

# **VMIVME-5504L**

## **D32/A16 RS-485 VMEbus REPEATER LINK**

### **Product Manual**



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500-005504-000 Rev. C



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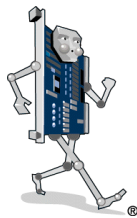
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# VMIC

## SAFETY SUMMARY

The following general safety precautions must be observed during all phases of the operation, service, and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of this product. VME Microsystems International Corporation assumes no liability for the customer's failure to comply with these requirements.

### **GROUND THE SYSTEM**

To minimize shock hazard, the chassis and system cabinet must be connected to an electrical ground. A three-conductor AC power cable should be used. The power cable must either be plugged into an approved three-contact electrical outlet or used with a three-contact to two-contact adapter with the grounding wire (green) firmly connected to an electrical ground (safety ground) at the power outlet.

### **DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE**

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

### **KEEP AWAY FROM LIVE CIRCUITS**

Operating personnel must not remove product covers. Component replacement and internal adjustments must be made by qualified maintenance personnel. Do not replace components with power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

### **DO NOT SERVICE OR ADJUST ALONE**

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

### **DO NOT SUBSTITUTE PARTS OR MODIFY SYSTEM**

Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the product. Return the product to VME Microsystems International Corporation for service and repair to ensure that safety features are maintained.

### **DANGEROUS PROCEDURE WARNINGS**

Warnings, such as the example below, precede only potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed.



**DANGEROUS VOLTAGES, CAPABLE OF CAUSING DEATH, ARE PRESENT IN THIS SYSTEM. USE EXTREME CAUTION WHEN HANDLING, TESTING, AND ADJUSTING.**

# **VMIVME-5504L D32/A16 RS-485 VMEbus REPEATER LINK**

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## SECTION 1

### INTRODUCTION

#### 1.1 INTRODUCTION

VMIC's VMIVME-5504L D32/A16 RS-485 VMEbus Repeater Link is a software transparent two-board set, plus interconnecting cables that allow the user to effectively extend (up to 1,000 feet) a VMEbus chassis to more than 20 slots. The "extended" slots, however, are only operational for VMEbus Slave boards. The Repeater Link has several unique features, as specified below:

- a. Multidrop capability reduces cost
- b. Differential line drivers and receivers provide  $\pm 7$  V common-mode noise rejection
- c. Software transparent link
- d. Supports up to 1,000 foot-cables
- e. Allows expansion to 19 x 19 x 16 slots using 20-slot backplanes in a star multidrop configuration
- f. Supports 8-, 16-, and 32-bit data transfers
- g. Supports 16-bit addressing
- h. Double Eurocard form factor
- i. Link includes one Master board, one Slave board, and a wide variety of cable length options
- j. DIN type I/O connectors
- k. Supports VMEbus Slaves on a "Slave Only" VMEbus

#### 1.2 FUNCTIONAL DESCRIPTION

The VMIC Multidrop Repeater Link is designed to use a single Master Repeater board which may be connected to as many as 16 Slave Repeater boards using a single cable assembly with cable taps. This configuration allows VMEbus Slave I/O boards residing in one VMEbus chassis to be controlled by a VMEbus Master residing in another chassis. The VMEbus chassis in which VMEbus Masters reside is referred to as a Master Chassis, while the VMEbus Slave modules reside in a Slave Chassis.

A typical Multidrop configuration is shown in Figure 3.1-3. This design concept allows the user to configure large I/O subsystems using a minimum number of slots in the master chassis.

The model number for a "Link" is VMIVME-5504L. The model number for a Master board is VMIVME-5504 Master. The model number for a Slave board is VMIVME-5504 Slave.

### 1.3 REFERENCE MATERIAL LIST

The reader should refer to "The VMEbus Specification" for a detailed explanation of the VMEbus. "The VMEbus Specification" is available from the following source:

VITA  
VFEA International Trade Association  
10229 N. Scottsdale Road  
Scottsdale, AZ 85253  
(602) 951-8866

The following Application and Configuration Guides are available from VMIC to assist the user in the selection, specification, and implementation of systems based on VMIC's products:

#### APPLICATION AND CONFIGURATION GUIDES

<u>TITLE</u>	<u>DOCUMENT NO.</u>
Digital Input Module Application Guide	825-000000-000
Change-of-State Application Guide	825-000000-002
Digital I/O (with Built-in-Test) Product Line Description	825-000000-003
Synchro/Resolver (Built-in-Test) Subsystem Configuration Guide	825-000000-004
Analog I/O Products (with Built-in-Test) Configuration Guide	825-000000-005
Connector and I/O Cable Application Guide	825-000000-006



## **SECTION 2**

### **PHYSICAL DESCRIPTION AND SPECIFICATION**

**REFER TO 800-005504-000 SPECIFICATION**

## SECTION 3

### THEORY OF OPERATION

#### 3.1 OPERATIONAL OVERVIEW

The VMIVME-5504L may be configured as a single repeat link (connecting two chassis as shown in Figure 3.1-1) or as a multidrop link in which three or more chassis are connected together with a single pair of cables. Expansion to several chassis can be achieved by utilizing multiple links (as shown in Figure 3.1-2) or by utilizing the multidrop capability as shown in Figure 3.1-3.

#### 3.2 VMEbus SIGNALS

The Repeater Link regenerates the following VMEbus signals:

D00 to D31	SYSRESET*
A01 to A15	LWORD*
DS0*	IACK*
DS1*	SYSFAIL*
AS*	BERR*
AM0 to AM5	DTACK*
WRITE*	

#### WARNING

**A VMIVME-5504 SLAVE BOARD SHALL BE THE ONLY BOARD ALLOWED TO ASSERT SYSRESET\* IN A SLAVE CHASSIS.**

The following signals in the slave chassis shall be in the states indicated in Table 3.2-1, if the VMIVME-5504 Master board does not have a valid +5 V or if the cables are disconnected. All other VMEbus signals in the slave chassis will be in an unknown state.

Table 3.2-1. State of the Slave VMEbus Signals While Master is Not Present

VMEbus Signals	State
AS*	Inactive
DS0*	Inactive
DS1*	Inactive
SYSRESET*	Active

M5504/T3.2-1

### 3.3 SINGLE REPEAT LINK CONFIGURATION

A single Repeater Link (see Figure 3.1-1) is comprised of a two-board set. One board is designated the VMIVME-5504 Master, while the other is designated VMIVME-5504 Slave. The two boards are referred to as such because of their association with the master and slave VMEbus chassis.

The VMIVME-5504 Master board appears to the master VMEbus chassis as a VMEbus slave board. The VMIVME-5504 Master has an address space of the combined address space of each slave board residing in the VMEbus slave chassis. The VMIVME-5504 Slave appears to the slave VMEbus chassis as a VMEbus Master residing in slot 1.

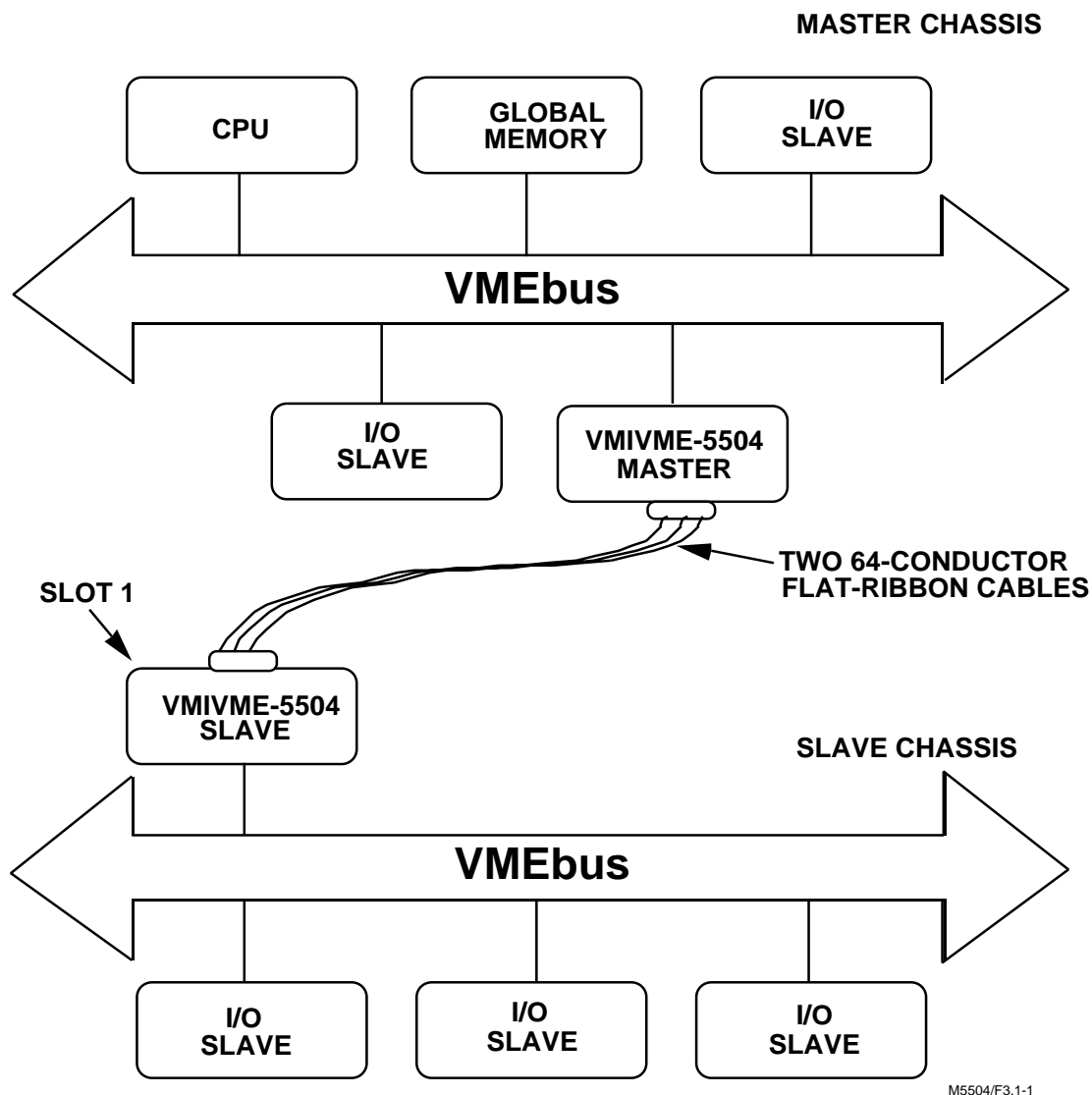
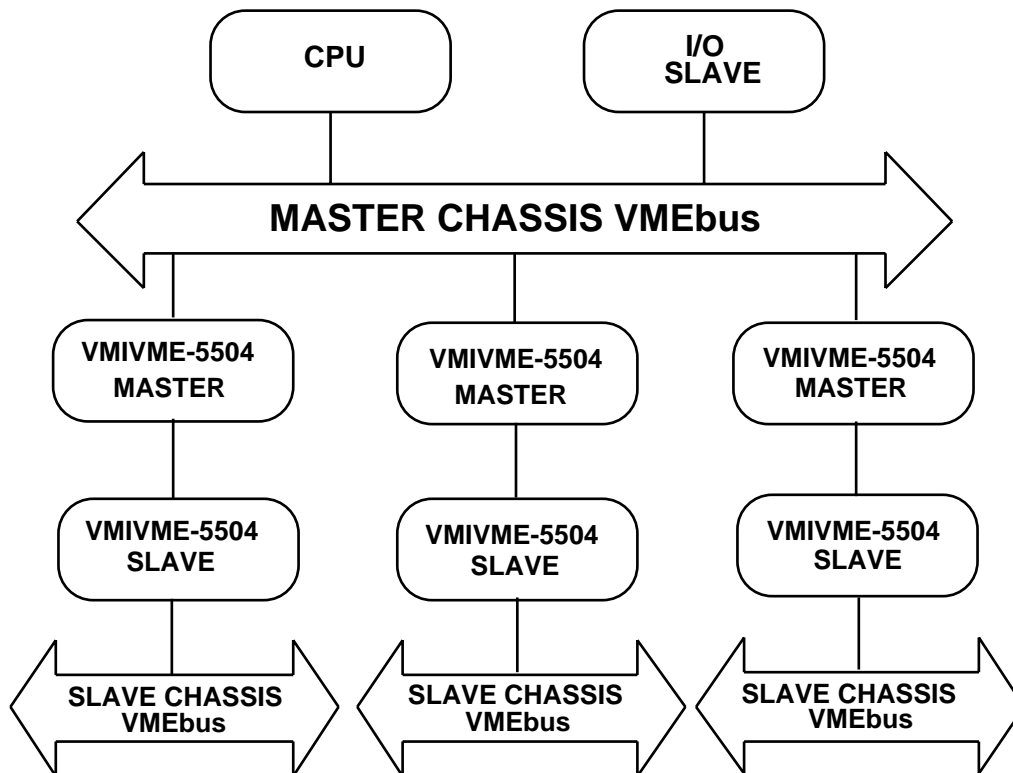


Figure 3.1-1. Typical VMEbus Configuration Using a VMIVME-5504 Link



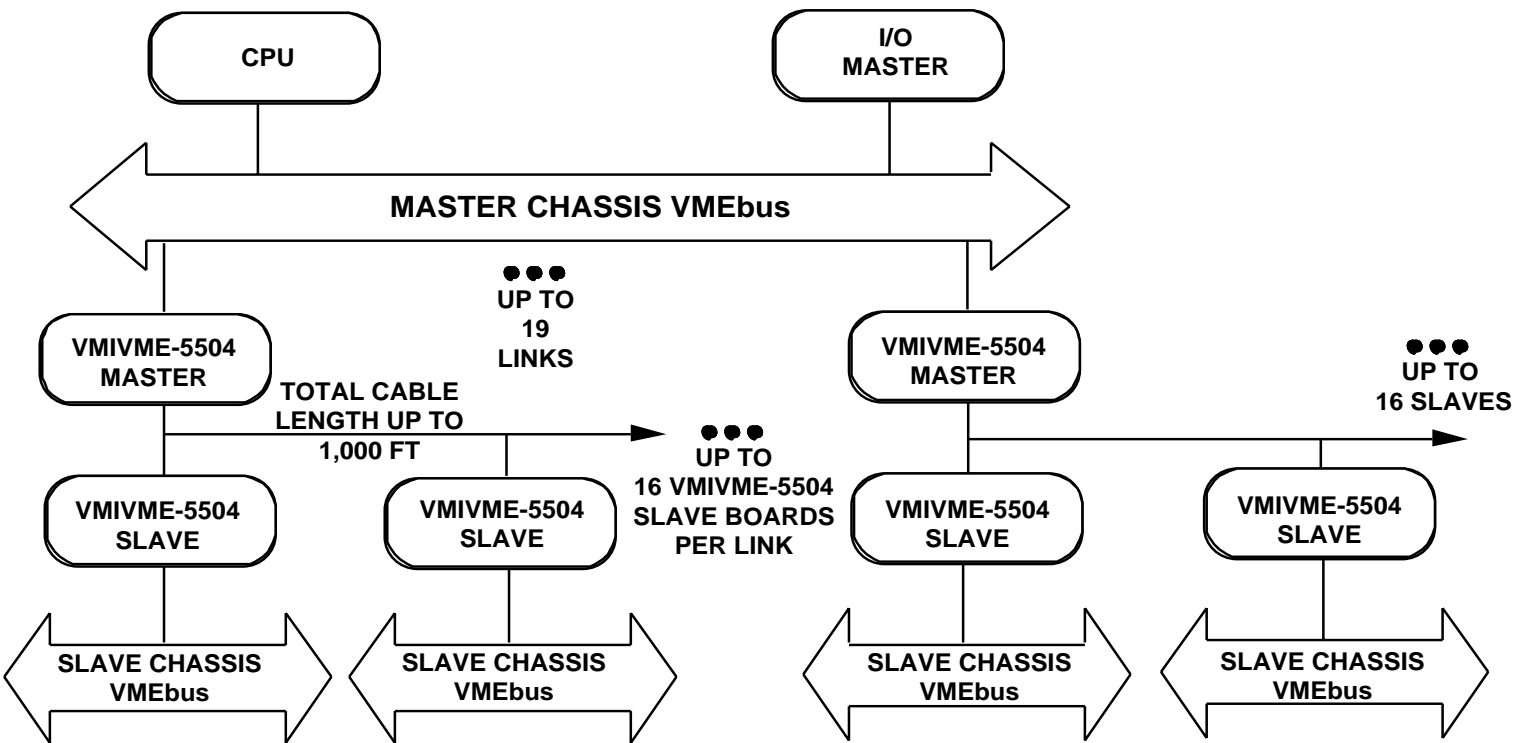
M5504/F3.1-2

Figure 3.1-2. Multiple Slave I/O Chassis

The data transceivers in the repeat master board are always enabled during a write cycle; however, they are enabled during a read cycle only if DTACK is generated in the slave chassis.

### 3.4 MULTIDROP CONFIGURATION

A typical Multidrop Long-Line Repeat Link configuration is shown in Figure 3.1-3. The Multidrop configuration operates the same as the single repeater link except that DTACK may originate on any one of the slave repeater boards. The DTACK signal on the repeat link cable is connected in a "wired OR" manner, i.e., DTACK is asserted on the cable when DTACK is generated in any one of the slave chassis.



M5504/F3.1-3

Figure 3.1-3. Multidrop Capability Provides for Expansion up to 304 VMEbus Slave Chassis per Master Chassis

## **SECTION 4**

### **PROGRAMMING**

#### **4.1 PROGRAMMING**

The VMIVME-5504L is software transparent. Boards residing in the Slave VMEbus chassis respond to VMEbus transfers as though they were located in the Master VMEbus chassis. Therefore, the Repeater Link requires no special programming considerations, except that standard addresses (A24) and extended addresses (A32) cannot be accessed in a slave chassis.

## SECTION 5

### CONFIGURATION AND INSTALLATION

#### 5.1 UNPACKING PROCEDURES

\*\*\*\*\*  
\* CAUTION \*  
\*\*\*\*\*

**SOME OF THE COMPONENTS ASSEMBLED ON VMIC'S PRODUCTS MAY BE SENSITIVE TO ELECTROSTATIC DISCHARGE AND DAMAGE MAY OCCUR ON BOARDS THAT ARE SUBJECTED TO A HIGH ENERGY ELECTROSTATIC FIELD. UNUSED BOARDS SHOULD BE STORED IN THE SAME PROTECTIVE BOXES IN WHICH THEY WERE SHIPPED. WHEN THE BOARD IS TO BE PLACED ON A BENCH FOR CONFIGURING, ETC., IT IS SUGGESTED THAT CONDUCTIVE MATERIAL BE INSERTED UNDER THE BOARD TO PROVIDE A CONDUCTIVE SHUNT.**

Upon receipt, any precautions found in the shipping container should be observed. All items should be carefully unpacked and thoroughly inspected for damage that might have occurred during shipment. The board(s) should be checked for broken components, damaged circuit board(s), heat damage, and other visible contamination. All claims arising from shipping damage should be filed with the carrier and a complete report sent to VMIC together with a request for advice about the disposition of the damaged item(s).

#### 5.2 PHYSICAL INSTALLATION

\*\*\*\*\*  
\* CAUTION \*  
\*\*\*\*\*

**DO NOT INSTALL OR REMOVE BOARDS WHILE POWER IS APPLIED.**

De-energize the equipment and insert the board into an appropriate slot of the chassis. While ensuring that the board is properly aligned and oriented in the supporting card guides, slide the board smoothly forward against the mating connector until firmly seated.

##### 5.2.1 Chassis/Board Configuration

- a. Install one jumper per board, to select time delay for data deskew (see Table 5.2.1-1). See Figures 5.2.1-1 and 5.2.1-2 for jumper locations.
- b. Install the VMIVME-5504 Master into the VMEbus Master Chassis, i.e., the chassis which contains CPUs, DMA devices, system controller, etc. The VMIVME-5504 may be installed in any slot except slot 1, which is usually reserved for the system controller.
- c. Install the VMIVME-5504 Slave into a VMEbus Slave Chassis, i.e., the chassis which contains Slave I/O boards. The VMIVME-5504 Slave must be installed in the left-most slot, designated as slot 1, of the slave chassis.

Table 5.2.1-1. Suggested Data/Address Deskew Time Delays  
(Jumper-Selectable) Versus Cable Length

<b>Jumper Selection</b>	<b>Time Delay Selected</b>	<b>Cable Length Ranges (in feet)</b>
E1	62.5 nsec	0 to 10 feet
E2	125 nsec	11 to 391 feet
E3	187 nsec	392 to 781 feet
E4	250 nsec	782 to 1,000 feet

M5504/T5.2.1-1

**NOTE:**

**THE VMIVME-5504 MASTER AND SLAVE BOARD(S) COMPRISING A LINK SHOULD HAVE THE JUMPERS SET TO THE SAME POSITIONS.**

**5.2.2 Termination Resistors**

Cable termination resistors are factory installed on all repeater master and slave boards. However, if the multidrop configuration is utilized (i.e., more than one slave board is connected to a repeat Master board), the cable termination resistors (RP1 through RP15, see Figure 5.2.1-2) must be removed from all VMIVME-5504 Slave boards except the one at the end of the cable.

**5.2.3 Cable Installation**

Two 64-conductor twisted flat-ribbon cables are required to interconnect the VMIVME-5504 Master and the VMIVME-5504 Slave boards. The reader should refer to Figure 5.2.1-1 for connector locations. If the multidrop configuration is utilized, additional connectors must be installed on both cables (reference VMIC's Connector and I/O Cable Application Guide, Document No. 825-000000-006).

- a. Connect the cable from VMIVME-5504 Master P3 connector to VMIVME-5504 Slave P3 connector(s).
- b. Connect the cable from VMIVME-5504 Master P4 connector to VMIVME-5504 Slave P4 connector(s).



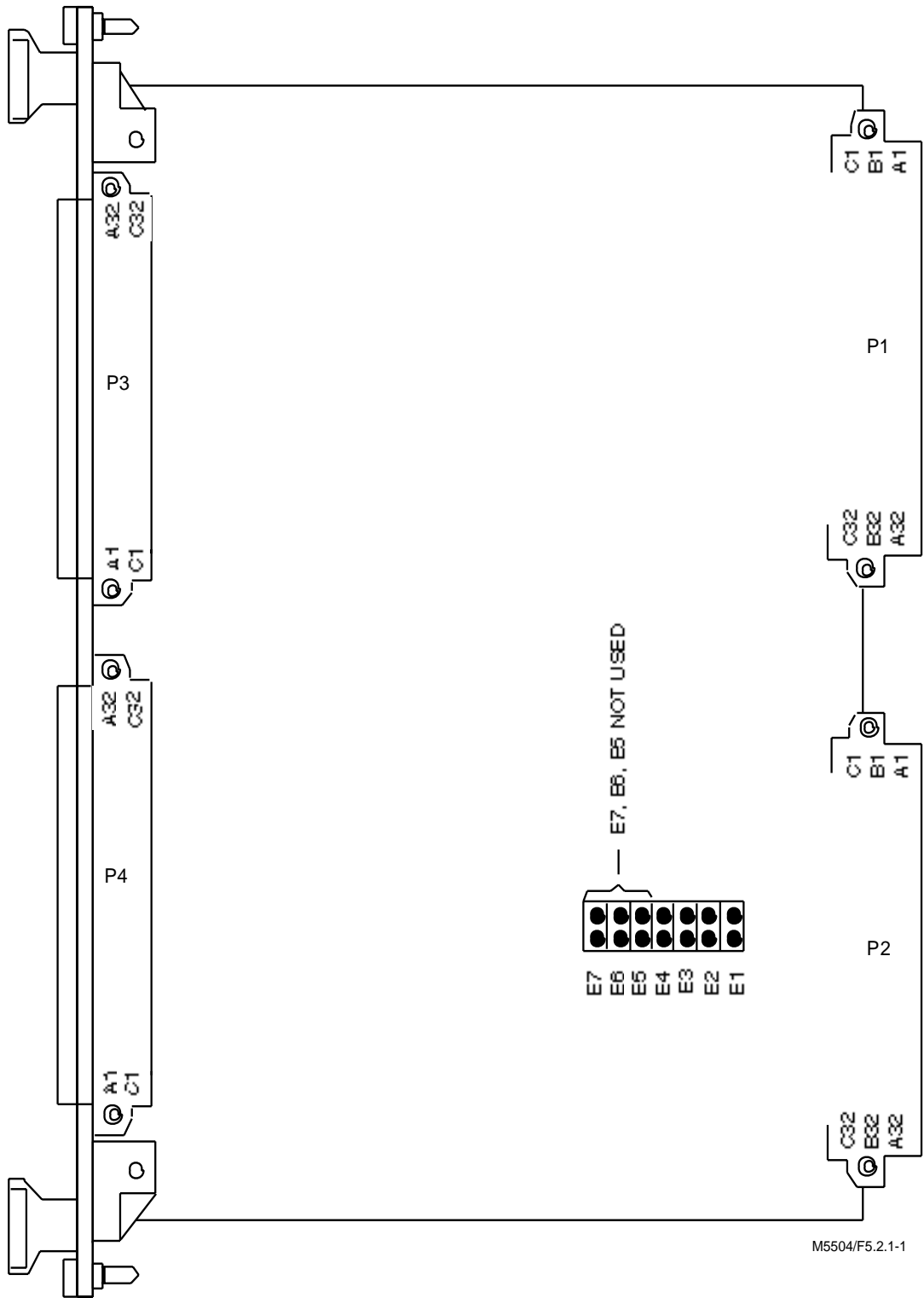


Figure 5.2.1-1. Jumper and Connector Locations for the Repeat Master

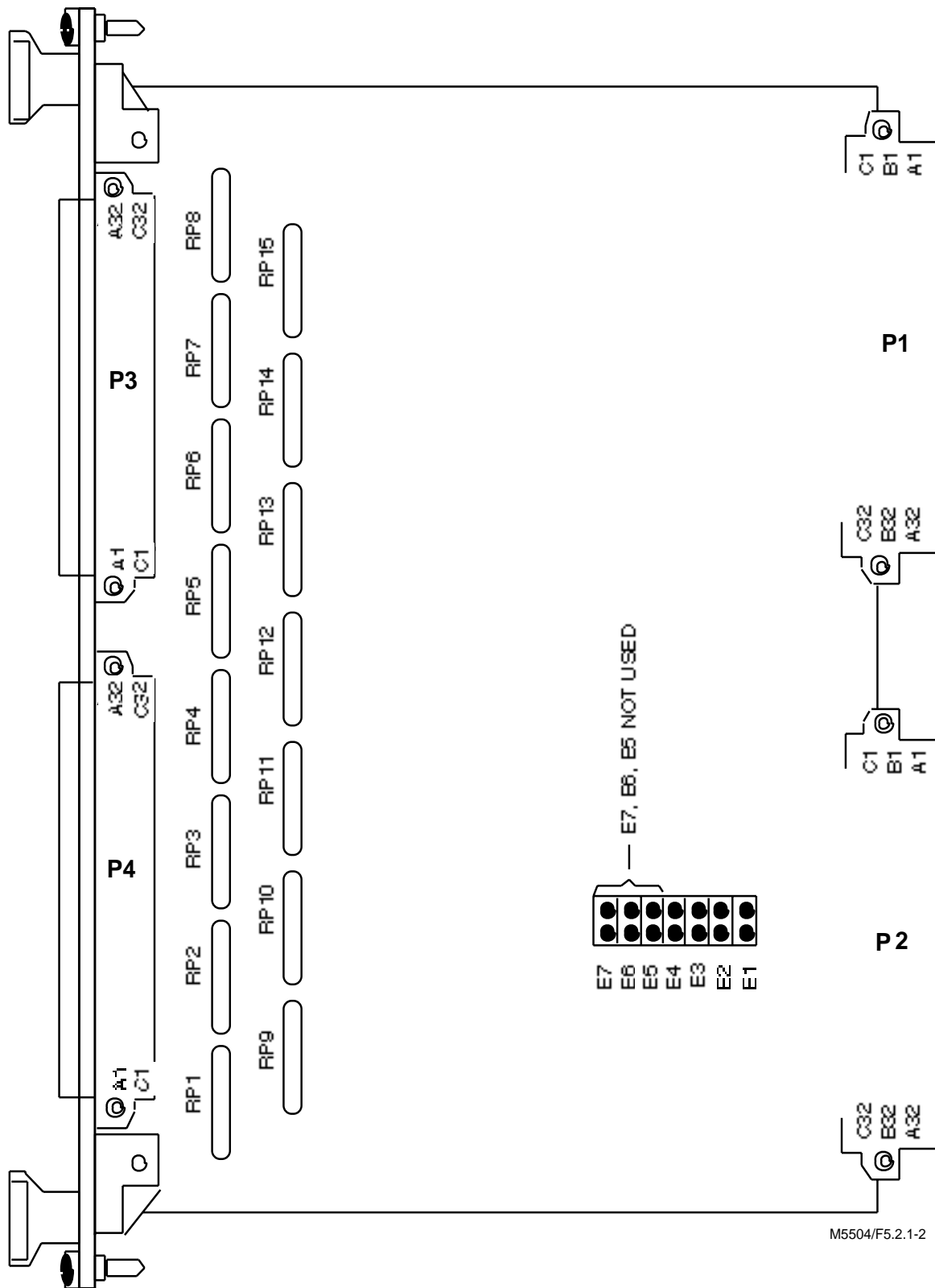


Figure 5.2.1-2. Jumper and Connector Locations for the Repeat Slave

### **5.3 POWER UP/POWER DOWN SEQUENCE**

There are no restrictions on the order in which Master/Slave chassis should be powered up or down. Likewise, cables can be connected or disconnected in any order with or without power applied. The user should be aware, however, that bus errors or invalid data may occur if bus accesses are attempted while chassis are powering up or down, or while cables are being connected or disconnected.

The VMIVME-5504 slave supplies a Power-on-Reset when the Slave chassis is powered up. This Power-on-Reset is guaranteed to be at least 200 msec in duration. SYSRESET\* is also asserted in the Slave chassis when the Master chassis is powered down or if the cables are disconnected. SYSRESET\* generated for these two (2) reasons is not guaranteed to be of any specified duration.

**NOTE:**

**THE POWER-ON-RESET CIRCUIT IN THE SLAVE CHASSIS MONITORS THE VMEbus +5 V. IF A SLAVE CHASSIS APPEARS TO BE GETTING RESET OCCASIONALLY OR IS NOT RESPONDING AT ALL, CHECK TO MAKE SURE THIS CHASSIS' +5 V IS WITHIN VMEbus SPECIFICATIONS (+4.875 TO 5.250 V).**

## SECTION 6

### MAINTENANCE AND WARRANTY

#### 6.1 MAINTENANCE

This section of the technical manual provides information relative to the care and maintenance of VMIC's products. Should the products malfunction, the user should verify the following:

- a. Software
- b. System configuration
- c. Electrical connections
- d. Jumper or configuration options
- e. Boards fully inserted into their proper connector location
- f. Connector pins are clean and free from contamination
- g. No components of adjacent boards are disturbed when inserting or removing the board from the VMEbus card cage
- h. Quality of cables and I/O connections

User level repairs are not recommended. Contact VMIC for a Return Material Authorization (RMA) Number. This RMA Number must be obtained prior to any return.

#### 6.2 MAINTENANCE PRINTS

The appendix(ices) to this manual contain(s) drawings and diagrams for reference purposes.

#### 6.3 WARRANTY

VMIC's Standard Products are warranted to be free from defects in material and workmanship for a period of two years (24 months) from the date of shipment. In discharge of this warranty, VMIC, at its option, agrees to either repair or replace, at VMIC's facility and at VMIC's discretion, any part, component, subassembly accessory, or any hardware, software, or system product, which under proper and normal use proves defective in material and workmanship.

The customer shall provide notice to VMIC of each such defect within a reasonable time after the customer's discovery of such defect.

In order to return the defective product(s) or part(s), the customer must contact VMIC's Customer Service Department to obtain a Call Ticket Number. The defective product(s) or part(s) must also be properly boxed and weighed. After a VMIC Call Ticket Number and RMA Number have been obtained, the defective product(s) or part(s) may be returned (transportation collect for surface UPS) to VMIC. Any replaced or repaired product(s) or part(s) will be shipped back to the customer at the expense of VMIC (also UPS surface).

The customer should be aware that the above process can sometimes take up to eight (8) days for the shipment to reach VMIC. The customer has the option to ship the defective product(s) or part(s) at the customer's own expense if the customer cannot afford this possible delay.

There shall be no warranty or liability on any VMIC product(s) or part(s) that is (are) damaged or subjected to accident(s), perils of nature, negligence, overtemperature, overvoltage, misapplication of electrical power, insertion or removal of boards from backplanes and/or I/O connectors with power applied by the customer(s), appointee(s), or any other person(s) without the expressed approval of VMIC.

Final determination of warranty eligibility shall be made by VMIC, and if a warranty claim is considered invalid for any reason, the customer will be charged for services performed and expenses incurred by VMIC in repair, handling and shipping the returned product or part. Determination as to whether the item is within warranty coverage shall not be unreasonably withheld.

The warranty period of the replacement or repaired product(s) or part(s) shall terminate with the termination of the warranty period with respect to the original product(s) or part(s) for all replacement parts supplied or repairs made during the original warranty period.

**THE FOREGOING WARRANTY AND REMEDY ARE EXCLUSIVE AND VMIC SHALL HAVE NO OTHER OR ADDITIONAL LIABILITY TO BUYER OR TO ANYONE CLAIMING UNDER BUYER (THIRD PARTY) UNDER ANY OTHER AGREEMENT OR WARRANTY, EXPRESS OR IMPLIED EITHER IN FACT OR BY OPERATION OF THE LAW, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS, STATUTORY, OR OTHERWISE. VMIC SHALL HAVE NO LIABILITY FOR SPECIAL OR CONSEQUENTIAL DAMAGES OF ANY KIND OR FROM ANY CAUSE ARISING OUT OF THE INSTALLATION OR USE OF ANY PRODUCT FURNISHED HEREUNDER.**

## **6.4 OUT-OF-WARRANTY REPAIR POLICY**

The following sections describe VMIC's policy on repairs and warranties on repaired products.

### **6.4.1 Repair Category**

VMIC's repair policy of standard products is divided into two categories, depending on the item to be repaired. These categories are:

- a. Product Exchange
- b. Fixed Price Repair

Category 1 (product exchange) represents the fastest turn around of the two categories. In this case, the customer sends the malfunctioning product to VMIC. VMIC will return an operational product to the customer within 72 hours of receipt provided VMIC has the product in stock.

Provided that the returned product is repairable customers should contact VMIC prior to returning products for repair to determine stocking status.

Category 2 (Fixed Price Repair) applies to products returned to VMIC for repair and subsequent return to the customer.

Return authorizations are required on all product repairs, and all purchase orders should refer to VMIC's RMA Number which is assigned by VMIC's Customer Service Department.

#### **6.4.2 Repair Pricing**

Contact your factory representative for repair pricing. Current pricing can be found in the Repair and Replacement Policy in the most current Standard Conditions of Sales Document (F0109-91). Refer to exclusions (Section 6.4.7).

#### **6.4.3 Payment**

Payment is due upon delivery or at VMIC's option, net thirty (30) days from the date of delivery. Payment should be made to:

VME Microsystems International Corporation  
12090 South Memorial Parkway  
Huntsville, AL 35803-3308  
Attention: Accounts Receivable

VMIC allows a one (1) percent discount for payment made within ten (10) days of invoice date or a two (2) percent discount on payment made prior to shipment of order. This payment discount, however, does not apply to freight.

#### **6.4.4 Shipping Charges**

Shipping charges are the customer's responsibility, with the exception of warranty repairs, whereby VMIC will pay the return to customer shipping charges.

#### **6.4.5 Shipping Instructions**

The type of packaging used to ship the product depends on whether the product is shipped singly, in a chassis, or packaged with other boards. The shipper should carefully pack the product(s), using the same precautions listed in the "unpacking procedures." The user should utilize the same (or equivalent) protective packaging container for re-shipment as provided by VMIC. Approved ESD procedures are recommended when handling VMIC's products.

#### **6.4.6 Warranty on Repairs**

Products repaired by VMIC are warranted against defects in workmanship and material for a period of ninety (90) days from date of shipment to the customer for all products that were repaired out of warranty. See Standard Conditions of Sale for products repaired within the warranty.

#### **6.4.7 Exclusions**

Repair rates may not apply to products which have received unusual physical or electrical damage. In such cases, VMIC will provide an estimated price for product repair or replacement. The customer may then choose to have the product repaired at the estimated price, returned unrepaired at no charge, or replaced at VMIC's current list price.