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V1600-1A / IH3A1
February 1997

Supplement to

MVME1603/MVME1604 Single Board Computer Installation and Use

(V1600-1A/IH3)

This supplement provides additional information about the MVME1603 and MVME1604 boards.

The attached pages are replacements for the corresponding pages in the manual.

- ❑ A vertical bar (|) in the margin of replacement pages indicates where a change was made.
- ❑ The supplement number is shown at the bottom of each new page.

Please replace the pages according to the following table:

Remove Existing Pages	Insert New Pages
Preface / Copyright	Preface / Copyright
vii / viii through ix / x	vii / viii through ix / x
1-33 / 1-34	1-33 / 1-34
1-37 / 1-38 through 1-41 / 1-42	1-37 / 1-38 through 1-41 / 1-42
3-1 / 3-2	3-1 / 3-2
3-7 / 3-8 through 3-9 / 3-10	3-7 / 3-8 through 3-9 / 3-10
3-23 / 3-24 through 3-25 / 3-26	3-23 / 3-24 through 3-25 / 3-26

Place this page behind the title page of the manual as a record of this change.

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

MVME1603/MVME1604 Single Board Computer Installation and Use

V1600-1A/IH3

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Preface

The *MVME1603/MVME1604 Single Board Computer Installation and Use* manual provides general information, hardware preparation and installation instructions, operating instructions, a functional description, and various types of interfacing information for the MVME1603/MVME1604 family of Single Board Computers.

This manual is intended for anyone who wants to design OEM systems, supply additional capability to an existing compatible system, or work in a lab environment for experimental purposes.

A basic knowledge of computers and digital logic is assumed. To use this manual, you should be familiar with the publications listed in the *Related Documentation* section in Appendix A of this manual.

The MVME1603/1604 family of Single Board Computers has two parallel branches based on two distinct versions of the base board. Both versions are populated with a number of similar plug-together components, which are listed in the following table.

Base Board	Processor Module		DRAM	Transition Module
MVME1600-001	PM603-00*x*	PM604-00*x* PM604-01*x*	RAM104-00*x*	MVME760
	PM603-01*x*			
	PM603-02*x*			
	PM603-03*x*			
MVME1600-011	PM603-00*x*	PM604-00*x* PM604-01*x*	RAM104-00*x*	MVME712M
	PM603-01*x*			
	PM603-02*x*			
	PM603-03*x*			

The information in this manual applies principally to the MVME1600-001 and MVME1600-011 base boards. The processor and DRAM modules are described briefly here; they are documented in detail in a separate publication.

Throughout this manual, a convention is used which precedes data and address parameters by a character identifying the numeric format as follows:

$	dollar	specifies a hexadecimal character
%	percent	specifies a binary number
&	ampersand	specifies a decimal number

Unless otherwise specified, all address references are in hexadecimal.
An asterisk (*) following the signal name for signals which are level-significant denotes that the signal is true or valid when the signal is low.

An asterisk (*) following the signal name for signals which are edge-significant denotes that the actions initiated by that signal occur on high-to-low transition.

In this manual, *assertion* and *negation* are used to specify forcing a signal to a particular state. In particular, *assertion* and *assert* refer to a signal that is active or true; *negation* and *negate* indicate a signal that is inactive or false. These terms are used independently of the voltage level (high or low) that they represent.

Data and address sizes are defined as follows:

A byte is eight bits, numbered 0 through 7, with bit 0 being the least significant.

A half word is 16 bits, numbered 0 through 15, with bit 0 being the least significant.

A word is 32 bits, numbered 0 through 31, with bit 0 being the least significant.

A double word is 64 bits, numbered 0 through 63, with bit 0 being the least significant.

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August 1996

Safety Summary
Safety Depends On You

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 violates safety standards of design, manufacture, and intended use of the equipment. Motorola, Inc. assumes no liability for the customer's failure to comply with these requirements.

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. The equipment is supplied with a three-conductor AC power cable. The power cable must be plugged into an approved three-contact electrical outlet. The power jack and mating plug of the power cable meet International Electrotechnical Commission (IEC) safety standards.

Do Not Operate in an Explosive Atmosphere.

Do not operate the equipment in the presence of flammable gases or fumes. Operation of any electrical equipment in such an environment constitutes a definite safety hazard.

Keep Away From Live Circuits.

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

Do Not Service or Adjust Alone.

Do not attempt internal service or adjustment unless another person capable of rendering first aid and resuscitation is present.

Use Caution When Exposing or Handling the CRT.

Breakage of the Cathode-Ray Tube (CRT) causes a high-velocity scattering of glass fragments (implosion). To prevent CRT implosion, avoid rough handling or jarring of the equipment. Handling of the CRT should be done only by qualified maintenance personnel using approved safety mask and gloves.

Do Not Substitute Parts or Modify Equipment.

Because of the danger of introducing additional hazards, 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 safety features are maintained.

Dangerous Procedure Warnings.

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

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

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

WARNING

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

CE

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

EN55022 (CISPR 22) Radio Frequency Interference

EN50082-1 (IEC801-2, IEC801-3, IEEC801-4) Electromagnetic Immunity

The product also fulfills EN60950 (product safety) which is essentially the requirement for the Low Voltage Directive (73/23/EEC).

This board product was 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/safety performance.

Hardware Preparation and Installation

1

Introduction

This manual provides general information, hardware preparation and installation instructions, operating instructions, and a functional description of the MVME1603/1604 family of Single Board Computers.

The MVME1603/1604 is a double-high VMEmodule equipped with a PowerPC™ Series microprocessor. The MVME1603 is equipped with a PowerPC 603 microprocessor; the MVME1604 has a PowerPC 604 microprocessor. 256KB L2 cache (level 2 secondary cache memory) is available as an option on both versions.

The MVME1603/1604 family has two parallel branches based on two distinct versions (MVME1600-001 and MVME1600-011) of the base board. The differences between the MVME1600-001 and the MVME1600-011 lie mainly in the area of I/O handling; the logic design is the same for both versions.

In either case, the complete MVME1603/1604 consists of the base board plus:

- A processor/memory module (PM603 or PM604) with optional L2 cache
- An LED mezzanine (MEZLED) to supply status indicators and Reset/Abort switches
- A DRAM module (RAM104) for additional memory
- An optional PCI mezzanine card (PMC) for additional versatility

The block diagrams in Figures 1-1 and 1-2 illustrate the architecture of the MVME1600-001 and the MVME1600-011 base boards.

Equipment Required

The following equipment is required to complete an MVME1603/1604 system:

- VME system enclosure
- System console terminal
- Transition module (MVME760 for the MVME1600-001 base boards, MVME712M for the MVME1600-011) and connecting cables
- Disk drives (and/or other I/O) and controllers
- Operating system (and/or application software)

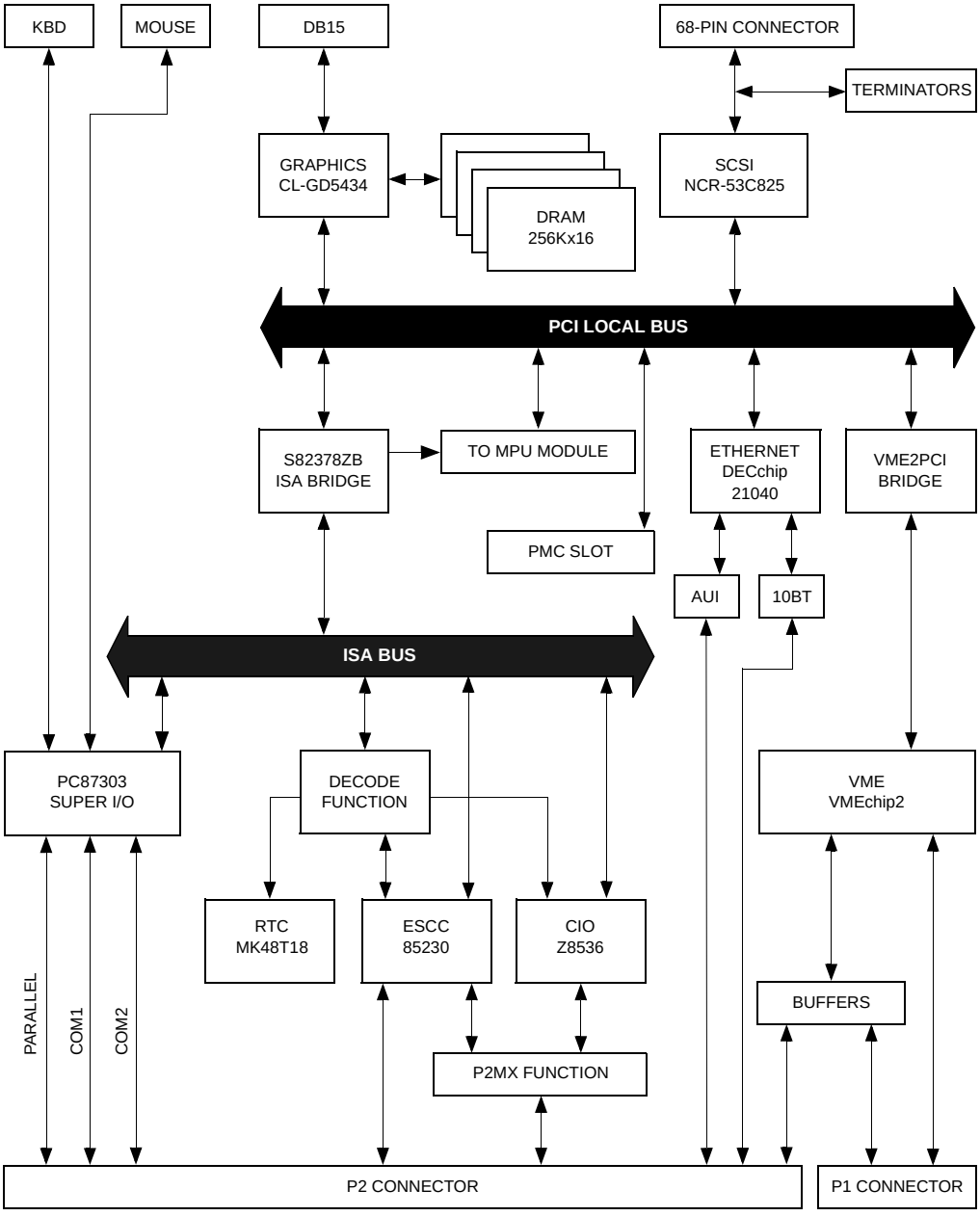


Figure 1-1. MVME1600-001 Base Board Block Diagram

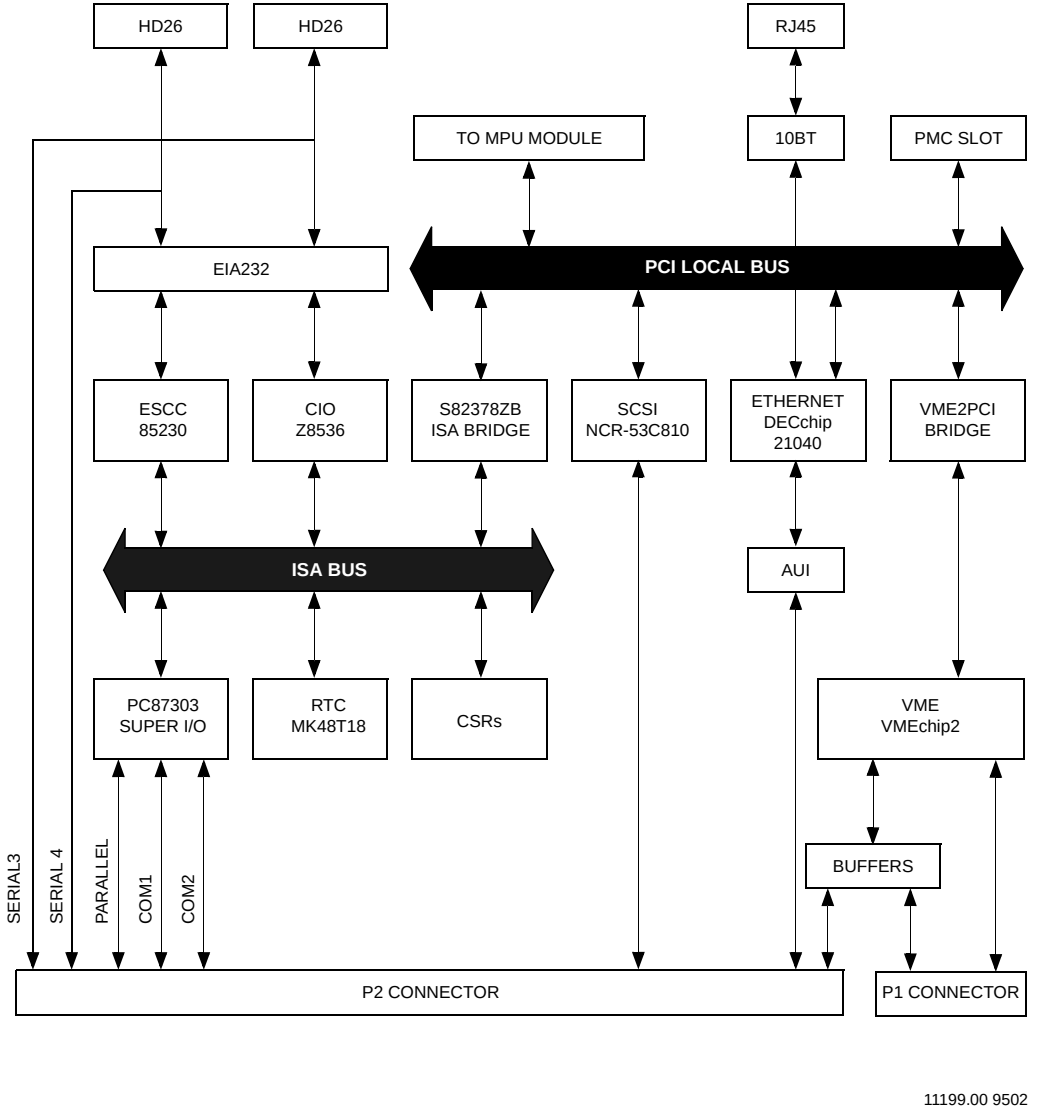


Figure 1-2. MVME1600-011 Base Board Block Diagram

Overview of Startup Procedure

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...	On page...
Unpack the hardware.	*Unpacking Instructions*	1-6
Configure the hardware by setting jumpers on the boards and transition modules.	*MVME1600-001 Base Board Preparation* and *MVME760 Transition Module Preparation*	1-7 and 1-15
	MVME1600-011 Base Board Preparation and *MVME712M Transition Module Preparation*	1-18 and 1-27
Ensure processor and memory mezzanines are properly installed on the base board.	*PM60x Processor/Memory Mezzanine Installation* and *RAM104 Memory Mezzanine Installation*	1-33 and 1-35
Install the MVME1603/1604 VMEmodule in the chassis.	*MVME1603/1604 VMEmodule Installation*	1-37
Install the transition module in the chassis.	*MVME760 Transition Module Installation* or *MVME712M Transition Module Installation*	1-39 or 1-42
Connect a console terminal.	*Console Port Configuration*	1-9
Connect any other equipment you will be using.	*Connector Pin Assignments*	4-1
	For more information on optional devices and equipment, refer to the documentation provided with the equipment.	
Power up the system.	*Switches and LEDs*	2-1
	Troubleshooting the MVME1603/1604; Solving Start-Up Problems	D-1
Note that the debugger prompt appears.	*Using the Debugger*	5-3
	You may also wish to obtain the *PPCBug Firmware Package User's Manual*, listed in Appendix A, *Related Documentation*.	A-1
Initialize the clock.	*Debugger Commands*, Set Time and Date (**SET**)	5-6
Examine and/or change environmental parameters.	*CNFG and ENV Commands*	6-1
Program the board as needed for your applications.	MVME1603/1604 Programmer's Reference Guide, listed in App. A, *Related Documentation*.	A-1

Unpacking Instructions

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.

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.



Caution

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

Hardware Configuration

To produce the desired configuration and ensure proper operation of the MVME1603/1604, you may need to carry out certain modifications before installing the module.

The MVME1603/1604 provides software control over most options: by setting bits in control registers after installing the MVME1603/1604 in a system, you can modify its configuration. (The MVME1603/1604 control registers are described in Chapter 3, and/or in the *MVME1603/MVME1604 Single Board Computer Programmer's Reference Guide* as listed under *Related Documentation* in Appendix A.)

Some options, however, are not software-programmable. Such options are controlled through manual installation or removal of header jumpers or interface modules on the base board or the associated modules.

MVME1600-001 Base Board Preparation

Figure 1-3 illustrates the placement of the switches, jumper headers, connectors, and LED indicators on the MVME1600-001. Manually configurable items on the base board include:

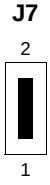
- SCSI bus terminator selection (J7)
- General-purpose software-readable header (J8)
- VMEbus system controller selection (J9)
- Serial Port 3 clock configuration (J10)
- Serial Port 4 clock configuration (J13)

Serial ports on the associated MVME760 transition module are also manually configurable. For a discussion of the configurable items on the transition module, refer to the user's manual for the MVME760 (part number VME760UA) as necessary.

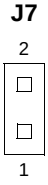
The MVME1600-001 has been factory tested and is shipped with the configurations described in the following sections. The MVME1600-001's required and factory-installed Debug Monitor, PPCBug, operates with those factory settings.

SCSI Bus Terminator Selection (J7)

The MVME1600-001 provides terminators for the SCSI bus. The SCSI terminators are enabled or disabled by a jumper on header J7. The SCSI terminators may be configured as follows.



On-Board SCSI Bus Termination Enabled
(factory configuration)



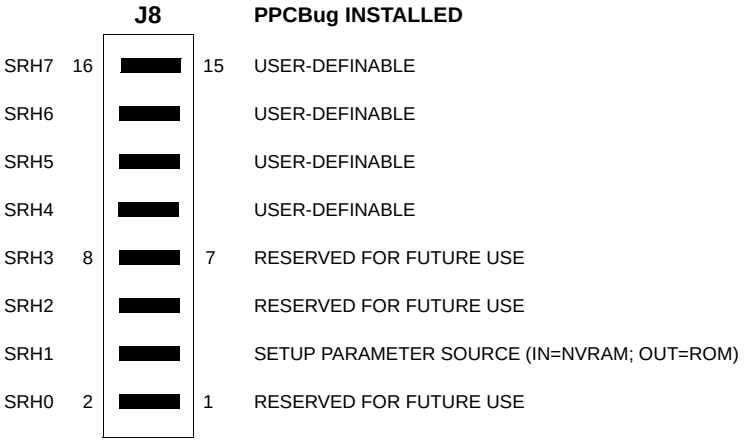
On-Board SCSI Bus Termination Disabled

General-Purpose Software-Readable Header (J8)

Header J8 provides eight readable jumpers. These jumpers can be read as a register at ISA I/O address $80000801. Bit 0 is associated with header pins 1 and 2; bit 7 is associated with pins 15 and 16. The bit values are read as a zero when the jumper is installed, and as a one when the jumper is removed. The PowerPC firmware (PPCBug) reserves the four lower-order bits, SRH3 to SRH0. They are defined as shown in the list below:

Low-Order Bit	Pins	Definition
Bit #0 (SRH0)	1—2	Reserved for future use.
Bit #1 (SRH1)	3—4	With the jumper installed between pins 3 and 4 (factory configuration), the debugger uses the current user setup / operation parameters in NVRAM. When the jumper is removed (making the bit a **1**), the debugger uses the default setup / operation parameters in ROM instead. Refer to the **ENV** command description in Chapter 6 for the ROM defaults.
Bit #2 (SRH2)	5—6	Reserved for future use.
Bit #3 (SRH3)	7—8	Reserved for future use.

The four higher-order bits, SRH4 to SRH7, are user-definable. They can be allocated as necessary to specific applications. The MVME1600-001 is shipped from the factory with J8 set to all zeros (jumpers on all pins).



Console Port Configuration

On the MVME1600-001 base board, either the standard serial console port (COM1) or the on-board video (VGA) port can serve as the PPCBug firmware console port.

The firmware checks for the presence of a connected keyboard and a connected mouse. If either device is connected to the PowerPC system and a firmware-supported video card / video device is found, the firmware is automatically brought up on the connected video terminal. If neither a mouse nor keyboard is connected, the firmware is brought up on the serial port (COM1). It is also brought up on the serial port (COM1) if no video terminal is found.

The following table shows how the display device is determined:

Mouse Connected	Keyboard Connected	On-Board VGA Device Present	Firmware Displayed on
Yes	Yes	Yes	VGA terminal
Yes	No	Yes	VGA terminal
No	Yes	Yes	VGA terminal
No	No	Yes	Serial port (COM1)
No	No	No	Serial port (COM1)
No	Yes	No	Serial port (COM1)

Notes If the mouse is connected but the keyboard is not, and the supported VGA device exists, the firmware is displayed on the video terminal. Because a keyboard is necessary for interactive use on a video terminal, however, the firmware will display a “Keyboard not connected” message. In order to use the firmware, you must then plug the keyboard in.

Conversely, if you remove the VGA monitor, also remove the keyboard and mouse to avoid unexpected behavior by the firmware.

If you plan to use a terminal other than a VGA device as the firmware console, set it up as follows:

- Eight bits per character
- One stop bit per character
- Parity disabled (no parity)
- Baud rate of 9600 baud

9600 baud is the power-up default for serial ports on MVME1603/1604 boards. After power-up you can reconfigure the baud rate if you wish, via the PPCBug firmware's Port Format (**PF**) command. Whatever the baud rate, the terminal must perform some type of hardware handshaking — either XON/OFF or via the CTS line.

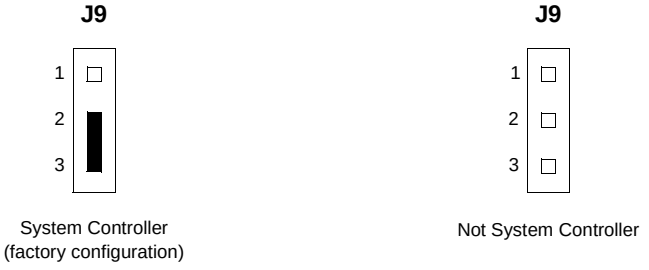
VMEbus System Controller Selection (J9)

The MVME1600-001 is factory-configured in system controller mode (i.e., a jumper is installed across pins 2 and 3 of header J9). This means that the MVME1600-001 assumes the role of system controller at system power-up or reset.

Leave the jumper installed across pins 2 and 3 if you intend to operate the MVME1600-001 as system controller in all cases.

Remove the jumper from J9 if the MVME1600-001 is not to operate as system controller under any circumstances.

Note that when the MVME1600-001 is functioning as system controller, the SYS LED is turned on.



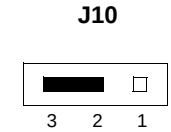
System Controller
(factory configuration)

Not System Controller

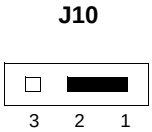
Serial Port 3 Clock Configuration (J10)

You can configure Serial port 3 on the MVME1600-001 to use the clock signals provided by the TXC signal line. Header J10 configures port 3 to either drive or receive TXC. The factory configuration has port 3 set to receive TXC.

To complete the configuration of the TXC clock line, you must also set serial port 3 clock configuration header J9 on the MVME760 transition module, described later in this chapter. For details on the configuration of that header, refer to the *MVME760 Transition Module* section or to the user's manual for the MVME760 (part number VME760UA).



Receive TXC
(factory configuration)



Drive TXC

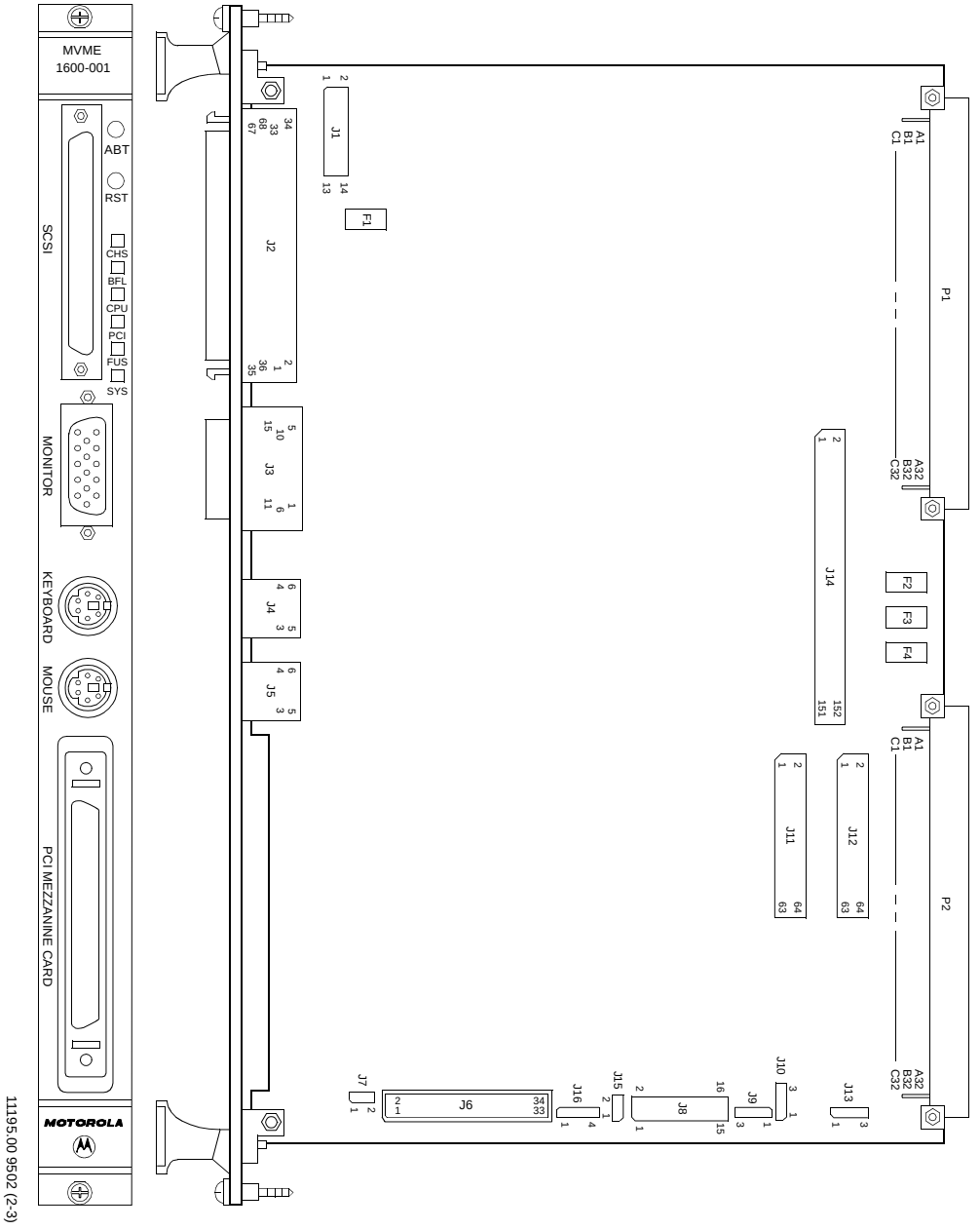
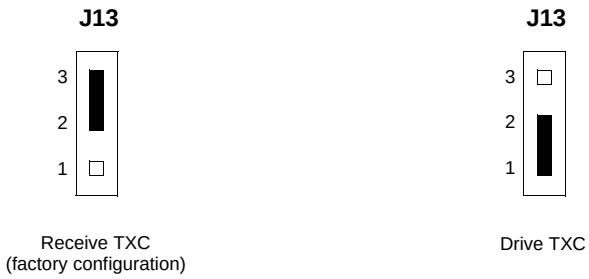


Figure 1-3. MVME1600-001 Switches, Headers, Connectors, Fuses, LEDs

Serial Port 4 Clock Configuration (J13)

You can configure Serial port 4 on the MVME1600-001 to use the clock signals provided by the TXC signal line. Header J13 configures port 4 to either drive or receive TXC. The factory configuration has port 4 set to receive TXC.

To complete the configuration of the TXC clock line, you must also set serial port 4 clock configuration header J8 on the MVME760 transition module (described later in this chapter). For details on the configuration of that header, refer to the *MVME760 Transition Module* section or to the user's manual for the MVME760 (part number VME760UA).



Remote Status and Control

The MVME1600-001 front panel LEDs and switches are mounted on a removable mezzanine board. Removing the LED mezzanine makes the mezzanine connector (J1, a keyed double-row 14-pin connector) available for service as a remote status and control connector. This allows a system designer to construct a RESET/LED panel that can be located apart from the MVME1600-001. Maximum cable length is 15 feet.

In this application, J1 can be connected to a user-supplied external cable to carry the signals for remote reset, abort, the LEDs, and a general-purpose I/O signal. The I/O signal is a general-purpose interrupt pin which can also function as a trigger input. The interrupt pin is level programmable.

Table 1-2 lists the pin numbers, signal mnemonics, and signal descriptions for J1.

Table 1-2. Remote Reset Connector J1 Interconnect Signals

Pin Number	Signal Mnemonic	Signal Name and Description
1		Not used.
2	RESETSW*	**RESET Switch**. Signal goes low when the RESET switch is pressed. It may be forced low externally for a remote reset.
3	IRQ	**Interrupt Request**. General-purpose interrupt input line.
4	ABORTSW*	**ABORT Switch**. Signal goes low when the ABORT switch is pressed. It may be forced low externally for a remote abort.
5	PCILED*	**PCI LED**. Signal goes low when the PCI LED illuminates.
6	FAILLED*	**FAIL LED**. Signal goes low when the FAIL LED illuminates.
7	LANLED*	**LAN LED**. Signal goes low when the LAN LED illuminates.
8	STATLED*	**STATUS LED**. Signal goes low when the STATUS LED illuminates.
9	FUSELED*	**RPWR LED**. Signal goes low when the FUSE LED illuminates.
10	RUNLED*	**RUN LED**. Signal goes low when the RUN LED illuminates.
11	SCSILED*	**SCSI LED**. Signal goes low when the SCSI LED illuminates.
12	SCONLED*	**SCON LED**. Signal goes low when the SCON LED illuminates.
13	+5VRMT	**+5 Vdc Power**. Fused through fuse F1; +5 Vdc power to a user-supplied external connection.
14	SPKR	**Speaker**. Speaker output line.

MVME760 Transition Module Preparation

The MVME760 transition module (Figure 1-4) is used in conjunction with the MVME1600-001 base board. The features of the MVME760 include:

- A parallel printer port
- An Ethernet interface supporting both AUI and 10BaseT connections
- Two EIA-232-D asynchronous serial ports (identified as COM1 and COM2 on the front panel)
- Two synchronous serial ports (ports 3 and 4)

Configuration of Serial Ports 3 and 4

The synchronous serial ports, Serial Port 3 and Serial Port 4, are configurable via a combination of serial interface modules (SIMs) and jumper settings. The following table lists the synchronous serial ports with their corresponding SIM connectors and jumper headers.

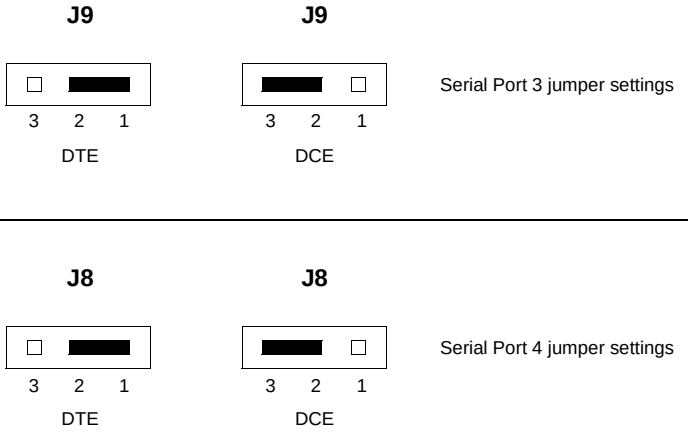
Synchronous Port	Board Connector	Panel Connector	SIM Connector	Jumper Header
Port 3	J7	SERIAL 3	J6	J9
Port 4	J2	None	J4	J8

Port 3 is routed both to board connector J7 and to the HD26 front panel connector marked SERIAL 3. Port 4 is available only at board connector J2. Four serial interface modules are available:

- EIA-232-D (DCE and DTE)
- EIA-530 (DCE and DTE)

You can change Serial Ports 3 and 4 from an EIA-232-D to an EIA-530 interface (or vice-versa) by mounting the appropriate SIM705 series interface module and setting the corresponding jumper. SIMs can be ordered separately as required.

Headers J9 and J8 are used to configure Serial Port 3 and Serial Port 4, respectively. With the jumper in position 1-2, the port is configured as a DTE. With the jumper in position 2-3, the port is configured as a DCE. *The jumper setting of the port should match the configuration of the corresponding SIM module.*



When installing the SIM modules, note that the headers are keyed for proper orientation.

For further information on the preparation of the transition module, refer to the user's manual for the MVME760 (part number VME760A / UM) as necessary.

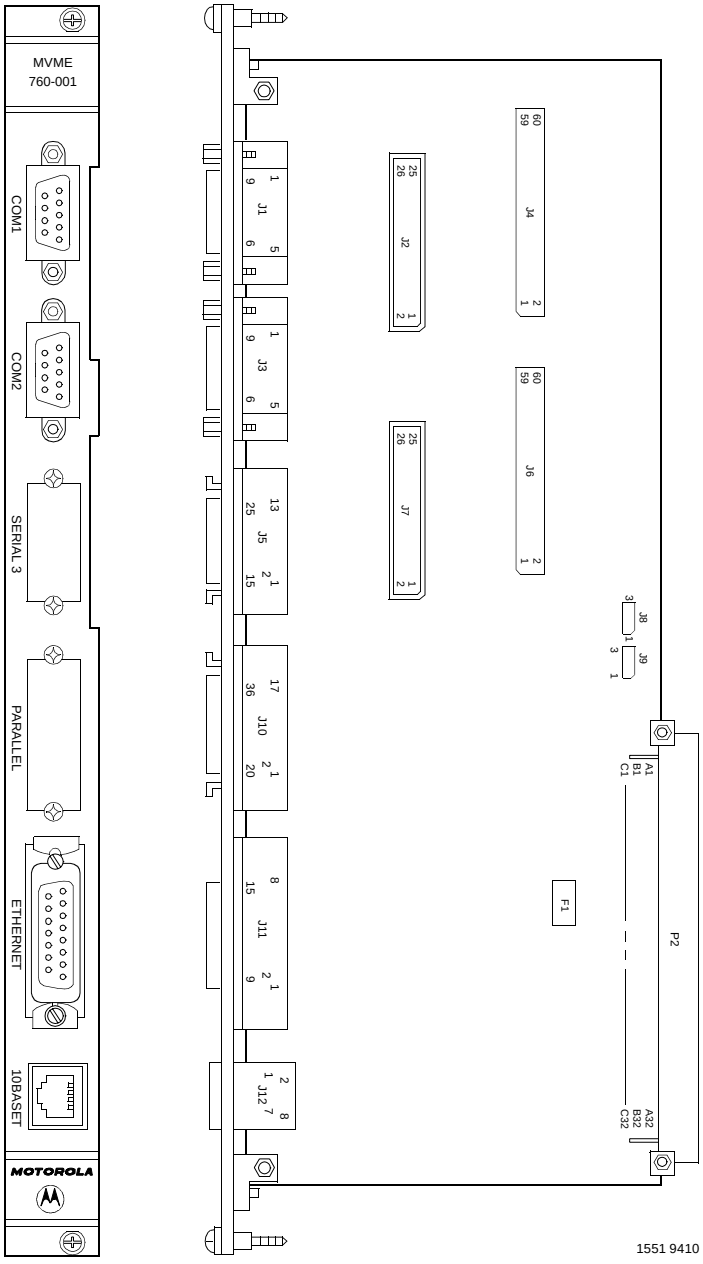


Figure 1-4. MVME760 Connector and Header Locations

MVME1600-011 Base Board Preparation

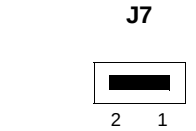
Figure 1-5 illustrates the placement of the switches, jumper headers, connectors, and LED indicators on the MVME1600-011. Manually configurable items on the base board include:

- Serial Port 4 DCE / DTE selection (J7)
- Serial Port 4 clock selection (J8, J15, J16)
- Serial Port 4 I / O path selection (J9)
- VMEbus system controller selection (J10)
- Serial Port 3 I / O path selection (J13)
- General-purpose software-readable header (J14)

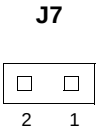
Serial ports on the associated MVME712M transition module are also manually configurable. For a discussion of the configurable items on the transition module, refer to the user's manual for the MVME712M (part number MVME712M) as necessary. The MVME1600-011 has been factory tested and is shipped with the configurations described in the following sections. The required and factory-installed Debug Monitor, PPCBug, operates with those factory settings.

Serial Port 4 DCE/DTE Selection (J7)

Serial port 4 on the MVME1600-011 is DCE / DTE configurable. Header J7 sets a configuration bit for serial port 4 in the Z8536 ID register. Software reads the bit as either a DCE or DTE value and configures the port accordingly. Header J7 may be configured as follows.



Jumper On = DTE in ID Register
(factory configuration)



Jumper Off = DCE in ID Register

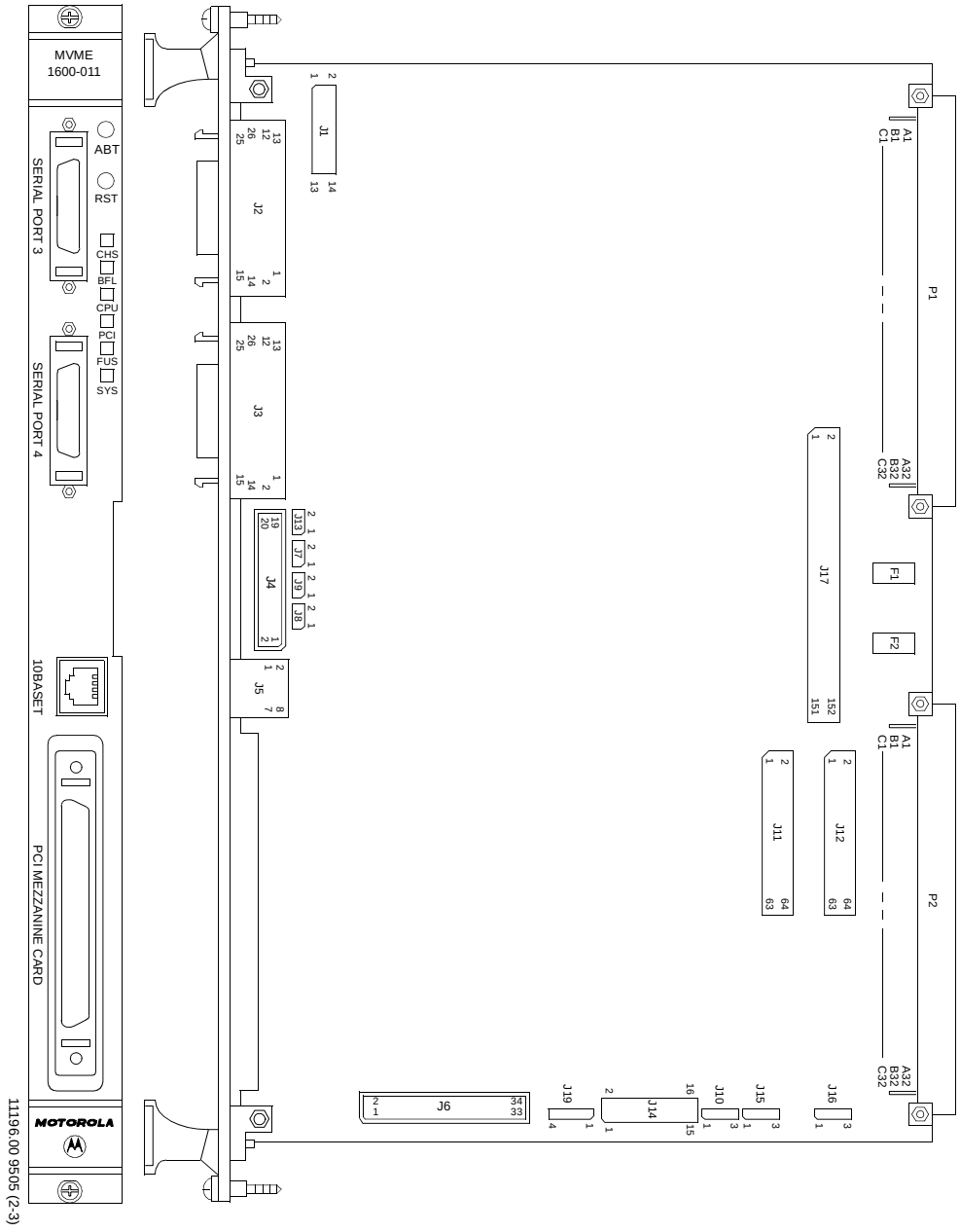
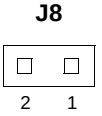
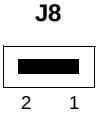


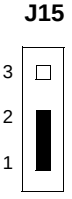
Figure 1-5. MVME1600-011 Switches, Headers, Connectors, Fuses, LEDs

Serial Port 4 Clock Selection (J8/15/16)

The MVME1600-011 is shipped from the factory with Serial Port 4 configured for asynchronous communications (i.e., the internal clock is used). Port 4 can be configured for synchronous communications as well. It can either drive (using the internal clock) or receive (using an external clock) the Receive and Transmit clock signals. To select synchronous communications for the Serial Port 4 connection, install jumpers on headers J8, J15, and J16 in one of the configurations shown below.







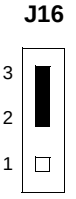
Drive TRXC4 Signal



Receive TRXC4 Signal
(Factory configuration)



Drive RTXC4 Signal



Receive RTXC4 Signal
(Factory configuration)

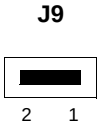
To complete the configuration of the clock lines, you must also set serial port 4 clock configuration header J15 on the MVME712M transition module (described later in this chapter). For details on the configuration of that header, refer to the *MVME712M Transition Module* section or to the user's manual for the MVME712M (part number MVME712M).

Serial Port 4 I/O Path Selection (J9)

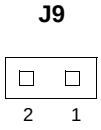
On the MVME1600-011, serial port 4's I/O signals are routed to backplane connector P2 and to front panel connector J3. Header J9 determines the state of the DSR, RI, and TM signals on serial port 4.

With a jumper installed on J9, DSR, RI, and TM come from the front panel.

With the jumper removed, P2 I/O is selected. The DSR, RI, and TM signals are not supported in this case, so DSR is held true while RI and TM are held false.



Jumper On = Front Panel I/O
DSR, RI, and TM from front panel
to 8536 device



Jumper Off = P2 I/O (factory configuration)
DSR to 8536 device held true
RI and TM to 8536 device held false

VMEbus System Controller Selection (J10)

The MVME1600-011 is factory-configured in system controller mode (i.e., a jumper is installed across pins 2 and 3 of header J10). This means that the MVME1600-011 assumes the role of system controller at system power-up or reset.

Leave the jumper installed across pins 2 and 3 if you intend to operate the MVME1600-011 as system controller in all cases.

Remove the jumper from J10 if the MVME1600-011 is not to operate as system controller under any circumstances.

Note that when the MVME1600-011 is functioning as system controller, the SYS LED is turned on.



System Controller
(factory configuration)

Not System Controller

Serial Port 3 I/O Path Selection (J13)

On the MVME1600-011, serial port 3's I/O signals are routed to backplane connector P2 and to front panel connector J2. Header J13 determines the state of the DSR, RI, and TM signals on serial port 3.

With a jumper installed on J13, DSR, RI, and TM come from the front panel.

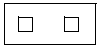
With the jumper removed, P2 I/O is selected. The DSR, RI, and TM signals are not supported in this case, so DSR is held true while RI and TM are held false.

J13



Jumper On = Front Panel I/O
DSR, RI, and TM from front panel
to 8536 device

J13



Jumper Off = P2 I/O (factory configuration)
DSR to 8536 device held true
RI and TM to 8536 device held false

General-Purpose Software-Readable Header (J14)

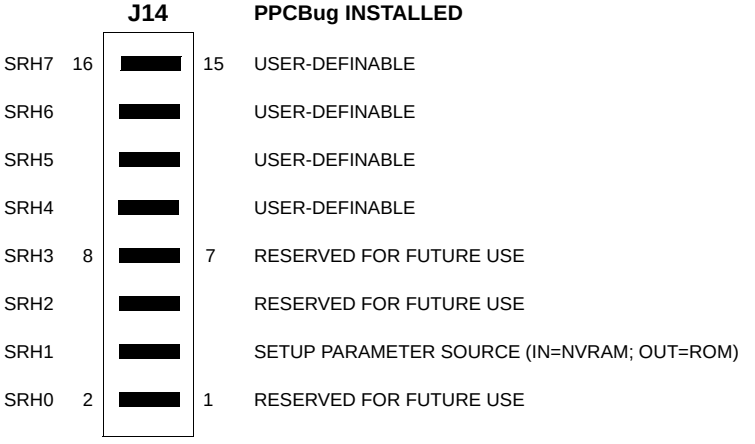
Header J14 provides eight readable jumpers. These jumpers can be read as a register at ISA I/O address $80000801. Bit 0 is associated with header pins 1 and 2; bit 7 is associated with pins 15 and 16. The bit values are read as a zero when the jumper is installed, and as a one when the jumper is removed.

The PowerPC firmware (PPCBug) reserves the four lower-order bits, SRH3 to SRH0. They are defined as shown in the following list:

Low-Order Bit	Pins	Definition
Bit #0 (SRH0)	1—2	Reserved for future use.
Bit #1 (SRH1)	3—4	With the jumper installed between pins 3 and 4 (factory configuration), the debugger uses the current user setup / operation parameters in NVRAM. When the jumper is removed (making the bit a **1**), the debugger uses the default setup / operation parameters in ROM instead. Refer to the **ENV** command description in Chapter 6 for the ROM defaults.
Bit #2 (SRH2)	5—6	Reserved for future use.
Bit #3 (SRH3)	7—8	Reserved for future use.

The four higher-order bits, SRH4 to SRH7, are user-definable. They can be allocated as necessary to specific applications.

The MVME1600-011 is shipped from the factory with J14 set to all zeros (jumpers on all pins).



Remote Status and Control

The remote status and control connector, J4, is a keyed double-row 20-pin connector located behind the front panel of the MVME1600-011. It connects to a user-supplied external cable and carries the signals for remote reset, abort, the LEDs, and three general-purpose I/O signals. This allows a system designer to construct a RESET/LED panel that can be located remotely from the MVME1600-011. This feature is similar to the remote connector provided on the MVME167 and MVME187 Single Board Computers; maximum cable length is 15 feet.

The general-purpose I/O signals include two TTL-level I/O pins and one general-purpose interrupt pin which can also function as a trigger input. The interrupt pin is level programmable.

Table 1-3 lists the pin numbers, signal mnemonics, and signal descriptions for J4.

Table 1-3. Remote Reset Connector J4 Interconnect Signals

Pin Number	Signal Mnemonic	Signal Name and Description
1	+5VRMT	**+5 Vdc Power**. Fused through fuse F1; +5 Vdc power to a user-supplied external connection.
2	LANLED*	**LAN LED**. Signal goes low when the LAN LED illuminates.
3	FUSELED*	**RPWR LED**. Signal goes low when the FUSE LED illuminates.
4	SCSILED*	**SCSI LED**. Signal goes low when the SCSI LED illuminates.
5	PCILED*	**PCI LED**. Signal goes low when the PCI LED illuminates.
6		10KΩ pullup line.
7	RUNLED*	**RUN LED**. Signal goes low when the RUN LED illuminates.
8	STATLED*	**STATUS LED**. Signal goes low when the STATUS LED illuminates.
9	FAILLED*	**FAIL LED**. Signal goes low when the FAIL LED illuminates.
10		10KΩ pullup line.
11	SCONLED*	**SCON LED**. Signal goes low when the SCON LED illuminates.
12	ABORTSW*	**ABORT Switch**. Signal goes low when the ABORT switch is pressed. It may be forced low externally for a remote abort.
13	RESETSW*	**RESET Switch**. Signal goes low when the RESET switch is pressed. It may be forced low externally for a remote reset.
14, 15	GND	**Ground**.
16		10KΩ pullup line.
17		Not used.
18	IRQ	**Interrupt Request**. General-purpose interrupt input line.
19	SPKR	**Speaker**. Speaker output line.
20	GND	**Ground**.

MVME712M Transition Module Preparation

The MVME712M transition module (Figure 1-6) and P2 adapter board are used in conjunction with the MVME1600-011 base board. The features of the MVME712M include:

- A parallel printer port (through the P2 adapter)
- An Ethernet interface supporting AUI connections (through the P2 adapter)
- Four EIA-232-D multiprotocol serial ports (through the P2 adapter)
- An SCSI interface (through the P2 adapter) for connection to both internal and external devices
- Socket-mounted SCSI terminating resistors for end-of-cable or middle-of-cable configurations
- Provision for modem connection
- Green LED for SCSI terminator power; yellow LED for Ethernet transceiver power

The features of the P2 adapter board include:

- A 50-pin connector for SCSI cabling to the MVME712M and / or to other SCSI devices
- Socket-mounted SCSI terminating resistors for end-of-cable or middle-of-cable configurations
- Fused SCSI teminator power developed from the +5Vdc present at connector P2
- A 64-pin DIN connector to interface the EIA-232-D, parallel, SCSI, and Ethernet signals to the MVME712M

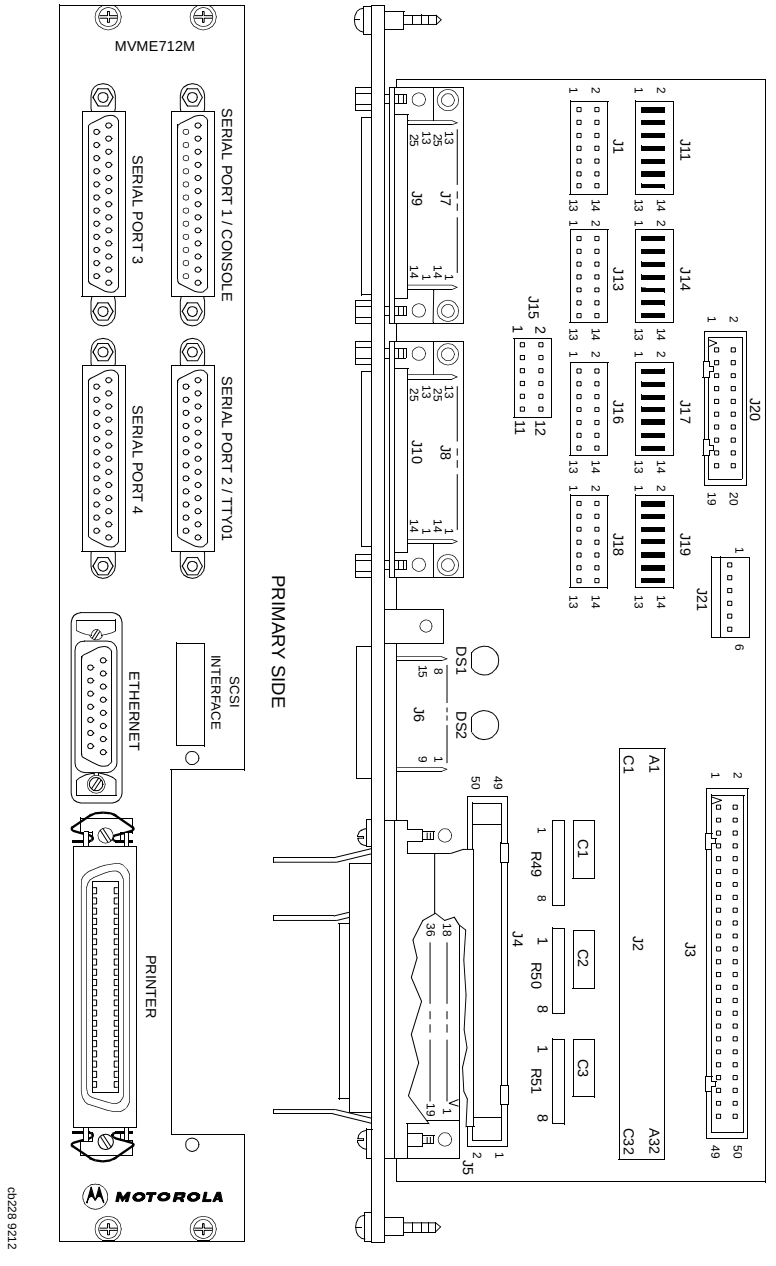


Figure 1-6. MVME712M Connector and Header Locations

Serial Ports 1-4 DCE/DTE Configuration

Serial ports 1 through 4 are configurable as modems (DCE) for connection to terminals, or as terminals (DTE) for connection to modems. The MVME712M is shipped with the serial ports configured for DTE operation.

Serial port DCE / DTE configuration is accomplished by positioning jumpers on one of two headers per port.The following table lists the serial ports with their corresponding jumper headers.

Serial Port	Board Connector	Panel Connector	Jumper Header
Port 1	J7	SERIAL PORT 1 / CONSOLE	J1 / J11
Port 2	J8	SERIAL PORT 2 / TTY	J16 / J17
Port 3	J9	SERIAL PORT 3	J13 / J14
Port 4	J10	SERIAL PORT 4	J18 / J19

Serial Port 4 Clock Configuration

Port 4 can be configured via J15 (Figure 1-7) to use the TrxC4 and RtxC4 signal lines. Part of the configuration must be done with headers J8, J15, and J16 on the MVME1600-011 (Figure 1-8).

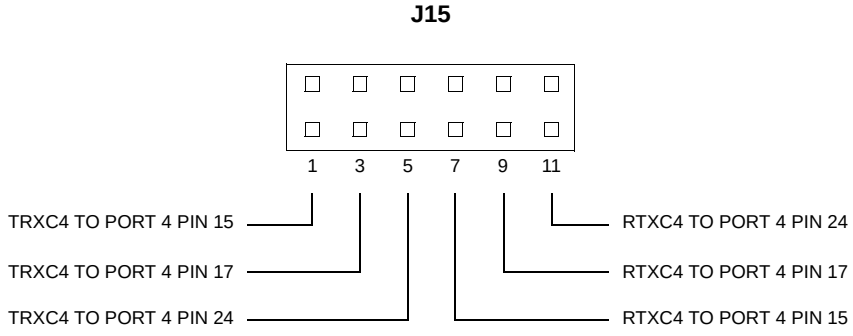


Figure 1-7. J15 Clock Line Configuration

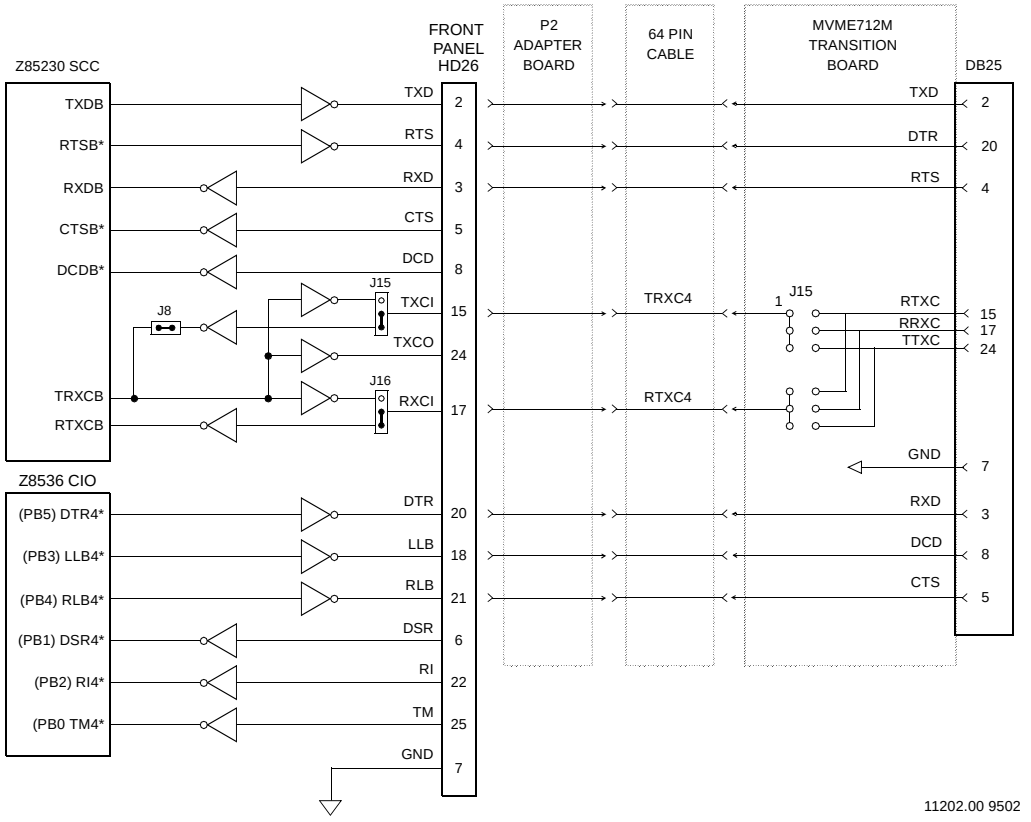


Figure 1-8. MVME1600-011 Serial Port 4 Clock Configuration

Preparation of the P2 adapter for the MVME712M consists of removing or installing the SCSI terminating resistors. Figure 1-9 illustrates the location of the resistors, fuse, and connectors.

For further information on the preparation of the transition module and the P2 adapter, refer to the user's manual for the MVME712M (part number MVME712M) as necessary.

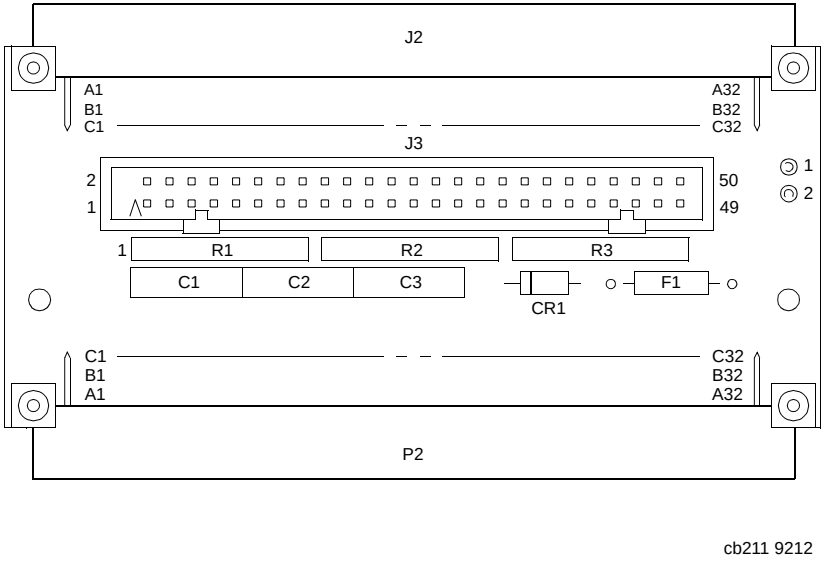


Figure 1-9. P2 Adapter Component Placement

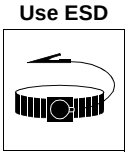
Hardware Installation

The following sections discuss the placement of the various mezzanine cards on the the MVME1600-001 and the MVME1600-011 base boards, the installation of the complete MVME1603/1604 VMEmodule assembly and corresponding transition module into a VME chassis, and the system considerations relevant to the installation. Before installing the MVME1603/1604, ensure that the serial ports and all header jumpers are configured as desired.

In most cases, the mezzanine cards—the processor/memory module, the LED mezzanine, the DRAM module, and (if applicable) the optional PCI mezzanine—are already in place on the MVME1603/1604. The user-configurable jumpers are accessible with the mezzanines installed.

Should it be necessary to install mezzanines on the base board, refer to the following sections for a brief description of the installation procedure. If necessary, you can find additional information in the user's manuals for the individual mezzanine cards.

ESD Precautions



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 ESD. After removing the component from the system or its protective wrapper, 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 unpainted metal part of the system chassis.

PM603/604 Processor/Memory Mezzanine

To install a PM603 or PM604 processor / memory mezzanine on an MVME1603 / 1604 main module, refer to Figure 1-10 and proceed as follows:

1. Attach an ESD strap to your wrist. Attach the other end of the ESD strap to the chassis as a ground. The ESD strap must be secured to your wrist and to ground throughout the procedure.
2. Perform an operating system shutdown. Turn the AC or DC power off and remove the AC cord or DC power lines from the system. Remove chassis or system cover(s) as necessary for access to the VMEmodules.

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.

3. Carefully remove the MVME1603 / 1604 from its VMEbus card slot and lay it flat, with connectors P1 and P2 (the rear panel) facing you.

Caution

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

Caution

The 192MB module is a factory-installed option. It is recommended that you do not attempt to remove it, as the components could easily be damaged.

4. Place the PM603 or PM604 mezzanine module on top of the MVME1603 / 1604, with the cutout corner at the upper right. Connector J5 at the bottom edge of the PM603 or PM604 should connect smoothly with its corresponding connector on the MVME1603 / 1604.

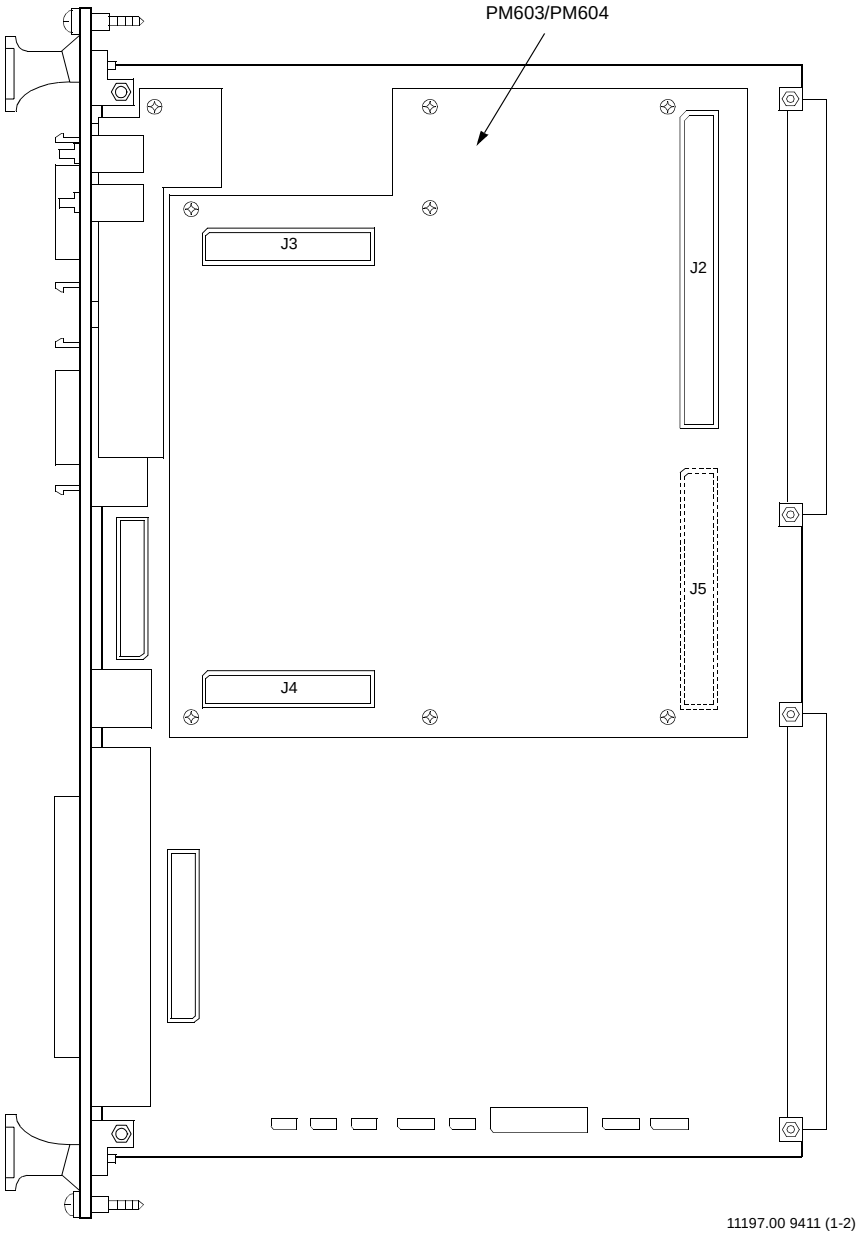


Figure 1-10. PM603/PM604 Placement on MVME1603/1604

5. Align the standoffs on the MVME1603/1604 board with the holes at the edges of the PM603 or PM604 mezzanine, insert the Phillips screws through the holes in the mezzanine and the spacers, and tighten the screws.
6. Reinstall the MVME1603/1604 assembly in its proper card slot. Be sure the module is seated properly in the backplane connectors. Do not damage or bend connector pins.
7. Replace the chassis or system cover(s), reconnect the system to the AC or DC power source, and turn the equipment power on.

RAM104 Memory Mezzanine Installation

The RAM104 DRAM mezzanine mounts on top of the PM603 or PM604 processor/memory mezzanine. To install a RAM104 mezzanine, refer to Figure 1-11 and proceed as follows:

1. Attach an ESD strap to your wrist. Attach the other end of the ESD strap to the chassis as a ground. The ESD strap must be secured to your wrist and to ground throughout the procedure.
2. Perform an operating system shutdown. Turn the AC or DC power off and remove the AC cord or DC power lines from the system. Remove chassis or system cover(s) as necessary for access to the VMEmodules.



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.

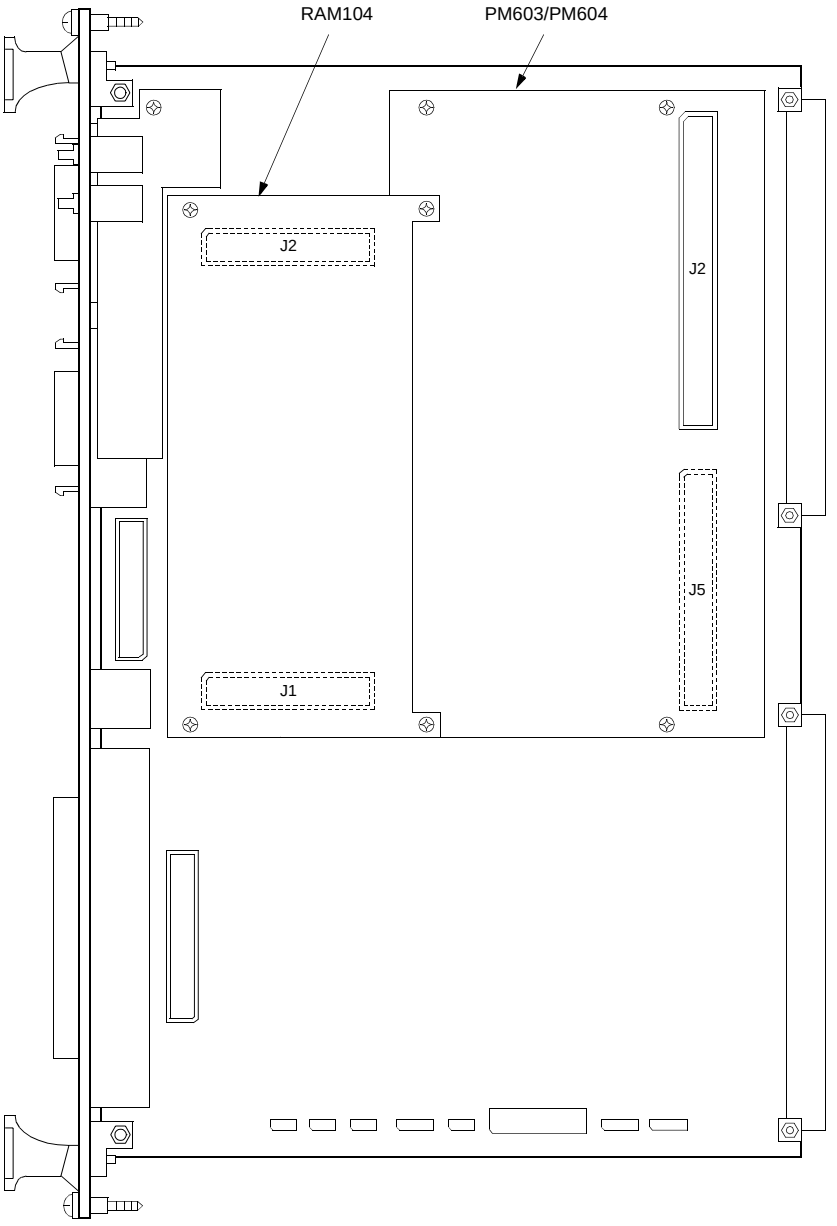


Figure 1-11. RAM104 Placement on PM603/PM604

3. Carefully remove the MVME1603/1604 from its VMEbus card slot and lay it flat on an ESD mat, component side up, with connectors P1 and P2 facing you and the PM603/PM604 corner cutout at the upper right. The ESD mat should be on a firm, flat surface.



Caution

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

4. Remove the four short Phillips screws from the holes at the top corners and the middle of the PM603/PM604.
5. Pick up the RAM104 mezzanine module, and note the positions of the male guide pins on the RAM104 connectors J1 and J2 at its left and right edges. Also note the positions of the female guide pins on the PM603/PM604 connectors. Align the RAM104 connectors J2 and J1 with the corresponding connectors J3 and J4 on the PM603/PM604, without actually setting the RAM104 on the PM603/PM604.
6. Place the RAM104 mezzanine module on top of the PM603 or PM604 mezzanine. Do NOT press the boards together yet.
7. Visually verify that the male guide pins on the RAM104 connectors are aligned with the female guide pins on the PM603/PM604 connectors. You can only see the guide pins from the sides. Do NOT press the boards together yet.



Caution

Failure to properly align the connectors on the RAM104 and the PM603/PM604 may result in damage to the modular components.

8. Place your thumbs on the top side of the RAM104 mezzanine module, in the middle of and behind each connector (J1 and (J2). Press firmly down with both thumbs until the RAM104 and the PM603/PM604 click together.
9. Visually verify that the connectors are fully seated. Connectors J2 and J1 at the left and right edges of the RAM104 should be connected with the corresponding connectors J3 and J4 on the PM603/PM604.
10. Insert two long Phillips screws through the holes at the top corners of the RAM104 module and into the standoffs on the

MVME160x. Install two similar screws in the bottom (tabbed) corners of the RAM104. Tighten the screws.

11. Reinstall the MVME1603/1604 assembly in its proper card slot. Be sure the module is seated properly in the backplane connectors. Do not damage or bend connector pins.
12. Replace the chassis or system cover(s), reconnect the system to the AC or DC power source, and turn the equipment power on.

MVME1603/1604 VMEmodule Installation

With mezzanine boards installed and headers properly configured, proceed as follows to install the MVME1603/1604 in the VME chassis:

1. Attach an ESD strap to your wrist. Attach the other end of the ESD strap to the chassis as a ground. The ESD strap must be secured to your wrist and to ground throughout the procedure.
2. Perform an operating system shutdown. Turn the AC or DC power off and remove the AC cord or DC power lines from the system. Remove chassis or system cover(s) as necessary for access to the VMEmodules.



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.

3. Remove the filler panel from the card slot where you are going to install the MVME1603/1604.

- If you intend to use the MVME1603/1604 as system controller, it must occupy the leftmost card slot (slot 1). The system controller must be in slot 1 to correctly initiate the bus-grant daisy-chain and to ensure proper operation of the IACK daisy-chain driver.
- If you do not intend to use the MVME1603/1604 as system controller, it can occupy any unused double-height card slot.

4. Slide the MVME1603/1604 into the selected card slot. Be sure the module is seated properly in the P1 and P2 connectors on the backplane. Do not damage or bend connector pins.



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

5. Secure the MVME1603/1604 in the chassis with the screws provided, making good contact with the transverse mounting rails to minimize RF emissions.
6. On the chassis backplane, remove the INTERRUPT ACKNOWLEDGE (IACK) and BUS GRANT (BG) jumpers from the header for the card slot occupied by the MVME1603/1604.

Note Some VME backplanes (e.g., those used in Motorola ''Modular Chassis'' systems) have an autojumpering feature for automatic propagation of the IACK and BG signals. Step 6 does not apply to such backplane designs.

7. Replace the chassis or system cover(s), cable peripherals to the panel connectors as appropriate, reconnect the system to the AC or DC power source, and turn the equipment power on.

MVME760 Transition Module Installation

The MVME760 transition module is used in conjunction with the MVME1600-001 base board. With the MVME1603/1604 installed, refer to Figure 1-12 and proceed as follows to install an MVME760 transition module:

1. Attach an ESD strap to your wrist. Attach the other end of the ESD strap to the chassis as a ground. The ESD strap must be secured to your wrist and to ground throughout the procedure.
2. Perform an operating system shutdown. Turn the AC or DC power off and remove the AC cord or DC power lines from the system. Remove chassis or system cover(s) as necessary for access to the VMEmodules.



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.

3. Remove the filler panel(s) from the appropriate card slot(s) at the front or rear of the chassis. (You may need to shift other modules in the chassis to allow space for the cables connected to the MVME760 transition module.)
4. Attach the flat ribbon cable supplied with the MVME760 to the P2 backplane connector at the slot occupied by the MVME1600-001 base board. Route the cable to P2 on the transition module. Be sure to orient cable pin 1 with connector pin 1.



Caution

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

5. Secure the MVME760 in the chassis with the screws provided, making good contact with the transverse mounting rails to minimize RF emissions.

6. Replace the chassis or system cover(s), making sure no cables are pinched. Cable the peripherals to the panel connectors, reconnect the system to the AC or DC power source, and turn the equipment power on.

Note Not all peripheral cables are provided with the MVME760; you may need to fabricate or purchase certain cables. (Motorola recommends shielded cable for all peripheral connections to minimize radiation.)

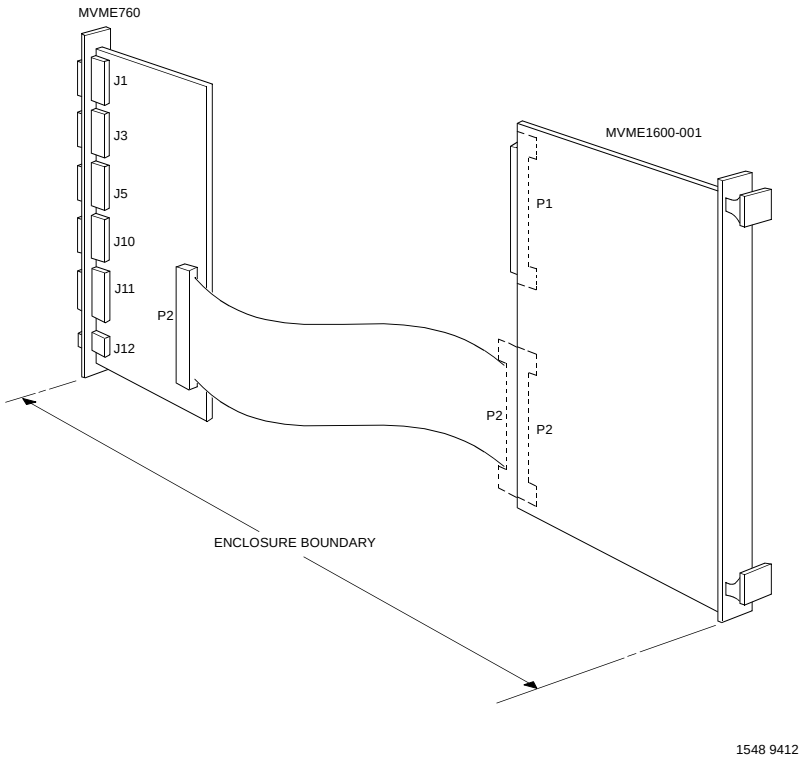


Figure 1-12. MVME760/MVME1600-001 Cable Connections

MVME712M Transition Module Installation

The MVME712M transition module is used in conjunction with the MVME1600-011 base board. With the MVME1603/1604 installed, refer to Figure 1-13 and proceed as follows to install an MVME712M transition module:

1. Attach an ESD strap to your wrist. Attach the other end of the ESD strap to the chassis as a ground. The ESD strap must be secured to your wrist and to ground throughout the procedure.
2. Perform an operating system shutdown. Turn the AC or DC power off and remove the AC cord or DC power lines from the system. Remove chassis or system cover(s) as necessary for access to the VMEmodules.



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.

3. Remove the filler panel(s) from the appropriate card slot(s) at the front or rear of the chassis. (You may need to shift other modules in the chassis to allow space for the MVME712M, which has a double-wide front panel.)
4. Attach the P2 adapter board and cable(s) to the P2 backplane connector at the slot occupied by the MVME1600-011 base board.
5. Route the 64-conductor cable to P2 on the transition module. Be sure to orient cable pin 1 with connector pin 1.

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

6. Secure the MVME712M in the chassis with the screws provided, making good contact with the transverse mounting rails to minimize RF emissions.
7. Route the 50-conductor cable to the internal or external SCSI devices as appropriate to your system configuration. Be sure to orient cable pin 1 with connector pin 1.

Note The SCSI cabling can be configured in a number of ways to accommodate various device and system configurations. Figure 1-13 shows a possible configuration for use with internal SCSI devices. For more detailed information on installing the P2 adapter board and the MVME712M transition module, refer to the *MVME712M Transition Module and P2 Adapter Board User's Manual*.

8. Replace the chassis or system cover(s), making sure no cables are pinched. Cable the peripherals to the panel connectors, reconnect the system to the AC or DC power source, and turn the equipment power on.

Note Not all peripheral cables are provided with the MVME712M; you may need to fabricate or purchase certain cables. (Motorola recommends shielded cable for all peripheral connections to minimize radiation.)

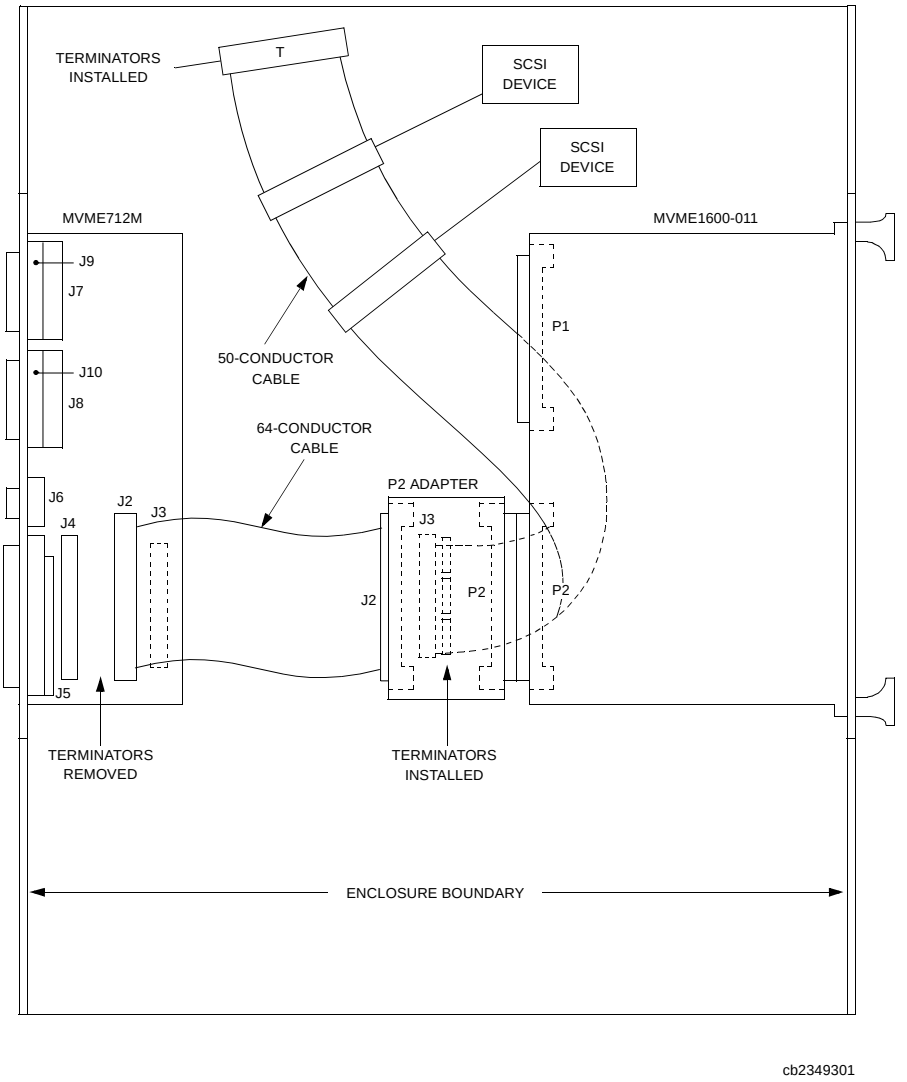


Figure 1-13. MVME712M/MVME1600-011 Cable Connections

System Considerations

The MVME1603/1604 draws power from VMEbus backplane connectors P1 and P2. P2 is also used for the upper 16 bits of data in 32-bit transfers, and for the upper 8 address lines in extended addressing mode. The MVME1603/1604 may not function properly without its main board connected to VMEbus backplane connectors P1 and P2.

Whether the MVME1603/1604 operates as a VMEbus master or as a VMEbus slave, it is configured for 32 bits of address and 32 bits of data (A32/D32). However, it handles A16 or A24 devices in the address ranges indicated in Chapter 2. D8 and/or D16 devices in the system must be handled by the PowerPC™ processor software. Refer to the memory maps in Chapter 2.

The MVME1603/1604 contains shared onboard DRAM (and, optionally, secondary cache memory) whose base address is software-selectable. Both the onboard processor and offboard VMEbus devices see this local DRAM at base physical address $00000000, as programmed by the PPCBug firmware. This may be changed via software to any other base address. Refer to the *MVME1603/MVME1604 Single Board Computer Programmer's Reference Guide* for more information.

If the MVME1603/1604 tries to access offboard resources in a nonexistent location and is not system controller, and if the system does not have a global bus timeout, the MVME1603/1604 waits forever for the VMEbus cycle to complete. This will cause the system to lock up. There is only one situation in which the system might lack this global bus timeout: when the MVME1603/1604 is not the system controller and there is no global bus timeout elsewhere in the system.

Multiple MVME1603/1604s may be installed in a single VME chassis. In general, hardware multiprocessor features are supported.

Note If you are installing multiple MVME1603/1604s in an MVME945 chassis, do not install an MVME1603/1604 in slot 12. The extra thickness of the module may cause clearance difficulties in that slot position.

Other MPUs on the VMEbus can interrupt, disable, communicate with, and determine the operational status of the processor(s). One register of the GCSR (global control/status register) set includes four bits that function as location monitors to allow one MVME1603/1604 processor to broadcast a signal to any other MVME1603/1604 processors. All eight registers are accessible from any local processor as well as from the VMEbus.

The MVME1600-001 and MVME1600-011 base boards draw +5Vdc, +12Vdc, and –12Vdc power from the VMEbus backplane through connectors P1 and P2. The 3.3Vdc power (used by the ISA Super I/O device on the base board, and by the PM603 or PM604 processor/memory mezzanine) is derived on-board from the +5Vdc.

MVME1600-001 Base Board

The MVME1600-001 base board furnishes +12Vdc, –12Vdc, and +5Vdc power to the MVME760 transition module through polyswitches (resettable fuses) F4, F2, and F3. The MVME760 uses these voltage sources to power the serial port drivers and any LAN transceivers connected to the transition module. The FUS LED (DS5) on the MVME1600-001 front panel illuminates when all three voltages are available.

The fused +5Vdc power is also supplied to the base board's keyboard and mouse connectors and to the 14-pin combined LED-mezzanine/remote-reset connector, J1.

In addition, the MVME1600-001 base board provides +5Vdc to the SCSI bus TERMPWR signal through fuse F1, located near the front panel SCSI connector. The FUS LED (DS5) on the front panel monitors the SCSI bus TERMPWR signal along with the other operating voltages; when the MVME1600-001 is connected to an SCSI bus, either directly or via the MVME760 module, SCSI terminator power helps illuminate the FUS LED.

Note Because any device on the SCSI bus can provide TERMPWR, and because the FUS LED monitors the status of several voltages, the LED does not directly indicate the condition of any single fuse. If the LED flickers or goes out, check all the fuses (polyswitches).

The MVME1600-001 base board supplies a SPEAKER_OUT signal to the 14-pin combined LED-mezzanine / remote-reset connector, J1. When J1 is used as a remote reset connector with the LED mezzanine removed, the SPEAKER_OUT signal can be cabled to an external speaker. For the pin assignments of J1, refer to Table 1-2.

MVME1600-011 Base Board

The MVME1600-011 base board provides +5Vdc power to the remote LED / switch connector (J4) through a 1A fuse (F1) located between P1 and P2. (J4 provides a separate connection point for a remote control and indicator panel, making it unnecessary to share the LED mezzanine connector for that purpose.) If none of the LEDs light and the ABORT and RESET switches do not operate, check fuse F1.

The MVME1600-011 base board provides +12Vdc power to the Ethernet transceiver interface through a 1A fuse (F2) located between P1 and P2. The FUS LED lights to indicate that +12Vdc is available. With the MVME712M transition module connected, the yellow DS1 LED on the MVME712M also signals the availability of LAN power, indicating in turn that the fuse is good. If the Ethernet transceiver fails to operate, check fuse F2.

The MVME1600-011 base board supplies SCSI terminator power through a 1A fuse (F1) located on the P2 adapter board. If the fuse is blown, the SCSI device(s) may function erratically or not at all. With the P2 adapter board cabled to an MVME712M and with an SCSI bus connected to the MVME712M, the green DS2 LED on the MVME712M illuminates when SCSI terminator power is available. If the DS2 LED flickers during SCSI bus operation, check fuse F1 on the P2 adapter board.

Like the MVME1600-001 base board, the MVME1600-011 supplies a SPEAKER_OUT signal to the 14-pin LED mezzanine connector, J1. Unlike the MVME1600-001 base board, the MVME1600-011 also applies the SPEAKER_OUT signal to the dedicated remote status and control connector, J4. The LED mezzanine need not be removed to cable the SPEAKER_OUT signal to an external speaker. For the pin assignments of J4, refer to Table 1-3.

Functional Description 3

Introduction

This chapter describes the MVME1603/MVME1604 single-board computer on a block diagram level. The *General Description* provides an overview of the MVME1603/MVME1604, followed by a detailed description of several blocks of circuitry. Figure 3-1 shows a block diagram of the overall board architecture.

Detailed descriptions of other MVME1603/MVME1604 blocks, including programmable registers in the ASICs and peripheral chips, can be found in the *Programmer's Reference Guide* (part number V1600-1A/PG). Refer to it for a functional description of the MVME1603/MVME1604 in greater depth.

Features

The following table summarizes the features of the MVME1600-001- and MVME1600-011-based MVME1603/MVME1604 single-board computers.

Table 3-1. MVME1603/MVME1604 Features

Feature	Description	Models
Microprocessor	MPC603 PowerPC™ processor	MVME1603
	MPC604 PowerPC™ processor	MVME1604 (2 slots)
DRAM	Up to 64MB on processor module	All models
	8MB-64MB on RAM104 module (192MB available as factory order only)	All models
L2 cache memory	(Optional) 256KB on processor module	PM603-02*x*, PM604-01*x*
Boot ROM	Two 32-pin PLCC sockets (1MB Flash)	All models
Software-readable header	8-bit readable header (4 bits reserved for firmware, 4 bits user-definable)	All models

Table 3-1. MVME1603/MVME1604 Features (Continued)

Feature	Description	Models
Real-time clock	8KB NVRAM with RTC and battery backup (SGS-Thomson M48T18)	All models
Switches	RESET and ABORT	All models
Status LEDs	Six: CHS, BFL, CPU, PCI, FUS, and SYS	All models
Tick timers	Four programmable 16-bit timers (one in S82378ZB ISA bridge; three in Z8536 CIO device)	All models
Watchdog timer	Provided in VMEchip2	All models
Interrupts	Eight software interrupts	All models
VME I/O	VMEbus P2 connector	All models
Serial I/O	2 async ports, 2 sync/async ports via P2 and MVME760 transition module (async: PC87303 SIO; sync: Zilog 85230 ESCC)	MVME1600-001 base board
	2 async ports via P2 and MVME712M transition module; 2 sync/async ports via P2 and MVME712M or front panel	MVME1600-011 base board
Parallel I/O	IEEE1284 Bidirectional parallel port (PC87303 SIO) via P2 and transition module	All models
SCSI I/O	16-bit SCSI interface (NCR 53C825) via front panel	MVME1600-001 base board
	8-bit SCSI interface (NCR 53C810) via P2 and MVME712M transition module	MVME1600-011 base board
Ethernet I/O	AUI and 10BaseT connections via P2 and MVME760 transition module	MVME1600-001 base board
	AUI connection via P2 and MVME712M transition module; 10BaseT connection via front panel	MVME1600-011 base board
PCI interface	One IEEE P1386.1 PCI Mezzanine Card (PMC) slot	All models
Keyboard/mouse interface	Support for keyboard and mouse input (PC87303 SIO) via front panel	MVME1600-001 base board

Table 3-1. MVME1603/MVME1604 Features (Continued)

Feature	Description	Models
Graphics port	Super VGA high-resolution color graphics (CL-GD5434 graphics accelerator)	MVME1600-001 base board
Floppy disk controller	Support for floppy disk drive (PC87303 SIO) via connectors on base board	All models
VMEbus interface	VMEbus system controller functions	All models
	VMEbus-to-local-bus interface (A24 / A32, D8 / D16 / D32 / block transfer [D8 / D16 / D32 / D64])	
	Local-bus-to-VMEbus interface (A16 / A24 / A32, D8 / D16 / D32)	
	VMEbus interrupter	
	VMEbus interrupt handler	
	Global CSR for interprocessor communications	
	DMA for fast local memory / VMEbus transfers (A16 / A24 / A32, D16 / D32 / D64)	

General Description

The MVME1603 / 1604 is a VMEmodule single-board computer equipped with a PowerPC™ Series microprocessor. The MVME1603 is equipped with a PowerPC 603 microprocessor; the MVME1604 has a PowerPC 604. 256KB L2 cache memory is available as an option on certain models of the MVME1603 and the MVME1604.

The MVME1603 / 1604 family has two parallel branches based on two distinct versions (MVME1600-001 and MVME1600-011) of the base board. The differences between the MVME1600-001 and the MVME1600-011 lie mainly in the area of I / O handling; the logic design is the same for both versions.

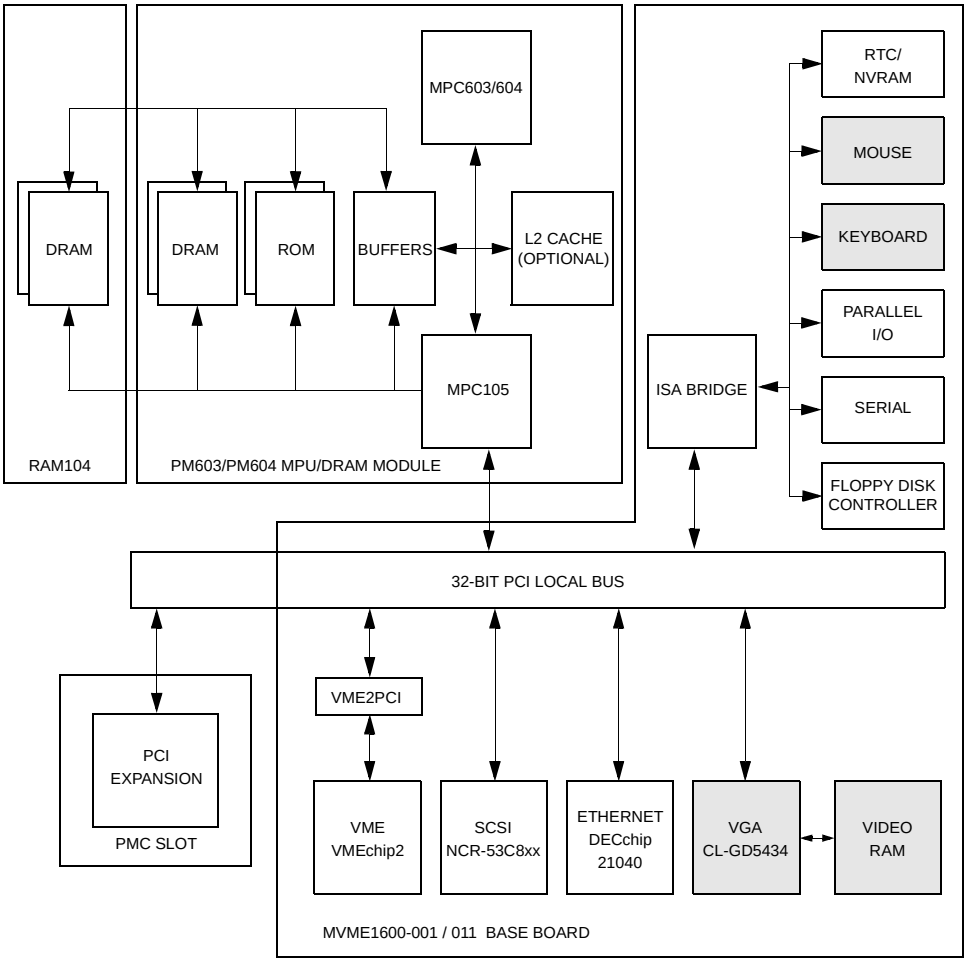
As shown in the *Features* section, The MVME1603/MVME1604 offers many standard features desirable in a computer system—such as synchronous and asynchronous serial ports, parallel port, boot ROM and DRAM, SCSI, Ethernet, provision for a disk drive mezzanine, and (MVME1600-001 base board only) keyboard, mouse, and graphics support—in a one- or two-slot VME package. Its flexible mezzanine architecture allows relatively easy upgrades of the processor and/or memory.

A key feature of the MVME1603/MVME1604 family is the PCI (Peripheral Component Interconnect) bus. In addition to the on-board local bus peripherals, the PCI bus supports an industry-standard mezzanine interface, IEEE P1386.1 PMC (PCI Mezzanine Card).

PMC modules offer a variety of possibilities for I/O expansion through FDDI (Fiber Distributed Data Interface), ATM (Asynchronous Transfer Mode), graphics, Ethernet, or SCSI ports. Both base boards support PMC front panel I/O.

Block Diagram

Figure 3-1 is a block diagram of the MVME1603/MVME1604's overall architecture. Shaded areas of the diagram apply to MVME1600-001-based versions only.



NOTES : 1. SHADED BOXES ARE MVME1600-001 FEATURES ONLY.
2. SCSI CONTROLLER IS NCR-53C825 ON MVME1600-001, NCR-53C810 ON -011.

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Figure 3-1. MVME1603/MVME1604 Block Diagram

SCSI Interface

The MVME1603/MVME1604 supports mass storage subsystems through the industry-standard SCSI bus. These subsystems may include hard and floppy disk drives, streaming tape drives, and other mass storage devices. The SCSI interface is implemented using the NCR 53C825 (on the MVME1600-001 base board) or NCR 53C810 (on the MVME1600-011 base board) SCSI I/O controller at a clock speed of 40MHz. The SCSI I/O controller connects directly to the PCI local bus.

The MVME1600-001 base board has an industry-standard 68-pin high-density SCSI connector on the front panel (as illustrated in Figure 1-3).

The MVME1600-011 base board routes its SCSI lines through the P2 connector to the MVME712M transition module (as illustrated in Figure 1-13). The SCSI control lines have filter networks to minimize the effects of VMEbus signal noise at P2.

The SCSI bus is 16 bits wide in MVME1600-001-based versions of the MVME1603/MVME1604, and 8 bits wide in MVME1600-011-based versions. Refer to Chapter 4 for the pin assignments of the MVME1600-001 front panel SCSI connector. Refer to the MVME712M *User's Manual* for the pin assignments of the transition module SCSI connectors used in the MVME1600-011 SCSI implementation. Refer to the NCR 53C825 and 53C810 user's guides and the MVME1603/MVME1604 *Programmer's Reference Guide* for detailed programming information.

SCSI Termination

The individual configuring the system must ensure that the SCSI bus is properly terminated at both ends.

The MVME1600-001 base board provides onboard SCSI bus termination. The terminators can be enabled or disabled by a jumper (J7—described in Chapter 1). If the SCSI bus ends at the

MVME1603/MVME1604 module, then SCSI termination must be enabled. +5Vdc power to the SCSI bus TERMPWR signal and termination resistors is supplied through a fuse (F1) and diode.

The MVME1600-011 base board uses the sockets provided for SCSI bus terminators on the P2 adapter board. If the SCSI bus ends at the adapter board, then termination resistors must be installed on the adapter board. +5Vdc power to the SCSI bus TERMPWR signal and termination resistors is supplied through a fuse located on the adapter board.

Ethernet Interface

The MVME1603/MVME1604 uses Digital Equipment's DECchip 21040 LAN controller to implement an Ethernet interface that supports both AUI and 10BaseT connections. The balanced differential transceiver lines for AUI and 10BaseT are coupled via on-board transformers.

The MVME1600-001 base board routes its AUI and 10BaseT lines through the P2 connector to the MVME760 transition module (as illustrated in Figure 1-12 on page 1-41). The MVME760 front panel has an industry-standard DB15 connector and 8-pin RJ45 connector for the AUI and 10BaseT connections respectively (see Figure 1-4 on page 1-17).

The MVME1600-011 base board uses an 8-pin RJ45 on its front panel for 10BaseT lines (see Figure 1-5 on page 1-19) and routes its AUI lines through the P2 connector to the MVME712M transition module (as illustrated in Figure 1-13 on page 1-44). The MVME712M front panel has an industry-standard DB15 connector for the AUI connections (see Figure 1-6 on page 1-28).

Every MVME1603/MVME1604 is assigned an Ethernet station address. The address is $08003E2*xxxxx*, where *xxxxx* is the unique 5-nibble number assigned to the board (i.e., every board has a different value for *xxxxx*).

Each MVME1603/MVME1604 displays its Ethernet station address on a label attached to backplane connector P2. In addition, the six bytes including the Ethernet station address are stored in the

NVRAM (BBRAM) configuration area specified by boot ROM. That is, 08003E2*xxxxx* is stored in NVRAM. At an address of $FFFC1F2C, the upper four bytes (08003E2*x*) can be read. At an address of $FFFC1F30, the lower two bytes (*xxxx*) can be read. The MVME1603/MVME1604 debugger, PPCBug, has the capability to retrieve or set the Ethernet station address.

If the data in the NVRAM is lost, use the number on the label on backplane connector P2 to restore it.

Refer to Chapter 4 for the pin assignments of the MVME1600-011 front panel 10BaseT connector. Refer to the MVME712M *User's Manual* for the pin assignments of the transition module AUI connector. Refer to the MVME760 *User's Manual* for the pin assignments of the transition module AUI and 10BaseT connectors used in the MVME1600-001 Ethernet implementation. Refer to the BBRAM/TOD Clock memory map description in the MVME1603/MVME1604 *Programmer's Reference Guide* for detailed programming information.

Note The MVME1603/MVME1604 will support either AUI or 10BaseT Ethernet connections, but not both at the same time. To switch from one type to the other, do the following:

1. Bring the MVME1603/MVME1604 up in PPCBug.
2. Remove the current Ethernet cable and connect the one you wish to use.
3. Reset the MVME1603/MVME1604 by pressing the RESET switch or typing the debug command **RESET**.

The new connection is automatically recognized by the LAN controller.

Graphics Interface

MVME1600-001-based versions of the MVME1603/MVME1604 have a Super VGA (Video Graphics Array) color graphics interface implemented with a Cirrus Logic CL-GD5434 graphics accelerator. The CL-GD5434 supports pixel clock rates of up to 110MHz. Its

internal palette DAC is configurable for industry-standard 16- or 256-color VGA modes. The DAC is also extensible to high- and true-color modes of 32 thousand or 16.7 million colors.

Depending on the color selection and bits-per-pixel mode, the CL-GD5434 device supports resolutions of up to 1280 x 1024. 2MB of video buffer memory (in the form of four 256K x 16, 40-pin SOJ, 60ns DRAM chips) are available to the CL-GD5434.

The VGA port routes the graphics data to an industry-standard 3-row DB15 connector on the front panel of the MVME1600-001 base board (as illustrated in Figure 1-3).

Refer to Chapter 4 for the pin assignments of the MVME1600-001 front panel VGA connector. Refer to Cirrus Logic's CL-GD5434 *Technical Reference Manual* for detailed programming information.

PCI Mezzanine Interface

A key feature of the MVME1603/MVME1604 family is the PCI (Peripheral Component Interconnect) bus. In addition to the on-board local bus devices (SCSI, Ethernet, graphics, etc.), the PCI bus supports an industry-standard mezzanine interface, IEEE P1386.1 PMC (PCI Mezzanine Card).

PMC modules offer a variety of possibilities for I/O expansion through FDDI (Fiber Distributed Data Interface), ATM (Asynchronous Transfer Mode), graphics, Ethernet, or SCSI ports. Both versions of the base board support PCI front panel I/O.

The MVME1603/MVME1604 supports one PMC slot. Two 64-pin connectors on the base board (J11 and J12) interface with 32-bit IEEE P1386.1 PMC-compatible mezzanines to add any desirable function. The PCI Mezzanine Card slot has the following characteristics:

Mezzanine Type	PMC (PCI Mezzanine Card)
Mezzanine Size	S1B: Single width, standard depth (75mm x 150mm) with front panel
PMC Connectors	J11 and J12 (32-Bit PCI with front-panel I/O only)
Signaling Voltage	V_{io} = 5.0Vdc

Refer to Chapter 4 for the pin assignments of the PMC connectors. For detailed programming information, refer to the PCI bus descriptions in the MVME1603/MVME1604 *Programmer's Reference Guide* and to the user documentation for the PMC modules you intend to use.

VMEbus Interface

The VMEchip2 ASIC, in tandem with the VME2PCI ASIC, constitutes the VMEbus interface. The VMEchip2 interfaces an MC68040-style local bus to the VMEbus. The VME2PCI interfaces the PCI bus to an MC68040-style local bus. When the VMEchip2 and the VME2PCI chips are used together, they form a PCI-bus-to-VMEbus interface.

The VMEchip2/VME2PCI combination provides:

- The local-bus-to-VMEbus interface
- The VMEbus-to-local-bus interface
- The DMA controller functions of the local VMEbus

The VMEchip2 includes Global Control and Status Registers (GCSRs) for interprocessor communications. It can provide the VMEbus system controller functions as well. For detailed programming information, refer to the VMEchip2 and VME2PCI discussions in the MVME1603/MVME1604 *Programmer's Reference Guide*.

ISA Super I/O Device (ISASIO)

The MVME1603/MVME1604 uses a PC87303 ISASIO chip from National Semiconductor to implement certain segments of the P2 and front-panel I/O:

- Two asynchronous serial ports (COM1 and COM2) via P2 and transition module
- IEEE1284 bidirectional parallel port via P2 and transition module
- Disk drive support via drive connector J6 and power connector J16 (on the MVME1600-001) or J19 (on the MVME1600-011)
- Keyboard and mouse interface (MVME1600-001 base board only)

Asynchronous Serial Ports

The two asynchronous ports provided by the ISASIO device employ TTL-level signals that are routed to the P2 connector. The TTL output lines are buffered through TTL drivers and series resistors. The EIA-232-D drivers and receivers that complete the serial interface are located on the MVME760 (for the MVME1600-001 base board) or MVME712M (for the MVME1600-011 base board) transition module.

Hardware initializes the two serial ports as COM1 and COM2 with ISA I/O base addresses of $3F8 and $2F8 respectively. This default configuration also assigns COM1 to IBC (ISA/PCI Bridge Controller) interrupt request line IRQ4 and COM2 to IRQ3. You can change the default configuration by reprogramming the ISASIO device. For detailed programming information, refer to the PCI and ISA bus discussions in the MVME1603/MVME1604 *Programmer's Reference Guide* and to the vendor documentation for the ISASIO device.

Parallel Port

The parallel port is an IEEE P1284 printer interface implemented with the ISASIO device. All parallel I/O interface signals are routed to P2 through series damping resistors.

Hardware initializes the parallel port as PPT1 with an ISA IO base address of $3BC. This default configuration also assigns the parallel port to IBC (ISA/PCI Bridge Controller) interrupt request line IRQ7. You can change the default configuration by reprogramming the ISASIO device. For detailed programming information, refer to the PCI and ISA bus discussions in the MVME1603/MVME1604 *Programmer's Reference Guide* and to the vendor documentation for the ISASIO device.

Disk Drive Controller

The ISASIO device incorporates a low- and high-density disk drive controller for use with an optional disk drive. The disk drive may take the form of a mezzanine board or a separate module. The drive interfaces with the ISASIO controller via base board connector J6. The unit receives power via connector J16 (on the MVME1600-001) or J19 (on the MVME1600-011).

The ISASIO disk drive controller is compatible with the DP8473, 765A, and N82077 devices commonly used to implement floppy disk controllers. Software written for those devices may be used without change to operate the ISASIO controller. The ISASIO device may be used to support any of the following devices:

- 3 1/2-inch 1.44MB floppy disk drive
- 5 1/4-inch 1.2MB floppy disk drive
- Standard 250kbps to 2Mbps tape drive system

Keyboard and Mouse Interface

On the MVME1600-001 base board, the ISASIO device provides ROM-based keyboard and mouse interface control. The front panel of the MVME1600-001 board has two 6-pin circular DIN connectors for keyboard and the mouse connections.

ISA Bridge Controller

The MVME1603/MVME1604 uses an Intel S82378ZB bridge controller to supply the interface between the PCI local bus and the ISA system I/O bus (diagrammed in Figure 1-1 and Figure 1-2 for the two base boards).

The ISA bridge controller provides the following functions:

- PCI bus arbitration for:
  - The MPC105 (PCI/MPU bus bridge and memory controller)
  - The SCSI controller
  - the Ethernet controller
  - The VME2PCI ASIC
  - The PMC (PCI Mezzanine Card) slot
- ISA bus arbitration for DMA devices
- ISA interrupt mapping for four PCI interrupts
- Interrupt controller functionality to support 14 ISA interrupts
- Edge/level control for ISA interrupts
- Seven independently programmable DMA channels
- One 16-bit timer
- Three interval counters/timers

The base address of the configuration space for the ISA bridge controller is at $00800800 in the PCI Configuration area.

Real-Time Clock and NVRAM

The MVME1603/MVME1604 employs an SGS-Thomson surface-mount M48T18 RAM and clock chip to provide 8KB of non-volatile static RAM and a real-time clock. This chip provides a clock, oscillator, crystal, power failure detection, memory write protection, 8KB of NVRAM, and a battery in a package consisting of two parts:

- A 28-pin 330mil SO device containing the real-time clock, the oscillator, power failure detection circuitry, 8KB of SRAM, and gold-plated sockets for a SNAPHAT battery
- A SNAPHAT battery housing a crystal along with the battery

The SNAPHAT battery package is mounted on top of the MT48T18 device. The battery housing is keyed to prevent reverse insertion.

The clock furnishes seconds, minutes, hours, day, date, month, and year in BCD 24-hour format. Corrections for 28-, 29- (leap year), and 30-day months are made automatically. The clock generates no interrupts. Although the M48T18 is an 8-bit device, 8-, 16-, and 32-bit accesses from the ISA bus to the M48T18 are supported. Refer to the MVME1603/MVME1604 *Programmer's Reference Guide* and to the M48T18 data sheet for detailed programming and battery life information.

Programmable Timers

Among the resources available to the local processor are a number of programmable timers. Timers are incorporated into the ISA bridge controller, the Z8536 CIO device (diagrammed in Figure 1-1 and Figure 1-2 for the two base boards), and the VMEchip2. They can be programmed to generate periodic interrupts to the processor.

Interval Timers

The ISA bridge controller has three built-in counters that are equivalent to those found in an 82C54 programmable interval timer. These counters are grouped into one timer unit, Timer 1, in the IBC. Each counter output has a specific function:

- Counter 0 is associated with interrupt request line IRQ0. It can be used for system timing functions, such as timer interrupt for a time-of-day.
- Counter 1 generates a refresh request signal for ISA memory. This timer is not used in the MVME1603/MVME1604.
- Counter 2 provides the tone for the speaker output function on the ISA bridge controller (the SPEAKER_OUT signal which can be cabled to an external speaker via the remote reset connector).

The interval timers use the OSC clock input as their clock source. The MVME1603/MVME1604 module drives the OSC pin with a 14.31818 MHz clock source.

16-Bit Timers

Four 16-bit timers are available on the MVME1603/MVME1604. The ISA bridge controller supplies one 16-bit timer; the Z8536 CIO device provides the other three. For information on programming these timers, refer to the data sheets for the S82378ZB ISA bridge controller and the Z8536 CIO device.

VMEchip2 Timers

Two 32-bit programmable tick timers are available in the optional VMEchip2 ASIC. Refer to the VMEchip2 description in the MVME1603/MVME1604 *Programmer's Reference Guide* for detailed programming information.

Note It is advisable to avoid using these timers for system timing functions, since the VMEchip2 may not be present in all versions of the MVME1603/MVME1604 module.

Serial Communications Interface

The MVME1603/MVME1604 uses a Zilog Z85230 ESCC (Enhanced Serial Communications Controller) to implement the two synchronous/asynchronous serial communications interfaces, which are routed through P2 for the MVME1600-001 base board and through the front panel for the MVME1600-011 base board. The Z85230 supports synchronous (SDLC/HDLC) and asynchronous protocols. The MVME1603/MVME1604 hardware supports asynchronous serial baud rates of 110B/s to 38.4KB/s.

Each interface supports the CTS, DCD, RTS, and DTR control signals as well as the TxD and RxD transmit/receive data signals, and TxC/RxC synchronous clock signals. Since not all modem control lines are available in the Z85230, a Z8536 CIO is used to provide the missing modem lines.

In the MVME1600-001 base board, all modem control lines from the ESCC are multiplexed/demultiplexed through P2 by a multiplexing function (P2MX, described later in this chapter) due to the pin limitations of the P2 connector.

A PAL device performs decoding of register accesses and pseudo interrupt acknowledge cycles for the Z85230 and the Z8536 in ISA I/O space. The ISA bridge controller supplies DMA support for the Z85230.

The Z85230 receives a 10MHz clock input. The Z85230 supplies an interrupt vector during pseudo interrupt acknowledge cycles. The vector is modified within the Z85230 according to the interrupt source. Interrupt request levels are programmed via the ISA bridge controller. Refer to the Z85230 data sheet and to the MVME1603/MVME1604 *Programmer's Reference Guide* for further information.

Z8536 CIO Device

The Z8536 CIO device complements the Z85230 ESCC by supplying signals for Abort interrupt status, fuse status, and SCSI terminator status and control, as well as furnishing modem control lines not provided by the Z85230 ESCC. In addition, the Z8536 CIO device has three independent 16-bit counters/timers.

For MVME1600-001 base boards, the Z8536 CIO device also provides a means of requesting the module ID of the two synchronous/asynchronous serial ports that reside on the MVME760 transition module. Refer to the Z8536 data sheet and to the MVME1603/MVME1604 *Programmer's Reference Guide* for further information.

Board Configuration Register

The Board Configuration Register is an 8-bit read-only register containing the details of the MVME1603/MVME1604 single-board computer's configuration. This register is located on the base board at ISA I/O address $0802.

Board Configuration Register - $0802								
BIT	SD7	SD6	SD5	SD4	SD3	SD2	SD1	SD0
FIELD	GIOP*	SCCP*		PMCP*	VMEP*	GFXP*	LANP*	SCSIP*
OPER	R	R	R	R	R	R	R	R
RESET	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A

GIOP* Transition module present. If set, the MVME760 transition module is not connected. If cleared, the MVME760 module is connected. (MVME1600-001 base boards only; not applicable to MVME1600-011 boards.)

SCCP* Z85230 ESCC present. If set, there is no on-board synchronous serial support (the ESCC not present). If cleared, the Z85230 ESCC is installed and there is on-board support for synchronous serial communication.

PMCP* PMC present. If set, no PCI mezzanine card is installed in the PMC slot. If cleared, the PMC slot contains a PCI mezzanine card.

VMEP* VMEbus present. If set, there is no VMEbus interface. If cleared, the VMEbus interface is supported.

GFXP* Graphics present. If set, no graphics interface is installed. If cleared, onboard graphics are available (MVME1600-001 base board only; the MVME1600-011 has no graphics capability).

LANP* Ethernet present. If set, no Ethernet transceiver interface is installed. If cleared, there is on-board Ethernet support.

SCSIP* SCSI present. If set, there is no on-board SCSI interface. If cleared, on-board SCSI is supported.

P2 Signal Multiplexing

Due to the limited availability of pins in the P2 backplane connector, the MVME1600-001 base board multiplexes and demultiplexes certain synchronous I/O control signals that pass between the base board and the MVME760 transition module. This is a hardware function that is entirely transparent to software.

Four signals are involved in the P2 multiplexing function: MXDO, MXDI, MXCLK, and MXSYNC*.

MXDO is a time-multiplexed data output line from the main board and MXDI is a time-multiplexed line from the MVME760 module. MXCLK is a 10MHz bit clock for the MXDO and MXDI data lines. MXSYNC* is asserted for one bit time at time slot 15 (refer to the following table) by the MVME1600-001 base board. The MVME760 transition module uses MXSYNC* to synchronize with the base board.

A 16-to-1 multiplexing scheme is used with MXCLK's 10MHz bit rate. Sixteen time slots are defined and allocated as follows:

Table 3-2. P2 Multiplexing Sequence

MXDO (From Base Board)		MXDI (From MVME760)	
Time Slot	**Signal Name**	**Time Slot**	**Signal Name**
0	RTS3	0	CTS3
1	DTR3	1	DSR3/MID1
2	LLB3/MODSEL	2	DCD3
3	RLB3	3	TM3/MID0
4	RTS4	4	RI3
5	DTR4	5	CTS4
6	LLB4	6	DSR4/MID3
7	RLB4	7	DCD4
8	IDREQ*	8	TM4/MID2
9	Reserved	9	RI4
10	Reserved	10	LANPWR
11	Reserved	11	Reserved

Table 3-2. P2 Multiplexing Sequence (Continued)

MXDO (From Base Board)		MXDI (From MVME760)	
Time Slot	**Signal Name**	**Time Slot**	**Signal Name**
12	Reserved	12	Reserved
13	Reserved	13	Reserved
14	Reserved	14	Reserved
15	Reserved	15	GENIO_PRESENT*

ABORT Switch (S1)

The ABORT switch is located on the LED mezzanine. When activated by software, the ABORT switch can generate an interrupt signal from the base board to the processor at a user-programmable level. The interrupt is normally used to abort program execution and return control to the PPCBug debugger firmware located in the MVME1603/1604 EPROM and Flash memory. The interrupt signal reaches the processor module via ISA bus interrupt line IRQ8*. The signal is also available at pin PB7 of the Z8536 CIO device, which handles various status signals, serial I/O lines, and counters.

The interrupter connected to the ABORT switch is an edge-sensitive circuit, filtered to remove switch bounce.

RESET Switch (S2)

The RESET switch is located on the LED mezzanine. The RESET switch resets all onboard devices; it also drives a SYSRESET* signal if the MVME1603/1604 is the system controller. The RESET switch may be disabled by software.

The VMEchip2 includes both a global and a local reset driver. When the VMEchip2 operates as the VMEbus system controller, the reset driver provides a global system reset by asserting the VMEbus signal SYSRESET*. A SYSRESET* signal may be generated by the RESET switch, a power-up reset, a watchdog timeout, or by a control bit in the LCSR in the VMEchip2. SYSRESET* remains asserted for at least 200 ms, as required by the VMEbus specification.

Similarly, the VMEchip2 provides an input signal and a control bit to initiate a local reset operation. By setting a control bit, software can maintain a board in a reset state, disabling a faulty board from participating in normal system operation. The local reset driver is enabled even when the VMEchip2 is not the system controller. A local reset may be generated by the RESET switch, a power-up reset, a watchdog timeout, a VMEbus SYSRESET* signal, or a control bit in the GCSR.

Note For an MVME1603/1604 without the VMEbus option (i.e., with no VMEchip2), the LCSR control bit is not available to reset the module. In this case, the watchdog timer is allowed to time out to reset the MVME1603/1604.

Front Panel Indicators (DS1 - DS6)

There are six LEDs on the MVME1603/1604 front panel: CHS, BFL, CPU, PCI, FUS, and SYS.

- CHS (DS1, yellow). Checkstop; driven by the MPC603/604 status lines on the MVME1603/1604. Lights when a halt condition from the processor is detected.
- BFL (DS2, yellow). Board Failure; lights when the BRDFAIL* signal line is active.
- CPU (DS3, green). CPU activity; lights when the DBB* (Data Bus Busy) signal line on the processor bus is active.
- PCI (DS4, green). PCI activity; lights when the IRDY* (Initiator Ready) signal line on the PCI bus is active. This indicates that the PCI mezzanine (if installed) is active.
- FUS (DS5, green). Fuse OK; lights when +5Vdc, +12Vdc, and –12Vdc power is available from the base board to the transition module and remote devices.

Note The circuitry monitored by the FUS LED differs between the MVME1600-001 and MVME1600-011 versions of the base board. The differences are detailed under the respective base board descriptions in Chapter 1.

Because the FUS LED monitors the status of several voltages on the MVME1600-001, it does not directly indicate the condition of any single fuse. If the LED flickers or goes out, check all the fuses (polyswitches).

- SYS (DS6, green). System Controller; lights when the VMEchip2 in the MVME1603/1604 is the VMEbus system controller.

Polyswitches (Resettable Fuses)

The MVME1600-001 and MVME1600-011 base boards draw fused +5Vdc, +12Vdc, and –12Vdc power from the VMEbus backplane through connectors P1 and P2. The 3.3Vdc power (used by the ISA Super I/O device on the base board, and by the PM603 or PM604 processor/memory mezzanine) is derived on-board from the +5Vdc. The following table lists the fuses with the voltages they protect on the respective base boards.

Table 3-3. Fuse Assignments by Base Board

Fuse	MVME1600-001	MVME1600-011
F1	+5Vdc (SCSI)	+5Vdc
F2	–12Vdc	+12Vdc
F3	+5Vdc	
F4	+12Vdc	

MVME1600-001 Base Board

The MVME1600-001 base board furnishes +12Vdc, –12Vdc, and +5Vdc power to the MVME760 transition module through polyswitches (resettable fuses) F4, F2, and F3. The MVME760 uses these voltage sources to power the serial port drivers and any LAN transceivers connected to the transition module. The FUS LED (DS5) on the MVME1600-001 front panel illuminates when all three voltages are available.

The fused +5Vdc power is also supplied to the base board's keyboard and mouse connectors and to the 14-pin combined LED-mezzanine/remote-reset connector, J1.

In addition, the MVME1600-001 base board provides +5Vdc to the SCSI bus TERMPWR signal through fuse F1, located near the front panel SCSI connector. The FUS LED (DS5) on the front panel monitors the SCSI bus TERMPWR signal along with the other operating voltages; when the MVME1600-001 is connected to an SCSI bus, either directly or via the MVME760 module, SCSI terminator power helps illuminate the FUS LED.

Note Because any device on the SCSI bus can provide TERMPWR, and because the FUS LED monitors the status of several voltages, the LED does not directly indicate the condition of any single fuse. If the LED flickers or goes out, check all the fuses (polyswitches).

MVME1600-011 Base Board

The MVME1600-011 base board provides +5Vdc power to the remote LED / switch connector (J4) through a 1A fuse (F1) located between P1 and P2. (J4 provides a separate connection point for a remote control and indicator panel, making it unnecessary to share the LED mezzanine connector for that purpose.) If none of the LEDs light and the ABORT and RESET switches do not operate, check fuse F1.

The MVME1600-011 base board provides +12Vdc power to the Ethernet transceiver interface through a 1A fuse (F2) located between P1 and P2. The FUS LED lights to indicate that +12Vdc is available. With the MVME712M transition module connected, the yellow DS1 LED on the MVME712M also signals the availability of LAN power, indicating in turn that the fuse is good. If the Ethernet transceiver fails to operate, check fuse F2.

The MVME1600-011 base board supplies SCSI terminator power through a 1A fuse (F1) located on the P2 adapter board. If the fuse is blown, the SCSI device(s) may function erratically or not at all. With the P2 adapter board cabled to an MVME712M and with an SCSI bus connected to the MVME712M, the green DS2 LED on the MVME712M illuminates when SCSI terminator power is available. If the DS2 LED flickers during SCSI bus operation, check fuse F1 on the P2 adapter board.

Speaker Control

The MVME1600-001 base board supplies a SPEAKER_OUT signal to the 14-pin combined LED-mezzanine / remote-reset connector, J1. When J1 is used as a remote reset connector with the LED mezzanine removed, the SPEAKER_OUT signal can be cabled to an external speaker to obtain a beep tone. For the pin assignments of J1, refer to Table 1-2.

Like the MVME1600-001 base board, the MVME1600-011 supplies a SPEAKER_OUT signal to the 14-pin LED mezzanine connector, J1. Unlike the MVME1600-001 base board, the MVME1600-011 also applies the SPEAKER_OUT signal to its dedicated remote status and control connector, J4. The LED mezzanine need not be removed to cable the SPEAKER_OUT signal to an external speaker. For the pin assignments of J4, refer to Table 1-3.

PM603/604 Processor/Memory Mezzanine Module

The PM603 or PM604 is the processor / memory mezzanine module that (together with an LED mezzanine, an optional RAM104 DRAM module, and an optional PCI mezzanine card) plugs into the MVME1600-001 or MVME1600-011 base board to make a complete single-board computer. See Figure 1-10.

You have the choice of a PowerPC603™ module (the PM603) or a PowerPC604™ module (the PM604) with from 8MB to 64MB of DRAM, or up to 128MB of DRAM with a RAM104. 256KB of L2 cache is available as an option. There is no parity or ECC protection on the DRAM.

The PowerPC603 is a 64-bit processor with 16KB or 32KB on-chip cache (8KB / 16KB data cache and 8KB / 16KB instruction cache). The PowerPC604 is a 64-bit processor with 32 KB on-chip cache (16KB data cache and 16KB instruction cache).

The MPC105 bridge / memory controller located on the processor / memory mezzanine provides the bridge between the PowerPC microprocessor bus and the PCI local bus. The memory is

kept on the processor bus to get the optimum performance from the designs. Electrically, the processor / memory module is a PCI connection.

MPC604 boards have double-wide front panels to accommodate a heat sink on the PowerPC604 that protrudes into the adjacent VME slot.

The PM603 / PM604 module accommodates additional memory. RAM104 modules of 8, 16, 32, or 64MB DRAM are available for memory expansion.

A 192MB memory module is available for the PM604 module as a factory-installed option.

The processor module has sockets for 1MB of Flash memory. The onboard monitor / debugger, PPCBug, resides in the Flash chips. PPCBug provides:

- A boot loader and extensive onboard diagnostics
- A single-line assembler / disassembler
- The capability to save and restore a configuration through NVRAM
- A remote boot capability

Under normal operation, the Flash devices are in “read-only” mode, their contents are pre-defined, and they are protected against inadvertent writes due to loss of power conditions. However, for programming purposes, programming voltage is always supplied to the devices and the Flash contents may be modified by executing the proper program command sequence. Refer to the third-party data sheet for further device-specific information and / or to the PFLASH PPCBug command.

Flash device speed is 150 ns. For this speed, software must not program ROMFAL (first access length) and ROMNAL (last access length) in the MPC105 device with values lower than the following minimum values for various processor external clock frequencies (hardware does not support the burst for which NAL is used):

Table 3-4. Minimum ROMFAL and ROMNAL Values

Processor External Bus Speed	ROMFAL Minimum Value	ROMNAL Minimum Value	8-Bit Access Times (Number of Clocks)	64-Bit Single/Burst Access Times (Number of Clocks)
25 MHz	1	1	4	32 / 32-32-32-32
33 MHz	2	2	5	40 / 40-40-40-40
40 MHz	3	3	6	48 / 48-48-48-48
50 Mhz	5	5	8	64 / 64-64-64-64
66 MHz	7	7	10	80 / 80-80-80-80

RAM104 Memory Module

The RAM104 is the optional DRAM memory mezzanine module that (together with a PM603 or PM604 processor / memory mezzanine, an LED mezzanine, and an optional PCI mezzanine card) plugs into the base board to make a complete MVME1603 or MVME1604 single-board computer. See Figure 1-11.

RAM104 modules of 8, 16, 32, or 64MB are available for memory expansion. There is no parity or ECC protection on the DRAM.

The addition of the memory module on the processor / memory module makes a stack three boards high. An MVME1603 SBC maintains a single VME slot width with this stacking, although it does brush the inter-card buffer zone. MVME1604 SBCs have a heatsink on the PowerPC604 that extends well into the adjacent VME slot, so MVME604 boards have double-wide front panels.

MVME760 Transition Module

The MVME760 transition module (Figure 1-4) is used in conjunction with the MVME1600-001 base board. The features of the MVME760 include:

- A parallel printer port
- An Ethernet interface supporting both AUI and 10BaseT connections
- Two EIA-232-D asynchronous serial ports (identified as COM1 and COM2 on the front panel)
- Two synchronous serial ports (ports 3 and 4)

Serial Interface Modules

The synchronous serial ports on the MVME760 are configurable via serial interface modules (SIMs), used in conjunction with the appropriate jumper settings. The SIMs are small plug-in printed circuit boards which contain all the circuitry needed to convert a TTL-level port to the standard voltage levels needed by various industry-standard serial interfaces, such as EIA-232, EIA-530, etc. The following types of SIMs are available:

Table 3-5. Module Type Identification

Model Number	Module Type	Part Number
SIM705-001	EIA-232 DCE	01-W3876B*xx*
SIM705-002	EIA-232 DTE	01-W3877B*xx*
SIM705-003	EIA-530 DCE	01-W3878B*xx*
SIM705-004	EIA-530 DTE	01-W3879B*xx*

For additional information about serial interface modules, refer to the MVME760 *User's Manual* (part number VME760A/UM) and to the SIM705 *Installation Guide* (part number SIM705A/IH).

MVME712M Transition Module

The MVME712M transition module (Figure 1-6) and P2 adapter board are used in conjunction with the MVME1600-011 base board. The features of the MVME712M include:

- A parallel printer port (through the P2 adapter)
- An Ethernet interface supporting AUI connections (through the P2 adapter)
- Four EIA-232-D multiprotocol serial ports (through the P2 adapter)
- An SCSI interface (through the P2 adapter) for connection to both internal and external devices
- Socket-mounted SCSI terminating resistors for end-of-cable or middle-of-cable configurations
- Provision for modem connection
- Green LED for SCSI terminator power; yellow LED for Ethernet transceiver power

The features of the P2 adapter board include:

- A 50-pin connector for SCSI cabling to the MVME712M and / or to other SCSI devices
- Socket-mounted SCSI terminating resistors for end-of-cable or middle-of-cable configurations
- Fused SCSI teminator power developed from the +5Vdc present at connector P2
- A 64-pin DIN connector to interface the EIA-232-D, parallel, SCSI, and Ethernet signals to the MVME712M

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