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VMEbus LONG-LINE REPEATER LINK

VMIVME-REPEAT L-485

INSTRUCTION MANUAL

DOCUMENT NO. 500-00RL85-000 H

Revised October 4, 1994

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RECORD OF REVISIONS

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B	08/03/89	Cover, Table of Contents, Page 1-2, Section 6, Appendix A, and Entire Document Renumbered	89-0015
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H	10/04/94	Reformat Entire Manual	94-0769

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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

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

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SAFETY SYMBOLS

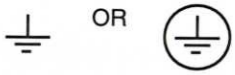
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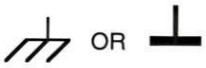
Indicates dangerous voltage (terminals fed from the interior by voltage exceeding 1000 volts are so marked).



Protective conductor terminal. For protection against electrical shock in case of a fault. Used with field wiring terminals to indicate the terminal which must be connected to ground before operating equipment.



Low-noise or noiseless, clean ground (earth) terminal. Used for a signal common, as well as providing protection against electrical shock in case of a fault. Before operating the equipment, terminal marked with this symbol must be connected to ground in the manner described in the installation (operation) manual.



Frame or chassis terminal. A connection to the frame (chassis) of the equipment which normally includes all exposed metal structures.



Alternating current (power line).



Direct current (power line).



Alternating or direct current (power line).

WARNING

The WARNING sign denotes a hazard. It calls attention to a procedure, a practice, a condition, or the like, which, if not correctly performed or adhered to, could result in injury or death to personnel.

CAUTION

The CAUTION sign denotes a hazard. It calls attention to an operating procedure, a practice, a condition, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the system.

NOTE:

The NOTE sign denotes important information. It calls attention to a procedure, a practice, a condition or the like, which is essential to highlight.

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VMIVME-REPEAT L-485
VMEbus LONG-LINE REPEATER LINK

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SECTION 1

INTRODUCTION

1.1 INTRODUCTION

VMIC's Long-Line Repeater Link is a software transparent two-board set, plus interconnecting cables that allow the user to effectively extend (up to 2,000 feet) a VMEbus chassis to more than 20 slots. The "extended" slots, however, are only operational for VMEbus slave boards.

The Long-Line Repeater Link has several unique features, as specified below.

a. Differential line drivers and receivers provide ±7 V noise rejection

b. Supports up to 2,000-ft cables

c. Supports all seven interrupt levels

d. Allows expansion to 19 x 19 slots using 20-slot backplanes in a star configuration

e. Supports 8- and 16-bit data transfers

f. Supports 16- and 24-bit addressing

g. Double Eurocard form factor

h. Link includes one model VMIVME-Repeat M-485, one model VMIVME-Repeat S-485, and two cables. (A wide variety of cable length options are available.)

i. DIN type I/O connectors

j. Supports VMEbus slaves on a "slave only" VMEbus

1.2 FUNCTIONAL DESCRIPTION

The VMIVME-Repeat L-485 is a two-board set which 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 boards reside in a slave chassis. The two-board set is configured with one board designated for the master chassis, while the other board is designated for the slave chassis. A master VMEbus chassis can communicate with several slave chassis by using multiple Repeater Links.

The Long-Line Repeater Link supports all seven interrupt levels. Interrupts are acknowledged by the IACKIN*/IACKOUT* daisy chain, which is routed through all of the slave chassis slots before being routed to the next VMEbus master chassis slot. Thus, any slot in the slave chassis can generate an interrupt.

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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 Applications and Configuration Guides are available from VMIC to assist the user in the selection, specification, and implementation of systems based on VMIC's products.

TITLE	DOCUMENT NO.
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

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SECTION 2

DESCRIPTION AND SPECIFICATIONS

REFER TO 800-00RL85-000 SPECIFICATIONS.

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SECTION 3

THEORY OF OPERATION

3.1 OPERATIONAL OVERVIEW

The VMIC Long-Line Repeater Link is comprised of a two-board set. One board is designated the VMIVME-Repeat M-485, while the other is designated VMIVME-Repeat S-485. The two boards are referred to as such because of their association with the master and slave VMEbus chassis.

The VMIVME-Repeat M-485 Board appears to the master VMEbus chassis as a VMEbus slave board. The VMIVME-Repeat M-485 has an address space of the combined address space of each slave board residing in the VMEbus slave chassis. The VMIVME-Repeat S-485 appears to the slave VMEbus chassis as a bus buffer residing in slot A1.

3.2 BLOCK DIAGRAMS

A typical Long-Line Repeat Link configuration is shown in Figure 3.2-1. A typical block diagram of multiple repeat links is shown in Figure 3.2-2.

3.3 VMEbus DATA TRANSFER

The VMEbus compatibility logic of the Long-Line Repeater Link supports 8- and 16-bit data transfers on a cable up to 2,000 feet in length.

3.4 INTERRUPT CAPABILITY

The Long-Line Repeater Link allows interrupts from boards residing in the slave chassis to be processed by interrupt handlers in the master VMEbus chassis. This is accomplished by busing all seven interrupt request signals and the associated interrupt acknowledge signals. Interrupt priority is maintained by the IACKIN*/IACKOUT* daisy chain. The daisy chain is bused directly from the master chassis slot, in which the VMIVME-Repeat M-485 resides, to the first slot in the slave VMEbus chassis. The IACKOUT* signal in the last slot of the slave chassis is configured to provide the IACKOUT* signal to the master VMEbus chassis if there are no boards in the slave chassis responsible for the interrupt. The configuration required by the Long-Line Repeater Link is simply one jumper installed on the slave chassis backplane to allow the IACKIN*/IACKOUT* daisy chain to continue to the next slot of the master VMEbus chassis. The reader should refer to Figure 3.4-1 for an interrupt daisy chain structure and to Figure 5.3-1 for interrupt configuration jumper installation.

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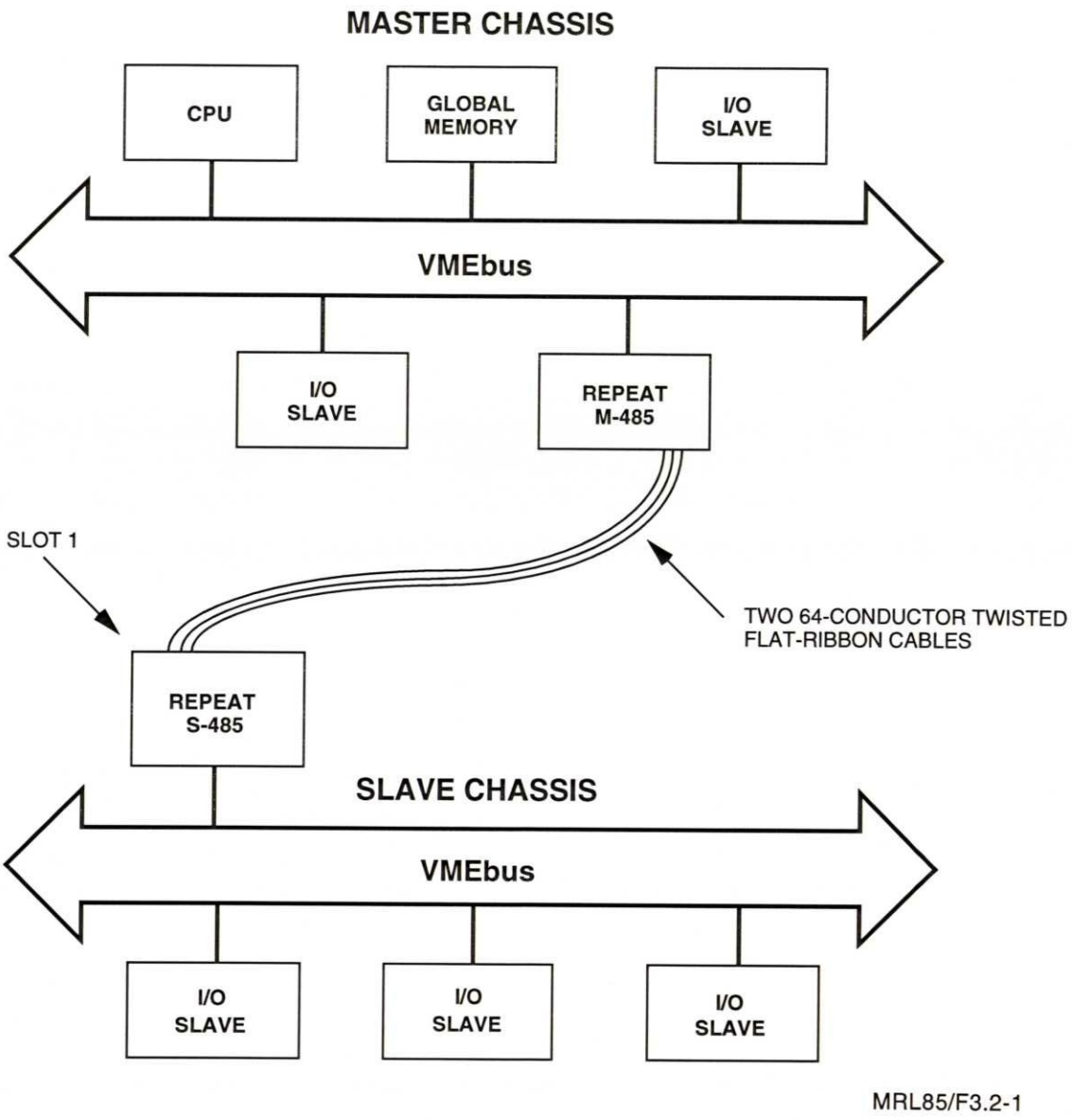


Figure 3.2-1. Typical VMEbus Configuration Using the VMIVME-Repeat L-485 Long-Line Repeater Link

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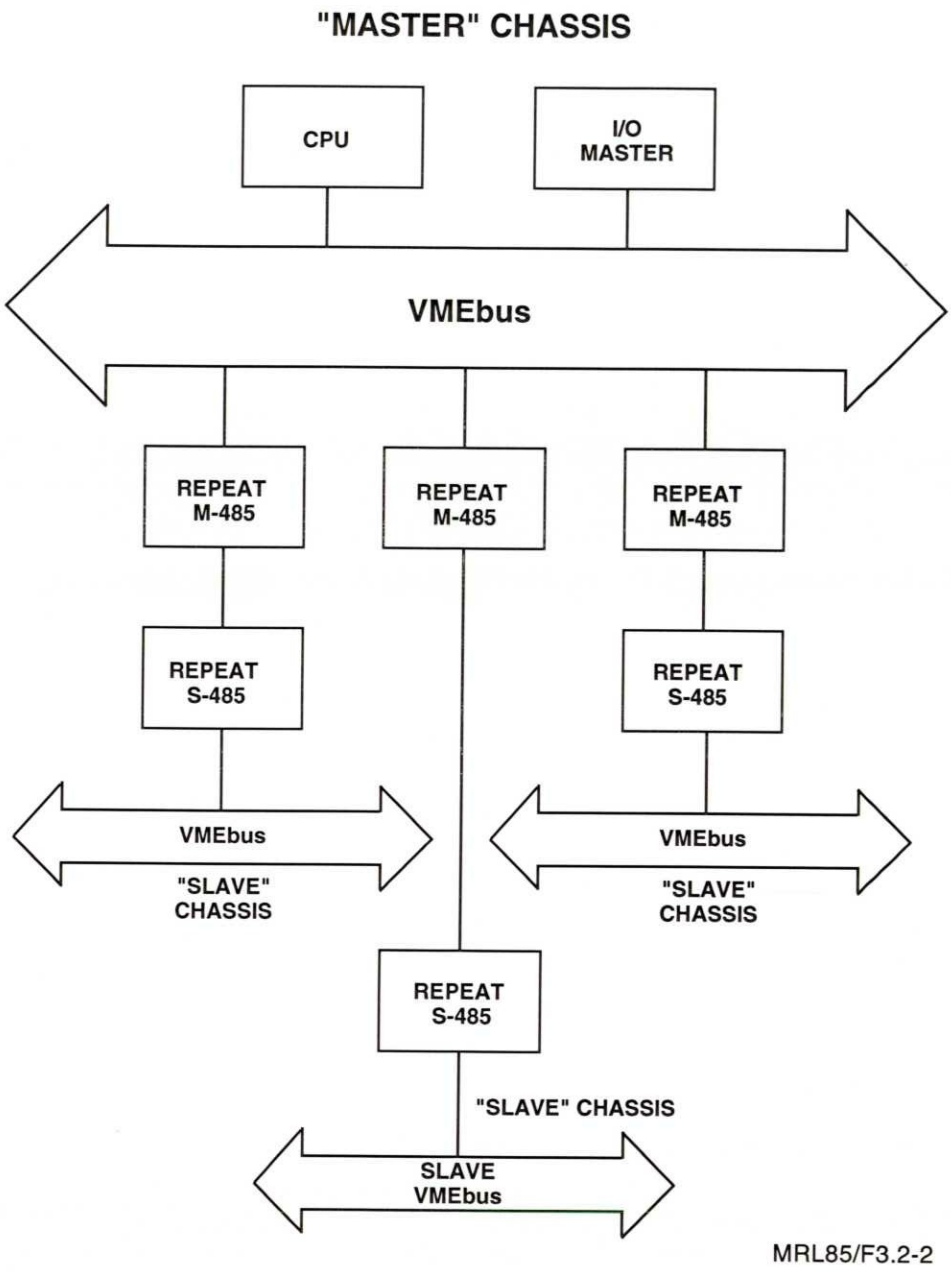


Figure 3.2-2. Multiple Slave I/O Chassis

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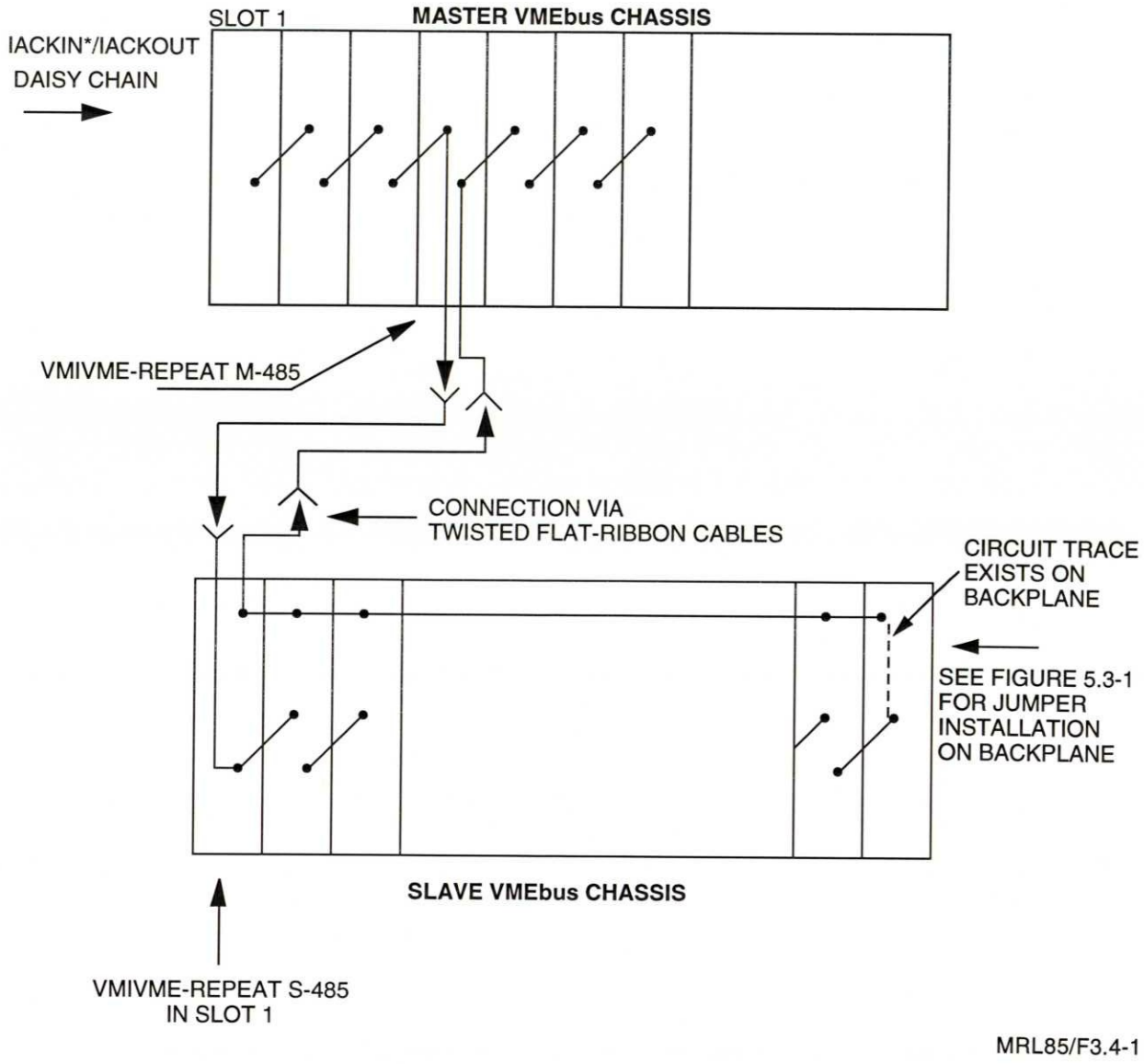


Figure 3.4-1. Interrupt Daisy Chain Structure

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SECTION 4

PROGRAMMING

4.1 PROGRAMMING

The VMIC Long-Line Repeater Link is software transparent. Boards residing in the slave VMEbus chassis respond to VMEbus transfers as if they were located in the master VMEbus chassis. Therefore, the Long-Line Repeater Link requires no special programming considerations, except that extended address (A32) and longword (D32) transfers cannot be made to/from boards residing in a slave chassis.

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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 LAID 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 printed-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 concerning the disposition of the damaged item(s).

5.2 PHYSICAL INSTALLATION

```
*****************
*    CAUTION    *
*****************
```

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

De-energize the equipment and insert the board into an appropriate slot of the chassis, while ensuring 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/Module Configuration

a. Install one jumper 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-Repeat M-485 into the VMEbus master chassis, i.e., the chassis which contains CPUs, DMA devices, system controller, etc. The VMIVME-Repeat M-485 may be installed in any slot except slot 1, which is usually reserved for the system controller.

c. Install the VMIVME-Repeat S-485 Board into the VMEbus slave chassis, i.e., the chassis which contains slave I/O boards. The VMIVME-Repeat S-485 Board must be installed in the left-most slot, designated as slot A1, of the slave chassis.

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Table 5.2.1-1. Suggested Deskew Time Delays (Jumper Selectable) Versus Expected Cable Time Skew and Cable Length

JUMPER SELECTION	TIME DELAY SELECTED	CABLE LENGTH RANGES (IN FEET)	
		IF 10 PERCENT SKEW	IF 5 PERCENT SKEW
T1	62.5 ns	0 TO 10 ft	0 TO 20 ft
T2	125 ns	11 TO 391 ft	21 TO 782 ft
T3	187 ns	392 TO 781 ft	783 TO 1,562 ft
T4	250 ns	782 TO 1,169 ft	1,563 TO 2,000 ft
T5	312 ns	1,170 TO 1,562 ft	2,339 TO 3,124 ft
T6	375 ns	1,563 TO 1,950 ft	——
T7	437 ns	1,951 TO 2,000 ft	——

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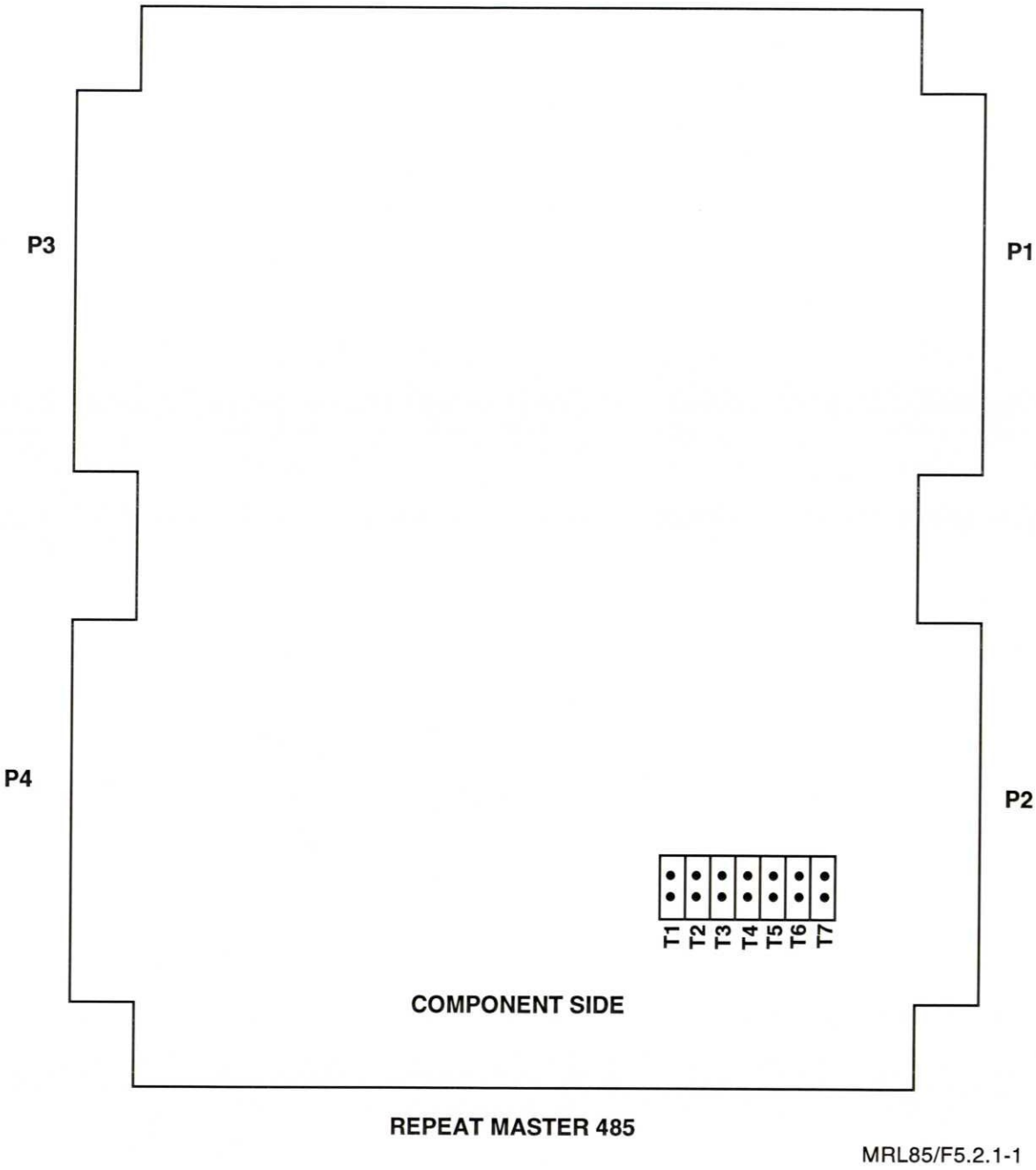


Figure 5.2.1-1. Jumper and Connector Locations for the VMIVME-Repeat M-485

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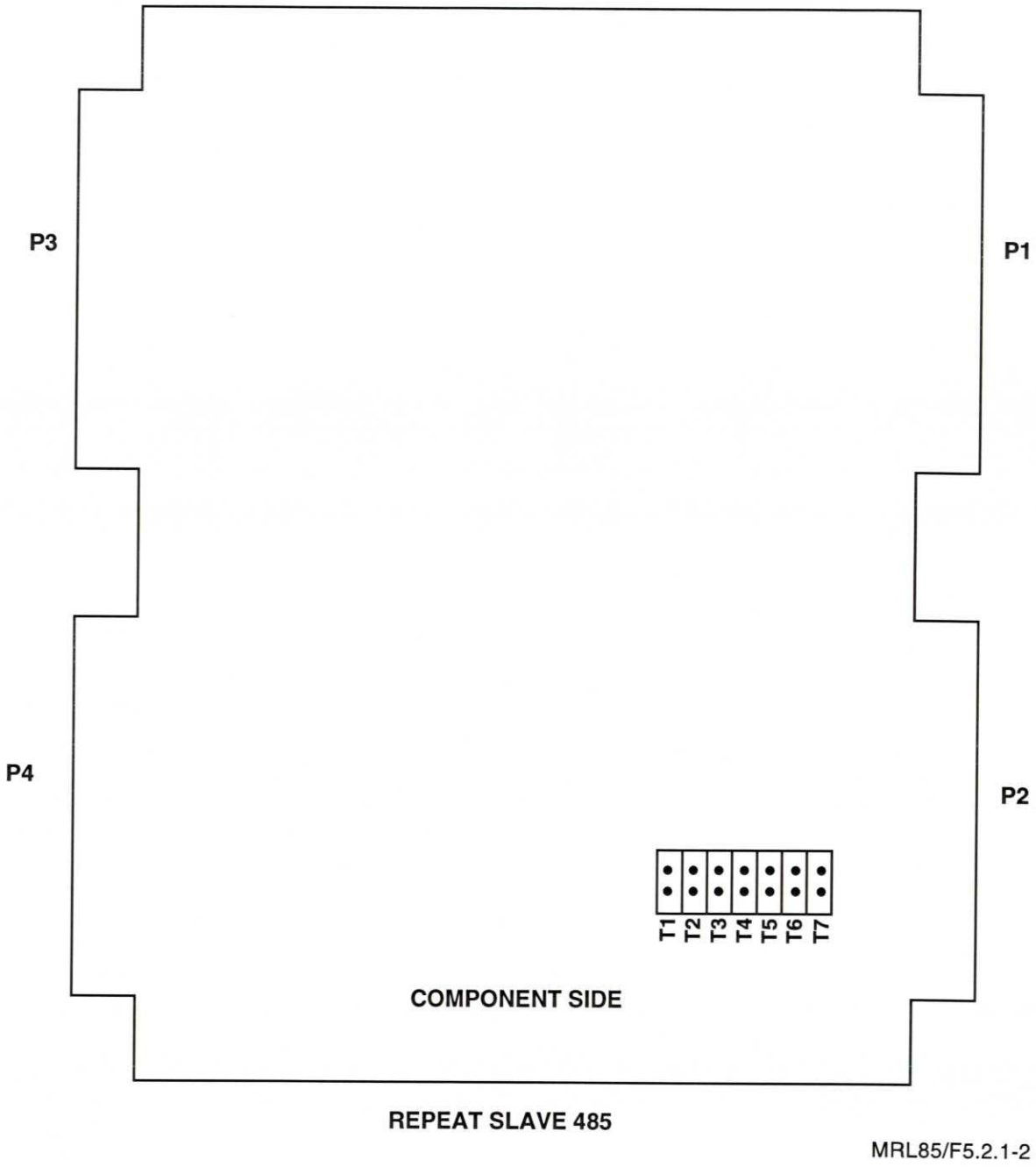


Figure 5.2.1-2. Jumper and Connector Locations for the VMIVME-Repeat S-485

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5.2.2 Cable Installation

Two 64-conductor twisted flat-ribbon cables are required to interconnect the VMIVME-Repeat M-485 Board and VMIVME-Repeat S-485 Board. The reader should refer to Figure 5.2.1-1 for connector locations.

a. Connect the cable from VMIVME-Repeat M-485 P3 connector to VMIVME-Repeat S-485 P3 connector.

b. Connect the cable from VMIVME-Repeat M-485 P4 connector to VMIVME-Repeat S-485 P4 connector.

The pin-to-signal assignments for P3 and P4 are shown in Tables 5.2.2-1 and 5.2.2-2, respectively.

5.3 SLAVE VMEbus CHASSIS INTERRUPT CONFIGURATION

The following configuration directions are not required for system operation if interrupt processing is not required by the slave chassis.

a. The IACKIN*/IACKOUT* daisy chain must be maintained in all slots of the slave VMEbus chassis, i.e., jumpered or interrupter boards installed.

b. Install a wire jumper to connect IACKOUT* pin of the last slot of the slave VMEbus chassis to the SERDAT pin of the last slot. If the last slot of the slave chassis does not have an interrupt request board inserted, then the SERDAT pin must be connected to the IACKIN* pin instead of the IACKOUT* pin. The reader should refer to Figure 5.3-1 for a diagram of interrupt jumper configuration.

5.4 POWER UP/POWER DOWN SEQUENCE

The Repeater Link does not bus any +5 VDC power or ground between the two VMEbus chassis.

The following power up and power down sequence should be followed to ensure protection against false interrupts into the master VMEbus chassis subsystem in the event that separate power supplies are used.

POWER UP SEQUENCE

1. Power up slave VMEbus chassis
2. Power up master VMEbus chassis

POWER DOWN SEQUENCE

1. Power down master VMEbus chassis
2. Power down slave VMEbus chassis

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Table 5.2.2-1. P3 Pin-Signal Assignment for Repeat-485 Master and Slave Boards

PIN	SIGNAL	PIN	SIGNAL
A1	DIF A15 H	A17	DIF D15 H
C1	DIF A15 L	C17	DIF D15 L
A2	DIF A14 H	A18	DIF D14 H
C2	DIF A14 L	C18	DIF D14 L
A3	DIF A13 H	A19	DIF D13 H
C3	DIF A13 L	C19	DIF D13 L
A4	DIF A12 H	A20	DIF D12 H
C4	DIF A12 L	C20	DIF D12 L
A5	DIF A11 H	A21	DIF D11 H
C5	DIF A11 L	C21	DIF D11 L
A6	DIF A10 H	A22	DIF D10 H
C6	DIF A10 L	C22	DIF D10 L
A7	DIF A09 H	A23	DIF D09 H
C7	DIF A09 L	C23	DIF D09 L
A8	DIF A08 H	A24	DIF D08 H
C8	DIF A08 L	C24	DIF D08 L
A9	DIF A07 H	A25	DIF D07 H
C9	DIF A07 L	C25	DIF D07 L
A10	DIF A06 H	A26	DIF D06 H
C10	DIF A06 L	C26	DIF D06 L
A11	DIF A05 H	A27	DIF D05 H
C11	DIF A05 L	C27	DIF D05 L
A12	DIF A04 H	A28	DIF D04 H
C12	DIF A04 L	C28	DIF D04 L
A13	DIF A03 H	A29	DIF D03 H
C13	DIF A03 L	C29	DIF D03 L
A14	DIF A02 H	A30	DIF D02 H
C14	DIF A02 L	C30	DIF D02 L
A15	DIF A01 H	A31	DIF D01 H
C15	DIF A01 L	C31	DIF D01 L
A16	DIF LWORD L	A32	DIF D00 H
C16	DIF LWORD H	C32	DIF D00 L

MRL85/T5.2.2-1

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Table 5.2.2-2. P4 Pin-Signal Assignment for Repeat-485 Master and Slave Boards

PIN	SIGNAL	PIN	SIGNAL
A1	DIF A16 H	A17	DIF IRQ1 L
C1	DIF A16 L	C17	DIF IRQ1 H
A2	DIF A17 H	A18	DIF IRQ2 L
C2	DIF A17 L	C18	DIF IRQ2 H
A3	DIF A18 H	A19	DIF IRQ3 L
C3	DIF A18 L	C19	DIF IRQ3 H
A4	DIF A19 H	A20	DIF IRQ4 L
C4	DIF A19 L	C20	DIF IRQ4 H
A5	DIF A20 H	A21	DIF IRQ5 L
C5	DIF A20 L	C21	DIF IRQ5 H
A6	DIF A21 H	A22	DIF IRQ6 L
C6	DIF A21 L	C22	DIF IRQ6 H
A7	DIF A22 H	A23	DIF IRQ7 L
C7	DIF A22 L	C23	DIF IRQ7 H
A8	DIF A23 H	A24	DIF SLAVE DTAK L
C8	DIF A23 L	C24	DIF SLAVE DTAK H
A9	DIF AM0 H	A25	DIF SYSRESET L
C9	DIF AM0 L	C25	DIF SYSRESET H
A10	DIF AM1 H	A26	DIF AS L
C10	DIF AM1 L	C26	DIF AS H
A11	DIF AM2 H	A27	DIF DS0 L
C11	DIF AM2 L	C27	DIF DS0 H
A12	DIF AM3 H	A28	DIF DS1 L
C12	DIF AM3 L	C28	DIF DS1 H
A13	DIF AM4 H	A29	DIF IACK IN L
C13	DIF AM4 L	C29	DIF IACK IN H
A14	DIF AM5 H	A30	DIF SLAVE IACK OUT L
C14	DIF AM5 L	C30	DIF SLAVE IACK OUT H
A15	DIF WRITE L	A31	DIF SLAVE BERR L
C15	DIF WRITE H	C31	DIF SLAVE BERR H
A16	DIF IACK L	A32	DIF SLAVE SYSFAIL L
C16	DIF IACK H	C32	DIF SLAVE SYSFAIL H

MRL85/T5.2.2-2

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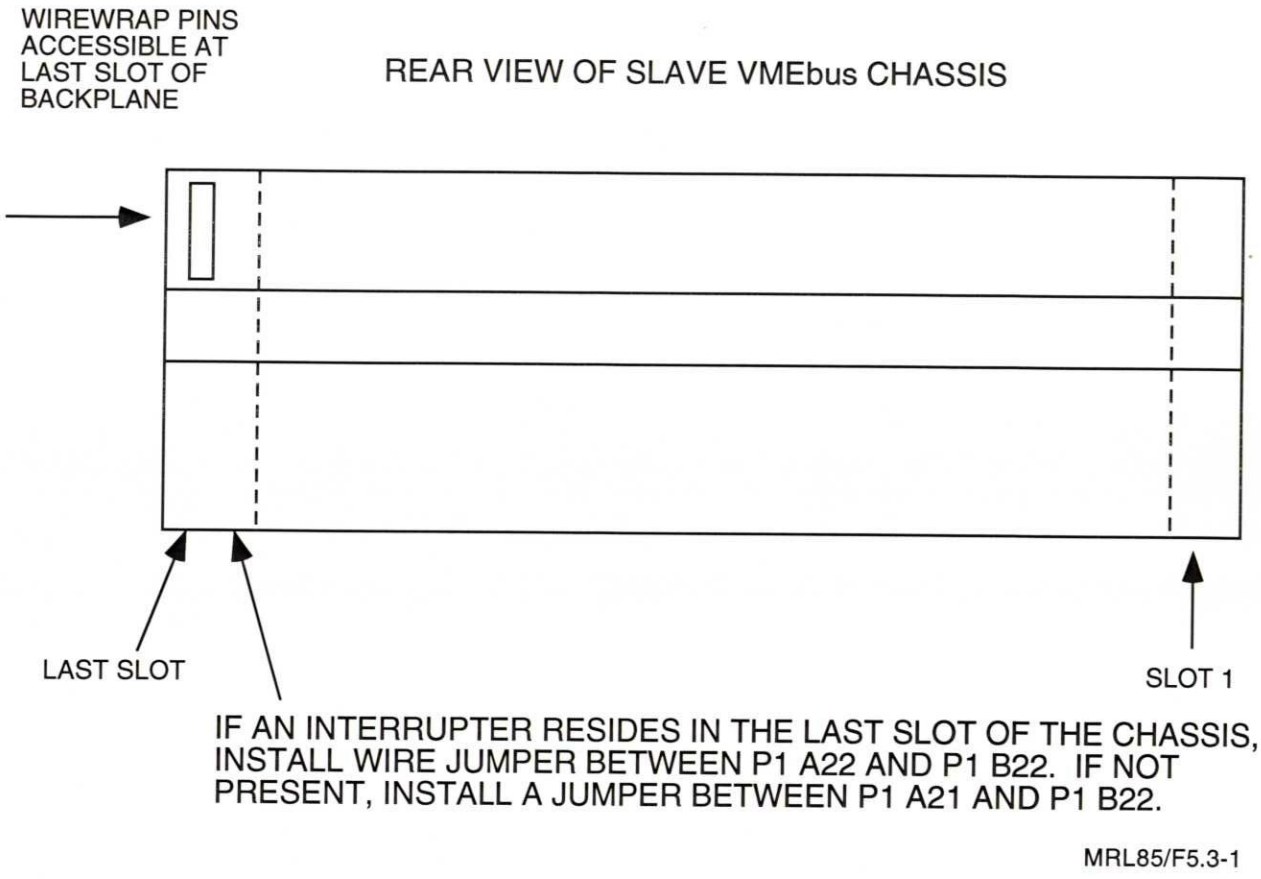


Figure 5.3-1. Interrupt Configuration Jumpers

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SECTION 6

MAINTENANCE

6.1 MAINTENANCE

This section provides information relative to the care and maintenance of VMIC's products. If the products malfunction, verify the following:

a. Software
b. System configuration
c. Electrical connections
d. Jumper or configuration options
e. Boards are 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 chassis
h. Quality of cables and I/O connections

If the products must be returned, contact VMIC for a Return Material Authorization (RMA) Number. **This RMA Number must be obtained prior to any return.**

6.2 MAINTENANCE PRINTS

User-level repairs are not recommended. The appendix to this manual contains drawings and diagrams for reference purposes only.

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APPENDIX A

ASSEMBLY DRAWING, PARTS LIST, AND SCHEMATIC

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