Guide to VME Modules
Open Architecture Systems

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MODCOMP

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Introduction

Open Architecture Systems

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Preface

This document provides overview and installation information common to a variety of VME modules supported on MODCOMP open architecture computer systems. Each individual VME module also has its own *Guide to VME Modules* document; this *Introduction* is intended to be used along with the *Guide to VME Modules* for each product to obtain complete installation and configuration information.

Audience

This manual is written for personnel responsible for installing VME cards and device drivers. Readers of this document should be familiar with the purpose and location of the major hardware components of their computer system, general hardware cabling procedures, software installation procedures, and the sysgen process for the REAL/IX Operating System.

Product Requirements

- MODCOMP Open Architecture Computer System
- REAL/IX Operating System

MODCOMP Service and Assistance

MODCOMP offers a variety of programs and services that demonstrate our commitment to customer satisfaction. Our Technical Education department provides comprehensive hands-on instruction either at our facilities or at customer-designated sites. Our worldwide field service organization is ready to give installation assistance, free service during the warranty period, and flexible service programs tailored to your requirements.

Questions, Problems, and Suggestions

Your MODCOMP sales and service representatives can help you with any questions, problems, or suggestions you may have for our products and services. In addition, for your convenience MODCOMP maintains toll-free telephone numbers at which we can be reached for questions, problems, and suggestions. Please feel free to use the following numbers:

- **For questions, sales information, or suggestions:** in the U.S. and Canada, 1–800–255–2066 (Outside the U.S. and Canada, please call your regional sales support office or 1–305–974–1380 extension 1800 worldwide.)
- **For service:** in the U.S., 1–800–327–8928; in Canada, 1–416–890–0666 (Outside the U.S. and Canada, please call your regional service/support office.)
- **For Technical Education information:** in the U.S., 1–305–977–1708 (Outside the U.S., please call your regional support office.)

For comments about documentation, please use the response form at the back of this manual.

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About VME Modules

A variety of VME modules are supported on MODCOMP® open architecture computer systems. These modules are available as add-on options to your base system and will be factory-installed if you purchase them at the same time as your base system. Otherwise, the VME modules can easily be installed in the field for existing systems.

Some modules may be the basic components for your system, such as the host CPU and memory. Several target processor modules are also available for multicomputer configurations.

Other VME modules provide a variety of communication and process I/O interfaces. The communication interfaces allow you to connect MODCOMP systems to various I/O devices that are compatible with industry-standard protocols. Many of these interfaces can also be used in multiprocessor configurations between two MODCOMP systems, or between a MODCOMP system and another computer system that supports the same communications protocol.

A number of MODACS 90 modules are available for data acquisition applications that monitor fewer than 300 points. These modules support basic analog input and output, change-of-state, counter, and timer capabilities. External signal conditioning modules, which are not part of the MODACS 90 product line, are required for points such as thermocouple, strain gauge, resistive thermal device, and high-level AC or DC inputs or outputs. The total number of MODACS 90 modules and the type used depend on the particular application and the availability of VMEbus slots in your system.

Each VME module typically consists of the following items:

- VME card
- Device driver
- Transition module
- Cables
- Utility software and/or user interface library
- Documentation

For some products the transition module, which provides the mechanism for user device connections, is required; for other products, the transition module may be optional.

FCC Compliance

Systems equipped with VME modules that are factory-installed by MODCOMP comply with the limits for Class A computing devices pursuant to CFR 47 part 15 Subpart B of the FCC rules. To maintain FCC compliance when adding a VME module to an existing system in the field, the VME module must be installed exactly according to the instructions contained in this document and in the specific *Guide to VME Modules* document for the product. Further, in the tower-style and meter-high cabinets, if the product includes a transition module, the transition module must be installed and used for any external cable connections.

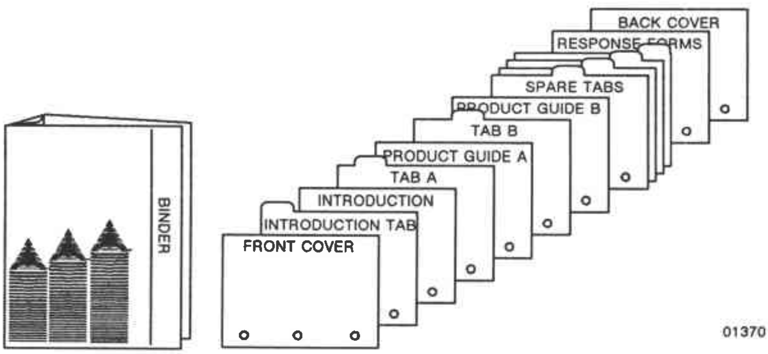
About this Guide

This guide is the introductory document in a set of documents collectively referred to as the *Guide to VME Modules*. It is supplied as part of your base computer system documentation set. The other guides in the set present information about particular VME modules supported on the open architecture systems. When you purchase one of the VME modules, you will receive the *Guide to VME Modules* document for that product.

This *Introduction* contains information that is common to all of the VME modules. When you install any of these modules in your system, you will need this *Introduction* and the specific product guide. The combination of these two documents will provide you with complete instructions for the hardware and software installation of a VME module.

Assembling Your Guide

The basic elements supplied to assemble your set of *Guide to VME Modules* include the binder, binder title card, tabs for the *Introduction* document (this one) and the individual product guides, several documentation response forms, and the front and back covers.



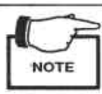
Place the heavy stock front cover and Introduction tab at the very front of the binder, followed by this *Introduction* document. Place other product guides for your system components in back of their related tabs. Place the documentation response forms and heavy stock back cover (originally packaged with this *Introduction* document) at the very back of the binder, behind all of the product guides.

By keeping your set of *Guide to VME Modules* current, adding product guides as you add VME modules to your system, your documentation will always reflect your site configuration of VME modules. For easy reference, ample blank space is provided on the binder title card for you to write in the product guides contained in the binder.

Note that hardcopy versions of online manual pages related to the product may be included at the end of each guide. These are intended to be removed and placed in the 7A section of the *REAL/IX® Reference Manual*. See page 7 for more information on the 7A manual pages.

Documentation Conventions

The following table gives the documentation conventions used in this document and the individual product guides.

Style	Item	Example
bold	REAL/IX shell commands	**sysgen** *or* **sysgen**(1M)
italics	File names	*/dev/gpib2*
`monofont`	Code samples	`#include <fcntl.h>`
bold	Literal text in example	**cat** *filename*
italics	Variable text in example	
	*The WARNING icon highlights software information that, if not observed, could cause a system failure or damage existing data on the system. In hardware information, it highlights a procedure, practice, condition, or statement that, if not strictly observed, could result in injury or death of personnel.*	
	*The CAUTION icon highlights software information that could cause a procedure or practice to fail but is not likely to cause a system failure or damage existing data. In hardware information, it highlights a procedure, practice, condition, or statement that, if not strictly observed, could result in damage to the equipment.*	
	*The NOTE icon highlights relevant software information that does not require a caution or warning. In hardware information, it highlights essential procedures, conditions, or statements.*	
	*The HINT icon identifies material that is indirectly related to the subject matter being discussed. For instance, a procedure may specify one way of doing the task, and the HINT would explain why it is done this way or optional ways of accomplishing the same task.*	

Organization of VME Product Guides

Each VME product guide follows the same organizational structure and covers the following topics:

- An *Introduction* section that gives an overview of the product's application and lists the hardware and software that make up the complete VME module product package.
- A *Software* section that describes each of the product's software components and its purpose.
- A *Hardware* section that describes each of the product's major hardware items, including illustrations to locate and identify installation-related components. Tables listing the pin assignments of interconnecting cable connectors are also presented.
- An *Installation* section that explains how to install both the hardware and software. The hardware installation section includes information about slot placement for the card in the VME chassis, hardware-selectable options set by jumpers and/or switches on the card, and connecting transition modules (if applicable) and cables.

  The software installation sections describe installing the software from the release tape and rebuilding the operating system using **sysgen**(1M). The detailed instructions for installing the software from the release tape and using sysgen to rebuild the operating system are presented in this *Introduction* document because the procedure is basically the same for all VME modules. Any information that supplements or differs from this is given in the product guide.

  NOTE

  The Installation section in each product guide references information in this Introduction document. By keeping this Introduction and the other product guides together in the same binder, you can easily reference both documents as needed during installation.

- An *Installation Verification* section that describes board-level tests that are performed on the card when it is first powered up.

Related Publications

The following manuals contain information about the MODCOMP open architecture hardware and the REAL/IX Operating System that you might find useful as reference material related to the topics addressed in this document and the individual product guides.

- *VMEbus-Based Computers System Guide*
  This is the top document in your hardware documentation set for VMEbus-based CPUs. It introduces the system's basic features; describes the different cabinet types and illustrates major cabinet component locations; and gives unpacking, operation, and preventive maintenance procedures.

- *Quadbus-Based Computers System Guide*
  This is the top document in your hardware documentation set for Quadbus-based CPUs. It covers the same topics as the *VMEbus-Based Computers System Guide*.

- *REAL/IX System Administrator's Guide*
  Gives instructions and background information about administering the operating system. Topics include system security, user/group IDs, file systems, setting up terminals and printers, using the **sysgen**(1M) utility, and job accounting.

- *REAL/IX Driver Development Guide*
  Introduces the process of writing drivers, including detailed information on porting and installing drivers. Can also be used to obtain information about the meaning of **sysgen** descriptors for standard device drivers.

- *REAL/IX Reference Manuals* (set of 3)
  Sections 1, 1M, and 1R
  Sections 2, 3, and 5
  Sections 4, 7, and 7A
  A set of three books that contain manual pages for user commands (1), administrative commands (1M), realtime commands (1R), system calls (2), library routines (3C, 3M, 3N, 3S, 3X), miscellaneous information (5), system files (4), and special device files for standard devices (7). Section 7A is for special device files for add-on packages; it contains only a tab labeled "Add-On Packages (7A)." The individual 7A manual pages are provided at the back of the guide for the particular add-on package. You should remove these pages from the product guide and insert them behind the Section 7A tab in the *Reference Manual*.

Additional information about the VMEbus environment is available in ANSI/IEEE Standard 1014–1987, *IEEE Standard for a Versatile Backplane Bus: VMEbus*.

Vendor Publications

You may also receive one or more vendor publications with each VME module that you purchase. The vendor documents provide information about the VME card, including board specifications, memory maps, interrupt processing, and status and control registers on the card. Each individual product guide has a "Related Publications" section that lists relevant vendor documents as well as any ANSI/IEEE standards publications that may apply.

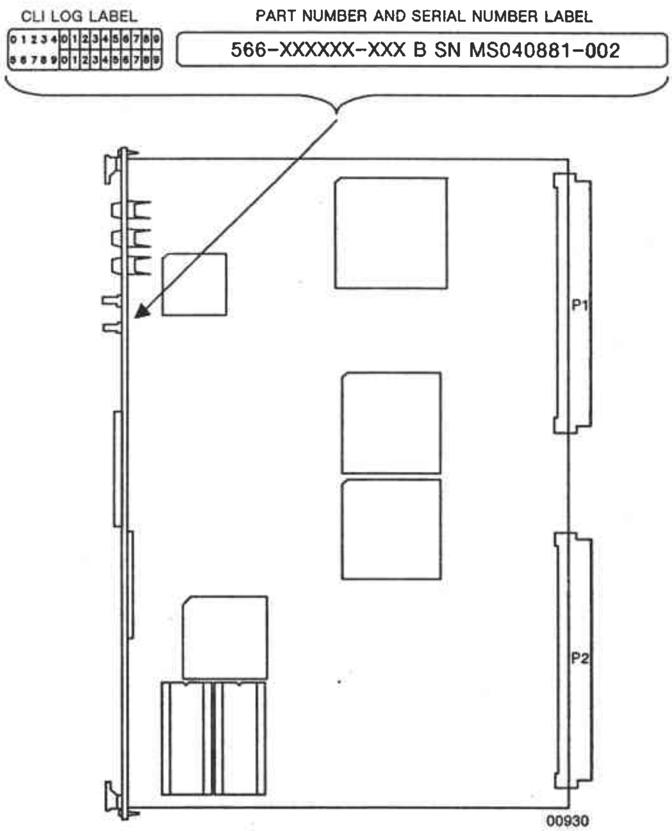
README Files and Man Pages

Additional sources of information for specific VME modules include README files and REAL/IX manual ("man") page documentation that may be installed by each product's installation procedure.

The manual pages contain product-specific information such as device naming conventions and **ioctl**(2) system calls supported by the particular driver. Hardcopy versions of these pages are included at the back of each product guide. These pages are intended to be placed in your *REAL/IX Reference Manual* as described in the "Related Publications" section on page 6. As with all other REAL/IX manual page documentation, online versions of these pages are available through the **man**(1) command.

Ordering Spare Parts

To order VME cards as spares or replacements, locate the 12-digit MODCOMP part number on the card. This number begins with the prefix 566 and is the number that should be used for ordering the card. The part number is printed on a label that is usually affixed to the rear face of the card's front panel, as shown below. (Depending on the card, the location of the part number label may be different from that shown.)



VME Chassis

The open architecture computer systems are housed in a variety of different cabinet types, each of which supports a varying number of VME slots:

- Desktop cabinet – 6 slots
- Tower-style cabinet – 9 slots
- Meter-high cabinet – fixed 20 slots, or a maximum of 20 slots in combinations of 6-, 10-, and 20-slot backplanes

Taller versions of the meter-high cabinet are also available for some configurations. These cabinets can contain a maximum of 20 VMEbus slots in combinations of 6-, 10-, and 20-slot backplanes.

After taking into account slots used for basic system modules such as the CPU and memory (if these modules connect to the VMEbus), the remaining number of slots in the VME chassis and mounting locations in the transition module mounting bay slots will determine how many additional VME modules your system can accommodate.

Some configurations support a VME chassis with vertically mounted slot locations, while other configurations support a VME chassis with horizontally mounted slot locations (called the Universal VME chassis or UVME). The UVME is a self-contained chassis that contains all of the components of the VME I/O subsystem, including slots for VME cards and the VMEbus backplane, a peripheral mounting bay, fans, air filter, and power supplies for the entire chassis. With vertically mounted slots, the peripheral mounting locations, fans, air filter, and power supplies are within the cabinet but outside of the VME chassis itself.

For the purpose of installing VME modules, you will need to know the location of the major mounting locations in your system, specifically the VME slots, backplane, backplane jumpers, and transition module mounting bay. Your *System Guide* provides specific information on the major component locations and internal access procedures for the different cabinet types.

VMEbus Backplane

The VMEbus backplane is part of the VME chassis, which mechanically supports the backplane, provides mechanical guides for installing VME cards, and provides a means of securing a VME card in its backplane slot. Figure 1 shows the rear view of a VMEbus backplane where the slots are mounted vertically; Figure 2 shows the rear view of a VMEbus backplane where the slots are mounted horizontally. For the purpose of pointing out the major components, a 6-slot configuration is shown, although it is representative of other configurations with more than six slots.

Note that in some documentation, the rear of the backplane is sometimes referred to as the pin side.

The slots on the backplane are numbered sequentially, starting at 1. Each slot has two 96-pin, triple-row connectors (rows A, B, and C). The connectors for each slot are designated as the J1 and J2 connectors by the naming conventions established in the VMEbus specification. For vertically mounted slots, the J1 connectors for each slot are the top row of connectors and the J2 connectors for each slot are the bottom row of connectors. For horizontally mounted slots, the J1 connectors are on the right while the J2 connectors are on the left.

Other terms that may be used in describing the two portions of the backplane, again taken from the VMEbus specification, are the J1 backplane and J2 backplane.

The J1 connector contains the utility and control signals for the VMEbus as well as the first 16 data lines and 24 address lines. Row B of the J2 connector contains the rest of the address and data signals that expand the VMEbus to a full 32-bit bus. The pins in rows A and C of the J2 connector are specific to each VME card and may carry signals specific to the card's application. Each individual VME product guide lists any application-specific signals for the connectors.

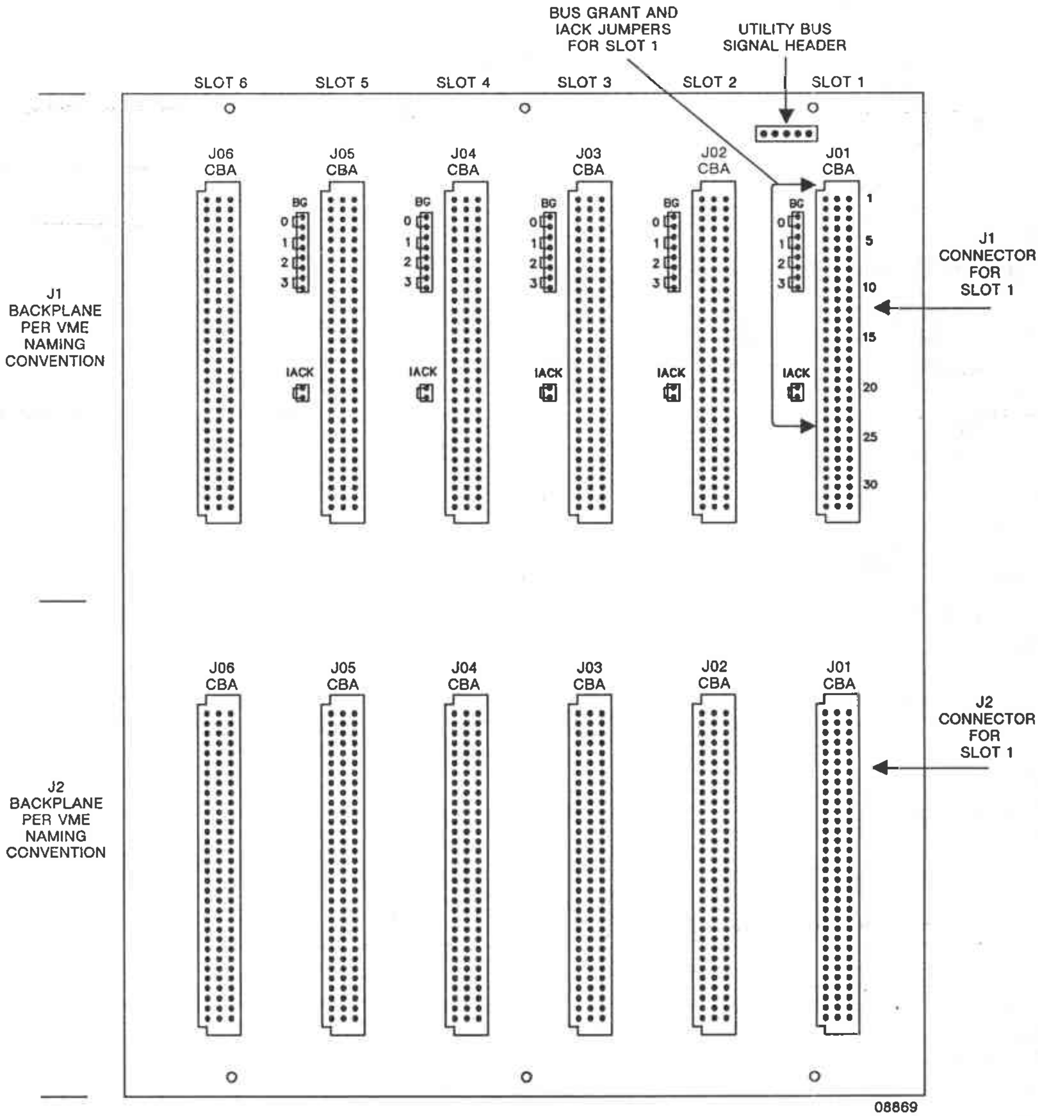


Figure 1. VMEbus Backplane – Vertically Mounted Slots

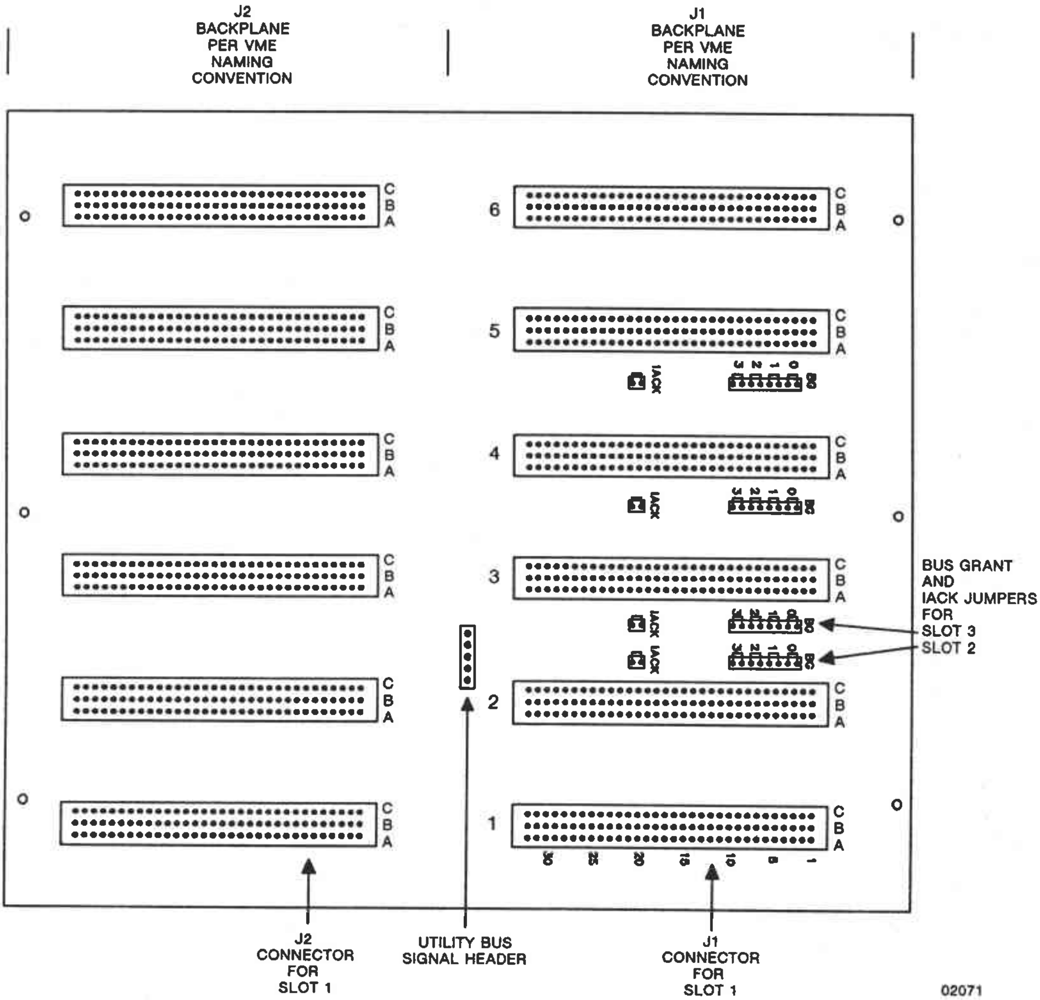


Figure 2. VMEbus Backplane – Horizontally Mounted Slots

VMEbus Backplane Jumpers

Some slots on the VMEbus backplane have their own bus grant (BG) and interrupt acknowledge (IACK) daisy-chain jumpers. Together, these jumpers are referred to as the VMEbus backplane jumpers.

In chassis with vertically mounted slots, the VMEbus backplane jumpers for a particular slot are to the left of the slot position on the backplane, between that slot and the next higher numbered slot. For example, the backplane jumpers for slot 4 are between slots 4 and 5 (see Figure 1). There are no backplane jumpers for the last slot because it is at the end of the BG and IACK daisy-chain.

In chassis with horizontally mounted slots, there are no BG or IACK jumpers on the backplane for the first and last slots. As shown in Figure 2, the backplane jumpers for slots 2 and 3 are between these two slot positions; the jumpers for slot 4 are between slots 3 and 4, etc.

The individual VME product guides give specific information for installing or removing jumpers on the backplane. In most cases, the VMEbus backplane jumpers will be removed for each slot in which a card is installed. In all cases, the VMEbus backplane jumpers must be installed in empty VMEbus slots.

NOTE

Loss of signal caused by missing jumpers in the BG daisy-chain will prevent a card from accessing the VMEbus. Loss of signal caused by missing jumpers in the IACK daisy-chain will prevent a card from having its interrupt serviced, causing the CPU to lock up or vector to a bad address when the card generates an interrupt.

Transition Modules

Some VME modules may also come with transition modules that are installed in the transition module mounting bay of the cabinet. The transition module is usually a small circuit board with its own front panel that physically adapts I/O signals from the VMEbus backplane to standard I/O connectors available at the rear of the computer cabinet. There is generally an internal cable that connects the transition module to the J2 connector on the back of the VMEbus, usually at the slot where its associated VME card is installed. An alternative type of interconnection connects the transition module to the front panel connectors of its associated VME card.

For some VME modules, a transition module is optional, while in others it is required. For VME modules where a transition module is optional and not used, device cables generally connect directly to the connectors on the front panel of the card.

NOTE

In the tower-style and meter-high cabinets, transition modules should be used for external cable connections to maintain FCC compliance.

Installing VME Modules

The following list presents the sequence of steps for installing a VME module. Common elements of this process, such as software installation and general sysgen procedures, are described in more detail later in this document. Any information unique to a specific VME module, such as special sysgen requirements or configuration utilities, is explained in the guide for that product.

WARNING!

Be sure to turn off the power to the computer system before installing or removing VME cards. Also use proper protection against damage to MOS devices from electrostatic discharge. Refer to your System Guide for details on these procedures.

1. Power down the system. Be sure to bring the system down in an orderly fashion to preserve the integrity of the file system. Refer to your host CPU documentation and to the *REAL/IX System Administrator's Guide* for information about the proper power-down procedures.

2. Select a VMEbus slot for the card you are installing. General guidelines to consider when making this decision are given in the section "Slot Selection Guidelines" on page 17. These guidelines give recommended placement of cards relative to other cards already installed in the VME chassis. No specific slot assignments are given.

3. Set any jumpers and switches on the card as described in the product guide.

4. Mechanically install the card in the slot selected in step 2. In most cases you will also need to remove the VMEbus backplane jumpers for that slot. Refer to the product guide for specific instructions on which VMEbus backplane jumpers, if any, should be removed.

5. You may also have a transition module with the type of card you are installing. Transition modules provide a convenient mechanism for connecting external device cables to the card. Transition modules, when used, are installed in the transition module mounting bay of the cabinet. There may be recommendations given in each product guide for placement of the transition module relative to its associated card in the VME chassis.

6. Depending on the particular card, there may be network or peripheral cables to install. Each product guide gives details about how to connect cables.

7. Power on the system and reboot the REAL/IX Operating System. These are standard system procedures; for more information, refer to your host CPU documentation and to the *REAL/IX System Administrator's Guide.*

8. Install the driver and any other software associated with the VME module. Software is loaded from the release tape by using the **installpkg** script of **sysadm**(1M). Step-by-step instructions for running this script are given in the section "Software Installation" on page 19.

Note that for some VME modules, the software may already be included in the operating system. In this case, a separate software installation is not required.

9. Rebuild the operating system. You can do this easily as part of the installation procedure because the **installpkg** script prompts as to whether or not you want to do this. Most VME modules are set up for a default configuration of one VME card per driver. If your configuration matches the defaults set up by the installation, you can answer **y** to the prompt and a sysgen will be run.

   You should answer **n** to this prompt if:

   - You are not sure that your sysgen is set up properly
   - You are installing more than the number of cards that are automatically enabled by the product's installation procedure
   - You want to change any of the default configuration parameters set up by the installation procedure

   In these cases, you will need to rebuild the operating system as a separate step. The section "sysgen Procedures" on page 22 gives more details on the different ways to do sysgen and when to use each. Special sysgen requirements unique to particular VME modules are given in the product guides.

10. After rebuilding the operating system, either as part of the installation procedure or as a separate step, halt and then reboot the system. The new operating system that is loaded will contain the VME driver as part of the operating system kernel.

11. Some VME modules may require you to run a configuration utility for each VME card. The configuration utility, if applicable, should be run after the driver is sysgened into the system.

Slot Selection Guidelines

This section presents guidelines for choosing the slot in which to install a VME card. Supplemental information about slot placement for particular VME cards may be given in each product guide.

- Unless you have certain requirements as to the bus request level for the VME card, there are no fixed rules for placing certain cards in a specific slot number. Usually the placement of cards depends on how the card is functioning within the system and what combination of cards are installed. The following guidelines are very general in nature; consult the product guide for each VME card to determine if they apply:

  - VMEbus system controller – slot 1
  - Slave only boards – between first and middle slots
  - Interrupter only boards – middle slots
  - Bus masters – usually last (higher-numbered) slots

- The VMEbus design incorporates a 2-step priority scheme for bus mastership. The first step takes into account the bus request level on which a card requests the bus. The levels are 0 through 3, with bus request level 3 being the highest priority. For cards assigned to the same bus request level and requesting the bus at the same time, the second step of the scheme takes into account the card's physical location in the VME chassis. Of two cards, for example, requesting the bus on the same bus request level and at the same time, the card closest to slot 1 will be granted bus mastership.

  For performance reasons, some cards can be jumpered to a null level, indicating they do not function as a bus master. See the specific product guide for details if applicable.

- The interrupt acknowledge (IACK) line is daisy-chained through most cards on the VMEbus, so cards with the highest frequency of IACK cycle usage should be placed in the middle slots of the chassis. Devices that have a lower frequency of IACK cycle usage should be placed in the last (higher-numbered) slots of the chassis.

- Bus grant (BG) lines are daisy-chained only through cards that are functioning as bus masters; thus the bus arbitration time is not affected by other types of cards that may reside on the VMEbus. These cards should be placed near the last (higher-numbered) slots of the chassis.

- VMEbus backplane jumpers must be installed in any empty slots that are left between occupied slots on the VMEbus. Otherwise, daisy-chained signals will be lost, thus preventing some cards from accessing the VMEbus and/or having their interrupts serviced.

- For quick testing of a new card, insert it into the last (highest-numbered) slot of the chassis. No VMEbus backplane jumpers need to be installed or removed because the card will be last in both the bus grant and interrupt acknowledge daisy-chains.

Module Base Address Assignments

The module base address is the specific starting address of the address space occupied by a particular card on the VMEbus. The address space of all cards on the VMEbus must be unique, that is, the address space of any two cards must not overlap. For each type of card, one or more unique base addresses are assigned by MODCOMP. These unique addresses are given in the product guides, and should be used when installing cards of the same type.

Base addresses for additional cards of the same type are not assigned unique addresses by MODCOMP. For these cards, addressed are assigned from a common pool of I/O device addresses. The important thing to remember about these addresses is that they are not unique to any particular type of card. This means, too, that they may have already been assigned to other cards on the VMEbus. The **sysgen**(1M) utility will inform you of any such address conflicts; it is the installer's responsibility to resolve any address conflicts in the configuration by assigning a unique address that does not conflict with other cards on the VMEbus.

Software Installation

Software for each VME module is installed by using the standard **sysadm**(1M) utility. **sysadm** is a menu-driven interface for performing a variety of system administration tasks, including software installation and removal. For a description of the full range of **sysadm** capabilities, refer to the *REAL/IX System Administrator's Guide* or to the **sysadm**(1M) man page documentation.

NOTE *Software for some VME modules is included with the REAL/IX Operating System. In such cases, there is no separate software installation and the following procedure does not apply.*

The following procedure lists the steps necessary to install the software for each VME module.

1. Log in as root.
2. Shut down the system to single-user mode:

   ```
   shutdown
   ```

3. Mount the */usr* file system (or the file system where the software is to be installed):

   ```
   mount /usr
   ```

4. Insert the release tape into the cartridge tape drive.
5. Invoke the **sysadm** utility:

   ```
   sysadm
   ```

6. Enter **2** at the first prompt to select the Software Management Menu.
7. Enter **1** at the next prompt to select the installpkg script.

HINT *Steps 5 – 7 can be combined into one step by entering:*

```
sysadm installpkg
```

During the installation, messages about files being installed and how much space they need will be displayed. After each message, you will be prompted whether or not to continue with the installation. Answer **y** to each question to continue, or **n** to stop the installation.

After all of the software is installed, you will be prompted whether or not you want to rebuild the operating system. If you answer **y**, a sysgen will be run using default parameters set up by the installation. These defaults are set up with a specific number of cards enabled; see the product guide for details on each default configuration.

If you rebuild the operating system as part of the installation, you can then shut down the system and reboot. The new operating system that will be loaded will contain the VME module's device driver as part of the operating system kernel.

You should answer **n** when prompted to rebuild the operating system if you are installing more than the number of cards enabled by default, or if you want to change any of the default card or driver parameters set up by the installation. You must then run sysgen as a separate step as described in the section "sysgen Procedures" on page 22.

Software Removal

The software for a VME module can be removed from your system with the **sysadm removepkg** script. The release tape originally used to install the software is required. Prior versions of VME module software must first be removed before installing a newer release.

NOTE *If the software for a VME module is included as part of the REAL/IX Operating System, it cannot be removed with the sysadm removepkg script. You can, however, disable the driver using the sysgen utility if you do not have any devices in your system that use the driver.*

To remove the software associated with a VME module, perform the following steps:

1. Log in as root.
2. Shut down the system to single-user mode:

   ```
   shutdown
   ```

3. Mount the */usr* file system (or the file system where the software was originally installed):

   ```
   mount /usr
   ```

4. Insert the original release tape into the cartridge tape drive.
5. Invoke the **sysadm** utility:

   ```
   sysadm
   ```

6. Enter **2** at the first prompt to select the Software Management Menu.
7. Enter **3** at the next prompt to select the removepkg script.

HINT *Steps 5 – 7 can be combined into one step by entering:*

```
sysadm removepkg
```

sysgen Procedures

This section explains the basic sysgen procedure for configuring VME modules into the operating system. It does not attempt to address unique sysgen requirements for specific VME modules; those are covered in the individual product guides.

This section assumes that you are familiar with the general REAL/IX sysgen process and the typing conventions used to modify or add sysgen information to the system configuration files. For additional information on these topics, refer to the sysgen chapter in the *REAL/IX System Administrator's Guide*.

sysgening One Card of a Type in the System

The software installation procedure for each VME module sets up default sysgen parameters for the VME card and driver. In most cases, these parameters can be used if you are installing the only VME card of its type in the system. For example, the DR11W installation sets up default sysgen parameters for the DR11W driver and one DR11W card.

In cases where you want to use the default parameters, you can rebuild the operating system as the last step in the installation procedure by answering **y** to the prompt. After the system is rebuilt, you can simply shut down the system and reboot. The new version of the operating system that is loaded will include the driver and one configured VME card as part of the operating system kernel.

sysgening Multiple Cards of the Same Type

If the sysgen parameters set up by the installation procedure are for one card and you are installing more than one card of the same type, sysgen cannot be run as part of the installation. In this case, answer **n** to the prompt about rebuilding the operating system at the last step in the installation procedure. You must then enable the additional cards by selecting them from the sysgen screens. The screens are presented when you invoke sysgen without any options.

Modifying sysgen Parameters

If you want to modify any sysgen parameters for the card or driver, you must invoke sysgen with the **-d** option. You can then change information as appropriate in the sysgen screens.

NOTE

Some modules may have restrictions or rules about modifications that can be made to the sysgen parameters for a card or driver. Always consult the product guide before modifying or adding sysgen parameters.

Manually Rebuilding the Operating System

If you answered **n** to the prompt to rebuild the operating system as the last step in the installation procedure, the operating system must be rebuilt manually. After you have enabled all installed cards and/or modified the card and driver sysgen parameters, enter **sysgen -gbi** to rebuild the operating system. After the new operating system is built, it can be loaded by first shutting down the system, then rebooting. The new operating system will include the driver and all configured cards as part of the operating system kernel.

Additional Steps for Some VME Modules

Some modules may also require you to initialize each VME card by running a configuration utility. Consult the product guide to see if this extra step is required.

Additionally, some modules may require you to manually set up special device files using the **mknod**(1M) command, although for most modules the special files are created as part of the installation procedure. Again, consult the product guide to see if this extra step is required.

sysgen Summary

The table below summarizes the basic VME module sysgen procedure. Refer to the individual product guides for information about any special sysgen requirements that may exist for each module.

sysgen Summary	
Use default sysgen parameters set up by installation procedure	Answer **y** when prompted to rebuild operating system. Shut down system, then reboot.
Enable more cards than provided by default sysgen parameters set up by installation procedure	Answer **n** when prompted to rebuild operating system. Invoke sysgen without options, enable additional cards in sysgen screens. Rebuild operating system with **sysgen −gbi**. Shut down system, then reboot.
Modify sysgen parameters for card(s) and/or driver	Answer **n** when prompted to rebuild operating system. Invoke sysgen with **−d** option, change information in sysgen screens as appropriate. Rebuild operating system with **sysgen −gbi**. Shut down system, then reboot.

Diagnostics

Stand-Alone System Diagnostics (SSD) or On-Line System Diagnostics (OSD) are optionally available for some VME modules. SSD runs without control of the REAL/IX Operating System and provides additional levels of hardware testing beyond any board-level tests that may execute at power-up. OSD tests run under the control of the operating system. The OSD package provides a menu interface program and on-line help for executing the tests. The OSD test suite includes exercisers for testing communication between the device and the device driver.

For more information on the availability of the diagnostics package for a particular VME module, contact your local sales representative.

SCSI Bus ID Assignments

This section applies to the SCSI bus in open architecture systems. Some CPUs, such as the MVME147, support an on-board internal SCSI controller, while in other systems support for the SCSI bus is provided through a separate controller card, the Intelligent SCSI Bus Adapter. This section applies equally to both types of SCSI controllers.

The SCSI standard assigns an ID in the range 0 – 7 to controllers on a SCSI bus. To identify physical or logical devices connected to a controller, the SCSI standard assigns logical unit numbers (LUNs) in the range 0 – 7. The composite address is usually expressed with the SCSI ID as the most significant digit and the LUN as the least significant digit. SCSI IDs are assigned as shown in Table 1. If you add a SCSI peripheral to the bus, select an available SCSI ID from the table and jumper the peripheral accordingly. SCSI bus IDs 6 and 7 are reserved for hosts, but the remaining IDs are available for added peripherals.

In systems with an MVME147 CPU, you must run the I/O teach (**iot**) command supported by the CPU firmware monitor level of operation if an added peripheral is to function as a device from which the operating system can be booted. Refer to the *MVME147 Host CPU Guide to VME Modules* for information about using the **iot** command.

Table 1. SCSI Bus ID Assignments

SCSI ID	Standard Assignment	Recommended Peripheral Type at This ID
0	Available	Disk
1	Available	Disk
2	Disk drive	Disk
3	Available	Disk
4	Tape drive	Tape
5	Available	Tape
6	Reserved for hosts	
7	Reserved for hosts	

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Guide to VME Modules

Intelligent Ethernet Interface (VLAN–E2)

AEG

200–430004–001

MODCOMP

Manual History Page

Manual Number: 200-430004-001

Title: Guide to VME Modules, Intelligent Ethernet Interface (VLAN-E2)

Revision Level	Date Issued	Description
000	06/90	Initial Issue
001	07/91	Reissued to support the VLAN-E2 product.

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Introduction

The Intelligent Ethernet™ Interface (VLAN–E2) is one of a series of add-on VME modules available for MODCOMP® open architecture computer systems. The module can be installed at the factory if ordered as part of a system, or it can be installed in the field for existing systems.

The VLAN–E2 module conforms to all requirements and conventions specified in the ANSI/IEEE Standard 1014–1987, *IEEE Standard for a Versatile Backplane Bus: VMEbus*.

The VLAN–E2 provides network connections to MODCOMP open architecture computer systems for IEEE 802.3 Ethernet and Thin Ethernet protocols. The VLAN–E2 offers an efficient communication path between the VMEbus and an Ethernet local area network for such devices as terminals and printers. A typical application is illustrated in Figure 1.

The complete Intelligent Ethernet Interface product consists of the following:

- VLAN–E2 card
- Transition module and internal cables (not used in desktop computer systems)
- Ethernet transceiver cable

The device driver for the VLAN–E2 card is included with the REAL/IX® Operating System software (Release B.0 or later). Diagnostic software is included in EPROMs located on the VLAN–E2 card. The hardware must be purchased separately as an add-on to the base system.

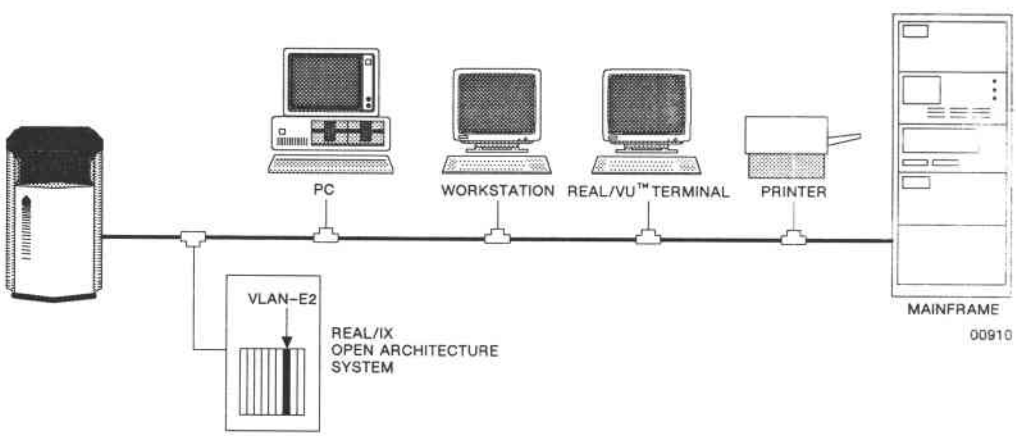

Figure 1. Typical Application

Related Publications

The *Guide to VME Modules Introduction* contains a list of manuals for reference regarding general hardware and operating system information. The publications listed here pertain specifically to the VLAN–E2 module.

The following vendor manuals, which describe the VLAN-E2 card, are available from MODCOMP. You should receive one copy of each of these publications with each VLAN-E2 card you purchase for your system.

- *SBE VLAN–E2 68020 VMEbus Local Area Network Controller User Reference Manual* (MODCOMP order number 211–114009–001)
- *EPROM TCP/IP VLAN–E and MLAN–E User Reference Manual*, (MODCOMP order number 211–114010–001)

For information about the Intelligent Ethernet Interface device driver, refer to the **vlan**(7) manual page documentation.

The following publications contain additional information about Ethernet network specifications:

- ANSI/IEEE Standard 802.3–1985, *Carrier Sense Multiple Access with Collision Detection (CSMA/CD)*
- ISO/DIS 8802/3, *Local Area Networks, Carrier Sense Multiple Access with Collision Detection*

NOTE *Throughout the rest of this document, you may be referred to the Guide to VME Modules Introduction for supplemental or additional information. The Introduction and this document are intended to be used together to obtain complete information on installing this product.*

Software

Software for the Intelligent Ethernet Interface consists of a driver, utilities, programming interfaces, and an operator-interactive diagnostic to test the functionality of the VLAN–E2 card.

Diagnostics for the VLAN–E2 card are run directly from EPROMs located on the card itself and do not require other software for operation. For installed systems to upgrade from the VLAN–E card to the VLAN–E2 card, no additional software is required over and above the REAL/IX Operating System.

Driver

The device driver for the VLAN–E2 module is provided with the REAL/IX Operating System and supports up to three VLAN–E2 cards per system. The driver is a true streams driver that supports the **open**(2), **close**(2), **read**(2), **write**(2), **putmsg**(2), **getmsg**(2), and **ioctl**(2) system calls. Refer to the **vlan**(7) manual page for more information about the driver.

Configuration Utility

There is no configuration utility associated with this product. A sysgen description file with three VLAN–E2 cards enabled is included as a standard part of the REAL/IX Operating System kernel. The **sysgen**(1M) utility can be used to view or modify the sysgen descriptors. Refer to the section "Reconfiguring the Operating System" (page 17) for more details.

Library

No special software library of user-callable routines is currently supported to communicate directly with the Intelligent Ethernet Interface. However, the application programmer may access the on-board protocols such as TCP/IP (Transmission Control Protocol/Internet Protocol), UDP (User Datagram Protocol), ARP (Address Resolution Protocol), Data Link Layer, etc., through the REAL/IX STREAMS application interface system calls: **open**(2), **close**(2), **read**(2), **write**(2), **putmsg**(2), **getmsg**(2), and **ioctl**(2). Refer to the *EPROM TCP/IP VLAN–E and MLAN–E User Reference Manual* for further information on the programming interface.

Application Interface

Two transport layer interfaces used for interprocess communication across a network are fully supported. The Berkeley Socket System-Call Interface and the AT&T System V Transport Library Interface™ communicate with TCP/IP running on the VLAN–E2 card. The Berkeley and AT&T interfaces are included with the REAL/IX Operating System.

Utilities

The Berkeley **r-** commands (such as: **rlogin**(1), **rcp**(1N), etc.), as well as **ftp**(1N), **telnet**(1N) and **uucp**(1C), are all supported and detailed in the manual page documentation.

Hardware

The VLAN–E2 card is based on an MC68020 local CPU running at 16 MHz and offers two serial I/O channels (one used to interface with on-board diagnostics), 256 Kbytes of program storage in EPROM, a full megabyte of DRAM, and an area of nonvolatile RAM for storage of configuration information. The VLAN–E2 card is constructed on a double-high, single-wide VME module that occupies one slot in the VME chassis.

A local area network controller (LANCE) and serial interface adapter (SIA) chip set implements the carrier sense multiple access with collision detection (CSMA/CD) network access protocol for access to the local area network at the physical level. In addition, the TCP/IP suite is fully implemented on the VLAN–E2 card. Altogether, levels 1 through 4 of the Open System Interconnection (OSI) model are implemented on the VLAN–E2 card.

Cables are connected through a transition module mounted in the rear of the computer cabinet. The transceiver (Ethernet or Thin Ethernet) is located outside the open architecture computer system.

NOTE *For desktop systems only, a transition module is not used, and no diagnostic port is available.*

The VLAN–E2 diagnostic software is contained within on-board EPROM firmware. The diagnostic software provides the ability to verify installation and general board health, plus the capability to run individual tests to check specific operations of the VLAN–E2 card.

Component Locations

Figure 2 shows the front panel and component side of the VLAN–E2 card. The figure is referred to throughout this guide as a reference to component locations. Jumper connections and switches are shown with their factory settings; these settings reflect how the card would be configured when installed into a system by MODCOMP.

Note that the original manufacturer's settings may not match the settings required for operation of the VLAN–E2 card in a MODCOMP computer system. Therefore, if you are adding cards to an existing system in the field, be sure to follow the recommendations given in this guide for all configuration options. For information about changing the factory settings, see the section "Setting Options" later in this document.

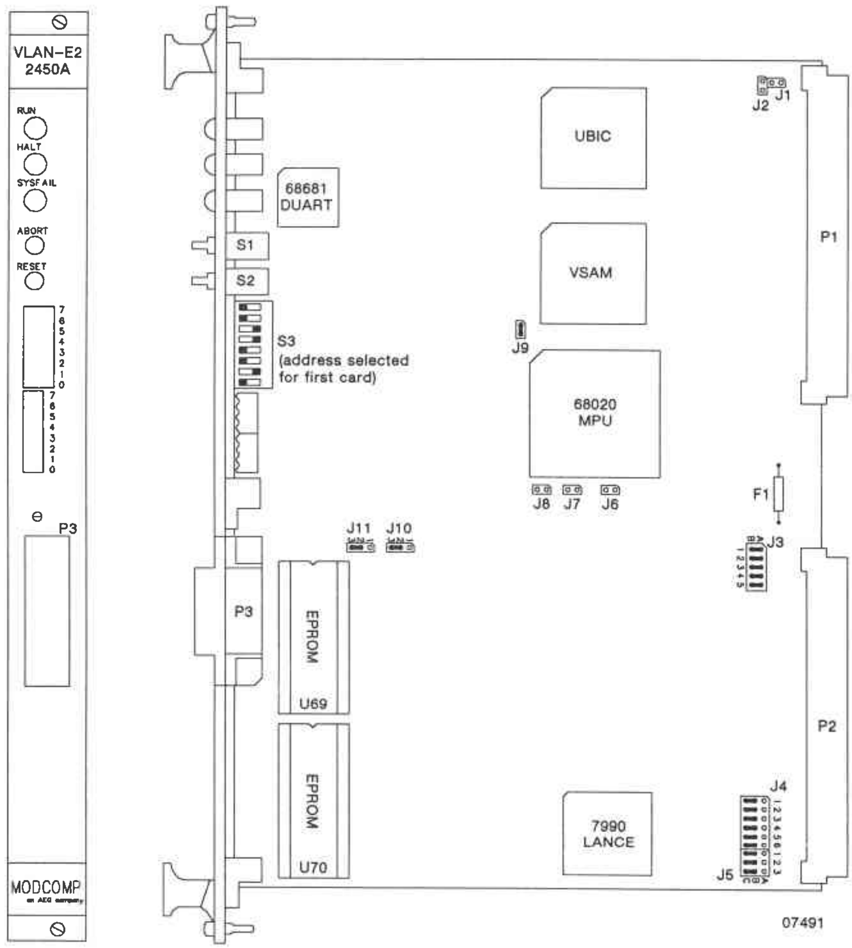

Figure 2. Component Locations

Front Panel Controls and Indicators

Table 1 lists the functions of controls and indicators located on the front panel of VLAN-E2 card. Table 2 explains the meaning of the eight LED indicators during normal operations.

Table 1. Front Panel Controls and Indicators

Control or Indicator	Type	Function/Comments
SYSFAIL	LED	ON = Module is driving the VMEbus SYSFAIL line
HALT	LED	ON = MPU halted due to double bus fault
RUN	LED	ON = Normal operation
RESET	button	Generates local reset
ABORT	button	Generates local nonmaskable interrupt
0–7 (S3)	switch	Sets the base address for the VLAN–E2 card
LEDs 0–7	LEDs	Indicate normal card activity during operation. In fatal error mode, the LEDs indicate the type of error that occurred. During diagnostics, the LEDs remain illuminated until passing tests.

Table 2. LED Display for Normal Operation

LED	Name	Function/Comments
0	MPU Alive Ticker	Blinks every 0.8 sec to indicate MPU is OK
1	Ethernet Receive	Turned ON whenever a packet is received from the network. Turned OFF in 0.1 sec if no next packet.
2	Ethernet Transmit	Turned ON whenever a packet is transmitted over the network. Turned OFF in 0.1 sec if no next packet.
3	Bus Request	Turned ON whenever a mailbox interrupt is received from the network. Turned OFF in 0.1 sec if no next interrupt.
4	Nonfatal Error	Indicate nonfatal errors in conjunction with LEDs 5, 6, 7
5	Nonfatal Error	Indicate nonfatal errors in conjunction with LEDs 4, 6, 7
6	Nonfatal Error	Indicate nonfatal errors in conjunction with LEDs 4, 5, 7
7	Fatal Error	Always OFF unless a fatal error occurs

In fatal error mode, the card stops processing all requests and displays an error code in the LEDs according to the chart in Table 3.

Table 3. LED Display for Fatal Error Mode

Error Type	Code (Hex)	LEDs							
		7	6	5	4	3	2	1	0
Bus Error	02	1	0	0	0	0	0	1	0
Address Error	03	1	0	0	0	0	0	1	1
Zero Divide	05	1	0	0	0	0	1	0	1
Stack Format Error	0E	1	0	0	0	1	1	1	0
Illegal Format	18 – 1D	1	0	0	1	1	x	x	x
Illegal Trap	20 – 2E	1	0	1	0	x	x	x	x
Illegal Instruction	all others	1	x	x	x	x	x	x	x

Transition Module

The transition module and cable assembly associated with the VLAN–E2 card provide an interface from the P2 connector on the VMEbus backplane to the network and diagnostic ports. There is one port for connecting an Ethernet (or Thin Ethernet) transceiver and one for diagnostic purposes. A third port, labeled *Reserved*, is reserved for future use. The front panel of the transition module is pictured in Figure 3.

NOTE *There is no transition module associated with the desktop system. The transceiver cable is connected to the front of the VME module instead.*

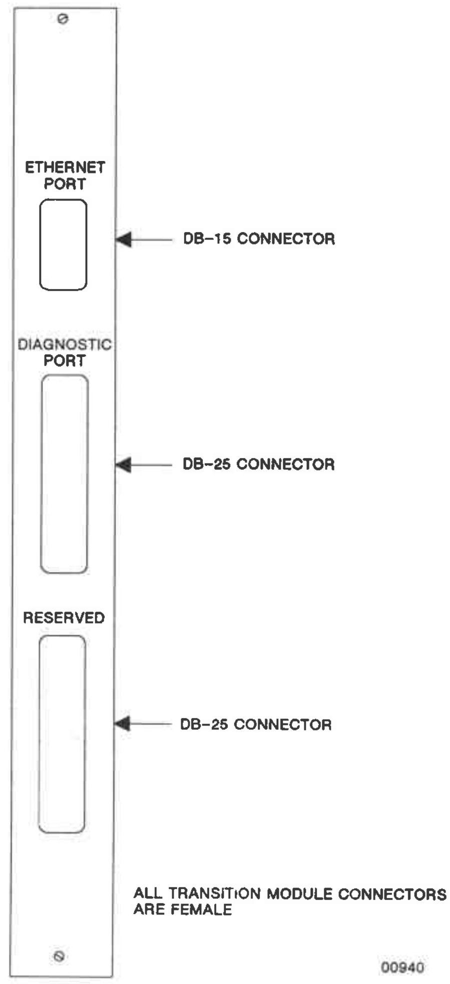

Figure 3. Transition Module Front Panel

Cabling

Each Intelligent Ethernet Interface includes two cables.

- Transition module and cable assembly – includes a ribbon cable (approximately 24 inches) with a 64-pin P2 type connector (female) on one end and three connectors (female) on the other: one DB-15 connector for the Ethernet port, one DB-25 connector for the diagnostic port, and another DB-25 connector for the reserved port.

- Ethernet transceiver cable – round shielded cable (10 feet) with two DB-15 connectors (one male, one female).

See Figure 5 for proper cable installation.

Installation

The following sections describe how to install the VLAN–E2 card, transition module, and cables. A separate software installation is not required because the VLAN–E2 device driver is included with the REAL/IX Operating System.

WARNING!

Be sure to turn off the power to the computer system before installing or removing VME cards. Also use proper protection against damage to MOS devices from electrostatic discharge. Refer to your computer System Guide for details.

Selecting a Slot

The *Guide to VME Modules Introduction* gives general guidelines for selecting a slot for VME modules. The information given here supplements these guidelines.

The Intelligent Ethernet Interface functions as a VMEbus master and uses a high frequency of interrupt acknowledge (IACK) cycles. Other cards already installed in the chassis should be considered relative to their frequency of using IACK cycles. Table 4 gives recommended slot placement for system configurations with up to three VLAN–E2 modules.

Table 4. Recommended Slot Placement

VMEbus Backplanes	Recommended VLAN–E2 Slots in Ascending Device Order		
	1–Card Configuration	2–Card Configuration	3–Card Configuration
6–Slot Backplane	slot 3	slots 3, 4	slots 3, 4, 5
9–Slot Backplane	slot 7	slots 7, 8	slots 6, 7, 8
20–Slot Backplane	slot 15	slots 15, 16	slots 15, 16, 17

Setting Options

Several options must be configured before installing the VLAN–E2 card. Jumpers located on the card are used to control various VMEbus and interface options. Check to see that your card is properly configured for your system. Table 5 lists the factory settings for the jumper options on the VLAN–E2 card; these settings refer to how the option would be configured when the card is installed into a system by MODCOMP. See the vendor manuals for information on changing the jumper settings. See Figure 2 for locations of the jumpers and switches.

Table 5. Jumper Settings

Jumper	Setting	Description
J1	OUT	Reset button does not assert SYSRESET
J2	OUT	Slot 1 functions disabled
J3	All 5 jumpers IN	RS–232C signals at P2 enabled
J4	All 6 jumpers IN, B to C	Ethernet Port at P2 (To enable the Ethernet port at the P3 connector on the front panel of the VLAN–E2 module, set all jumpers J4 A to B)
J5	All 3 jumpers IN, B to C	Enables VLAN–E2 card to power Ethernet transceiver at P2 (To enable the Ethernet port at the P3 connector on the front panel of the VLAN–E2 module, set all jumpers J5 A to B)
J6	OUT	Reset button does not assert SYSRESET
J7	OUT	Local bus timeout feature disabled
J8	OUT	Cache feature enabled
J9	IN	Mailbox reset enabled
J10	Connect 2–3	To select 2K x 8 NVRAM size
J11	Connect 2–3	To select 27512 NVRAM size

Bus Request Level

The bus request level for the VLAN–E2 is a software-controlled parameter and is set to level 3 for all three cards supported.

Interrupt Request Level

The interrupt request priority is a programmable parameter that is set automatically to level 1. The VLAN–E2 software sets up a default interrupt request level (IRQ) of 1 for all three VLAN–E2 cards in the system. Use the **sysgen(1M)** utility to reconfigure the interrupt request level in the VLAN–E2 description file.

Module Base Address

Each VLAN–E2 card's base address can be configured to begin at any one of the sixty-four 1K boundaries within the VME short address space using a switch (S3) accessible on the front panel of the VLAN–E2 card. Address 0xC0000000 is reserved for the first VLAN–E2 card in the system; the setting for this address is shown in Figure 4.

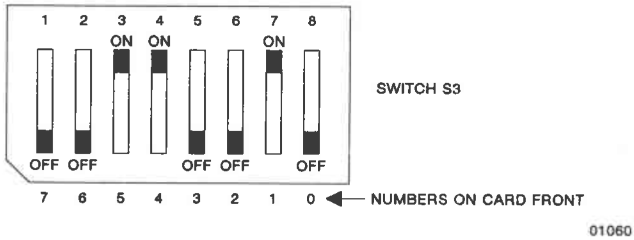

Figure 4. Base Address Switch (S3)

Table 6 lists the base addresses reserved for up to three VLAN–E2 cards, the maximum number supported per system. If the cards are installed by MODCOMP as part of an integrated system, the base addresses are preset according to these recommendations. If you are installing VLAN–E2 cards as add-ons to an existing system, verify the base address jumper settings before installing the cards in the VME chassis. The **sysgen(1M)** utility will inform you of any address conflicts. It is the installer's responsibility to resolve these conflicts by assigning a unique address that does not conflict with any other cards on the VMEbus.

Table 6. Base Addresses

Card Number	Switch Positions								Reserved Base Addresses (hex)
	7	6	5	4	3	2	1	0	
1st	–	–	ON	ON	–	–	ON	–	C0000000
2nd	–	–	ON	ON	–	–	ON	ON	C1000000
3rd	–	–	ON	ON	–	ON	–	–	C2000000

The OFF state is signified by a dash.

See the *EPROM TCP/IP VLAN–E and MLAN–E User Reference Manual* for further information on setting the module base address.

Transceiver Power Source

The power source for the external Ethernet transceiver is set through jumper J5 on the VLAN–E2 card. Set the power source so that the Ethernet transceiver receives power from the VLAN–E2 card (all 3 jumpers in, B to C). If you have a transceiver which has its own power source, then remove all four columns of jumper J5.

CAUTION

Neglecting to remove the jumpers in J5 for a configuration using a transceiver as the external power source can cause fuse F1 to open under an overload. If this occurs, remove the J5 jumpers and replace F1 (shown in Figure 2) with a 3 Ampere fuse.

Other Card Options

The remaining VLAN–E2 card options (listed in Table 5) are set at the MODCOMP factory.

Mechanical Installation

The following sections describe the mechanical installation of the VLAN–E2 module, including inserting the card into the backplane, setting backplane jumpers, installing the transition module, and connecting cables.

Inserting Card Into Backplane

After selecting a backplane slot for the VLAN–E2 module and installing or removing jumpers on the card as previously discussed, mechanically install the card into the VME chassis.

WARNING!

Be sure to turn off the power to the computer system before installing or removing VME cards. Also use proper protection against damage to MOS devices from electrostatic discharge. Refer to your computer System Guide for details.

Setting Backplane Jumpers

Because the VLAN–E2 card is a VMEbus master, backplane jumpers for the daisy-chained bus grant signals (BG0 – BG3) and interrupt acknowledge (IACK) are removed.

Installing Transition Module

The transition module should be installed in the transition module mounting bay slot that corresponds to the VLAN–E2 card.

Figure 5 shows how to connect the internal ribbon cable between the P2 connector on the VMEbus backplane and the transition module.

NOTE

In desktop systems, cables are connected without the use of a transition module because of space restrictions. VLAN–E2 modules ordered for desktop systems do not include the diagnostic cable; however, the cable is available through special order.

Connecting Cables

Cables should be connected after the VLAN–E2 card has been configured and mechanically installed into the chassis. See Figure 5 for proper cable installation.

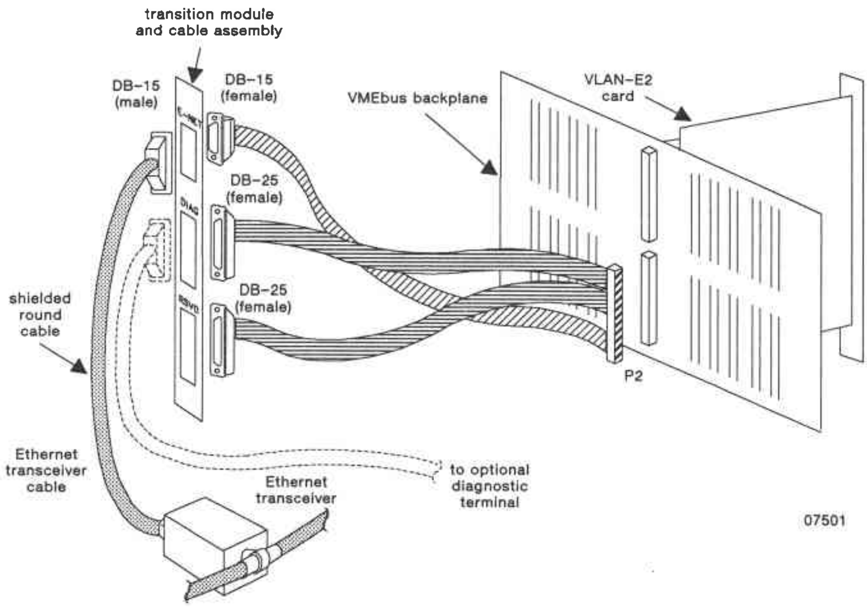

Figure 5. Cable Installation

Connect transition module and cable assembly. Plug female 64-pin P2 connector to the P2 pins on the VME backplane and attach the transition module to the I/O bulkhead.

Connect transceiver cable. Plug male DB-15 connector into Ethernet port on the transition module and then attach the other end (DB-15, female) to the Ethernet or Thin Ethernet transceiver.

Connect optional diagnostic terminal. An asynchronous terminal must be connected to the diagnostic port for access to the diagnostic interface. The terminal must be set up for the following specifications:

- 9600 baud
- 8-bit word
- No parity
- 1 stop bit
- Full duplex
- Flow control: X-ON/X-OFF

To connect an optional diagnostic terminal to your system, plug the diagnostic terminal cable (Thin Ethernet type) into the diagnostic port on the transition module and connect the other end to the diagnostic terminal.

Powering Up

Power up the system following the instructions given in your computer *System Guide*. Once the system has been powered up, execute **sysadm**(1M) to configure the network.

Installing Driver Software

Software for the Intelligent Ethernet Interface is included with the REAL/IX Operating System. The driver is enabled and configured under REAL/IX for up to three VLAN–E2 controllers. Refer to the system generation (**sysgen**) information in the *REAL/IX System Administrator's Guide* or the *REAL/IX Driver Development Guide* for information on modifying or displaying **sysgen** descriptors.

Removing Driver Software

To disable the VLAN–E2 driver, enter **sysgen**, cancel the selection of the **vlan** descriptor, then remake and reboot the updated operating system.

Reconfiguring the Operating System

As previously mentioned, the REAL/IX Operating System includes a description file for the VLAN–E2 card. This file is assembled into the bootable system object when a sysgen is run. The system is set up with three VLAN–E2 cards enabled.

The **sysgen**(1M) utility is used to display the current configuration. It can also be used to modify the parameter that defines the number of queues for a VLAN–E2 card. The default for this parameter is set to 128 queues per card; however, the number can be set to a maximum of 255 queues per card. Each queue represents a unique connection to the card.

To modify the sysgen parameters for any of the VLAN–E2 cards, rebuild the operating sytem following the steps listed below:

1. Invoke **sysgen –d**
2. Modify information in the sysgen screens as appropriate
3. Rebuild the operating system before exiting sysgen, or separately using **sysgen –gbi**
4. Shut down the system
5. Reboot the system

Diagnostics

Once installed, the Intelligent Ethernet Interface supports a suite of tests to validate the controller's functional integrity. These test suites run in two modes: 1) automatically upon power-up for installation verification, or 2) interactively through the VLAN-E2 PROBUG™ debugger program for problem isolation. The power-up diagnostics complete in about ten seconds.

In order to interact with the diagnostic program and to display messages, an asynchronous terminal (an option) should be connected. Connect the terminal to the diagnostic port as described in the "Connecting Cables" section.

Installation Verification

The following tests are performed automatically on power-up. Upon receipt of a RESET signal these tests exercise all the critical components of the Ethernet controller. First the SYSFAIL LED lights for a moment, then LEDs 0 through 7 are lit. As each test is run, successful pass of each test turns off the corresponding LED. Additionally, a message is printed to the serial port (P2) identifying if the test has passed or not. When all of the tests have successfully completed, the display will resemble the following:

```
VLAN-E2 POWER UP DIAGNOSTICS
RAM detected from 00000880 to 000FEFFF.
pattern = 55555555
RAM test                                  passed.
NVRAM detected FFFA8000 to FFFA9FFF.
NVRAM test                                passed.
ROM CRC checking                          passed.
Ethernet ID verification                  passed. (ID = xxxxxxxx)
LANCE internal loopback test              passed.
LANCE CRC logic check test                passed.
LANCE collision detection and retry test passed.
LANCE external loopback test              passed.
Bus Error Interrupt test                  passed.
Parity Error Test                         passed.
Timer interrupt test                      passed.
```

Should an error be detected, a message will be displayed indicating the nature of the error and, in some cases, possible corrective action. A sample error message:

```
LANCE external loopback test failed. No carrier. Check transceiver cable.
```

RAM Test

The RAM test checks the entire Ethernet controller RAM. It writes, reads, and compares several bit patterns. Memory is accessed in bytes, words, and long words on various boundaries. The following three tests are performed:

- a walking 1 bit pattern
- a 0xAAAAAAAA pattern
- a 0x55555555 pattern

NVRAM Test

The NVRAM test reads the available nonvolatile RAM (NVRAM) on the Ethernet card. The memory is accessed in long words.

ROM CRC Check

The ROM CRC check calculates the ROM checksum and compares it to the checksum value stored in the ROM.

Ethernet ID Verification

The Ethernet ID verification checks a known location in NVRAM to verify the Ethernet ID. The ID is displayed on the serial port if valid. Otherwise, failure is reported.

LANCE Test

The LANCE test includes the four tests listed below and reports any card failures or missing cables.

- External Loopback Test (requires connection to a network)
- Collision Detection and Retry Test (requires connection to a network)
- CRC Logic Check Test
- Internal Loopback Test

Bus Error Test

The bus error test accesses a nonexistent memory location. Success is reported if a bus error interrupt is generated. Otherwise, failure is reported.

Parity Error Interrupt Test

The parity interrupt test changes the parity of the Ethernet card, stores a byte in RAM, and returns the parity to its original value. Success is reported if a parity error interrupt is generated when the byte is accessed. Otherwise, failure is reported.

Timer Interrupt Test

The timer interrupt test ensures that the VBIC timer is generating proper interrupts.

Problem Isolation

To aid the diagnostic user in isolating problems within the system, several interactive diagnostic tools are available. All the test suites for the Ethernet controller may be run individually.

Before running these tests, the REAL/IX Operating System must be shut down gracefully (see **shutdown(1)**). Then follow these steps to display the main menu:

1) Press the RESET button on the VLAN-E2 card.
2) Press the ABORT button on the VLAN-E2 card.

After the ABORT button is pressed, the values of certain onboard registers are displayed:

```
*** NON-MASKABLE INTERRUPT ***
     (0)       (1)       (2)       (3)       (4)       (5)       (6)       (7)
D) 000001E6  00000032  00000010  6F76F8FE  EFFFFFFA  B59FB9E5  00000010  FFFFFFE4
A) FFF15028  FFF1D99F  00000400  00000000  FFF98000  FFF0D176  00000580  00000600
PC) FFF000A4  SR) 2704  CCR) --Z--  USP) 37DEFEDF  .SSP) 00000600
```

3) Following the register display, enter **g.** at the **>** prompt and press the Return key.

Upon successful initiation of the diagnostic, the main diagnostic menu is displayed:

```
VLAN-E2 INTERACTIVE DIAGNOSTICS
0- RAM/NVRAM Test
1- ROM CRC Checking
2- Ethernet ID Verification
3- LANCE Test
4- Serial Interface Test
5- Bus Error Interrupt Test
6- Parity Error Interrupt Test
7- Timer Interrupt Test
q- Quit and return to PROBUG
```

From this menu, you can select a specific test and run it individually. If a problem is found and cannot be resolved, call your MODCOMP customer service representative.

NOTE *The only way to restore the network to operation after running the diagnostics is to reset the CPU board and reboot the REAL/IX Operating System.*

RAM/NVRAM Test

The RAM/NVRAM test (menu selection 0) allows destructive or nondestructive (default) testing of the RAM. The user will be prompted:

```
Enter test type - 1 = destructive, 2 = non-destructive (default):
```

If 1, destructive testing of the RAM is chosen, the following information is displayed:

```
Destructive test cannot be performed on reserved memory.
Following is a list of reserved memory spaces:
00000000 - 000003FF
00000400 - 000007FF
00000800 - 0000087F
000FF000 - 000FFFFF
FFFA87E8 - FFFA87E8

Enter RAM/NVRAM test starting address:
Enter RAM/NVRAM ending (inclusive) address:
Enter access type- b=byte, w=word, l=long (default):
Do you want the test to continue after errors detected (Y/N):
Repeat factor (0=indefinite):
```

If 2, non-destructive testing of the RAM is chosen, the following information must be entered:

```
Enter RAM/NVRAM test starting address:
Enter RAM/NVRAM ending (inclusive) address:
Enter access type- b=byte, w=word, l=long (default):
Do you want the test to continue after errors detected (Y/N):
Repeat factor (0=indefinite):
```

The repeat factor is the number of times a test is to be performed. If "0", indefinite, is chosen, the test runs indefinitely until an error is found or until you press the Return key to stop the test.

The following hexadecimal patterns are used to test memory locations specified by the user:

	Byte	Word	Long
1)	01	0001	00000001
2)	81	8001	80000001
3)	AA	AAAA	AAAAAAAA
4)	55	5555	55555555

These tests validate the memory. Both the RAM and the NVRAM may be validated with this test. A successful pass of this test displays the following message:

```
RAM test passed.
```

ROM CRC Checking

The ROM CRC Checking (menu selection 1) calculates the ROM checksum and compares it to the factory calculated value stored in the ROM. A successful pass of this test turns off LED 2 and displays the following message:

```
ROM CRC checking passed.
```

Ethernet ID Verification

The Ethernet ID Verification (menu selection 2) checks a known location in NVRAM to verify the Ethernet Identity (ID). The ID is displayed on the serial port and LED 3 is turned off if valid. Otherwise, failure is reported.

LANCE Test

This test (menu selection 3) presents a menu to allow you to select one of four separate tests. The LANCE test will report any card failure or missing cables. LED 4 is turned off if any of the tests listed below are successful. LED 4 remains off until the diagnostic program is started up again.

```
1 - External Loopback Test
2 - Collision Detection and Retry Test
3 - CRC Logic Check Test
4 - Internal Loopback Test
q - Quit
```

Serial Interface Test

In order to run this test (menu selection 4) you need to use a loopback connector (Figure 6) which connects the RS232 pins 2 and 3. This test requires the serial port number. Data will be written to the given port and read back through the loopback connector. Currently, the serial port is used to support the diagnostic interface.

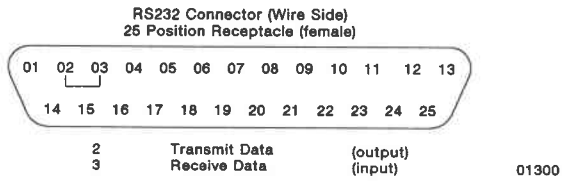

Figure 6. RS232 Loopback Connector

Bus Error Interrupt Test

This test (menu selection 5) accesses a non-existent memory location. Success is reported and LED 5 is turned OFF if a Bus Error Interrupt is generated. Otherwise, failure is reported.

Parity Error Interrupt Test

This test (menu selection 6) changes the parity of the board, stores a byte in RAM, and changes the parity back to what it was before. Success is reported and LED 6 is turned OFF if a parity error interrupt is generated when the byte is accessed. Otherwise, failure is reported.

Timer Interrupt Check Test

This test (menu selection 7) makes sure that the VBIC timer is generating proper interrupts. Success is reported and LED 7 is turned OFF if proper interrupts are generated.

Guide to VME Modules

MVME188A RISC CPU Board Set

AEG

200–730004–001

MODCOMP

MODULAR COMPUTER SYSTEMS, INC.
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For comments about documentation, please use the response form at the back of this manual.

Contents

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Tables

Manual History 200–730004

MVME188A RISC CPU Board Set, Guide to VME Modules

This section identifies each issue of this manual and lists them in reverse chronological order. Except for the initial issue, a detailed summary explains the changes made in each of the five most recent revisions.

Revision 000 (Initial Issue) 07/91

Revision 001 (Reissue) 09/92

Revised for MVME188A CPU board set (versus earlier MVME188 CPU board set). Corrected jumper information in Installation section, specifically, instructions for VMEbus backplane jumpers (reference Service Flash 92–17). Updated console cable part number (reference DCO 91–295). Incorporated editorial and format changes.

Introduction

The MVME188A Reduced-Instruction-Set-Computer (RISC) Microcomputer, hereinafter referred to as the CPU board set, is used as a host CPU in MODCOMP® open architecture VMEbus-based computer systems. It can be installed at the factory if ordered at the time of your initial system purchase, or it can be installed in the field for upgrading existing computer systems.

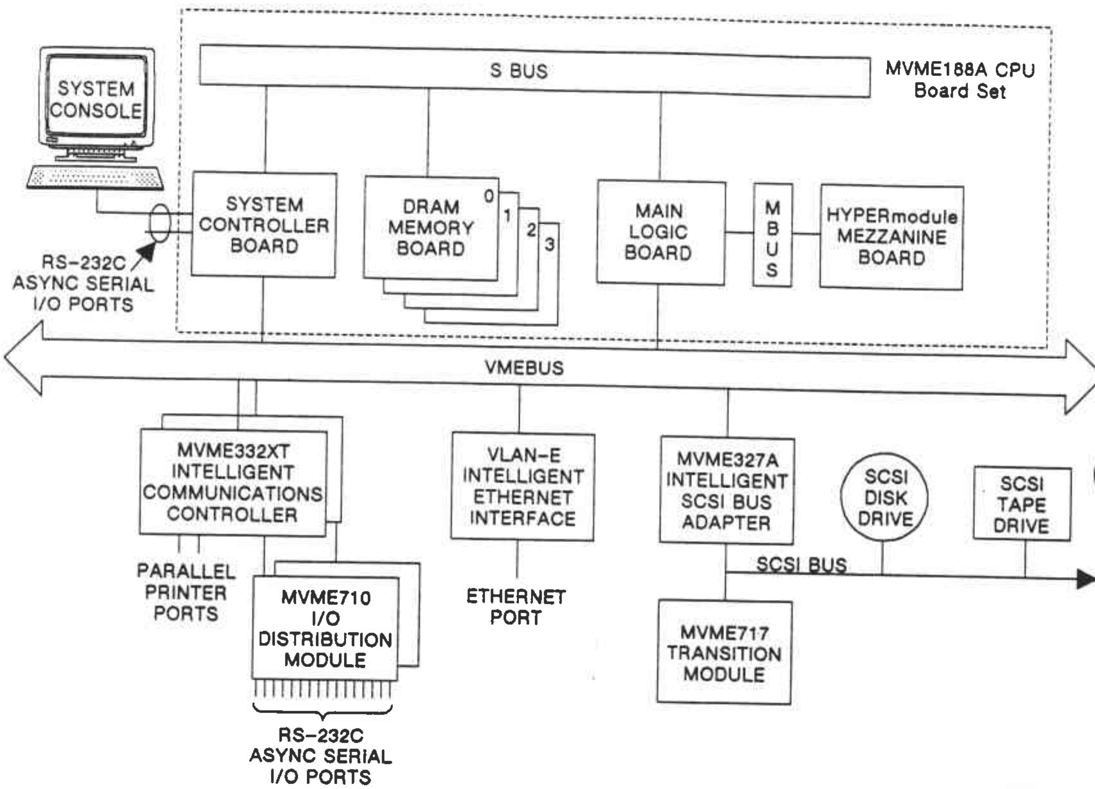
The CPU board set comprises a system controller board, at least one DRAM memory board (referred to simply as "memory board" in this guide), and a main logic board. Up to three additional memory boards may be ordered to form a six-board set. Memory boards are available in 16 Mbyte and 64 Mbyte versions with parity checking. A 32 Mbyte version with error correction code (ECC) checking is also available. All boards of the set are connected mechanically and electrically to form a single unit.

The boards are interconnected through a very high-speed local slave bus (S bus). Central processing functions are implemented through an enhanced memory bus (M bus) by one, two, or four MC88100 RISC CPUs operating at 25 MHz. Each CPU is clustered with a number of MC88200 or MC88204 cache/memory management units (CMMUs) to provide 128 Kbytes or 256 Kbytes of cache memory, depending on CPU board set model. The CPU clusters are contained on the HYPERmodule™ mezzanine board, which is mounted on the main logic board.

NOTE *In this guide, references to the CPU board set apply to all models of the MVME188A CPU board set supplied by MODCOMP. For information on specific models, including the various configurations of the HYPERmodule, see the "Technical Notes" section at the end of this guide.*

The CPU board set also provides two RS-232C serial ports (on the system controller board). I/O support for systems based on the CPU board set is provided by other VME controllers. See your *Guide to VME Modules Summary* for a listing of the various VME controllers available.

Figure 1 shows a typical MVME188A-based system.



NOTES:
(1) DRAM memory boards 1, 2, and 3 are optional.

Figure 1. Typical MVME188A–Based System

Related Publications

NOTE *This manual is one in a series of documents that you need for complete information on your system. Your System Guide and the Guide to VME Modules Introduction are also required. Other manuals, depending on your system, may also be required. Refer to the System Guide for a listing of these manuals.*

The Preface in your *System Guide* contains a list of the manuals that you may need for general hardware and operating system information. In addition, the following vendor manuals describe the CPU board set. You should receive one copy of these publications when you purchase the board set for your system.

- *MVME188A VMEmodule™ RISC Microcomputer User's Manual* (MODCOMP order no. 240–100299–000)
- *HM88K HYPERmodule™ 32–Bit RISC Processor Mezzanine Module User's Manual* (MODCOMP order no. 240–100317–001)
- *MVME188BUG 188Bug™ Debugging Package User's Manual* (MODCOMP order no. 240–100298–000)

The *MVME188A VMEmodule RISC Microcomputer Support Information Manual* containing connector interconnect signal information, parts lists, and schematics for components of the MVME188A CPU Board Set can be obtained from the source listed in the "Related Documentation" section of the *MVME188A VMEmodule™ RISC Microcomputer User's Manual*.

Firmware

The 188Bug monitor/debugger package is provided in firmware as part of the CPU board set. This package includes a command-driven, interactive software debugger for software development and a command-driven diagnostics package for CPU hardware testing. 188Bug is stored in EPROM on the system controller board.

Software

The CPU board set is supported by the REAL/IX® Operating System, Revision C.0 or later.

Hardware

All active logic for the CPU board set is contained on single-wide VME modules, which are coupled mechanically and electrically to form a single unit. Together, the board set occupies from three to six slots in the VME chassis, depending on the number of memory boards included in the board set.

Connection to the VMEbus for each board is provided by two 96-pin backplane connectors, P1 (rows A, B, C) and P2 (row B). The outside rows of the P2 connector (rows A and C) are used only on the system controller board, to provide an optional method of connecting to the serial ports. The same serial ports are also accessible through connectors J3 and J4 on the front panel of the system controller board. The memory board uses the P1 and P2 backplane connectors only to draw power.

Each board also contains two 96-pin connectors (P3, P4), which implement the S bus. On the main logic board only, the enhanced M bus is implemented by three 100-pin connectors (J1 – J3), which connect to the HYPERmodule mezzanine board.

Component Locations

Figures 2 through 5 show the position of the major components on the CPU board set. Jumper connections and switch settings are depicted with factory settings.

Table 1 explains the functions of the controls and indicators located on the front panel of the system controller board and the 32 Mbyte ECC memory board. No other controls and indicators exist on the board set.

Table 1. Controls and Indicators

Control or Indicator	Type	Description
FAIL	LED	OFF = CPU self-tests passed ON = CPU self-tests failed; VMEbus SYSFAIL signal asserted
HALT	LED	ON = CPU is reset
RUN	LED	ON = CPU executing a VMEbus or S bus access
ABORT	Pushbutton switch	Software abort; aborts program execution and returns to the monitor
RESET	Pushbutton switch	Generates local reset and VMEbus system reset
MEM ERROR	LED	ON = Uncorrectable multiple bit error detected

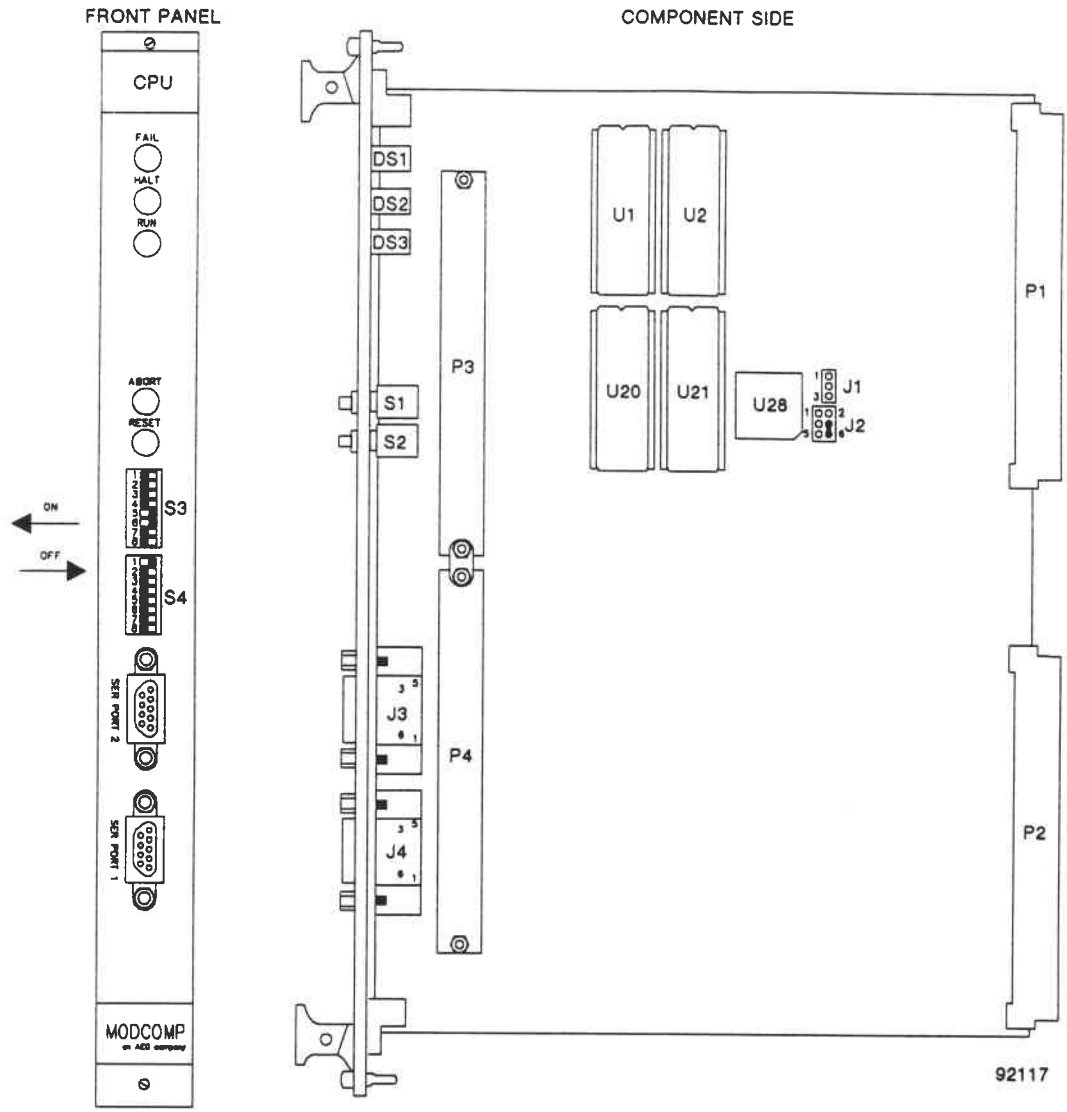


Figure 2. Component Locations – System Controller Board

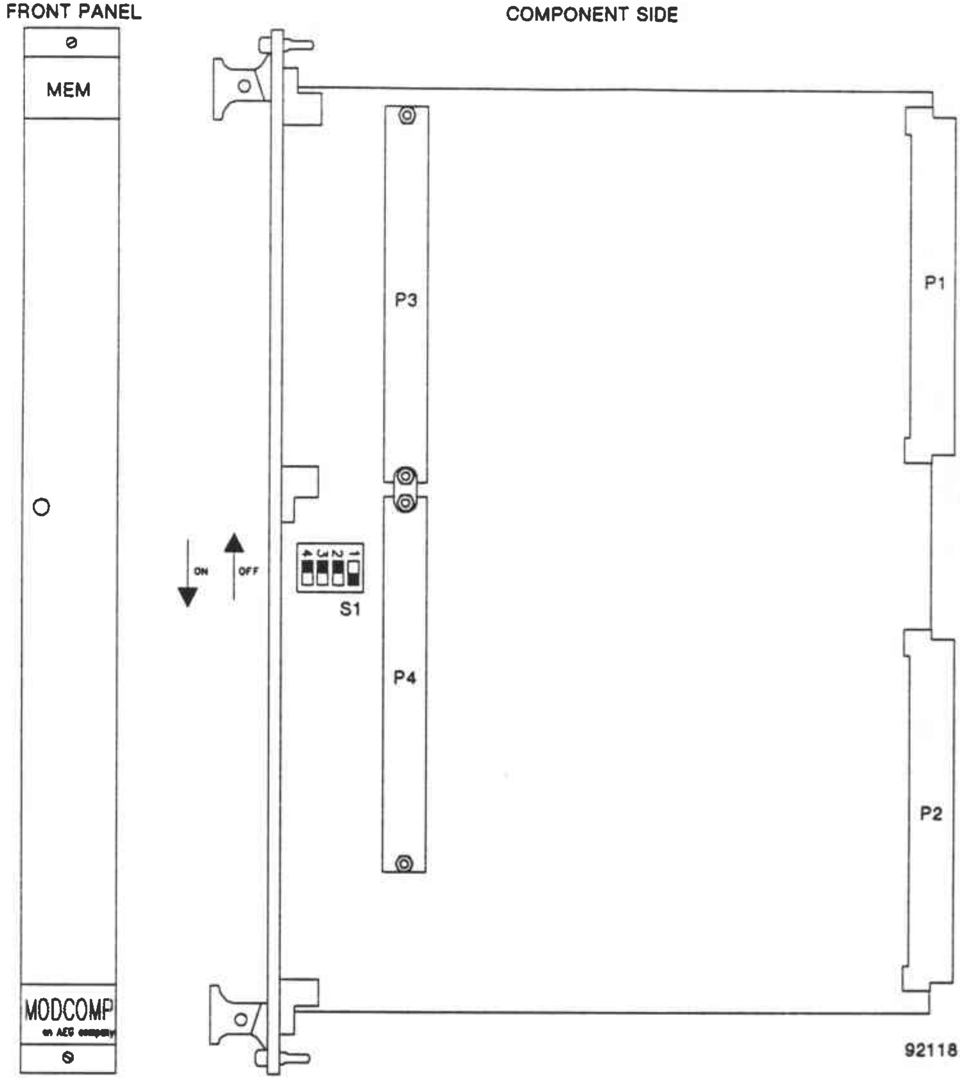


Figure 3. Component Locations — 16 Mbyte and 64 Mbyte Memory Boards

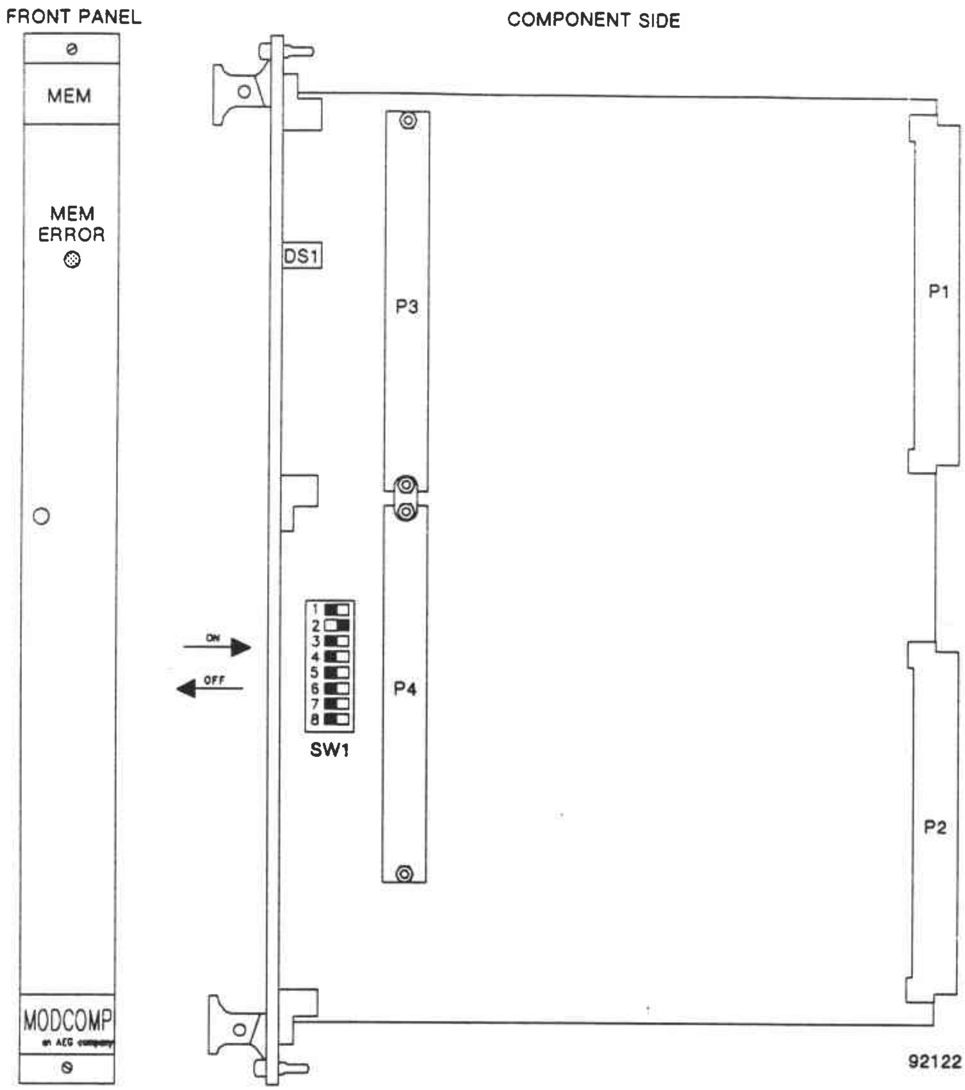


Figure 4. Component Locations – 32 Mbyte ECC Memory Board

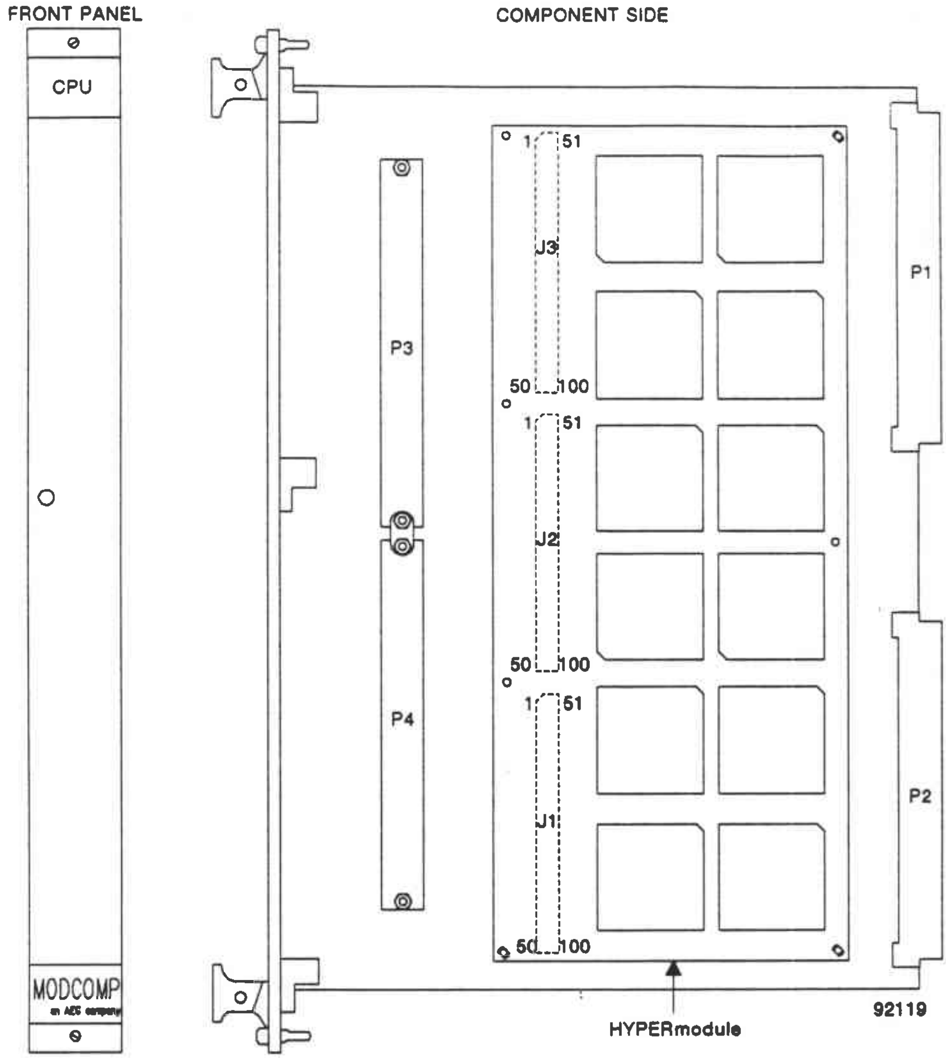


Figure 5. Component Locations – Main Logic Board

Transition Module

The CPU board set does not require a transition module. However, a transition panel and cable assembly are used to provide access from the rear of the cabinet to the two serial ports on the front panel of the system controller board.

The transition panel is installed in the transition module mounting bay and occupies one single-wide location. Two internal cables mounted to the back of the transition panel connect to the 9-pin serial connectors on the front panel of the system controller board.

Cabling

In addition to the internal cables that are provided with the transition panel, the CPU board set requires at least one external cable for connection to the system console. The system console cable must be wired as a null modem and have male DB25 connectors on each end. One end connects to the transition panel; the other end connects to the system console.

Connector Signal Assignments

For signal and pin assignments for the P1 through P4 connectors on all boards, the J3 and J4 serial port connectors on the system controller board, or the J1 through J3 connectors on the main logic board, refer to the *MVME188A VMEmodule RISC Microcomputer Support Information* manual.

Installation

The following sections describe how to mechanically install the CPU board set and interconnecting cables. Prior to actually installing the board set into the backplane, you need to select the slots that it will occupy and set the appropriate switches and jumpers. For information about adding optional memory boards, refer to the *MVME188A VMEmodule RISC Microcomputer User's Manual*.

Selecting a Slot

The CPU board set occupies from three to six slots, depending on the number of memory boards in your system. In any case, install the CPU board set with the system controller board in slot 1. The remaining boards in the set occupy the adjacent slots.

In a three-board set with one memory board, the system controller board occupies slot 1, the memory board slot 2, and the main logic board slot 3. Memory boards are mounted between the system controller board and the main logic board. So, memory boards occupy the slots beginning with slot 2; the main logic board always occupies the last (highest numbered) slot occupied by the board set.

Setting Options

Instructions for setting the switch and jumper options on the CPU board set follow.

System Controller Board Switches and Jumpers

Switches S3 and S4 are two banks of eight two-way switches accessible through the front panel (see Figure 2). Factory settings for the switches are shown both in Figure 2 and in Table 2. Ensure switches are set as shown. The off-on (open-closed) orientation of these switches is as follows:

- vertically-mounted VME chassis (slot 1 on the bottom):
  - switch lever down = closed (ON)
  - switch lever up = open (OFF)
- horizontally-mounted VME chassis (slot 1 on the left):
  - switch lever to the left = closed (ON)
  - switch lever to the right = open (OFF)

Jumpers J1 and J2 set the onboard timer device parameters. Factory settings for these jumpers are shown in Figure 6 for reference. These jumpers are not accessible with the CPU board set assembled and require no changes to the factory settings.

Table 2. System Controller Board Switch Settings

Switch	Position	Function
S3–1	ON	System controller enable
S3–2	ON	ENV0* set to 0
S3–3	ON	ENV1* set to 0
S3–4	ON	ENV2* set to 0
S3–5	OFF	GCSR group base address ($C800) within the VMEbus short I/O (A16) space
S3–6	OFF	
S3–7	ON	
S3–8	ON	
S4–1	OFF	
S4–2	ON	
S4–3	ON	
S4–4	ON	
S4–5	ON	GCSR board base address ($C800) within the VMEbus short I/O (A16) space
S4–6	ON	
S4–7	ON	
S4–8	ON	

Notes:
(1) ON = closed; OFF = open

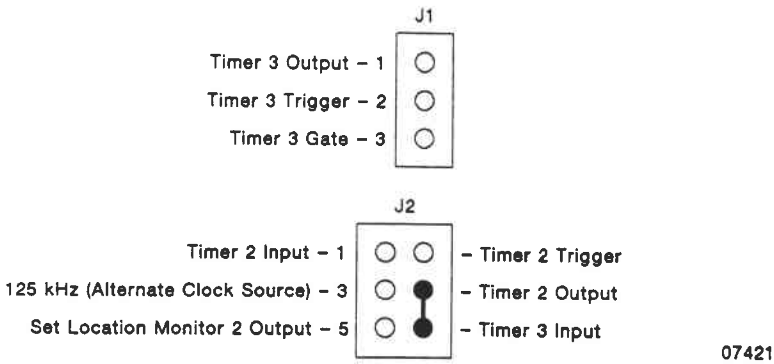


Figure 6. System Controller Board Jumper Settings

16 Mbyte and 64 Mbyte Memory Board Switch Settings

The memory board number is set by switch S1. Switches S1-1 through S1-4 set one of four possible memory board selects (0–3). One memory board must be set up as board 0. Switch settings for CPU board sets with up to four memory boards are listed in Table 3. Settings are applicable to both 16 Mbyte and 64 Mbyte versions of the memory board.

If you are installing a CPU board set exactly as it was shipped to you from MODCOMP, no change of S1 settings is required. If you are installing an additional memory board in your CPU board set, set S1 to the next highest unused board number in the board set. For example, the second memory board should have its S1 switch set for board 1, the third for board 2, etc.

(Address ranges are set up by the software. See the *MVME188A VMEmodule RISC Microcomputer User's Manual* for programming details.)

Table 3. 16 Mbyte and 64 Mbyte Memory Board Switch Settings

Memory Board Number	Switch S1			
	4	3	2	1
0	OFF	OFF	OFF	ON
1	OFF	OFF	ON	OFF
2	OFF	ON	OFF	OFF
3	ON	OFF	OFF	OFF

32 Mbyte ECC Memory Board Switch Settings

The memory board number and the control and status register (CSR) decode is set by switch SW1. Switches SW1-2 through SW1-5 set one of four possible memory board selects (0–3). One memory board must be set up as board 0. Switch settings for CPU board sets with up to four memory boards are listed in Table 4.

Switches SW1-6 through SW1-8 (CSR decode) should be set to the open or OFF position. Switch SW1-1 is not used and has no required setting.

If you are installing a CPU board set exactly as it was shipped to you from MODCOMP, no change of SW1 settings is required. If you are installing an additional memory board in your CPU board set, set the board number select portion of SW1 to the next highest unused board number in the board set. For example, the second memory board should have its Sw1 switch set for board 1, the third for board 2, etc.

(Address ranges are set up by the software. See the *MVME188A VMEmodule RISC Microcomputer User's Manual* for programming details.)

Table 4. 32 Mbyte ECC Memory Board Switch Settings

Memory Board Number	Switch SW1			
	5	4	3	2
0	OFF	OFF	OFF	ON
1	OFF	OFF	ON	OFF
2	OFF	ON	OFF	OFF
3	ON	OFF	OFF	OFF

Notes:
(1) SW1−1 not used
(2) SW1−6 through SW1−8 = OFF

Mechanical Installation

Mechanical installation of the CPU board set consists of inserting it into the backplane, setting backplane jumpers, connecting cables, and installing the transition panel.

Inserting CPU Board Set into Backplane

To install the board set, proceed as follows:

WARNING!

Be sure to turn off the power to the computer system before installing or removing any cards. Also, use proper protection against damage to MOS devices from electrostatic discharge. Refer to your System Guide for details.

1. Turn off power to the system.
2. Follow the internal access procedures for your cabinet as described in your *System Guide*.
3. Remove the filler panels at the slots where the CPU board set is to be installed.
4. Insert the CPU board set in the appropriate slots as discussed in "Slot Selection" on page 11. Seat the boards fully in their backplane connectors and tighten retaining screws of each board.
5. Remove the filler panel from the transition module mounting bay where the transition panel is to be mounted.

Setting Backplane Jumpers

The VME backplane jumpers are mounted on the pin side of the backplane and are clearly marked. The bus grant (BG0 – BG3) and IACK jumpers for the slot occupied by the system controller (slot 1) must be removed. Leave the bus grant and IACK jumpers installed in the slots in which the remaining boards of the CPU board set are installed. If necessary, refer to the *Guide to VME Modules Introduction* for the location of these jumpers.

Installing Transition Panel and Serial Port Cables

The transition panel comes assembled with two serial port cables for connection to front panel connectors J3 and J4 on the system controller board. To install, proceed as follows:

1. Route the serial cables through the location in the transition module mounting bay where the transition panel is to be installed.

2. Referring to Figure 7, connect the cable mounted in the SERIAL PORT 1/CONSOLE cutout on the transition panel to the SER PORT 1 connector (J4) on the front panel of the system controller board.

3. Connect the cable mounted in the SERIAL PORT 2 cutout on the transition panel to the SER PORT 2 connector (J3) on the front panel of the system controller board.

4. Position the transition panel in its mounting location and tighten the retaining screws.

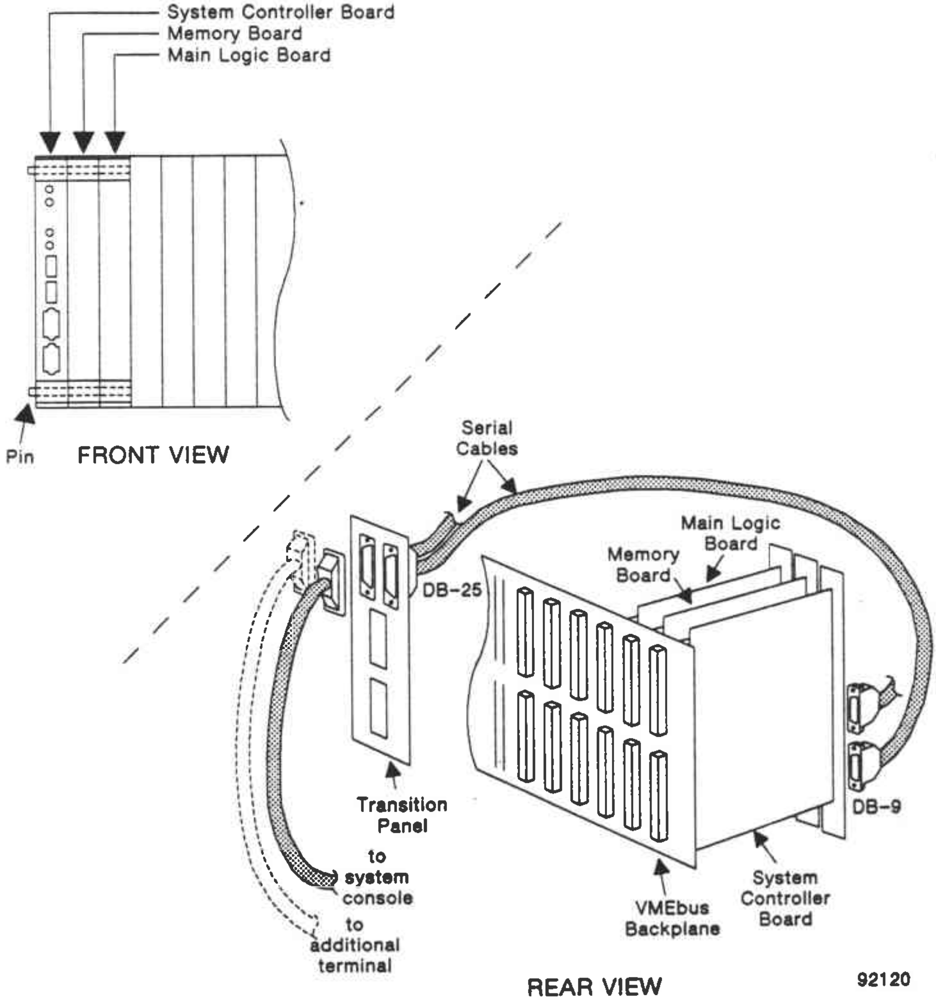


Figure 7. CPU Board Set and Transition Panel Cable Installation

Operation

This section contains procedures for operating the computer and includes the following topics:

- Setting Up the System Console
- Powering Up the System
- Running System Tests
- About the Monitor Environments (includes bug and system)
- Debugger Commands
- Powering Down the System
- Installing the Operating System and Associated Software
- Shutting Down the System

Setting Up the System Console

To set up the system console, perform the following steps in order:

1. Connect the keyboard to the console.
2. Connect the console to the computer.
3. Connect AC power to the console.
4. Configure the console for communication with the computer.

Refer to the console vendor manual for specific instructions about items 1 and 3 above. Specifically, you should read any installation-related information in that manual before proceeding with console installation. Instructions for items 2 and 4 are given in the following subsections.

Many sites attach a printer to the system console to keep a hardcopy of everything typed at the console and all console messages received. Refer to the console vendor manual for information about connecting a printer to its serial printer port.

Connecting the System Console

The transition panel provides the connections for two RS-232C terminals. Serial port 1 is dedicated to the system console by convention.

Connect the system console to the computer with cable part number 535-100055-004. Connect one end of the cable to the main port of the terminal. Connect the other end of the cable to the SERIAL PORT 1/CONSOLE port on the transition panel (see Figure 8).

Cable part number 535-100055-004 has male DB25 connectors on both ends and is wired as a null modem. The serial ports on the transition panel are fixed in the DTE configuration, thus requiring the null modem cable to connect to the system console. Refer to "Technical Notes" on page 37 for the pin assignments of the transition panel serial ports.

NOTE

The board set is factory configured to access the 188Bug debugger from a terminal that is connected to the SER PORT 1 connector on the system controller board. Consequently, when the transition panel is installed, the terminal must be connected to the SERIAL PORT 1/CONSOLE connector. If you want to access the debugger from a terminal connected to any other port, you must reconfigure the port. See the MVME188BUG 188Bug Debugging Package User's Manual *for details.*

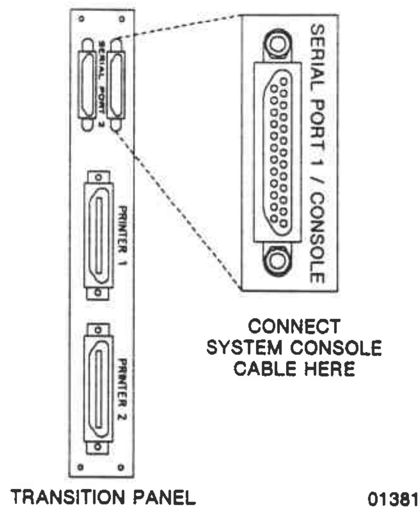


Figure 8. Connecting the System Console

Configuring System Console Communications

NOTE

The system console is the principal means of determining proper system power-up later during the power-up procedure. Set up the communications configuration of the system console now to ensure messages will be properly displayed during the power-up procedure.

Each manufacturer may differ slightly as to the console's default operating values. You should refer to the specific vendor manual for instructions about configuring the operating values of the console. Switch on the console and, following the instructions in the vendor manual, select the following values for communicating with the computer:

- ❑ Main Rcv Baud = 9600
- ❑ Main Xmt Baud = 9600
- ❑ Main Rcv Handsk = XON/XOFF
- ❑ Main Xmt Handsk = None
- ❑ Main Data/Parity = 8/None
- ❑ Main Stop Bits = 1
- ❑ Comm Mode = Full Duplex

If you have a printer attached to the console printer port, you also need to set communications values for the printer port. Refer to the vendor manual for the printer for information about communications values it supports.

When you've completed setting up the correct communications values, follow any instructions in the console vendor manual about saving the values you've entered. This is usually a separate step or action that must be taken in system console designs that feature keyboard- or menu-programmable communications values. Be sure to save the new operating values; otherwise, they may be lost next time you power cycle the console.

Powering Up the System

You can power up the system after the CPU board set has been installed, all cables are connected, and you have set up the system console.

To power up the system, proceed as follows:

1. Place the AC power switch for the console in its on position. Wait about 20 seconds to be sure you can see the cursor. If you can't see the cursor, adjust the screen controls so that the cursor becomes visible on the screen.
2. Place the system AC power switch in its on position.
3. Observe the console for the self-test and cold start messages, followed by either of the prompts shown in the screen below.

NOTE *The following screens and text are used as examples and the monitor prompt is shown as 188-Bug or 188-Diag. The exact prompt shown on the screen may differ slightly, depending on whether you are working in the bug or system environment.*

```
MVME188 Debugger/Diagnostics Release Version x.x - MM/DD/YY
COLD Start

Local Memory Found = 01000000 (&16777216)

Mezzanine Configuration: 4-MPU 8-CMMU
Current M-Bus Master    : MPU0
Idle MPU(s)             : MPU1 MPU2 MPU3

188-Bug>

(or ...)


xxxxxxxxxxxxxxxxxxxxxxxx.....................Running >
```

At power-up, the host CPU executes a monitor/debugger firmware program stored in its onboard EPROM. At this point, the monitor provides the user interface to the system.

- **If you have the `188-Bug>` prompt,** your system was shipped with the monitor set to the bug environment (board mode). In the bug environment, only a limited set of hardware confidence tests are executed. Together, the appearance of the `188-Bug>` prompt **and** the FAIL indicator on the system controller board front panel being extinguished, indicate that these self-tests have passed. Proceed to "Running System Tests" on page 26 if the self-tests pass and you have the `188-Bug>` prompt.

- **If you have the `Running >` prompt,** your system was shipped with the monitor set to the system environment (system mode). In the system environment, the full set of system tests are run automatically at power-up. This will take about 15 to 45 minutes (depending on the number of memory boards in the board set), during which time each new test description will overprint the previous one on the system console screen. The `Running >` prompt is the only indication that the system is operating properly during these tests. When the tests complete, the system returns the `188-Diag>` prompt. At that point, you may proceed to "Debugger Commands" on page 30. If your system fails any of the system tests, contact your MODCOMP Customer Engineer for assistance.

In either environment (bug or system), the host CPU initially runs limited self-tests. If any of these self-tests fail, the test is aborted, the FAIL indicator remains lit, and an error message is displayed. Contact your MODCOMP Customer Engineer for assistance.

Running System Tests

A more comprehensive set of system tests is available in the diagnostic directory. These system tests should be run before attempting to install the operating system. (If your system was shipped with the monitor in the system environment, these tests are run automatically at power-up.) The display shown below provides a sample of how to run the system tests. **Bold** type shows your response to the system prompts.

```
188-Bug>   sd
188-Diag>   st

(system tests run...)

188-Diag>
```

1. From the 188-Bug> prompt, change to the diagnostic directory by typing **sd**. This gives you the 188-Diag> prompt.

2. From the 188-Diag> prompt, type **st**. This runs the system tests, which take about 15 to 45 minutes to complete. Upon completion of the system tests, the 188-Diag> prompt returns. From here, you may proceed to "Debugger Commands" on page 30. If your system fails any of the system tests, contact your MODCOMP Customer Engineer for assistance.

The **de** (display errors) command can be useful when the system tests are completed. If any errors did occur, this command will display all of them. Refer to the *MVME188BUG 188Bug Debugging Package User's Manual* for a complete description of all diagnostic commands.

About the Monitor

The information in this section is general in nature and is not required reading for installing the system. If you like, you can go to "Debugger Commands" on page 30.

Upon power-up of a newly installed system, the system comes up in the monitor, which is a firmware program stored in EPROM on the system controller board.

Two operating environments are supported by the monitor, bug and system. The environment affects the way the system behaves at power-up and reset. Monitor environments are discussed in "Monitor Environments" on page 28.

Two operating directories are provided, the diagnostic directory and the debugger directory. In the bug environment, the user interface to the debugger directory is the `188-Bug>` prompt and you have all of the debugger commands available for use. In the system environment, the user interface to the diagnostic directory is the `188-Diag>` prompt and both the debugger commands and the diagnostic commands are at your disposal.

To switch between directories, you simply enter the switch directories (**sd**) command. Transitions between the directories do not change the environment. The **env** command must be used to change environments, and the current environment will be saved in NVRAM (non-volatile random-access memory) immediately for the next reset or power-up. Entering the help (**he**) command at either of the prompts displays a list of the available commands in the directory.

Monitor Environments

Two operating environments are supported by the monitor, the bug environment and the system environment. The selected environment affects the way the system behaves at power-up and reset. The two environments are discussed separately below along with instructions on switching environments.

Bug Environment

The bug environment is characterized by the `188-Bug>` prompt. This environment is generally used when you are going to remain in the monitor and work with the debugger commands. In the bug environment, the monitor performs the following sequence of principal operations at power-up or reset:

1. Runs limited confidence hardware tests, displays debugger's name and version, cold start message, and HYPERmodule mezzanine configuration. (See the screen under the section "Powering Up the System" on page 24.)

2. If autoboot is not enabled (**noab**), displays `188-Bug>` prompt and waits for input.

3. If autoboot is enabled for power-up only and this is a reset, not a power-up cycle, displays `188-Bug>` prompt and waits for input.

4. If autoboot is enabled for any board reset, attempts autoboot using boot parameters stored in NVRAM. If parameters are valid, continues with autoboot. If parameters are not valid, displays autoboot fail message, issues `188-Bug>` prompt, and waits for input.

System Environment

The system environment is generally used for operating the host CPU with an operating system, without pausing at the monitor. In the system environment, the monitor performs the following sequence of principal operations at power-up or reset:

1. Runs limited confidence hardware tests, displays debugger's name and version, cold start message, and HYPERmodule mezzanine configuration. (See the screen under the section "Powering Up the System" on page 24.)

2. Upon successful completion of limited self-tests, pauses five seconds. (You can enter any character to halt the sequence here.) If a character is received, halts autoboot sequence and displays system menu as shown below:

```
1) Continue System Start Up
2) Select Alternate Boot Device
3) Go to System Debugger
4) Initiate Service Call
5) Display System Test Errors
6) Dump Memory to Tape
Enter Menu #:
```

NOTE *If you make any selection other than "Continue System Start Up," you can return to the system menu when you have finished making your selections (this is usually done by entering a . with a carriage return then entering* **menu** *at the prompt). See the* MVME188BUG 188Bug Debugging Package User's Manual *for details.*

3. Runs system tests if pause elapses without receipt of halt request or you select "Continue System Start Up" from the menu. For any failure, displays error message, returns to the system menu, and waits for input.

4. If system tests complete successfully, runs autoboot sequence with boot parameters stored in NVRAM or from an alternate boot device (if that option was selected from the menu). If parameters are not valid, displays autoboot fail message, returns to the system menu, and waits for input.

Choosing and Setting Monitor Environments

Your choice of monitor environment will affect the way the system behaves when it is powered up or reset and, once the operating system is installed and running, when transitions are made between operating system states. When comparing the two environments, consider the following differences in behavior in making your choice:

- If you choose the *bug environment*, the system test suite is bypassed. You also have the option of enabling or disabling autoboot.

- If you choose the *system environment*, the system test suite is executed and autoboot is enabled.

Upon making a choice, use the **env** command to display or change the current environment. Note that if you change the environment from its current setting, the sequence of principal operations for the new environment will ensue when a reset or power-up condition occurs.

Debugger Commands

The information in this section is an introduction to the debugger. The following subsections give specific instructions about setting up the operating defaults for a few essential commands. Setting up the appropriate defaults now will prepare the system for the installation of the operating system. For more information about the debugger, refer to the *MVME188BUG 188Bug Debugging Package User's Manual*.

The following debugger commands are of specific interest for setting up your system. For the most part, these are the commands you will be using now, and later when you install the operating system:

- **env**, the environment command. This command displays or changes the current environment. The current parameters are saved in NVRAM.
- **ab**, the autoboot command. This command executes the autoboot sequence if enabled by **env**.
- **noab**, the no autoboot command. This command disables autoboot but does not alter the default parameters saved with **env**.
- **bo**, the manual boot command. This command with arguments boots the operating system.
- **reset**, the reset command. This command allows you to issue, through the monitor, a CPU and VMEbus reset. It also allows you to specify the level of reset operation that will be in effect when a reset is detected by the CPU.

Using env to Set Environment and Autoboot Parameters

The **env** command can be used to display and change the current environment (bug or system), autoboot parameters, ROM boot parameters, and the memory configuration parameters. The environment and autoboot parameters can be changed at your discretion, depending on what makes sense for your site. These are the parameters that are emphasized in these instructions. It is recommend that you set these parameters now, even though the operating system may not yet be installed.

env also gives access to many other parameters that must be left in their default conditions; these are not addressed here. In case these parameters become set to other than their defaults, the defaults can be restored by entering **env;d** at the prompt. Following that, perform the following procedure to restore the environment and autoboot parameters to those chosen for your site.

A few general notes about using the **env** command are provided below, followed by the procedure for using **env**.

In the following procedure, you will be entering the **env** command and responding to a subset of its several prompts for parameters. A few general notes about getting around within the **env** command follow:

- **env** prompts you one line at a time for default parameters. It shows you the current setting and may also show valid choices or guidelines for valid choices.
- Entering a carriage return keeps the current setting and advances to the next prompt.
- Entering a circumflex (^) followed by a carriage return displays the previous prompt.
- Entering a dot (.) terminates the collection of default parameters. **env** then prompts about updating NVRAM and resetting the system.

```
188-Bug>  env
Bug or System environment [B,S] = S?
Field Service Menu Enable [Y/N] = N?
Remote Start Method Switch [G/M/B/N] = B?
Probe System for Supported Disk/Tape Controllers [Y/N] = Y?
Negate VMEbus SYSFAIL* Always [Y/N] = N?
PWB Serial Number String [Y(Null String)/(String)] = ?
MPU Clock Speed in Megahertz = 25?
Auto Boot Enable [Y/N] = N?
Auto Boot at power-up only [Y/N] = Y?
Auto Boot Controller LUN = 00?     02
Auto Boot Device LUN = 00?     20
Auto Boot Default String [Y(NULL String)/(String)] = ?        /stand/re

Update Non-Volatile RAM [Y/N]?      y
Reset Local System (CPU) [Y/N]?      y
```

1. If you currently have the system menu, enter menu **#3** to get the `188-Bug>` or `188-Diag>` prompt.

2. At the prompt, enter **env**. The monitor asks if you want the bug (B) or system (S) environment, and also displays the current environment. If the current environment is what you want, just press RETURN. Otherwise, enter either **B** or **S** to select your choice.

3. The next six prompts ask about the field service menu, remote start method, system probe, VMEbus SYSFAIL* signal, serial number string, and MPU clock speed. Press RETURN to retain these defaults set at the factory. Defaults are shown here for reference.

4. Autoboot enable: The monitor asks if you want to enable autoboot. It also displays the current choice. If the current choice is what you want, just press RETURN. Otherwise, enter either **Y** or **N** to select your choice.

5. Boot at power-up only: This prompt asks you to make a choice about when autoboot will occur. It also displays the current choice. If the current choice is what you want, just press RETURN. If you enter **Y**, autoboot will occur only when the system is power cycled, i.e., powered down, then powered up. If you enter **N**, autoboot will occur when the system is power cycled and any time a reset occurs (when RESET button is pushed or otherwise). You can make any choice that makes sense for your site.

6. Controller LUN: This prompt asks for the SCSI ID of the disk controller from which the operating system will be booted. Enter **02** to select the first MVME327 SCSI controller. If you are using a different boot controller, supply the appropriate information here. (Refer to the *MVME188BUG 188Bug Debugging Package User's Manual* for a complete listing of the controllers supported by the firmware.)

7. Device LUN: This prompt asks for the SCSI ID of the boot device. Enter **20**. This number indicates device 0 on SCSI controller 2, the standard boot device of the system. If you are using a different disk device, supply the appropriate information here.

8. Default string: This prompt asks for a default string, which is actually a pathname to the file that contains the bootable kernel image of the REAL/IX Operating System. Enter **/stand/realix** followed by a dot (.) to terminate default parameter collection

9. **env** next prompts you about updating the NVRAM. Enter **y**.

10. Finally, **env** prompts you about resetting the system now. Parameters you enter are not in effect until after a system reset. This means that any change you've made to the monitor environment and autoboot process will be in effect upon system reset, and that the system may behave differently the next time through the reset process.

    If you've set the monitor to autoboot, and the operating system has not been installed yet, be prepared to press the system console <BREAK> key to terminate the autoboot process.

    Enter **y** in response to the prompt about resetting the system.

Using Autoboot

The **ab** (autoboot) command is used to invoke the autoboot sequence. The default boot parameters are stored in NVRAM, including the parameters set up by the **env** command.

The procedure is as follows:

1. At the `188-Bug>` or `188-Diag>` prompt, enter **ab**. If an autoboot sequence cannot be invoked, check that the parameters are correct by entering the verbose option (**ab;v**). This option displays the controller and device it is attempting to boot from. If necessary, reset the parameters with the **env** command.

2. At the prompt, enter **noab** to disable the autoboot function while you install the operating system. The parameters are retained.

   Later, after the operating system has been installed, you can invoke the autoboot function by typing **ab** at the prompt.

The monitor gives you a few chances to interrupt an autoboot sequence. This comes in handy when the operating system is installed and you want to do some work in the monitor without changing the monitor environment settings. You can interrupt an autoboot sequence only under the following conditions:

- When the monitor displays the cold start message and pauses. Here, the monitor pauses for five seconds and tests for a halt request. Entering any character during this pause halts the system in the monitor.

- When the monitor displays the message `Autoboot in progress... To abort hit <BREAK>`. Pressing the system console <break> key repeatedly until you get the `Break Detected` message aborts the autoboot and stops in the monitor.

- In the system environment, while the system test suite is running. You can stop the tests and return to the system menu by pressing either the ABORT button on the front panel of the system controller board or the system console <BREAK> key. To continue with the autoboot process, including the system test suite, select the menu option to continue the system startup.

Using the Boot Command

The **bo** (boot) command is used to manually boot the system. You must identify the device where the bootloader software is stored. For example, to boot from controller LUN 2, device LUN 20, enter the following at the prompt:

```
bo 2,20
```

The pathname of the file that contains the bootable kernel image of the operating system is automatically loaded (see **env** command on page 31).

Setting Up the reset Command

The **reset** command allows you to issue, through the monitor, a reset for the host CPU, VMEbus, and local SCSI bus. It also allows you to specify the level of reset operation that will be in effect when a reset is detected by the CPU, either by way of the RESET pushbutton or a software reset. The display shown below provides a sample of how to set up the **reset** command defaults.

```
188-Bug>   reset
Cold/Warm Reset [C,W] = C?
Execute System Reset (via MVME188) [Y,N] N?
Execute System Reset (via VEBOARD) [Y,N] N?
188-Bug>
```

1. If you currently have the system menu, enter menu **#3** to get the `188-Bug>` or `188-Diag>` prompt.

2. At the prompt, enter **reset**. The monitor asks if you want the cold/warm reset flag set. This response should be C. If it is, press RETURN; otherwise enter **C**. In a cold reset, all static variables are initialized. A warm start preserves static variables, convenient for keeping breakpoints, offset register values, and other static variables in the system.

3. Next, the monitor asks if you want to execute a system reset via the MVME188 CPU now. This type of reset resets the system including the CPU board set. If you enter **y**, the reset command prompts end and the system reset is executed. If the default answer is what you want, just press the carriage return. Otherwise, enter your choice, either yes or no [Y,N].

4. If you did not answer yes to the previous prompt, another prompt about resetting the system (via VEBOARD) appears. The response to this prompt should always be **n**.

5. After pressing the final carriage return in the **reset** sequence, the monitor stores the information about future resets in NVRAM and performs whatever resets you have selected.

Powering Down the System

Any time the system is running the monitor, you can power down the system by placing the AC power switch in the off position.

Installing the OS and Associated Software

For detailed instructions about installing the operating system, refer to the *REAL/IX Software Installation Guide.*

You can install any optional I/O software, such as VME device drivers, by using the standard **sysadm installpkg** script. Refer to the appropriate *Guide to VME Modules* for specific installation instructions for add-on software.

If at any time you need to remove any add-on software, run the **sysadm removepkg** script. The release tape used to originally install the software is required. Refer to the appropriate *Guide to VME Modules* for step-by-step instructions on running this script. Prior versions of the software must first be removed before installing a newer release.

Shutting Down the System

To shut down the system after the operating system and associated software is installed, type in **shutdown -i0** at the console. The system will shut down in about 2–3 minutes and place you in the monitor.

You may choose other methods to shut down the system. Refer to the *REAL/IX System Administrator's Guide* for details.

Diagnostics

Diagnostic firmware is included as part of the 188Bug package resident in EPROM. A complete diagnostic directory is available that provides utilities and tests for exercise, test, and debug of the CPU board set hardware. See "Running System Tests" on page 26 and the *MVME188BUG 188Bug Debugging Package User's Manual* for details.

Connecting Devices

The CPU board set relies on other VME controllers for I/O support. Particularly, the Intelligent Communications Controller provides support for connecting user terminals, serial and parallel printers, and other devices that require serial I/O support. Refer to the *Intelligent Communications Controller Guide to VME Modules* for details.

Technical Notes

This section provides configuration information about the CPU board set and pin assignments for the serial ports on the transition panel.

Variations of the CPU Board Set

The CPU board set configuration varies according to the number and type of memory boards included and the version of HYPERmodule used. As for the memory board related variations, the CPU board set is shipped with either a 16 Mbyte, 32 Mbyte, or 64 Mbyte MVME288 memory board. Up to three more memory boards may be added for a maximum total memory configuration of 256 Mbytes.

Table 5 lists the HYPERmodule versions used in the various CPU board sets offered by MODCOMP. For technical details about the HYPERmodule version listed, refer to the *HM88K HYPERmodule 32-Bit RISC Processor Mezzanine Module User's Manual*.

Table 5. CPU Board Set to HYPERmodule Cross Reference

HYPERmodule Version	CPU Board Set Characteristics	
	Number of Processors	Cache Size in Kbytes
HM88K-1P128-2	1	128
HM88K-2P128-2	2	128
HM88K-2P256-2	2	256
HM88K-4P128-2	4	128

Transition Panel Serial I/O Ports Pin Assignments

Table 6 lists the industry standard DTE pin assignments of the transition panel serial I/O ports.

Table 6. Transition Panel Serial I/O Ports Pin Assignments

Pin Number	Signal Mnemonic	Signal Name (Direction)
2	TXDA	Transmit data (to DCE)
3	RXDA	Receive data (from DCE)
4	RTS	Request to send (to DCE)
5	CTS	Clear to send (from DCE)
6	DSR	Data set ready (from DCE)
7	SGND	Signal ground
8	CD	Carrier detect (from DCE)
20	DTR	Data terminal ready (to DCE)

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Guide to VME Modules

Intelligent SCSI Bus Adapter

AEG

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Introduction

The MODCOMP® Intelligent Small Computer System Interface (SCSI, pronounced "scuzzy") Bus Adapter is used on MODCOMP open architecture systems. It can be installed at the factory if ordered at the time of your initial system purchase, or it can be installed in the field for existing systems. The REAL/IX® Operating System, Release B.0 or later, is required.

The MODCOMP SCSI Bus Adapter conforms to all requirements and conventions specified in ANSI/IEEE Standard 1014–1987, *IEEE Standard for a Versatile Backplane Bus: VMEbus*.

Each SCSI Bus Adapter product consists of:

- SCSI controller card (Modified Motorola® MVME327A)
- P2 adapter board
- MVME717 transition module
- SCSI bus cable

The SCSI controller provides an interface to the SCSI bus in the MODCOMP host computer system.

The SCSI Bus Adapter is an intelligent host adapter that provides a link between the 32-bit VMEbus and the 8-bit SCSI bus. Through the SCSI controller, commands and data can be passed between the CPU, main memory, and peripheral devices on the SCSI bus. The maximum number of SCSI controllers per open architecture system is two.

The MODCOMP MVME141-, MVME188- and Quadbus-based CPU computer systems, which do not have an on-board SCSI bus, must use one SCSI Bus Adapter and may use a second adapter for dual SCSI configurations. The MODCOMP MVME147-based computer system supports one on-board SCSI bus and may use an additional SCSI Bus Adapter for a dual SCSI configuration.

Figure 1 illustrates a MODCOMP open architecture system that does not have an on-board CPU SCSI Bus Adapter. Two SCSI Bus Adapters with transition modules are shown. MODCOMP open architecture systems that support one on-board SCSI bus may use the SCSI Bus Adapter for a dual SCSI configuration (see Figure 2).

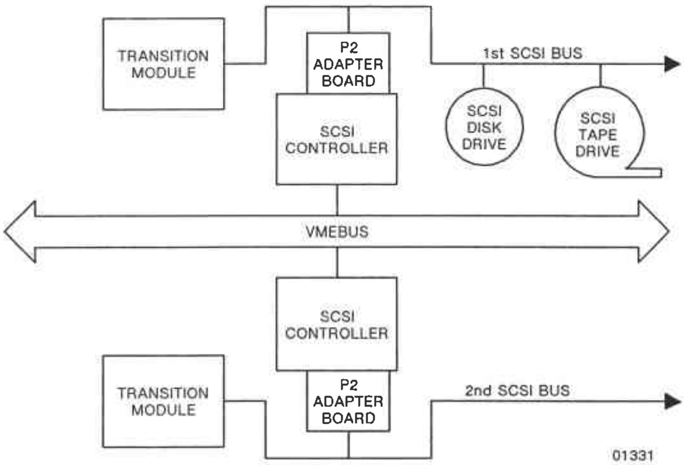


Figure 1. Dual SCSI Configuration (two controllers)

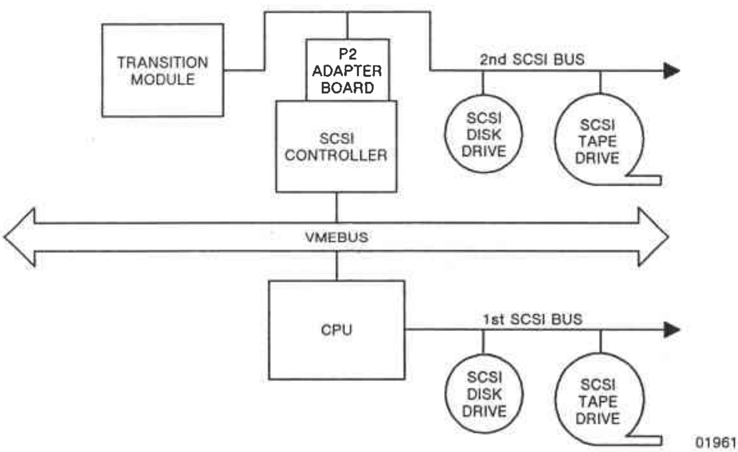


Figure 2. Dual SCSI Configuration (single controller)

Related Publications

The Preface in your *System Guide* contains a list of manuals that you may need for general hardware and operating system information.

In addition, the following vendor manuals describe the SCSI Bus Adapter. You should receive one copy of each publication with each SCSI Bus Adapter you purchase for use with your system.

- *MVME327A/D1 VMEbus To SCSI Bus Adapter and MVME717 Transition Module User's Manual*, MODCOMP order number 240–100222–001

- *MVME327AFW/D1 Firmware User's Manual*, MODCOMP order number 240–100238–001

For information about the SCSI Bus Adapter device driver, refer to the **mvme327**(7) man page documentation.

NOTE

This manual is one in a series of documents that you will need for complete information about your system. The System Guide and the Guide to VME Modules Introduction are also required. Other manuals, depending on your system, may also be required. You should refer to your System Guide for a listing of these manuals.

Software

Software for the SCSI controller card consists of a driver and an include file that defines various structures and commands.

Driver

The SCSI controller card driver is a fully semaphored REAL/IX character driver that supports synchronous and asynchronous data transfers directly between the user's buffer and the controller.

Configuration Utility

There is no configuration utility for this product. Configuration is done through the standard sysgen process.

Library

There is no special library of user-callable routines for this product. Application programs access the SCSI controller card driver through **ioctl**(2) system calls. For information about **ioctl** calls supported by the driver, refer to the **mvme327**(7) man page documentation.

Hardware

The SCSI controller card is constructed on a single-wide, double-high VME module that occupies one slot in the VME chassis.

The controller has one SCSI port. Connections between the port and the transition module are passed directly through from the outside rows of the P2 backplane connector (rows A and C) to the P2 adapter board. The P2 adapter board presses onto the J2 backplane connector at the slot occupied by the SCSI controller card. The P2 adapter board connects to the transition module and the SCSI devices by an internal ribbon cable.

Component Locations

Figure 3 shows the component side and front panel of a SCSI controller card. This figure is referred to throughout the installation procedure as a guide to component locations.

The Motorola MVME327A SCSI controller card has been modified by MODCOMP and is not a standard Motorola MVME327A board.

Transition Module

The MVME717 transition module provides for terminating one end of the SCSI bus. The transition module is installed in the mounting bay of the cabinet and occupies one single-wide location. The component side and front panel of the transition module are shown in Figure 4.

The transition module has one internal connector (J3) and one SCSI interface connector (J1) on its front panel. The J1 connector is not used. There is also one green LED, TERM PWR, mounted on the front panel that when lit indicates normal operation.

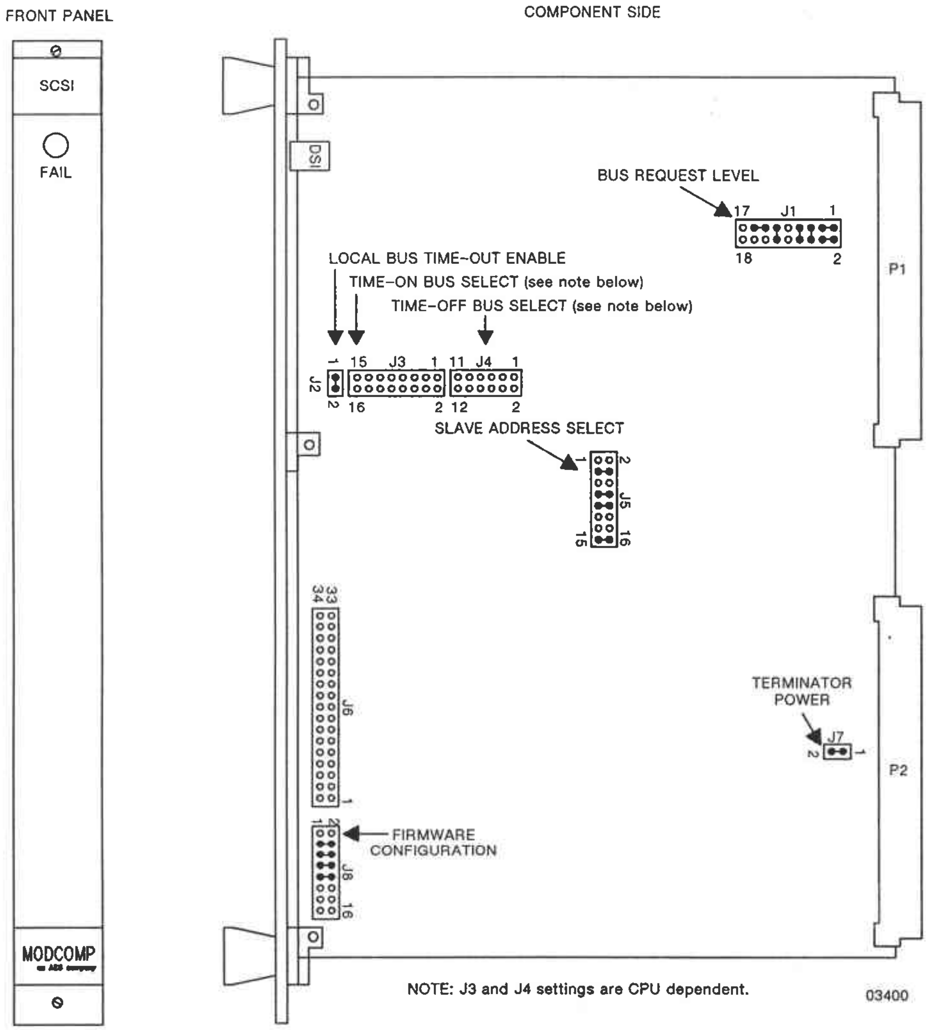


Figure 3. Component Locations

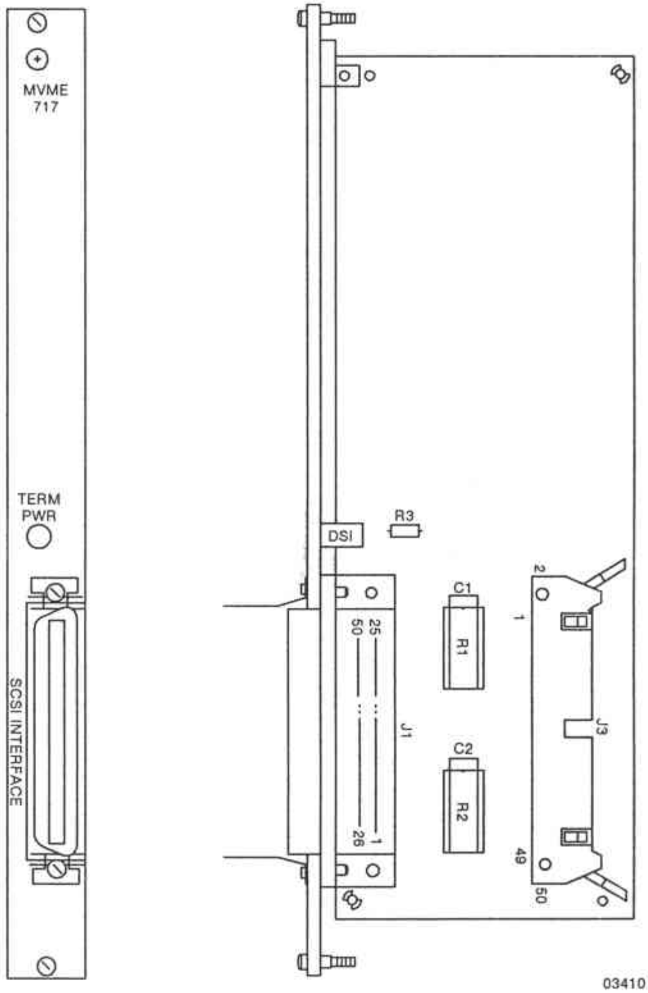


Figure 4. MVME717 Transition Module

P2 Adapter Board

The P2 adapter board (see Figure 5) has one outside edge connector (P2) which plugs directly into the J2 backplane connector at the slot occupied by the SCSI controller card. A 50-pin connector (J1) on the P2 adapter connects the SCSI controller card to the SCSI devices and a transition module. The J2 connector on the P2 adapter board is not used.

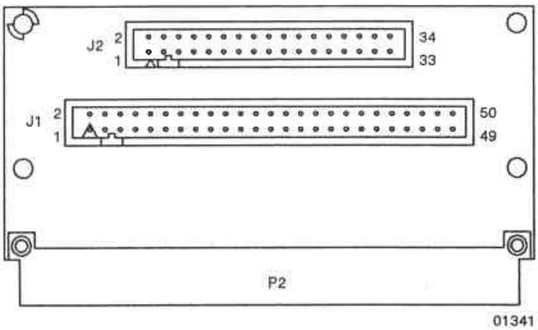


Figure 5. P2 Adapter Board

Cabling

The SCSI Bus Adapter uses only one 50-pin flat ribbon cable to connect the P2 adapter, transition module, and either individual devices or a peripheral chassis. Therefore, the number of connectors on a SCSI bus cable and its length are configuration-dependent and vary from system to system. Extra connectors may be left unconnected and used for future peripheral device expansion. The SCSI bus cable connects to the J3 connector on the transition module, the J1 connector on the P2 adapter board, and either bulkhead connector J1 (first SCSI bus) or bulkhead connector J2 (second SCSI bus) on the peripheral chassis or to each peripheral device (i.e tape drive, disk drive, etc.) if no bulkhead peripheral chassis is used. Refer to your *System Guide* for internal cabling of the peripheral chassis.

Cable Requirements

The maximum SCSI bus cable length for all interconnected devices must not exceed a total of 12 feet (3.7 meters) to ensure proper operation and data integrity.

Connector Signal Assignments

The P2 adapter board has a standard triple-row, 96-pin connector (P2) and a 50-pin connector (J1). Tables 1 and 2 list signal and pin assignments for these connectors. For signal descriptions refer to the *MVME327A SCSI Bus Adapter User's Manual* listed in the Related Publications section of this manual.

Table 1. Adapter Board P2 Connector Pin Assignments

Pin Number	Row A Signal	Row B Signal	Row C Signal
1	DB1	not used	DB0
2	DB3	GND	DB2
3	DB5	not used	DB4
4	GND	not used	DB6
5	GND	not used	DB7
6	GND	not used	DBP
7	GND	not used	TERMPWR
8	GND	not used	ATN
9	GND	not used	BSY
10	GND	not used	ACK
11	GND	not used	RST
12	GND	GND	MSG
13	GND	not used	SEL
14	GND	not used	C/D
15	GND	not used	REQ
16	GND	not used	I/O
17	GND	not used	RPM
18	GND	not used	SELECT4
19	GND	not used	INDEX
20	GND	not used	SELECT1
21	GND	not used	SELECT2
22	GND	GND	SELECT3
23	GND	not used	MOTORON
24	GND	not used	DIRECTION

Table 1. Adapter Board P2 Connector Pin Assignments (cont.)

Pin Number	Row A Signal	Row B Signal	Row C Signal
25	GND	not used	STEP
26	GND	not used	WRITE DATA
27	GND	not used	WRITE GATE
28	GND	not used	TRACK 00
29	GND	not used	WRITE PROTECT
30	GND	not used	READ DATA
31	GND	GND	SLIDE SELECT
32	GND	not used	READY

Table 2. Adapter Board J1 Connector Pin Assignments

J1 Connector			
Pin	**Signal**	**Pin**	**Signal**
1–19 (ODD)	GND	36	BSY
2–16 (EVEN)	DB0–DB7	37–49 (ODD)	GND
18	DBP	38	ACK
20–24	GND	40	RST
25		42	MSG
26	TERMPWR	44	SEL
27–31	GND	46	C/D
32	ATN	48	REQ
33–35	GND	50	I/O

Installation

The following sections describe the installation procedure for the SCSI Bus Adapter, including setting options, mechanical installation of the controller and P2 adapter cards, transition module, and cable. A separate software installation is not required because the SCSI device driver is included as part of the REAL/IX Operating System software. Information about SCSI sysgen requirements is given following the mechanical installation, in the section "Reconfiguring the Operating System" (see page 18). Information about SCSI device IDs is provided in the *Guide to VME Modules Introduction*.

Be sure to turn off the power to the computer system before installing or removing VME cards. Also use proper protection against damage to MOS devices from electrostatic discharge. Refer to your System Guide for details.

Selecting a Slot

The *Guide to VME Modules Introduction* gives general guidelines for selecting a slot for VME cards. The information given here supplements these guidelines.

The SCSI Bus Adapter functions as a bus master type board and also sustains a high frequency of interrupt acknowledge (IACK) cycle usage. It should therefore be placed in available slots somewhere between the middle and last (highest-numbered) slots in the VME chassis. Consideration must be given to other cards already installed in this area of the chassis relative to their frequency of IACK cycle use. Always place controllers with the highest frequency of IACK cycle usage closer to slot 1 than controllers with a lower frequency of IACK cycle usage.

Slot selection for the associated transition module should be the same slot number in the mounting bay as selected for the SCSI controller card in the VME chassis. If you are installing two SCSI controllers, the second controller should be installed in the next higher slot number with the associated transition module installed in the corresponding slot number in the mounting bay.

Setting Options

Some SCSI controller options are set by jumpers on the card; others have been hardwired along with component changes. The following subsections provide jumper information for the SCSI controller card.

VME Bus Request Level

Jumper block J1 on the controller card (Figure 6) determines the VMEbus request level. MODCOMP VMEbus-based CPU systems contain a single-level bus arbiter and require priority level 3. Quadbus-based CPU systems contain a four-level bus arbiter and may use priority levels 0 through 3, but priority level 3 is recommended.

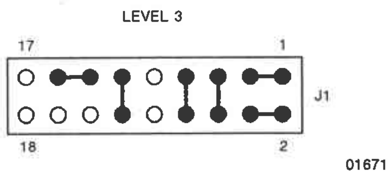


Figure 6. VME Bus Request Level (J1)

Local Bus Time–Out Enable

Jumper block J2 (Figure 7) allows the local bus time-outs to occur. The jumper is always installed so that time-outs are enabled.

Figure 7. Local Bus Time–Out Enable (J2)

Time–On Bus

Jumper block J3 (Figure 8) selects the time limit that the SCSI controller spends on the VMEbus when bursting data to or from the SCSI bus. See Figure 8 for CPU-dependent jumper settings.

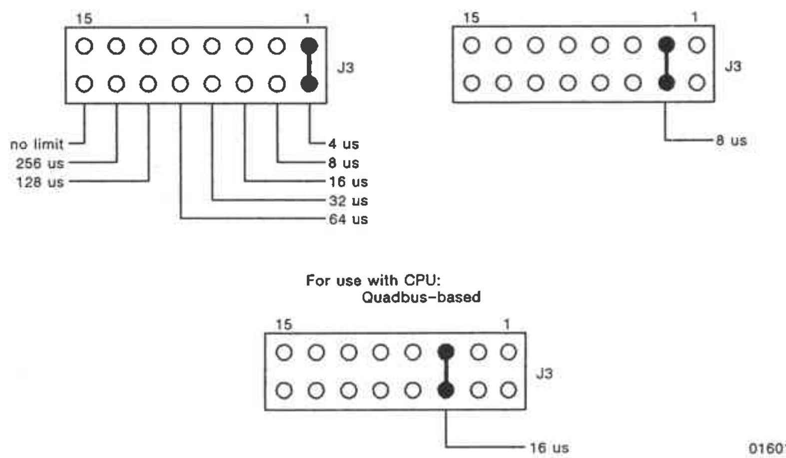


Figure 8. Time–On Bus (J3)

Time–Off Bus

Jumper block J4 (Figure 9) selects the time limit that the SCSI controller checks before reissuing a request to acquire the VMEbus. After the VMEbus mastership is released, a timer is started. When the time expires, the VMEbus requester is allowed to reissue a bus request for the VMEbus.

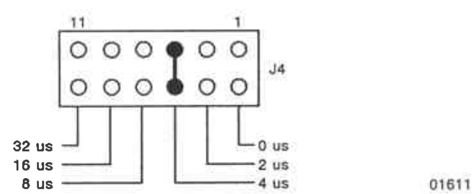


Figure 9. Time–Off Bus (J4)

Module Base Address

Jumper block J5 (Figure 10) selects the address for the card. For systems with one SCSI controller, the card is configured to address hex FFFFA600. If a second controller is used, the card should be set to address hex FFFFA700.

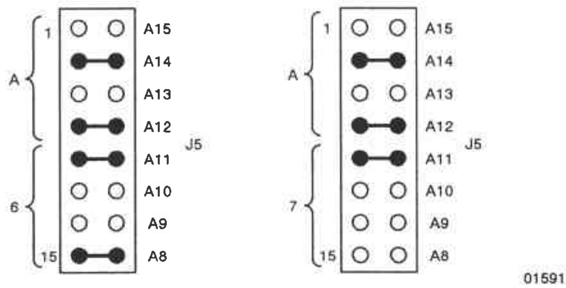


Figure 10. Module Address (J5)

Enable/Disable Terminator Power

The SCSI controller is a dual initiator/target and must be capable of providing terminator power to the SCSI bus. Jumper block J7 (Figure 11) enables the terminator generator power used with the SCSI controller. The jumper is always in.

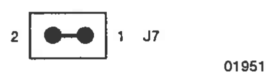


Figure 11. Enable/Disable Terminator Power (J7)

Firmware Configuration

Jumper block J8 is used for firmware configuration. The configuration used for the SCSI controller card is shown in Figure 12. Refer to the *MVME327AFW Firmware User's Manual* for more detailed information.

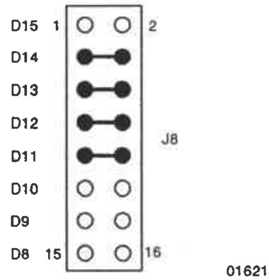


Figure 12. Firmware Configuration (J8)

Mechanical Installation

The following information addresses the mechanical installation of the SCSI Bus Adapter, including inserting the SCSI controller and P2 adapter cards into the backplane, setting the backplane jumpers, connecting the cable, and installing the transition module.

Installing the SCSI Bus Adapter

To install the SCSI Bus Adapter, proceed as follows:

1. Turn off power to the system.

Before inserting or removing any card into the backplane, turn the AC power switch off. Failure to do so may damage components or introduce latent defects that can lead to failures later. Also, use proper protection against damage to MOS devices from electrostatic discharge.

2. Follow the internal access procedures for your cabinet as described in the *System Guide*.

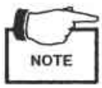
3. Remove the filler panel at the slot where the card is to be installed.

4. Insert the SCSI controller card in the selected slot. Seat the card fully in the backplane connectors and tighten the card retaining screws.

5. Install the P2 adapter board on the P2 connector for the slot occupied by the SCSI controller card at the rear of the backplane. Be sure to orient pin 1 of the P2 adapter board with pin 1 of the backplane connector.

6. Ensure that the terminator resistors R1 and R2 are installed on the transition module (see Figure 4).

7. Remove the filler panel from the mounting bay slot where the transition module is to be mounted.



When connecting the SCSI cable in a peripheral chassis that has bulkhead connectors, connect the cable to bulkhead connector J1 for the first SCSI bus. Use bulkhead connector J2 for the second SCSI bus.

8. Connect the SCSI cable to connector J1 of the P2 adapter board and to either the peripheral chassis bulkhead connector (J1 or J2) or the SCSI devices. Refer to Figures 13 and 14.

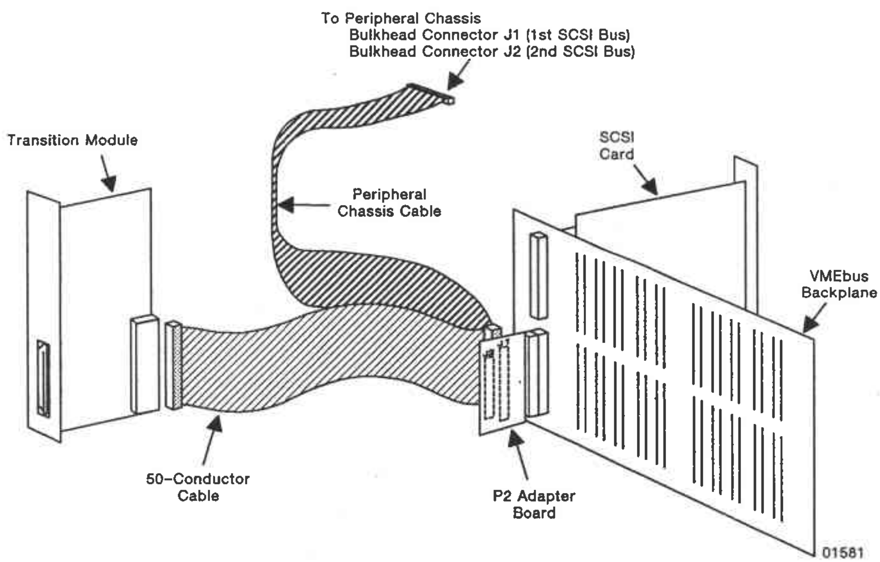


Figure 13. SCSI Bus Adapter Cabling to Peripheral Chassis

9. Pull the SCSI cable through and connect it to the J3 connector on the transition module.

10. Mount the transition module in the bay slot and tighten the transition module retaining screws.

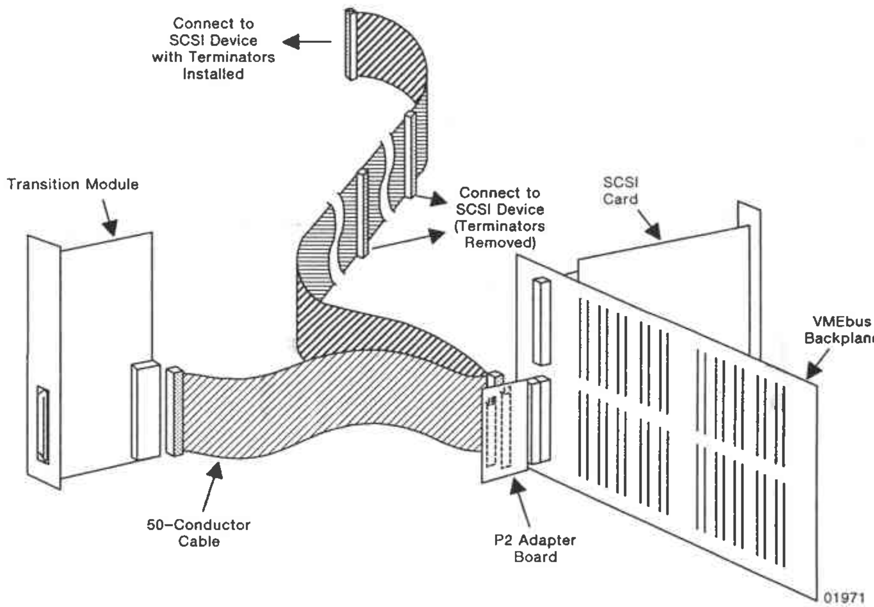


Figure 14. SCSI Bus Adapter Cabling to SCSI Devices

Backplane Jumpers

When installing the SCSI controller card, remove all bus grant (BG) and interrupt acknowledge (IACK) jumpers on the backplane for the slot occupied by the SCSI controller card. If these backplane jumpers are not removed, the controller will not appear to be generating any interrupts or requesting the VMEbus.

Powering Up

Power up the system following the instructions given in your *System Guide*. When you boot the system, the REAL/IX Operating System kernel is configured for at least one SCSI Bus Adapter. If you have installed a second SCSI Bus Adapter, or if you want to change the sysgen descriptors for any of the controllers, you must modify information in the sysgen screens and rebuild the operating system. This is done using the standard **sysgen**(1M) utility.

Reconfiguring the Operating System

This section presents information specific to the sysgen for the SCSI Bus Adapter. It is assumed that you are already familiar with the basic REAL/IX sysgen process, in particular how to add, modify, and enable information presented in the sysgen screens and rebuild the operating system. If you are not familiar with this process, refer to the sysgen chapter in the *REAL/IX System Administrator's Guide* or to the **sysgen**(1M) man page documentation.

Enabling a Second SCSI Controller

The REAL/IX Operating System includes a description file for the SCSI Bus Adapter that is assembled into the bootable system object when a sysgen is run. The system may be set up with either one or two SCSI Bus Adapters enabled. If the system is configured with one SCSI Bus Adapter and you want to add a second one, you must enable the additional SCSI Bus Adapter in the sysgen description file and rebuild the operating system according to the following steps:

1. Invoke **sysgen** without any options.
2. Enable the additional controller in the sysgen screens.
3. Rebuild the operating system before exiting sysgen, or separately using **sysgen −gbi**.
4. Shut down the system.
5. Reboot the system.

The new operating system that is brought up after you reboot will include the enabled second SCSI Bus Adapter with the default sysgen parameters set up in the description file.

Changing the sysgen Parameters

To modify sysgen parameters for the SCSI Bus Adapter, rebuild the operating system following the steps listed below.

1. Invoke **sysgen −d**.
2. Modify information in the sysgen screens as appropriate.
3. Rebuild the operating system before exiting sysgen, or separately using **sysgen −gbi**.
4. Shut down the system.
5. Reboot the system.