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VMIVME-5531L VMEbus
FIBER-OPTIC REPEATER LINK

PRODUCT MANUAL

DOCUMENT NO. 500-005531-000 B

Revised December 21, 1995

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RECORD OF REVISIONS

REVISION LETTER	DATE	PAGES INVOLVED	CHANGE NUMBER
A	04/19/94	Release	94-0546
B	12/21/95	Changes per ECO Pages v, vi, 1-1, 1-2, 1-3, 3-1, 3-6, 3-7, 6-1	96-0052

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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.

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

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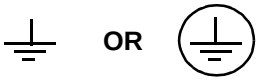
GENERAL DEFINITIONS OF SAFETY SYMBOLS USED IN THIS MANUAL



Instruction manual symbol: the product is marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect against damage to the system.



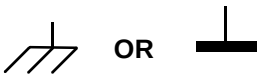
Indicates dangerous voltage (terminals fed from the interior by voltage exceeding 1000 volts are so marked).



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.



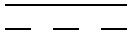
Low-noise or noiseless, clean ground (earth) terminal. Used for a signal common, as well as providing protection against electrical shock in case of a fault. Before operating the equipment, terminal marked with this symbol must be connected to ground in the manner described in the installation (operation)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



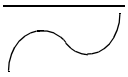
Frame or chassis terminal. A connection to the frame (chassis) of the equipment which normally includes all exposed metal structures.



Alternating current (power line).



Direct current (power line).



Alternating or direct current (power line).



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.



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-5531L VMEbus FIBER-OPTIC REPEATER LINK

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VMIVME-5531L VMEbus FIBER-OPTIC REPEATER LINK

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A Assembly Drawing, Parts List, and Schematic

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SECTION 1

INTRODUCTION

1.1 FEATURES FOR 6U BOARD

VMIC's VMIVME-5531L Fiber-Optic Repeater Link is a software transparent two-board set, with interconnecting cables that allow the user to effectively extend a VMEbus chassis to more than 20-slots. The "extended" slots, however, are only operational for non-interrupting VMEbus slave modules. The extended slots will not support VMEbus master modules.

The Repeater Link has several unique features, as listed below:

a. Software transparency, allows direct communication from primary chassis to secondary chassis with no software overhead (unidirectional link control with bi-directional data transfers)

b. Plug-and-play operation

c. Supports 8-, 16-, and 32-bit transfers

d. Supports 16-, 24-, and 32-bit addressing

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

f. Supports fiber-optic cables up to 6,560 feet (2,000 meters) long

g. Allows expansion to 19 x 19 slots, using 20-slot backplane in a star configuration

h. Double Eurocard form factor

i. Industry standard ST* type I/O connectors

j. Link includes one Model VMIVME-5531M, one VMIVME-5531S, and two interconnecting fiber-optic cables

1.2 FEATURES FOR 3U BOARD

VMIC's VMIVME-5531S 3U board is a DTB master (for use in a secondary chassis). The fiber-optic repeater link is a software transparent two-board set, with interconnecting cables that allow the user to effectively extend a VMEbus chassis to more than 20 slots. The "extended" slots, however, are only operational for noninterrupting VMEbus slave modules. The extended slots will not support VMEbus master modules. Although the 3U board will fit in a VMEbus 6U card cage, it does not use the P2 connector and must not be used to access 6U slave boards with A32 or D32 cycles.

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Some of the many unique features of the 3U board are listed below:

a. Supports 8-, 16-bit data

b. Supports 16-, 24-bit addressing

c. VMEbus signals supported: Write*, SYSRESET*, DS0*, DS1*, and LWORD*

d. Supporting cable lengths from 5 to 6,500 feet

NOTE:

THIS BOARD DOES NOT USE THE P2 CONNECTOR ON THE VMEbus BACKPLANE, WHEN INSTALLED IN A 6U CARD CAGE. THEREFORE, 32-bit DATA TRANSFERS ARE NOT SUPPORTED.

1.3 FUNCTIONAL DESCRIPTION

The VMIVME-5531L is a two-board set that allows non-interrupting 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 the VMEbus master resides is referred to as a primary chassis, while the VMEbus slave board resides in a secondary chassis. A primary VMEbus chassis can communicate with several secondary chassis by using multiple Repeater Links.

1.4 REFERENCE MATERIAL LIST

For a detailed explanation of the VMEbus and its characteristics, the publication "The VMEbus Specification" is available from:

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

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SECTION 2

PHYSICAL DESCRIPTION AND SPECIFICATIONS

REFER TO 800-005531-000 SPECIFICATION

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SECTION 3

THEORY OF OPERATION

3.1 OPERATIONAL OVERVIEW

The VMIVME-5531 Link is a high performance, yet easy to use method of inking two or more VMEbus systems together via fiber-optic cable. The Repeater Link is a two-board set which allows VMEbus slave boards residing in one VMEbus chassis to be controlled by a VMEbus master residing in another chassis. The VMEbus chassis in which the VMEbus master resides is referred to as the primary chassis, while the VMEbus slave boards reside in a secondary chassis. The two-board set is configured as shown in Figure 3.1-1, with one board designated for the primary chassis while the other board is designated for the secondary chassis. A master VMEbus chassis can communicate with several secondary chassis by using multiple Repeater Links in a star configuration as shown in Figure 3.1-2.

The link is software transparent (no registers requiring software initialization). Any VMEbus master in the primary chassis may access (read or write) to any slave board in the secondary chassis. Only non-interrupting slave boards are allowed in the secondary chassis. The link between the primary chassis and secondary chassis is automatically established when a VMEbus master (typically a CPU board) addresses any board in the secondary chassis (with AM codes 09, 0D, 29, 2D, 39 or 3D).

Any time a master in the primary chassis initiates a read/write access it will be repeated to the secondary chassis. If a slave board in the secondary chassis responds to that address, the data transfer (read or write) will occur between the chassis and a Data Transfer Acknowledge (DTACK) will be returned to the master (in the primary chassis) to complete the cycle.

A link consists of two boards (VMIVME-5531M and VMIVME-5531S) and the two fiber-optic cables which enable a VMEbus system to be expanded beyond a single chassis. Refer to Figures 3.1-3 through 3.1-5 for block diagrams of the boards.

A link reset switch located on the front panel of the VMIVME-5531M allows the user to assert SYSRESET* in the secondary chassis without resetting the primary (or additional secondary chassis in multiple link configurations). When SYSRESET* is asserted in the primary chassis it is repeated to all secondary chassis.

Both the VMIVME-5531M and VMIVME-5531S have a bi-color LED which indicates the status of the link. The LED is green when the local receiver has achieved phase-lock and frame synchronization with the remote transmitter. A red LED indicates that the link is not ready which may be due to damaged or miswired cables, unpowered remote chassis, or a damaged link. The LED is red momentarily during reset.

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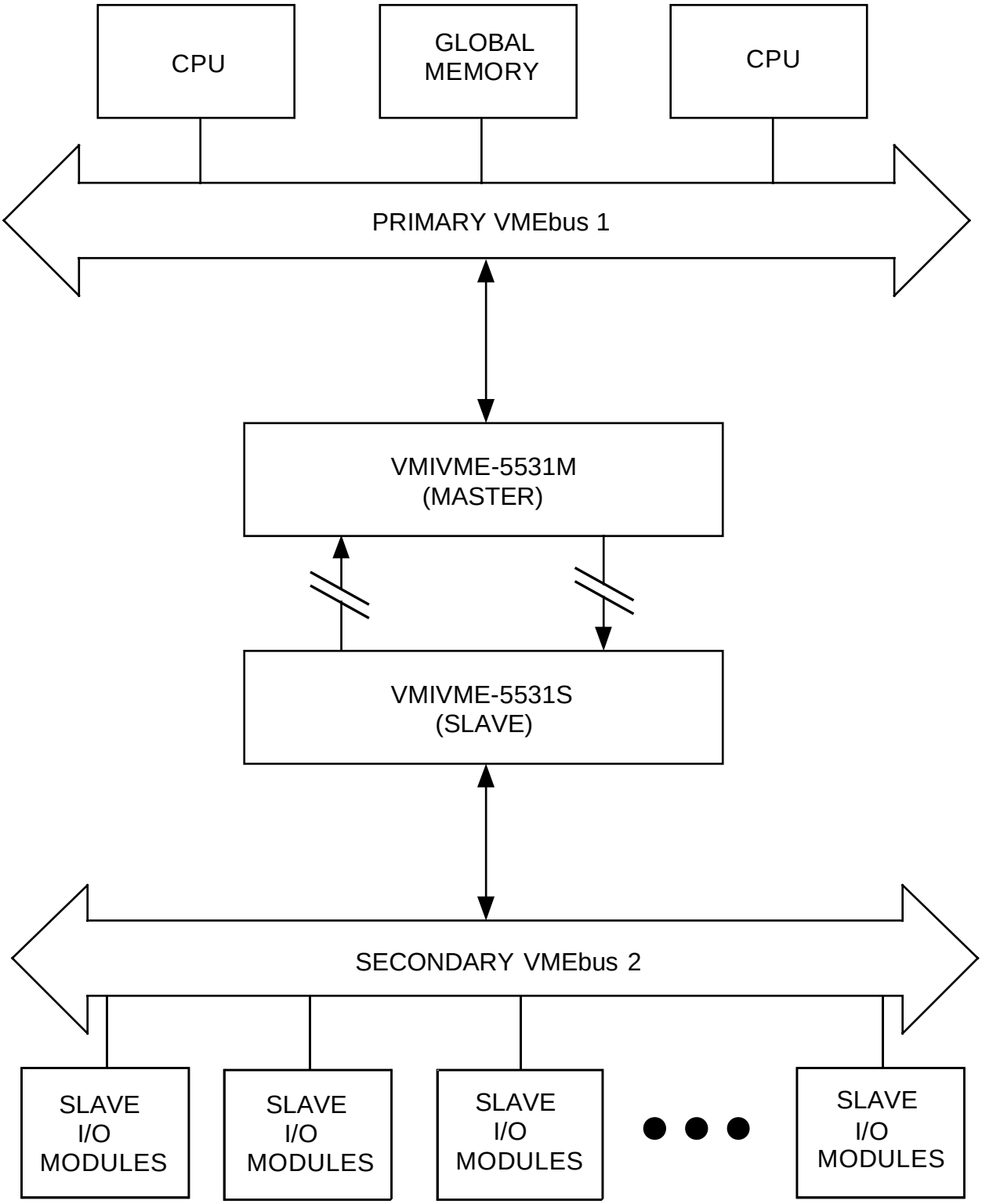


Figure 3.1-1. Single Link Application Configuration

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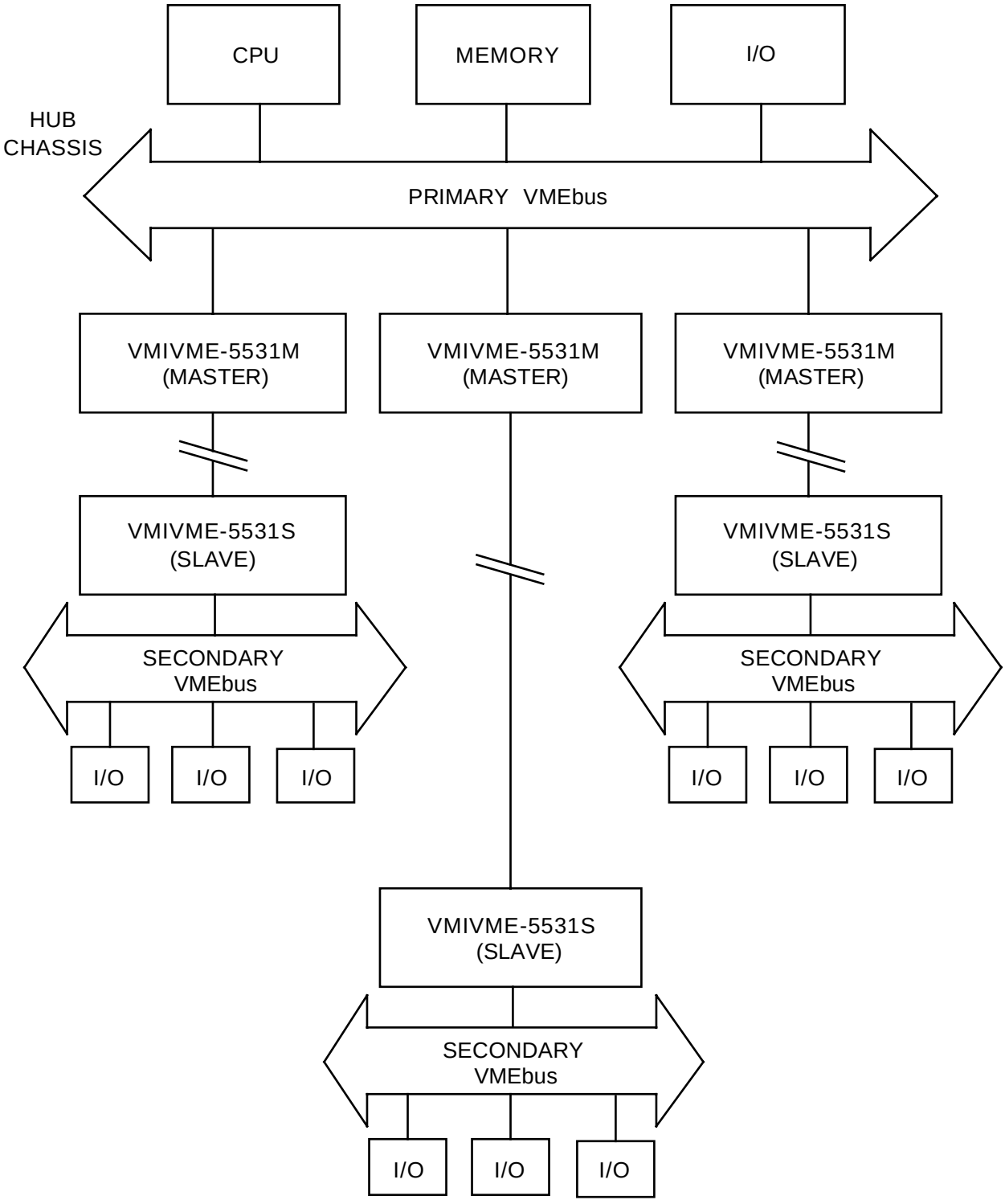


Figure 3.1-2. Star Configuration

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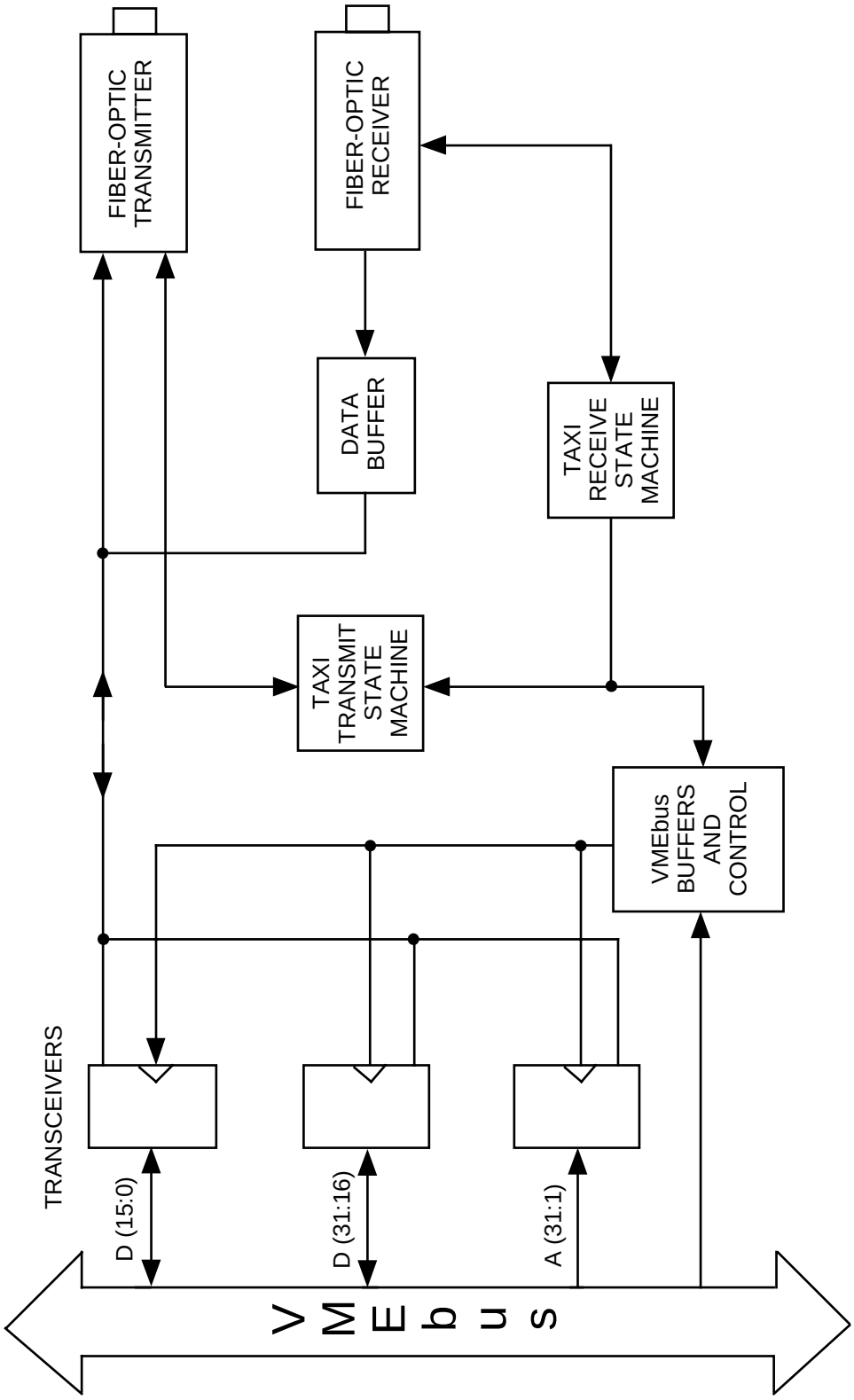


Figure 3.1-3. Block Diagram of VMIVME-5531M Primary Chassis Repeater Link Board

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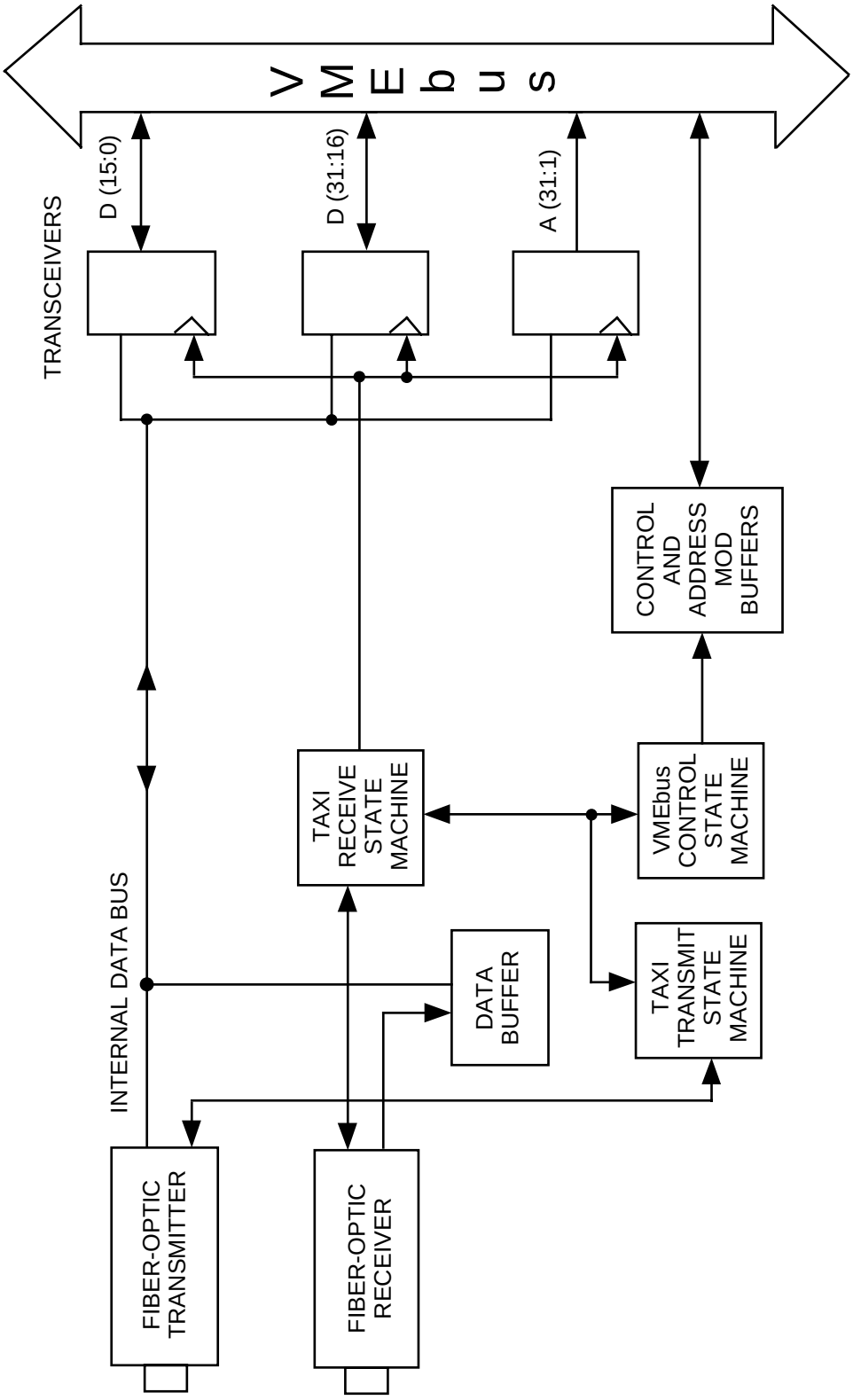


Figure 3.1-4. Block Diagram of VMIVME-5531S Secondary Chassis Repeater Link Board

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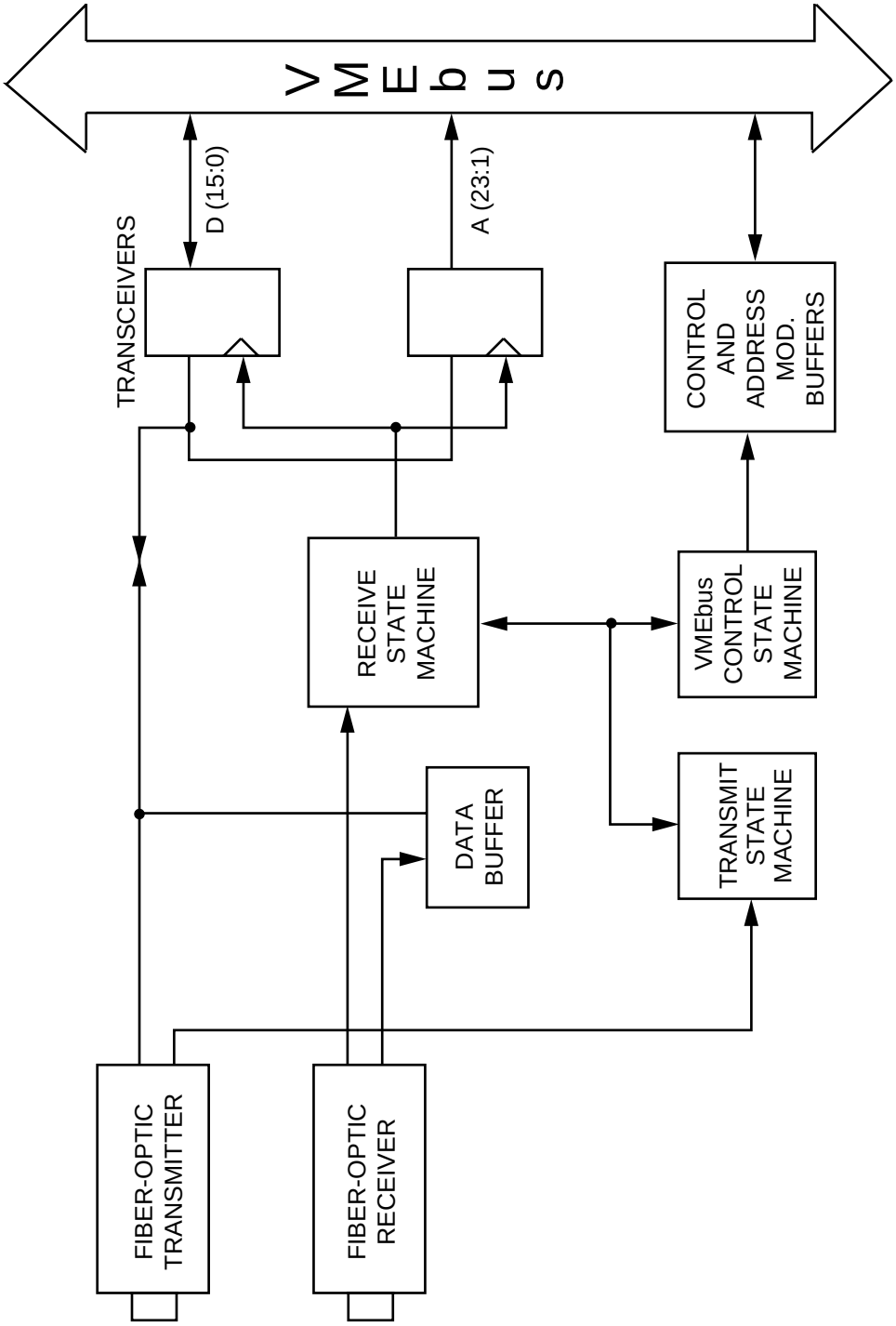


Figure 3.1-5. Block Diagram of the VMIVME-5531S Secondary Chassis Repeater Link Board (3U)

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3.2 THEORY OF OPERATION

The VMIVME-5531M and VMIVME-5531S each consist of three state machines, Taxi Transmitter, Taxi Receiver, Fiber-Optic Transmitter, Fiber-Optic Receiver, random logic, and buffers. The three state machines control the VMEbus interface, the Taxi Transmitter and the Taxi Receiver.

3.3 BUS ARBITRATION SIGNALS

The bus arbitration signals are not repeated over the link because the secondary chassis can only contain slave boards. Therefore, the VMIVME-5531S (the "S" designating slave chassis) actually functions as a lone bus master receiving VMEbus information over the fiber-optic cable and then generating the appropriate VMEbus cycle in the secondary chassis.

In the primary chassis, the VMIVME-5531M (the "M" designating master chassis where the CPUs reside) functions as a slave device, sending appropriate read/write accesses across the fiber-optic cable. The BGIN* signals are connected to the BGOUT* signals in order to maintain the BUS Grant daisy chain in the primary chassis.

3.4 INTERRUPT SIGNALS

The interrupt signals are not repeated over the fiber-optic link. Therefore, the VMIVME-5531S regenerates the IACK* signal as a logic high on the secondary chassis. On the primary chassis, the VMIVME-5531M connects IACKIN* to IACKOUT* in order to maintain the Interrupt Acknowledge daisy chain.

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SECTION 4

PROGRAMMING

4.1 PROGRAMMING

The VMIC's VMIVME-5531L Fiber-Optic Repeater Link is software transparent. Boards residing in the secondary VMEbus chassis respond to VMEbus transfers as if they were located in the primary VMEbus chassis. Therefore, the Repeater Link requires no special programming considerations, due to the fact that the address and data signals are transmitted to the secondary chassis. Any VMEbus read/write access (with AM codes 09, 0D, 29, 2D, 39 or 3D) in the primary chassis is transmitted across the link to the secondary 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 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.

5.3 BOARD CONFIGURATION

The VMIVME-5531M or VMIVME-5531S require no user-level configuration.

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5.4 CABLE INSTALLATION

The Fiber-optic Repeater Link requires two multimode fiber-optic cables with 62.5 µm core. There must be an ST connector at each end of the cable. Refer to Figure 5.4-1 for the cable connections.

1. Connect one cable from the VMIVME-5531M board connector (TX) to the VMIVME-5531S connector (RX).

2. Connect the other cable from the VMIVME-5531M board connector (RX) to the VMIVME-5531S connector (TX).

At this point, the VMIVME-5531L Repeater Link is ready to use when system power is applied

NOTE

THE RUBBER CAPS FOR THE FIBER-OPTIC CONNECTORS ON THE REPEAT BOARDS SHOULD BE ON THE CONNECTORS WHEN THE CABLES ARE NOT CONNECTED TO MINIMIZE CONTAMINATION OF THE FIBER-OPTIC TRANSCEIVERS. ALSO, FOR BEST RESULTS, AVOID SEVERE BENDS AND KINKS OF THE FIBER-OPTIC CABLE.

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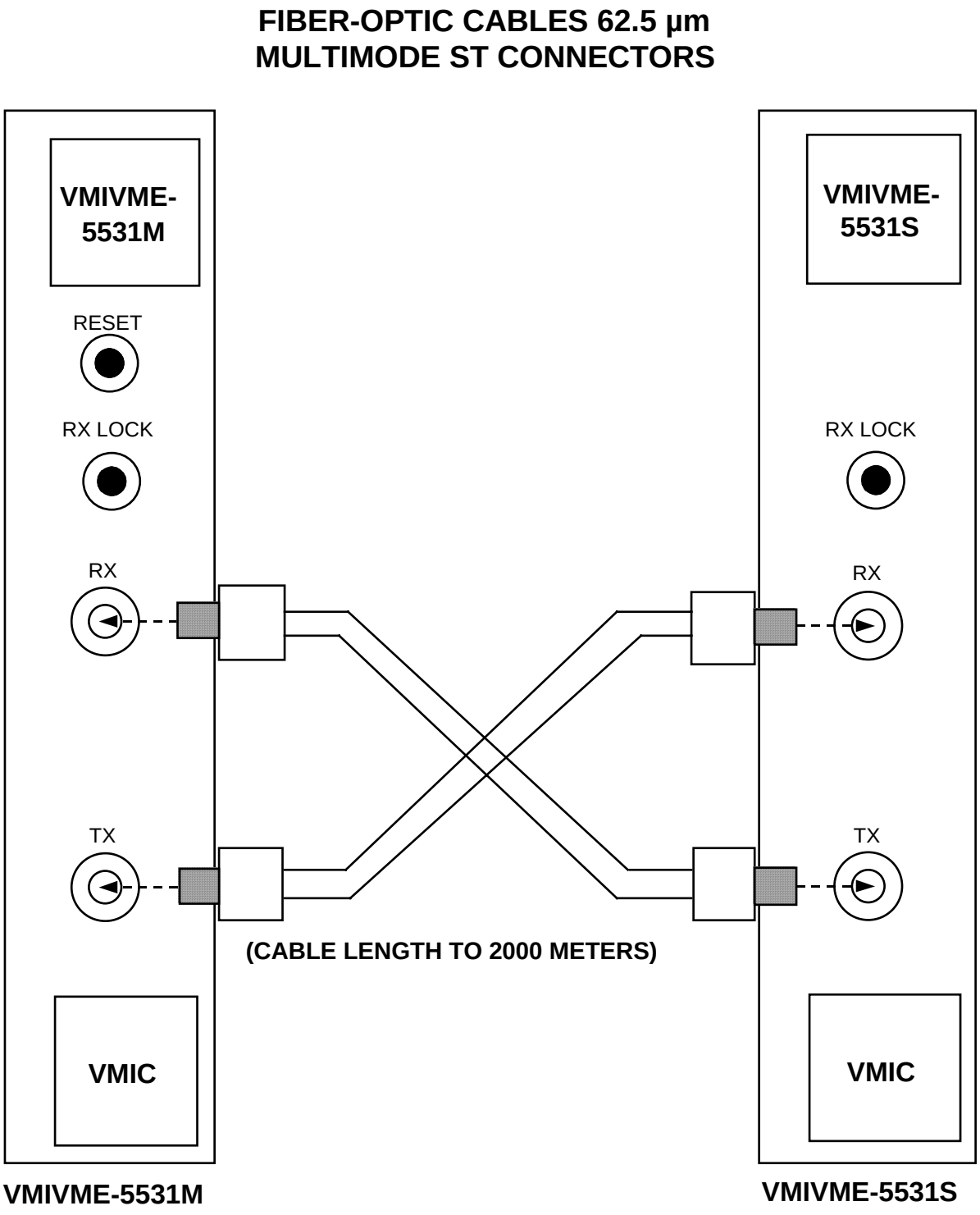


Figure 5.5-1. VMIVME-5531L Cable Connection

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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

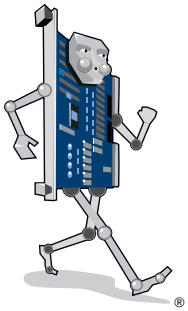
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