MVME6100
Single-Board Computer

Installation and Use

V6100A/IH1

June 2004 Edition

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.

Warning

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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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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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.

Model Number	Description
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

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 IPMC7*xx* module. The Discovery II PHB (MV64360) does not recognize address lines below AD16. For this reason, although an IPMC7*xx* 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.	*Unpacking Guidelines* on page 1-4
Configure the hardware by setting jumpers on the board.	*MVME6100 Preparation* on page 1-5
Install the MVME6100 board in a chassis.	*Installing the MVME6100 into a Chassis* on page 1-12
Connect any other equipment you will be using	*Connection to Peripherals* on page 1-13
Verify the hardware is installed.	*Completing the Installation* on page 1-14

Unpacking Guidelines

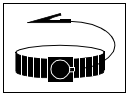
Unpack the equipment from the shipping carton. Refer to the packing list and verify that all items are present. Save the packing material for storing and reshipping of equipment.

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.

Caution

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

Use ESD



Wrist Strap

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.

Caution

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

Warning

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

Jumper/ Switch	Function	Settings	
J7	SCON Header	[No jumper installed] 1-2 2-3	Auto-SCON Always SCON No SCON
J10, J15–J18, J25–J28	PMC/IPMC Selection Headers	[Jumper installed] 1-2 [2-3]	PMC I/O IPMC I/O for IPMC7*xx* support (default)
J30	Front/Rear Ethernet and Transition Module Options Header	Refer to *Front/Rear Ethernet and Transition Module Options Header (J30)* on page 1-9 for details.	
S3	SROM Configuration Switch, sets board Geographical Address	Refer to *SROM Configuration Switch (S3)* on page 1-10 for details.	
S4	Flash Boot Bank Select Configuration Switch, sets Write Protect A, Write Protect B, Boot Bank Select, and Safe Start	Refer to *Flash Boot Bank Select Configuration Switch (S4)* 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.

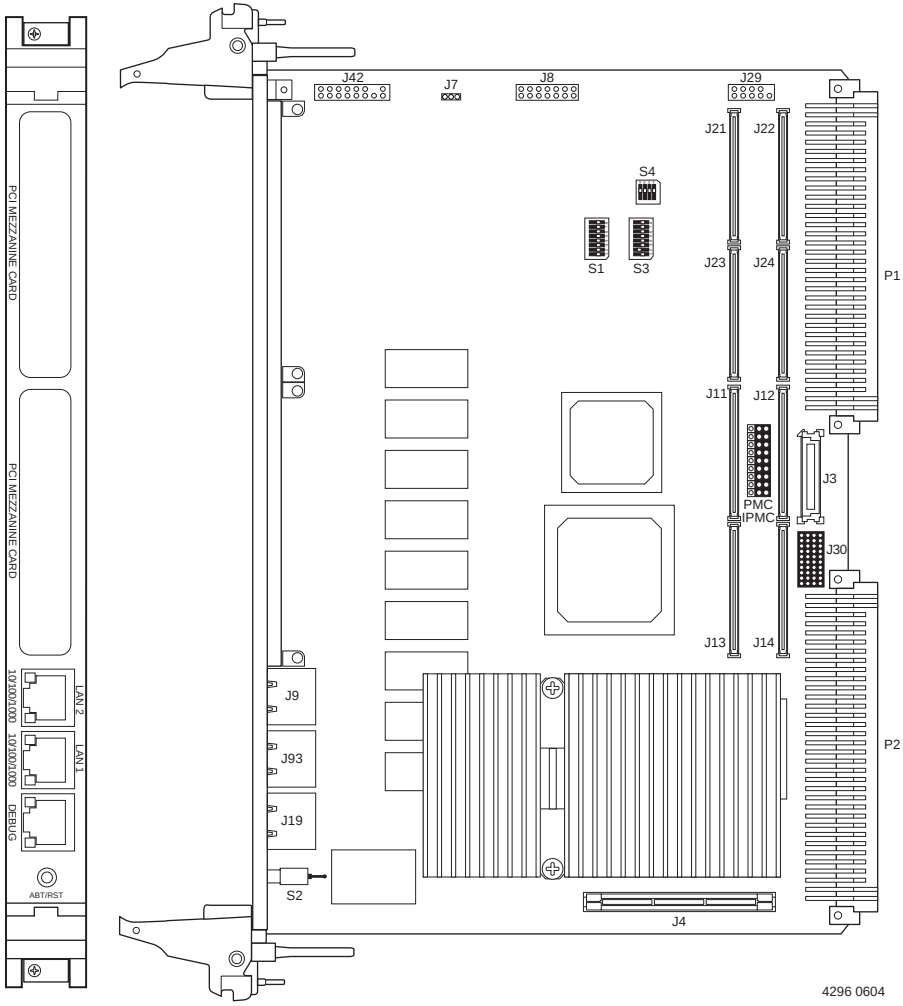
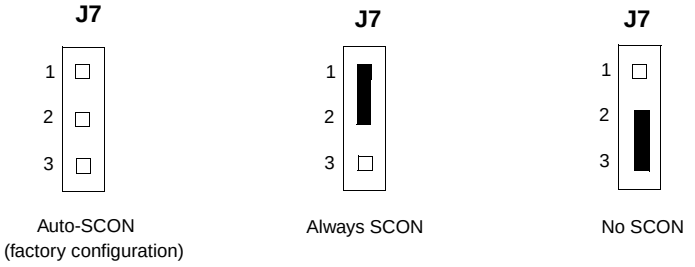


Figure 1-1. MVME6100 Layout

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.



Auto-SCON
(factory configuration)

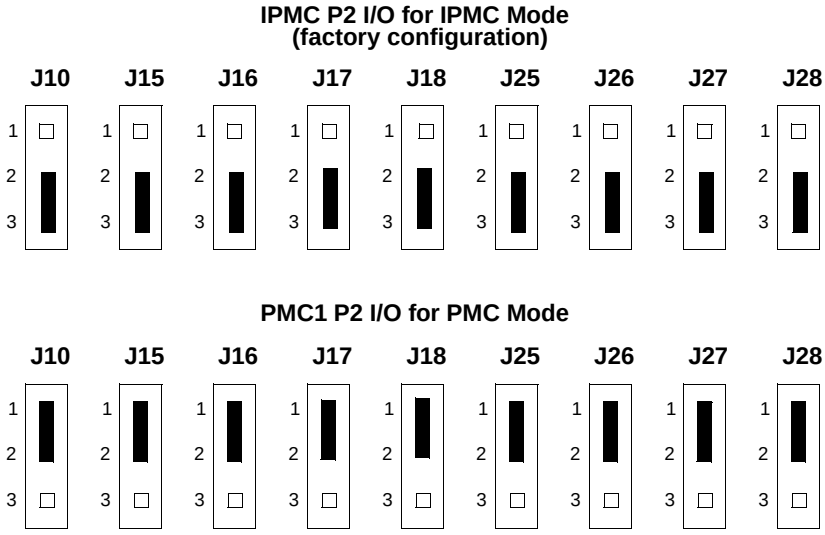
Always SCON

No 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.

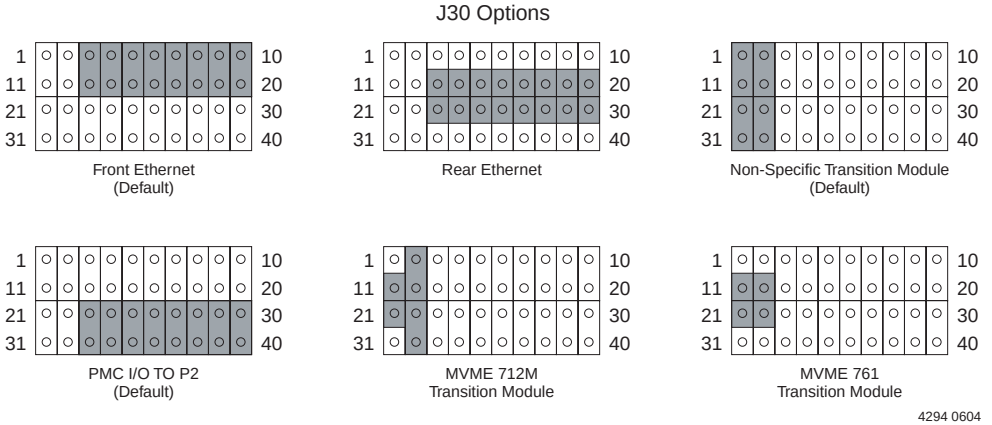
A jumper installed across pins 1 and 2 on all nine headers selects PMC1 for PMC I/O mode. A jumper across pins 2 and 3 on all nine headers selects IPMC I/O mode.



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^2C EEPROM write protection.

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

The SROM WP switch is OFF to enable write protection on all I^2C. The switch is ON to disable the I^2C 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.

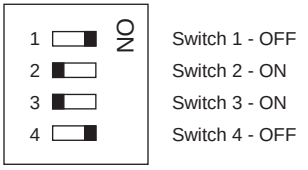
When the Boot Bank Sel Switch is ON, the board boots from Bank B, when OFF, the board boots from Bank A. Default is ON (boot from Bank B).

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 WP	ON No WP	ON Bank B	OFF Norm ENV

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



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.

Warning

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.

Startup and Operation 2

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

Function	Label	Color	Description
CPU Bus Activity	CPU	Green	CPU bus is busy
Board Fail	BDFAIL	Yellow	Board has a failure

MOTLoad Firmware 3

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

Table 3-1. MOTLoad Commands (continued)

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

Table 3-1. MOTLoad Commands (continued)

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

Table 3-1. MOTLoad Commands (continued)

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

Table 3-1. MOTLoad Commands (continued)

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

- 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 images 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
0xFFF00000 to 0xFFFFFFFF	Boot block. Recovery code
0xFFE00000 to 0XFFFFFFFF	Reserved for MCG use. (MOTLoad update image)
0xFFD00000 to 0xFFDFFFFF (FBD00000 or F7D00000)	First possible alternate image (Bank B / Bank A actual)
0xFFC00000 to 0xFFCFFFFF (FBC00000 or F7C00000)	Second possible alternate image (Bank B / Bank A actual)
....	Alternate boot images
0xFF899999 to 0xFF8FFFFF (Fb800000 or F3800000)	Last possible alternate image (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
NOPQRSTUVabcdefghijk#lmn3opqrsstuvxyzaWXZ
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 *MOTLoad Image Flags* 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 **ImageRamAddress** before execution
IMAGE_MCG	0x00000002	MCG-specific image
IMAGE_POST	0x00000004	POST image
DONT_AUTO_RUN	0x00000008	Image *not* 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.

Functional Description 4

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	– Single 1.267 GHz MPC7457 processor – Bus clock frequency at 133 MHz – 36-bit address, 64-bit data buses – Integrated L1 and L2 cache
L3 Cache	– Bus clock frequency at 211 MHz (when supported by processor) – Up to 2MB using DDR SRAM
Flash	– Two banks (A & B) of soldered Intel StrataFlash devices – 8 to 64MB supported on each bank – Boot bank is switch selectable between banks – Bank A has combination of software and hardware write-protect scheme – Bank B top 1MB block can be write-protected through software/hardware write-protect control
System Memory	– Two banks on board for up to 1Gb using 256Mb or 512Mb devices – Bus clock frequency at 133 MHz
Memory Controller PCI Host Bridge Dual 10/100/1000 Ethernet Interrupt Controller PCI Interface I^2C Interface	– Provided by Marvell MV64360 system controller

Table 4-1. MVME6100 Features Summary (continued)

Feature	Description
NVRAM Real-Time Clock 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 – 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 – 33/66 MHz PCI or 66/100 MHz PCI-X
VME Interface	– Tsi148 VME 2eSST ASIC provides: ❏ Eight programmable VMEbus map decoders ❏ A16, A24, A32, and A64 address ❏ 8-bit, 16-bit, and 32-bit single cycle data transfers ❏ 8-bit, 16-bit, 32-bit, and 64-bit block transfers ❏ Supports SCT, BLT, MBLT, 2eVME, and 2eSST protocols ❏ 8 entry command and 4KB data write post buffer ❏ 4KB read ahead buffer
PMCspan Support	– One PMCspan slot – Supports 33/66 MHz, 32/64-bit PCI bus – Access through PCI6520 bridge to PMCspan
Form Factor	– Standard 6U VME
Miscellaneous	– Combined reset and abort switch – Status LEDs – 8-bit software-readable switch (S1) – VME geographical address switch (S3) – Boundary Scan header (J8) – CPU RISCWatch COP header (J42)

Block Diagram

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

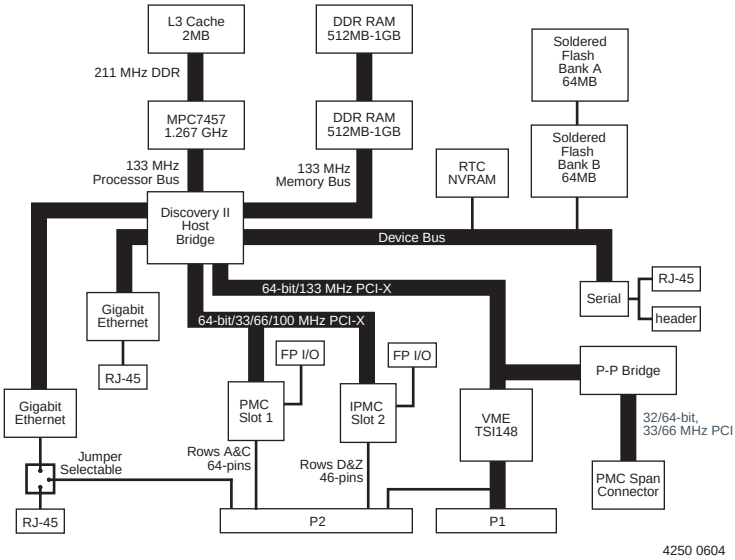


Figure 4-1. MVME6100 Block Diagram

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^2C 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

Flash Bank A	Device Bus Bank 0	Bank width 32-bit, parity disabled
Flash Bank B	Device Bus Boot Bank	Bank width 32-bit, parity disabled
Real-Time Clock **Serial Ports** **Board Specific Registers**	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

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_2O Message Unit

I_2O compliant messaging for the MVME6100 board is provided by an I_2O 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_2O messaging, as defined in the Intelligent I/O (I_2O) Standard specification. For additional details regarding the I_2O 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.

I²C Serial Interface and Devices

A two-wire serial interface for the MVME6100 board is provided by a master/slave capable I²C serial controller integrated into the MV64360 device. The I²C 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 I²C 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
- ❏ PMCspan 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, TSSOPII 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:

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

PMC slot 2 supports:

Mezzanine Type:	PMC = PCI Mezzanine Card
Mezzanine Size:	S1B = Single width and standard depth (75mm x 150mm) with front panel
PMC Connectors:	J21, J22, J23, and J24 (32/64-bit PCI with front and rear I/O)
Signalling Voltage:	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:

Mezzanine Type:	PMC = PCI Mezzanine Card
Mezzanine Size:	Double width and standard depth (150mm x 150mm) with front panel
PMC Connectors:	J11, J12, J13, J14, J21, J22, J23, and J24 (32/64-bit PCI with front and rear I/O)
Signaling Voltage:	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).

Pin Assignments 5

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+[1]	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[2]	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.

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)

Pin	Signal	Signal	Pin
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)

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

Pin	Signal	Signal	Pin
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

Pin	Signal	Signal	Pin
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

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)

Pin	Signal	Signal	Pin
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	EREADY1	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

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 (J24-2)	PMC0_2 (J14-2)	+5V	P2_IO_GLAN1_ MDIO_1-	PMC1_1 (J24-1)	1
2	GND	PMC0_4 (J14-4)	GND	P2_IO_GLAN1_ MDIO_1+	PMC1_3 (J24-3)	2
3	PMC1_5 (J4-5)	PMC0_6 (J14-6)	RETRY#	P2_IO_GLAN1_ MDIO_0-	PMC1_4 (J24-4)	3
4	GND	PMC0_8 (J14-8)	VA24	P2_IO_GLAN1_ MDIO_0+	PMC1_6 (J24-6)	4
5	PMC1_8 (J24-8)	PMC0_10 (J14-10)	VA25	PMC0_9 (J14-9)	PMC1_7 (J24-7)	5
6	GND	PMC0_12 (J14-12)	VA26	PMC0_11 (J14-11)	PMC1_9 (J24-9)	6
7	PMC1_11 (J24-11)	PMC0_14 (J14-14)	VA27	PMC0_13 (J14-13)	PMC1_10 (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 (J14-16)	VA28	PMC0_15 (J14-15)	PMC1_12 (J24-12)	8
9	PMC1_14 (J24-14)	PMC0_18 (J14-18)	VA29	PMC0_17 (J14-17)	PMC1_13 (J24-13)	9
10	GND	PMC0_20 (J14-20)	VA30	PMC0_19 (J14-19)	PMC1_15 (J24-15)	10
11	PMC1_17 (J24-17)	PMC0_22 (J14-22)	VA31	PMC0_21 (J14-21)	PMC1_16 (J24-16)	11
12	GND	PMC0_24 (J14-24)	GND	PMC0_23 (J14-23)	PMC1_18 (J24-18)	12
13	PMC1_20 (J24-20)	PMC0_26 (J14-26)	+5V	PMC0_25 (J14-25)	PMC1_19 (J24-19)	13
14	GND	PMC0_28 (J14-28)	VD16	PMC0_27 (J14-27)	PMC1_21 (J24-21)	14
15	PMC1_23 (J24-J23)	PMC0_30 (J14-30)	VD17	PMC0_29 (J14-29)	PMC1_22 (J24-22)	15
16	GND	PMC0_32 (J14-32)	VD18	PMC0_31 (J14-31)	PMC1_24 (J24-24)	16
17	PMC1_26 (J24-J26)	PMC0_34 (J14-34)	VD19	PMC0_33 (J14-33)	PMC1_25 (J24-25)	17
18	GND	PMC0_36 (J14-36)	VD20	PMC0_35 (J14-35)	PMC1_27 (J24-27)	18
19	PMC1_29 (J24-29)	PMC0_38 (J14-38)	VD21	PMC0_37 (J14-37)	PMC1_28 (J24-28)	19
20	GND	PMC0_40 (J14-40)	VD22	PMC0_39 (J14-39)	PMC1_30 (J24-30)	20
21	PMC1_32 (J24-32)	PMC0_42 (J14-42)	VD23	PMC0_41 (J14-41)	PMC1_31 (J24-31)	21
22	GND	PMC0_44 (J14-44)	GND	PMC0_43 (J14-43)	PMC1_33 (J24-33)	22

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

	ROW Z	ROW A	ROW B	ROW C	ROW D	
23	PMC1_35 (J24-35)	PMC0_46 (J14-46)	VD24	PMC0_45 (J14-45)	PMC1_34 (J24-34)	23
24	GND	PMC0_48 (J14-48)	VD25	PMC0_47 (J14-47)	PMC1_36 (J24-36)	24
25	P2_IO_GLAN1_ MDIO_2+	PMC0_50 (J14-50)	VD26	PMC0_49 (J14-49)	PMC1_37 (J24-37)	25
26	GND	PMC0_52 (J14-52)	VD27	PMC0_51 (J14-51)	PMC1_39 (J24-39)	26
27	P2_IO_GLAN1_ MDIO_2-	PMC0_54 (J14-54)	VD28	PMC0_53 (J14-53)/TXB	PMC1_40 (J24-40)	27
28	GND	PMC0_56 (J14-56)	VD29	PMC0_55 (J14-55)/RXB	PMC1_42 (J24-42)	28
29	P2_IO_GLAN1_ MDIO_3+	PMC0_58 (J14-58)	VD30	PMC0_57 (J14-57)/RTSB	PMC1_43 (J24-43)	29
30	GND	PMC0_60 (J14-60)	VD31	PMC0_59 (J14-59)/CTSB	PMC1_45 (J24-45)	30
31	P2_IO_GLAN1_ MDIO_3-	PMC0_62 (J14-62)	GND	PMC0_61 (J14-61)	GND	31
32	GND	PMC0_64 (J14-64)	+5V	PMC0_63 (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 (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 (J24-29)	AFD#	VD21	PRPE	PMC2_28 (J24-28)
20	GND	SLIN#	VD22	PRSEL	PMC2_30 (J24-30)
21	PMC2_32 (J24-32)	TXD3	VD23	INIT#	PMC2_31 (J24-31)
22	GND	RXD3	GND	PRFLT#	PMC2_33 (J24-33)
23	PMC2_35 (J24-35)	RTXC3	VD24	TXD1_232	PMC2_34 (J24-34)
24	GND	TRXC3	VD25	RXD1_232	PMC2_36 (J24-36)
25	PMC2_38 (J24-38)	TXD4	VD26	RTS1_232	PMC2_37 (J24-37)
26	GND	RXD4	VD27	CTS1_232	PMC2_39 (J24-39)
27	PMC2_41 (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 (J24-44)		VD30	RTS2_232	PMC2_43 (J24-43)
30	GND	-12VF	VD31	CTS2_232	PMC2_45 (J24-45)
31	PMC2_46 (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 (PMC I/O)	Pin/Row 2 (P2 Pins)	Pin/Row 3 (IPMC Pins)
J28	PMC1_IO(2)	P2_PMC1_IO(2)	IPMC DB8_L
J16	PMC1_IO(5)	P2_PMC1_IO(5)	IPMC DB9_L
J18	PMC1_IO(8)	P2_PMC1_IO(8)	IPMC DB10_L
J25	PMC1_IO(11)	P2_PMC1_IO(11)	IPMC DB11_L
J27	PMC1_IO(14)	P2_PMC1_IO(14)	IPMC DB12_L

Table 5-18. PMC/IPMC Configuration Jumper Block

	Pin/Row 1 (PMC I/O)	Pin/Row 2 (P2 Pins)	Pin/Row 3 (IPMC Pins)
J26	PMC1_IO(17)	P2_PMC1_IO(17)	IPMC DB13_L
J17	PMC1_IO(20)	P2_PMC1_IO(20)	IPMC DB14_L
J10	PMC1_IO(23)	P2_PMC1_IO(23)	IPMC DB15_L
J15	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

Pin	Signal	Signal	Pin
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 (From PMC I/O)	Row C (To P2 Connector)	Row B (From LAN2 Controller)	Row A (To Front Panel Ethernet)
1	PMC0_IO(13)	P2[1]_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[2]-23	MDI_0P (J9[3]-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.

Specifications

A

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 Maximum: 51W@ +5V
MVME6100-0163 with IPMC712/761	Typical: 46W @ +5V 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) 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 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) (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)

Thermal Validation

B

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

Reference Designator	Generic Description	Max. Allowable Component Temperature (deg. C)	Measurement Location
U3-U11, 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	

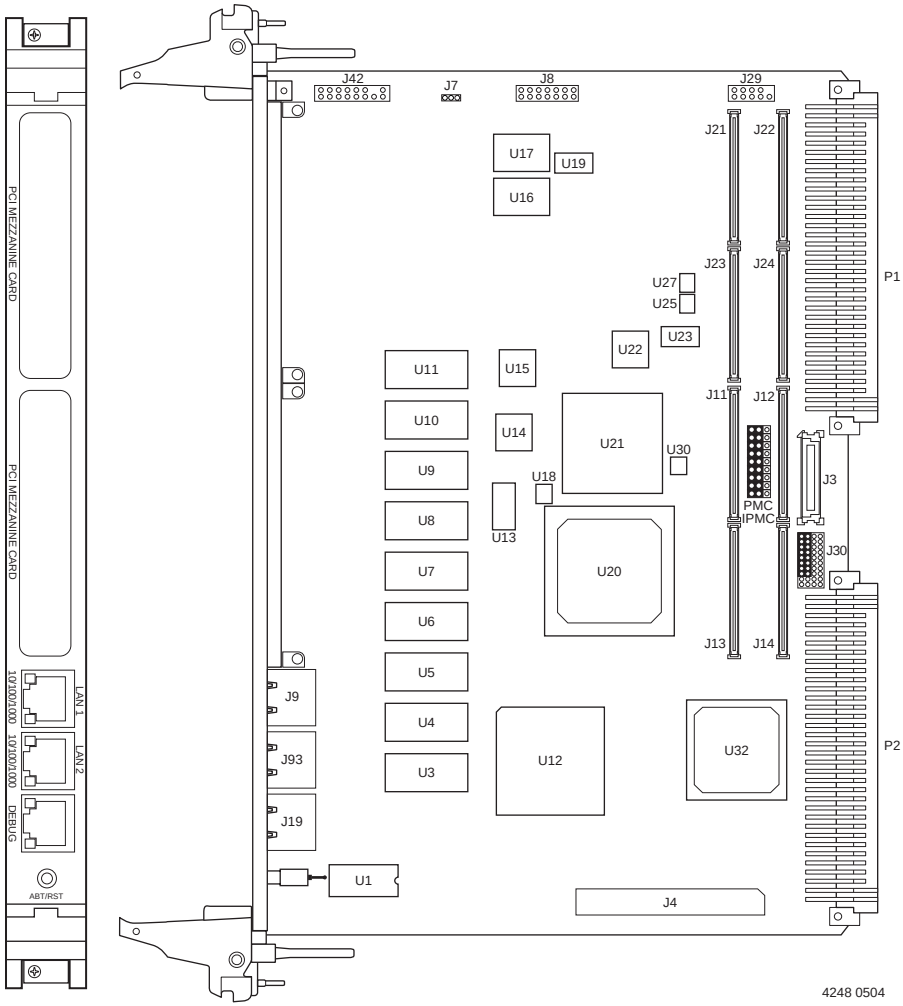


Figure B-1. Thermally Significant Components—Primary Side

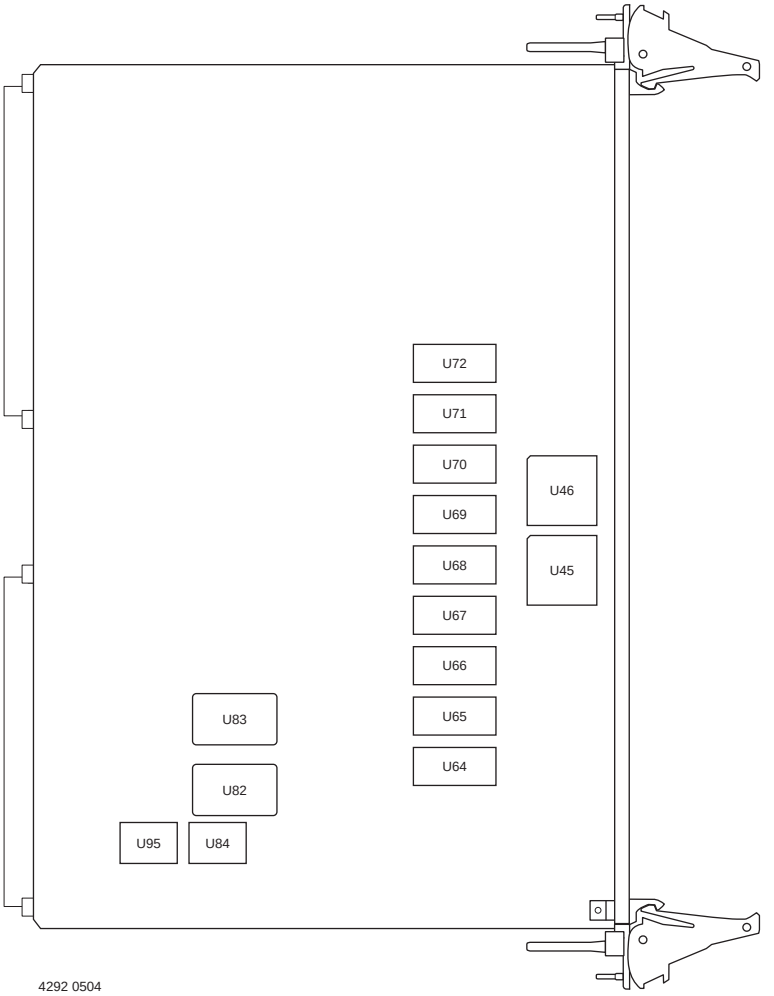


Figure B-2. Thermally Significant Components—Secondary Side

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

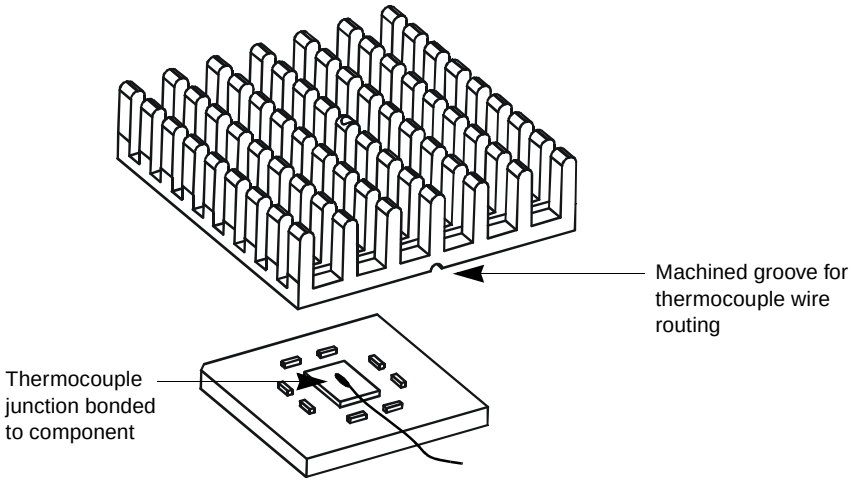
Some components have an on-chip thermal measuring device such as a thermal diode. For instructions on measuring temperatures using the on-board device, refer to the component manufacturer's documentation listed in Appendix C, *Related Documentation*.

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.



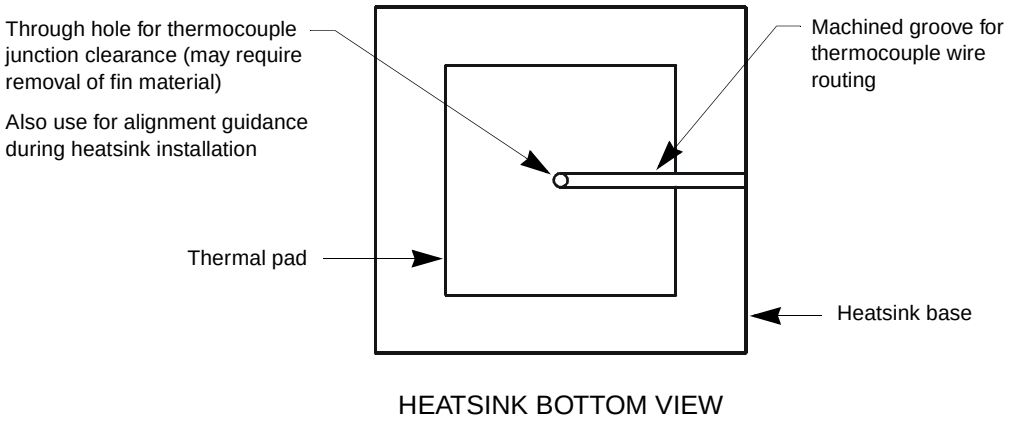


Figure B-3. Mounting a Thermocouple Under a Heatsink

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.

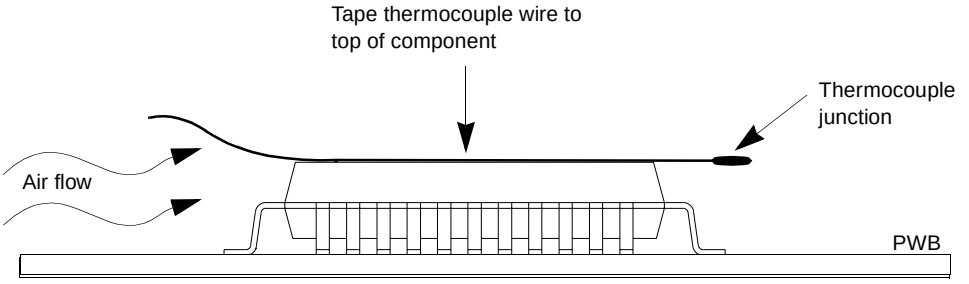


Figure B-4. Measuring Local Air Temperature

Related Documentation

C

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

Document Title	Motorola Publication Number
MVME6100 Single-Board Computer Programmer's Reference Guide	V6100A/PG
MOTLoad Firmware Package User's Manual	MOTLODA/UM
IPMC712/761 I/O Module Installation and Use	VIPMCA/IH
PMCspan PMC Adapter Carrier Board Installation and Use	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 Literature Distribution Center for Motorola Telephone: 1-800- 441-2447 FAX: (602) 994-6430 or (303) 675-2150 Web Site: http://e-www.motorola.com/webapp/sps/library/prod_lib.jsp E-mail: ldcformotorola@hibbertco.com	MPC7457EC/D Rev. 1.3,3/2003
Tsi148 PCI/X to VME Bus Bridge User Manual Tundra Semiconductor Corporation 603 March Road Ottawa, Ontario, Canada K2K 2M5 Web Site: www.tundra.com	80A3020_MA001_02
PowerPC™ Apollo Microprocessor Implementation Definition Book IV Literature Distribution Center for Motorola Telephone: 1-800- 441-2447 FAX: (602) 994-6430 or (303) 675-2150 Web Site: http://e-www.motorola.com/webapp/sps/library/prod_lib.jsp E-mail: ldcformotorola@hibbertco.com	Addendum to SC-Vger Book IV Version - 1.0 04/21/00
MV64360 System Controller for PowerPC Processors Data Sheet Marvell Technologies, Ltd. Web Site: http://www.marvell.com/	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 Broadcom Corporation Web Site: http://www.broadcom.com	5421S-DS05-D2 10/25/02
3 Volt Intel StrataFlash Memory 28F256K3 Intel Corporation Literature Center 19521 E. 32nd Parkway Aurora CO 80011-8141 Web Site: http://developer.intel.com/design/flcomp/datashts/290737.htm	290737
PCI6520 (HB7) Transparent PCIx/PCIx Bridge Preliminary Data Book PLX Technology, Inc. 870 Maude Avenue Sunnyvale, California 94085 Web Site: http://www.hintcorp.com/products/hint/default.asp	PCI6520 Ver. 0.992
EXAR ST16C554/554D, ST68C554 Quad UART with 16-Byte FIFOs EXAR Corporation 48720 Kato Road Fremont, CA 94538 Web Site: http://www.exar.com	ST16C554/554D Rev. 3.10

C

Table C-2. Manufacturers' Documents (continued)

Document Title and Source	Publication Number
3.3V-5V 256Kbit (32Kx8) Timekeeper SRAM ST Microelectronics 1000 East Bell Road Phoenix, AZ 85022 Web Site: http://www.st.com/stonline/books/toc/index.htm	M48T37V
2-Wire Serial CMOS EEPROM Atmel Corporation San Jose, CA Web Site: http://www.atmel.com/atmel/support/	AT24C02N AT24C64A
Dallas Semiconductor DS1621Digital Thermometer and Thermostat Dallas Semiconductor Web Site: http://www.dalsemi.com	DS1621
TSOP Type I Shielded Metal Cover SMT Yamaichi Electronics USA Web Site: http://www.yeu.com	

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
VITA http://www.vita.com/	
VME64 Specification	ANSI/VITA 1-1994
VME64 Extensions	ANSI/VITA 1.1-1997
2eSST Source Synchronous Transfer	VITA 1.5-199x
PCI Special Interest Group (PCI SIG) http://www.pcisig.com/	
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
IEEE http://standards.ieee.org/catalog/	
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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