior. After the watchdog timer is enabled, it becomes a free running counter that must be serviced periodically to keep it from expiring. Refer to the *MV64360 Data Sheet*, listed in [Appendix C, Related Documentation](#), for additional information and programming details.

## I<sub>2</sub>O Message Unit

I<sub>2</sub>O compliant messaging for the MVME6100 board is provided by an I<sub>2</sub>O messaging unit integrated into the MV64360 system controller. The MV64360 messaging unit includes hardware hooks for message transfers between PCI devices and the CPU. This includes all of the registers required for implementing the I<sub>2</sub>O messaging, as defined in the Intelligent I/O (I<sub>2</sub>O) Standard specification. For additional details regarding the I<sub>2</sub>O messaging unit, refer to the *MV64360 Data Sheet*, listed in [Appendix C, Related Documentation](#).

## Four Channel Independent DMA Controller

The MV64360 incorporates four independent direct memory access (IDMA) engines. Each IDMA engine has the capability to transfer data

between any two interfaces. Refer to the *MV64360 Data Sheet*, listed in [Appendix C, Related Documentation](#), for additional information and programming details.

## I<sup>2</sup>C Serial Interface and Devices

A two-wire serial interface for the MVME6100 board is provided by a master/slave capable I<sup>2</sup>C serial controller integrated into the MV64360 device. The I<sup>2</sup>C serial controller provides two basic functions. The first function is to optionally provide MV64360 register initialization following a reset. The MV64360 can be configured (by switch setting) to automatically read data out of a serial EEPROM following a reset and initialize any number of internal registers. In the second function, the controller is used by the system software to read the contents of the VPD EEPROM contained on the MVME6100 board, along with the SPD EEPROMs for on-board memory to further initialize the memory controller and other interfaces.

The MVME6100 board contains the following I<sup>2</sup>C serial devices:

- 8KB EEPROM for user-defined MV64360 initialization
- 8KB EEPROM for VPD
- 8KB EEPROM for user data
- Two 256 byte EEPROMs for SPD
- DS1621 temperature sensor
- One 256 byte EEPROM for PMCspan PCIx-PCIx bridge use

The 8KB EEPROM devices are implemented using Atmel AT24C64A devices or similar parts. These devices use two byte addressing to address the 8KB of the device.

## Interrupt Controller

The MVME6100 uses the interrupt controller integrated into the MV64360 device to manage the MV64360 internal interrupts as well as the external interrupt requests. The interrupts are routed to the MV64360 MPP

pins from on-board resources as shown in the *MVME6100 Programmer's Guide*. The external interrupt sources include the following:

- On-board PCI device interrupts
- PMC slot interrupts
- VME interrupts
- RTC interrupt
- Watchdog timer interrupts
- Abort switch interrupt
- External UART interrupts
- Ethernet PHY interrupts
- IPMC761 interrupts
- PMCsplan interrupts

For additional details regarding the external interrupt assignments, refer to the *MVME6100 Programmer's Guide*.

## PCI Bus Arbitration

PCI arbitration is performed by the MV64360 system controller. The MV64360 integrates two PCI arbiters, one for each PCI interface (PCI bus 0/1). Each arbiter can handle up to six external agents plus one internal agent (PCI bus 0/1 master). The internal PCI arbiter REQ#/GNT# signals are multiplexed on the MV64360 MPP pins. The internal PCI arbiter is disabled by default (the MPP pins function as general-purpose inputs). Software configures the MPP pins to function as request/grant pairs for the internal PCI arbiter. The arbitration pairs for the MVME6100 are assigned to the MPP pins as shown in the *MVME6100 Programmer's Guide*.

## VMEbus Interface

The VMEbus interface is provided by the Tsi148 ASIC. Refer to the *Tsi148 User's Manual* available from Tundra Semiconductor for additional information as listed in [Appendix C, Related Documentation](#). 2eSST operations are not supported on 3-row backplanes. You must use VME64x (VITA 1.5) compatible backplanes, such as 5-row backplanes, to achieve maximum VMEbus performance.

## PMCspan Interface

The MVME6100 provides a PCI expansion connector to add more PMC interfaces than the two on the MVME6100 board. The PMCspan interface is provided through the PCI6520 PCIx/PCIx bridge.

## Flash Memory

The MVME6100 contains two banks of flash memory accessed via the device controller bus contained within the MV64360 device. Both banks are soldered on board and have different write-protection schemes.

## System Memory

MVME6100 system memory consists of double-data-rate SDRAMs. The DDR SDRAMs support two data transfers per clock cycle. The memory device is a standard monolithic (32M x 8 or 64M x 8) DDR, 8-bit wide, 66-pin, TSSOP package. Both banks are provided on board the MVME6100 and operate at 133 MHz clock frequency with both banks populated.

## Asynchronous Serial Ports

The MVME6100 board contains one EXAR ST16C554D quad UART (QUART) device connected to the MV64360 device controller bus to provide asynchronous debug ports. The QUART supports up to four asynchronous serial ports, two of which are used on the MVME6100.

COM1 is an RS232 port and the TTL- level signals are routed through appropriate EIA-232 drivers and receivers to an RJ-45 connector on the front panel. COM2 is also an RS232 port that is routed to an on-board planar header (as factory default build configuration) or to the P2 connector for rear I/O access via optional inductors/resistors. Unused control inputs on COM1 and COM2 are wired active. The reference clock frequency for the QUART is 1.8432 MHz. All UART ports are capable of signaling at up to 115 Kbaud.

## PCI Mezzanine Card Slots

The MVME6100 board supports two PMC slots. Two sets of four EIA-E700 AAAB connectors are located on the MVME6100 board to interface to the 32-bit/64-bit IEEE P1386.1 PMC to add any desirable function. The PMC slots are PCI/PCI-X 33/66/100 capable.

PMC/IPMC slot 1 supports:

|                           |   |
|---------------------------|---|
| <b>Mezzanine Type:</b>    | PMC/IPMC = PCI Mezzanine Card   |
| <b>Mezzanine Size:</b>    | S1B = Single width and standard depth (75mm x 150mm) with front panel |
| <b>PMC Connectors:</b>    | J11, J12, J13, and J14 (32/64-bit PCI with front and rear I/O)        |
| <b>Signaling Voltage:</b> | VIO = +3.3V (+5V tolerant) or +5V, selected by keying pin             |

PMC slot 2 supports:

|                            |   |
|----------------------------|---|
| <b>Mezzanine Type:</b>     | PMC = PCI Mezzanine Card  |
| <b>Mezzanine Size:</b>     | S1B = Single width and standard depth (75mm x 150mm) with front panel |
| <b>PMC Connectors:</b>     | J21, J22, J23, and J24 (32/64-bit PCI with front and rear I/O)        |
| <b>Signalling Voltage:</b> | VIO = +3.3V (+5V tolerant) or +5V, selected by keying pin             |



**Note** You cannot use 3.3V and 5V PMCs together; the voltage keying pin on slots 1 and 2 must be identical. When in 5V mode, the bus runs at 33 MHz.

In addition, the PMC connectors are located such that a double-width PMC may be installed in place of the two single-width PMCs.

In this case, the MVME6100 supports:

|                           |   |
|---------------------------|---|
| <b>Mezzanine Type:</b>    | PMC = PCI Mezzanine Card  |
| <b>Mezzanine Size:</b>    | Double width and standard depth<br>(150mm x 150mm) with front panel                   |
| <b>PMC Connectors:</b>    | J11, J12, J13, J14, J21, J22, J23, and J24<br>(32/64-bit PCI with front and rear I/O) |
| <b>Signaling Voltage:</b> | VIO = +3.3V (+5V tolerant) or +5V, selected by keying pin                             |

**Note** On either PMC site, the user I/O – Jn4 signals will only support the low-current, high-speed signals and not for any current bearing power supply usage. The maximum current rating of each pin/signal is 250 mA.

## Real-Time Clock/NVRAM/Watchdog Timer

The real-time clock/NVRAM/watchdog timer is implemented using an integrated SGS-Thompson M48T37V Timekeeper SRAM and Snaphat battery. The minimum M48T37V watchdog timer time-out resolution is 62.5 msec (1/16s) and maximum time-out period is 124 seconds. The interface for the Timekeeper and SRAM is connected to the MV64360 device controller bus on the MVME6100 board. Refer to the *MV64360 Data Sheet*, listed in [Appendix C, Related Documentation](#), for additional information and programming details.

## IDSEL Routing

PCI device configuration registers are accessed by using the IDSEL signal of each PCI agent to an A/D signal as defined in version 2.2 of the PCI specification. IDSEL assignments to on-board resources are specified in the *MVME6100 Programmer's Guide*.

## Reset Control Logic

The sources of reset on the MVME6100 are the following:

- Powerup
- Reset Switch
- NVRAM Watchdog Timer
- MV64360 Watchdog Timer
- VMEbus controller – Tsi148 ASIC
- System Control register bit
- PCI Bus 0 reset via System Control register
- PCI Bus 1 reset via System Control register

## Debug Support

The MVME6100 provides JTAG/COP headers for debug capability for Processor as well as PCI0 bus use. These connectors are not populated as factory build configuration.

## Processor JTAG/COP Headers

The MVME6100 provides JTAG/COP connectors for JTAG/COP emulator support (RISCWatch COP J42), as well as supporting board boundary scan capabilities (Boundary Scan header J8).

## Introduction

This chapter provides pin assignments for various headers and connectors on the MMVE6100 single-board computer.

- ❑ *PMC Expansion Connector (J4)*
- ❑ *Gigabit Ethernet Connectors (J9, J93)*
- ❑ *PCI Mezzanine Card (PMC) Connectors (J11 – J14, J21 – J24)*
- ❑ *COM1 Connector (J19)*
- ❑ *VMEbus P1 Connector*
- ❑ *VMEbus P2 Connector (IPMC Mode)*

The following headers are described in this chapter:

- ❑ *SCON Header (J7)*
- ❑ *Boundary Scan Header (J8)*
- ❑ *PMC/IPMC Selection Headers (J10, J15 – J18, J25 – J28)*
- ❑ *COM2 Header (J29)*
- ❑ *Front/Rear Ethernet and Transition Module Options Header (J30)*
- ❑ *Processor JTAG/COP Header (J42)*

## Connectors

### PMC Expansion Connector (J4)

One 114-pin Mictor connector with a center row of power and ground pins is used to provide PCI expansion capability. The pin assignments for this connector are as follows:

**Table 5-1. PMC Expansion Connector (J4)  
Pin Assignments**

| Pin | Signal   |     | Signal   | Pin |
|-----|----------|-----|----------|-----|
| 1   | +3.3V    | GND | +3.3V    | 2   |
| 3   | PCICLK   |     | PMCINTA# | 4   |
| 5   | GND      |     | PMCINTB# | 6   |
| 7   | PURST#   |     | PMCINTC# | 8   |
| 9   | HRESET#  |     | PMCINTD# | 10  |
| 11  | TDO      |     | TDI      | 12  |
| 13  | TMS      |     | TCK      | 14  |
| 15  | TRST#    |     | PCIXP#   | 16  |
| 17  | PCIXGNT# |     | PCIXREQ# | 18  |
| 19  | +12V     |     | -12V     | 20  |
| 21  | PERR#    |     | SERR#    | 22  |
| 23  | LOCK#    |     | SDONE    | 24  |
| 25  | DEVSEL#  |     | SBO#     | 26  |
| 27  | GND      |     | GND      | 28  |
| 29  | TRDY#    |     | IRDY#    | 30  |
| 31  | STOP#    |     | FRAME#   | 32  |
| 33  | GND      |     | M66EN    | 34  |
| 35  | ACK64#   |     | Reserved | 36  |
| 37  | REQ64#   |     | Reserved | 38  |

**Table 5-1. PMC Expansion Connector (J4)  
Pin Assignments (continued)**

| Pin | Signal |      | Signal  | Pin |
|-----|--------|------|---------|-----|
| 39  | PAR    | +5V  | PCIRST# | 40  |
| 41  | C/BE1# |      | C/BE0#  | 42  |
| 43  | C/BE3# |      | C/BE2#  | 44  |
| 45  | AD1    |      | AD0     | 46  |
| 47  | AD3    |      | AD2     | 48  |
| 49  | AD5    |      | AD4     | 50  |
| 51  | AD7    |      | AD6     | 52  |
| 53  | AD9    |      | AD8     | 54  |
| 55  | AD11   |      | AD10    | 56  |
| 57  | AD13   |      | AD12    | 58  |
| 59  | AD15   |      | AD14    | 60  |
| 61  | AD17   |      | AD16    | 62  |
| 63  | AD19   |      | AD18    | 64  |
| 65  | AD21   |      | AD20    | 66  |
| 67  | AD23   |      | AD22    | 68  |
| 69  | AD25   |      | AD24    | 70  |
| 71  | AD27   |      | AD26    | 72  |
| 73  | AD29   | AD28 | 74      |     |
| 75  | AD31   | AD30 | 76      |     |

**Table 5-1. PMC Expansion Connector (J4)  
Pin Assignments (continued)**

| Pin | Signal |     | Signal   | Pin |
|-----|--------|-----|----------|-----|
| 77  | PAR64  | GND | Reserved | 78  |
| 79  | C/BE5# |     | C/BE4#   | 80  |
| 81  | C/BE7# |     | C/BE6#   | 82  |
| 83  | AD33   |     | AD32     | 84  |
| 85  | AD35   |     | AD34     | 86  |
| 87  | AD37   |     | AD36     | 88  |
| 89  | AD39   |     | AD38     | 90  |
| 91  | AD41   |     | AD40     | 92  |
| 93  | AD43   |     | AD42     | 94  |
| 95  | AD45   |     | AD44     | 96  |
| 97  | AD47   |     | AD46     | 98  |
| 99  | AD49   |     | AD48     | 100 |
| 101 | AD51   |     | AD50     | 102 |
| 103 | AD53   |     | AD52     | 104 |
| 105 | AD55   |     | AD54     | 106 |
| 107 | AD57   |     | AD56     | 108 |
| 109 | AD59   |     | AD58     | 110 |
| 111 | AD61   |     | AD60     | 112 |
| 113 | AD63   |     | AD62     | 114 |

All PMC expansion signals are dedicated PMC expansion PCI bus signals.

## Gigabit Ethernet Connectors (J9, J93)

Access to the dual Gigabit Ethernet is provided by two transpower RJ-45 connectors with integrated magnetics and LEDs located on the front panel of the MVME6100. The pin assignments for these connectors are as follows:

**Table 5-2. Gigabit Ethernet Connectors (J9, J93)  
Pin Assignment**

| Pin # | Signal       | 1000 Mb/s                      | 10/100 Mb/s       |
|-------|--------------|--------------------------------|-------------------|
| 1     | CT_BOARD     | +2.5V                          | +2.5V             |
| 2     | MDIO0+       | B1_DA+ <sup>1</sup>            | TD+               |
| 3     | MDIO0-       | B1_DA-                         | TD-               |
| 4     | MDIO1+       | B1_DB+                         | RD+               |
| 5     | MDIO1-       | B1_DC+                         | Not Used          |
| 6     | MDIO2+       | B1-DC-                         | Not Used          |
| 7     | MDIO2-       | B1_DB-                         | RD-               |
| 8     | MDIO3+       | B1_DD+                         | Not Used          |
| 9     | MDIO3-       | B1_DD-                         | Not Used          |
| 10    | CT_CONNECTOR | GNDC                           | GNDC              |
| DS1   | LED1A        | PHY_10_100_LINK_L <sup>2</sup> | PHY_10_100_LINK_L |
| DS2   | LED1B        | PHY_1000_LINK_L                | PHY_1000_LINK_L   |
| DS3   | LED2A        | PHY_XMT_L                      | PHY_XMT_L         |
| DS4   | LED2B        | PHY_RCV_L                      | PHY_RCV_L         |

- Notes**
1. Pin 2-9 on the connector is connected to PHY BCM5421S.
  2. DS1 and DS2 signals are controlled by the on-board Reset PLD.

## PCI Mezzanine Card (PMC) Connectors (J11 – J14, J21 – J24)

There are eight 64-pin SMT connectors on the MVME6100 to provide 32/64-bit PCI interfaces and P2 I/O for two optional add-on PMCs.

**Note** PMC slot connectors J14 and J24 contain the signals that go to VME P2 I/O rows A, C, D, and Z.

The pin assignments for these connectors are as follows.

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**Table 5-3. PMC Slot 1 Connector (J11)  
Pin Assignments**

| Pin | Signal      | Signal   | Pin |
|-----|-------------|----------|-----|
| 1   | TCK         | -12V     | 2   |
| 3   | GND         | INTA#    | 4   |
| 5   | INTB#       | INTC#    | 6   |
| 7   | PMCPRSNT1#  | +5V      | 8   |
| 9   | INTD#       | PCI_RSVD | 10  |
| 11  | GND         | +3.3Vaux | 12  |
| 13  | CLK         | GND      | 14  |
| 15  | GND         | PMCGNT1# | 16  |
| 17  | PMCREQ1#    | +5V      | 18  |
| 19  | +3.3V (VIO) | AD31     | 20  |
| 21  | AD28        | AD27     | 22  |
| 23  | AD25        | GND      | 24  |
| 25  | GND         | C/BE3#   | 26  |
| 27  | AD22        | AD21     | 28  |
| 29  | AD19        | +5V      | 30  |
| 31  | +3.3V (VIO) | AD17     | 32  |
| 33  | FRAME#      | GND      | 34  |
| 35  | GND         | IRDY#    | 36  |



**Table 5-3. PMC Slot 1 Connector (J11)  
Pin Assignments (continued)**

| Pin | Signal      | Signal   | Pin |
|-----|-------------|----------|-----|
| 37  | DEVSEL#     | +5V      | 38  |
| 39  | GND         | LOCK#    | 40  |
| 41  | PCI_RSVD    | PCI_RSVD | 42  |
| 43  | PAR         | GND      | 44  |
| 45  | +3.3V (VIO) | AD15     | 46  |
| 47  | AD12        | AD11     | 48  |
| 49  | AD09        | +5V      | 50  |
| 51  | GND         | C/BE0#   | 52  |
| 53  | AD06        | AD05     | 54  |
| 55  | AD04        | GND      | 56  |
| 57  | +3.3V (VIO) | AD03     | 58  |
| 59  | AD02        | AD01     | 60  |
| 61  | AD00        | +5V      | 62  |
| 63  | GND         | REQ64#   | 64  |

**Table 5-4. PMC Slot 1 Connector (J12)  
Pin Assignments**

| Pin | Signal   | Signal    | Pin |
|-----|----------|-----------|-----|
| 1   | +12V     | TRST#     | 2   |
| 3   | TMS      | TDO       | 4   |
| 5   | TDI      | GND       | 6   |
| 7   | GND      | Not Used  | 8   |
| 9   | Not Used | Not Used  | 10  |
| 11  | Pull-up  | +3.3V     | 12  |
| 13  | RST#     | Pull-down | 14  |

**Table 5-4. PMC Slot 1 Connector (J12)  
Pin Assignments (continued)**

| <b>Pin</b> | <b>Signal</b> | <b>Signal</b>         | <b>Pin</b> |
|------------|---------------|-----------------------|------------|
| 15         | +3.3V         | Pull-down             | 16         |
| 17         | Not Used      | GND                   | 18         |
| 19         | AD30          | AD29                  | 20         |
| 21         | GND           | AD26                  | 22         |
| 23         | AD24          | +3.3V                 | 24         |
| 25         | IDSEL1        | AD23                  | 26         |
| 27         | +3.3V         | AD20                  | 28         |
| 29         | AD18          | GND                   | 30         |
| 31         | AD16          | C/BE2#                | 32         |
| 33         | GND           | IDSEL1B               | 34         |
| 35         | TRDY#         | +3.3V                 | 36         |
| 37         | GND           | STOP#                 | 38         |
| 39         | PERR#         | GND                   | 40         |
| 41         | +3.3V         | SERR#                 | 42         |
| 43         | C/BE1#        | GND                   | 44         |
| 45         | AD14          | AD13                  | 46         |
| 47         | M66EN         | AD10                  | 48         |
| 49         | AD08          | +3.3V                 | 50         |
| 51         | AD07          | REQ1B#                | 52         |
| 53         | +3.3V         | GNT1B#                | 54         |
| 55         | Not Used      | GND                   | 56         |
| 57         | Not Used      | EREADY0               | 58         |
| 59         | GND           | Not Used              | 60         |
| 61         | ACK64#        | +3.3V                 | 62         |
| 63         | GND           | No Connect (MONARCH#) | 64         |

**Table 5-5. PMC Slot 1 Connector (J13)  
Pin Assignments**

| Pin | Signal      | Signal | Pin |
|-----|-------------|--------|-----|
| 1   | Reserved    | GND    | 2   |
| 3   | GND         | C/BE7# | 4   |
| 5   | C/BE6#      | C/BE5# | 6   |
| 7   | C/BE4#      | GND    | 8   |
| 9   | +3.3V (VIO) | PAR64  | 10  |
| 11  | AD63        | AD62   | 12  |
| 13  | AD61        | GND    | 14  |
| 15  | GND         | AD60   | 16  |
| 17  | AD59        | AD58   | 18  |
| 19  | AD57        | GND    | 20  |
| 21  | +3.3V (VIO) | AD56   | 22  |
| 23  | AD55        | AD54   | 24  |
| 25  | AD53        | GND    | 26  |
| 27  | GND         | AD52   | 28  |
| 29  | AD51        | AD50   | 30  |
| 31  | AD49        | GND    | 32  |
| 33  | GND         | AD48   | 34  |
| 35  | AD47        | AD46   | 36  |
| 37  | AD45        | GND    | 38  |
| 39  | +3.3V (VIO) | AD44   | 40  |
| 41  | AD43        | AD42   | 42  |
| 43  | AD41        | GND    | 44  |
| 45  | GND         | AD40   | 46  |
| 47  | AD39        | AD38   | 48  |
| 49  | AD37        | GND    | 50  |

**Table 5-5. PMC Slot 1 Connector (J13)  
Pin Assignments (continued)**

| <b>Pin</b> | <b>Signal</b> | <b>Signal</b> | <b>Pin</b> |
|------------|---------------|---------------|------------|
| 51         | GND           | AD36          | 52         |
| 53         | AD35          | AD34          | 54         |
| 55         | AD33          | GND           | 56         |
| 57         | +3.3V (VIO)   | AD32          | 58         |
| 59         | Reserved      | Reserved      | 60         |
| 61         | Reserved      | GND           | 62         |
| 63         | GND           | Reserved      | 64         |

**Table 5-6. PMC Slot 1 Connector (J14)  
Pin Assignments**

| <b>Pin</b> | <b>Signal</b>    | <b>Signal</b>    | <b>Pin</b> |
|------------|------------------|------------------|------------|
| 1          | PMC0_1 (P2-C1)   | PMC0_2 (P2-A1)   | 2          |
| 3          | PMC0_3 (P2-C2)   | PMC0_4 (P2-A2)   | 4          |
| 5          | PMC0_5 (P2-C3)   | PMC0_6 (P2-A3)   | 6          |
| 7          | PMC0_7 (P2-C4)   | PMC0_8 (P2-A4)   | 8          |
| 9          | PMC1_9 (P2-C5)   | PMC0_10 (P2-A5)  | 10         |
| 11         | PMC0_11 (P2-C6)  | PMC0_12 (P2-A6)  | 12         |
| 13         | PMC0_13 (P2-C7)  | PMC0_14 (P2-A7)  | 14         |
| 15         | PMC0_15 (P2-C8)  | PMC0_16 (P2-A8)  | 16         |
| 17         | PMC0_17 (P2-C9)  | PMC0_18 (P2-A9)  | 18         |
| 19         | PMC0_19 (P2-C10) | PMC0_20 (P2-A10) | 20         |
| 21         | PMC0_21 (P2-C11) | PMC0_22 (P2-A11) | 22         |
| 23         | PMC0_23 (P2-C12) | PMC0_24 (P2-A12) | 24         |
| 25         | PMC0_25 (P2-C13) | PMC0_26 (P2-A13) | 26         |
| 27         | PMC0_27 (P2-C14) | PMC0_28 (P2-A14) | 28         |

**Table 5-6. PMC Slot 1 Connector (J14)  
Pin Assignments (continued)**

| Pin | Signal           | Signal           | Pin |
|-----|------------------|------------------|-----|
| 29  | PMC0_29 (P2-C15) | PMC0_30 (P2-A15) | 30  |
| 31  | PMC0_31 (P2-C16) | PMC0_32 (P2-A16) | 32  |
| 33  | PMC0_33 (P2-C17) | PMC0_34 (P2-A17) | 34  |
| 35  | PMC0_35 (P2-C18) | PMC0_36 (P2-A18) | 36  |
| 37  | PMC0_37 (P2-C19) | PMC0_38 (P2-A19) | 38  |
| 39  | PMC0_39 (P2-C20) | PMC0_40 (P2-A20) | 40  |
| 41  | PMC0_41 (P2-C21) | PMC0_42 (P2-A21) | 42  |
| 43  | PMC0_43 (P2-C22) | PMC0_44 (P2-A22) | 44  |
| 45  | PMC0_45 (P2-C23) | PMC0_46 (P2-A23) | 46  |
| 47  | PMC0_47 (P2-C24) | PMC0_48 (P2-A24) | 48  |
| 49  | PMC0_49 (P2-C25) | PMC0_50 (P2-A25) | 50  |
| 51  | PMC0_51 (P2-C26) | PMC0_52 (P2-A26) | 52  |
| 53  | PMC0_53 (P2-C27) | PMC0_54 (P2-A27) | 54  |
| 55  | PMC0_55 (P2-C28) | PMC0_56 (P2-A28) | 56  |
| 57  | PMC0_57 (P2-C29) | PMC0_58 (P2-A29) | 58  |
| 59  | PMC0_59 (P2-C30) | PMC0_60 (P2-A30) | 60  |
| 61  | PMC0_61 (P2-C31) | PMC0_62 (P2-A31) | 62  |
| 63  | PMC0_63 (P2-C32) | PMC0_64 (P2-A32) | 64  |

**Table 5-7. PMC Slot 2 Connector (J21)  
Pin Assignments**

| <b>Pin</b> | <b>Signal</b> | <b>Signal</b> | <b>Pin</b> |
|------------|---------------|---------------|------------|
| 1          | TCK           | -12V          | 2          |
| 3          | GND           | INTC#         | 4          |
| 5          | INTD#         | INTA#         | 6          |
| 7          | PMCPRSNT1#    | +5V           | 8          |
| 9          | INTB#         | PCI_RSVD      | 10         |
| 11         | GND           | +3.3Vaux      | 12         |
| 13         | CLK           | GND           | 14         |
| 15         | GND           | PMCGNT1#      | 16         |
| 17         | PMCREQ1#      | +5V           | 18         |
| 19         | +3.3V (VIO)   | AD31          | 20         |
| 21         | AD28          | AD27          | 22         |
| 23         | AD25          | GND           | 24         |
| 25         | GND           | C/BE3#        | 26         |
| 27         | AD22          | AD21          | 28         |
| 29         | AD19          | +5V           | 30         |
| 31         | +3.3V (VIO)   | AD17          | 32         |
| 33         | FRAME#        | GND           | 34         |
| 35         | GND           | IRDY#         | 36         |
| 37         | DEVSEL#       | +5V           | 38         |
| 39         | GND           | LOCK#         | 40         |
| 41         | PCI_RSVD      | PCI_RSVD      | 42         |
| 43         | PAR           | GND           | 44         |
| 45         | +3.3V (VIO)   | AD15          | 46         |
| 47         | AD12          | AD11          | 48         |
| 49         | AD09          | +5V           | 50         |

**Table 5-7. PMC Slot 2 Connector (J21)  
Pin Assignments (continued)**

| Pin | Signal      | Signal | Pin |
|-----|-------------|--------|-----|
| 51  | GND         | C/BE0# | 52  |
| 53  | AD06        | AD05   | 54  |
| 55  | AD04        | GND    | 56  |
| 57  | +3.3V (VIO) | AD03   | 58  |
| 59  | AD02        | AD01   | 60  |
| 61  | AD00        | +5V    | 62  |
| 63  | GND         | REQ64# | 64  |

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**Table 5-8. PMC Slot 2 Connector (J22)  
Pin Assignments**

| Pin | Signal   | Signal    | Pin |
|-----|----------|-----------|-----|
| 1   | +12V     | TRST#     | 2   |
| 3   | TMS      | TDO       | 4   |
| 5   | TDI      | GND       | 6   |
| 7   | GND      | Not Used  | 8   |
| 9   | Not Used | Not Used  | 10  |
| 11  | Pull-up  | +3.3V     | 12  |
| 13  | RST#     | Pull-down | 14  |
| 15  | +3.3V    | Pull-down | 16  |
| 17  | Not Used | GND       | 18  |
| 19  | AD30     | AD29      | 20  |
| 21  | GND      | AD26      | 22  |
| 23  | AD24     | +3.3V     | 24  |
| 25  | IDSEL1   | AD23      | 26  |
| 27  | +3.3V    | AD20      | 28  |

**Table 5-8. PMC Slot 2 Connector (J22)  
Pin Assignments (continued)**

| <b>Pin</b> | <b>Signal</b> | <b>Signal</b>         | <b>Pin</b> |
|------------|---------------|-----------------------|------------|
| 29         | AD18          | GND                   | 30         |
| 31         | AD16          | C/BE2#                | 32         |
| 33         | GND           | IDSEL1B               | 34         |
| 35         | TRDY#         | +3.3V                 | 36         |
| 37         | GND           | STOP#                 | 38         |
| 39         | PERR#         | GND                   | 40         |
| 41         | +3.3V         | SERR#                 | 42         |
| 43         | C/BE1#        | GND                   | 44         |
| 45         | AD14          | AD13                  | 46         |
| 47         | M66EN         | AD10                  | 48         |
| 49         | AD08          | +3.3V                 | 50         |
| 51         | AD07          | REQ1B#                | 52         |
| 53         | +3.3V         | GNT1B#                | 54         |
| 55         | Not Used      | GND                   | 56         |
| 57         | Not Used      | EREDY1                | 58         |
| 59         | GND           | Not Used              | 60         |
| 61         | ACK64#        | +3.3V                 | 62         |
| 63         | GND           | No Connect (MONARCH#) | 64         |



**Table 5-9. PMC Slot 2 Connector (J23)  
Pin Assignments**

| Pin | Signal      | Signal | Pin |
|-----|-------------|--------|-----|
| 1   | Reserved    | GND    | 2   |
| 3   | GND         | C/BE7# | 4   |
| 5   | C/BE6#      | C/BE5# | 6   |
| 7   | C/BE4#      | GND    | 8   |
| 9   | +3.3V (VIO) | PAR64  | 10  |
| 11  | AD63        | AD62   | 12  |
| 13  | AD61        | GND    | 14  |
| 15  | GND         | AD60   | 16  |
| 17  | AD59        | AD58   | 18  |
| 19  | AD57        | GND    | 20  |
| 21  | +3.3V (VIO) | AD56   | 22  |
| 23  | AD55        | AD54   | 24  |
| 25  | AD53        | GND    | 26  |
| 27  | GND         | AD52   | 28  |
| 29  | AD51        | AD50   | 30  |
| 31  | AD49        | GND    | 32  |
| 33  | GND         | AD48   | 34  |
| 35  | AD47        | AD46   | 36  |
| 37  | AD45        | GND    | 38  |
| 39  | +3.3V (VIO) | AD44   | 40  |
| 41  | AD43        | AD42   | 42  |
| 43  | AD41        | GND    | 44  |
| 45  | GND         | AD40   | 46  |
| 47  | AD39        | AD38   | 48  |
| 49  | AD37        | GND    | 50  |

**Table 5-9. PMC Slot 2 Connector (J23)  
Pin Assignments (continued)**

| Pin | Signal      | Signal   | Pin |
|-----|-------------|----------|-----|
| 51  | GND         | AD36     | 52  |
| 53  | AD35        | AD34     | 54  |
| 55  | AD33        | GND      | 56  |
| 57  | +3.3V (VIO) | AD32     | 58  |
| 59  | Reserved    | Reserved | 60  |
| 61  | Reserved    | GND      | 62  |
| 63  | GND         | Reserved | 64  |

**Table 5-10. PMC Slot 2 Connector (J24)  
Pin Assignments**

| Pin | Signal           | Signal           | Pin |
|-----|------------------|------------------|-----|
| 1   | PMC1_1 (P2-D1)   | PMC1_2 (P2-Z1)   | 2   |
| 3   | PMC1_3 (P2-D2)   | PMC1_4 (P2-D3)   | 4   |
| 5   | PMC1_5 (P2-Z3)   | PMC1_6 (P2-D4)   | 6   |
| 7   | PMC1_7 (P2-D5)   | PMC1_8 (P2-Z5)   | 8   |
| 9   | PMC1_9 (P2-D6)   | PMC1_10 (P2-D7)  | 10  |
| 11  | PMC1_11 (P2-Z7)  | PMC1_12 (P2-D8)  | 12  |
| 13  | PMC1_13 (P2-D9)  | PMC1_14 (P2-Z9)  | 14  |
| 15  | PMC1_15 (P2-D10) | PMC1_16 (P2-D11) | 16  |
| 17  | PMC1_17 (P2-Z11) | PMC1_18 (P2-D12) | 18  |
| 19  | PMC1_19 (P2-D13) | PMC1_20 (P2-Z13) | 20  |
| 21  | PMC1_21 (P2-D14) | PMC1_22 (P2-D15) | 22  |
| 23  | PMC1_23 (P2-Z15) | PMC1_24 (P2-D16) | 24  |
| 25  | PMC1_25 (P2-D17) | PMC1_26 (P2-Z17) | 26  |
| 27  | PMC1_27 (P2-D18) | PMC1_28 (P2-D19) | 28  |

**Table 5-10. PMC Slot 2 Connector (J24)  
Pin Assignments (continued)**

| Pin | Signal           | Signal           | Pin |
|-----|------------------|------------------|-----|
| 29  | PMC1_29 (P2-Z19) | PMC1_30 (P2-D20) | 30  |
| 31  | PMC1_31 (P2-D21) | PMC1_32 (P2-Z21) | 32  |
| 33  | PMC1_33 (P2-D22) | PMC1_34 (P2-D23) | 34  |
| 35  | PMC1_35 (P2-Z23) | PMC1_36 (P2-D24) | 36  |
| 37  | PMC1_37 (P2-D25) | PMC1_38 (P2-Z25) | 38  |
| 39  | PMC1_39 (P2-D26) | PMC1_40 (P2-D27) | 40  |
| 41  | PMC1_41 (P2-Z27) | PMC1_42 (P2-D28) | 42  |
| 43  | PMC1_43 (P2-D29) | PMC1_44 (P2-Z29) | 44  |
| 45  | PMC1_45 (P2-D30) | PMC1_46 (P2-Z31) | 46  |
| 47  | Not Used         | Not Used         | 48  |
| 49  | Not Used         | Not Used         | 50  |
| 51  | Not Used         | Not Used         | 52  |
| 53  | Not Used         | Not Used         | 54  |
| 55  | Not Used         | Not Used         | 56  |
| 57  | Not Used         | Not Used         | 58  |
| 59  | Not Used         | Not Used         | 60  |
| 61  | Not Used         | Not Used         | 62  |
| 63  | Not Used         | Not Used         | 64  |

## COM1 Connector (J19)

A standard RJ-45 connector located on the front panel of the MVME6100 provides the interface to the asynchronous serial debug port. The pin assignments for this connector are as follows:

**Table 5-11. COM1 Connector (J19) Pin Assignments**

| Pin | Signal |
|-----|--------|
| 1   | DCD    |
| 2   | RTS    |
| 3   | GNDC   |
| 4   | TX     |
| 5   | RX     |
| 6   | GNDC   |
| 7   | CTS    |
| 8   | DTR    |

## VMEbus P1 Connector

The VME P1 connector is an 160-pin DIN. The P1 connector provides power and VME signals for 24-bit address and 16-bit data. The pin assignments for the P1 connector is as follows:

**Table 5-12. VMEbus P1 Connector Pin Assignments**

|   | ROW Z    | ROW A | ROW B   | ROW C | ROW D    |   |
|---|----------|-------|---------|-------|----------|---|
| 1 | Reserved | D00   | BBSY*   | D08   | Reserved | 1 |
| 2 | GND      | D01   | BCLR*   | D09   | Reserved | 2 |
| 3 | Reserved | D02   | ACFAIL* | D10   | Reserved | 3 |
| 4 | GND      | D03   | BG0IN*  | D11   | Reserved | 4 |
| 5 | Reserved | D04   | BG0OUT* | D12   | Reserved | 5 |

**Table 5-12. VMEbus P1 Connector Pin Assignments (continued)**

|    | ROW Z    | ROW A    | ROW B   | ROW C     | ROW D    |    |
|----|----------|----------|---------|-----------|----------|----|
| 6  | GND      | D05      | BG1IN*  | D13       | Reserved | 6  |
| 7  | Reserved | D06      | BG1OUT* | D14       | Reserved | 7  |
| 8  | GND      | D07      | BG2IN*  | D15       | Reserved | 8  |
| 9  | Reserved | GND      | BG2OUT* | GND       | Reserved | 9  |
| 10 | GND      | SYSCLK   | BG3IN*  | SYSFAIL*  | Reserved | 10 |
| 11 | Reserved | GND      | BG3OUT* | BERR*     | Reserved | 11 |
| 12 | GND      | DS1*     | BR0*    | SYSRESET* | Reserved | 12 |
| 13 | Reserved | DS0*     | BR1*    | LWORD*    | Reserved | 13 |
| 14 | GND      | WRITE*   | BR2*    | AM5       | Reserved | 14 |
| 15 | Reserved | GND      | BR3*    | A23       | Reserved | 15 |
| 16 | GND      | DTACK*   | AM0     | A22       | Reserved | 16 |
| 17 | Reserved | GND      | AM1     | A21       | Reserved | 17 |
| 18 | GND      | AS*      | AM2     | A20       | Reserved | 18 |
| 19 | Reserved | GND      | AM3     | A19       | Reserved | 19 |
| 20 | GND      | IACK*    | GND     | A18       | Reserved | 20 |
| 21 | Reserved | IACKIN*  | SERA    | A17       | Reserved | 21 |
| 22 | GND      | IACKOUT* | SERB    | A16       | Reserved | 22 |
| 23 | Reserved | AM4      | GND     | A15       | Reserved | 23 |
| 24 | GND      | A07      | IRQ7*   | A14       | Reserved | 24 |
| 25 | Reserved | A06      | IRQ6*   | A13       | Reserved | 25 |
| 26 | GND      | A05      | IRQ5*   | A12       | Reserved | 26 |
| 27 | Reserved | A04      | IRQ4*   | A11       | Reserved | 27 |
| 28 | GND      | A03      | IRQ3*   | A10       | Reserved | 28 |

**Table 5-12. VMEbus P1 Connector Pin Assignments (continued)**

|    | ROW Z    | ROW A | ROW B    | ROW C | ROW D    |    |
|----|----------|-------|----------|-------|----------|----|
| 29 | Reserved | A02   | IRQ2*    | A09   | Reserved | 29 |
| 30 | GND      | A01   | IRQ1*    | A08   | Reserved | 30 |
| 31 | Reserved | -12V  | +5VSTDBY | +12V  | Reserved | 31 |
| 32 | GND      | +5V   | +5V      | +5V   | Reserved | 32 |

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**VMEBus P2 Connector (PMC Mode)**

The VME P2 connector is an 160-pin DIN. Row B of the P2 connector provides power to the MVME6100 and to the upper eight VMEbus address lines and additional 16 VMEbus data lines. The pin assignments for the P2 connector are as follows:

**Table 5-13. VMEbus P2 Connector Pin Assignments (PMC Mode)**

|   | ROW Z               | ROW A               | ROW B  | ROW C                   | ROW D               |   |
|---|---------------------|---------------------|--------|-------------------------|---------------------|---|
| 1 | PMC1_2<br>(J24-2)   | PMC0_2<br>(J14-2)   | +5V    | P2_IO_GLAN1_<br>MDIO_1- | PMC1_1<br>(J24-1)   | 1 |
| 2 | GND                 | PMC0_4<br>(J14-4)   | GND    | P2_IO_GLAN1_<br>MDIO_1+ | PMC1_3<br>(J24-3)   | 2 |
| 3 | PMC1_5<br>(J4-5)    | PMC0_6<br>(J14-6)   | RETRY# | P2_IO_GLAN1_<br>MDIO_0- | PMC1_4<br>(J24-4)   | 3 |
| 4 | GND                 | PMC0_8<br>(J14-8)   | VA24   | P2_IO_GLAN1_<br>MDIO_0+ | PMC1_6<br>(J24-6)   | 4 |
| 5 | PMC1_8<br>(J24-8)   | PMC0_10<br>(J14-10) | VA25   | PMC0_9<br>(J14-9)       | PMC1_7<br>(J24-7)   | 5 |
| 6 | GND                 | PMC0_12<br>(J14-12) | VA26   | PMC0_11<br>(J14-11)     | PMC1_9<br>(J24-9)   | 6 |
| 7 | PMC1_11<br>(J24-11) | PMC0_14<br>(J14-14) | VA27   | PMC0_13<br>(J14-13)     | PMC1_10<br>(J24-10) | 7 |

**Table 5-13. VMEbus P2 Connector  
Pin Assignments (PMC Mode) (continued)**

|    | ROW Z                | ROW A               | ROW B | ROW C               | ROW D               |    |
|----|----------------------|---------------------|-------|---------------------|---------------------|----|
| 8  | GND                  | PMC0_16<br>(J14-16) | VA28  | PMC0_15<br>(J14-15) | PMC1_12<br>(J24-12) | 8  |
| 9  | PMC1_14<br>(J24-14)  | PMC0_18<br>(J14-18) | VA29  | PMC0_17<br>(J14-17) | PMC1_13<br>(J24-13) | 9  |
| 10 | GND                  | PMC0_20<br>(J14-20) | VA30  | PMC0_19<br>(J14-19) | PMC1_15<br>(J24-15) | 10 |
| 11 | PMC1_17<br>(J24-17)  | PMC0_22<br>(J14-22) | VA31  | PMC0_21<br>(J14-21) | PMC1_16<br>(J24-16) | 11 |
| 12 | GND                  | PMC0_24<br>(J14-24) | GND   | PMC0_23<br>(J14-23) | PMC1_18<br>(J24-18) | 12 |
| 13 | PMC1_20<br>(J24-20)  | PMC0_26<br>(J14-26) | +5V   | PMC0_25<br>(J14-25) | PMC1_19<br>(J24-19) | 13 |
| 14 | GND                  | PMC0_28<br>(J14-28) | VD16  | PMC0_27<br>(J14-27) | PMC1_21<br>(J24-21) | 14 |
| 15 | PMC1_23<br>(J24-J23) | PMC0_30<br>(J14-30) | VD17  | PMC0_29<br>(J14-29) | PMC1_22<br>(J24-22) | 15 |
| 16 | GND                  | PMC0_32<br>(J14-32) | VD18  | PMC0_31<br>(J14-31) | PMC1_24<br>(J24-24) | 16 |
| 17 | PMC1_26<br>(J24-J26) | PMC0_34<br>(J14-34) | VD19  | PMC0_33<br>(J14-33) | PMC1_25<br>(J24-25) | 17 |
| 18 | GND                  | PMC0_36<br>(J14-36) | VD20  | PMC0_35<br>(J14-35) | PMC1_27<br>(J24-27) | 18 |
| 19 | PMC1_29<br>(J24-29)  | PMC0_38<br>(J14-38) | VD21  | PMC0_37<br>(J14-37) | PMC1_28<br>(J24-28) | 19 |
| 20 | GND                  | PMC0_40<br>(J14-40) | VD22  | PMC0_39<br>(J14-39) | PMC1_30<br>(J24-30) | 20 |
| 21 | PMC1_32<br>(J24-32)  | PMC0_42<br>(J14-42) | VD23  | PMC0_41<br>(J14-41) | PMC1_31<br>(J24-31) | 21 |
| 22 | GND                  | PMC0_44<br>(J14-44) | GND   | PMC0_43<br>(J14-43) | PMC1_33<br>(J24-33) | 22 |

**Table 5-13. VMEbus P2 Connector  
Pin Assignments (PMC Mode) (continued)**

|    | <b>ROW Z</b>            | <b>ROW A</b>        | <b>ROW B</b> | <b>ROW C</b>             | <b>ROW D</b>        |    |
|----|-------------------------|---------------------|--------------|--------------------------|---------------------|----|
| 23 | PMC1_35<br>(J24-35)     | PMC0_46<br>(J14-46) | VD24         | PMC0_45<br>(J14-45)      | PMC1_34<br>(J24-34) | 23 |
| 24 | GND                     | PMC0_48<br>(J14-48) | VD25         | PMC0_47<br>(J14-47)      | PMC1_36<br>(J24-36) | 24 |
| 25 | P2_IO_GLAN1_<br>MDIO_2+ | PMC0_50<br>(J14-50) | VD26         | PMC0_49<br>(J14-49)      | PMC1_37<br>(J24-37) | 25 |
| 26 | GND                     | PMC0_52<br>(J14-52) | VD27         | PMC0_51<br>(J14-51)      | PMC1_39<br>(J24-39) | 26 |
| 27 | P2_IO_GLAN1_<br>MDIO_2- | PMC0_54<br>(J14-54) | VD28         | PMC0_53<br>(J14-53)/TXB  | PMC1_40<br>(J24-40) | 27 |
| 28 | GND                     | PMC0_56<br>(J14-56) | VD29         | PMC0_55<br>(J14-55)/RXB  | PMC1_42<br>(J24-42) | 28 |
| 29 | P2_IO_GLAN1_<br>MDIO_3+ | PMC0_58<br>(J14-58) | VD30         | PMC0_57<br>(J14-57)/RTSB | PMC1_43<br>(J24-43) | 29 |
| 30 | GND                     | PMC0_60<br>(J14-60) | VD31         | PMC0_59<br>(J14-59)/CTSB | PMC1_45<br>(J24-45) | 30 |
| 31 | P2_IO_GLAN1_<br>MDIO_3- | PMC0_62<br>(J14-62) | GND          | PMC0_61<br>(J14-61)      | GND                 | 31 |
| 32 | GND                     | PMC0_64<br>(J14-64) | +5V          | PMC0_63<br>(J14-63)      | VPC                 | 32 |

**Note** The default configuration for P2, C27-C30 are connected to PMC0\_IO (53,55,57,59).



## VMEbus P2 Connector (IPMC Mode)

The VME P2 connector is an 160-pin DIN. Row B of the P2 connector provides power to the MVME6100 and to the upper eight VMEbus address lines and additional 16 VMEbus data lines. The pin assignments for the P2 connector are as follows:

**Table 5-14. VME P2 Connector Pinouts with IPMC712**

| Pin | Row Z            | Row A | Row B | Row C         | Row D            |
|-----|------------------|-------|-------|---------------|------------------|
| 1   | PMC2_2           | DB0#  | +5V   | RD-           | PMC2_1 (J24-1)   |
| 2   | GND              | DB1#  | GND   | RD+           | PMC2_3 (J24-3)   |
| 3   | PMC2_5           | DB2#  | N/C   | TD-           | PMC2_4 (J24-4)   |
| 4   | GND              | DB3#  | VA24  | TD+           | PMC2_6 (J24-6)   |
| 5   | PMC2_8           | DB4#  | VA25  | NOT USED      | PMC2_7 (J24-7)   |
| 6   | GND              | DB5#  | VA26  | NOT USED      | PMC2_9 (J24-9)   |
| 7   | PMC2_11          | DB6#  | VA27  | +12V<br>(LAN) | PMC2_10 (J24-10) |
| 8   | GND              | DB7#  | VA28  | PRSTB#        | PMC2_12 (J24-12) |
| 9   | PMC2-14          | DBP#  | VA29  | P DB0         | PMC2_13 (J24-13) |
| 10  | GND              | ATN#  | VA30  | P DB1         | PMC2_15 (J24-15) |
| 11  | PMC2_17          | BSY#  | VA31  | P DB2         | PMC2_16 (J24-16) |
| 12  | GND              | ACK#  | GND   | P DB3         | PMC2_18 (J24-18) |
| 13  | PMC2_20          | RST#  | +5V   | P DB4         | PMC2_19 (J24-19) |
| 14  | GND              | MSG#  | VD16  | P DB5         | PMC2_21 (J24-21) |
| 15  | PMC2_23          | SEL#  | VD17  | P DB6         | PMC2_22 (J24-22) |
| 16  | GND              | D/C#  | VD18  | P DB7         | PMC2_24 (J24-24) |
| 17  | PMC2_26          | REQ#  | VD19  | P ACK#        | PMC2_25 (J24-25) |
| 18  | GND              | I/O#  | VD20  | P BSY         | PMC2_27 (J24-27) |
| 19  | PMC2_29 (J24-29) | TXD3  | VD21  | P PE          | PMC2_28 (J24-28) |
| 20  | GND              | RXD3  | VD22  | P SEL         | PMC2_30 (J24-30) |

**Table 5-14. VME P2 Connector Pinouts with IPMC712 (continued)**

| Pin | Row Z            | Row A | Row B | Row C    | Row D            |
|-----|------------------|-------|-------|----------|------------------|
| 21  | PMC2_32 (J24-32) | RTS3  | VD23  | P IME    | PMC2_31 (J24-31) |
| 22  | GND              | CTS3  | GND   | P FAULT# | PMC2_33 (J24-33) |
| 23  | PMC2_35 (J24-35) | DTR3  | VD24  | TXD1_232 | PMC2_34 (J24-34) |
| 24  | GND              | DCD3  | VD25  | RXD1     | PMC2_36 (J24-36) |
| 25  | PMC2_38 (J24-38) | TXD4  | VD26  | RTS1     | PMC2_37 (J24-37) |
| 26  | GND              | RXD4  | VD27  | CTS1     | PMC2_39 (J24-39) |
| 27  | PMC2_41 (J24-41) | RTS4  | VD28  | TXD2     | PMC2_40 (J24-40) |
| 28  | GND              | TRXC4 | VD29  | RXD2     | PMC2_42 (J24-42) |
| 29  | PMC2_44 (J24-44) | CTS4  | VD30  | RTS2     | PMC2_43 (J24-43) |
| 30  | GND              | DTR4  | VD31  | CTS2     | PMC2_45 (J24-45) |
| 31  | PMC2_46 (J24-46) | DCD4  | GND   | DTR2     | GND              |
| 32  | GND              | RTXC4 | +5V   | DCD2     | VPC              |

**Table 5-15. VME P2 Connector Pinouts with IPMC761**

| Pin | Row Z | Row A | Row B  | Row C        | Row D            |
|-----|-------|-------|--------|--------------|------------------|
| 1   | DB8#  | DB0#  | +5V    | RD- (10/100) | PMC2_1 (J24-1)   |
| 2   | GND   | DB1#  | GND    | RD+ (10/100) | PMC2_3 (J24-3)   |
| 3   | DB9#  | DB2#  | RETRY# | TD- (10/100) | PMC2_4 (J24-4)   |
| 4   | GND   | DB3#  | VA24   | TD+ (10/100) | PMC2_6 (J24-6)   |
| 5   | DB10# | DB4#  | VA25   | Not Used     | PMC2_7 (J24-7)   |
| 6   | GND   | DB5#  | VA26   | Not Used     | PMC2_9 (J24-9)   |
| 7   | DB11# | DB6#  | VA27   | +12VF        | PMC2_10 (J24-10) |
| 8   | GND   | DB7#  | VA28   | PRSTB#       | PMC2_12 (J24-12) |
| 9   | DB12# | DBP#  | VA29   | PRD0         | PMC2_13 (J24-13) |
| 10  | GND   | ATN#  | VA30   | PRD1         | PMC2_15 (J24-15) |

**Table 5-15. VME P2 Connector Pinouts with IPMC761 (continued)**

| Pin | Row Z               | Row A | Row B | Row C    | Row D            |
|-----|---------------------|-------|-------|----------|------------------|
| 11  | DB13#               | BSY#  | VA31  | PRD2     | PMC2_16 (J24-16) |
| 12  | GND                 | ACK#  | GND   | PRD3     | PMC2_18 (J24-18) |
| 13  | DB14#               | RST#  | +5V   | PRD4     | PMC2_19 (J24-19) |
| 14  | GND                 | MSG#  | VD16  | PRD5     | PMC2_21 (J24-21) |
| 15  | DB15#               | SEL#  | VD17  | PRD6     | PMC2_22 (J24-22) |
| 16  | GND                 | D/C#  | VD18  | PRD7     | PMC2_24 (J24-24) |
| 17  | DBP1#               | REQ#  | VD19  | PRACK#   | PMC2_25 (J24-25) |
| 18  | GND                 | O/I#  | VD20  | PRBSY    | PMC2_27 (J24-27) |
| 19  | PMC2_29<br>(J24-29) | AFD#  | VD21  | PRPE     | PMC2_28 (J24-28) |
| 20  | GND                 | SLIN# | VD22  | PRSEL    | PMC2_30 (J24-30) |
| 21  | PMC2_32<br>(J24-32) | TXD3  | VD23  | INIT#    | PMC2_31 (J24-31) |
| 22  | GND                 | RXD3  | GND   | PRFLT#   | PMC2_33 (J24-33) |
| 23  | PMC2_35<br>(J24-35) | RTXC3 | VD24  | TXD1_232 | PMC2_34 (J24-34) |
| 24  | GND                 | TRXC3 | VD25  | RXD1_232 | PMC2_36 (J24-36) |
| 25  | PMC2_38<br>(J24-38) | TXD4  | VD26  | RTS1_232 | PMC2_37 (J24-37) |
| 26  | GND                 | RXD4  | VD27  | CTS1_232 | PMC2_39 (J24-39) |
| 27  | PMC2_41<br>(J24-41) | RTXC4 | VD28  | TXD2_232 | PMC2_40 (J24-40) |
| 28  | GND                 | TRXC4 | VD29  | RXD2_232 | PMC2_42 (J24-42) |

**Table 5-15. VME P2 Connector Pinouts with IPMC761 (continued)**

| Pin | Row Z               | Row A  | Row B | Row C    | Row D            |
|-----|---------------------|--------|-------|----------|------------------|
| 29  | PMC2_44<br>(J24-44) |        | VD30  | RTS2_232 | PMC2_43 (J24-43) |
| 30  | GND                 | -12VF  | VD31  | CTS2_232 | PMC2_45 (J24-45) |
| 31  | PMC2_46<br>(J24-46) | MSYNC# | GND   | MDO      | GND              |
| 32  | GND                 | MCLK   | +5V   | MDI      | VPC              |

**Note** Rows A and C and Zs (Z1, 3, 5, 7, 9, 11, 13, 15, and 17) functionality is provided by the IPMC761 in slot 1 and the MVME6100 Ethernet port 2.

## Headers

### SCON Header (J7)

A 3-pin planar header allows the choice for auto/enable/disable SCON VME configuration. A jumper installed across pins 1 and 2 configures for SCON always enabled. A jumper installed across pins 2 and 3 configures for SCON disabled. No jumper installed configures for auto SCON. The pin assignments for this connector are as follows:

**Table 5-16. SCON Header (J7) Pin Assignments**

| Pin | Signal    |
|-----|-----------|
| 1   | SCONEN_L  |
| 2   | GND       |
| 3   | SCONDIS_L |

## Boundary Scan Header (J8)

The 14-pin boundary scan header provides an interface for programming the on-board PLDs and for boundary scan testing/debug purposes. The pin assignments for this header are as follows:

**Table 5-17. Boundary Scan Header (J8) Pin Assignments**

| Pin | Signal | Signal      | Pin |
|-----|--------|-------------|-----|
| 1   | TRST_L | GND         | 2   |
| 3   | TDO    | GND         | 4   |
| 5   | TDI    | GND         | 6   |
| 7   | TMS    | GND         | 8   |
| 9   | TCLK   | GND         | 10  |
| 11  | NC     | CPU_BSCAN_L | 12  |
| 13  | AW_L   | GND         | 14  |

## PMC/IPMC Selection Headers (J10, J15 – J18, J25 – J28)

Nine 3-pin 2 mm planar headers allow for PMC/IPMC I/O selection. These nine headers can also be combined into one single header block where a block shunt can be used as a jumper. The pin assignments for these connectors are as follows:

**Table 5-18. PMC/IPMC Configuration Jumper Block**

|            | Pin/Row 1<br>(PMC I/O) | Pin/Row 2<br>(P2 Pins) | Pin/Row 3<br>(IPMC Pins) |
|------------|------------------------|------------------------|--------------------------|
| <b>J28</b> | PMC1_IO(2)             | P2_PMC1_IO(2)          | IPMC DB8_L               |
| <b>J16</b> | PMC1_IO(5)             | P2_PMC1_IO(5)          | IPMC DB9_L               |
| <b>J18</b> | PMC1_IO(8)             | P2_PMC1_IO(8)          | IPMC DB10_L              |
| <b>J25</b> | PMC1_IO(11)            | P2_PMC1_IO(11)         | IPMC DB11_L              |
| <b>J27</b> | PMC1_IO(14)            | P2_PMC1_IO(14)         | IPMC DB12_L              |

**Table 5-18. PMC/IPMC Configuration Jumper Block**

|            | <b>Pin/Row 1<br/>(PMC I/O)</b> | <b>Pin/Row 2<br/>(P2 Pins)</b> | <b>Pin/Row 3<br/>(IPMC Pins)</b> |
|------------|--------------------------------|--------------------------------|----------------------------------|
| <b>J26</b> | PMC1_IO(17)                    | P2_PMC1_IO(17)                 | IPMC DB13_L                      |
| <b>J17</b> | PMC1_IO(20)                    | P2_PMC1_IO(20)                 | IPMC DB14_L                      |
| <b>J10</b> | PMC1_IO(23)                    | P2_PMC1_IO(23)                 | IPMC DB15_L                      |
| <b>J15</b> | PMC1_IO(26)                    | P2_PMC1_IO(26)                 | IPMC DBP1_L                      |

A jumper installed across pins 2 and 3 on all nine headers selects PMC1 I/O for IPMC mode.

## COM2 Header (J29)

A 10-pin 0.100" planar header provides the interface to a second asynchronous serial debug port. COM2 only goes to the on-board header as the default configuration. The pin assignments for this header are as follows:

**Table 5-19. COM2 Planar Serial Port Header (J29) Pin Assignments**

| <b>Pin</b> | <b>Signal</b> | <b>Signal</b> | <b>Pin</b> |
|------------|---------------|---------------|------------|
| 1          | COM2_DCD      | COM2_DSR      | 2          |
| 3          | COM2_RX       | COM2_RTS      | 4          |
| 5          | COM2_TX       | COM2_CTS      | 6          |
| 7          | COM2_DTR      | COM2_RI       | 8          |
| 9          | GND           | KEY (no pin)  | 10         |

## Front/Rear Ethernet and Transition Module Options Header (J30)

The pin assignments for this connector are as follows:

**Table 5-20. Front/Rear Ethernet and Transition Module Options Header (J30) Pin Assignment**

| Pin | Row D<br>(From PMC<br>I/O) | Row C<br>(To P2 Connector)   | Row B<br>(From LAN2<br>Controller) | Row A<br>(To Front Panel<br>Ethernet) |
|-----|----------------------------|------------------------------|------------------------------------|---------------------------------------|
| 1   | PMC0_IO(13)                | P2 <sup>1</sup> _C7          | Fused +12V                         | No Connect                            |
| 2   | PMC0_IO(60)                | P2_A30                       | Fused -12V                         | No Connect                            |
| 3   | PMC0_IO(7)                 | P2_C4(P2_IO_GLAN1_ MDIO_0+)  | magnetic T2 <sup>2</sup> -23       | MDI_0P (J9 <sup>3</sup> -2)           |
| 4   | PMC0_IO(5)                 | P2_C3(P2_IO_GLAN1_ MDIO_0-)  | magnetic T2-22                     | MDI_0N (J9-3)                         |
| 5   | PMC0_IO(3)                 | P2_C2(P2_IO_GLAN1_ MDIO_1+)  | magnetic T2-20                     | MDI_1P (J9-4)                         |
| 6   | PMC0_IO(1)                 | P2_C1(P2_IO_GLAN1_ MDIO_1-)  | magnetic T2-19                     | MDI_1N (J9-5)                         |
| 7   | PMC1_IO(38)                | P2_Z25(P2_IO_GLAN1_ MDIO_2+) | magnetic T2-17                     | MDI_2P (J9-6)                         |
| 8   | PMC1_IO(41)                | P2_Z27(P2_IO_GLAN1_ MDIO_2-) | magnetic T2-16                     | MDI_2N (J9-7)                         |
| 9   | PMC1_IO(44)                | P2_Z29(P2_IO_GLAN1_ MDIO_3+) | magnetic T2-14                     | MDI_3P (J9-8)                         |
| 10  | PMC1_IO(46)                | P2_Z31(P2_IO_GLAN1_ MDIO_3-) | magnetic T2-13                     | MDI_3N (J9-9)                         |

- Notes**
1. VME P2.
  2. Transformer for Ethernet port #2.
  3. Ethernet port #2 front connector.

## Processor JTAG/COP Header (J42)

There is one standard 16-pin header that provides an interface for the RISCWatch function. The pin assignments for this header are as follows:

**Table 5-21. Processor JTAG/COP (RISCWatch) Header (J42) Pin Assignments**

| Pin | Signal       | Signal         | Pin |
|-----|--------------|----------------|-----|
| 1   | CPU_TDO      | CPU_QACK_L     | 2   |
| 3   | CPU_TDI      | CPU_TRST_L     | 4   |
| 5   | CPU_QREQ_L   | PU CPU_VIO     | 6   |
| 7   | CPU_TCK      | OPT PU CPU_VIO | 8   |
| 9   | CPU_TMS      | NC             | 10  |
| 11  | CPU_SRST_L   | OPTPD_GND      | 12  |
| 13  | CPU_HRST_L   | KEY (no pin)   | 14  |
| 15  | CPU_CKSTPO_L | GND            | 16  |

**Note** Some signals are actually resistor buffered versions of the named signal.



## Power Requirements

In its standard configuration, the MVME6100 requires +5V, +12V, and -12V for operation. On-board converters supply the processor core voltage, +3.3V, +1.8V, and +2.5V.

## Supply Current Requirements

[Table A-1](#) provides an estimate of the typical and maximum current required from each of the input supply voltages.

**Table A-1. Power Requirements**

| Model                             | Power                                    |
|-----------------------------------|--|
| MVME6100-0163                     | Typical: 42W @ +5V<br>Maximum: 51W @ +5V |
| MVME6100-0163 with<br>IPMC712/761 | Typical: 46W @ +5V<br>Maximum: 55W @ +5V |

**Note** In a 3-row chassis, PMC current should be limited to 19.8 watts (total of both PMC slots). In a 5-row chassis, PMC current should be limited to 46.2 watts (total of both PMC slots).

## Environmental Specifications

Table A-2 lists the environmental specifications, along with the board dimensions.

**Table A-2. MVME6100 Specifications**

| Characteristics       | Specifications   |
|-----------------------|--|
| Operating Temperature | 0° to +55° C or 32° to 131° F (forced air cooling required)<br>400 LFM (linear feet per minute) of forced air cooling is recommended for operation in the upper temperature range. |
| Storage Temperature   | -40° to +70° C or -40° to +158° F  |
| Relative Humidity     | Operating: 5% to 90% non-condensing<br>Non-operating: 5% to 90% non-condensing   |
| Vibration             | Non-operating: 1 G sine sweep, 5–100 Hz, horizontal and vertical (NEBS1)   |
| Physical Dimensions   | 6U, 4HP wide (233 mm x 160 mm x 20 mm)<br>(9.2 in. x 6.3 in. x 0.8 in)   |
| MTBF                  | 328,698 hours (calculated based on BellCore Issue 6, Method 1, case 3 for the central office or environmentally controlled remote shelters or customer premise areas)              |

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Board component temperatures are affected by ambient temperature, air flow, board electrical operation, and software operation. In order to evaluate the thermal performance of a circuit board assembly, it is necessary to test the board under actual operating conditions. These operating conditions vary depending on system design.

While Motorola Computer Group performs thermal analysis in a representative system to verify operation within specified ranges, refer to [Appendix A, \*Specifications\*](#), you should evaluate the thermal performance of the board in your application.

This appendix provides systems integrators with information which can be used to conduct thermal evaluations of the board in their specific system configuration. It identifies thermally significant components and lists the corresponding maximum allowable component operating temperatures. It also provides example procedures for component-level temperature measurements.

## Thermally Significant Components

The following table summarizes components that exhibit significant temperature rises. These are the components that should be monitored in order to assess thermal performance. The table also supplies the component reference designator and the maximum allowable operating temperature.

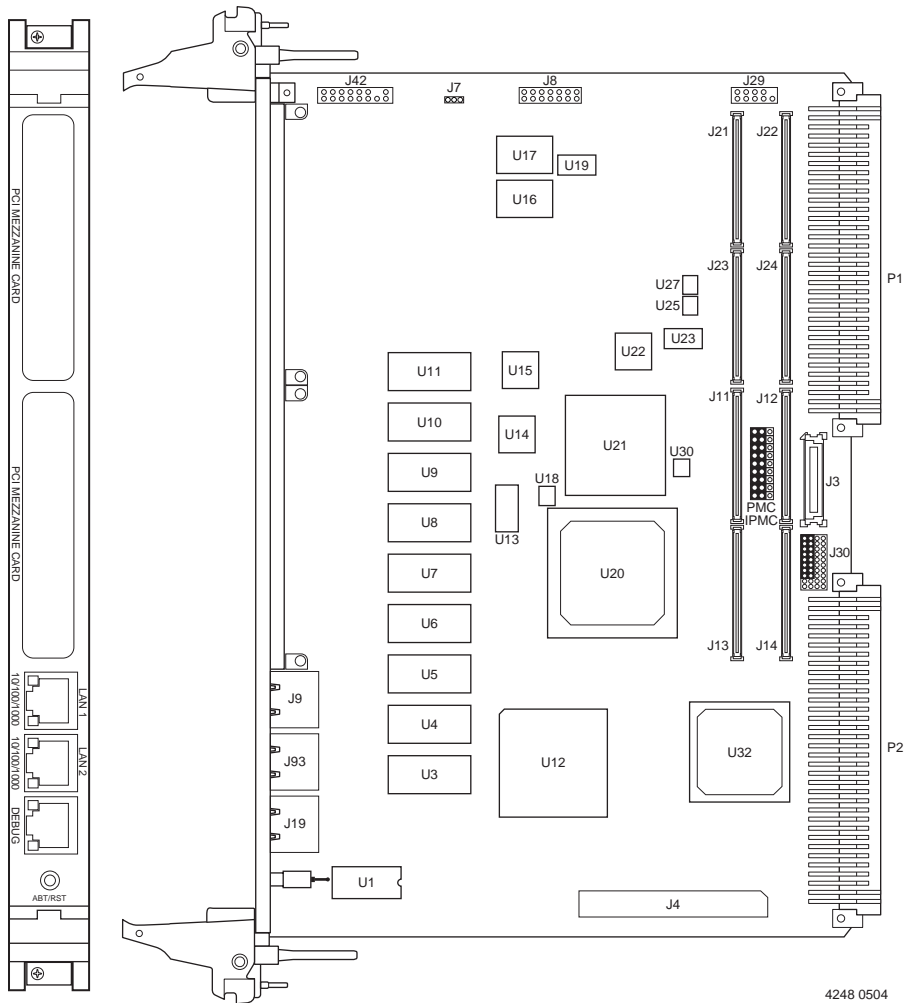
You can find components on the board by their reference designators as shown in [Figure B-1](#) and [Figure B-2](#). Versions of the board that are not fully populated may not contain some of these components.

The preferred measurement location for a component may be *junction*, *case*, or *air* as specified in the table. Junction temperature refers to the temperature measured by an on-chip thermal device. Case temperature

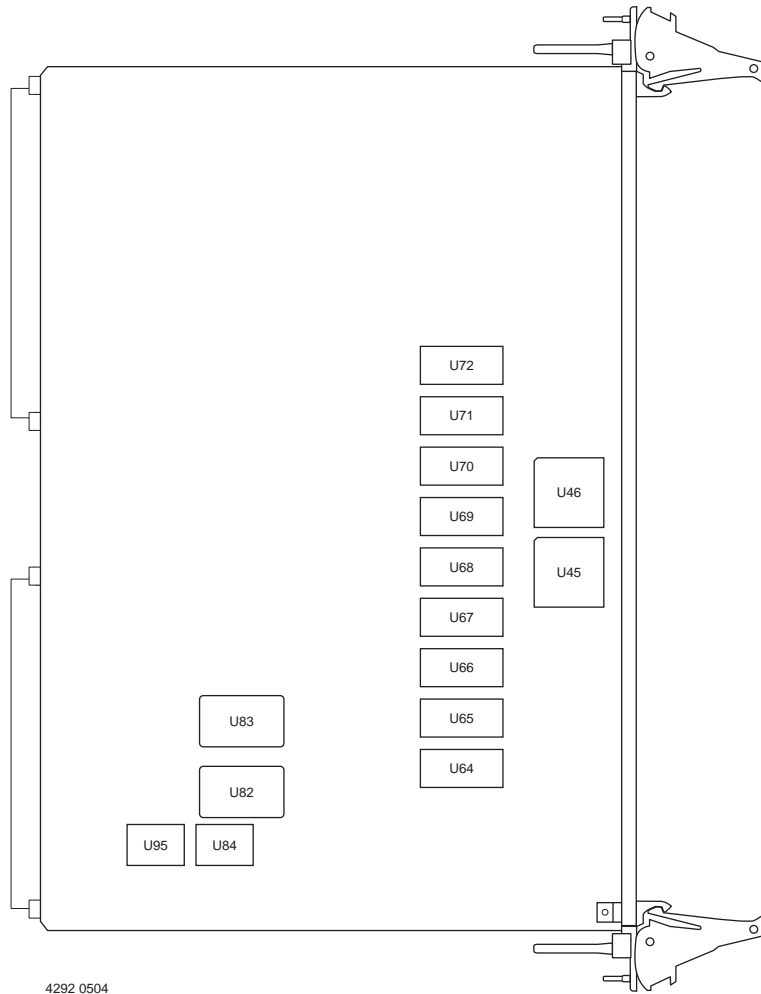
refers to the temperature at the top, center surface of the component. Air temperature refers to the ambient temperature near the component.

**Table B-1. Thermally Significant Components**

| <b>Reference Designator</b> | <b>Generic Description</b>    | <b>Max. Allowable Component Temperature (deg. C)</b> | <b>Measurement Location</b> |
|-----------------------------|-------------------------------|--|-----------------------------|
| U3-U11,<br>U64-U72          | DDR SDRAM                     | 70   | Air                         |
| U84, U95                    | Gigabit Ethernet Transceiver  | 129  | Case                        |
| U82, U83                    | Cache                         | 115  | Case                        |
| U45, U46                    | Programmable Logic Device     | 70   | Air                         |
| U32                         | PCI Bridge                    | 70   | Air                         |
| U20                         | Discovery II                  | 110  | Case                        |
| U15                         | Clock Generator               | 85   | Air                         |
| U14, U22                    | Clock Buffer                  | 85   | Air                         |
| U12                         | MC7457RX, 1.267 GHz Processor | 103  | Case                        |
| U21                         | Tsi148 VME Bridge ASIC        | 100  |                             |



**Figure B-1. Thermally Significant Components—Primary Side**



**Figure B-2. Thermally Significant Components—Secondary Side**

# Component Temperature Measurement

The following sections outline general temperature measurement methods. For the specific types of measurements required for thermal evaluation of this board, see [Table B-1](#).

## Preparation

We recommend 40 AWG (American wire gauge) thermocouples for all thermal measurements. Larger gauge thermocouples can wick heat away from the components and disturb air flowing past the board.

Allow the board to reach thermal equilibrium before taking measurements. Most circuit boards will reach thermal equilibrium within 30 minutes. After the warm up period, monitor a small number of components over time to assure that equilibrium has been reached.

## Measuring Junction Temperature

Some components have an on-chip thermal measuring device such as a thermal diode. For instructions on measuring temperatures using the on-board device, refer to the component manufacturer's documentation listed in [Appendix C, Related Documentation](#).

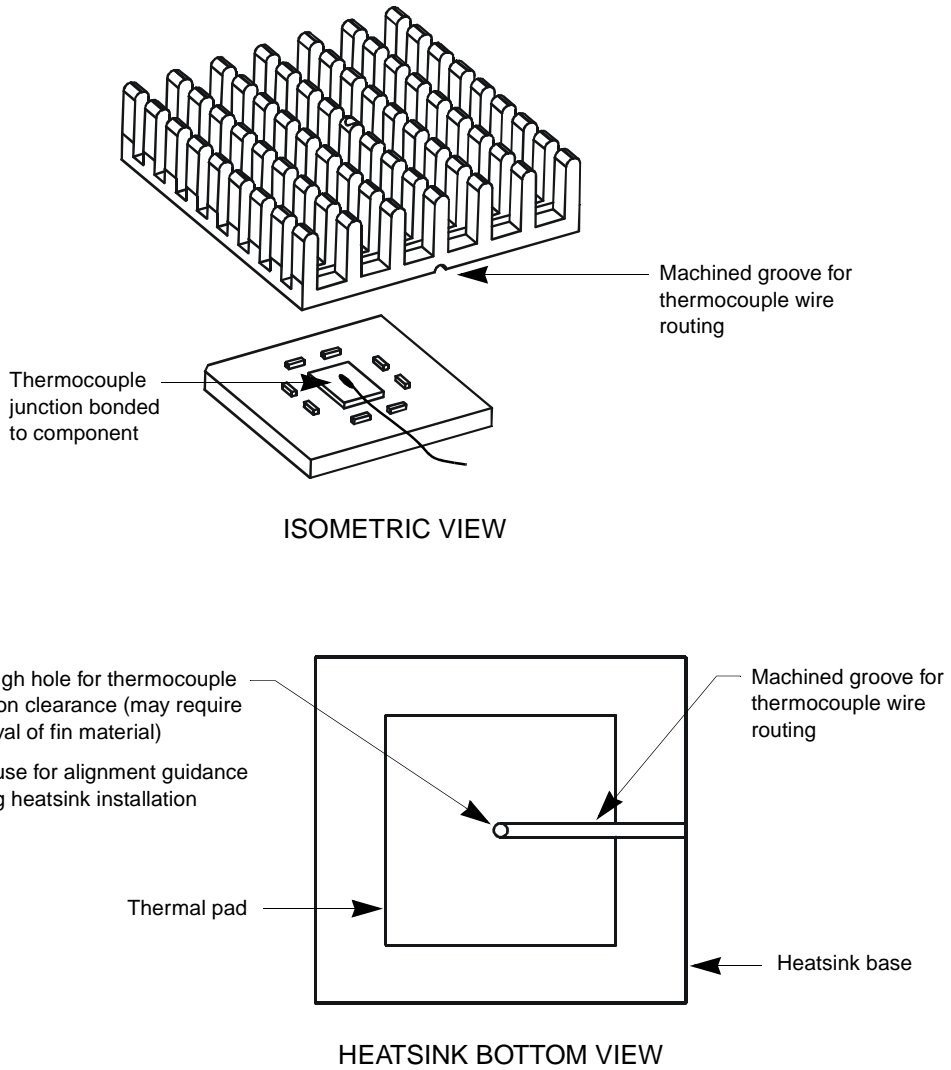
## Measuring Case Temperature

Measure the case temperature at the center of the top of the component. Make sure there is good thermal contact between the thermocouple junction and the component. We recommend you use a thermally conductive adhesive such as Loctite 384.

If components are covered by mechanical parts such as heatsinks, you will need to machine these parts to route the thermocouple wire. Make sure that the thermocouple junction contacts *only* the electrical component. Also make sure that heatsinks lay flat on electrical components. The following figure shows one method of machining a heatsink base to provide a thermocouple routing path.

**Note** Machining a heatsink base reduces the contact area between the heatsink and the electrical component. You can partially compensate for this effect by filling the machined areas with thermal grease. The grease should not contact the thermocouple junction.

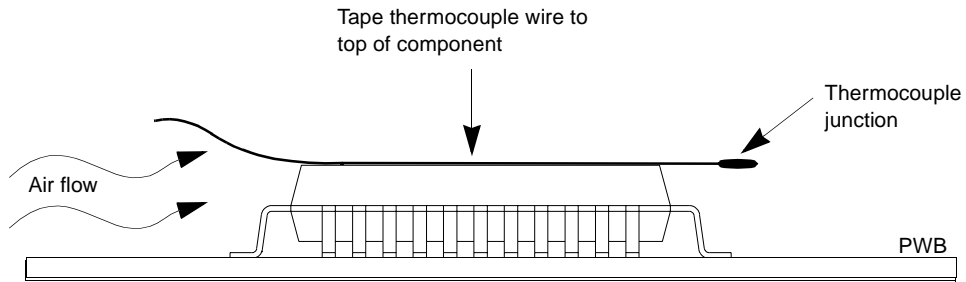




**Figure B-3. Mounting a Thermocouple Under a Heatsink**

## Measuring Local Air Temperature

Measure local component ambient temperature by placing the thermocouple downstream of the component. This method is conservative since it includes heating of the air by the component. The following figure illustrates one method of mounting the thermocouple.



**Figure B-4. Measuring Local Air Temperature**



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## Motorola Computer Group Documents

The Motorola publications listed below are referenced in this manual. You can obtain electronic copies of Motorola Computer Group publications by:

- Contacting your local Motorola sales office
- Visiting Motorola Computer Group's World Wide Web literature site, <http://www.motorola.com/computer/literature>

**Table C-1. Motorola Computer Group Documents**

| <b>Document Title</b>  | <b>Motorola Publication Number</b> |
|--|------------------------------------|
| <i>MVME6100 Single-Board Computer Programmer's Reference Guide</i> | V6100A/PG                          |
| <i>MOTLoad Firmware Package User's Manual</i>                      | MOTLODA/UM                         |
| <i>IPMC712/761 I/O Module Installation and Use</i>                 | VIPMCA/IH                          |
| <i>PMCSpan PMC Adapter Carrier Board Installation and Use</i>      | PMCSpanA/IH                        |

To obtain the most up-to-date product information in PDF or HTML format, visit <http://www.motorola.com/computer/literature>.

## Manufacturers' Documents

For additional information, refer to the following table for manufacturers' data sheets or user's manuals. As an additional help, a source for the listed document is provided. Please note that, while these sources have been verified, the information is subject to change without notice.

**Table C-2. Manufacturers' Documents**

| Document Title and Source   | Publication Number                                       |
|---|--|
| MPC7457 RISC Microprocessor Hardware Specification<br>Literature Distribution Center for Motorola<br>Telephone: 1-800- 441-2447<br>FAX: (602) 994-6430 or (303) 675-2150<br>Web Site: <a href="http://e-www.motorola.com/webapp/sps/library/prod_lib.jsp">http://e-www.motorola.com/webapp/sps/library/prod_lib.jsp</a><br>E-mail: <a href="mailto:ldcformotorola@hibbertco.com">ldcformotorola@hibbertco.com</a>               | MPC7457EC/D<br>Rev. 1.3,3/2003                           |
| Tsi148 PCI/X to VME Bus Bridge User Manual<br>Tundra Semiconductor Corporation<br>603 March Road<br>Ottawa, Ontario, Canada<br>K2K 2M5<br>Web Site: <a href="http://www.tundra.com">www.tundra.com</a>  | 80A3020_MA001_02   |
| PowerPC™ Apollo Microprocessor Implementation Definition Book IV<br>Literature Distribution Center for Motorola<br>Telephone: 1-800- 441-2447<br>FAX: (602) 994-6430 or (303) 675-2150<br>Web Site: <a href="http://e-www.motorola.com/webapp/sps/library/prod_lib.jsp">http://e-www.motorola.com/webapp/sps/library/prod_lib.jsp</a><br>E-mail: <a href="mailto:ldcformotorola@hibbertco.com">ldcformotorola@hibbertco.com</a> | Addendum to SC-Vger<br>Book IV Version - 1.0<br>04/21/00 |
| MV64360 System Controller for PowerPC Processors Data Sheet<br>Marvell Technologies, Ltd.<br>Web Site: <a href="http://www.marvell.com/">http://www.marvell.com/</a>  | MV-S100414-00C   |

**Table C-2. Manufacturers' Documents (continued)**

| Document Title and Source  | Publication Number         |
|--|----------------------------|
| BCM5421S 10/100/1000BASE-T Gigabit Transceiver with SERDES Interface<br>Broadcom Corporation<br>Web Site: <a href="http://www.broadcom.com">http://www.broadcom.com</a>  | 5421S-DS05-D2<br>10/25/02  |
| 3 Volt Intel StrataFlash Memory<br>28F256K3<br>Intel Corporation<br>Literature Center<br>19521 E. 32nd Parkway<br>Aurora CO 80011-8141<br>Web Site:<br><a href="http://developer.intel.com/design/flcomp/datashts/290737.htm">http://developer.intel.com/design/flcomp/datashts/290737.htm</a> | 290737                     |
| PCI6520 (HB7) Transparent PCIx/PCIx Bridge Preliminary Data Book<br>PLX Technology, Inc.<br>870 Maude Avenue<br>Sunnyvale, California 94085<br>Web Site: <a href="http://www.hintcorp.com/products/hint/default.asp">http://www.hintcorp.com/products/hint/default.asp</a>                     | PCI6520<br>Ver. 0.992      |
| EXAR ST16C554/554D, ST68C554 Quad UART with 16-Byte FIFOs<br>EXAR Corporation<br>48720 Kato Road<br>Fremont, CA 94538<br>Web Site: <a href="http://www.exar.com">http://www.exar.com</a>   | ST16C554/554D<br>Rev. 3.10 |

C

**Table C-2. Manufacturers' Documents (continued)**

| <b>Document Title and Source</b>  | <b>Publication Number</b> |
|---|---------------------------|
| 3.3V-5V 256Kbit (32Kx8) Timekeeper SRAM<br>ST Microelectronics<br>1000 East Bell Road<br>Phoenix, AZ 85022<br>Web Site: <a href="http://www.st.com/stonline/books/toc/index.htm">http://www.st.com/stonline/books/toc/index.htm</a> | M48T37V                   |
| 2-Wire Serial CMOS EEPROM<br>Atmel Corporation<br>San Jose, CA<br>Web Site: <a href="http://www.atmel.com/atmel/support/">http://www.atmel.com/atmel/support/</a>   | AT24C02N<br>AT24C64A      |
| Dallas Semiconductor DS1621 Digital Thermometer and Thermostat<br>Dallas Semiconductor<br>Web Site: <a href="http://www.dalsemi.com">http://www.dalsemi.com</a>   | DS1621                    |
| TSOP Type I Shielded Metal Cover SMT<br>Yamaichi Electronics USA<br>Web Site: <a href="http://www.yeu.com">http://www.yeu.com</a>   |                           |

## Related Specifications

For additional information, refer to the following table for related specifications. For your convenience, a source for the listed document is also provided. It is important to note that in many cases, the information is preliminary and the revision levels of the documents are subject to change without notice.

**Table C-3. Related Specifications**

| Document Title and Source  | Publication Number          |
|--|-----------------------------|
| <b>VITA</b> <a href="http://www.vita.com/">http://www.vita.com/</a>                                      |                             |
| VME64 Specification  | ANSI/VITA 1-1994            |
| VME64 Extensions   | ANSI/VITA 1.1-1997          |
| 2eSST Source Synchronous Transfer  | VITA 1.5-199x               |
| <b>PCI Special Interest Group (PCI SIG)</b> <a href="http://www.pcisig.com/">http://www.pcisig.com/</a>  |                             |
| Peripheral Component Interconnect (PCI) Local Bus Specification, Revision 2.0, 2.1, 2.2                  | PCI Local Bus Specification |
| PCI-X Addendum to the PCI Local Bus Specification  | Rev 1.0b                    |
| <b>IEEE</b> <a href="http://standards.ieee.org/catalog/">http://standards.ieee.org/catalog/</a>          |                             |
| IEEE - Common Mezzanine Card Specification (CMC) Institute of Electrical and Electronics Engineers, Inc. | P1386 Draft 2.0             |
| IEEE - PCI Mezzanine Card Specification (PMC) Institute of Electrical and Electronics Engineers, Inc.    | P1386.1 Draft 2.0           |

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