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MVME2700 Series
Single Board Computer
Installation and Use

V2700A/IH2
August 2000

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Preface

The *MVME2700 Series 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 MVME2700 family of single-board computers.The information in this manual applies to MVME2700 models assembled from any of the plug-together components listed in the following list.

MVME2700-1221A through 1251A	MVME2700-3421 through 3461
MVME2700-1321 through 1361	MVME2700-4221A through 4251A
MVME2700-1421 through 1461	MVME2700-4321 through 4361
MVME2700-3221A through 3251A	MVME2700-4421 through 4461
MVME2700-3321 through 3361	RAM200-04*x*

This manual is intended for anyone who wants to supply OEM systems, add 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.

After using this manual, you may wish to become familiar with the publications listed in the *Related Documentation* section in *Appendix A* of this manual.

Summary of Changes

Change Date	Description
8/10/00	Corrected pin assignment descriptior for A21 and A22 in *Table 6-16* Updated VME board model numbers. *Preface*, *Table 1-1*, *MVME712M Transition Module Preparation*, *MVME761 Transition Module Preparation*
9/17/99	Corrected pin assignment descriptor for C31 and C32 in *Table 6-16*
5/24/99	Corrected Related Documentation table and updated sources for additional documentation. *Appendix A*.
5/15/99	Updated VME board model numbers. *Preface*, *Table 1-1*, *MVME712M Transition Module Preparation*, *MVME761 Transition Module Preparation*
5/15/99	Added P2 adapter board features for the MVME761 transition module. Page *26* in chapter 5.
4/15/99	Corrected signal information for Row C pins 1-6, 31, 32 on the VMEbus Connector P2. *Table 6-11*.
4/08/99	Universe ASIC replaced with Universe II ASIC

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 must 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.

Lithium Battery Caution

The board contains a lithium battery to power the clock and calendar circuitry.



Caution

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



Attention

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



Vorsicht

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

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.

Changes or modificaitons not expressly approved by Motorola Computer Group could void the user's authority to operate the equipment.

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, IEC801-4) 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.

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Introduction to the MVME2700

1

Overview

This manual provides general information, hardware preparation and installation instructions, operating instructions, and a functional description of the MVME2700 family of single-board computers.

The MVME2700 is a single-slot VMEmodule equipped with a PowerPC® 750 microprocessor. 32KB L1 cache (Level 1 cache memory) and 1MB L2 cache (Level 2 ‘‘backside’’ cache memory) are available on all versions.

The complete MVME2700 consists of the base board plus:

- An ECC DRAM module (RAM200 series) for memory
- An optional PCI mezzanine card (PMC) for additional versatility
- An optional carrier board (PMCspan) for additional PCI expansion

The block diagram in Figure 1-1 illustrates the architecture of the MVME2700 base board. For a view of the overall board architecture, refer to Figure 5-1 in the *Functional Description* chapter.

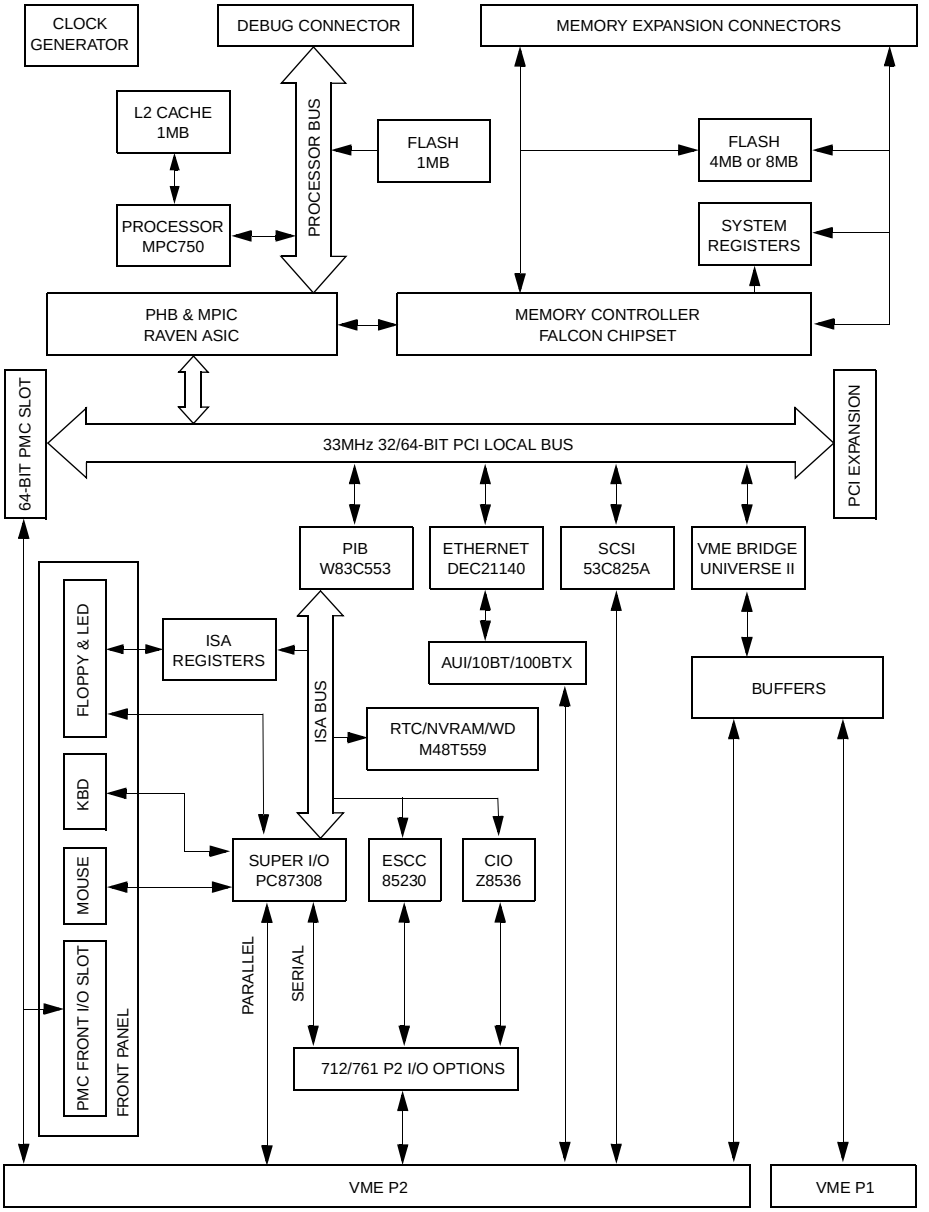


Figure 1-1. MVME2700 Base Board Block Diagram

Equipment Required

The following equipment is required to complete an MVME2700 system:

- ❏ VME system enclosure
- ❏ System console terminal
- ❏ Operating system (and/or application software)
- ❏ Disk drives (and/or other I/O) and controllers
- ❏ Transition module (MVME712M or MVME761) and connecting cables

MVME2700 VMEmodules are factory-configured for I/O handling via either MVME712M or MVME761 transition modules. The following table shows the relationship between MVME2700 model numbers and the applicable transition module.

Table 1-1. VMEmodule/Transition Module Correspondence

MVME761-Compatible Models*	MVME712-Compatible Models*
MVME2700-1221A (16MB ECC DRAM)	MVME2700-4221A (16MB ECC DRAM)
MVME2700-1231A (32MB ECC DRAM)	MVME2700-4231A (32MB ECC DRAM)
MVME2700-1241A (64MB ECC DRAM)	MVME2700-4241A (64MB ECC DRAM)
MVME2700-1251A (128MB ECC DRAM)	MVME2700-4251A (128MB ECC DRAM)
MVME2700-1321 (16MB ECC DRAM	MVME2700-4321 (16MB ECC DRAM)
MVME2700-1331 (32MB ECC DRAM)	MVME2700-4331 (32MB ECC DRAM)
MVME2700-1341 (64MB ECC DRAM)	MVME2700-4341 (64MB ECC DRAM)
MVME2700-1351 (128MB ECC DRAM)	MVME2700-4351 (128MB ECC DRAM)
MVME2700-1361 (256MB ECC DRAM)	MVME2700-4361 (256MB ECC DRAM)
MVME2700-1421 (16MB ECC DRAM)	MVME2700-4421 (16MB ECC DRAM)
MVME2700-1431 (32MB ECC DRAM)	MVME2700-4431 (32MB ECC DRAM)
MVME2700-1441 (64MB ECC DRAM)	MVME2700-4441 (64MB ECC DRAM)
MVME2700-1451 (128MB ECC DRAM)	MVME2700-4451 (128MB ECC DRAM)
MVME2700-1461 (256MB ECC DRAM)	MVME2700-4461 (256MB ECC DRAM)
MVME2700-3221A (16MB ECC DRAM)	
MVME2700-3231A (32MB ECC DRAM)	

Table 1-1. VMEmodule/Transition Module Correspondence

MVME761-Compatible Models*	MVME712-Compatible Models*
MVME2700-3241A (64MB ECC DRAM)	
MVME2700-3251A (128MB ECC DRAM)	
MVME2700-3321 (16MB ECC DRAM)	
MVME2700-3331 (32MB ECC DRAM)	
MVME2700-3341 (64MB ECC DRAM)	
MVME2700-3351 (128MB ECC DRAM)	
MVME2700-3361 (256MB ECC DRAM)	
MVME2700-3421 (16MB ECC DRAM)	
MVME2700-3431 (32MB ECC DRAM)	
MVME2700-3441 (64MB ECC DRAM)	
MVME2700-3451 (128MB ECC DRAM)	
MVME2700-3461 (256MB ECC DRAM)	
*All models have 233MHz, 266MHz or 366MHz processors, 5MB or 8MB Flash memory and 1MB L2 cache.	

In models of the MVME2700 series that are configured for MVME712M I/O mode, the pin assignments of VMEbus connector P2 are fully compatible with other transition modules of the MVME712 series. In MVME761-compatible models, certain signals are multiplexed through P2 for additional I/O capacity. Refer to *P2 Signal Multiplexing* in *Chapter 5* for details.

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 1-2. 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.	*MVME2700 Base Board Preparation* and *MVME712M Transition Module Preparation* or *MVME761 Transition Module Preparation*	2-2 and 2-8 or 2-18
Ensure that mezzanine boards are properly installed.	*Hardware Installation*, RAM200 Memory Mezzanine; PMC Module; PMC Carrier Board	3-3 through 3-6
Install the MVME2700 VMEmodule in the chassis.	*MVME2700 VMEmodule Installation*	3-9
Install the transition module in the chassis.	*MVME712M Transition Module Installation* or *MVME761 Transition Module Installation*	3-11 or 3-14
Connect a console terminal.	*System Considerations*, MVME2700 VMEmodule	3-17
Connect any other equipment you will be using.	*Connector Pin Assignments* For more information on optional devices and equipment, refer to the documentation provided with the equipment.	6-1
Power up the system.	*Applying Power*	4-1
	Troubleshooting CPU Boards; Solving Start-Up Problems	D-1
Note that the debugger initializes the MVME2700.	*Using the Debugger*	7-3
	You may also wish to obtain the *PPCBug Firmware User's Manual*, listed in Appendix A, *Related Documentation*.	A-1
Initialize the system clock.	*Using the Debugger*, Debugger Commands	7-3
Examine and/or change environmental parameters.	*Using PPCBug Firmware*, Displaying the Board Configuration Block	7-3 and/or 8-1
Program the board as needed for your applications.	*CNFG* and *ENV* commands	8-2

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 MVME2700, you may need to carry out certain hardware modifications before installing the module.

The MVME2700 provides software control over most options: by setting bits in control registers after installing the module in a system, you can modify its configuration. The MVME2700 control registers are described in *Chapter 5*, and/or in the *MVME2600 Series Single Board Computer Programmer's Reference Guide* listed under *Related Documentation*.

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 transition module.

Instructions on preparing the base board, transition modules and P2 adapter are covered in *Chapter 2*. Installation instructions for the base board, memory mezzanine, transition modules and P2 adapter are covered in *Chapter 3*.

Hardware Preparation 2

Overview

The following sections discuss the:

- Preparation of the MVME2700 base board, including jumper settings
- Preparation of the MVME712M and MVME761transition modules
- Preparation of the P2 adapter card

Covered in this chapter is information on the configurable items on the MVME2700 base board and MVME712M and MVME761 transition modules and their serial port settings and configurations. The P2 adapters (three- and five-row) used with the transition modules are also described.

2

MVME2700 Base Board Preparation

Figure 2-1 illustrates the placement of the switches, jumper headers, connectors, and LED indicators on the MVME2700. Manually configurable items on the base board are listed in the following table. Refer to the sections or figures listed along side the jumper function for more information.

Table 2-1. Jumper Settings

Jumper	Function
J9	Flash bank selection, page 2-4
J20	System controller selection, page 2-7
J18	SP3 transmit clock configuration, page 2-6
J16	SP4 receive clock configuration, page 2-4
J17	SP4 transmit clock configuration, page 2-5
J19	SP4 transmit clock receiver buffer control, page 2-5

In conjunction with the serial port settings on the base board, serial ports on the associated MVME712M or MVME761 transition module are also manually configurable. For a discussion of the configurable items on the transition module, refer to the *MVME712M Transition Module Preparation* and *MVME761 Transition Module Preparation* sections. For further information, refer to the *Related Documentation* appendix.

The MVME2700 is factory tested and shipped with the configurations described in the following sections. The MVME2700's required and factory-installed debug monitor, PPCBug, operates with those factory settings.

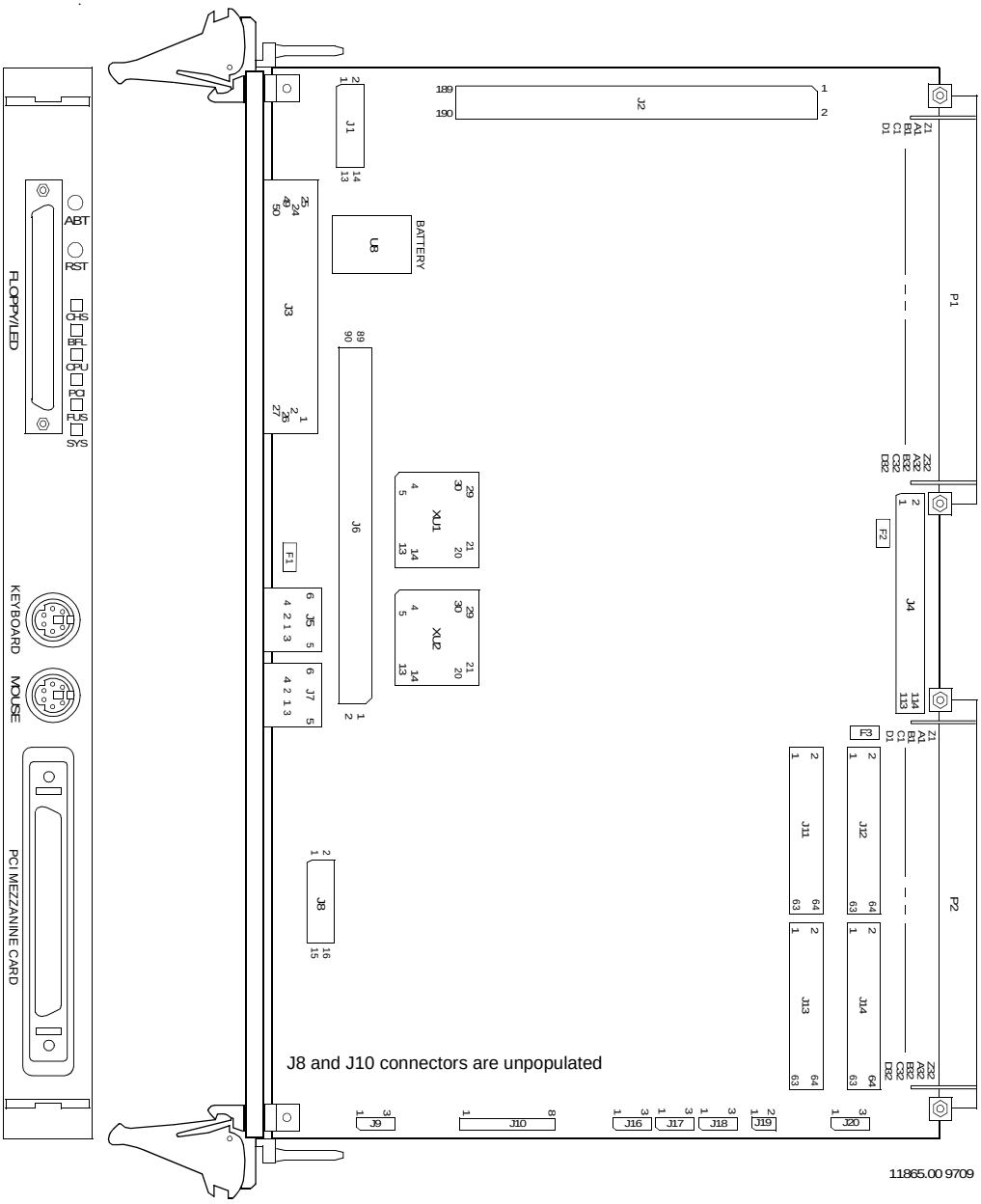


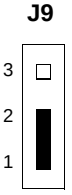
Figure 2-1. MVME2700 Switches, Headers, Connectors, Fuses, LEDs

Flash Bank Selection (J9)

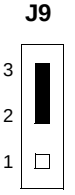
The MVME2700 base board has provision for 1MB of 16-bit Flash memory. The RAM200 memory mezzanine accommodates 4MB or 8MB of additional 64-bit Flash memory.

The Flash memory is organized in either one or two banks, each bank either 16 or 64 bits wide.

To enable Flash bank A (4MB or 8MB of firmware resident on soldered-in devices on the RAM200 mezzanine), place a jumper across header J9 pins 1 and 2. To enable Flash bank B (1MB of firmware located in sockets on the base board), place a jumper across header J9 pins 2 and 3.



Flash Bank A Enabled (4MB/8MB, Soldered)



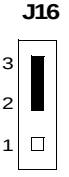
Flash Bank B Enabled (1MB, Sockets)
(factory configuration)

Serial Port 4 Receive Clock Configuration (J16)

In synchronous serial communications, you can configure serial port 4 on the MVME2700 to use the clock signals provided by the RxC signal line. The configurations for the MVME712M-compatible and MVME761-compatible versions of the base board require different settings for port 4 to either drive or receive RxC (default).



Drive RxC



Receive RxC
(factory configuration)

Serial port configurations for the MVME712M are illustrated in figures 2-4 through 2-9.

Serial port configurations for the MVME761 are illustrated in figures 2-11 through 2-28.

Serial Port 4 Transmit Clock Configuration (J17)

In synchronous serial communications, you can configure serial port 4 on the MVME2700 to use the clock signals provided by the TxC signal line. Header J17 configures port 4 to either drive or receive TxC (default). The factory configuration has port 4 set to receive TxC.

A complete configuration of serial port 4 requires that you set additional jumper headers on the MVME2700 or the transition module.



Serial port configurations for the MVME712M are illustrated in figures 2-4 through 2-9.

Serial port configurations for the MVME761 are illustrated in figures 2-11 through 2-28.

Serial Port 4 Transmit Clock Receiver Buffer Control (J19)

A transmit clock receiver buffer (controlled by header J19) is associated with serial port 4. Installing a jumper on J19 enables the buffer. Removing the jumper disables the buffer. The factory configuration has the serial port 4 buffer enabled.

As described in other sections, a complete configuration of serial port 4 requires that you set additional jumper headers on the MVME2700 or the transition module.



Serial port configurations for the MVME712M are illustrated in figures 2-4 through 2-9.

Serial port configurations for the MVME761 are illustrated in figures 2-11 through 2-28.

Serial Port 3 Transmit Clock Configuration (J18)

On *MVME761-compatible* versions only of the base board, this header configures port 3 to either drive or receive TxC. The factory configuration has serial port 3 set to receive TxC. On MVME761-compatible versions, you must set J2 on the transition module to complete the configuration of serial port 3.

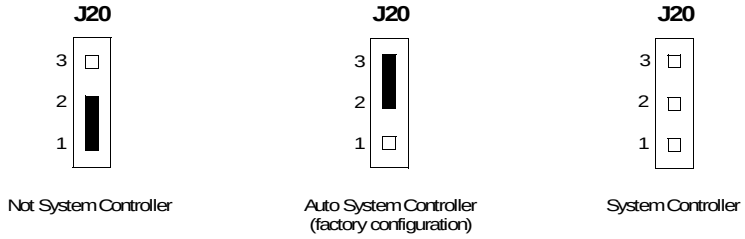


Serial port configurations for the MVME712M are illustrated in figures 2-4 through 2-9.

Serial port configurations for the MVME761 are illustrated in figures 2-11 through 2-28.

System Controller Selection (J20)

The MVME2700 is factory-configured as a VMEbus system controller by jumper header J20. If you select the “automatic” system controller function by placing a jumper on J20 pins 2 and 3, the MVME2700 determines whether it is the system controller by its position on the bus. If the board is in the first slot from the left, it configures itself as the system controller. If the MVME2700 is not to be system controller under any circumstances, place the jumper on J20 pins 1 and 2. When the board is functioning as system controller, the SCON LED is turned on.



Remote Status and Control (J1)

The MVME2700 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. In this application, J1 can be connected to a user-supplied external cable to carry the Reset and Abort signals and the LED lines to a control panel located apart from the MVME2700. Maximum cable length is 15 feet.

Table 6-1 lists the pin numbers and signal mnemonics for J1.

2

MVME712M Transition Module Preparation

The MVME712M transition module and P2 adapter board are used in conjunction with the following models of the MVME2700 VMEmodule:

With MCG front panel/handles	With Scanbe front panel/handles
MVME2700-4321 (16MB ECC DRAM)	MVME2700-4221A (16MB ECC DRAM)
MVME2700-4331 (32MB ECC DRAM)	MVME2700-4231A (32MB ECC DRAM)
MVME2700-4341 (64MB ECC DRAM)	MVME2700-4241A (64MB ECC DRAM)
MVME2700-4351 (128MB ECC DRAM)	MVME2700-4251A (128MB ECC DRAM)
MVME2700-4361 (256MB ECC DRAM)	MVME2700-4421 (16MB ECC DRAM)
	MVME2700-4431 (32MB ECC DRAM)
	MVME2700-4441 (64MB ECC DRAM)
	MVME2700-4451 (128MB ECC DRAM)
	MVME2700-4461 (256MB ECC DRAM)

For a description of the MVME712M features, refer to *MVME712M Transition Module* on page 5-24.

For installations in VME64 backplanes, you may wish to use the five-row P2 adapter and cable supplied with the MVME761 transition module. Although the MVME712M itself does not support the additional I/O capability on rows D and Z of the MVME2700's five-row P2 connector, those signals remain available for user-specific applications. To gain access to the 16-bit SCSI and PMC I/O present on rows D and Z when the MVME2700 is installed in a VME64 backplane, use the five-row P2 adapter.

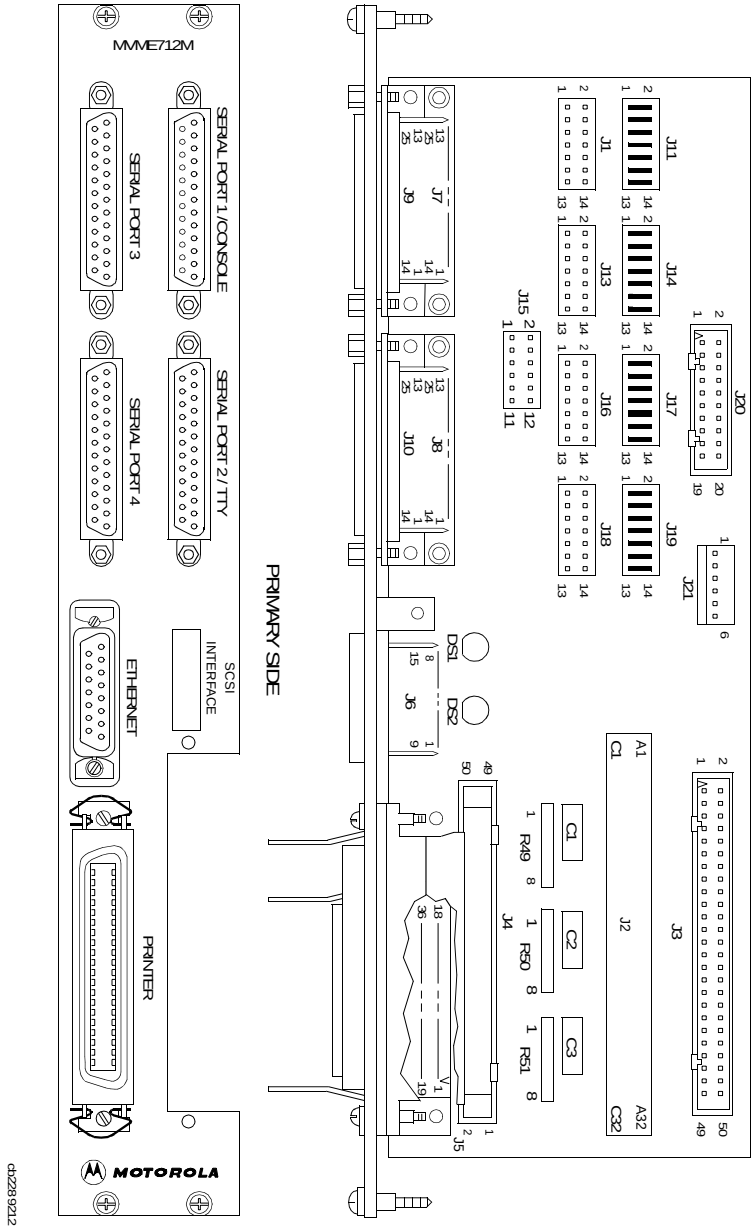


Figure 2-2. MVME712M Connector and Header Locations

2

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.

Table 2-2. MVME712M Port/Jumper Correspondence

Serial Port	Board Connector	Panel Connector	Jumper Header DCE/DTE
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 port4	J18/J19

Figures 2-4 through 2-9 illustrate the MVME2700 base board and MVME712M transition module with the interconnections and jumper settings for DCE/DTE configuration on each serial port.

Serial Port 4 Clock Configuration

Serial port 4 can be configured via J15 (Figure 2-3) to use the TrxC4 and RtxC4 signal lines. Part of the configuration is done with headers J16, J17, and J19 on the MVME2700 (Figures 2-8 and 2-9).

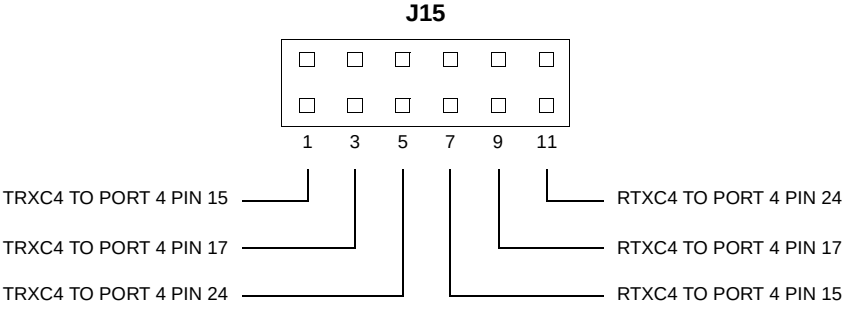


Figure 2-3. J15 Clock Line Configuration

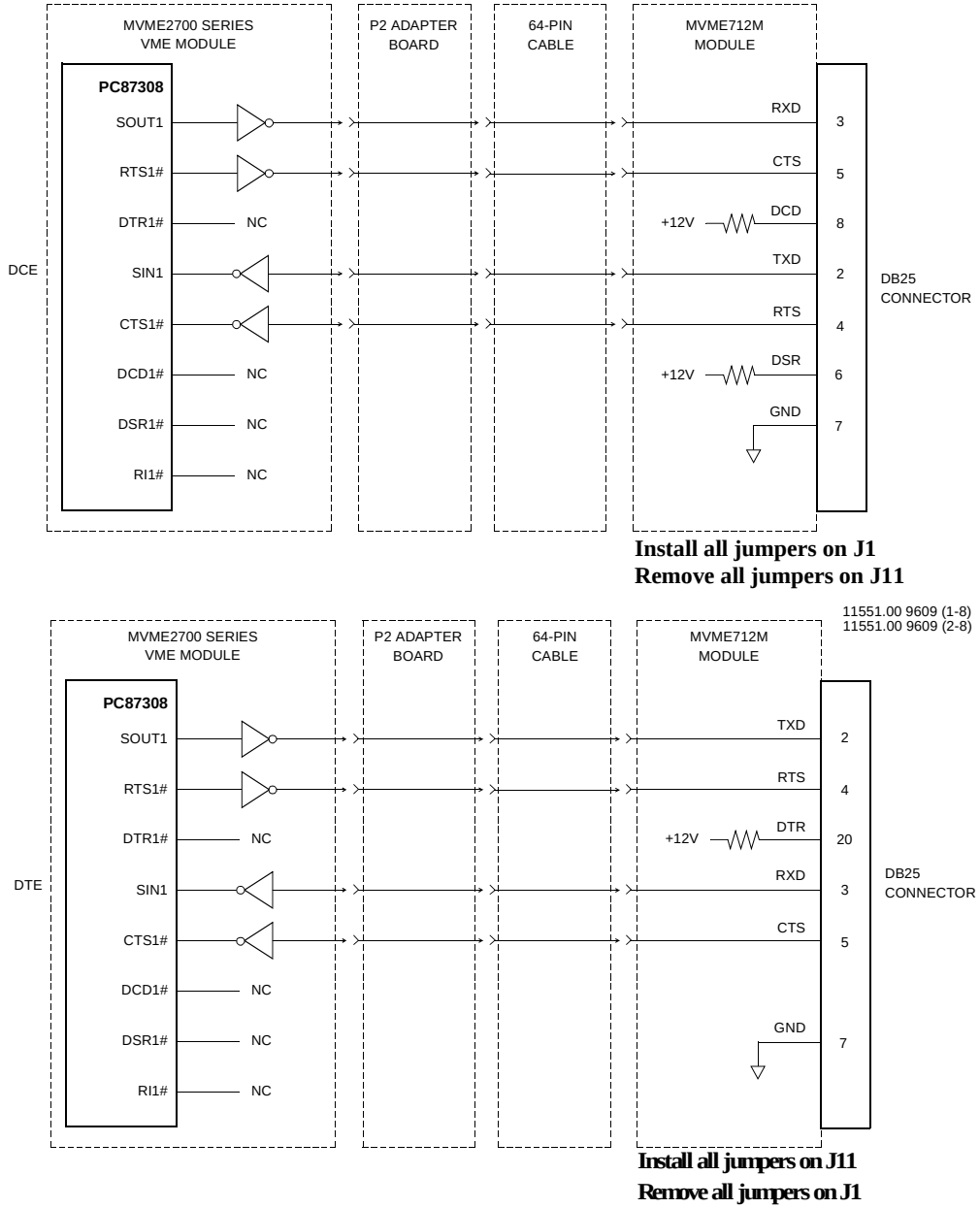


Figure 2-4. MVME712M Serial Port 1 DCE/DTE Configuration

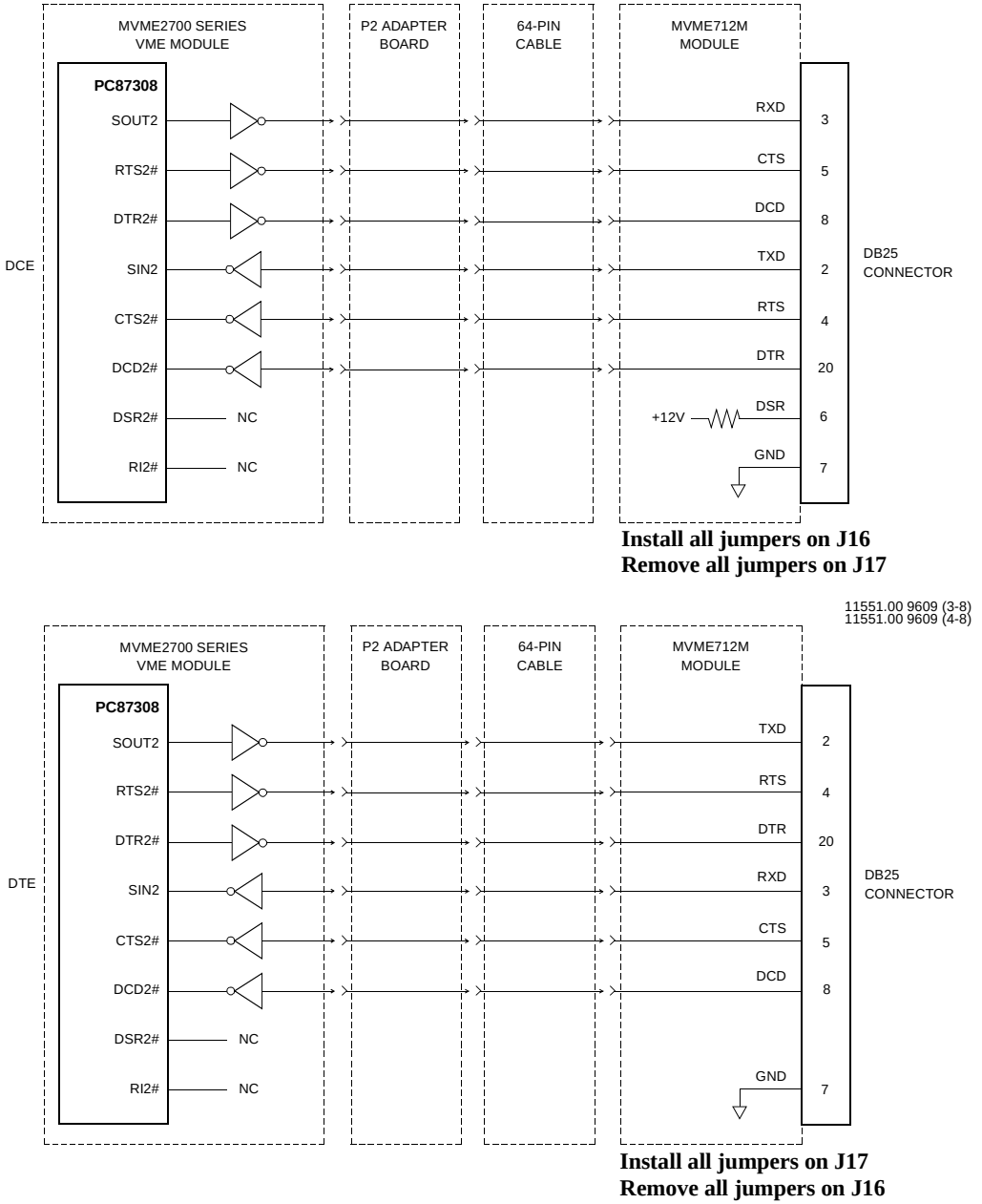


Figure 2-5. MVME712M Serial Port 2 DCE/DTE Configuration

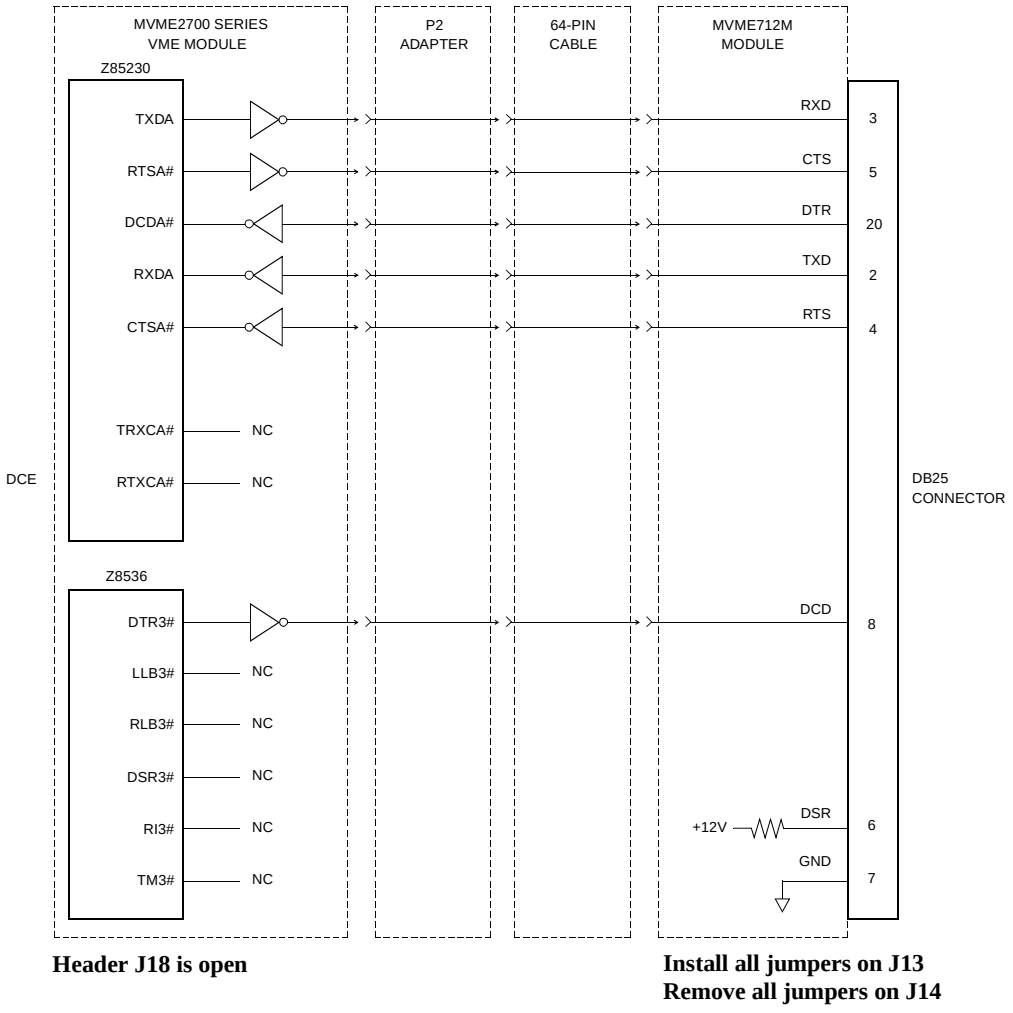


Figure 2-6. MVME712M Serial Port 3 DCE Configuration

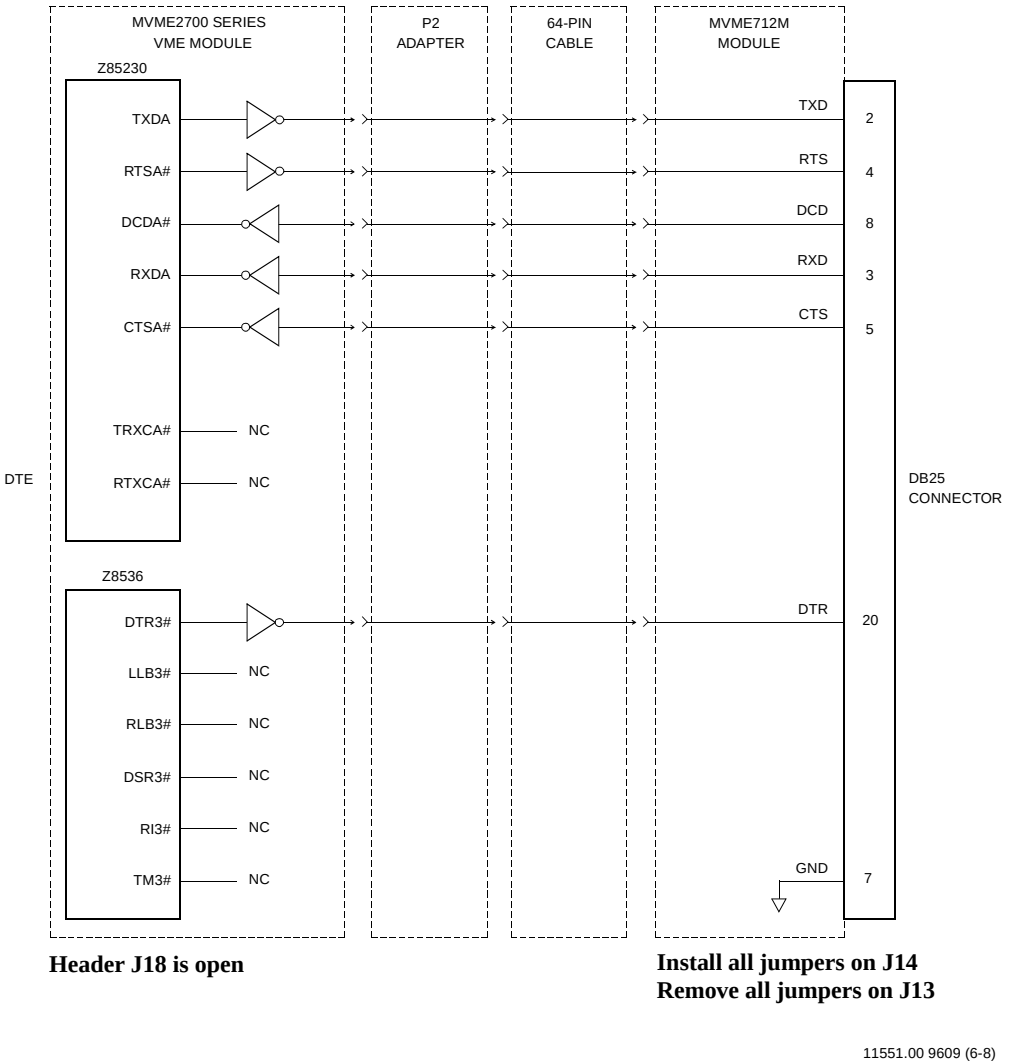
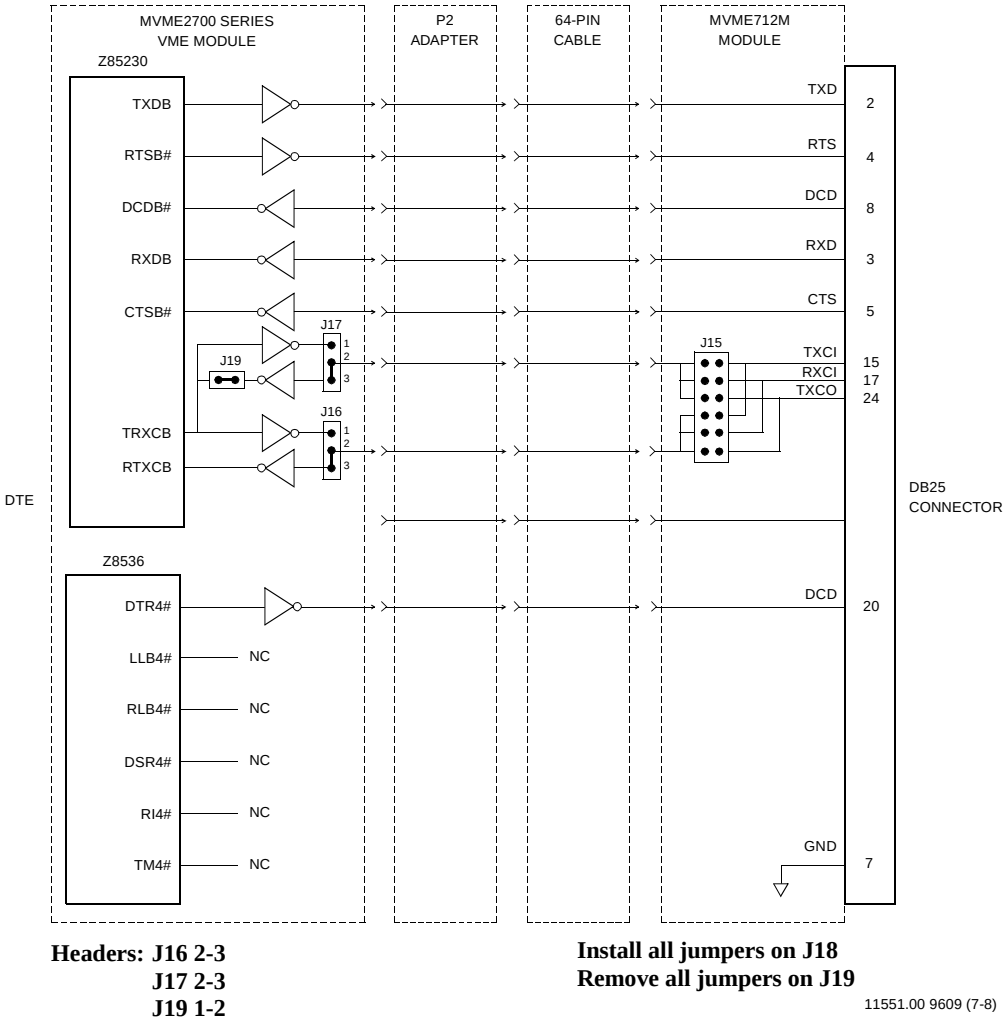
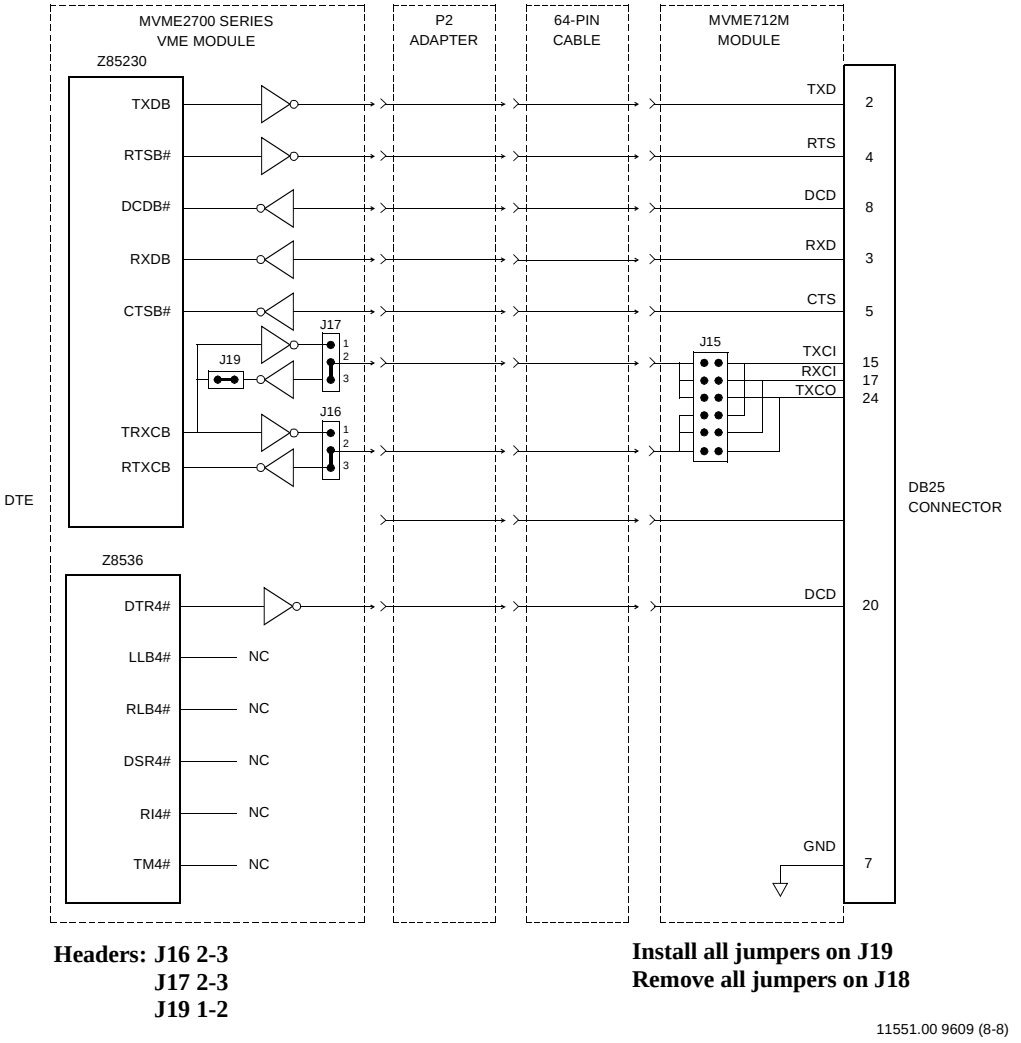


Figure 2-7. MVME712M Serial Port 3 DTE Configuration



NOTE: No jumpers on J15. Refer to Figure 2-3 on page 2-10.

Figure 2-8. MVME712M Serial Port 4 DCE Configuration



NOTE: No jumpers on J15. Refer to Figure 2-3 on page 2-10.

Figure 2-9. MVME712M Serial Port 4 DTE Configuration

P2 Adapter Preparation

In its factory configuration, the MVME712M transition module uses a three-row P2 adapter to transfer synchronous/asynchronous serial, parallel, and Ethernet signals to and from the MVME2700 series VMEmodule. A 50-pin male connector (J3) on the P2 adapter carries 8-bit SCSI signals from the MVME2700.

Preparation of the three-row P2 adapter for the MVME712M consists of removing or installing the SCSI terminating resistors, R1-R3. Figure 2-10 illustrates the location of the resistors, the connectors, and SCSI terminator power fuse F1. For further information on the preparation of the transition module and this P2 adapter, refer to the user's manual for the MVME712M, listed in *Related Documentation*.

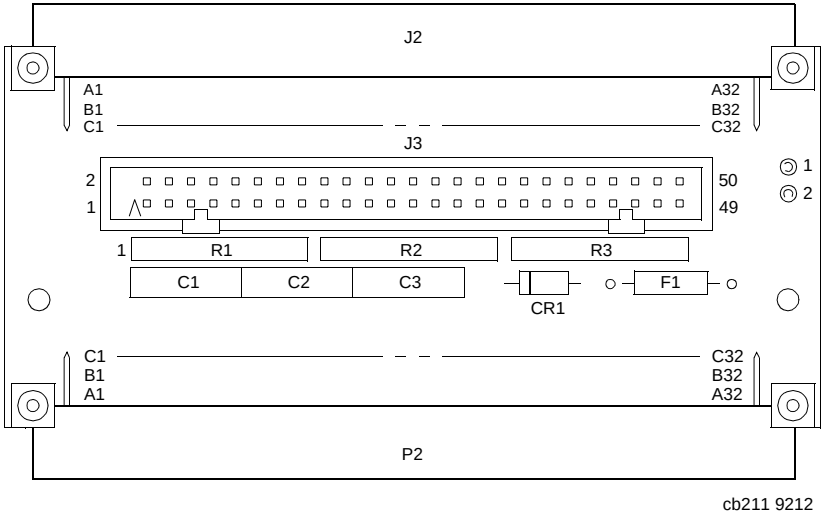


Figure 2-10. MVME712M Three-Row P2 Adapter

If you plan to connect the MVME712M to a VME64 backplane with a five-row P2 adapter refer to on page 2-27 for guidelines on preparing the adapter.

2

MVME761 Transition Module Preparation

The MVME761 transition module (Figure 2-11) and P2 adapter board are used in conjunction with the following models of the MVME2700 VMEmodule:

MCG front panel/handles	Scanbe front panel handles
MVME2700-1221A (16MB ECC DRAM)	MVME2700-3221A (16MB ECC DRAM)
MVME2700-1231A (32MB ECC DRAM)	MVME2700-3231A (32MB ECC DRAM)
MVME2700-1241A (64MB ECC DRAM)	MVME2700-3241A (64MB ECC DRAM)
MVME2700-1251A (128MB ECC DRAM)	MVME2700-3251A (128MB ECC DRAM)
MVME2700-1321 (16MB ECC DRAM)	MVME2700-3421 (16MB ECC DRAM)
MVME2700-1331 (32MB ECC DRAM)	MVME2700-3431 (32MB ECC DRAM)
MVME2700-1341 (64MB ECC DRAM)	MVME2700-3441 (64MB ECC DRAM)
MVME2700-1351 (128MB ECC DRAM)	MVME2700-3451 (128MB ECC DRAM)
MVME2700-1361 (256MB ECC DRAM)	MVME2700-3461 (256MB ECC DRAM)
MVME2700-1421 (16MB ECC DRAM)	
MVME2700-1431 (32MB ECC DRAM)	
MVME2700-1441 (64MB ECC DRAM)	
MVME2700-1451 (128MB ECC DRAM)	
MVME2700-1461 (256MB ECC DRAM)	
MVME2700-3321 (16MB ECC DRAM)	
MVME2700-3331 (32MB ECC DRAM)	
MVME2700-3341 (64MB ECC DRAM)	
MVME2700-3351 128MB ECC DRAM)	
MVME2700-3361 (256MB ECC DRAM)	

For a description of the MVME761M features, refer to *MVME761 Transition Module* on page 5-25.

Use the MVME761's three-row P2 adapter board in three-row VME backplanes. Use the five-row adapter in VME64 backplanes, which are equipped with five-row P2 connectors.

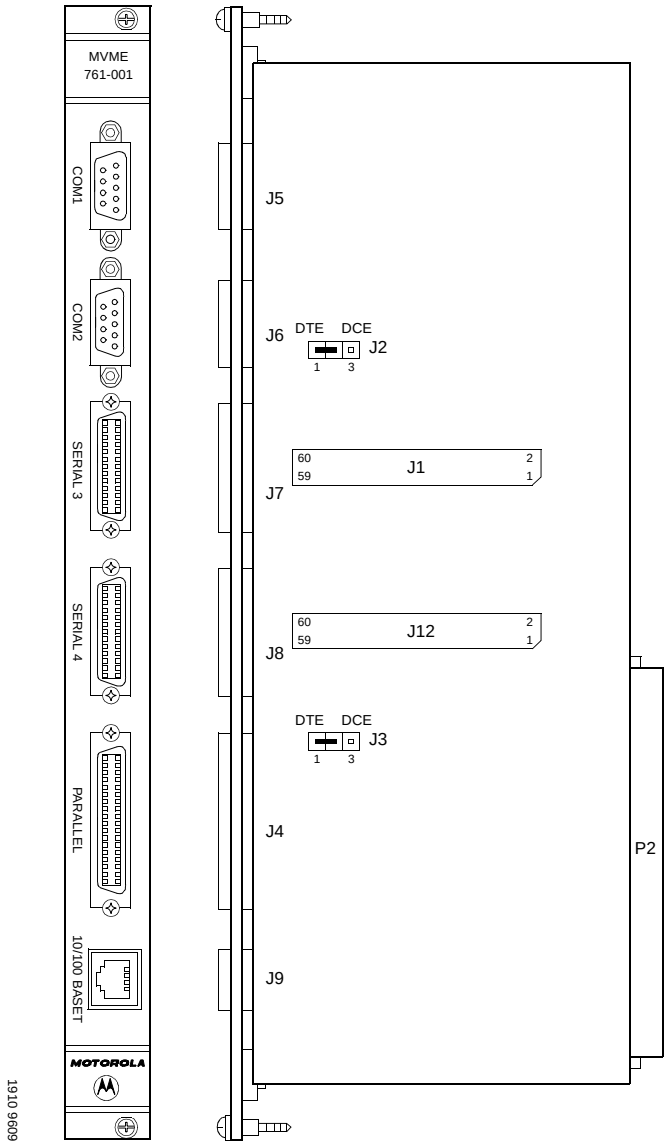


Figure 2-11. MVME761 Connector and Header Locations

Serial Ports 1 and 2

On MVME761-compatible models of the MVME2700, the asynchronous serial ports (serial ports 1 and 2) are configured permanently as Data Circuit-terminating Equipment (DCE). The port configuration is illustrated in Figure 2-12.

Configuration of Serial Ports 3 and 4

The synchronous serial ports, serial port 3 and serial port 4, are configurable through a combination of serial interface module (SIM) selection and jumper settings. The following table lists the SIM connectors and jumper headers corresponding to each of the synchronous serial ports.

Synchronous Port	Board Connector	SIM Connector	Jumper Header
Port 3	J7	J1	J2
Port 4	J8	J12	J3

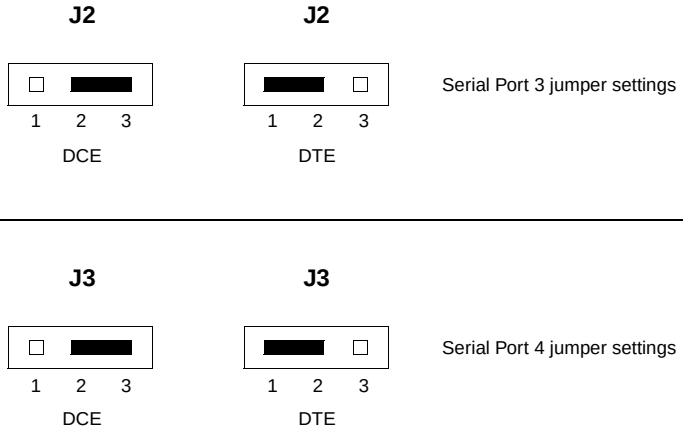
Serial port 3 is routed to board connector J7. Serial port 4 is routed to board connector J8. Eight serial interface modules are available:

- EIA-232-D (DCE and DTE)
- EIA-530 (DCE and DTE)
- V.35 (DCE and DTE)
- X.21 (DCE and DTE)

You can configure serial ports 3 and 4 for any of the above serial protocols by installing the appropriate serial interface module and setting the corresponding jumper. Refer to Figure 2-12 on page 2-22 through Figure 2-28 on page 2-38. SIMs can be ordered separately as required.

Note Part numbers of the various SIMs are listed in Table 5-6 on page 5-26, *SIM Type Identification*.

Headers J2 and J3 are used to configure serial port 3 and serial port 4, respectively, in tandem with SIM selection. 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 MVME761, listed in *Related Documentation*.

The next figures illustrate the MVME2700 base board and MVME761 transition module with the interconnections and jumper settings for DCE/DTE configuration on each serial port.

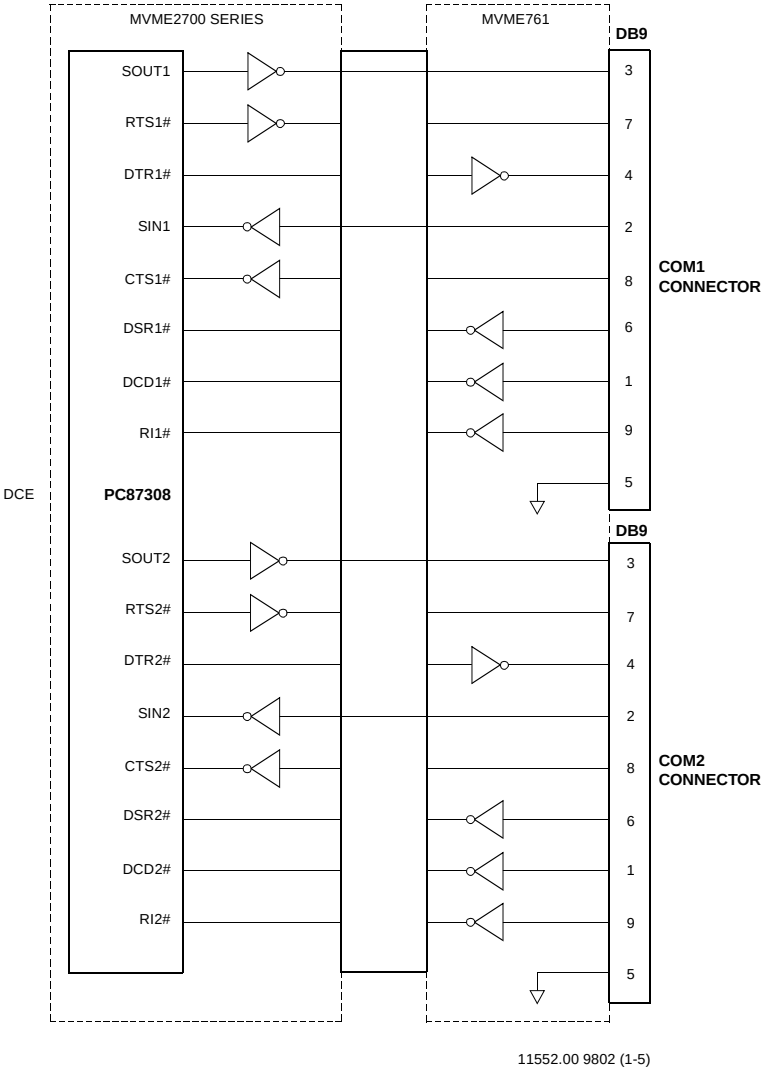


Figure 2-12. MVME761 Serial Ports 1 and 2 (DCE Only)

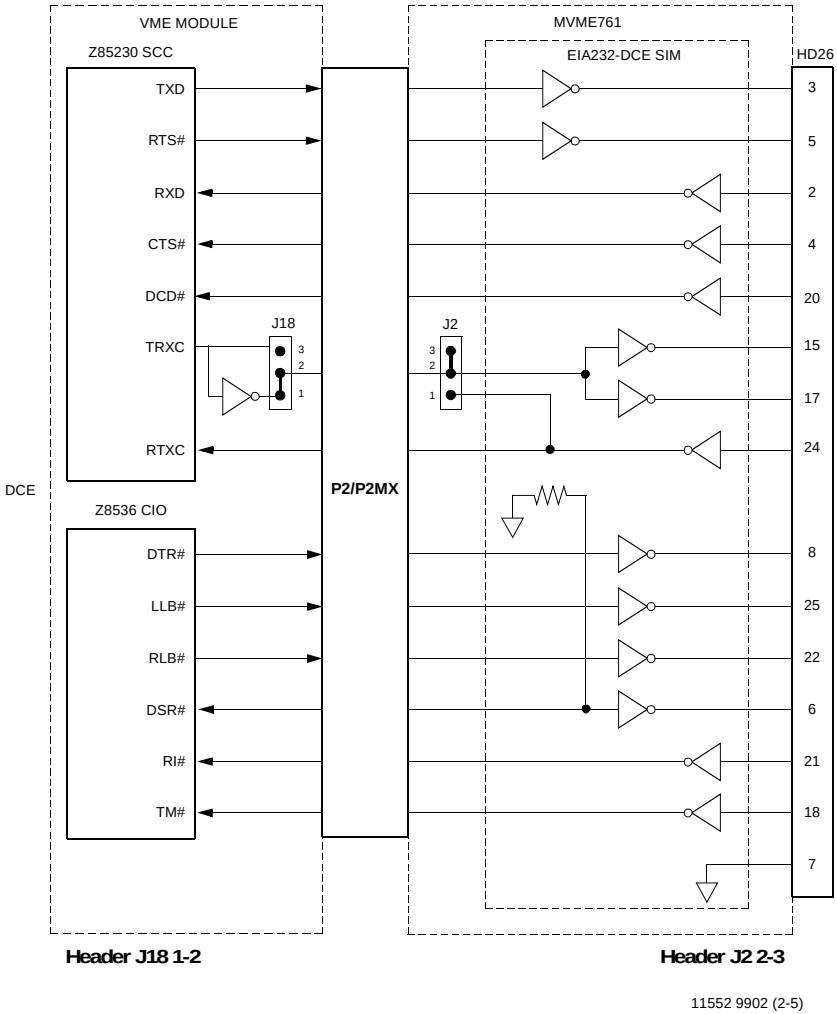


Figure 2-13. MVME761 EIA-232-D Port 3 DCE Configuration

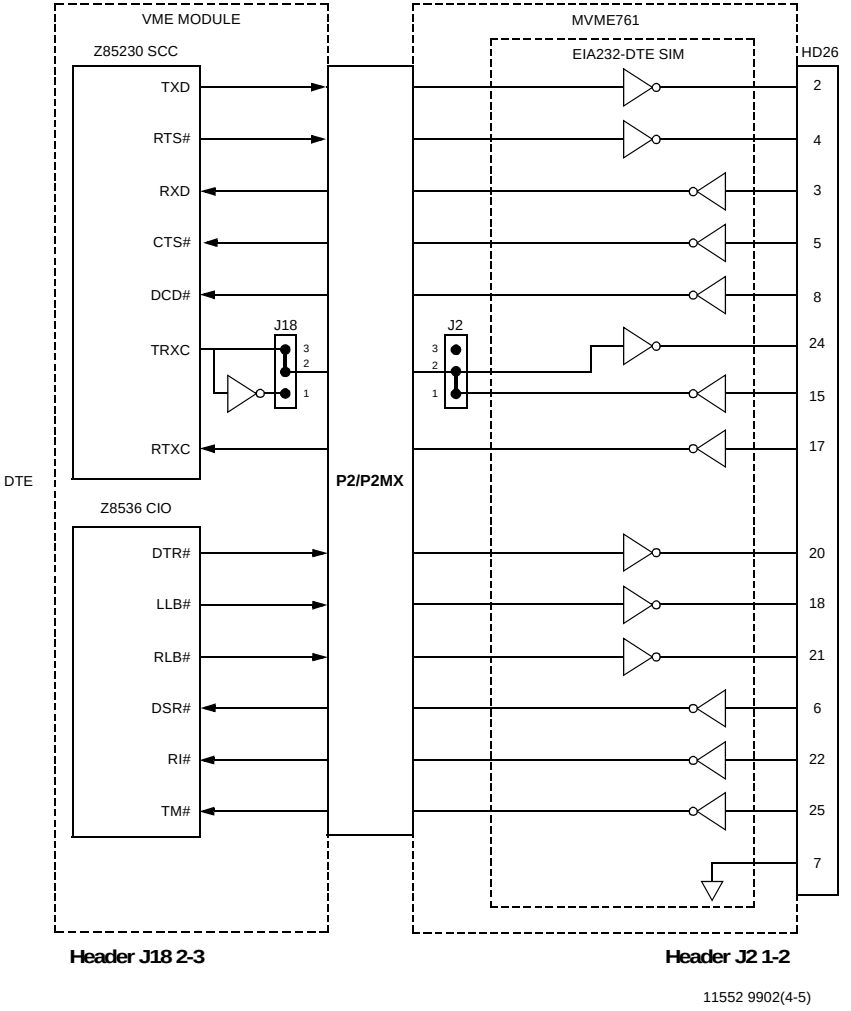


Figure 2-14. MVME761 EIA-232-D Port 3 DTE Configuration

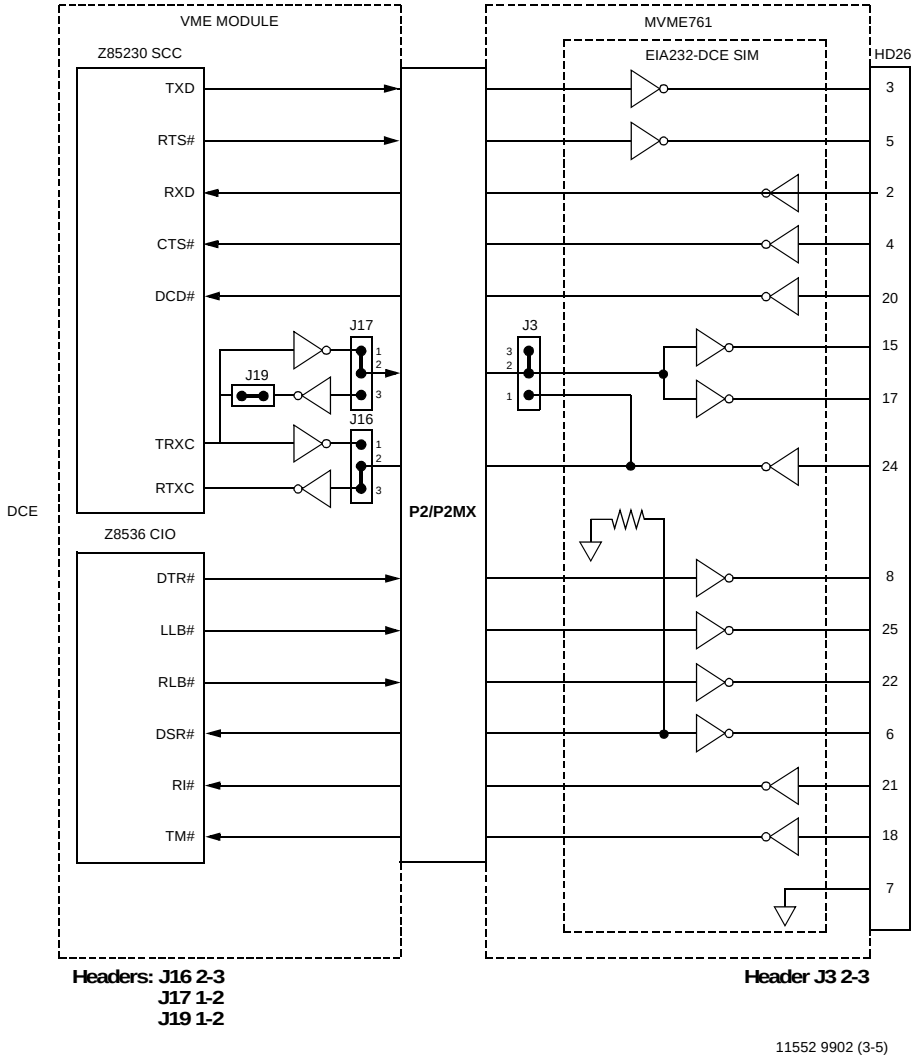


Figure 2-15. MVME761 EIA-232-D Port 4 DCE Configuration

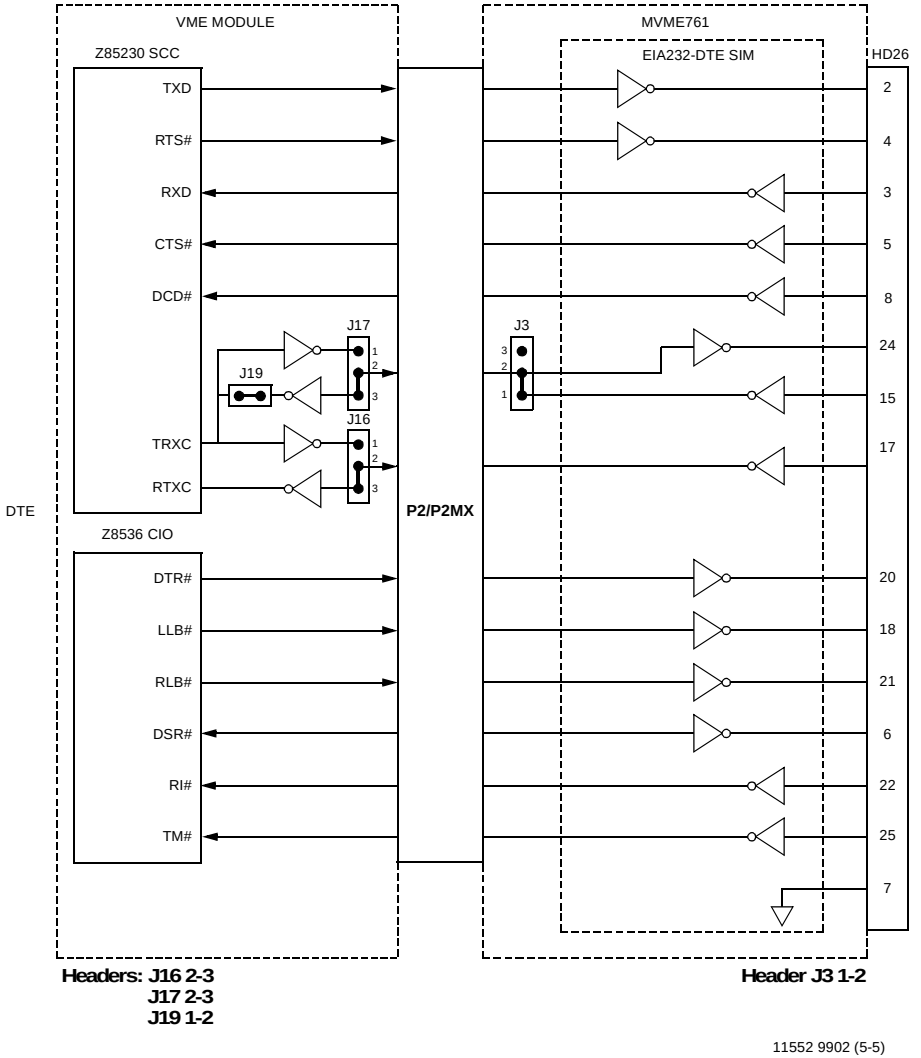


Figure 2-16. MVME761 EIA-232-D Port 4 DTE Configuration

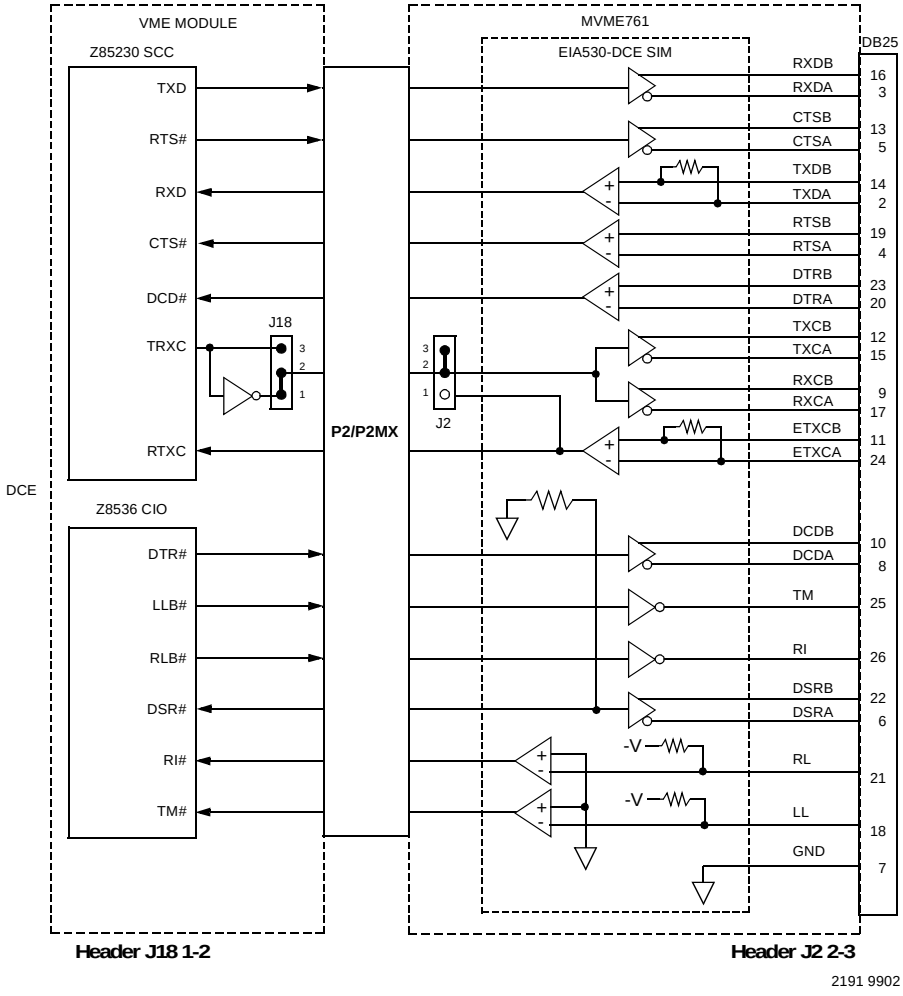


Figure 2-17. MVME761 EIA-530-DCE Configuration Port 3

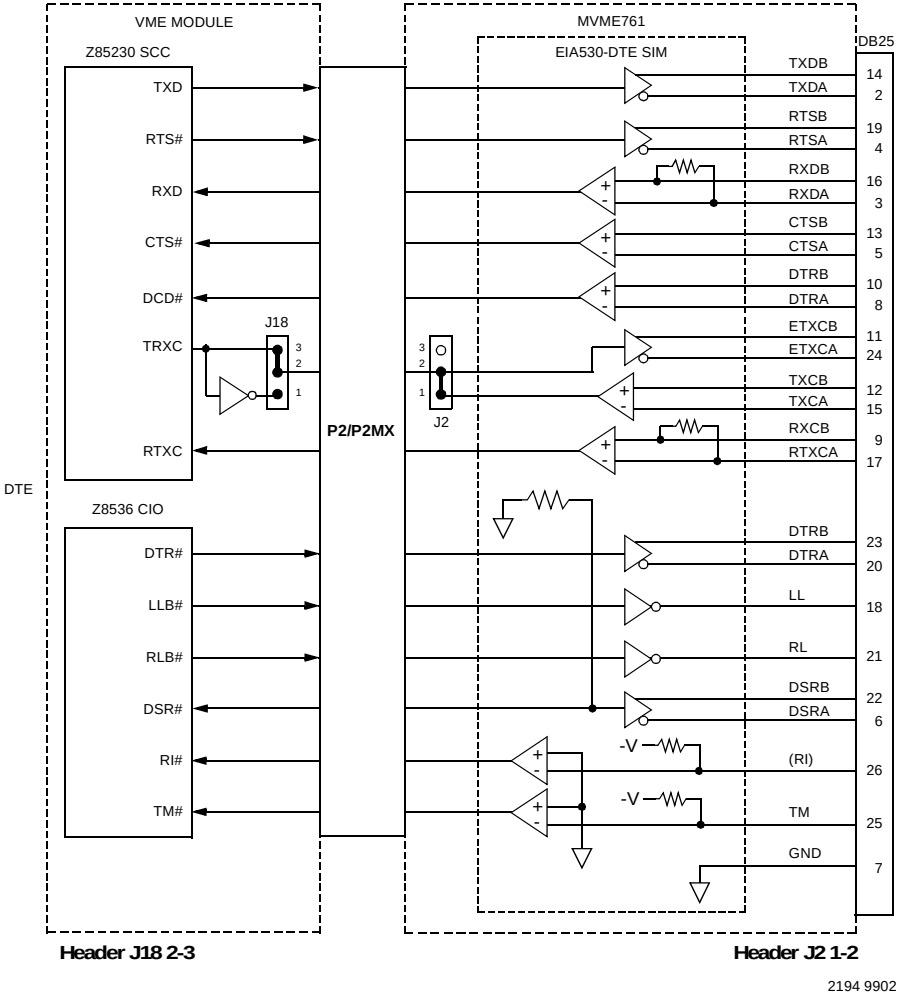


Figure 2-18. MVME761 EIA-530-DTE Configuration Port 3

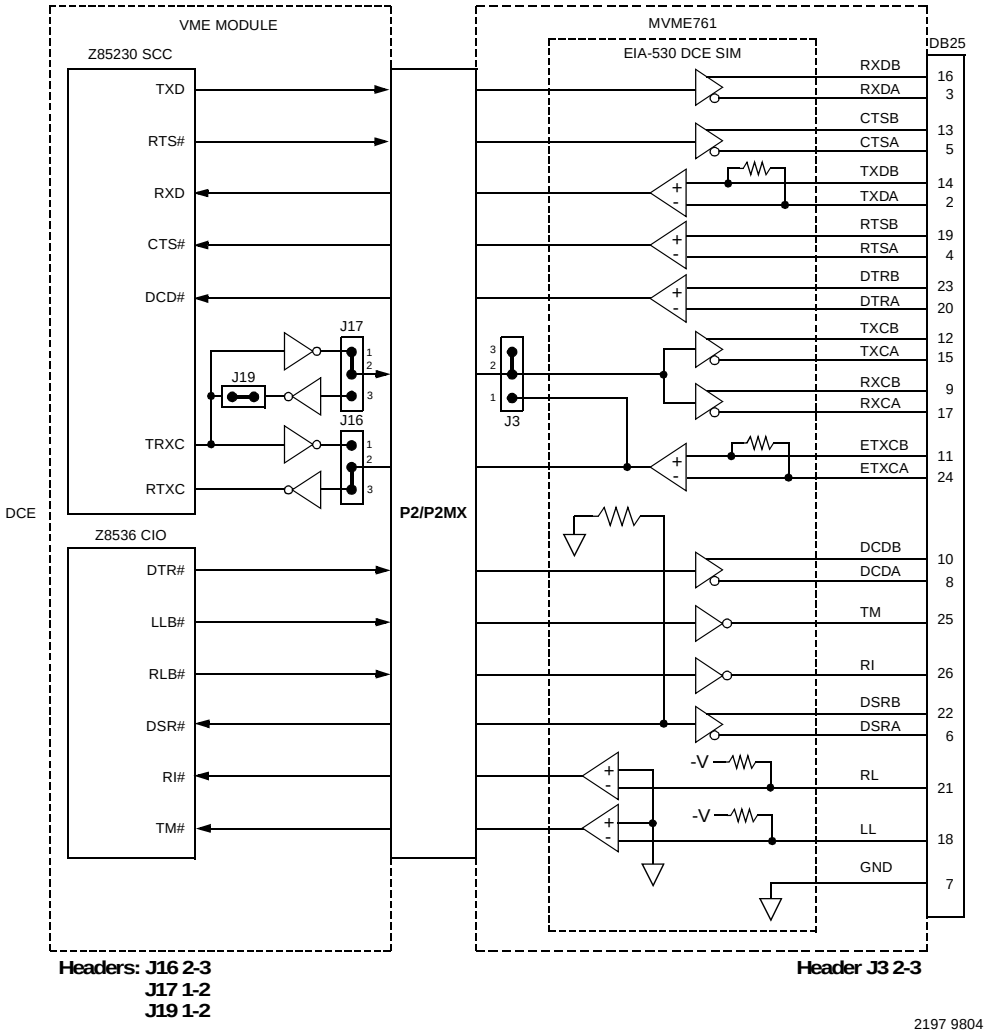


Figure 2-19. MVME761 EIA-530-DCE Configuration Port 4

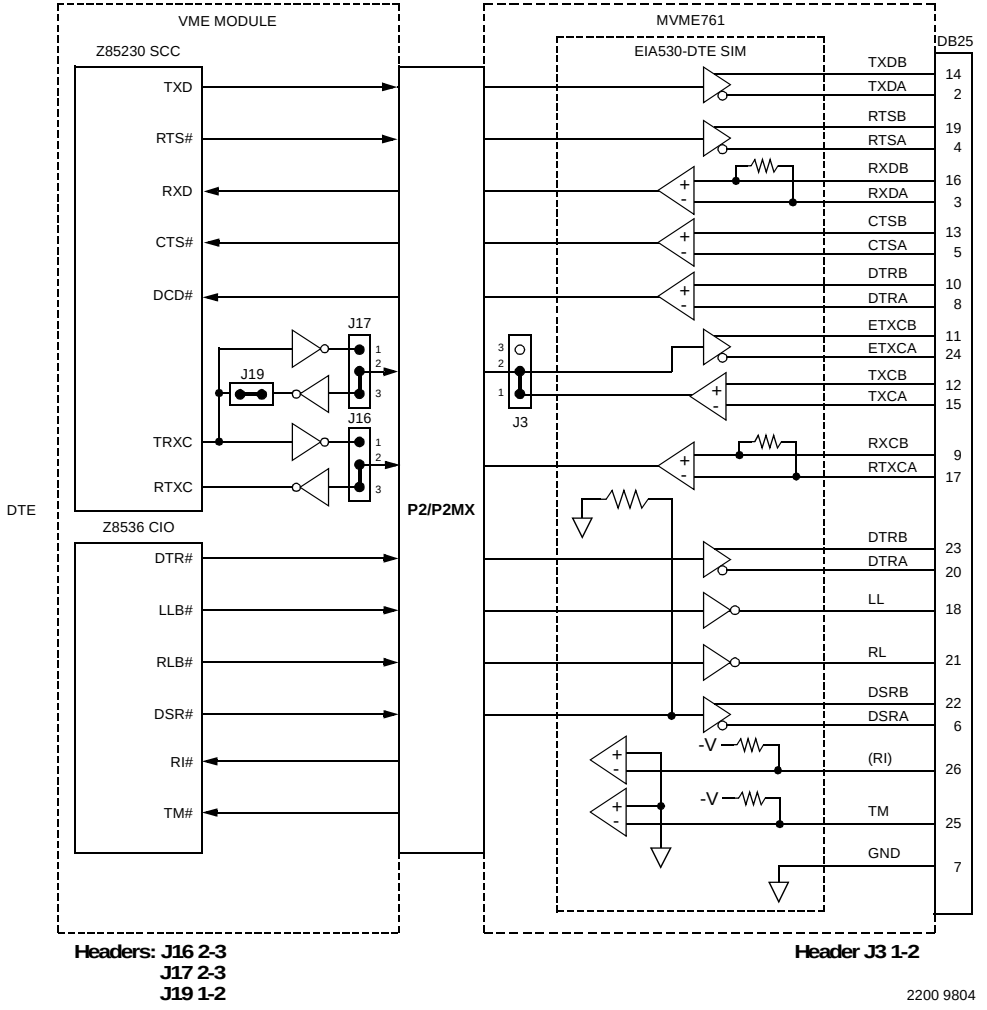


Figure 2-20. MVME761 EIA-530-DTE Port Configuration Port 4

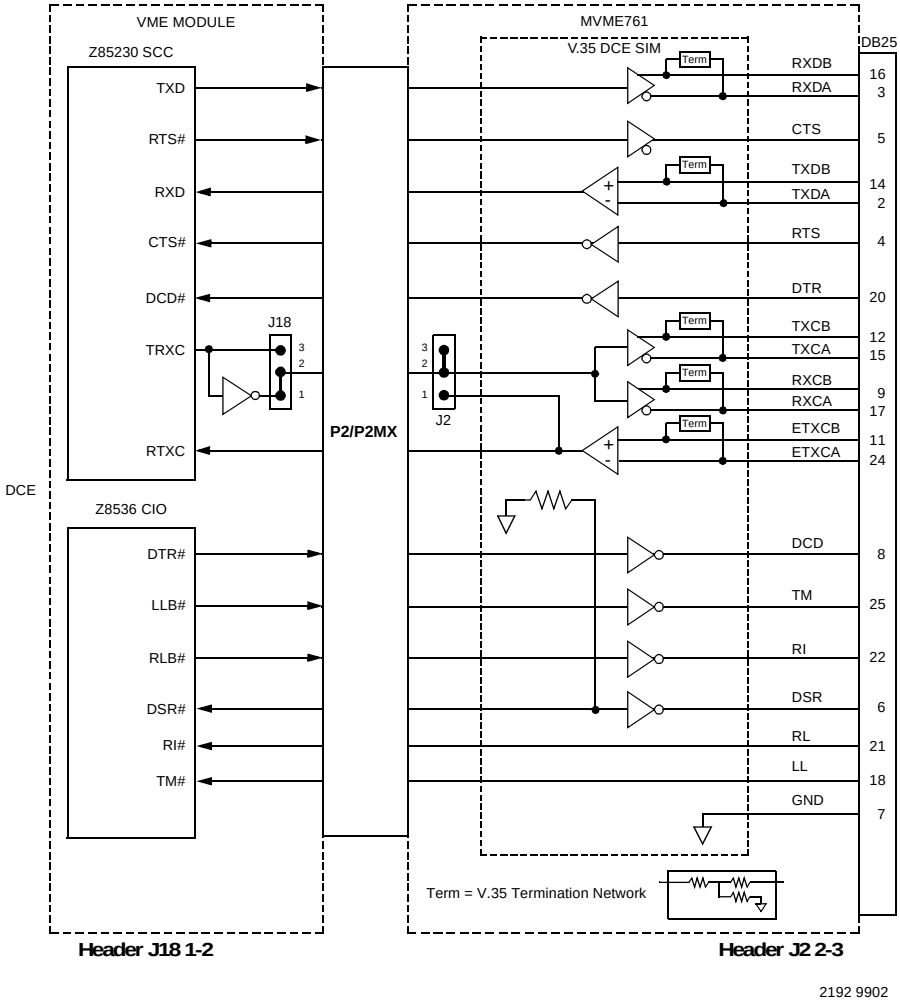


Figure 2-21. MVME761 V.35-DCE Configuration Port 3

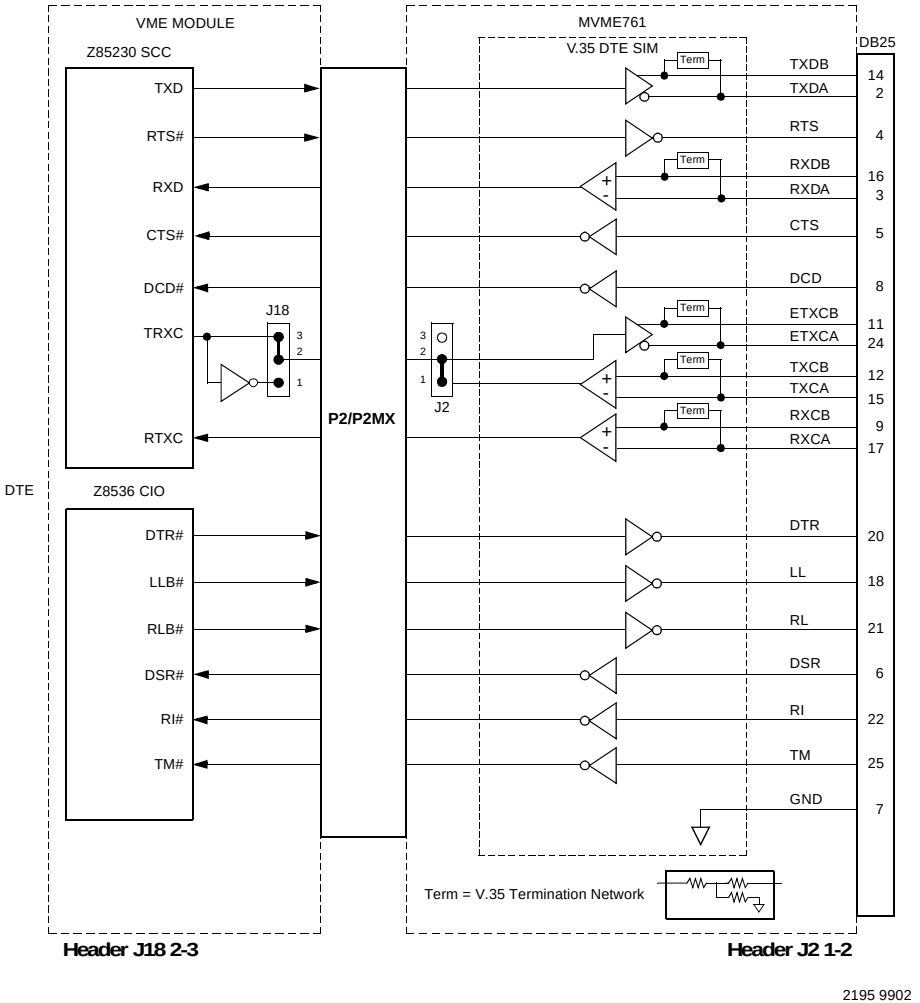


Figure 2-22. MVME761 V.35-DTE Configuration Port 3

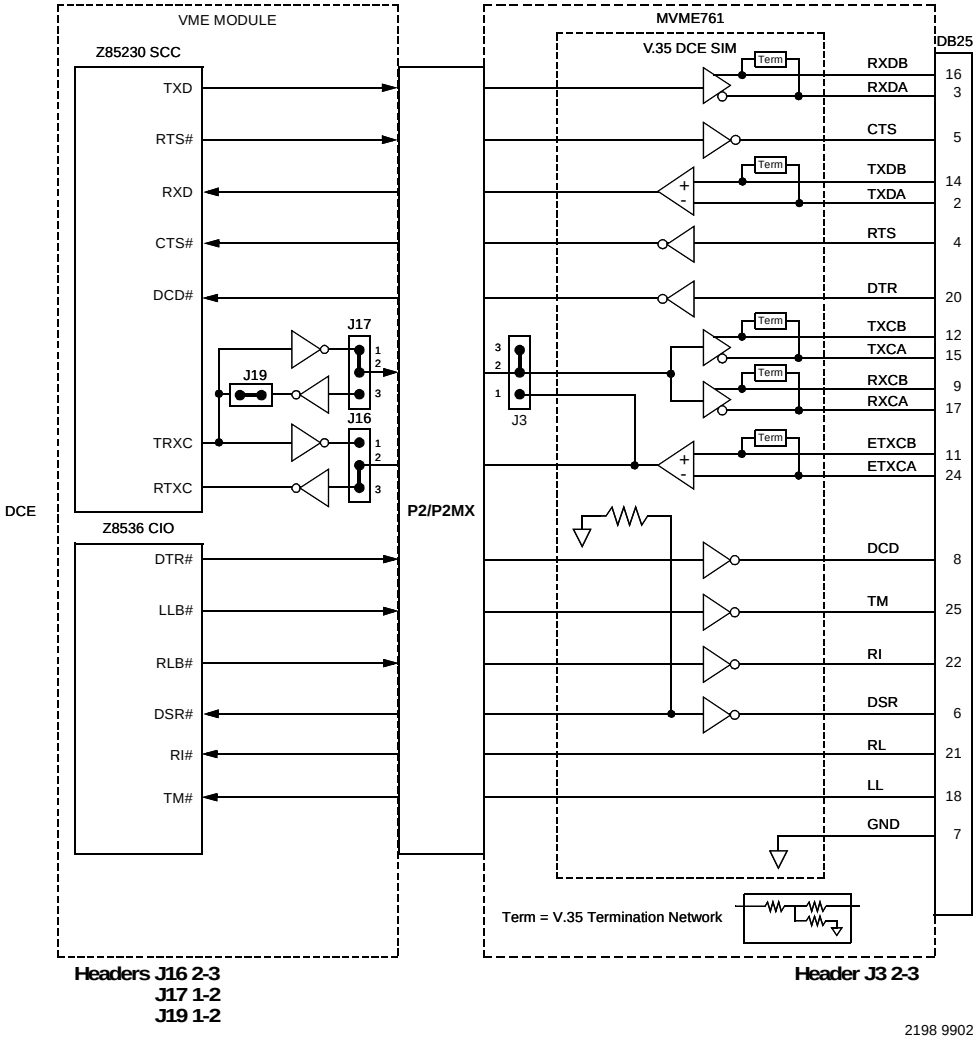


Figure 2-23. MVME761 V.35-DCE Configuration Port 4

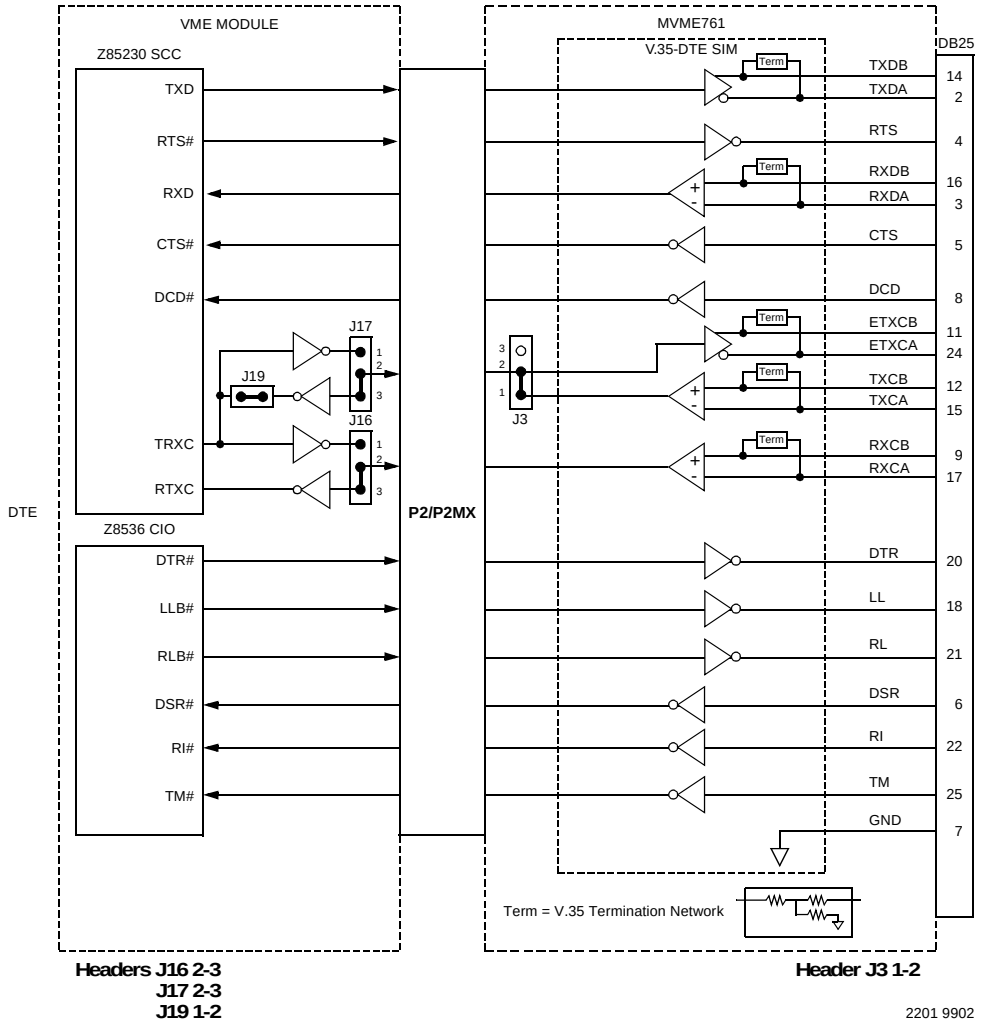


Figure 2-24. MVME761 V.35-DTE Configuration Port 4

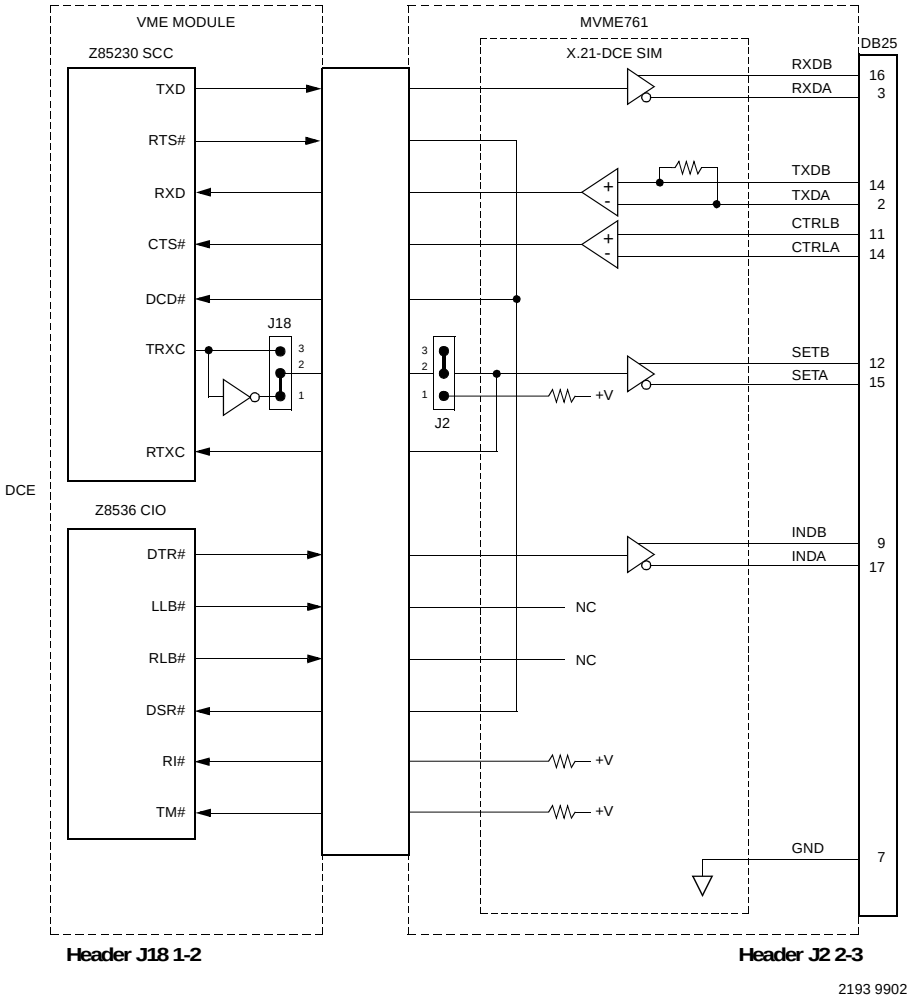


Figure 2-25. MVME761 X.21-DCE Configuration Port 3

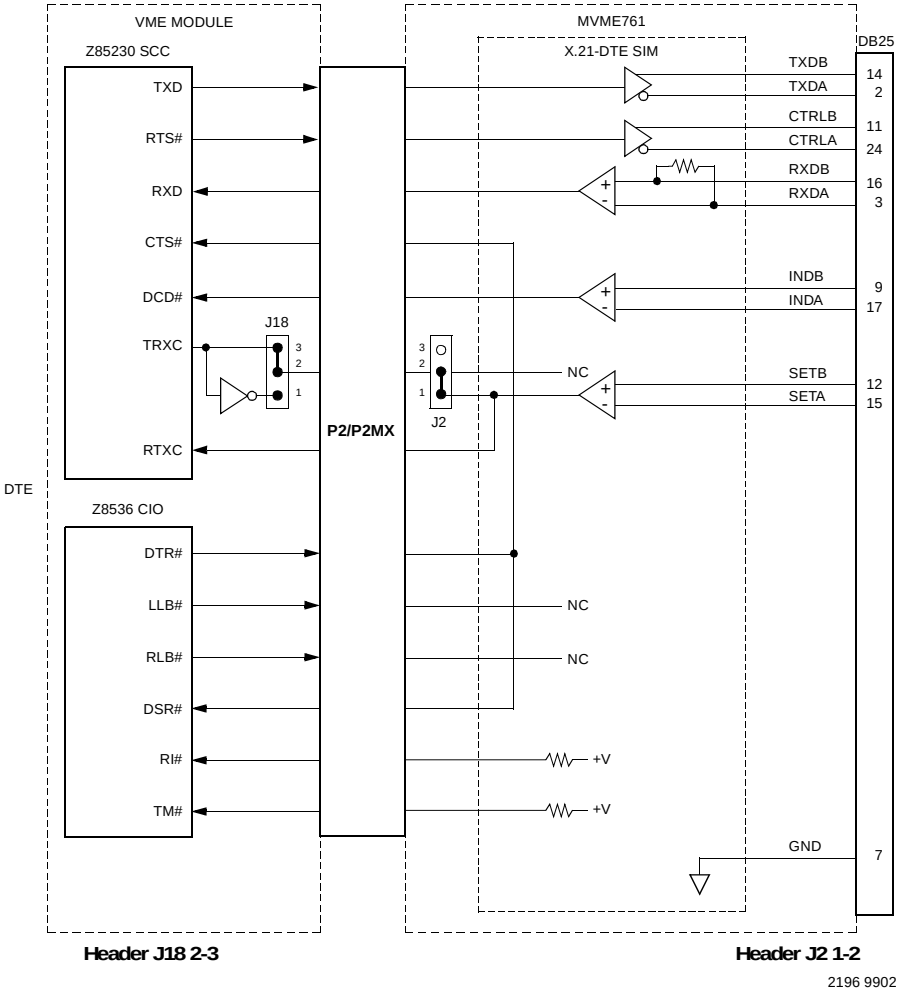


Figure 2-26. MVME761 X.21-DTE Configuration Port 3

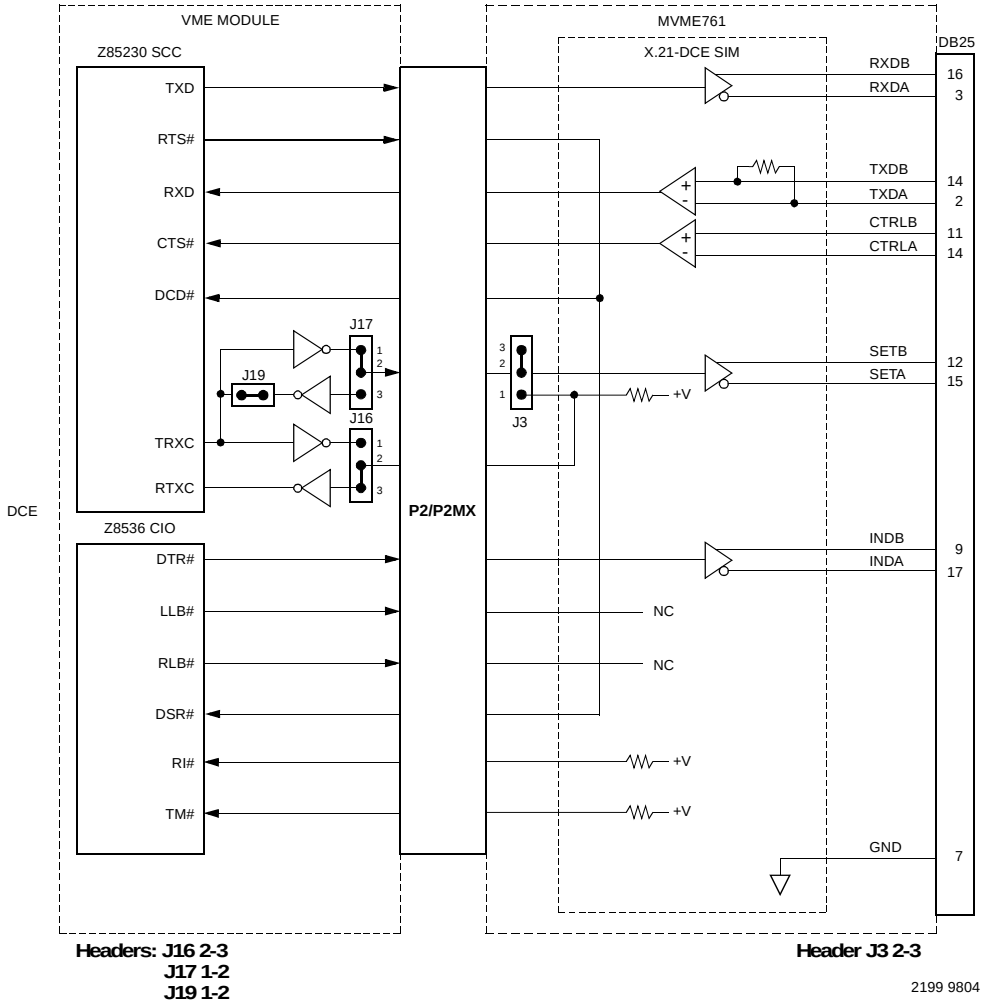


Figure 2-27. MVME761 X.21-DCE Configuration Port 4

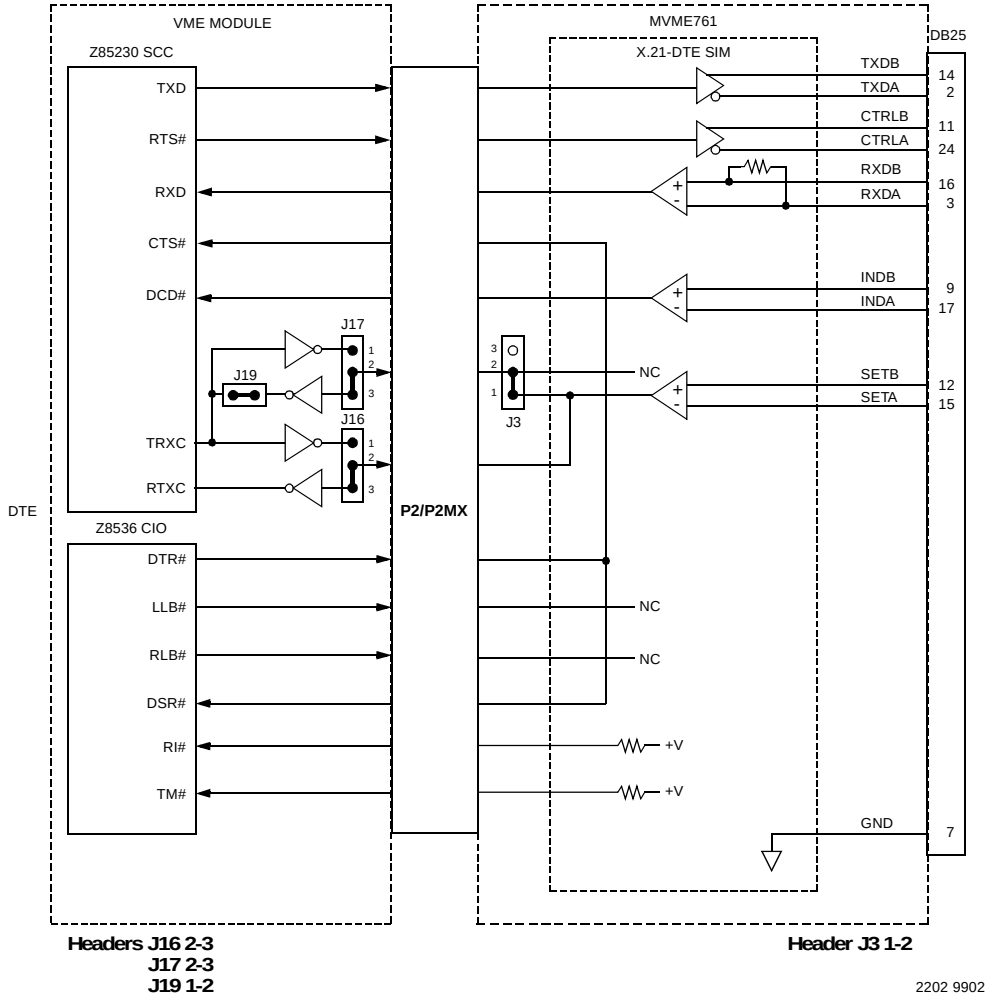


Figure 2-28. MVME761 X.21-DTE Configuration Port 4

P2 Adapter Preparation

The MVME761 transition module uses a three-row or five-row P2 adapter to transfer serial, parallel, and Ethernet signals to and from the MVME2700 series VMEmodule.

Three-Row Adapter

On the MVME761-001, three-row P2 adapter, a 50-pin male connector (J2) also carries 8-bit SCSI signals from the MVME2700 board. Preparation of a three-row P2 adapter for the MVME761 consists of installing a jumper on header J1 to enable the SCSI terminating resistors if necessary. Figure 2-29 illustrates the location of the jumper header and connectors on the MVME761's three-row P2 adapter.

For basic preparation of the five-row P2 adapter, refer to the next section.

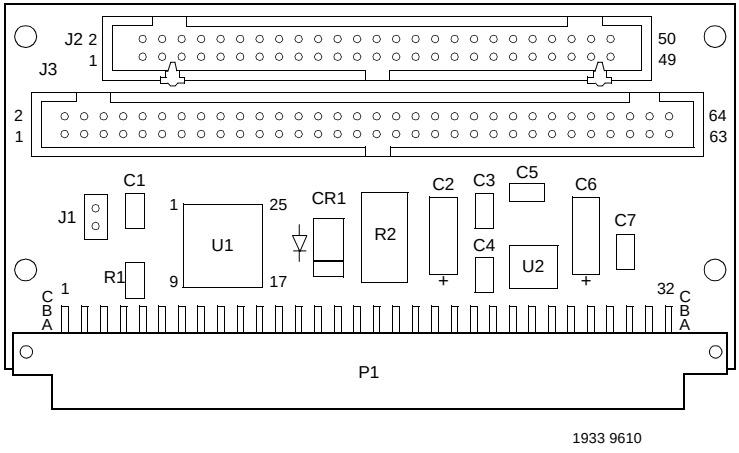


Figure 2-29. MVME761 Three-Row P2 Adapter

Five-Row Adapter

On the MVME761-011, five-row adapter for the MVME761, a 68-pin female connector (J1) carries 16-bit SCSI signals from the MVME2700 base board.

Preparation of a five-row P2 adapter for the MVME761 consists of installing a jumper on header J5 to enable the SCSI terminating resistors if necessary. Figure 2-19 illustrates the location of the jumper header, the connectors, and SCSI terminator power fuse (polyswitch) R4.

For further information on the preparation of the transition module and the P2 adapter, refer to the user's manual for the MVME76, listed in *Related Documentation*.

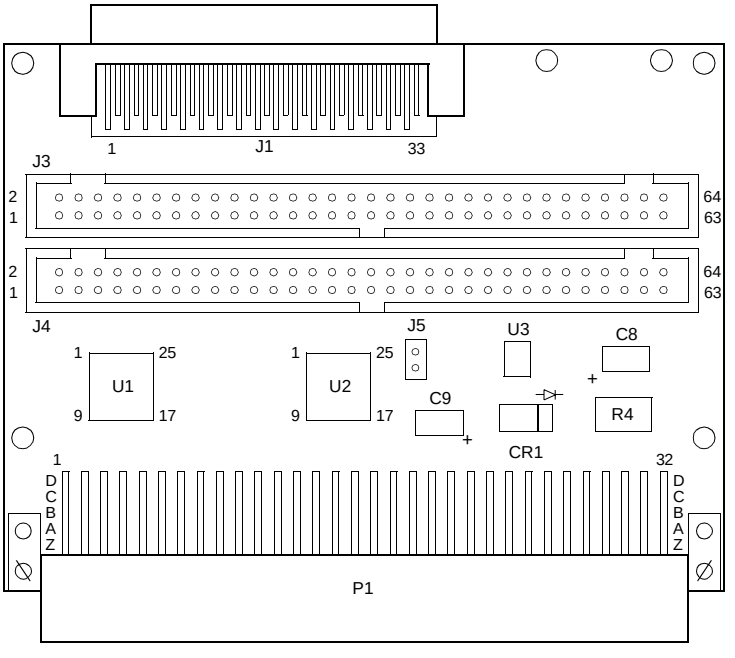


Figure 2-19. MVME761 Five-Row P2 Adapter

Hardware Installation 3

Overview

The following sections discuss the:

- Placement of mezzanine cards on the MVME2700 base board
- Installation of the complete MVME2700 VMEmodule assembly and transition module into a VME chassis
- System considerations relevant to the installation

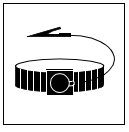
Before installing the MVME2700, ensure that the serial ports and all header jumpers are configured as desired.

In most cases, the mezzanine cards—the RAM200 ECC DRAM module, the optional PCI mezzanine (if applicable), and the optional carrier board for additional PCI expansion (if applicable)—are already in place on the MVME2700. The user-configurable jumpers are accessible with the mezzanines installed.

If it is necessary to install mezzanines on the base board, refer to the following sections for a brief description of the installation procedure.

ESD Precautions

Use ESD



Wrist Strap

Motorola strongly recommends that you use an antistatic wrist strap and a conductive foam pad when installing or upgrading the system. Electronic components, such as disk drives, computer boards, and memory modules, can be extremely sensitive to ESD. After removing the component from the computer 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). Wrap one end of a wrist grounding strap around your wrist.

Attach the grounding end (usually a piece of copper foil or an alligator clip) to an electrical ground. An electrical ground can be a piece of metal that literally runs into the ground (such as an unpainted metal pipe) or a metal part of a grounded electrical appliance. An appliance is grounded if it has a three-prong plug and is plugged into a three-prong grounded outlet. You cannot use the computer itself as a ground, because it is unplugged when you work on it.

Important Cautions and Warnings

The following cautions and warning apply to all installation procedures described in this chapter.



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.



Caution

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

RAM200 Memory Mezzanine Installation

The RAM200 DRAM mezzanine mounts on top of the MVME2700 base board. To upgrade or install a RAM200 mezzanine, refer to Figure 3-1 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.
3. Carefully remove the MVME2700 from its VMEbus card slot and lay it flat, with connectors P1 and P2 facing you.
4. Place the RAM200 mezzanine module on top of the base board. Connector J9 on the underside of the RAM200 should connect smoothly with the corresponding connector J6 on the MVME2700.

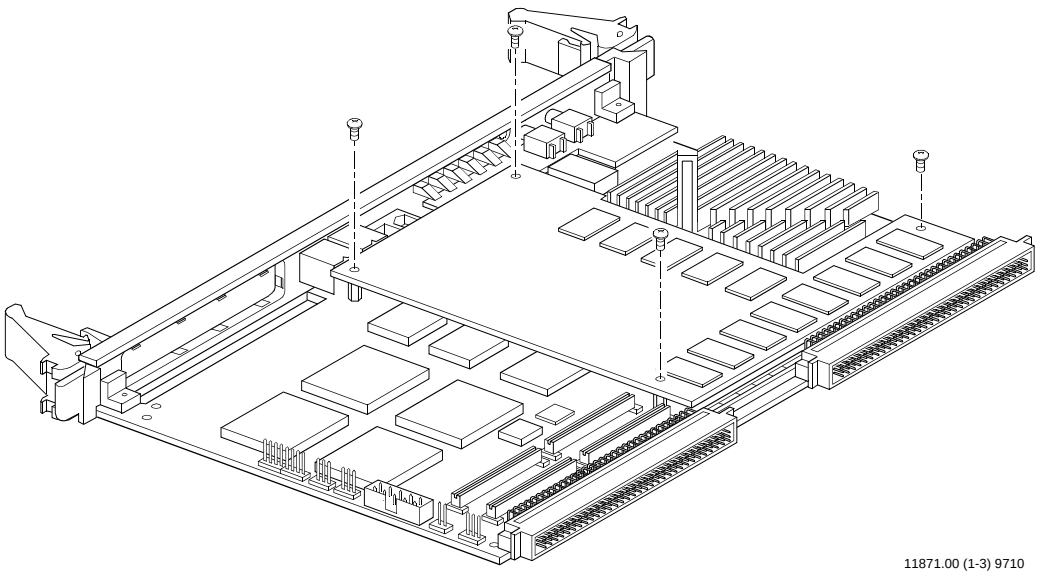


Figure 3-1. RAM200 Placement on MVME2700

5. Insert the four short Phillips screws through the holes at the corners of the RAM200, into the standoffs on the MVME2700. Tighten the screws.
6. Reinstall the MVME2700 assembly in its proper card slot. Be sure the module is well seated 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.

PMC Module Installation

PCI mezzanine card (PMC) modules mount beside the RAM200 mezzanine on top of the MVME2700 base board. To install a PMC module, refer to Figure 3-2 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.
3. Carefully remove the MVME2700 from its VMEbus card slot and lay it flat, with connectors P1 and P2 facing you.
4. Remove the PCI filler from the front panel.

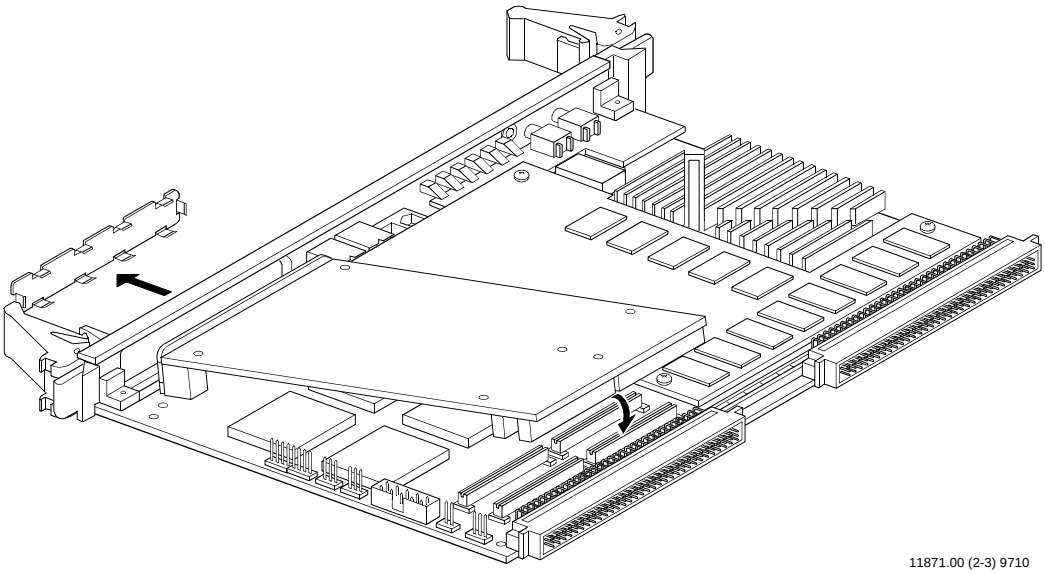


Figure 3-2. PMC Module Placement on MVME2700

5. Slide the edge connector of the PMC module into the front panel opening from behind and place the PMC module on top of the base board. The four connectors on the underside of the PMC module should then connect smoothly with the corresponding connectors (J11/12/13/14) on the MVME2700.
6. Insert the two short Phillips screws through the holes at the forward corners of the PMC module, into the standoffs on the MVME2700. Tighten the screws.
7. Reinstall the MVME2700 assembly in its proper card slot. Be sure the module is well seated in the backplane connectors. Do not damage or bend connector pins.
8. Replace the chassis or system cover(s), reconnect the system to the AC or DC power source, and turn the equipment power on.

PMC Carrier Board Installation

PCI mezzanine card (PMC) carrier boards mount above the RAM200 mezzanine and (if installed) PMC module on the MVME2700. You can stack up to two PMC carrier boards on the MVME2700 base board for additional PCI expansion. To install the lower PMC carrier board, refer to Figure 3-3 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.
3. Carefully remove the MVME2700 from its VMEbus card slot and lay it flat, with connectors P1 and P2 facing you.
4. If PMC modules are to be installed on the carrier board, install the modules at this point.

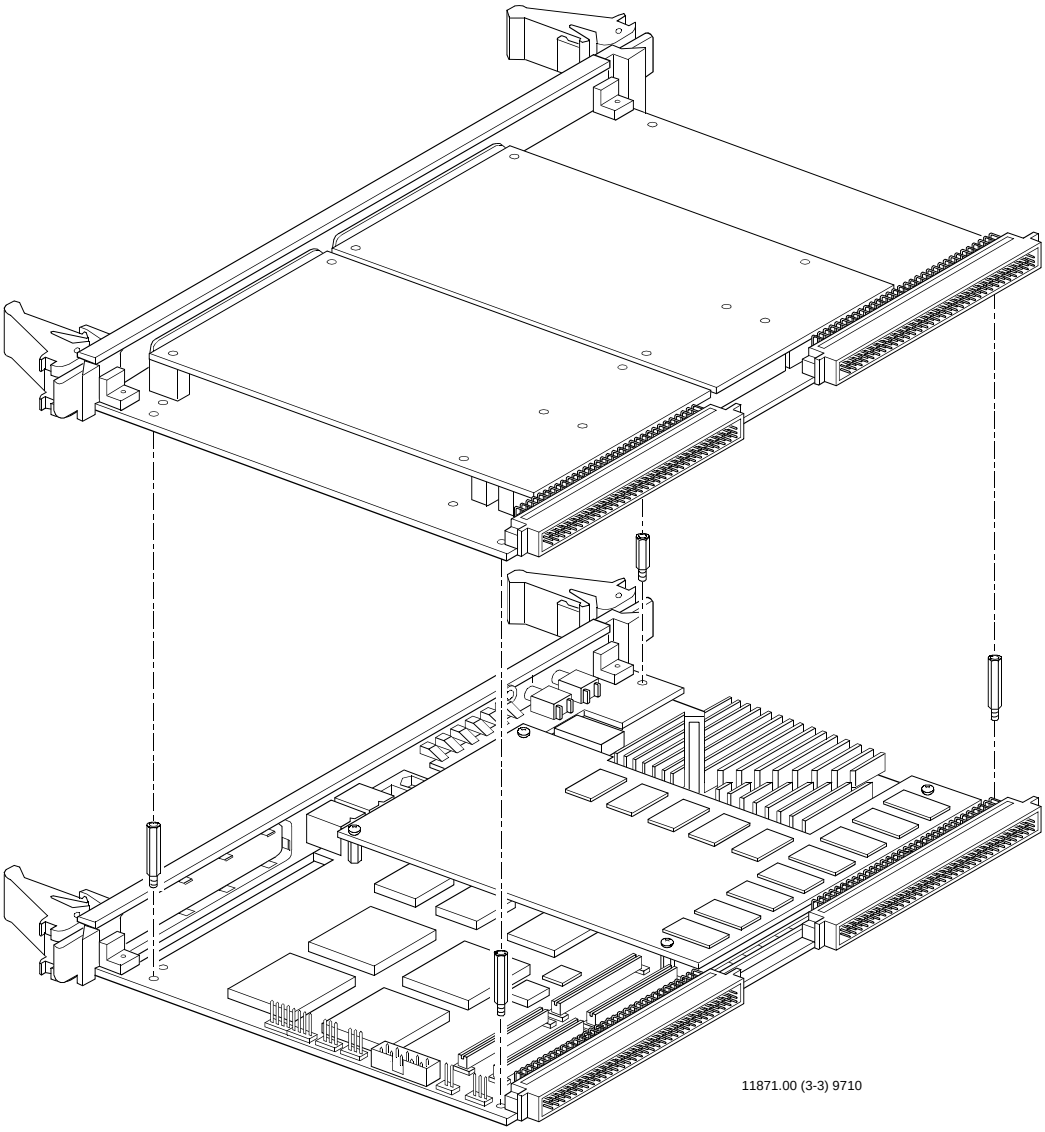


Figure 3-3. PMC Carrier Board Placement on MVME2700

5. Remove the LED module screw located at the upper front corner of the base board. Install a short (0.394 inch) standoff in its place.
6. At the other three corners of the base board, install long (0.737 inch) standoffs.
7. Place the PMC carrier board on top of the base board. The connector on the underside of the carrier board should connect smoothly with the corresponding connector J4 (located between P1 and P2) on the MVME2700.
   – If you plan to install a second carrier board as well, secure the bottom board to the MVME2700 by threading a set of long standoffs through the holes at the corners of the board. Then seat the second carrier board upon it.
8. Insert the four short Phillips screws through the holes at the corners of the carrier board, into the standoffs on the MVME2700 (or, if applicable, the lower carrier board). Tighten the screws.
9. Reinstall the MVME2700 assembly in the proper card slots. Be sure the assembly is well seated in the backplane connectors. Do not damage or bend connector pins.
10. Replace the chassis or system cover(s), reconnect the system to the AC or DC power source, and turn the equipment power on.

MVME2700 VMEmodule Installation

With mezzanine board(s) installed and headers properly configured, proceed as follows to install the MVME2700 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.
3. Remove the filler panel from the card slot where you are going to install the MVME2700.
   - If you intend to use the MVME2700 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 MVME2700 as system controller, it can occupy any unused double-height card slot.
4. Slide the MVME2700 into the selected card slot. Be sure the module is well seated in the P1 and P2 connectors on the backplane. Do not damage or bend connector pins.
5. Secure the MVME2700 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 MVME2700.

Note Some VME backplanes, such as 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. If necessary, install an MVME712M or MVME761 transition module and cable it to the MVME2700 as described in the following sections of this document.
8. 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.

MVME712M Transition Module Installation

This section applies to MVME712M-compatible models of the MVME2700 VMEmodule. With the MVME2700 installed, refer to Figure 3-4 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.
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 to the P2 backplane connector at the slot occupied by the MVME2700 VMEmodule.
5. Route the 64-conductor cable furnished with the MVME712M from J2 on the P2 adapter board to J2 on the transition module. Be sure to orient cable pin 1 with connector pin 1.
6. Secure the MVME712M in the chassis with the screws provided, making good contact with the transverse mounting rails to minimize RF emissions.
7. Referring to the user's manual for the MVME712M, listed in the *Related Documentation* appendix, 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 installed in a number of ways to suit various device and system configurations. Figure 3-4 shows a possible configuration for use with internal SCSI devices.

For more information on installing the P2 adapter board and the MVME712M transition module, refer to the user's manual listed in the *Related Documentation* appendix.

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. To minimize radiation, Motorola recommends shielded cable for peripheral connections where possible.

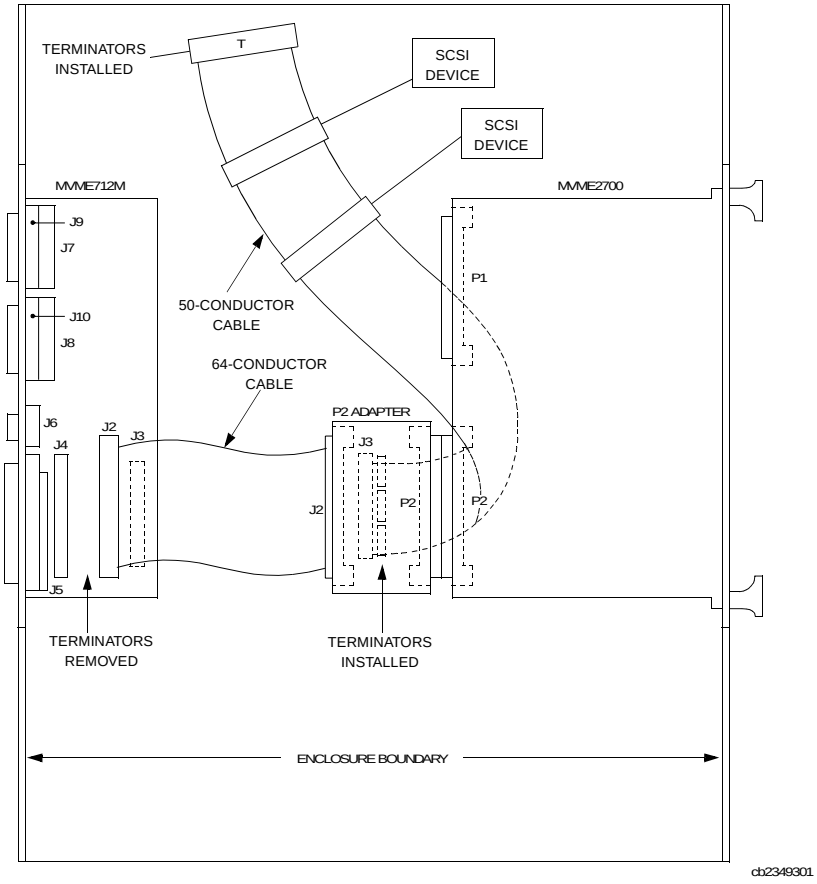


Figure 3-4. MVME712M/MVME2700 Cable Connections

MVME761 Transition Module Installation

This section applies to MVME761-compatible models of the MVME2700 VMEmodule. With the MVME2700 installed, refer to Figure 3-4 and proceed as follows to install an MVME761 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.
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 cabling to the MVME761.)
4. Attach the P2 adapter board to the P2 backplane connector at the slot occupied by the MVME2700 VMEmodule.

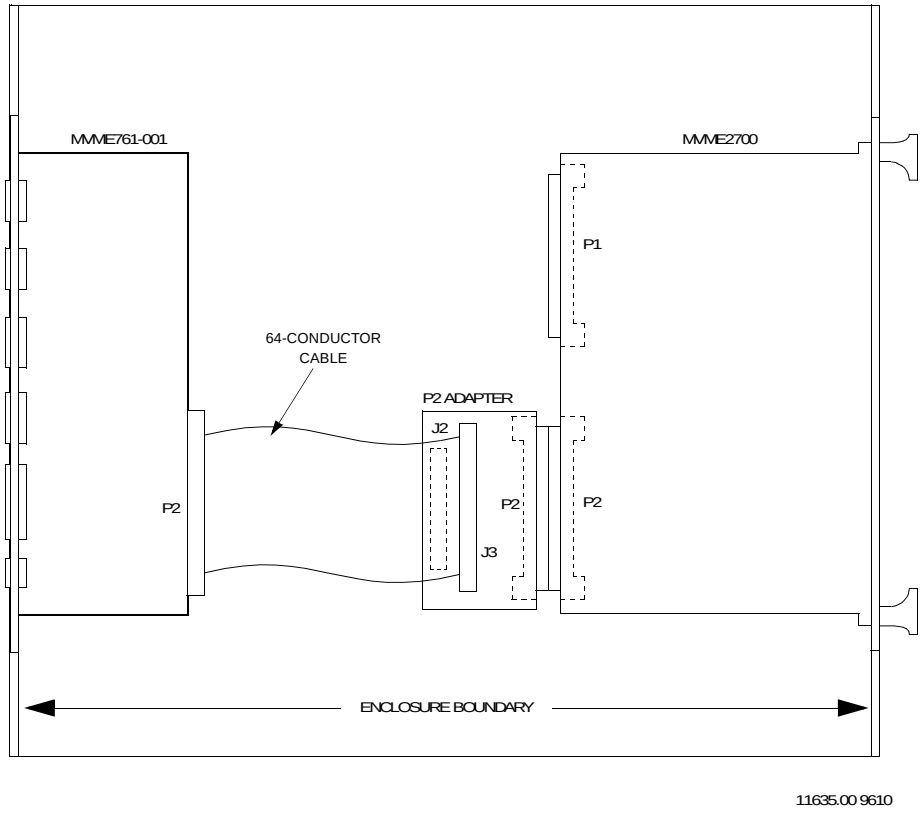


Figure 3-5. MVME761/MVME2700 Cable Connections

5. Route the 64-conductor cable furnished with the MVME761 from J3 on the P2 adapter board to P2 on the transition module. Be sure to orient cable pin 1 with connector pin 1.

6. Secure the MVME761 in the chassis with the screws provided, making good contact with the transverse mounting rails to minimize RF emissions.

Note The cabling can be configured in a number of ways to accommodate various device and system configurations. Figure 3-4 shows one possible configuration. For more detailed information on installing the P2 adapter board and the MVME761 transition module, refer to the user's manual listed in the *Related Documentation*.

7. 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 MVME761. You may need to fabricate or purchase certain cables. To minimize radiation, Motorola recommends shielded cable for peripheral connections where possible.

System Considerations

The MVME2700 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 MVME2700 may not function properly without its main board connected to VMEbus backplane connectors P1 and P2.

Whether the MVME2700 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 4*.

The MVME2700 contains shared onboard DRAM and 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 firmware. This may be changed via software to any other base address. Refer to the *MVME2600 Series Single Board Computer Programmer's Reference Guide* for more information.

If the MVME2700 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 MVME2700 waits forever for the VMEbus cycle to complete. This causes the system to lock up. There is only one situation when the system might lack this global bus timeout: when the MVME2700 is not the system controller and there is no global bus timeout elsewhere in the system.

Multiple MVME2700s may be installed in a single VME chassis. In general, hardware multiprocessor features are supported.

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 MVME2700 processor to broadcast a signal to any other MVME2700 processors. All eight registers are accessible from any local processor as well as from the VMEbus.

The MVME2700 VMEmodule draws +5Vdc, +12Vdc, and –12Vdc power from the VMEbus backplane through connectors P1 and P2. The 3.3Vdc and 2.5Vdc power is derived on-board from the +5Vdc.

MVME2700 VMEmodule

The MVME2700 VMEmodule furnishes +12Vdc and (in MVME761 I/O mode) –12Vdc power to the transition module through polyswitches (resettable fuses) F2 and F3 respectively. These voltage sources power the serial port drivers and any LAN transceivers connected to the transition module. Fused +5Vdc power is supplied through polyswitch F1 to the base board's keyboard and mouse connectors and to the 14-pin combined LED-mezzanine/remote-reset connector, J1. The FUS LED (DS5) on the MVME2700 front panel illuminates when all three voltages are available.

In MVME712M I/O mode, the yellow DS1 LED on the MVME712M also signals the availability of +12Vdc LAN power, indicating in turn that polyswitch F2 is good. If the Ethernet transceiver fails to operate, check polyswitch F2.

In MVME712M I/O mode, the MVME2700 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 a transition module and with an SCSI bus connected to the transition module, the green SCSI LED on the module illuminates when SCSI terminator power is available. If the SCSI LED on the transition module flickers during SCSI bus operation, check fuse F1 on the P2 adapter board.

Note Because any device on the SCSI bus can provide the TERMPWR signal, and because the MVME2700 FUS LED monitors the status of several voltages, the LED does not directly indicate the condition of any single fuse. If the FUS LED flickers or goes out, check all the fuses (polyswitches).

In MVME761 I/O mode, the MVME2700 supplies SCSI terminator power through a polyswitch (resettable fuse) located on the P2 adapter board.

The MVME2700 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 6-1 on page 6-3.

On the MVME2700 series VMEmodule, the standard serial console port COM1, accessible through the transition module, serves as the firmware console port. The firmware console should be set 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 MVME2700 boards. After power-up you can reconfigure the baud rate if you wish, using the PPCBug **PF** (Port Format) command via the command line interface. Whatever the baud rate, some type of hardware handshaking — either XON/OFF or via the RTS/CTS line — is desirable if the system supports it.

Operating Instructions 4

Overview

This chapter supplies information for use of the MVME2700 series of single-board computers in a system configuration. Here you will find the power-up procedure and descriptions of the switches and LEDs, memory maps, and software initialization.

Power-up the System

After you have verified that all necessary hardware preparation has been done, that all connections have been made correctly, and that the installation is complete, you can power up the system. The MPU, hardware, and firmware initialization process is performed by the PPCBug firmware at power-up or system reset. The firmware initializes the devices on the MVME2700 module in preparation for booting the operating system.

The firmware is shipped from the factory with an appropriate set of defaults. In most cases there is no need to modify the firmware configuration before you boot the operating system.

The flowchart in Figure 4-1 shows the basic initialization process that takes place during system startup.

For further information on PPCBug firmware, refer to *Chapter 7* and to *Appendix D* or to the *PPCBug Firmware User's Manual*.

Switches and LEDs

The MVME2700 front panel has ABORT and RESET switches and six LED (light-emitting diode) status indicators (CHS, BFL, CPU, PCI, FUS, SYS). The switches and LEDs are mounted on an LED mezzanine board that plugs into the base board.

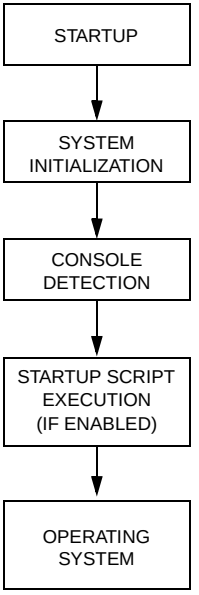


Figure 4-1. PPCBug Firmware System Startup

ABORT Switch (S1)

The ABORT switch sends an interrupt signal to the processor. The interrupt is normally used to abort program execution and return control to the debugger firmware located in the MVME2700 EPROM and Flash memory.

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

RESET Switch (S2)

The RESET switch resets all onboard devices; it also drives a SYSRESET* signal if the MVME2700 is the system controller. SYSRESET* signals may be generated by the RESET switch, a power-up reset, a watchdog timeout, or by a control bit in the Miscellaneous Control Register (MISC_CTL) in the Universe II ASIC. For further details, refer to *RESET Switch (S2)* on page 5-19.

Front Panel Indicators (DS1 - DS6)

There are six LEDs on the MVME2700 front panel. The LEDs perform the functions listed below.

Table 4-1. MVME2700 LEDs

LED	Function
CHS (DS1, yellow)	Checkstop; lights when a halt condition from the processor is detected.
BFL (DS2, amber)	Board failure; indicates a fault is present on the MVME2700.
CPU (DS3, green)	CPU activity; lights when the MPC750 processor bus is active.
PCI (DS4, green)	PCI activity; lights when the PCI bus is active.
FUS (DS5, green	Fuse OK; indicates that +5Vdc, +12Vdc, and –12Vdc power is available on the board.
SYS (DS6, green)	System Controller; lights when the MVME2700 is functioning as VMEbus system controller.

Notes At reset, a lamp test function illuminates all the LEDs.

Because the FUS LED monitors the status of several voltages on the MVME2700, it does not directly indicate the condition of any single fuse. If the LED flickers or goes out, check all the fuses (polyswitches) described in Chapter 3.

Memory Maps

There are three points of view for memory maps:

- The mapping of all resources as viewed by the processor (MPU bus memory map)
- The mapping of onboard resources as viewed by PCI local bus masters (PCI bus memory map)
- The mapping of onboard resources as viewed by VMEbus masters (VMEbus memory map)

The following sections give a general description of the MVME2700 memory organization from the above three points of view. Detailed memory maps can be found in the *MVME2600 Series Single Board Computer Programmer's Reference Guide*, which is also applicable to the MVME2700.

Processor Memory Map

The processor memory map configuration is under the control of the Raven bridge controller ASIC and the Falcon memory controller chip set. The Raven and Falcon devices adjust system mapping to suit a given application via programmable map decoder registers. At system power-up or reset, a default processor memory map takes over.

Default Processor Memory Map

The default processor memory map that is valid at power-up or reset remains in effect until reprogrammed for specific applications. Table 4-2 defines the entire default map ($00000000 to $FFFFFFFF).

Table 4-2. Processor Default View of the Memory Map

Processor Address		Size	Definition	Notes
Start	End			
00000000	7FFFFFFF	2GB	Not Mapped	
80000000	8001FFFF	128KB	PCI/ISA I/O Space	1
80020000	FEF7FFFF	2GB-16MB-640KB	Not Mapped	
FEF80000	FEF8FFFF	64KB	Falcon Registers	
FEF90000	FEFEFFFF	384KB	Not Mapped	
FEFF0000	FEFFFFFF	64KB	Raven Registers	
FF000000	FFEFFFFF	15MB	Not Mapped	
FFF00000	FFFFFFFF	1MB	ROM/Flash Bank A or Bank B	2

Notes

1. Default map for PCI/ISA I/O space. Allows software to determine whether the system is MPC105-based or Falcon/Raven-based by examining either the PHB Device ID or the CPU Type register.
2. The first 1MB of ROM/Flash bank A (socketed 1MB ROM/Flash) appears in this range after a reset if the **rom_b_rv** control bit in the Falcon's ROM B Base/Size register is cleared. If the **rom_b_rv** control bit is set, this address range maps to ROM/Flash bank B (soldered 4MB or 8MB ROM/Flash).

For detailed processor memory maps, including suggested CHRP- and PREP-compatible memory maps, refer to the *MVME2600 Series Single Board Computer Programmer's Reference Guide*.

PCI Local Bus Memory Map

The PCI memory map is controlled by the Raven MPU/PCI bus bridge controller ASIC and by the Universe II PCI/VME bus bridge ASIC. The Raven and Universe devices adjust system mapping to suit a given application via programmable map decoder registers.

No default PCI memory map exists. Resetting the system turns the PCI map decoders off, and they must be reprogrammed in software for the intended application.

For detailed PCI memory maps, including suggested CHRP- and PREP-compatible memory maps, refer to the *MVME2600 Series Single Board Computer Programmer's Reference Guide.*

VMEbus Memory Map

The VMEbus is programmable. Like other segments of the MVME2700 memory map, the mapping of local resources as viewed by VMEbus masters varies among applications.

The Universe II PCI/VME bus bridge ASIC includes a user-programmable map decoder for the VMEbus-to-local-bus interface. The address translation capabilities of the Universe II enable the processor to access any range of addresses on the VMEbus.

Recommendations for VMEbus mapping, including suggested CHRP- and PREP-compatible memory maps, can be found in the *MVME2600 Series Single Board Computer Programmer's Reference Guide*. The following figure shows the overall mapping approach from the standpoint of a VMEbus master.

Programming Considerations

Good programming practice dictates that only one MPU at a time have control of the MVME2700 control registers. Of particular note are:

- Registers that modify the address map
- Registers that require two cycles to access
- VMEbus interrupt request registers

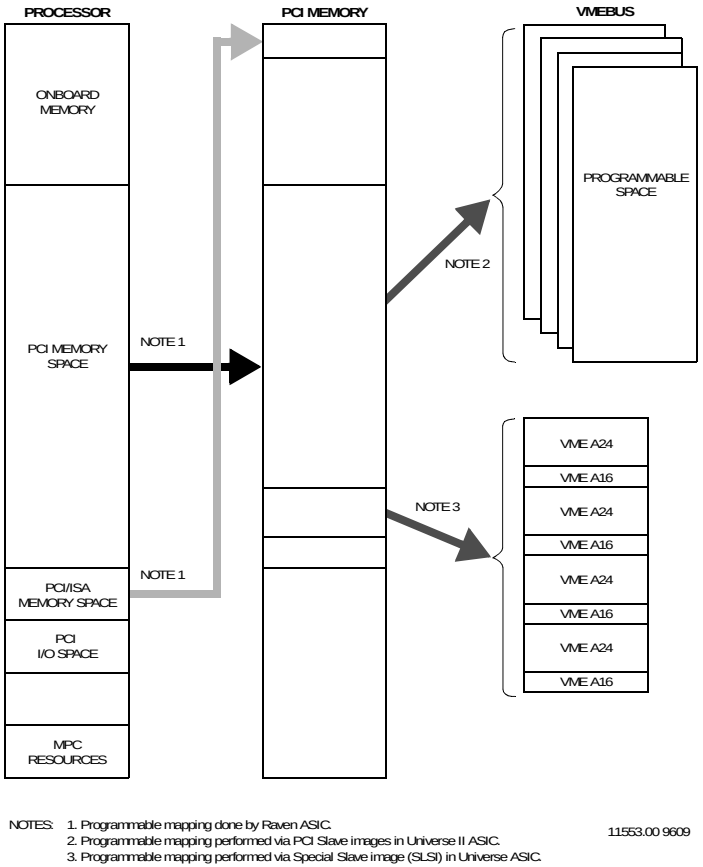


Figure 4-2. VMEbus Master Mapping

PCI Arbitration

There are seven potential PCI bus masters on the MVME2700 single-board computer:

- Raven ASIC (MPU/PCI bus bridge controller)
- Winbond W83C553 PIB (PCI/ISA bus bridge controller)
- DECchip 21140 Ethernet controller
- SYM53C825A SCSI controller
- Universe II ASIC (PCI/VME bus bridge controller)
- PMC Slot 1 (PCI mezzanine card)
- PMCspan (PCI expansion)

The Winbond W83C553 PIB device supplies the PCI arbitration support for these seven types of devices. The PIB supports flexible arbitration modes of fixed priority, rotating priority, and mixed priority, as appropriate in a given application. Details on PCI arbitration can be found in the *MVME2600 Series Single Board Computer Programmer's Reference Guide*.

The arbitration assignments for the MVME2700 are shown in the following table.

Table 4-3. PCI Arbitration Assignments

PCI Bus Request	PCI Master(s)
PIB (Internal)	PIB
CPU	Raven ASIC
Request 0	PMCspan (PCIX)
Request 1	PMC Slot 1
Request 2	Ethernet
Request 3	SCSI
Request 4	VMEbus (Universe II ASIC)

Interrupt Handling

The Raven ASIC, which controls PHB (PCI Host Bridge) MPU/local bus interface functions on the MVME2700, performs interrupt handling as well. Sources of interrupts may be any of the following:

- The Raven ASIC itself (timer or transfer error interrupts)
- The processor (processor self-interrupts)
- The Falcon chip set (memory error interrupts)
- The PCI bus (interrupts from PCI devices)
- The ISA bus (interrupts from ISA devices)

The following figure illustrates interrupt architecture on the MVME2700. For details on interrupt handling, refer to the *MVME2600 Series Single Board Computer Programmer's Reference Guide*.

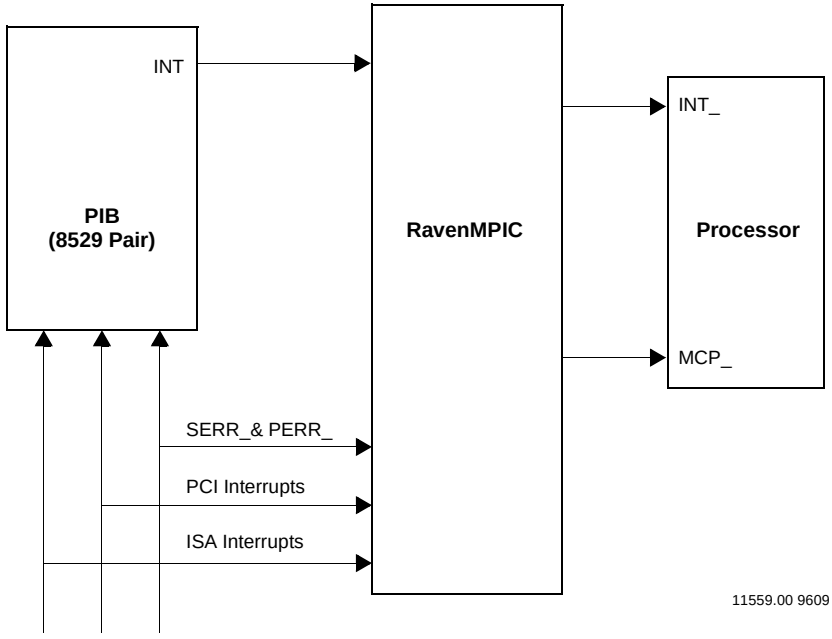


Figure 4-3. MVME2700 Interrupt Architecture

DMA Channels

The PIB supports seven DMA channels. Channels 0 through 3 support 8-bit DMA devices. Channels 5 through 7 are dedicated to 16-bit DMA devices. The channels are allocated as follows:

Table 4-4. IBC DMA Channel Assignments

IBC Priority	IBC Label	Controller	DMA Assignment
1	Channel 0	DMA1	Serial Port 3 Receiver (Z85230 Port A Rx)
2	Channel 1		Serial Port 3 Transmitter (Z85230 Port A Tx)
3	Channel 2		Floppy Drive Controller
4	Channel 3		Parallel Port
5	Channel 4	DMA2	Not available — Cascaded from DMA1
6	Channel 5		Serial Port 4 Receiver (Z85230 Port B Rx)
7	Channel 6		Serial Port 4 Transmitter (Z85230 Port B Tx)
8	Channel 7		Not Used

Sources of Reset

The MVME2700 single-board computer has several potential sources of reset:

1. Power-on reset
2. RESET switch (resets the VMEbus when the MVME2700 is system controller)
3. Watchdog timer Reset function controlled by the SGS-Thomson M48T559 timekeeper device (resets the VMEbus when the MVME2700 is system controller)
4. ALT_RST* function controlled by the Port 92 register in the PIB (resets the VMEbus when the MVME2700 is system controller)
5. PCI/ISA I/O Reset function controlled by the Clock Divisor register in the PIB
6. The VMEbus SYSRESET* signal

7. VMEbus Reset sources from the Universe II ASIC (PCI/VME bus bridge controller): the System Software reset, Local Software Reset, and VME CSR Reset functions

The following table shows which devices are affected by the various types of resets. For details on using resets, refer to the *MVME2600 Series Single Board Computer Programmer's Reference Guide*.

Table 4-5. Classes of Reset and Effectiveness

Device Affected / Reset Source	Processor	Raven ASIC	Falcon Chip Set	PCI Devices	ISA Devices	VMEbus (as system controller
Power-On reset	√	√	√	√	√	√
Reset switch	√	√	√	√	√	√
Watchdog reset	√	√	√	√	√	√
VME SYSRESET*signal	√	√	√	√	√	√
VME System SW reset	√	√	√	√	√	√
VME Local SW reset	√	√	√	√	√	
VME CSR reset	√	√	√	√	√	
Hot reset (Port 92)	√	√	√	√	√	
PCI/ISA reset				√	√	

Endian Issues

The PowerPC processor and the VMEbus are inherently big-endian, while the PCI bus is inherently little-endian. The following sections summarize how the MVME2700 handles software and hardware differences in big- and little-endian operations. For further details on endian considerations, refer to the *MVME2600 Series Single Board Computer Programmer's Reference Guide*.

Processor/Memory Domain

The MPC750 processor can operate in both big-endian and little-endian mode. However, it always treats the external processor/memory bus as big-endian by performing *address rearrangement and reordering* when running in little-endian mode. The MPC registers in the Raven MPU/PCI

bus bridge controller ASIC and the Falcon memory controller chip set, as well as DRAM, ROM/Flash, and system registers, always appear as big-endian.

Role of the Raven ASIC

Because the PCI bus is little-endian, the Raven performs byte swapping in both directions (from PCI to memory and from the processor to PCI) to maintain address invariance while programmed to operate in big-endian mode with the processor and the memory subsystem.

In little-endian mode, the Raven *reverse-rearranges* the address for PCI-bound accesses and *rearranges* the address for memory-bound accesses (from PCI). In this case, no byte swapping is done.

PCI Domain

The PCI bus is inherently little-endian. All devices connected directly to the PCI bus operate in little-endian mode, regardless of the mode of operation in the processor's domain.

PCI and SCSI

SCSI is byte-stream-oriented; the byte having the lowest address in memory is the first one to be transferred regardless of the endian mode. Since the Raven ASIC maintains address invariance in both little-endian and big-endian modes, no endian issues should arise for SCSI data. Big-endian software must still take the byte-swapping effect into account when accessing the registers of the PCI/SCSI device, however.

PCI and Ethernet

Ethernet is also byte-stream-oriented; the byte having the lowest address in memory is the first one to be transferred regardless of the endian mode. Since the Raven maintains address invariance in both little-endian and big-endian mode, no endian issues should arise for Ethernet data. Big-endian software must still take the byte-swapping effect into account when accessing the registers of the PCI/Ethernet device, however.

Role of the Universe II ASIC

Because the PCI bus is little-endian while the VMEbus is big-endian, the Universe PCI/VME bus bridge ASIC performs byte swapping in both directions (from PCI to VMEbus and from VMEbus to PCI) to maintain address invariance, regardless of the mode of operation in the processor's domain.

VMEbus Domain

The VMEbus is inherently big-endian. All devices connected directly to the VMEbus must operate in big-endian mode, regardless of the mode of operation in the processor's domain.

In big-endian mode, byte-swapping is performed first by the Universe II ASIC and then by the Raven. The result is transparent to big-endian software (a desirable effect).

In little-endian mode, however, software must take the byte-swapping effect of the Universe II ASIC and the address *reverse-rearranging* effect of the Raven into account.

For further details on endian considerations, refer to the *MVME2600 Series Single Board Computer Programmer's Reference Guide*.

Functional Description 5

Overview

This chapter describes the MVME2700 series single-board computer on a block diagram level. Figure 5-1 shows a block diagram of the overall board architecture. The *General Description* on page 5-3 provides an overview of the MVME2700, followed by a detailed description of several blocks of circuitry.

Detailed descriptions of other MVME2700 blocks, including programmable registers in the ASICs and peripheral chips, can be found in the *MVME2600 Series Single Board Computer Programmer's Reference Guide*. Refer to it for a functional description of the MVME2700 in greater depth.

Features

The next table summarizes the features of the MVME2700 series single-board computer.

Table 5-1. MVME2700 Features

Feature	Description
Microprocessor	233MHz, 266MHz or 366MHz MPC750 PowerPC® processor
ECC DRAM	16MB-256MB on RAM200 module
L2 cache memory	1MB on base board
Flash Memory	1MB 16-bit Flash on base board (two 32-pin PLCC sockets) 4MB or 8MB 64-bit Flash (two banks) on RAM200 module
Real-time clock	8KB x 8 NVRAM with RTC and battery backup
Switches	RESET and ABORT
Status LEDs	Six: CHS, BFL, CPU, PCI, FUS, and SYS

Table 5-1. MVME2700 Features (Continued)

Feature	Description
Raven PCI-MPU Bridge	Adjusts system mapping to suit a given application via programmable map decoder registers
Tick timers	Four programmable 32-bit timers (one in SL82C565 ISA bridge; three in Z8536 CIO device)
Watchdog timer	Provided in SGS-Thomson M48T559
Interrupts	Software interrupt handling via Raven (PCI-MPU bridge) and Winbond (PCI-ISA bridge) controllers
VME I/O	VMEbus P2 connector
Serial I/O	MVME712M-compatible models: 3 async ports, 1 sync/async port via P2 and transition module
	MVME761-compatible models: 2 async ports, 2 sync/async ports via P2 and transition module
Parallel I/O	MVME712M-compatible models: Centronics parallel port (PC87308 SIO) via P2 and transition module
	MVME761-compatible models: IEEE 1284 bidirectional parallel port (PC87308 SIO) via P2 and transition module
SCSI I/O	MVME712M-compatible models: 8-bit/16-bit single-ended fast SCSI-2 interface (SYM53C825A) via P2 and transition module
	MVME761-compatible models: 8-bit/16-bit single-ended fast SCSI-2 interface (SYM53C825A) via P2
Ethernet I/O	MVME712M-compatible models: AUI connections via P2 and transition module
	MVME761-compatible models: 10Base-T/100Base-TX connections via P2 and transition module
PCI interface	One IEEE P1386.1 PCI Mezzanine Card (PMC) slot; one 114-pin Mictor connector for additional PMC carrier board (PMCspan)
Keyboard/mouse interface	Support for keyboard and mouse input (PC87308 SIO) via front panel
Floppy disk controller	Support for floppy disk drive (PC87308 SIO) via front panel connector

Table 5-1. MVME2700 Features (Continued)

Feature	Description
VMEbus interface	VMEbus system controller functions
	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 control/status register for interprocessor communications
	DMA for fast local memory/VMEbus transfers (A16/A24/A32, D16/D32/D64)

General Description

The MVME2700 is a VMEmodule single-board computer equipped with a PowerPC® 750 microprocessor. All versions of the board offer 32KB L1 cache (Level 1 cache memory) and 1MB L2 cache (Level 2 ‘‘backside’’ cache memory).

As shown in the *Features* section, the MVME2700 offers many standard features desirable in a computer system, such as:

- Synchronous and asynchronous serial ports
- Parallel port
- Boot ROM and DRAM
- SCSI bus
- Ethernet or AUI
- Floppy drive, tape drive
- SCSI drive devices, internal/external
- Keyboard and mouse

- Mezzanine architecture allows flexible, easy upgrades in memory and functionality

A key feature of the MVME2700 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. The base board supports PMC front panel I/O. There is also provision for additional expansion via a PMC carrier board.

Block Diagram

Figure 5-1 is a block diagram of the MVME2700's overall architecture.

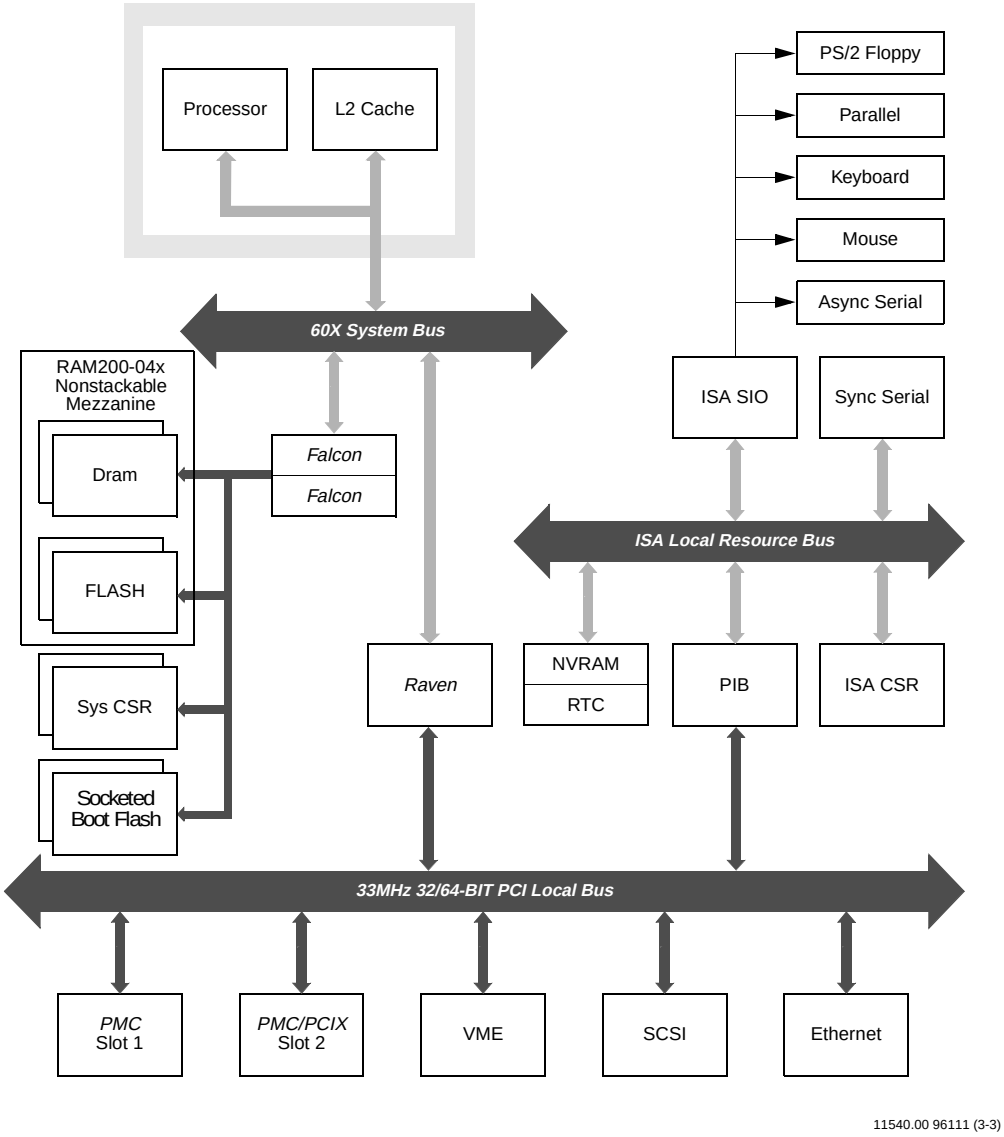


Figure 5-1. MVME2700 Block Diagram

SCSI Interface

The MVME2700 VMEmodule 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 Symbios 53C825A SCSI I/O controller at a clock speed of 40MHz. The SCSI I/O controller connects directly to the PCI local bus.

MVME712M-compatible versions of the MVME2700 route the SCSI lines through the P2 connector to the MVME712M transition module, as illustrated in Figure 3-4. The SCSI control lines have filter networks to minimize the effects of VMEbus signal noise at P2.

In the MVME761-compatible version, the SCSI lines are routed through the P2 connector up to connector J2 on the P2 adapter board, as illustrated in Figure 3-5. The MVME761 itself has no SCSI support, however, SCSI devices are supported via the use of a three-row or five-row adapter board included with the MVME761 transition board.

The SCSI bus is 16 bits wide in systems that support the VME64 extension (those equipped with 5-row, 160-pin VME backplane connectors). The SCSI bus is 8 bits wide in VME systems with three-row backplanes. Refer to the MVME712M *Transition Module and P2 Adapter Board Installation and Use* manual for the pin assignments of the SCSI connectors used on the transition module. Refer to the Symbios 53C825A data manual for detailed programming information.

SCSI Termination

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

In MVME712M I/O mode, the base board uses the sockets provided for SCSI bus terminators on the three-row P2 adapter board supplied with the MVME712M. If the SCSI bus ends at the adapter board, termination resistors must be installed there. +5Vdc power to the SCSI bus TERMPWR signal and termination resistors is supplied through a fuse located on the adapter board. The five-row P2 adapter, MVME761P2-011 is compatible with the MVME712M for support of 16-bit SCSI and PMC I/O. It requires a five-row backplane.

In MVME761 I/O mode, the P2 adapter board used with the MVME761 has a jumper to enable/disable SCSI bus terminators. +5Vdc power for SCSI termination is supplied through a polyswitch located on the adapter board.

Ethernet Interface

The MVME2700 VMEmodule uses Digital Equipment's DEC21140 PCI Fast Ethernet LAN controller to implement an Ethernet interface that supports both AUI (via MVME712M) and 10Base-T/100Base-TX (via MVME761) connections. The balanced differential transceiver lines are coupled via on-board transformers.

The MVME2700 routes its AUI or 10Base-T/100Base-TX lines through the P2 connector to the transition module (as illustrated in Figure 3-4 and Figure 3-5). The MVME712M front panel has an industry-standard DB15 connector for an AUI connection. The MVME761 supports 10Base-T/100Base-TX connections.

Every MVME2700 is assigned an Ethernet station address. The address is $08003E2*xxxxx*, where *xxxxx* is the unique 5-nibble number assigned to the board (every board has a different value for *xxxxx*).

Each MVME2700 displays its Ethernet station address on a label attached to the base board in the PMC connector keepout area just behind the front panel. In addition, the six bytes including the Ethernet station address are

stored in the NVRAM (BBRAM) configuration area specified by boot ROM. That is, the value 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 MVME2700 debugger (the PPCBug firmware) has the capability to retrieve or set the Ethernet station address.

If the data in NVRAM is lost, use the number on the label in the PMC connector keepout area to restore it.

For the pin assignments of the transition module AUI or 10Base-T/100Base-TX connector, refer to the user's manual for the MVME712M or MVME761. Refer to the BBRAM/TOD Clock memory map description in the *MVME2600 Series Single Board Computer Programmer's Reference Guide* for detailed programming information.

PCI Mezzanine Interface

A key feature of the MVME2700 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. The base board supports PMC front panel and rear P2 I/O. There is also provision for stacking a PMC carrier board on the base board for additional expansion.

The MVME2700 supports one PMC slot. Four 64-pin connectors on the base board (J11, J12, J13, and J14) 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, J12, J13, J14 (32/64-Bit PCI with front and rear I/O)
Signaling Voltage	V_{io} = 5.0Vdc

The PMC carrier board connector (J4) is a 114-pin Mictor connector.

Refer to *Chapter 6, Connector Pin Assignments* for the pin assignments of the PMC connectors. For detailed programming information, refer to the PCI bus descriptions in the *MVME2600 Series Programmer's Reference Guide* and to the user documentation for the PMC modules you intend to use.

VMEbus Interface

The VMEbus interface is implemented with the CA91C142 'Universe II ASIC. The Universe chip interfaces the 32/64-bit PCI local bus to the VMEbus. The Universe II ASIC provides:

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

The Universe II chip includes Universe Control and Status Registers (UCSRs) for interprocessor communications. It can provide the VMEbus system controller functions as well. For detailed programming information, refer to the *Universe II User's Manual* and to the discussions in the *MVME2600 Series Programmer's Reference Guide*.

ISA Super I/O Device (ISASIO)

The MVME2700 uses a PC87308 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
- Parallel port via P2 and transition module:
  - Centronics printer port in MVME712M-compatible models
  - IEEE1284 bidirectional parallel port in MVME761-compatible models

- Floppy disk drive support via drive/power connector J3
- Keyboard and mouse interface via circular DIN connectors J5 and J7

Asynchronous Serial Ports

The two asynchronous ports provided by the ISASIO device employ TTL-level signals that are buffered through EIA-232-D drivers and receivers and routed to the P2 connector.

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 PIB (PCI/ISA Bridge Controller) interrupt request line IRQ4 and COM2 to line IRQ3. To change the default configuration, reprogram the ISASIO device. For detailed programming information, refer to the PCI and ISA bus discussions in the *MVME2600 Series Programmer's Reference Guide* and to the vendor documentation for the ISASIO device.

Parallel Port

The parallel port is a Centronics printer interface in MVME712M-compatible models, and a full IEEE1284 bidirectional parallel port in MVME761-compatible models. Both versions are 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 PIB (PCI/ISA 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 *MVME2600 Series Programmer's Reference Guide* and to the vendor documentation for the ISASIO device.

Disk Drive Controller

The ISASIO device incorporates a PS/2-compatible low- and high-density disk drive controller for use with an optional external disk drive. The drive interfaces with the ISASIO controller via base board connector J3, which relays both power and control signals.

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:

- 3½-inch 1.44MB floppy disk drive
- 5¼-inch 1.2MB floppy disk drive
- Standard 250kbps to 2mbps tape drive system

Keyboard and Mouse Interface

The National Semiconductor PC87308 ISASIO chip used to implement certain segments of the P2 and front-panel I/O provides ROM-based keyboard and mouse interface control. The front panel of the MVME2700 board has two 6-pin circular DIN connectors for the keyboard and mouse connections.

PCI-ISA Bridge (PIB) Controller

The MVME2700 uses a Winbond W83C553 bridge controller to supply the interface between the PCI local bus and the ISA system I/O bus (diagrammed in Figure 1-1).

The PIB controller provides the following functions:

- PCI bus arbitration for:
  - ISA (Industry Standard Architecture) bus DMA
  - The PHB (PCI Host Bridge) MPU/local bus interface function, implemented by the Raven ASIC
  - All on-board PCI devices
  - The PMC (PCI Mezzanine Card) slot
- ISA (Industry Standard Architecture) 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

Accesses to the configuration space for the PIB (PCI/ISA Bridge) controller are performed by way of the CONADD and CONDAT (Configuration Address and Data) registers in the Raven bridge controller ASIC. The registers are located at offsets $CF8 and $CFC, respectively, from the PCI I/O base address.

Real-Time Clock/NVRAM/Timer Function

The MVME2700 employs an SGS-Thomson surface-mount M48T59 RAM and clock chip to provide 8KB of nonvolatile static RAM, a real-time clock, and a watchdog timer function. This chip supplies 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, timer logic, 8KB of static RAM, and gold-plated sockets for a battery
- A SNAPHAT battery housing a crystal along with the battery

The SNAPHAT battery package is mounted on top of the M48T559 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 M48T559 is an 8-bit device, 8-, 16-, and 32-bit accesses from the ISA bus to the M48T559 are supported. Refer to the *MVME2600 Series Programmer's Reference Guide* and to the M48T559 data sheet for detailed programming and battery life information.

About the Battery

The power source for the real-time clock is an M4T28-BR12 SH1 lithium battery which is socketed for easy removal and replacement.

The battery has a storage life of 50 years at 55° C. The length of its service lifetime is very dependent on the ambient temperature of the board and the power-on duty cycle. At 70° C, the anticipated time span for battery protection (100% duty cycle) is 10 years. At lower ambient temperatures, the backup time is correspondingly longer.

If you intend to place the board in storage, putting the M48T559 in power-save mode by stopping the oscillator will extend the service life of the battery. This is especially important at high ambient temperatures. To enter power-save mode, execute the PPCBug **PS** command. Refer to *Debugger Commands* on page 7-4 or its equivalent application-specific command.

When restoring the board to service, execute the PPCBug **SET** command (**set *mmddyyhhmm***) after installation to restart the oscillator and initialize the clock.

Warning

Lithium batteries incorporate flammable materials such as lithium and organic solvents. If lithium batteries are mistreated or handled incorrectly, they may burst open and ignite, possible resulting in injury and/or fire. When dealing with lithium batteries, carefully follow the precautions listed below in order to prevent accidents.

- Do not short circuit.
- Do not disassemble, deform, or apply excessive pressure.
- Do not heat or incinerate.
- Do not apply solder directly.
- Do not use different models, or new and old batteries together.
- Do not charge.
- Always check proper polarity.

Programmable Timers

Among the resources available to the local processor are a number of programmable timers. Timers are incorporated into the PIB controller and the Z8536 CIO device as diagrammed in Figure 1-1 and Figure 5-1. They can be programmed to generate periodic interrupts to the processor.

Interval Timers

The PCI-ISA Bridge controller has three built-in counters that serve as programmable interval timers. The counters are grouped into one timer unit, Timer 1, in the PIB controller. 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 a timer interrupt for a time-of-day function.
- Counter 1 generates a refresh request signal for ISA memory. This timer is not used in the MVME2700.
- Counter 2 provides the tone for the speaker output function on the PIB 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 MVME2700 drives the OSC pin with a 14.31818MHz clock source.

16-Bit Timers

Four 16-bit timers are available on the MVME2700. The PIB 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 Winbond W83C553 PIB controller and the Zilog Z8536 CIO device.

Serial Communications Interface

The MVME2700 uses a Zilog Z85230 ESCC (Enhanced Serial Communications Controller) to implement the two serial communications interfaces, which are routed through P2. The Z85230 supports synchronous (SDLC/HDLC) and asynchronous protocols. The MVME2700 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.

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 PIB 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 PIB controller. Refer to the Z85230 data sheet and to the *MVME2600 Series Single Board Computer Programmer's Reference Guide* for further information.

Z8536 CIO Device

The Z8536 CIO device complements the Z85230 ESCC by supplying modem control lines not provided by the Z85230 ESCC. In addition, the Z8536 CIO device has three independent 16-bit counters/ timers. The Z85230 receives a 5MHz clock input.

Base Module Feature Register

The Base Module Feature Register contains the details of the MVME2700 single-board computer's configuration. It is an 8-bit read-only register located on the base board at ISA I/O address $0802.

Base Module Feature Register — Offset $0802								
BIT	SD7	SD6	SD5	SD4	SD3	SD2	SD1	SD0
FIELD	Not Used	SCCP*	PMC2P*	PMC1P*	VMEP*	Not Used	LANP*	SCSIP*
OPER		R	R	R	R		R	R
RESET		N/A	1	N/A	N/A		N/A	N/A

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

PMC2P* PMC/PMCIX slot 2 present. If set, no PCI mezzanine card (or PCI expansion device) is installed in PMC slot 2. If cleared, PMC/PMCIX slot 2 contains a PCI mezzanine card (or PCI expansion device).

PMC1P* PMC slot 1 present. If set, no PCI mezzanine card is installed in PMC slot 1. If cleared, PMC slot 1 contains a PCI mezzanine card.

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

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 supply of available pins in the P2 backplane connectors of MVME2700 models that are configured for MVME761 I/O mode, certain signals are multiplexed through VMEbus connector P2 for additional I/O capacity.

The signals affected are synchronous I/O control signals that pass between the base board and the MVME761 transition module. The multiplexing 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 MVME761 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 MVME2700 base board. The MVME761 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 5-2. P2 Multiplexing Sequence

MXDO (From Base Board)		MXDI (From MVME761)	
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	DTR1	9	RI4
10	DTR2	10	RI1
11	Reserved	11	DSR1
12	Reserved	12	DCD1
13	Reserved	13	RI2
14	Reserved	14	DSR2
15	Reserved	15	DCD2

ABORT Switch (S1)

The ABORT switch is located on the LED mezzanine. It can be actuated by software as well as by hand. When enabled by software, the ABORT switch can generate an interrupt signal to the processor. The interrupt is normally used to abort program execution and return control to the debugger firmware located in the MVME2700 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 MVME2700 is the system controller.

The Universe II ASIC includes both a global and a local reset driver. When the Universe II 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 Miscellaneous Control Register (MISC_CTL) in the Universe II ASIC. SYSRESET* remains asserted for at least 200 ms, as required by the VMEbus specification.

Similarly, the Universe II ASIC supplies 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 Universe II ASIC is not system controller. Local resets may be generated by the RESET switch, a power-up reset, a watchdog timeout, a VMEbus SYSRESET*, or a control bit in the MISC_CTL register.

Front Panel Indicators (DS1 - DS6)

There are six LEDs on the MVME2700 front panel. The LEDs monitor the status of the board as described below.

Table 5-3. MVME2700 LEDs

LED	Function
CHS (DS1, yellow)	Checkstop; driven by the MPC750 status lines on the MVME2700. Lights when a halt condition from the processor is detected. Should extinguish when the board is reset.
BFL (DS2, amber)	Board failure; lights when the BRDFAIL∗ signal line is active, indicating a fault is present on the MVME2700.
CPU (DS3, green)	CPU activity; lights when the DBB∗ (Data Bus Busy) signal line on the MPC750 processor bus is active.
PCI (DS4, green)	PCI activity; lights when the IRDY∗ (Initiator Ready) signal line on the PCI bus is active. 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.
SYS (DS6, green)	System Controller; lights when the Universe II ASIC in the MVME2700 is functioning as VMEbus system controller.

Notes At reset, a lamp test function illuminates all the LEDs.

Because the FUS LED monitors the status of several voltages on the MVME2700, it does not directly indicate the condition of any single fuse. If the LED flickers or goes out, check all the fuses (polyswitches).

Polyswitches (Resettable Fuses)

The MVME2700 base board draws fused +5Vdc, +12Vdc, and –12Vdc power from the VMEbus backplane through connectors P1 and P2. The 3.3Vdc and 2.5Vdc power is derived on-board from the +5Vdc. The following table lists the fuses with the voltages they protect.

Table 5-4. Fuse Assignments

Fuse	Voltage
F1	+5Vdc
F2	+12Vdc
F3	–12Vdc (used on MVME761 versions)

I/O Power

The MVME2700 base board furnishes +12Vdc and (in MVME761 I/O versions) –12Vdc power to the transition module through polyswitches (resettable fuses) F2 and F3 respectively. These voltage sources power the serial port drivers and any LAN transceivers connected to the transition module. Fused +5Vdc power is supplied through polyswitch F1to the base board's keyboard and mouse connectors and to the 14-pin combined LED-mezzanine/remote-reset connector, J1. The FUS LED (DS5) on the MVME2700 front panel illuminates when all three voltages are available.

In MVME712M I/O mode, the yellow DS1 LED on the MVME712M also signals the availability of +12Vdc LAN power, indicating in turn that polyswitch F2 is good. If the Ethernet transceiver fails to operate, check polyswitch F2.

In MVME712M I/O mode, the MVME2700 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 a transition module and with an SCSI bus connected to the transition module, the green SCSI LED on the module illuminates when SCSI terminator power is available. If the SCSI LED on the transition module flickers during SCSI bus operation, check fuse F1 on the P2 adapter board.

Note Because any device on the SCSI bus can provide TERMPWR, and because the FUS LED on the MVME2700 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).

In MVME761 I/O mode, the MVME2700 supplies SCSI terminator power through a polyswitch (resettable fuse) located on the P2 adapter board.

Speaker Control

The MVME2700 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 6-1.

MPC750 Processor

The PowerPC 750 is a 32-bit microprocessor whose 32 KB on-chip cache is composed of 32KB/32KB L1 cache. The L2 cache and 1MB of 16-bit Flash memory reside on the MVME2700 base board. The 16MB to 256MB ECC DRAM and 4MB or 8MB of additional (64-bit) Flash memory are located on the RAM200 memory mezzanine.

The Raven bridge controller ASIC provides the bridge between the PowerPC microprocessor bus and the PCI local bus. Electrically, the Raven chip is a 64-bit PCI connection. Four programmable map decoders in each direction provide flexible addressing between the PowerPC microprocessor bus and the PCI local bus.

Flash Memory

The MVME2700 base board has provision for 1MB of 16-bit Flash memory in two 8-bit sockets. The RAM200 memory mezzanine accommodates 4MB or 8MB of additional 64-bit Flash memory.

The onboard monitor/debugger, the PPCBug firmware, resides in the Flash chips. PPCBug provides functionality for:

- Booting and resetting the system
- Initializing a request
- Displaying and modifying configuration variables
- Running self-tests and diagnostics
- Updating firmware ROM

A jumper header (J9) tells the Falcon chip set where in memory to fetch the board reset vector. Depending on the configuration of J9, resets execute either from Flash memory bank A (64-bit Flash) or from bank B (16-bit Flash).

In normal operation the Flash devices are in “read-only” mode, their contents are predefined, and they are protected against inadvertent writes due to loss of power conditions. For ease in programming, however, programming voltage is continuously supplied to the devices; you can modify the Flash contents by simply executing the proper program command sequence. Refer to the third-party data sheet and/or to the *PPCBug Firmware Package User’s Manual* for further device-specific information on modifying Flash contents.

RAM200 Memory Module

The RAM200 is the ECC DRAM memory mezzanine module that (together with an LED mezzanine and an optional PCI mezzanine card) plugs into the base board to make a complete MVME2700 single-board computer. See Figure 3-1.

The ECC DRAM is controlled by the Falcon memory controller chip set. The Falcon ASICs perform two-way interleaving, with double-bit error detection and single-bit error correction. RAM200 modules available for MVME2700 memory expansion are listed in the following table.

Table 5-5. RAM200 Memory Modules

Part Number	Characteristics
RAM200-043a	32MB ECC DRAM mezzanine, 8MB Flash
RAM200-044a	64MB ECC DRAM mezzanine, 8MB Flash
RAM200-045a	128MB ECC DRAM mezzanine, 8MB Flash
RAM200-046a	256MB ECC DRAM mezzanine, 8MB Flash

In addition to the ECC DRAM, the RAM200 module supplies 4MB to 8MB of additional 64-bit Flash memory in two banks (A and B). A jumper header (J9) tells the Falcon chip set where in memory to fetch the board reset vector. Depending on the configuration of J9, resets execute either from Flash memory bank A or from bank B.

MVME712M Transition Module

The MVME712M transition module (Figure 2-2) and P2 adapter board are used in conjunction with the models of the MVME2700 VMEmodules as listed in *MVME712M Transition Module Preparation* on page 2-8.

The features of the MVME712M include:

- A parallel printer port (via P2 adapter)
- An Ethernet interface supporting AUI connections (via P2 adapter)
- Four EIA-232-D multiprotocol serial ports (via P2 adapter)
- An SCSI interface (via 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 terminator 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

MVME761 Transition Module

The MVME761 transition module (Figure 2-11) and P2 adapter board are used in conjunction with the models of the MVME2700 VMEmodule as listed in *MVME761 Transition Module Preparation* on page 2-18.

The features of the MVME761 include:

- A parallel printer port (IEEE 1284-I compliant)
- An Ethernet interface supporting 10Base-T/100Base-TX connections
- Two EIA-232-D asynchronous serial ports (identified as COM1 and COM2 on the front panel)
- Two synchronous serial ports (SERIAL 3 and SERIAL 4 on the front panel), configurable for EIA-232-D, EIA-530, V.35, or X.21 protocols
- Two 60-pin Serial Interface Module (SIM) connectors

The features of the P2 adapter board include:

- A 50-pin (3-row VME backplane) or 68-pin (5-row VME backplane) connector for SCSI cabling to the MVME761 and/or to other SCSI devices
- Jumper-selectable active SCSI terminating resistors
- Fused SCSI terminator power developed from the +5Vdc present at connector P2
- A 64-pin VME connector to the MVME761

Serial Interface Modules

The synchronous serial ports on the MVME761 are configurable via serial interface modules (SIMs), used in conjunction with the appropriate jumper settings on the transition module and base board. 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. SIMs are available for the following configurations:

Table 5-6. SIM Type Identification

Model Number	Module Type
SIM232DCE	EIA-232 DCE
SIM232DTE	EIA-232 DTE
SIM530DCE	EIA-530 DCE
SIM530DTE	EIA-530 DTE
SIMV35DCE	V.35 DCE
SIMV35DTE	V.35 DTE
SIMX21DCE	X.21 DCE
SIMX21DTE	X.21 DTE

For additional information about the serial interface modules, refer to the *MVME761 Transition Module Installation and Use* manual.

Connector Pin Assignments

6

MVME2700 Connectors

This chapter summarizes the pin assignments for the following groups of interconnect signals for the MVME2700:

- Connectors with pin assignments common to MVME712M as well as MVME761-compatible versions of the base board

Connector	Table
LED Mezzanine connector J1	6-1
Debug connector J2	6-2
Floppy/LED connector J3	6-3
PCI Expansion connector J4	6-4
Keyboard and Mouse connectors J5, J7	6-5, 6-6
DRAM Mezzanine connector J6	6-7
PCI Mezzanine connectors J11/12/13/14	6-8
VMEbus connector P1	6-9

- Connectors with pin assignments specific to MVME712M-compatible versions of the base board

Connector	Table
VMEbus connector P2	6-11
SCSI connector (at MVME712M)	6-12
Serial Ports 1-4 (at MVME712M)	6-13
Parallel I/O connector (at MVME712M)	6-14
Ethernet AUI Connector (at MVME712M)	6-15

- Connectors with pin assignments specific to MVME761-compatible versions of the base board

Connector	Table
VMEbus connector P2	6-16
Serial Ports 1 and 2 (at MVME761)	6-17
Serial Ports 3 and 4 (at MVME761)	6-18
Parallel I/O connector (at MVME761)	6-19
Ethernet 10Base-T/100Base-TX connector (at MVME761)	6-20

The following tables furnish pin assignments only. For detailed descriptions of the various interconnect signals, consult the support information documentation package for the MVME2700 single-board computer or the support information sections of the transition module documentation as necessary.

Common Connectors

The following tables describe connectors used with the same pin assignments by MVME712M- as well as MVME761-compatible versions of the base board.

LED Mezzanine Connector (J1)

A 14-pin connector (J1 on the base board) supplies the interface between the base board and the LED mezzanine module. On the base board, this connector is a 2x7 header. On the LED mezzanine, it is a 2x7 surface-mount socket strip.

Removing the LED mezzanine makes the mezzanine connector available for service as a remote status and control connector. In this application, J1 can be connected to a user-supplied external cable to carry the Reset and Abort signals and the LED lines to a control panel located apart from the MVME2700. Maximum cable length is 15 feet. The pin assignments are as follows:

Table 6-1. LED Mezzanine Connector J1

1	GND	RESETSW*	2
3	No Connection	ABORTSW*	4
5	PCILED*	FAILLED*	6
7	LANLED*	STATLED*	8
9	FUSELED*	RUNLED*	10
11	SBSYLED*	SCONLED*	12
13	+5V	SPKR	14

Debug Connector (J2)

A 190-pin connector (J2 on the MVME2700 base board) provides access to the processor bus (MPU bus) and some bridge/memory controller signals. It can be used for debugging purposes. The pin assignments are listed in the following table.

Table 6-2. Debug Connector J2

1	PA0		PA1	2
3	PA2		PA3	4
5	PA4		PA5	6
7	PA6		PA7	8
9	PA8		PA9	10
11	PA10		PA11	12
13	PA12		PA13	14
15	PA14		PA15	16
17	PA16		PA17	18
19	PA18	GND	PA19	20
21	PA20		PA21	22
23	PA22		PA23	24
25	PA24		PA25	26
27	PA26		PA27	28
29	PA28		PA29	30
31	PA30		PA31	32
33	PA_PAR0		PA_PAR1	34
35	PA_PAR2		PA_PAR3	36
37	APE*		RSRV*	38
39	PD0		PD1	40
41	PD2		PD3	42
43	PD4		PD5	44
45	PD6		PD7	46
47	PD8		PD9	48
49	PD10		PD11	50
51	PD12		PD13	52
53	PD14		PD15	54
55	PD16		PD17	56
57	PD18	+5V	PD19	58
59	PA20		PD21	60
61	PD22		PD23	62
63	PD24		PD25	64
65	PD26		PD27	66
67	PD28		PD29	68
69	PD30		PD31	70

Table 6-2. Debug Connector J2 (Continued)

71	PD32		PD33	72
73	PD34		PD35	74
75	PD36		PD37	76
77	PD38		PD39	78
79	PD40		PD41	80
81	PD42		PD43	82
83	PD44		PD45	84
85	PD46		PD47	86
87	PD48		PD49	88
89	PA50		PD51	90
91	PD52		PD53	92
93	PD54		PD55	94
95	PD56	GND	PD57	96
97	PD58		PD59	98
99	PD60		PD61	100
101	PD62		PD63	102
103	PDPAR0		PDPAR1	104
105	PDPAR2		PDPAR3	106
107	PDPAR4		PDPAR5	108
109	PDPAR6		PDPAR7	110
111	No Connection		No Connection	112
113	DPE*		DBDIS*	114
115	TT0		TSIZ0	116
117	TT1		TSIZ1	118
119	TT2		TSIZ2	120
121	TT3		TC0	122
123	TT4		TC1	124
125	CI*		TC2	126
127	WT*		CSE0	128
129	GLOBAL*		CSE1	130
131	SHARED*		DBWO*	132
133	AACK*	+3.3V	TS*	134
135	ARTY*		XATS*	136
137	DRTY*		TBST*	138
139	TA*		No Connection	140
141	TEA*		No Connection	142
143	No Connection		DBG*	144
145	No Connection		DBB*	146
147	No Connection		ABB*	148
149	TCLK_OUT		CPUGNT*	150
151	L2PRSNT0*		CPUREQ*	152

Table 6-2. Debug Connector J2 (Continued)

153	L2ADSC*		IBCINT*	154
155	L2BAA*		MCHK*	156
157	L2DIRTYI*		SMI*	158
159	L2DIRTYO*		CKSTPI*	160
161	L2DOE*		CKSTPO*	162
163	L2DWE1*		HALTED (N/C)	164
165	L2HIT*		TLBISYNC*	166
167	L2TALE		TBEN	168
169	L2TALOE*		SUSPEND*	170
171	L2TOE*	GND	DRVMOD0	172
173	L2TWE*		DRVMOD1 (N/C	174
175	L2TV		NAPRUN (N/C	176
177	L2PRSNT1*		QREQ*	178
179	SRESET*		QACK*	180
181	HRESET*		CPUTDO	182
183	GND		CPUTDI	184
185	CPUCLK1		CPUTCK	186
187	CPUCLK2		CPUTMS	188
189	CPUCLK3		CPUTRST*	190

Floppy/LED Connector (J3)

A 50-pin high-density connector (J3 on the MVME2700 base board) supplies the interface between the base board and an optional external floppy disk drive. In addition to the disk drive control signals, a set of 16 lines is available to drive an external LED array. The pin assignments are listed in the following table.

Table 6-3. Floppy/LED Connector J3

1	+5VF	+5VF	2
3	LEDDISP0	LEDDISP1	4
5	LEDDISP2	LEDDISP3	6
7	LEDDISP4	LEDDISP5	8
9	LEDDISP6	LEDDISP7	10
11	LEDDISP8	LEDDISP9	12
13	LEDDISP10	LEDDISP11	14
15	LEDDISP12	LEDDISP13	16
17	LEDDISP14	LEDDISP15	18
19	LEDBLNK	F_DENSEL	20

Table 6-3. Floppy/LED Connector J3

21	GND	F_MSEN0	22
23	GND	F_INDEX*	24
25	GND	F_MTR0*	26
27	GND	F_DR1*	28
29	GND	F_DR0*	30
31	GND	F_MTR1*	32
33	GND	F_DIR*	34
35	GND	F_STEP*	36
37	GND	F_WDATA*	38
39	GND	F_WGATE*	40
41	GND	F_TRK0*	42
43	GND	F_WP*	44
45	GND	F_RDATA*	46
47	GND	F_HDSEL*	48
49	GND	F_DSKCHG*	50

PCI Expansion Connector (J4)

The MVME2700 has provision for stacking a PMC carrier board on the base board for additional PCI expansion. A 114-pin connector (J4 on the base board) supplies the interface between the MVME2700 and the carrier board. The pin assignments are listed in the following table.

Table 6-4. PCI Expansion Connector J4

1	+3.3V		+3.3V	2
3	PCICLK3		PMCINTA*	4
5	GND		PMCINTB*	6
7	PURESET*		PMCINTC*	8
9	HRESET*		PMCINTD*	10
11	PMC2DO		PHYTDO	12
13	TMS		TCK	14
15	TRST*		PMC2P*	16
17	PMC2GNT*		PMC2REQ*	18
19	+12V	GND	–12V	20
21	PERR*		SERR*	22
23	LOCK*		SDONE	24
25	DEVSEL*		SBO*	26
27	GND		GND	28

Table 6-4. PCI Expansion Connector J4 (Continued)

29	TRDY*		IRDY*	30
31	STOP*		FRAME*	32
33	GND		GND	34
35	ACK64*		Reserved	36
37	REQ64*		Reserved	38
39	PAR		PCIRST*	40
41	CBE1*		CBE0*	42
43	CBE3*		CBE2*	44
45	AD1		AD0	46
47	AD3		AD2	48
49	AD5		AD4	50
51	AD7		AD6	52
53	AD9		AD8	54
55	AD11		AD10	56
57	AD13	+5V	AD12	58
59	AD15		AD14	60
61	AD17		AD16	62
63	AD19		AD18	64
65	AD21		AD20	66
67	AD23		AD22	68
69	AD25		AD24	70
71	AD27		AD26	72
73	AD29		AD28	74
75	AD31		AD30	76
77	PAR64		Reserved	78
79	CBE5*		CBE4*	80
81	CBE7*		CBE6*	82
83	AD33		AD32	84
85	AD35		AD34	86
87	AD37		AD36	88
89	AD39		AD39	90
91	AD41		AD40	92
93	AD43		AD42	94
95	AD45	GND	AD44	96
97	AD47		AD46	98
99	AD49		AD48	100
101	AD51		AD50	102
103	AD53		AD52	104
105	AD55		AD54	106
107	AD57		AD56	108
109	AD59		AD58	110
111	AD61		AD60	112
113	AD63		AD62	114

Keyboard and Mouse Connectors (J5, J7)

The MVME2700 has two 6-pin circular DIN connectors located on the front panel for the keyboard (J5) and mouse (J7). The pin assignments for those connectors are listed in the following two tables.

Table 6-5. Keyboard Connector J5

1	K_DATA
2	No Connection
3	GND
4	+5VF
5	K_CLK
6	No Connection

Table 6-6. Mouse Connector J7

1	M_DATA
2	No Connection
3	GND
4	+5VF
5	M_CLK
6	No Connection

DRAM Mezzanine Connector (J6)

A 190-pin connector (J6 on the MVME2700 base board) supplies the interface between the processor bus (MPU bus) and the RAM200 DRAM mezzanine. The pin assignments are listed in the following table.

Table 6-7. DRAM Mezzanine Connector J6

1	A_RAS*		A_CAS*	2
3	B_RAS*		B_CAS*	4
5	C_RAS*		C_CAS*	6
7	D_RAS*		D_CAS*	8
9	OEL*		OEU*	10
11	WEL*		WEU*	12
13	ROMACS*		ROMBCS*	14
15	RAMAEN		RAMBEN	16
17	RAMCEN		EN5VPWR	18
19	RAL0	GND	RAL1	20
21	RAL2		RAL3	22
23	RAL4		RAL5	24
25	RAL6		RAL7	26
27	RAL8		RAL9	28
29	RAL10		RAL11	30
31	RAL12		RAU0	32
33	RAU1		RAU2	34
35	RAU3		RAU4	36
37	RAU5		RAU6	38
39	RAU7		RAU8	40
41	RAU9		RAU10	42
43	RAU11		RAU12	44
45	RDL0		RDL1	46
47	RDL2		RDL3	48
49	RDL4		RDL5	50
51	RDL6		RDL7	52
53	RDL8		RDL9	54
55	RDL10		RDL11	56
57	RDL12	+5V	RDL13	58
59	RDL14		RDL15	60
61	RDL16		RDL17	62
63	RDL18		RDL19	64
65	RDL20		RDL21	66
67	RDL22		RDL23	68
69	RDL24		RDL25	70
71	RDL26		RDL27	72
73	RDL28		RDL29	74

Table 6-7. DRAM Mezzanine Connector J6 (Continued)

75	RDL30		RDL31	76
77	RDL32		RDL33	78
79	RDL34		RDL35	80
81	RDL36		RDL37	82
83	RDL38		RDL39	84
85	RDL40		RDL41	86
87	RDL42		RDL43	88
89	RDL44		RDL45	90
91	RDL46		RDL47	92
93	RDL48		RDL49	94
95	RDL50	GND	RDL51	96
97	RDL52		RDL53	98
99	RDL54		RDL55	100
101	RDL56		RDL57	102
103	RDL58		RDL59	104
105	RDL60		RDL61	106
107	RDL62		RDL63	108
109	CDL0		CDL1	110
111	CDL2		CDL3	112
113	CDL4		CDL5	114
115	CDL6		CDL7	116
117	No Connection		No Connection	118
119	RDU0		RDU1	120
121	RDU2		RDU3	122
123	RDU4		RDU5	124
125	RDU6		RDU7	126
127	RDU8		RDU9	128
129	RDU10		RDU11	130
131	RDU12		RDU13	132
133	RDU14	+3.3V	RDU15	134
135	RDU16		RDU17	136
137	RDU18		RDU19	138
139	RDU20		RDU21	140
141	RDU22		RDU23	142
143	RDU24		RDU25	144
145	RDU26		RDU27	146
147	RDU28		RDU39	148
149	RDU30		RDU31	150
151	RDU32		RDU33	152

Table 6-7. DRAM Mezzanine Connector J6 (Continued)

153	RDU34		RDU35	154
155	RDU36		RDU37	156
157	RDU38		RDU39	158
159	RDU40		RDU41	160
161	RDU42		RDU43	162
163	RDU44		RDU45	164
165	RDU46		RDU47	166
167	RDU48		RDU49	168
169	RDU50		RDU51	170
171	RDU52	GND	RDU53	172
173	RDU54		RDU55	174
175	RDU56		RDU57	176
177	RDU58		RDU59	178
179	RDU60		RDU61	180
181	RDU62		RDU63	182
183	CDU0		CDU1	184
185	CDU2		CDU3	186
187	CDU4		CDU5	188
189	CDU6		CDU7	190

PCI Mezzanine Card Connectors (J11-J14)

Four 64-pin connectors (J11/12/13/14 on the MVME2700) supply the interface between the base board and an optional PCI mezzanine card (PMC). The pin assignments are listed in the tables on the next two pages.

Note Each PMC can draw a maximum of 7.5W of power, per the IEEE P1386.1 Specification. This can be with any single PMC voltage (+3.3V, +5V, or +12V) or any combination, as long as the total does not exceed 7.5W per PMC slot.1

Table 6-8. PCI Mezzanine Card Connectors J11-J14

	J11				J12		
1	TCK	–12V	2	1	+12V	TRST*	2
3	GND	PMCINTA*	4	3	TMS	TDO	4
5	PMCINTB*	PMCINTC*	6	5	PMC2TDO	GND	6
7	PMC1P*	+5V	8	7	GND	Not Used	8
9	PMCINTD*	Not Used	10	9	Not Used	Not Used	10

Table 6-8. PCI Mezzanine Card Connectors J11-J14

11	GND	Not Used	12	11	Pull-up	+3.3V	12
13	PCICLK4	GND	14	13	PCIRST*	Pull-down	14
15	GND	PMC1GNT*	16	15	+3.3V	Pull-down	16
17	PMC1REQ*	+5V	18	17	Not Used	GND	18
19	+5V	AD31	20	19	AD30	AD29	20
21	AD28	AD27	22	21	GND	AD26	22
23	AD25	GND	24	23	AD24	+3.3V	24
25	GND	CBE3*	26	25	IDSEL	AD23	26
27	AD22	AD21	28	27	+3.3V	AD20	28
29	AD19	+5V	30	29	AD18	GND	30
31	+5V	AD17	32	31	AD16	CBE2*	32
33	FRAME*	GND	34	33	GND	Not Used	34
35	GND	IRDY*	36	35	TRDY*	+3.3V	36
37	DEVSEL*	+5V	38	37	GND	STOP*	38
39	GND	LOCK*	40	39	PERR*	GND	40
41	SDONE*	SBO*	42	41	+3.3V	SERR*	42
43	PAR	GND	44	43	CBE1*	GND	44
45	+5V	AD15	46	45	AD14	AD13	46
47	AD12	AD11	48	47	GND	AD10	48
49	AD09	+5V	50	49	AD08	+3.3V	50
51	GND	CBE0*	52	51	AD07	Not Used	52
53	AD06	AD05	54	53	+3.3V	Not Used	54
55	AD04	GND	56	55	Not Used	GND	56
57	+5V	AD03	58	57	Not Used	Not Used	58
59	AD02	AD01	60	59	GND	Not Used	60
61	AD00	+5V	62	61	ACK64*	+3.3V	62
63	GND	REQ64*	64	63	GND	Not Used	64
	J13				**J14**		
1	Not Used	GND	2	1	PMCIO0	PMCIO1	2
3	GND	CBE7*	4	3	PMCIO2	PMCIO3	4
5	CBE6*	CBE5*	6	5	PMCIO4	PMCIO5	6
7	CBE4*	GND	8	7	PMCIO6	PMCIO7	8
9	+5V	PAR64	10	9	PMCIO8	PMCIO9	10
11	AD63	AD62	12	11	PMCIO10	PMCIO11	12
13	AD61	GND	14	13	PMCIO12	PMCIO13	14
15	GND	AD60	16	15	PMCIO14	PMCIO15	16
17	AD59	AD58	18	17	PMCIO16	PMCIO17	18
19	AD57	GND	20	19	PMCIO18	PMCIO19	20
21	+5V	AD56	22	21	PMCIO20	PMCIO21	22
23	AD55	AD54	24	23	PMCIO22	PMCIO23	24
25	AD53	GND	26	25	PMCIO24	PMCIO25	26
27	GND	AD52	28	27	PMCIO26	PMCIO27	28
29	AD51	AD50	30	29	PMCIO28	PMCIO29	30

Table 6-8. PCI Mezzanine Card Connectors J11-J14

31	AD49	GND	32	31	PMCIO30	PMCIO31	32
33	GND	AD48	34	33	Not Used	Not Used	34
35	AD47	AD46	36	35	Not Used	Not Used	36
37	AD45	GND	38	37	Not Used	Not Used	38
39	+5V	AD44	40	39	Not Used	Not Used	40
41	AD43	AD42	42	41	Not Used	Not Used	42
43	AD41	GND	44	43	Not Used	Not Used	44
45	GND	AD40	46	45	Not Used	Not Used	46
47	AD39	AD38	48	47	Not Used	Not Used	48
49	AD37	GND	50	49	Not Used	Not Used	50
51	GND	AD36	52	51	Not Used	Not Used	52
53	AD35	AD34	54	53	Not Used	Not Used	54
55	AD33	GND	56	55	Not Used	Not Used	56
57	+5V	AD32	58	57	Not Used	Not Used	58
59	Not Used	Not Used	60	59	Not Used	Not Used	60
61	Not Used	GND	62	61	Not Used	Not Used	62
63	GND	Not Used	64	63	Not Used	Not Used	64

P1 and P2 Connectors

Two 160-pin connectors (P1 and P2) supply the interface between the MVME2700 and the VMEbus. P1 provides power and VME signals for 24-bit addressing and 16-bit data. Its pin assignments are set by the VMEbus specification. They are listed in Table 6-9.

Table 6-9. VMEbus Connector P1

	Row Z	Row A	Row B	Row C	Row D	
1	Not Used	VD0	VBBSY*	VD8	Not Used	1
2	GND	VD1	VBCLR*	VD9	GND	2
3	Not Used	VD2	VACFAIL*	VD10	Not Used	3
4	GND	VD3	VBGIN0*	VD11	Not Used	4
5	Not Used	VD4	VBGOUT0*	VD12	Not Used	5
6	GND	VD5	VBGIN1*	VD13	Not Used	6
7	Not Used	VD6	VBGOUT1*	VD14	Not Used	7
8	GND	VD7	VBGIN2*	VD15	Not Used	8
9	Not Used	GND	VBGOUT2*	GND	VMEGAP*	9
10	GND	VSYSCLK	VBGIN3*	VSYSFAIL*	VMEGA0*	10
11	Not Used	GND	VBGOUT3*	VBERR*	VMEGA1*	11
12	GND	VDS1*	VBR0*	VSYSRESET*	Not Used	12
13	Not Used	VDS0*	VBR1*	VLWORD	VMEGA2*	13
14	GND	VWRITE*	VBR2*	VAM5	Not Used	14

Table 6-9. VMEbus Connector P1 (Continued)

15	Not Used	GND	VBR3*	VA23	VMEGA3*	15
16	GND	VDTACK*	VAM0	VA22	Not Used	16
17	Not Used	GND	VAM1	VA21	VMEGA4*	17
18	GND	VAS*	VAM2	VA20	Not Used	18
19	Not Used	GND	VAM3	VA19	Not Used	19
20	GND	VIACK*	GND	VA18	Not Used	20
21	Not Used	VIACKIN*	VSERCLK	VA17	Not Used	21
22	GND	VIACKOUT*	VSERDAT	VA16	Not Used	22
23	Not Used	VAM4	GND	VA15	Not Used	23
24	GND	VA7	VIRQ7*	VA14	Not Used	24
25	Not Used	VA6	VIRQ6*	VA13	Not Used	25
26	GND	VA5	VIRQ5*	VA12	Not Used	26
27	Not Used	VA4	VIRQ4*	VA11	Not Used	27
28	GND	VA3	VIRQ3*	VA10	Not Used	28
29	Not Used	VA2	VIRQ2*	VA9	Not Used	29
30	GND	VA1	VIRQ1*	VA8	Not Used	30
31	Not Used	–12V	+5VSTDBY	+12V	GND	31
32	GND	+5V	+5V	+5V	Not Used	32

RISCwatch Connector (J8)

Connector J8 has been designated for RISCwatch/JTAG, however it remains unpopulated on the base board. The pin assignment are listed in the following table.

Table 6-10. RISCwatch Connector J8

1	CPUT D0	NC	2
3	CPUT D1	CPUT RST_L	4
5	NC	1KPU_3.3V	6
7	CPUT CK	NC	8
9	CPUT MS	NC	10
11	SRESET_L	NC	12
13	MPURST_L	KEYPIN	14
15	CKSTPO_L	GND	16

MVME712M-Compatible Versions

The next tables summarize the pin assignments of connectors specific to MVME2700 modules that are configured for use with MVME712M transition modules.

VMEbus Connector P2 (MVME712M I/O Mode)

Two 160-pin connectors (P1 and P2) supply the interface between the MVME2700 and the VMEbus.

P1 provides power and VME signals for 24-bit addressing and 16-bit data. Its pin assignments are set by the VMEbus specification.

P2 rows A, C, Z, and D provide power and interface signals to the MVME712M transition module. P2 row B supplies the MVME2700 with power, with the upper eight VMEbus address lines, and with an additional 16 VMEbus data lines. The pin assignments for P2 in the MVME712M I/O configuration are listed in Table 6-11.

Table 6-11. VMEbus Connector P2 (MVME712M I/O Mode)

	Row Z	Row A	Row B	Row C	Row D	
1	SDB8*	SDB0*	+5V	C-	PMCIO0	1
2	GND	SDB1*	GND	C+	PMCIO1	2
3	SDB9*	SDB2*	RETRY*	T-	PMCIO2	3
4	GND	SDB3*	VA24	T+	PMCIO3	4
5	SDB10*	SDB4*	VA25	R-	PMCIO4	5
6	GND	SDB5*	VA26	R+	PMCIO5	6
7	SDB11*	SDB6*	VA27	+12VF	PMCIO6	7
8	GND	SDB7*	VA28	PR_STB*	PMCIO7	8
9	SDB12*	SDBP0	VA29	PR_DATA0	PMCIO8	9
10	GND	SATN*	VA30	PR_DATA1	PMCIO9	10
11	SDB13*	SBSY*	VA31	PR_DATA2	PMCIO10	11
12	GND	SACK*	GND	PR_DATA3	PMCIO11	12
13	SDB14*	SRST*	+5V	PR_DATA4	PMCIO12	13
14	GND	SMSG*	VD16	PR_DATA5	PMCIO13	14
15	SDB15*	SSEL*	VD17	PR_DATA6	PMCIO14	15
16	GND	SCD*	VD18	PR_DATA7	PMCIO15	16
17	SDBP1	SREQ*	VD19	PR_ACK*	PMCIO16	17
18	GND	SIO*	VD20	PR_BUSY	PMCIO17	18
19	Not Used	TxD3	VD21	PR_PE	PMCIO18	19

Table 6-11. VMEbus Connector P2 (MVME712M I/O Mode)

20	GND	RxD3	VD22	PR_SLCT	PMCIO19	20
21	Not Used	RTS3	VD23	PR_INIT*	PMCIO20	21
22	GND	CTS3	GND	PR_ERR*	PMCIO21	22
23	Not Used	DTR3	VD24	TxD1	PMCIO22	23
24	GND	DCD3	VD25	RxD1	PMCIO23	24
25	Not Used	TxD4	VD26	RTS1	PMCIO24	25
26	GND	RxD4	VD27	CTS1	PMCIO25	26
27	Not Used	RTS4	VD28	TxD2	PMCIO26	27
28	GND	TRxC4	VD29	RxD2	PMCIO27	28
29	PMCIO30	CTS4	VD30	RTS2	PMCIO28	29
30	GND	DTR4	VD31	CTS2	PMCIO29	30
31	PMCIO31	DCD4	GND	DTR2	GND	31
32	GND	RTxC4	+5V	DCD2	Not Used	32

SCSI Connector (MVME712M I/O Mode)

The SCSI connector for the MVME2700 is a 50-pin connector located on the front panel of the MVME712M transition module. The pin assignments for the SCSI connector are listed in Table 6-12.

Table 6-12. SCSI Connector (MVME712M)

1	GND	DB00*	26
2	GND	DB01*	27
3	GND	DB02*	28
4	GND	DB03*	29
5	GND	DB04*	30
6	GND	DB05*	31
7	GND	DB06*	32
8	GND	DB07*	33
9	GND	DBP*	34
10	GND	GND	35
11	GND	GND	36
12	GND	GND	37
13	Reserved	TERMPWR	38
14	GND	GND	39
15	GND	GND	40
16	GND	ATN*	41
17	GND	GND	42
18	GND	BSY*	43
19	GND	ACK*	44

Table 6-12. SCSI Connector (MVME712M)

20	GND	RST*	45
21	GND	MSG*	46
22	GND	SEL*	47
23	GND	D/C*	48
24	GND	REQ*	49
25	GND	O/I*	50

Serial Ports 1-4 (MVME712M I/O Mode)

The MVME2700 provides both asynchronous (ports 1 and 2) and synchronous/asynchronous (ports 3 and 4) serial connections, implemented with four EIA-232-D DB25 connectors (J7-J10). These connectors are located on the front panel of the MVME712M transition module. The pin assignments for serial ports 1-4 on the MVME712M are listed in the next table.

Table 6-13. Serial Connections—MVME712M Ports 1-4

1	No Connection
2	ETxD*n*
3	ERxD*n*
4	ERTS*n*
5	ECTS*n*
6	EDSR*n*
7	GND
8	EDCD*n*
9	No Connection
10	No Connection
11	No Connection
12	No Connection
13	No Connection
14	No Connection
15	ERTxC (*Port 4 only*)
16	No Connection
17	ERRxC (*Port 4 only*)
18	No Connection
19	No Connection
20	EDTR*n*

Table 6-13. Serial Connections—MVME712M Ports 1-4

21	No Connection
22	No Connection
23	No Connection
24	ETTxC (*Port 4 only*)
25	No Connection

Parallel Connector (MVME712M I/O Mode)

Both versions of the base board provide parallel I/O connections. For MVME712M-compatible base boards, the parallel interface is implemented with a 36-pin Centronics-type socket connector. The connector is located on the MVME712M transition module. The pin assignments are listed in the next table.

Table 6-14. Parallel I/O Connector (MVME712M)

1	PRSTB*	GND	19
2	PRD0	GND	20
3	PRD1	GND	21
4	PRD2	GND	22
5	PRD3	GND	23
6	PRD4	GND	24
7	PRD5	GND	25
8	PRD6	GND	26
9	PRD7	GND	27
10	PRACK*	GND	28
11	PRBSY	GND	29
12	PRPE	GND	30
13	PRSEL	INPRIME*	31
14	No Connection	PRFAULT*	32
15	No Connection	No Connection	33
16	GND	No Connection	34
17	No Connection	No Connection	35
18	No Connection	No Connection	36

Ethernet AUI Connector

The MVME2700 provides both AUI and 10Base-T/100Base-TX LAN connections. For MVME712M-compatible base boards, the LAN interface is an AUI connection implemented with a DB15 connector (J6) located on the MVME712M transition module. The pin assignments are listed in the next table.

Table 6-15. Ethernet AUI Connector (MVME712M)

1	GND
2	C+
3	T+
4	GND
5	R+
6	GND
7	No Connection
8	No Connection
9	C–
10	T–
11	No Connection
12	R–
13	+12V
14	No Connection
15	No Connection

MVME761-Compatible Versions

The next tables summarize the pin assignments of connectors specific to MVME2700 modules that are configured for use with MVME761 transition modules.

VMEbus Connector P2 (MVME761 I/O Mode)

Two 160-pin connectors (P1 and P2) supply the interface between the MVME2700 and the VMEbus.

P1 provides power and VME signals for 24-bit addressing and 16-bit data. Its pin assignments are set by the VMEbus specification.

P2 rows A, C, Z, and D provide power and interface signals to the MVME761 transition module. P2 row B supplies the MVME2700 with power, with the upper eight VMEbus address lines, and with an additional 16 VMEbus data lines. The pin assignments for P2 in the MVME761 I/O configuration are listed in the next table.

Table 6-16. VMEbus Connector P2 (MVME761 I/O Mode)

	Row Z	Row A	Row B	Row C	Row D	
1	SDB8*	SDB0*	+5V	RD– (10/100)	PMCIO0	1
2	GND	SDB1*	GND	RD+ (10/100)	PMCIO1	2
3	SDB9*	SDB2*	RETRY*	TD– (10/100)	PMCIO2	3
4	GND	SDB3*	VA24	TD+ (10/100)	PMCIO3	4
5	SDB10*	SDB4*	VA25	Not Used	PMCIO4	5
6	GND	SDB5*	VA26	Not Used	PMCIO5	6
7	SDB11*	SDB6*	VA27	+12VF	PMCIO6	7
8	GND	SDB7*	VA28	PR_STB*	PMCIO7	8
9	SDB12*	SDBP0	VA29	PR_DATA0	PMCIO8	9
10	GND	SATN*	VA30	PR_DATA1	PMCIO9	10
11	SDB13*	SBSY*	VA31	PR_DATA2	PMCIO10	11
12	GND	SACK*	GND	PR_DATA3	PMCIO11	12
13	SDB14*	SRST*	+5V	PR_DATA4	PMCIO12	13
14	GND	SMSG*	VD16	PR_DATA5	PMCIO13	14
15	SDB15*	SSEL*	VD17	PR_DATA6	PMCIO14	15
16	GND	SCD*	VD18	PR_DATA7	PMCIO15	16
17	SDBP1	SREQ*	VD19	PR_ACK*	PMCIO16	17
18	GND	SIO*	VD20	PR_BUSY	PMCIO17	18
19	Not Used	AFD*	VD21	PR_PE	PMCIO18	19

Table 6-16. VMEbus Connector P2 (MVME761 I/O Mode)

20	GND	SLIN*	VD22	PR_SLCT	PMCIO19	20
21	Not Used	TxD3	VD23	PR_INIT*	PMCIO20	21
22	GND	RxD3	GND	PR_ERR*	PMCIO21	22
23	Not Used	RTxC3	VD24	TxD1	PMCIO22	23
24	GND	TRxC3	VD25	RxD1	PMCIO23	24
25	Not Used	TxD4	VD26	RTS1	PMCIO24	25
26	GND	RxD4	VD27	CTS1	PMCIO25	26
27	Not Used	RTxC4	VD28	TxD2	PMCIO26	27
28	GND	TRxC4	VD29	RxD2	PMCIO27	28
29	PMCIO30	Not Used	VD30	RTS2	PMCIO28	29
30	GND	–12VF	VD31	CTS2	PMCIO29	30
31	PMCIO31	MSYNC*	GND	MDO	GND	31
32	GND	MCLK	+5V	MDI	VPC	32

Serial Ports 1 and 2 (MVME761 I/O Mode)

The MVME2700 provides both asynchronous (ports 1 and 2) and synchronous/asynchronous (ports 3 and 4) serial connections. The asynchronous interface is implemented with a pair of EIA-574-compliant DB9 connectors (COM1 and COM2) located on the MVME761 transition module. The pin assignments are listed in the following table.

Table 6-17. Serial Connections—Ports 1 and 2 (MVME761)

1	SP*n*DCD
2	SP*n*RxD
3	SP*n*TxD
4	SP*n*DTR
5	GND
6	SP*n*DSR
7	SP*n*RTS
8	SP*n*CTS
9	SP*n*RI

Serial Ports 3 and 4 (MVME761 I/O Mode)

For MVME761-compatible versions of the base board, the synchronous/asynchronous interface for ports 3 and 4 is implemented with a pair of HD26 connectors (J7 and J8) located on the front panel of the transition module. The pin assignments for serial ports 3 and 4 are listed in the following table.

Table 6-18. Serial Connections—Ports 3 and 4 (MVME761)

1	No Connection
2	TXD*n*
3	RXD*n*
4	RTS*n*
5	CTS*n*
6	DSR*n*
7	GND
8	DCD*n*
9	SP*n*_P9
10	SP*n*_P10
11	SP*n*_P11
12	SP*n*_P12
13	SP*n*_P13
14	SP*n*_P14
15	TXCI*n*
16	SP*n*_P16
17	RXCI*n*
18	LLB*n*
19	SP*n*_P19
20	DTR*n*
21	RLB*n*
22	RI*n*
23	SP*n*_P23
24	TXCO*n*
25	TM*n*
26	No Connection

Parallel Connector (MVME761 I/O Mode)

Both versions of the base board provide parallel I/O connections. For MVME761-compatible models, the parallel interface is implemented with an IEEE P1284 36-pin connector (J10) located on the MVME761 transition module. The pin assignments are listed in the following table.

Table 6-19. Parallel I/O Connector (MVME761)

1	PRBSY	GND	19
2	PRSEL	GND	20
3	PRACK*	GND	21
4	PRFAULT*	GND	22
5	PRPE	GND	23
6	PRD0	GND	24
7	PRD1	GND	25
8	PRD2	GND	26
9	PRD3	GND	27
10	PRD4	GND	28
11	PRD5	GND	29
12	PRD6	GND	30
13	PRD7	GND	31
14	INPRIME*	GND	32
15	PRSTB*	GND	33
16	SELIN*	GND	34
17	AUTOFD*	GND	35
18	Pull-up	No Connection	36

Ethernet 10Base-T/100Base-TX Connector

The MVME2700 provides both AUI and 10Base-T/100Base-TX LAN connections. For MVME761-compatible boards, the LAN interface is a 10Base-T/100Base-TX connection implemented with a standard RJ45 socket located on the MVME761 transition module. The pin assignments are listed in the following table.

Table 6-20. Ethernet 10Base-T/100Base-TX Connector (MVME761)

1	TD+
2	TD–
3	RD+
4	Terminated
5	Terminated
6	RD–
7	Terminated
8	Terminated

For detailed descriptions of the various interconnect signals, consult the support information documentation package for the MVME2700 single-board computer or the support information sections of the transition module documentation as necessary.

PPCBug Firmware 7

Overview

The PowerPC debugger, PPCBug, is a versatile tool used to evaluate and debug systems built around Motorola PowerPC microcomputers. Its primary uses are to test and initialize the system hardware, determine the hardware configuration, and boot the operating system. Facilities are also available for loading and executing user programs under complete operator control for system evaluation.

The PowerPC debugger provides a high degree of functionality and user friendliness, and yet stresses portability and ease of maintenance. It achieves these features because it was written entirely in the C programming language, except where necessary to use assembler functions.

PPCBug includes commands for display and modification of memory, breakpoint and tracing capabilities, a powerful assembler and disassembler useful for patching programs, and a ‘‘self-test at power-up’’ feature which verifies the integrity of the main CPU board. Various PPCBug routines that handle I/O, data conversion, and string functions are available to user programs through the System Call handler. PPCBug consists of three parts:

- A command-driven user-interactive software debugger, also called PPCBug.
- A set of command-driven diagnostics.”
- A user interface which accepts commands from the system console terminal.

When using PPCBug, you operate from within either the debugger directory (`PPC1-Bug`) or the diagnostic directory (`PPC1-Diag`) which tells you the current directory.

Because PPCBug is command-driven, it performs its various operations in response to user commands entered at the keyboard. When you enter a command, PPCBug executes the command and the prompt reappears. However, if you enter a command that causes execution of user target code (for instance, **GO**), then control may or may not return to PPCBug, depending on the outcome of the user program. The flow of control in PPCBug is described in the *PPCBug Firmware Package User's Manual.*

PPCBug is similar to previous Motorola firmware debugging packages (MVME147Bug, MVME167Bug, MVME187Bug), with differences due to microprocessor architectures. These are primarily reflected in the instruction mnemonics, register displays, addressing modes of the assembler/disassembler, and the passing of arguments to the system calls.

7

Memory Requirements

PPCBug requires a total of 768KB of read/write memory (for example, DRAM). The debugger allocates this space from the top of memory. For example, a system containing 64MB ($04000000) of read/write memory will place the PPCBug memory page at locations $03F80000 to $03FFFFFF.

Implementation

PPCBug is written largely in the C programming language, providing benefits of portability and maintainability. Where necessary, assembly language has been used in the form of separately compiled program modules containing only assembler code. No mixed-language modules are used.

Physically, PPCBug is contained in two socketed 32-pin PLCC Flash devices that together provide 1MB of storage. The executable code is checksummed at every power-on or reset firmware entry, and the result (which includes a precalculated checksum contained in the Flash devices), is verified against the expected checksum.

Use the Debugger

PPCBug is command-driven and performs its various operations in response to commands that you enter at the keyboard. When the `PPC1-Bug` prompt appears on the screen, the debugger is ready to accept debugger commands. When the `PPC1-Diag` prompt appears on the screen, the debugger is ready to accept diagnostics commands. To switch from one mode to the other, enter **SD**.

What you key in is stored in an internal buffer. Execution begins only after you press the Return or Enter key. This allows you to correct entry errors, if necessary, with the control characters described in the *PPCBug Firmware Package User's Manual.*

After the debugger executes the command, the prompt reappears. However, if the command causes execution of user target code (for example **GO**) then control may or may not return to the debugger, depending on what the user program does. For example, if a breakpoint has been specified, then control returns to the debugger when the breakpoint is encountered during execution of the user program. Alternately, the user program could return to the debugger by means of the System Call Handler routine RETURN. For more about this, refer to the **GD**, **GO**, and **GT** commands.

For information on control characters and debugger commands, refer to the *PPCBug Firmware Package User's Manual*.

A debugger command is made up of the following parts:

- The command name, either uppercase or lowercase (for example, **MD** or **md**)
- Any required arguments, as specified by command
- At least one space before the first argument. Precede all other arguments with either a space or comma
- One or more options. Precede an option or a string of options with a semicolon (**;**). If no option is entered, the command's default option conditions are used.

Debugger Commands

The individual debugger commands are listed in the following table.

Note You can list all the available debugger commands by entering the Help (**HE**) command alone. You can view the syntax for a particular command by entering **HE** and the command mnemonic, as listed below.

Table 7-1. Debugger Commands

Command	Description
AS	One Line Assembler
BC	Block of Memory Compare
BF	Block of Memory Fill
BI	Block of Memory Initialize
BM	Block of Memory Move
BR	Breakpoint Insert
NOBR	Breakpoint Delete
BS	Block of Memory Search
BV	Block of Memory Verify
CM	Concurrent Mode
NOCM	No Concurrent Mode
CNFG	Configure Board Information Block
CS	Checksum
CSAR	PCI Configuration Space READ Access
CSAW	PCI Configuration Space WRITE Access
DC	Data Conversion
DMA	Block of Memory Move
DS	One Line Disassembler
DU	Dump S-Records
ECHO	Echo String
ENV	Set Environment
FORK	Fork Idle MPU at Address

Table 7-1. Debugger Commands (Continued)

Command	Description
FORKWR	Fork Idle MPU with Registers
GD	Go Direct (Ignore Breakpoints)
GEVBOOT	Global Environment Variable Boot
GEVDEL	Global Environment Variable Delete
GEVDUMP	Global Environment Variable(s) Dump
GEVEDIT	Global Environment Variable Edit
GEVINIT	Global Environment Variable Initialization
GEVSHOW	Global Environment Variable(s) Display
GN	Go to Next Instruction
GO	Go Execute User Program
GT	Go to Temporary Breakpoint
HE	Help
IDLE	Idle Master MPU
IOC	I/O Control for Disk
IOI	I/O Inquiry
IOP	I/O Physical (Direct Disk Access)
IOT	I/O Teach for Configuring Disk Controller
IRD	Idle MPU Register Display
IRM	Idle MPU Register Modify
IRS	Idle MPU Register Set
LO	Load S-Records from Host
MA	Macro Define/Display
NOMA	Macro Delete
MAE	Macro Edit
MAL	Enable Macro Listing
NOMAL	Disable Macro Listing
MAR	Load Macros
MAW	Save Macros
MD, MDS	Memory Display
MENU	System Menu
MM	Memory Modify

Table 7-1. Debugger Commands (Continued)

Command	Description
MMD	Memory Map Diagnostic
MS	Memory Set
MW	Memory Write
NAB	Automatic Network Boot
NAP	Nap MPU
NBH	Network Boot Operating System, Halt
NBO	Network Boot Operating System
NIOC	Network I/O Control
NIOP	Network I/O Physical
NIOT	Network I/O Teach (Configuration)
NPING	Network Ping
OF	Offset Registers Display/Modify
PA	Printer Attach
NOPA	Printer Detach
PBOOT	Bootstrap Operating System
PF	Port Format
NOPF	Port Detach
PFLASH	Program Flash Memory
PS	Put RTC into Power Save Mode
RB	ROMboot Enable
NORB	ROMboot Disable
RD	Register Display
REMOTE	Remote
RESET	Cold/Warm Reset
RL	Read Loop
RM	Register Modify
RS	Register Set
RUN	MPU Execution/Status
SD	Switch Directories
SET	Set Time and Date
SROM	SROM Examine/Modify

Table 7-1. Debugger Commands (Continued)

Command	Description
SYM	Symbol Table Attach
NOSYM	Symbol Table Detach
SYMS	Symbol Table Display/Search
T	Trace
TA	Terminal Attach
TIME	Display Time and Date
TM	Transparent Mode
TT	Trace to Temporary Breakpoint
VE	Verify S-Records Against Memory
VER	Revision/Version Display
WL	Write Loop



Caution

Although a command to allow the erasing and reprogramming of Flash memory is available to you, keep in mind that reprogramming any portion of Flash memory will erase everything currently contained in Flash, including the PPC1Bug debugger.

Flash bank B contains the PPCBug debugger.

Diagnostic Tests

The individual diagnostic test sets are listed in the following table. The diagnostics are described in the *PPC1Bug Diagnostics Manual*.

Table 7-2. Diagnostic Test Groups

Test Set	Description	Applicability
DEC21x40	DEC 21x40 Ethernet Controller Chip Tests	All boards
Falcon	Falcon ECC Memory Controller Tests	All boards *
ISABRDGE	PCI/ISA Bridge Tests	All boards
KBD8730x	PC8730x Keyboard/Mouse Tests	All boards
L2CACHE	Level 2 Cache Tests	All boards with L2 cache
MPIC	Multiprocessor Interrupt Controller Tests	All boards *
NCR	NCR 53C825/53C810 SCSI-2 I/O Processor Tests	All boards
NVRAM	Nonvolatile RAM tests	All boards
PAR8730x	PC8730x Parallel Port Test	All boards
PCIBUS	Generic PCI/PMC Slot Test	All boards
RAM	Random Access Memory Tests	All boards
Raven	Raven PCI Bridge Tests	All boards *
RTC	Real-Time Clock Tests	All boards
SCC	Serial Communications Controller Tests	All boards
UART	PC16550 (or PC87308) UART Tests	All boards
Universe II	VMEbus to PCI Interface ASIC Tests	All boards *
VGA543x	Video Graphics Tests	All MVME3600/4600 boards; not applicable to MVME2600 or MVME2700 series boards
Z8536	Z8536 Counter/Timer Tests	All boards

Notes You may enter command names in either uppercase or lowercase characters.

Some diagnostics depend on restart defaults that are set up only in a particular restart mode. Refer to the documentation on a particular diagnostic for the correct mode. Test Sets marked with an asterisk (*) are not available on PPCBug Release 3.1 and earlier.

CNFG and ENV Commands

8

Overview

You can use the factory-installed debug monitor, PPCBug, to modify certain parameters contained in the PowerPC board's Non-Volatile RAM (NVRAM), also known as Battery Backed-up RAM (BBRAM).

- The Board Information Block in NVRAM contains various elements relating to the operating parameters of the hardware itself. Use the PPCBug command **CNFG** to change those parameters.
- Use the PPCBug command **ENV** to change configurable PPCBug parameters in NVRAM.

The **CNFG** and **ENV** commands are both described in the *PPCBug Firmware Package User's Manual*. Refer to that manual for general information about their use and capabilities.

The following paragraphs present additional information about **CNFG** and **ENV** that is specific to the debugger, along with the PPCBug parameters that can be configured with the **ENV** command.

CNFG - Configure Board Information Block

Use this command to display and configure the Board Information Block, which is resident within the NVRAM. The Board Information Block contains various elements that correspond to specific operational parameters of the PowerPC board. The board structure for the MVME2700 is as shown in the following example:

```
Board (PWA) Serial Number  = “2717994        ”
Board Identifier           = “MVME2700       ”
Artwork (PWA) Identifier   = “01-w3287F01B   ”
MPU Clock Speed            = “233            ”
Bus Clock Speed            = “067            ”
Ethernet Address           = 08003E25C4C9
Local SCSI Identifier      = “07”
System Serial Number       = “1463725        ”
System Identifier          = “Motorola MVME2700         ”
License Identifier         = “12345678 “
```


The parameters that are quoted are left-justified character (ASCII) strings padded with space characters, and the quotes (“) are displayed to indicate the size of the string. Parameters that are not quoted are considered data strings, and data strings are right-justified. The data strings are padded with zeroes if the length is not met.

The Board Information Block is factory-configured before shipment. There is no need to modify block parameters unless the NVRAM is corrupted.

Refer to the *MVME2600 Series Single Board Computer Programmer’s Reference Guide (*applicable to the MVME2700) for the actual location and other information about the Board Information Block.

Refer to the *PPCBug Firmware Package User’s Manual* for a description of **CNFG** and examples.

ENV - Set Environment

Use the **ENV** command to view and/or configure interactively all PPCBug operational parameters that are kept in Non-Volatile RAM (NVRAM).

Refer to the *PPCBug Firmware Package User's Manual* for a description of the use of **ENV**. Additional information on registers in the Universe II ASIC that affect these parameters can be found in the *Programmer's Reference Guide* for your PowerPC board.

Listed and described below are the parameters that you can configure using **ENV**. The default values shown are those in effect when this publication went to print.

Configure the PPCBug Parameters

The parameters that can be configured using **ENV** are:


```
Bug or System environment [B/S] = B?
```

B Bug is the mode where no system type of support is displayed. However, system-related items are still available. (Default)

S System is the standard mode of operation, and is the default mode if NVRAM should fail. System mode is defined in the *PPCBug Firmware Package User's Manual*.

```
Field Service Menu Enable [Y/N] = N?
```

Y Display the field service menu.

N Do not display the field service menu.(Default)

```
Remote Start Method Switch [G/M/B/N] = B?
```

The Remote Start Method Switch is used when the MVME2600/ MVME2700/MVME3600/MVME4600 is cross-loaded from another VME-based CPU, to start execution of the cross-loaded program.

G Use the Global Control and Status Register on the Universe II chip to pass and start execution of the cross-loaded program. (*Not applicable to MVME4600 boards*.)

M Use the Multiprocessor Control Register (MPCR) in shared RAM to pass and start execution of the cross-loaded program.

B Use both the GCSR and the MPCR methods to pass and start execution of the cross-loaded program. (Default)

N Do not use any Remote Start Method.


```
Probe System for Supported I/O Controllers [Y/N] = Y?
```

Y Accesses will be made to the appropriate system buses (e.g., VMEbus, local MPU bus) to determine the presence of supported controllers. (Default)

N Accesses will not be made to the VMEbus to determine the presence of supported controllers.

```
Auto-Initialize of NVRAM Header Enable [Y/N] = Y?
```

Y NVRAM (PReP partition) header space will be initialized automatically during board initialization, but only if the PREP partition fails a sanity check. (Default)

N NVRAM header space will not be initialized automatically during board initialization.

```
Network PReP-Boot Mode Enable [Y/N] = N?
```

Y Enable PReP-style network booting (same boot image from a network interface as from a mass storage device).

N Do not enable PReP-style network booting. (Default)

```
Negate VMEbus SYSFAIL* Always [Y/N] = N?
```

Y Negate the VMEbus SYSFAIL* signal during board initialization.

N Negate the VMEbus SYSFAIL* signal after successful completion or entrance into the bug command monitor. (Default)

```
SCSI Bus Reset on Debugger Startup [Y/N] = N?
```

Y Local SCSI bus is reset on debugger setup.

N Local SCSI bus is not reset on debugger setup. Default)

```
Primary SCSI Bus Negotiations Type [A/S/N] = A?
```

A Asynchronous SCSI bus negotiation. (Default)

S Synchronous SCSI bus negotiation.

N None.

```
Primary SCSI Data Bus Width [W/N] = N?
```

W Wide SCSI (16-bit bus).

N Narrow SCSI (8-bit bus). (Default)

```
Secondary SCSI Identifier = "07"?
```

The address representing the MVME2700 VMEmodule on the secondary SCSI bus. The value is application-specific.
(Default = device number 07)

```
NVRAM Bootlist (GEV.fw-boot-path) Boot Enable [Y/N] = N?
```

Y Give boot priority to devices defined in the *fw-boot-path* global environment variable (GEV).

N Do not give boot priority to devices listed in the *fw-boot-path* GEV. (Default)

Note When enabled, the GEV (Global Environment Variable) boot takes priority over all other boots, including Autoboot and Network Boot.

```
NVRAM Bootlist (GEV.fw-boot-path) Boot at power-up only [Y/N] = N?
```

Y Give boot priority to devices defined in the *fw-boot-path* GEV at power-up reset only.

N Give power-up boot priority to devices listed in the *fw-boot-path* GEV at any reset. (Default)


```
NVRAM Bootlist (GEV.fw-boot-path) Boot Abort Delay = 5?
```

The time in seconds that a boot from the NVRAM boot list delays before starting the boot. The purpose for the delay is to allow you the option of stopping the boot by use of the **BREAK** key. The time value is from 0-255 seconds. (Default = 5 seconds)

```
Auto Boot Enable [Y/N]   = N?
```

Y The Autoboot function is enabled.

N The Autoboot function is disabled.(Default)

```
Auto Boot at power-up only [Y/N] = N?
```

Y Autoboot is attempted at power-up reset only.

N Autoboot is attempted at any reset.(Default)

```
Auto Boot Scan Enable [Y/N]   = Y?
```

Y If Autoboot is enabled, the Autoboot process attempts to boot from devices specified in the scan list (e.g., FDISK/CDROM/TAPE/HDISK). (Default)

N If Autoboot is enabled, the Autoboot process uses the Controller LUN and Device LUN to boot.

```
Auto Boot Scan Device Type List = FDISK/CDROM/TAPE/HDISK?
```

The listing of boot devices displayed if the Autoboot Scan option is enabled. If you modify the list, follow the format shown above (uppercase letters, using forward slash as separator).

```
Auto Boot Controller LUN   = 00?
```

Refer to the *PPCBug Firmware Package User's Manual* for a listing of disk/tape controller modules currently supported by PPCBug. (Default = $00)

```
Auto Boot Device LUN    = 00?
```

Refer to the *PPCBug Firmware Package User's Manual* for a listing of disk/tape devices currently supported by PPCBug.
(Default = $00)

```
Auto Boot Partition Number = 00?
```

Which disk "partition" is to be booted, as specified in the PowerPC Reference Platform (PRP) specification. If set to zero, the firmware searches the partitions in order (1, 2, 3, 4) until it finds the first "bootable" partition. That is then the partition that will be booted. Other acceptable values are 1, 2, 3, or 4. In these four cases, the partition specified will be booted without searching.

```
Auto Boot Abort Delay = 7?
```

The time in seconds that the Autoboot sequence delays before starting the boot. The purpose for the delay is to allow you the option of stopping the boot by use of the **BREAK** key. The time value is from 0-255 seconds. (Default = 7 seconds)

```
Auto Boot Default String [NULL for an empty string] = ?
```

You may specify a string (filename) which is passed on to the code being booted. The maximum length of this string is 16 characters. (Default = null string)

```
ROM Boot Enable [Y/N] = N?
```

Y The ROMboot function is enabled.

N The ROMboot function is disabled. (Default)

```
ROM Boot at power-up only [Y/N] = Y?
```

Y ROMboot is attempted at power-up only. (Default)

N ROMboot is attempted at any reset.

```
ROM Boot Enable search of VMEbus [Y/N] = N?
```

Y VMEbus address space, in addition to the usual areas of memory, will be searched for a ROMboot module.

N VMEbus address space will not be accessed by ROMboot. (Default)

```
ROM Boot Abort Delay = 5?
```

The time in seconds that the ROMboot sequence delays before starting the boot. The purpose for the delay is to allow you the option of stopping the boot by use of the **BREAK** key. The time value is from 0-255 seconds. (Default = 5 seconds)

```
ROM Boot Direct Starting Address = FFF00000?
```

The first location tested when PPCBug searches for a ROMboot module. (Default = $FFF00000)

```
ROM Boot Direct Ending Address = FFFFFFFC?
```

The last location tested when PPCBug searches for a ROMboot module. (Default = $FFFFFFFC)

```
Network Auto Boot Enable [Y/N] = N?
```

Y The Network Auto Boot (NETboot) function is enabled.

N The NETboot function is disabled. (Default)

```
Network Auto Boot at power-up only [Y/N] = N?
```

Y NETboot is attempted at power-up reset only.

N NETboot is attempted at any reset. (Default)

```
Network Auto Boot Controller LUN = 00?
```

Refer to the *PPCBug Firmware Package User's Manual* for a listing of disk/tape controller modules currently supported by PPCBug. (Default = $00)

```
Network Auto Boot Device LUN = 00?
```

Refer to the *PPCBug Firmware Package User's Manual* for a listing of disk/tape controller modules currently supported by PPCBug. (Default = $00)

```
Network Auto Boot Abort Delay = 5?
```

The time in seconds that the NETboot sequence delays before starting the boot. The purpose for the delay is to allow you the option of stopping the boot by use of the **BREAK** key. The time value is from 0-255 seconds. (Default = 5 seconds)

```
Network Auto Boot Configuration Parameters Offset (NVRAM) =
00001000?
```

The address where the network interface configuration parameters are to be saved/retained in NVRAM; these parameters are the necessary parameters to perform an unattended network boot. A typical offset might be $1000, but this value is application-specific. (Default = $00001000)

Caution

If you use the NIOT debugger command, these parameters need to be saved somewhere in the offset range $00000000 through $00000FFF. The NIOT parameters do not exceed 128 bytes in size. The setting of this ENV pointer determines their location. If you have used the same space for your own program information or commands, they will be overwritten and lost.

You can relocate the network interface configuration parameters in this space by using the ENV command to change the Network Auto Boot Configuration Parameters offset from its default of $00001000 to the value you need to be clear of your data within NVRAM.

```
Memory Size Enable [Y/N] = Y?
```

Y	Memory will be sized for Self Test diagnostics. (Default)
N	Memory will not be sized for Self Test diagnostics.


```
Memory Size Starting Address = 00000000?
```

The default Starting Address is $00000000.

```
Memory Size Ending Address = 02000000?
```

The default Ending Address is the calculated size of local memory. If the memory start is changed from $00000000, this value also needs to be adjusted.

```
DRAM Speed in NANO Seconds = 60?
```

The default setting for this parameter varies depending on the speed of the DRAM memory parts installed on the board. The default is set to the slowest speed found on the available banks of DRAM memory.

```
ROM First Access Length (0 - 31) = 10?
```

This is the value programmed into the MPC105 “ROMFAL” field (Memory Control Configuration Register 8: bits 23-27) to indicate the number of clock cycles used in accessing the ROM. The lowest allowable ROMFAL setting is $00; the highest allowable is $1F. The value to enter depends on processor speed. The default value varies according to the system’s bus clock speed.

Note ROM First Access Length is not applicable to the MVME2600/MVME2700/MVME3600/MVME4600. PPCBUG ignores the configured value.

```
ROM Next Access Length (0 - 15) = 0?
```

The value programmed into the MPC105 “ROMNAL” field (Memory Control Configuration Register 8: bits 28-31) to represent wait states in access time for nibble (or burst) mode ROM accesses. The lowest allowable ROMNAL setting is $0; the highest allowable is $F. The value to enter depends on processor speed. The default value varies according to the system’s bus clock speed.

Note ROM Next Access Length is not applicable to the MVME2600/MVME2700/MVME3600/MVME4600. PPCBUG ignores the configured value

```
DRAM Parity Enable [On-Detection/Always/Never - O/A/N] = O?
```

O DRAM parity is enabled upon detection. (Default)

A DRAM parity is always enabled.

N DRAM parity is never enabled.

Note This parameter also applies to enabling ECC for DRAM.

```
L2 Cache Parity Enable [On-Detection/Always/Never - O/A/N] = O?
```

O L2 Cache parity is enabled upon detection. (Default)

A L2 Cache parity is always enabled.

N L2 Cache parity is never enabled.


```
PCI Interrupts Route Control Registers (PIRQ0/1/2/3) = 0A0B0E0F?
```

Initializes the PIRQx (PCI Interrupts) route control registers in the IBC (PCI/ISA bus bridge controller). The **ENV** parameter is a 32-bit value that is divided by 4 to yield the values for route control registers PIRQ0/1/2/3. The default is determined by system type. For details on PCI/ISA interrupt assignments and for suggested values to enter for this parameter, refer to the *8259 Interrupts* section of Chapter 5 in the *MVME2600 Series Single Board Computer Programmer's Reference Guide*.

```
Serial Startup Code Master Enable [Y/N] = N?
```

Y Set up and enable the serial I/O ports.

N Do not set up or enable the serial I/O ports (Default).

```
Serial Startup Code LF Enable [Y/N] = N?
```

Y Enable line feeds at the serial I/O ports.

N Do not enable line feeds at the serial I/O ports (Default).

Configure the VMEbus Interface

ENV asks the following series of questions to set up the VMEbus interface for MVME2600/MVME2700/MVME3600/MVME4600 series VMEmodules. To perform this configuration, you should have a working knowledge of the Universe II ASIC as described in the *Programmer's Reference Guide*.

```
VME3PCI Master Master Enable [Y/N] = Y?
```

Y	Set up and enable the VMEbus Interface (Default)
N	Do not set up or enable the VMEbus Interface.

```
PCI Slave Image 0 Control = 00000000?
```

The configured value is written into the LSI0_CTL register of the Universe II chip.

```
PCI Slave Image 0 Base Address Register = 00000000?
```

The configured value is written into the LSI0_BS register of the Universe II chip.

```
PCI Slave Image 0 Bound Address Register = 00000000?
```

The configured value is written into the LSI0_BD register of the Universe II chip.

```
PCI Slave Image 0 Translation Offset = 00000000?
```

The configured value is written into the LSI0_TO register of the Universe II chip.

```
PCI Slave Image 1 Control = C0820000?
```

The configured value is written into the LSI1_CTL register of the Universe II chip.

```
PCI Slave Image 1 Base Address Register = 01000000?
```

The configured value is written into the LSI1_BS register of the Universe II chip.

```
PCI Slave Image 1 Bound Address Register = 20000000?
```

The configured value is written into the LSI1_BD register of the Universe II chip.

```
PCI Slave Image 1 Translation Offset = 00000000?
```

The configured value is written into the LSI1_TO register of the Universe II chip.

```
PCI Slave Image 2 Control = C0410000?
```

The configured value is written into the LSI2_CTL register of the Universe II chip.

```
PCI Slave Image 2 Base Address Register = 20000000?
```

The configured value is written into the LSI2_BS register of the Universe II chip.

```
PCI Slave Image 2 Bound Address Register = 22000000?
```


The configured value is written into the LSI2_BD register of the Universe II chip.

```
PCI Slave Image 2 Translation Offset = D0000000?
```

The configured value is written into the LSI2_TO register of the Universe II chip.

```
PCI Slave Image 3 Control = C0400000?
```

The configured value is written into the LSI3_CTL register of the Universe II chip.

```
PCI Slave Image 3 Base Address Register = 2FFF0000?
```

The configured value is written into the LSI3_BS register of the Universe II chip.

```
PCI Slave Image 3 Bound Address Register = 30000000?
```

The configured value is written into the LSI3_BD register of the Universe II chip.

```
PCI Slave Image 3 Translation Offset = D0000000?
```

The configured value is written into the LSI3_TO register of the Universe II chip.

```
VMEbus Slave Image 0 Control = E0F20000?
```

The configured value is written into the VSI0_CTL register of the Universe II chip.

```
VMEbus Slave Image 0 Base Address Register = 00000000?
```

The configured value is written into the VSI0_BS register of the Universe II chip.

```
VMEbus Slave Image 0 Bound Address Register = (Local DRAM Size)?
```

The configured value is written into the VSI0_BD register of the Universe II chip. The value is the same as the Local Memory Found number already displayed.

```
VMEbus Slave Image 0 Translation Offset = 80000000?
```

The configured value is written into the VSI0_TO register of the Universe II chip.

```
VMEbus Slave Image 1 Control = 00000000?
```

The configured value is written into the VSI1_CTL register of the Universe II chip.

```
VMEbus Slave Image 1 Base Address Register = 00000000?
```

The configured value is written into the VSI1_BS register of the Universe II chip.

```
VMEbus Slave Image 1 Bound Address Register = 00000000?
```

The configured value is written into the VSI1_BD register of the Universe II chip.

```
VMEbus Slave Image 1 Translation Offset = 00000000?
```

The configured value is written into the VSI1_TO register of the Universe II chip.

```
VMEbus Slave Image 2 Control = 00000000?
```

The configured value is written into the VSI2_CTL register of the Universe II chip.

```
VMEbus Slave Image 2 Base Address Register = 00000000?
```

The configured value is written into the VSI2_BS register of the Universe II chip.

```
VMEbus Slave Image 2 Bound Address Register = 00000000?
```

The configured value is written into the VSI2_BD register of the Universe II chip.

```
VMEbus Slave Image 2 Translation Offset = 00000000?
```

The configured value is written into the VSI2_TO register of the Universe II chip.

```
VMEbus Slave Image 3 Control = 00000000?
```

The configured value is written into the VSI3_CTL register of the Universe II chip.

```
VMEbus Slave Image 3 Base Address Register = 00000000?
```


The configured value is written into the VSI3_BS register of the Universe II chip.

```
VMEbus Slave Image 3 Bound Address Register = 00000000?
```

The configured value is written into the VSI3_BD register of the Universe II chip.

```
VMEbus Slave Image 3 Translation Offset = 00000000?
```

The configured value is written into the VSI3_TO register of the Universe II chip.

```
PCI Miscellaneous Register = 10000000?
```

The configured value is written into the LMISC register of the Universe II chip.

```
Special PCI Slave Image Register = 00000000?
```

The configured value is written into the SLSI register of the Universe II chip.

```
Master Control Register = 80C00000?
```

The configured value is written into the MAST_CTL register of the Universe II chip.

```
Miscellaneous Control Register = 52060000?
```

The configured value is written into the MISC_CTL register of the Universe II chip.

```
User AM Codes = 00000000?
```

The configured value is written into the USER_AM register of the Universe II chip.

Related Documentation A

Motorola Computer Group Documents

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

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

Table A-1. Motorola Computer Group Documents

Document Title	Publication Number
MVME2700 Series Single Board Computer Installation and Use	V2700A/IH
MVME2600/2700 Series Single Board Computer Programmer's Reference Guide	V2600A/PG
PPCBug Firmware Package User's Manual (Parts 1 and 2)	PPCBUGA1/UM PPCBUGA2/UM
PPC1Bug Diagnostics Manual	PPC1DIAA/UM
MVME712M Transition Module and P2 Adapter Board Installation and Use	VME712MA/IH
MVME761 Transition Module Installation and Use	VME761A/IH
PMCspan PMC Adapter Carrier Board Installation and Use	PMCSPANA/IH

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

Manufacturers' Documents

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

Table A-2. Manufacturers' Documents

Document Title and Source	Publication Number
PowerPC® 750 RISC Microprocessor Technical Summary Literature Distribution Center for Motorola Telephone: (800) 441-2447 FAX: (602) 994-6430 or (303) 675-2150 E-mail: ldcformotorola@hibbertco.com	MPC750/D
PowerPC® 750 RISC Microprocessor User's Manual Literature Distribution Center for Motorola Telephone: (800) 441-2447 FAX: (602) 994-6430 or (303) 675-2150 E-mail: ldcformotorola@hibbertco.com OR IBM Microelectronics Mail Stop A25/862-1 PowerPC Marketing 1000 River Street Essex Junction, Vermont 05452-4299 Telephone: 1-800-PowerPC Telephone: 1-800-769-3772 FAX: 1-800-POWERfax FAX: 1-800-769-3732	MPC750UM/AD MPR750UMU-01

Table A-2. Manufacturers' Documents (Continued)

Document Title and Source	Publication Number
PowerPC™ Microprocessor Family: The Programming Environments Literature Distribution Center for Motorola Telephone: (800) 441-2447 FAX: (602) 994-6430 or (303) 675-2150 E-mail: ldcformotorola@hibbertco.com OR IBM Microelectronics Mail Stop A25/862-1 PowerPC Marketing 1000 River Street Essex Junction, Vermont 05452-4299 Telephone: 1-800-PowerPC Telephone: 1-800-769-3772 FAX: 1-800-POWERfax FAX: 1-800-769-3732 http://www.ibm.com/	MPCFPE/AD MPRPPCFPE-01
DECchip 21140 PCI Fast Ethernet LAN Controller Hardware Reference Manual Digital Equipment Corporation Maynard, Massachusetts DECchip Information Line Telephone (United States and Canada): 1-800-332-2717 TTY (United States only): 1-800-332-2515 Telephone (outside North America): +1-508-568-6868 http://www.digital.com/	EC-QC0CA-TE
PC87308VUL (Super I/O™ Enhanced Sidewinder Lite) Floppy Disk Controller, Keyboard Controller, Real-Time Clock, Dual UARTs, IEEE 1284 Parallel Port, and IDE Interface National Semiconductor Corporation Customer Support Center (or nearest Sales Office) 2900 Semiconductor Drive P.O. Box 58090 Santa Clara, California 95052-8090 Telephone: 1-800-272-9959 http://www.nsc.com/	PC87308VUL

Table A-2. Manufacturers' Documents (Continued)

Document Title and Source	Publication Number
M48T559 CMOS 8K x 8 TIMEKEEPER™ SRAM Data Sheet SGS-Thomson Microelectronics Group Marketing Headquarters (or nearest Sales Office) 1000 East Bell Road Phoenix, Arizona 85022 Telephone: (602) 485-6100 FAX: ((602) 485-6330 http://www.st.com/	M48T559
SYM 53CXX (was NCR 53C8XX) Family PCI-SCSI I/O Processors Programming Guide LSI Logic 1551 McCarthy Blvd. Milpitas, California 95035 Telephone: (408)433-8000 FAX: (408) 433-8989 http://www.lsilogic.com/	J10931I
SCC (Serial Communications Controller) User's Manual (for Z85230 and other Zilog parts) Zilog, Inc. 910 East Hamilton Ave. Campbell, California 95008-6600 Telephone: (408) 558-8500 FAX: (408) 558-8300 http://www.zilog.com/	DC-8293-02
Z8536 CIO Counter/Timer and Parallel I/O Unit Product Specification and User's Manual (in Z8000® Family of Products Data Book) Zilog, Inc. 910 East Hamilton Ave. Campbell, California 95008-6600 Telephone: (408) 558-8500 FAX: (408) 558-8300 http://www.zilog.com/	DC-8319-00

Table A-2. Manufacturers' Documents (Continued)

Document Title and Source	Publication Number
W83C553 Enhanced System I/O Controller with PCI Arbiter (PIB) Winbond Electronics Corporation Winbond Systems Laboratory 2730 Orchard Parkway San Jose, CA 95134 Telephone: 1-408-943-6666 FAX: 1-408-943-6668 http://www.contect.com/winbond.htm	W83C553
Universe II User Manual Tundra Semiconductor Corporation 603 March Road Kanata, ON K2K 2M5, Canada Telephone: 1-800-267-7231 Telephone: (613) 592-1320 http://www.tundra.com/unidex.html OR 695 High Glen Drive San Jose, California 95133, USA Telephone: (408) 258-3600 FAX: (408) 258-3659	Universe II (Part Number 8091142.MD300.01)

Related Specifications

For additional information, refer to the following table for related specifications. As an additional help, a source for the listed document is provided along with that company's or organization's Uniform Reference Locator (URL), if available. Please note that in many cases, the information is preliminary and the revision levels of the documents are subject to change without notice.

Table A-3. Related Specifications

Document Title and Source	Publication Number
ANSI Small Computer System Interface-2 (SCSI-2), Draft Document Global Engineering Documents 15 Inverness Way East Englewood, CO 80112-5704 Telephone: 1-800-854-7179 Telephone: (303) 792-2181	X3.131.1990
VME64 Specification VITA (VMEbus International Trade Association) 7825 E. Gelding Drive, Suite 104 Scottsdale, Arizona 85260-3415 Telephone: (602) 951-8866 FAX: (602) 951-0720 http://www.vita.com/ **NOTE:** An earlier version of this specification is available as: Versatile Backplane Bus: VMEbus Institute of Electrical and Electronics Engineers, Inc. Publication and Sales Department 345 East 47th Street New York, New York 10017-21633 Telephone: 1-800-678-4333 http://www.ieee.com/ OR Microprocessor system bus for 1 to 4 byte data Bureau Central de la Commission Electrotechnique Internationale 3, rue de Varembé Geneva, Switzerland	ANSI/VITA 1-1994 ANSI/IEEE Standard 1014-1987 IEC 821 BUS

Table A-3. Related Specifications (Continued)

Document Title and Source	Publication Number
IEEE - Common Mezzanine Card Specification (CMC) Institute of Electrical and Electronics Engineers, Inc. Publication and Sales Department 345 East 47th Street New York, New York 10017-21633 Telephone: 1-800-678-4333 http://www.ieee.com/	P1386 Draft 2.0
IEEE - PCI Mezzanine Card Specification (PMC) Institute of Electrical and Electronics Engineers, Inc. Publication and Sales Department 345 East 47th Street New York, New York 10017-21633 Telephone: 1-800-678-4333 http://www.ieee.com/	P1386.1 Draft 2.0
Bidirectional Parallel Port Interface Specification Institute of Electrical and Electronics Engineers, Inc. Publication and Sales Department 345 East 47th Street New York, New York 10017-21633 Telephone: 1-800-678-4333 http://www.ieee.com/	IEEE Standard 1284
Peripheral Component Interconnect (PCI) Local Bus Specification, Revision 2.1 PCI Special Interest Group 2575 NE Kathryn St #17 Hillsboro, OR 97124 Telephone: (800) 433-5177 (inside the U.S.) or (503) 693-6232 (outside the U.S.) FAX: (503) 693-8344 http://www.pcisig.com/	PCI Local Bus Specification

Table A-3. Related Specifications (Continued)

Document Title and Source	Publication Number
PowerPC® Microprocessor Common Hardware Reference Platform: A System Architecture (CHRP), Version 1.0 Literature Distribution Center for Motorola Telephone: (800) 441-2447 FAX: (602) 994-6430 or (303) 675-2150 E-mail: ldcformotorola@hibbertco.com OR APDA, Apple Computer, Inc. P.O. Box 319 Buffalo, NY 14207 Telephone: (800) 282-2732 FAX: (716) 871-6511 OR IBM 1580 Route 52, Bldg. 504 Hopewell Junction, NY 12533-6531 Telephone: (800) PowerPC OR Morgan Kaufmann Publishers, Inc. 340 Pine Street, Sixth Floor San Francisco, CA 94104-3205, USA Telephone: (415) 392-2665 FAX: (415) 982-2665	TB338/D MPRPPCHRP-01 ISBN 1-55860-394-8
PowerPC Reference Platform (PRP) Specification, Third Edition, Version 1.0, Volumes I and II International Business Machines Corporation Power Personal Systems Architecture 11400 Burnet Rd. Austin, TX 78758-3493 Document/Specification Ordering Telephone: 1-800-PowerPC Telephone: 1-800-769-3772 Telephone: 708-296-9332 URL: http://www.ibm.com	MPR-PPC-RPU-02

Table A-3. Related Specifications (Continued)

Document Title and Source	Publication Number
IEEE Standard for Local Area Networks: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications Institute of Electrical and Electronics Engineers, Inc. Publication and Sales Department 345 East 47th Street New York, New York 10017-21633 Telephone: 1-800-678-4333 URL: http://www.ieee.com/	IEEE 802.3
Information Technology - Local and Metropolitan Networks - Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications Global Engineering Documents 15 Inverness Way East Englewood, CO 80112-5704 Telephone: 1-800-854-7179 Telephone: (303) 792-2181 *(This document can also be obtained through the national standards body of member countries.)*	ISO/IEC 8802-3
Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange (EIA-232-D) Electronic Industries Association Engineering Department 2001 Eye Street, N.W. Washington, D.C. 20006 http://www.eia.org/	ANSI/EIA-232-D Standard

Specifications B

MVME2700 Board Specifications

Table B-1 lists the general specifications for MVME2700 series VMEmodules. Subsequent sections detail cooling requirements and FCC compliance.

A complete functional description of the MVME2700 appears in *Chapter 5*. Specifications for the optional PCI mezzanines can be found in the documentation for those modules.

Table B-1. MVME2700 Specifications

Characteristics	Specifications
Power requirements (Excluding PMC module, transition module, external AUI transceiver)	+5Vdc (±5%), 5.5A typical, 6.5A maximum +12Vdc (±10%), 250mA typical, 500mA maximum –12Vdc (±10%), 100mA typical, 250mA maximum
Operating temperature	0°C to 55°C entry air with forced-air cooling (refer to *Cooling Requirements* section)
Nonoperating/storage temperature	–40°C to +85° C
Relative humidity	5% to 90% (non-condensing)
Physical dimensions Base board only Height Depth Width Base board with front panel and connectors Height Depth Front panel width	Double-high VMEboard 9.2 in. (233 mm) 6.3 in. (160 mm) 0.8 in. (19.8mm) 10.3 in. (262 mm) 7.4 in. (188 mm) 0.8 in. (20mm)

B

Cooling Requirements

The Motorola MVME2700 family of single-board computers is specified, designed, and tested to operate reliably with an incoming air temperature range from 0° to 55° C (32° to 131° F) with forced air cooling of the entire assembly (base board and modules) at a velocity typically achievable by using a 100 CFM axial fan. Temperature qualification is performed in a standard Motorola VMEsystem chassis. Twenty-five-watt load boards are inserted in two card slots, one on each side, adjacent to the board under test, to simulate a high power density system configuration. An assembly of three axial fans, rated at 100 CFM per fan, is placed directly under the VME card cage. The incoming air temperature is measured between the fan assembly and the card cage, where the incoming airstream first encounters the module under test. Test software is executed as the module is subjected to ambient temperature variations. Case temperatures of critical, high power density integrated circuits are monitored to ensure component vendors' specifications are not exceeded.

While the exact amount of airflow required for cooling depends on the ambient air temperature and the type, number, and location of boards and other heat sources, adequate cooling can usually be achieved with 10 CFM and 490 LFM flowing over the module. Less airflow is required to cool the module in environments having lower maximum ambients. Under more favorable thermal conditions, it may be possible to operate the module reliably at higher than 55° C with increased airflow. It is important to note that there are several factors, in addition to the rated CFM of the air mover, which determine the actual volume and speed of air flowing over a module.

EMC Compliance

The MVME2700 is a board-level product and is meant to be used in standard VME applications. As such, it is the responsibility of system integrators to meet the regulatory guidelines pertaining to a given application. The MVME2700 has been tested in a representative chassis for CE class B EMC certification. Compliance was achieved under the following conditions:

- Shielded cables on all external I/O ports.
- Cable shields connected to earth ground via metal shell connectors bonded to a conductive module front panel.
- Conductive chassis rails connected to earth ground. This provides the path for connecting shields to earth ground.
- Front panel screws properly tightened.

For minimum RF emissions, it is essential that the conditions above be implemented. Failure to do so could compromise the EMC compliance of the equipment containing the module.

Serial Interconnections C

Introduction

As described in previous chapters of this manual, the MVME2700 serial communications interface has four ports. Two of them are combined synchronous/asynchronous ports; the other two are asynchronous only. Both synchronous and asynchronous ports supply an EIA-232-D DCE/DTE interface via P2 and the MVME712M transition module.

Asynchronous Serial Ports

The MVME2700 uses a PC87308 ISASIO chip from National Semiconductor to implement the two asynchronous serial ports (in addition to the disk drive controller, parallel I/O, and keyboard/mouse interface).

The asynchronous ports provided by the ISASIO device are routed through P2 and the associated transition module. The TTL-level signals from the ISASIO chip are buffered through TTL drivers and series resistors, then routed through EIA-232-D drivers and receivers to complete the asynchronous serial interface enroute to the MVME712M transition module.

The MVME2700 hardware supports asynchronous serial baud rates of 110B/s to 38.4Kb/s. For detailed programming information, refer to the PCI and ISA bus discussions in the *MVME2600 Series Single Board Computer Programmer's Reference Guide* and to the vendor documentation for the ISASIO device.

Synchronous Serial Ports

The MVME2700 uses a Zilog Z85230 ESCC (Enhanced Serial Communications Controller) with a 10MHz clock to implement the two synchronous/asynchronous serial communications ports, which are routed through P2 to the transition module. The Z85230 handles both

synchronous (SDLC/HDLC) and asynchronous protocols. The hardware supports asynchronous serial baud rates of 110B/s to 38.4Kb/s and synchronous baud rates of up to 2.5Mb/s.

Each port 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 device is used to provide the missing modem lines.

EIA-232-D Connections

The EIA-232-D standard defines the electrical and mechanical aspects of this serial interface. The interface employs unbalanced (single-ended) signaling and is generally used with DB25 connectors, although other connector styles (such as DB9 and RJ45) are sometimes used as well.

Table C-1 lists the standard EIA-232-D interconnections. Not all pins listed in the table are necessary in every application.

To interpret the information correctly, remember that the EIA-232-D serial interface was developed to connect a terminal to a modem. Serial data leaves the sending device on a Transmit Data (TxD) line and arrives at the receiving device on a Receive Data (RxD) line. When computing equipment is interconnected without modems, one of the units must be configured as a terminal (Data Terminal Equipment: DTE) and the other as a modem (Data Circuit-terminating Equipment: DCE). Since computers are normally configured to work with terminals, they are said to be configured as a modem in most cases.

Notes

1. A high EIA-232-D signal level is +3 to +15 volts. A low level is –3 to –15 volts. Connecting units in parallel may produce out-of-range voltages and is contrary to specifications.
2. The EIA-232-D interface is intended to connect a terminal to a modem. When computers are connected without modems, one computer must be configured as a modem and the other as a terminal.

Table C-1. EIA-232-D Interconnect Signals

Pin Number	Signal Mnemonic	Signal Name and Description
1		Not used.
2	TxD	**Transmit Data**. Data to be transmitted; input to modem from terminal.
3	RxD	**Receive Data**. Data which is demodulated from the receive line; output from modem to terminal.
4	RTS	**Request To Send**. Input to modem from terminal when required to transmit a message. With RTS off, the modem carrier remains off. When RTS is turned on, the modem immediately turns on the carrier.
5	CTS	**Clear To Send**. Output from modem to terminal to indicate that message transmission can begin. When a modem is used, CTS follows the off-to-on transition of RTS after a time delay.
6	DSR	**Data Set Ready**. Output from modem to terminal to indicate that the modem is ready to send or receive data.
7	SG	**Signal Ground**. Common return line for all signals at the modem interface.
8	DCD	**Data Carrier Detect**. Output from modem to terminal to indicate that a valid carrier is being received.
9-14		Not used.
15	TxC	**Transmit Clock** (DCE). Output from modem to terminal; clocks data from the terminal to the modem.
16		Not used.
17	RxC	**Receive Clock**. Output from terminal to modem; clocks input data from the terminal to the modem.
18, 19		Not used.
20	DTR	**Data Terminal Ready**. Input to modem from terminal; indicates that the terminal is ready to send or receive data.
21		Not used.
22	RI	**Ring Indicator**. Output from modem to terminal; indicates that an incoming call is present. The terminal causes the modem to answer the phone by carrying DTR true while RI is active.
23		Not used.
24	TxC	**Transmit Clock** (DTE). Input to modem from terminal; same function as TxC on pin 15.
25	BSY	**Busy**. Input to modem from terminal; a positive EIA signal applied to this pin causes the modem to go off-hook and make the associated phone busy.

Interface Characteristics

C

The EIA-232-D interface standard specifies all parameters for serial binary data interchange between DTE and DCE devices using unbalanced lines. EIA-232-D transmitter and receiver parameters applicable to the MVME2700 are listed in the following tables.

Table C-2. EIA-232-D Interface Transmitter Characteristics

Parameter	Value		Unit
	Minimum	Maximum	
Output voltage (with load resistance of 3000Ω to 7000Ω)	±8.5		V
Open circuit output voltage		±12	V
Short circuit output current (to ground or any other interconnection cable conductor)		±100	mA
Power-off output resistance	300		W
Output transition time (for a transition region of -3V to +3V and with total load capacitance, including connection cable, of less than 2500pF)		2	µs
Open circuit slew rate		30	V/µs

The MVME2700 conforms to EIA-232-D specifications. Note that although the EIA-232-D standard recommends the use of short interconnection cables not more than 50 feet (15m) in length, longer cables are permissible provided the total load capacitance measured at the interface point and including signal terminator does not exceed 2500pF.

Table C-3. EIA-232-D Interface Receiver Characteristics

Parameter	Value		Unit
	Minimum	Maximum	
Input signal voltage		±25	V
Input high threshold voltage		2.25	V
Input low threshold voltage	0.75		V
Input hysteresis	1.0		V
Input impedance ($-15V < V_{in} < +15V$)	3000	7000	W

EIA-530 Connections

The EIA-530 interface complements the EIA-232-D interface in function. The EIA-530 standard defines the mechanical aspects of this interface, which is used for transmission of serial binary data, both synchronous and asynchronous. It is adaptable to balanced (double-ended) as well as unbalanced (single-ended) signaling and offers the possibility of higher data rates than EIA-232-D with the same DB25 connector.

Table C-4 lists the EIA-530 interconnections that are available at MVME761 serial ports 3 and 4 (J7 and J8 on the board surface) when those ports are configured via serial interface modules as EIA-530 DCE or DTE ports.

Table C-4. MVME761 EIA-530 Interconnect Signals

Pin Number	Signal Mnemonic	Signal Name and Description
1		Not used.
2	TxD_A	**Transmit Data (A).** Data to be transmitted; output from DTE to DCE.
3	RxD_A	**Receive Data (A).** Data which is demodulated from the receive line; input from DCE to DTE.
4	RTS_A	**Request to Send (A).** Output from DTE to DCE when required to transmit a message.
5	CTS_A	**Clear to Send (A).** Input to DTE from DCE to indicate that message transmission can begin.
6	DSR_A	**Data Set Ready (A).** Input to DTE from DCE to indicate that the DCE is ready to send or receive data. In DCE configuration, always true.
7	SG	**Signal Ground.** Common return line for all signals.
8	DCD_A	**Data Carrier Detect (A)**. Receive line signal detector output from DCE to DTE to indicate that valid data is being transferred to the DTE on the RxD line.
9	RxC_B	**Receive Signal Element Timing—DCE (B).** Control signal that clocks input data.
10	DCD_B	**Data Carrier Detect (B).** Receive line signal detector output from DCE to DTE to indicate that valid data is being transferred to the DTE on the RxD line.
11	TxCO_B	**Transmit Signal Element Timing—DTE (B).** Control signal that clocks output data.

C

Table C-4. MVME761 EIA-530 Interconnect Signals

Pin Number	Signal Mnemonic	Signal Name and Description
12	TxC_B	**Transmit Signal Element Timing—DCE (B).** Control signal that clocks input data.
13	CTS_B	**Clear to Send (B).** Input to DTE from DCE to indicate that message transmission can begin.
14	TxD_B	**Transmit Data (B).** Data to be transmitted; output from DTE to DCE.
15	TxC_A	**Transmit Signal Element Timing—DCE (A).** Control signal that clocks input data.
16	RxD_B	**Receive Data (B).** Data which is demodulated from the receive line; input from DCE to DTE.
17	RxC_A	**Receive Signal Element Timing—DCE (A).** Control signal that clocks input data.
18	RTS_B	**Request to Send (B).** Output from DTE to DCE when required to transmit a message.
19	LL_A	**Local Loopback (A).** Reroutes signal within local DCE. In DTE configuration, always tied inactive and driven false. In DCE configuration, ignored
20	DTR_A	**Data Terminal Ready (A).** Output from DTE to DCE indicating that the DTE is ready to send or receive data.
21	RL_A	**Remote Loopback (A).** Reroutes signal within remote DCE. In DTE configuration, always tied inactive and driven false. In DCE configuration, ignored.
22	DSR_B	**Data Set Ready (B).** Input to DTE from DCE to indicate that the DCE is ready to send or receive data. In DCE configuration, always true.
23	DTR_B	**Data Terminal Ready (B).** Output from DTE to DCE indicating that the DTE is ready to send or receive data.
24	TxCO_A	**Transmit Signal Element Timing—DTE (A).** Control signal that clocks output data.
25	TM_A	**Test Mode (A).** Indicates whether the local DCE is under test. In DTE configuration, ignored. In DCE configuration, always tied inactive and driven false.

Interface Characteristics

In specifying parameters for serial binary data interchange between DTE and DCE devices, the EIA-530 standard assumes the use of balanced lines, except for the Remote Loopback, Local Loopback, and Test Mode lines, which are single-ended. Balanced-line data interchange is generally employed in preference to unbalanced-line data interchange where any of the following conditions prevail:

- The interconnection cable is too long for effective unbalanced operation.
- The interconnection cable is exposed to extraneous noise sources that may cause an unwanted voltage in excess of ±1V measured differentially between the signal conductor and circuit ground at the load end of the cable, with a 50Ω resistor substituted for the transmitter.
- It is necessary to minimize interference with other signals.
- Inversion of signals may be required (e.g., plus polarity MARK to minus polarity MARK may be achieved by inverting the cable pair).

EIA-530 interface transmitter and receiver parameters applicable to the MVME2700 are listed in the following tables.

Table C-5. EIA-530 Interface Transmitter Characteristics

Parameter	Value		Unit
	Minimum	Maximum	
Differential output voltage (absolute, with 100Ω load)	2.0		V
Open circuit differential voltage output (absolute)		6.0	V
Output offset voltage (with 100Ω load)	2.0		V
Short circuit output current (for any voltage between –7V and +7V)		±180	mA
Power off output current (for any voltage between –7V and +7V)		±100	µA
Output transition time (with 100Ω, 15pF load)		15	ns

Table C-6. EIA-530 Interface Receiver Characteristics

Parameter	Value		Unit
	Minimum	Maximum	
Differential input voltage		±12	V
Input offset voltage		±12	V
Differential input high threshold voltage		200	mV
Differential input low threshold voltage		–200	V
Input hysteresis	1.0		V
Input impedance (–15V < V_{in} < +15V)	3000	7000	W

Proper Grounding

An important subject to consider is the use of ground pins. There are two pins labeled GND. Pin 7 is the *signal ground* and must be connected to the distant device to complete the circuit. Pin 1 is the *chassis ground*, but it must be used with care. The chassis is connected to the power ground through the green wire in the power cord and must be connected to be in compliance with the electrical code.

The problem is that when units are connected to different electrical outlets, there may be several volts of difference in ground potential. If pin 1 of each device is interconnected with the others via cable, several amperes of current could result. This condition may not only be dangerous for the small wires in a typical cable, but may also produce electrical noise that causes errors in data transmission. That is why Table C-1 and Table C-4 show no connection for pin 1. Normally, pin 7 (*signal ground*) should only be connected to the *chassis ground* at one point; if several terminals are used with one computer, the logical place for that point is at the computer. The terminals should not have a connection between the logic ground return and the chassis.

Troubleshooting CPU Boards: Solving Startup Problems

D

Introduction

In the event of difficulty with your CPU board, try the simple troubleshooting steps on the following pages before calling for help or sending the board back for repair. Some of the procedures will return the board to the factory debugger environment. The board was tested under these conditions before it left the factory. The self-tests may not run in all user-customized environments.

Table D-1. Troubleshooting MVME2700 Boards

Condition	Possible Problem	Try This:
I. Nothing works, no display on the terminal.	A. If the FUS (or CPU) LED is not lit, the board may not be getting correct power.	1. Make sure the system is plugged in. 2. Check that the board is securely installed in its backplane or chassis. 3. Check that all necessary cables are connected to the board, per this manual. 4. Check for compliance with System Considerations, per this manual. 5. Review the Installation and Startup procedures, per this manual. They include a step-by-step powerup routine. Try it.
	B. If the LEDs are lit, the board may be in the wrong slot.	1. For VMEmodules, the CPU board should be in the first (leftmost) slot. 2. Also check that the “system controller” function on the board is enabled, per this manual.
	C. The “system console” terminal may be configured incorrectly.	Configure the system console terminal per this manual.

D

Table D-1. Troubleshooting MVME2700 Boards (Continued)

Condition	Possible Problem	Try This:
II. There is a display on the terminal, but input from the keyboard and/or mouse has no effect.	A. The keyboard or mouse may be connected incorrectly.	Recheck the keyboard and/or mouse connections and power.
	B. Board jumpers may be configured incorrectly.	Check the board jumpers per this manual.
	C. You may have invoked flow control by pressing a HOLD or PAUSE key, or by typing**:** **<CTRL>-S**	Press the HOLD or PAUSE key again. If this does not free up the keyboard, type in: **<CTRL>-Q**
III. Debug prompt `PPC1-Bug>` does not appear at powerup, and the board does not autoboot.	A. Debugger EPROM/Flash may be missing	1. Disconnect *all* power from your system. 2. Check that the proper debugger EPROM or debugger Flash memory is installed per this manual. 3. Reconnect power. 4. Restart the system by "double-button reset": press the RESET and ABORT switches at the same time; release RESET first, wait seven seconds, then release ABORT. 5. If the debug prompt appears, go to step IV or step V, as indicated. If the debug prompt does not appear, go to step VI.
	B. The board may need to be reset.	

Table D-1. Troubleshooting MVME2700 Boards (Continued)

Condition	Possible Problem	Try This:
IV. Debug prompt `PPC1-Bug>` appears at powerup, but the board does not autoboot.	A. The initial debugger environment parameters may be set incorrectly.	1. Start the onboard calendar clock and timer. Type: **set *mmddyyhhmm* <CR>** where the characters indicate the month, day, year, hour, and minute. The date and time will be displayed.
	B. There may be some fault in the board hardware.	**Caution** Performing the next step (**env;d**) will change some parameters that may affect your system's operation.
		(continues>)

D

Table D-1. Troubleshooting MVME2700 Boards (Continued)

Condition	Possible Problem	Try This:
IV. *Continued*		2. At the command line prompt, type in: **env;d <CR>** This sets up the default parameters for the debugger environment. 3. When prompted to Update Non-Volatile RAM, type in: **y <CR>** 4. When prompted to Reset Local System, type in: **y <CR>** 5. After clock speed is displayed, immediately (within five seconds) press the Return key: **<CR>** or **BREAK** to exit to the System Menu. Then enter a 3 for "Go to System Debugger" and Return: **3 <CR>** Now the prompt should be: `PPC1-Diag>` 6. You may need to use the **cnfg** command (see your board Debugger Manual) to change clock speed and/or Ethernet Address, and then later return to: **env <CR>** and step 3. 7. Run the selftests by typing in: **st <CR>** The tests take as much as 10 minutes, depending on RAM size. They are complete when the prompt returns. (The onboard selftest is a valuable tool in isolating defects.) 8. The system may indicate that it has passed all the selftests. Or, it may indicate a test that failed. If neither happens, enter: **de <CR>** Any errors should now be displayed. If there are any errors, go to step VI. If there are no errors, go to step V.

Table D-1. Troubleshooting MVME2700 Boards (Continued)

Condition	Possible Problem	Try This:
V. The debugger is in system mode and the board autoboots, or the board has passed self-tests.	A. No apparent problems — troubleshooting is done.	No further troubleshooting steps are required.
VI. The board has failed one or more of the tests listed above, and cannot be corrected using the steps given.	A. There may be some fault in the board hardware or the on-board debugging and diagnostic firmware.	1. Document the problem and return the board for service. 2. Phone 1-800-222-5640.
TROUBLESHOOTING PROCEDURE COMPLETE.		

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