DWMVA VME Adapter Installation Guide

Order Number EK–DWMVA–IN–002

This guide describes the installation of the DWMVA I/O adapter in a VAX 6000 or VAX 7000/10000 computer system.

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Preface

This manual describes how to install a DWMVA VME adapter in a VAX 6000 or VAX 7000/10000 system equipped with an expansion cabinet that provides a VMEbus interface.

Audience

This manual is intended for users of the DWMVA VME adapter and Digital customer service engineers.

Document Structure

The manual consists of four chapters.

- **Chapter 1, Overview**, presents the packing list for the DWMVA adapter, describes the components of the installation kit, specifies system and environmental requirements, and introduces troubleshooting methods.

- **Chapter 2, Installation Procedures**, tells how to install the T2018 module, the C3200 module, and the cable assemblies.

- **Chapter 3, Verification**, explains the verification procedure for acceptance and gives a sample run of the EVCLA tests.

- **Chapter 4, Advanced Troubleshooting**, describes how to perform advanced diagnostic tests and gives a sample run of the EVCLC diagnostic program.

Associated Documents

Other documents related to the DWMVA adapter include:

- *DWMVA VME Adapter Technical Manual*, EK–DWMVA–TM

  Intended for software developers who want to write drivers and application programs for the DWMVA adapter.

- *BA62 VME Enclosure Installation Manual*, EK–VME01–IN

  Describes the BA62 enclosure that is used as an expansion cabinet to provide a VMEbus backplane and to house the C3200 module.

- *IEEE Standard for a Versatile Backplane Bus: VMEbus*, IEEE Std 1014, 1987.

  Provides complete specifications for the VMEbus.

- *VMS Version 5.4-3 Release Notes*, AA–PHUFA–TE

  Includes a chapter (Open Bus Driver Support Features) that discusses VMS support for VMEbus devices.

- *VMS Device Support Manual*, AA–PBPWA–TE

  Describes the components of a VMS device driver and the basic rules that device drivers must observe.

- *VMS Device Support Reference Manual*, AA–PBPXA–TE

  Describes driver data structures, routines, and entry points.

Chapter 1
Overview

The DWMVA I/O adapter is a hardware option used with VAX 6000 and VAX 7000/10000 computer systems. It establishes communication between a VMEbus and the XMI bus, which is the system bus of the VAX 6000 and is an I/O bus of the VAX 7000/10000. This chapter provides the following:

- An overview of the DWMVA adapter hardware kit

- System and environmental requirements

- Introduction to the DWMVA diagnostic programs

Figure 1–1 shows a block diagram of the DWMVA configuration.

Figure 1–1: DWMVA Block Diagram
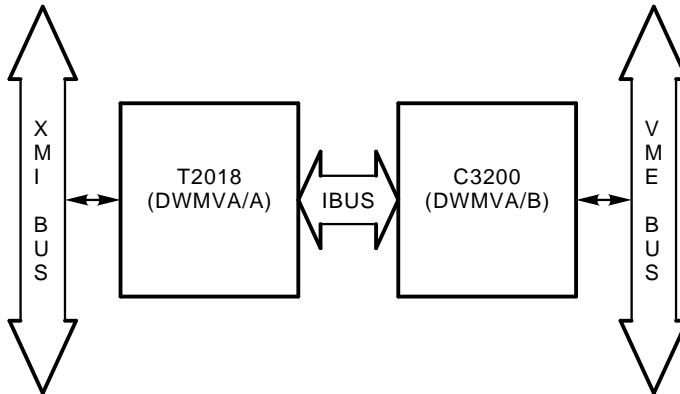
msb–p424b–91

1.1 DWMVA Adapter Kit

The DWMVA option consists of two modules (PC boards), three cable assemblies, and a single-size blank panel. Table 1–1 lists the items in the DWMVA option kit and gives their respective part numbers.

Table 1–1:   Packing List for the DWMVA Adapter

Part Number	Quantity	Description
T2018 (DWMVA/A)	1	XMI module of the DWMVA
C3200 (DWMVA/B)	1	VMEbus module of the DWMVA
17-02926-01	1	XMI internal cable assembly
17-02973-01	1	VME internal cable assembly
17-02972-01	1	IBUS external cable assembly
74-26407-01	1	Single-size blank panel
BA62-BA/BB[1]	1	VME enclosure

[1]Included in the DWMVA-BA/BB configuration only.

Brief descriptions of the items in the DWMVA option kit follow.

- **T2018**

  The T2018 module (Figure 1–2) is a standard XMI board that is
  installed in the XMI card cage to provide an I/O interface. It has
  two LED indicators. The yellow LED lights when the XMI self-test
  completes successfully. The red LED indicates a hardware failure.

Figure 1–2:   T2018 Module

msb-0060A-91
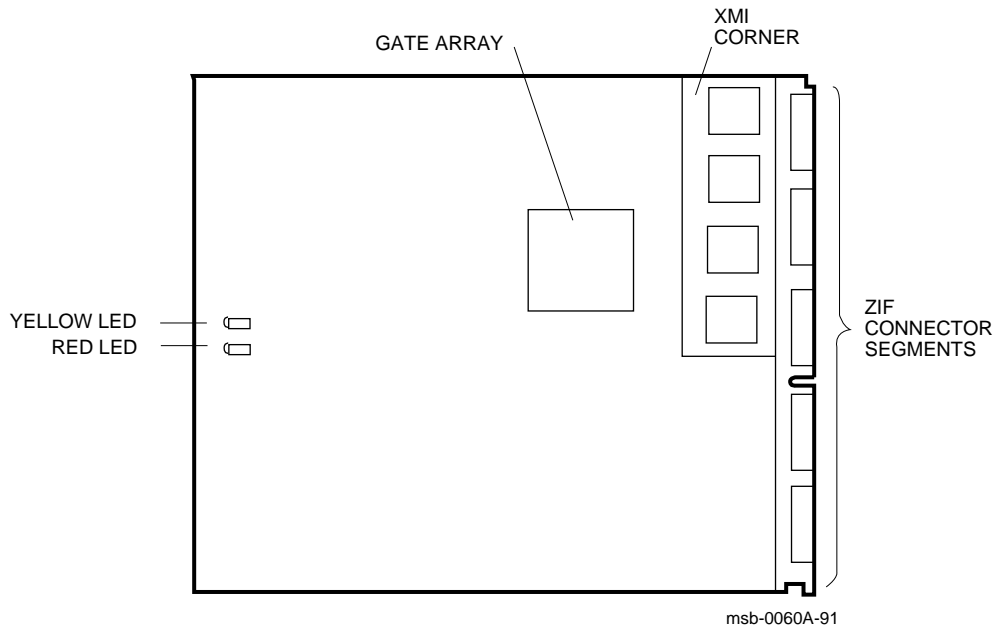
- **C3200**

  The C3200 module (Figure 1–3) is a 6U standard VME board (160 mm depth) with a handle and two ejectors. It is installed in a VMEbus expansion cabinet, such as the BA62 enclosure, and provides the interface to the VMEbus.

Figure 1–3: C3200 Module

msb-0061A-91
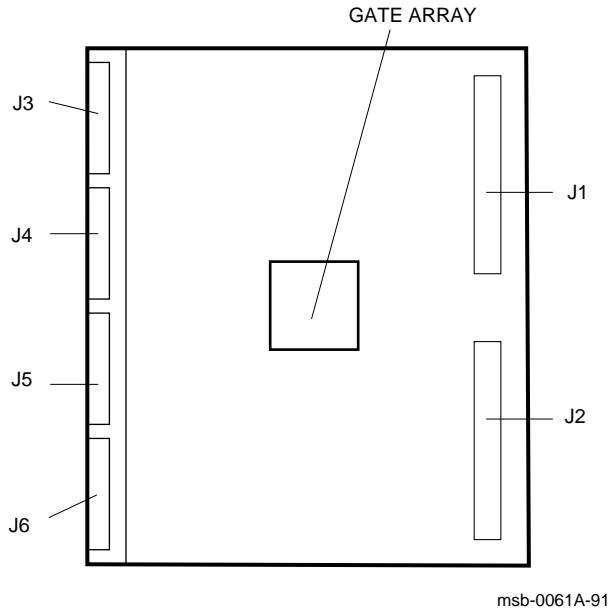
- **XMI Internal Cable Assembly**

  This cable assembly (17-02926-01) connects the XMI and the IBUS external cable assembly (see Figure 2–8). At one end, it has four 30-pin connectors labeled D1, D2, E1, and E2. The other end connects to a single-size bulkhead with a 100-pin microD connector.

- **VME Internal Cable Assembly**

  This cable assembly (17-02973-01) connects the C3200 module and the I/O bulkhead of the expansion cabinet (see Figure 2–5). At one end four flat cables have four 30-position connectors labeled P3, P4, P5, and P6. The other end has a microD connector secured on a mounting bracket.

- **IBUS External Cable Assembly**

  This 90-ohm, controlled-impedance, cable assembly (17-02972-01) connects the I/O bulkhead of the VAX system to the I/O bulkhead of the VME expansion cabinet. It is a 3-meter shielded cable with a right-angle connector for the XMI end and a straight connector for the C3200 end.

- **Single-Size Blank Panel**

  This single-size blank panel measuring 2 inches by 4.75 inches is used to cover half of the dual-sized cutout where the microD end of the XMI internal cable assembly is mounted.

- **BA62 VME Enclosure**

  This enclosure features six slots for 6U modules (160 mm deep) and three slots for 9U modules (400 mm deep). The enclosure also provides a power supply and cooling fans for the equipment.

1.2 Requirements

This section describes the system and environmental requirements for the DWMVA adapter.

1.2.1 System

The system requirements for the DWMVA adapter include:

- VAX computer system supporting the DWMVA adapter
- Expansion cabinet for the VMEbus
- VMS Version 5.4-3 or higher for VAX 6000 systems
- VMS Version 6.0 or higher for VAX 7000/10000 systems

The console ROM and the diagnostic ROM on the VAX 6000 processor module must support the DWMVA adapter. Table 1–2 gives the minimum versions for these ROMs. The two ROMs have the same version number. All higher versions also support the DWMVA.

VAX 7000/10000 processor modules must have ROM version V2.5 or higher.

Table 1–2: VAX 6000 Processor ROM Requirements

Model	Processor	Module	ROM Minimum Version
200	KA62A-AA	T2011-00	V7.0
300	KA62B-AA	T2011-YA	V8.0
	KA62B-AB	T2011-YC	V8.0
400	KA64A-AA	T2015-00	V4.0
	KA64A-AB	T2015-YA	V4.0
500	KA65A-AA	T2052-00	V3.0
	KA65A-AB	T2052-AB	V3.0
600	KA66A-AA	T2054-00	any
	KA66A-AB	T2054-AB	any

The DWMVA is available in two configurations:

- **DWMVA-AA**, includes the module set, the cable assemblies, and a single-size blank panel. Does not include a VME cabinet.

- **DWMVA-BA/BB**, includes the module set, the cable assemblies, the single-size blank panel, and a BA62 VME cabinet.

NOTE: *In this manual, it is assumed that the BA62 enclosure (available from Digital) is used as the expansion cabinet. Refer to the BA62 VME Enclosure Installation Manual for specifications on the BA62 enclosure.*

1.2.2 Environmental

Table 1–3 gives the environmental requirements for the DWMVA adapter modules.

For the C3200 module power requirements, see *BA62 VME Enclosure Installation Manual*.

Table 1–3: DWMVA Environmental Requirements

Operating Environment	
Temperature	10º to 40ºC (50º to 104ºF)
Humidity	10 to 90%, noncondensing
Altitude	To 2.4 km (8,000 ft)

Storage Environment	
Temperature	-40º to 66ºC (-40º to 151ºF)
Humidity	Up to 95%, short duration (less than 60 days)
Altitude	To 4.9 km (16,000 ft)

1.3 Troubleshooting

The DWMVA adapter is supported on VAX 6000 systems by two loadable diagnostic programs: EVCLA and EVCLC. Both programs are run by booting the VAX Diagnostic Supervisor (VAX/DS) from the console prompt. EVCLA can be run right after booting VAX/DS. EVCLC requires a Radstone test module to be installed in the VME cabinet before the test program can be executed. The test module is obtainable from Digital (see Chapter 4).

Chapter 2
Installation Procedures

Installation of the DWMVA adapter requires the completion of three tasks:

1. Installing the T2018 module

2. Installing the C3200 module

3. Connecting the cable assemblies

The XMI card cage in the VAX system houses the T2018 module. The C3200 module is installed in an external cabinet, which can be supplied either by Digital (BA62 enclosure) or by the customer. The discussions in this chapter assume that a BA62 enclosure or compatible VME cabinet is already installed.

2.1 Preparing for Installation

Observe the following BEFORE you start any installation procedure:

WARNINGS:

- *Wear an antistatic (ESD) wrist strap that is connected to the processor cabinet whenever you work inside the cabinet. This measure grounds you and thus prevents you from damaging the electronic components by discharging static electricity.*

- *Place any circuit board removed during the installation procedures in a conductive container to prevent harm to the electronic components of the board.*

Perform the following tasks:

1. Verify that the VAX processor ROMs support the DWMVA adapter. The appropriate versions of the ROMs are given in Table 1–2. If the ROMs need to be updated, contact your local Field Change Order (FCO) coordinator for upgrade instructions.

2. Determine the slot in the XMI card cage where the T2018 is to be installed. Figure 2–1 shows the location of the XMI card cage in a VAX 6000 system. In a VAX 7000/10000 system, the XMI card cage is in the bottom of one of the CPU cabinets.

Figure 2–1:   Location of XMI Card Cage in a VAX 6000 System

FRONT

XMI CARD CAGE

msb-0316D-91
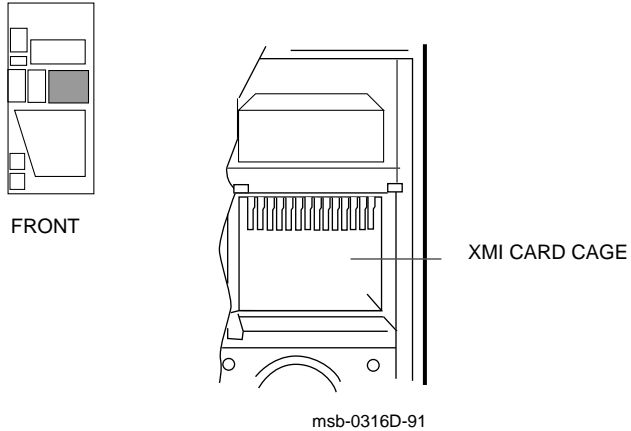
NOTE: *In a VAX 6000 Model 200/300/400 system, the T2018 module can be installed in slots 1 through 4 and B through E. In other VAX 6000 systems, the T2018 module can be installed in slots 1 through 5 and A through E. It is recommended that you install the module in the highest available slot in VAX 6000 systems. In VAX 7000/10000 systems, any available XMI slot may be used.*

Figure 2–2 shows the slots in the XMI card cage. Slot 4 is used for illustrations of the installation procedures.

3. Install the BA62 enclosure (or other VME cabinet) and place it within 1.82 m (6 ft) of the host system. Installation instructions are included in the shipment of the BA62 enclosure.

You can now proceed with the installation of the DWMVA adapter.

Figure 2–2: XMI Card Cage Slots
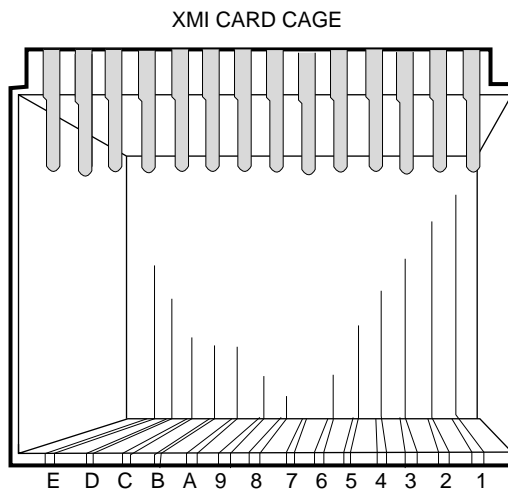
msb-0396-90

2.2 Installing the T2018 Module

Install the T2018 module in the XMI card cage as follows:

1. Power down the host computer system (see Figure 2–3).

   a. Turn the upper switch at the control panel to the 0 position.

   b. Pull out the main circuit breaker T-handle on the H405-E/F power controller.

2. Open the front door of the VAX cabinet.

3. Put on the ESD wrist strap that is attached to the system chassis.

4. Remove the door in front of the XMI card cage.

5. Locate the selected slot in the XMI card cage where the T2018 module is to be installed.

6. Grasp the T2018 module at the edge opposite the connectors. Without touching the components, lift the lever of the selected slot, align the module with the card guides, and carefully slide it into the slot until it comes to a halt. No force is necessary because the XMI card cage is of zero-insertion-force type.

7. Press the lever down to lock the connector.

8. Replace the door in front of the XMI card cage.

You have completed the installation of the T2018 module.

NOTE: *Powering down a VAX 7000/10000 system is similar. Refer to the Installation Guide for the relevant system for details.*

Figure 2–3: Powering Down the VAX 6000

Standby   Run
Enable   Battery
Secure   Fault

Update
Halt
Auto Start   Restart

ON

OFF
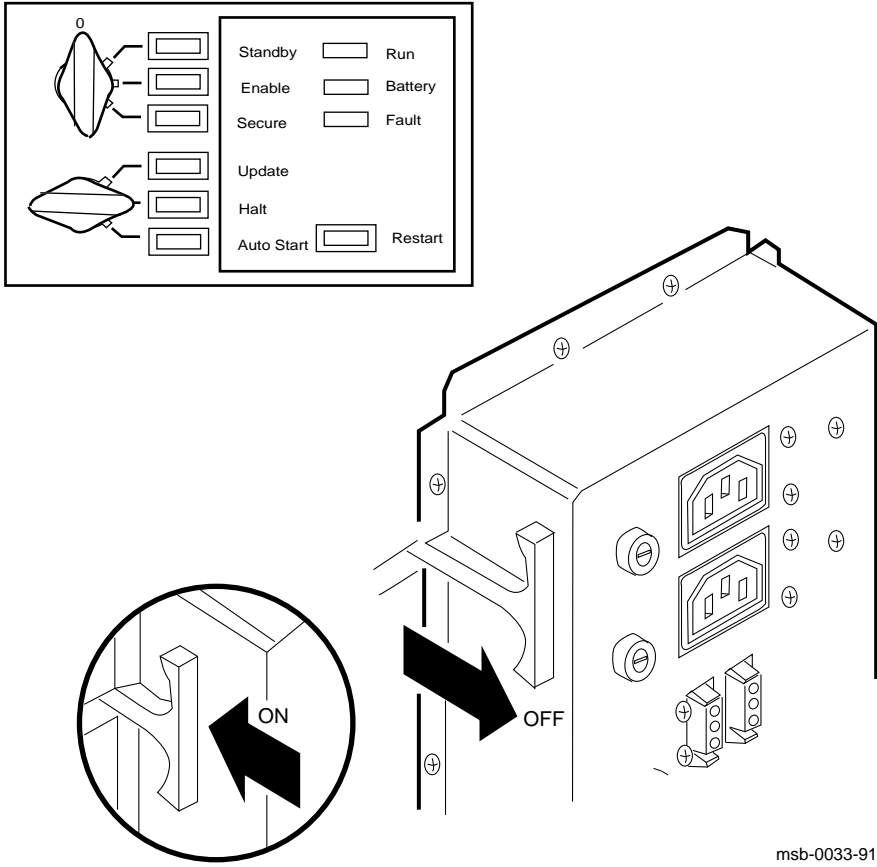
msb-0033-91

2.3 Installing the C3200 Module

Install the C3200 module in the 6U VME card cage (see Figure 2–4) as follows:

1. Make sure you are wearing a properly grounded antistatic wrist strap.

2. Power down the BA62 enclosure (or other VME cabinet) by pressing the main power switch in the upper-right corner of the front panel.

3. Remove the rear panel of the enclosure (not shown in Figure 2–4) by grasping the panel at the bottom edge and pulling the panel straight back.

Figure 2–4:   BA62 VME Enclosure (Rear View)
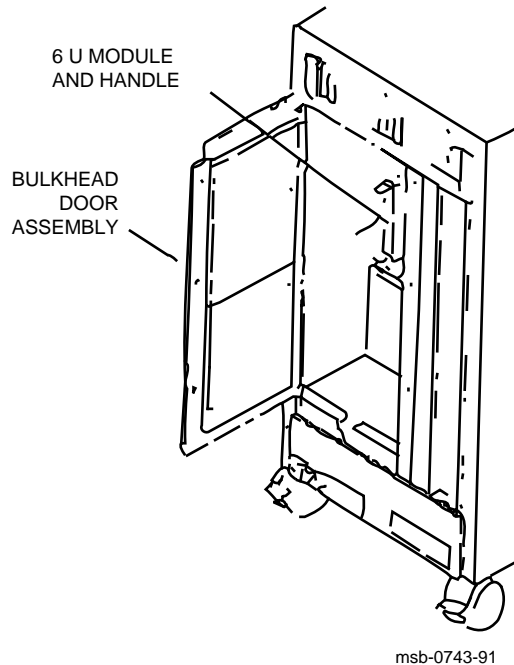
6 U MODULE
AND HANDLE

BULKHEAD
DOOR
ASSEMBLY

msb-0743-91

.

4. Loosen the three captive screws securing the bulkhead door assembly to the rear of the enclosure. Then swing the bulkhead door assembly to the left (see Figure 2–4).

5. Locate slot 1 of the 6U card cage and make sure that the IACK and BG0–BG3 jumpers of the slot are removed from the backplane.

   NOTE: *In the BA62, slot 1 is the leftmost slot viewed from the rear of the cabinet.*

6. Grasp the C3200 module at the top and the bottom of the handle, align the module with the upper and lower card guides of slot 1, and insert it into the slot. Carefully slide the module in by pressing on the upper and lower ejectors of the handle until the J1 and J2 connectors are fully seated in the VMEbus backplane.

   NOTE: *To remove the module from the 6U card cage, press outward on the ejectors until the module is released; then pull the module out.*

7. Secure the module in the card cage by tightening the screws on the module's handle.

You have completed the installation of the C3200 module.

2.4 Connecting T2018 to C3200

Connection of the T2018 to the C3200 requires the installation and interconnection of three cable assemblies:

- VME internal cable assembly
- XMI internal cable assembly
- IBUS external cable assembly

2.4.1 Installing VME Internal Cable Assembly

Install the VME internal cable assembly (17-02973-01) as follows:

1. Insert the P3, P4, P5, and P6 connectors to corresponding connectors marked J3, J4, J5, and J6 on the C3200 module handle. Install cables so that the red stripes on the cables are at the top of the J connectors (see Figure 2–5).

Figure 2–5:   VME Internal Cable Connection
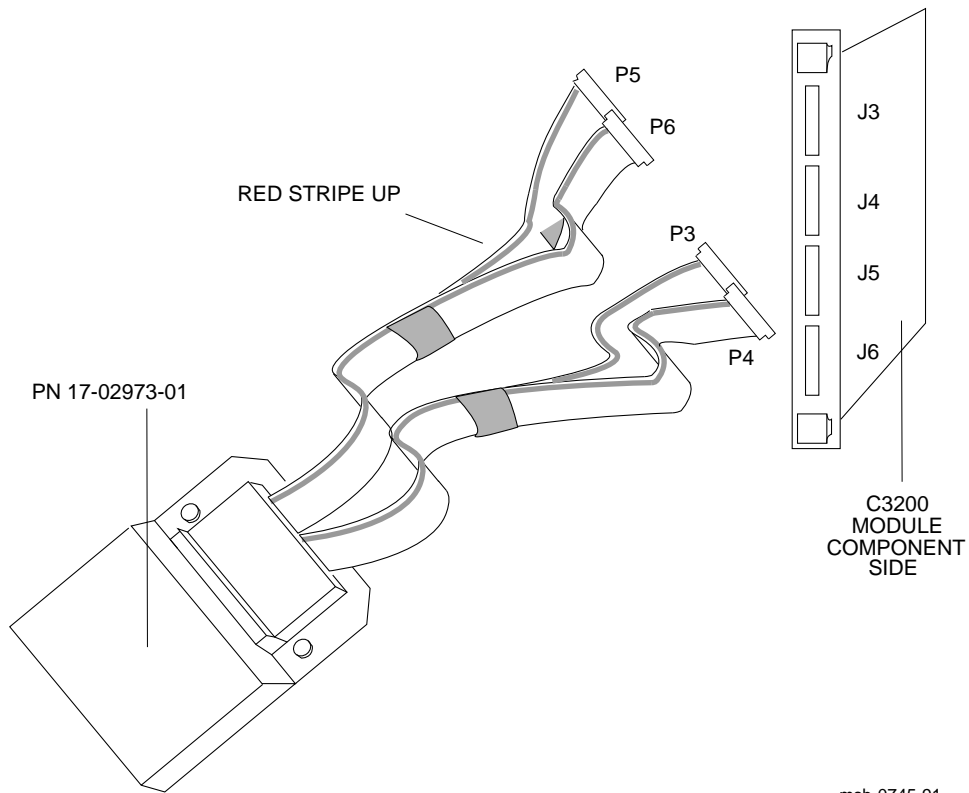
msb-0745-91

2. Insert the straight microD male connector of the IBUS external cable assembly (17-02972-01) into the 100-pin female connector attached to a mounting plate at the other end of the VME internal cable assembly (see Figure 2–6).

   This connection must be made before the VME internal cable assembly is mounted to the enclosure, because the female microD connector is not accessible once the mounting plate of the VME internal cable assembly is flipped and secured to the enclosure (see next step).

Figure 2–6: IBUS to VME Internal Cable Connection

IBUS
CABLE ASSEMBLY
PN 17-02972-01I

METAL MOUNTING
PLATE AND CAB LE
PN 17-02973-01

msb-0746-91
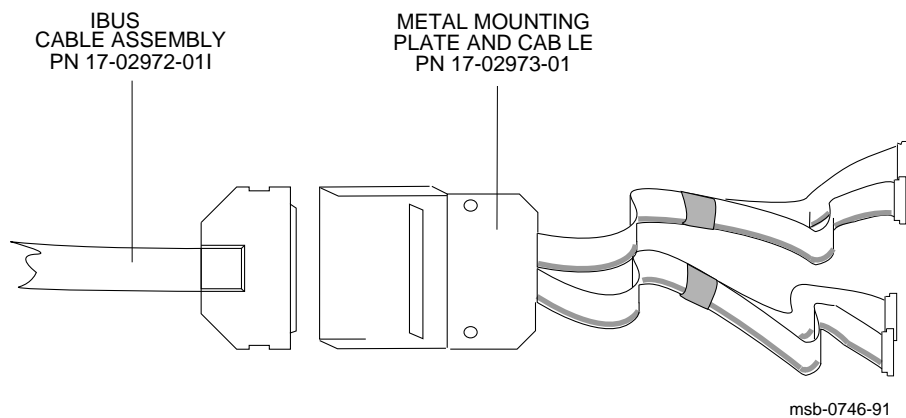
3. Flip the mounting plate (connectors underneath) and secure it to the floor of the enclosure making sure that the shielded cable is routed through the cutout at the bottom of the enclosure chamber.

4. Close the rear door of the enclosure.

5. Reinstall the rear panel.

2.4.2 Installing XMI Internal Cable Assembly

Install the XMI internal cable assembly (17-02926-01) as follows:

1. Open the rear door of the VAX cabinet.

2. Unscrew and remove one of the two double-size I/O panels on the bulkhead tray.

3. Loosen the screw on the bracket holding the bulkhead tray to the rear of the cabinet and lower the tray until it rests at a 90° angle from the cabinet.

4. Locate the XMI backplane. Figure 2–7 shows the XMI backplane location and indicates segments D and E where the internal cable assembly connectors are to be plugged.

Figure 2–7: XMI Backplane Segments D and E

5. Find the XMI slot corresponding to the T2018 module (slot 4 in Figure 2–7) and insert the four 30-position (2 by 15) connectors of the internal cable assembly labeled D1, D2, E1, and E2, into the corresponding connectors of the selected slot. Make sure the red stripes on the cables are at the top of the backplane connectors (see Figure 2–8).
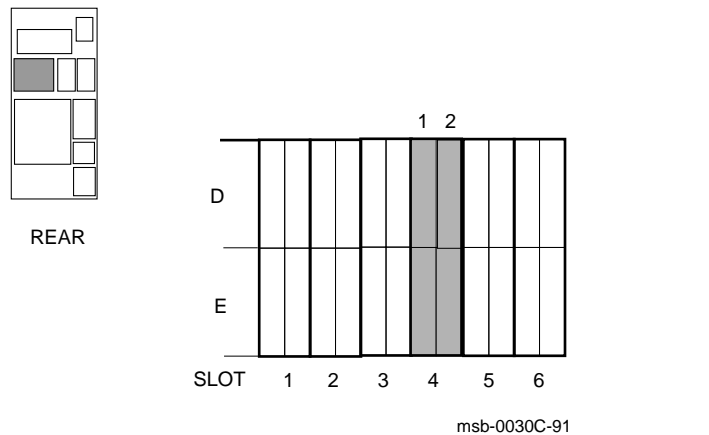
Figure 2–8: XMI Internal Cable Connection

VAX 6000
I/O BULKHEAD
MOUNTING PLATE

IBUS
CABLE ASSEMBLY
PN 17-02972-01

D2

D1

E2

E1

msb-0747-91
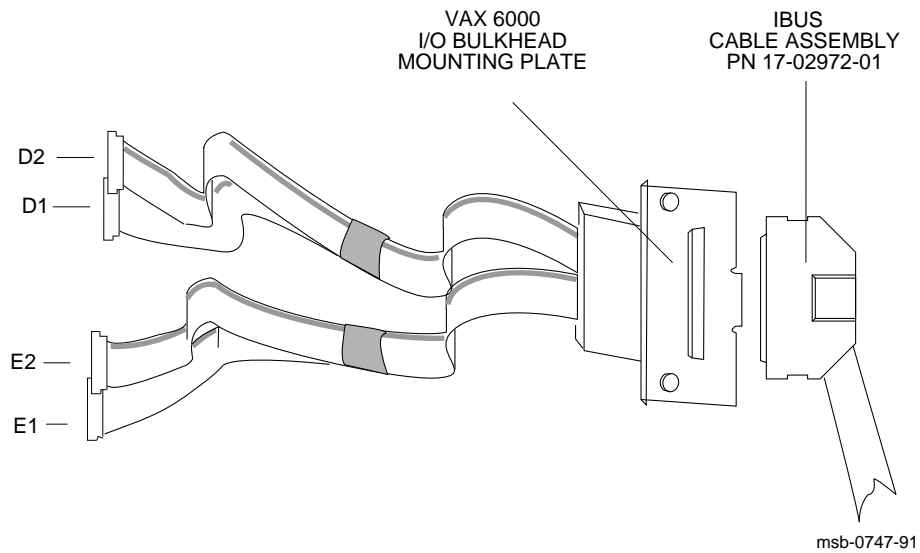
6. Lift the bulkhead tray back up and fasten it to the holding bracket.

7. Secure the panel with the microD connector to the bulkhead on the
    right side of the double-size bulkhead cutout. Make sure that the panel
    tab on the microD connector is oriented to the right (see Figure 2–8).

8. Install the single-size blank panel included in the adapter kit on the
    left side of the double-size bulkhead cutout.

2.4.3 Installing IBUS External Cable Assembly

Complete the installation of the IBUS cable assembly (17-02972-01) as follows:

1. Connect the right-angle connector of the IBUS external cable assembly to the female microD connector of the XMI internal cable assembly (see Figure 2–8).

2. Close the rear door of the computer cabinet.

You have completed the installation of the DWMVA adapter. You can now move on to the verification procedures.

Chapter 3

Verification

After you have completed the installation of the DWMVA adapter (T2018, C3200, and cabling), you are ready to verify its operation. Verification consists of two procedures: self-test, which is executed automatically by the VAX processor on power-up, and a series of diagnostic tests performed by the EVCLA program. EVCLA is only supported on VAX 6000 systems.

3.1 Power-Up Self-Test

On power-up, the boot (primary) processor executes a minimum set of ROM-based tests on the DWMVA modules as part of the VAX system self-test. Proceed as follows:

1. Power up the BA62 enclosure (VME subsystem) by pressing the main power switch in the upper-right corner of the front panel.

2. Power up the host computer system.

   a. Push the main circuit breaker T-handle.

   b. Turn the upper switch of the control panel to the Enable position.

   c. Turn the lower switch of the control panel to the Halt position.

The system executes a self-test and outputs the console prompt at the terminal. The yellow LED on the T2018 lights, indicating that the module passed self-test. If the red LED lights, an error was detected in the DWMVA. Refer to the *DWMVA VME Adapter Technical Manual* for information on errors.

3.2 Running EVCLA Tests

NOTE: *EVCLA is only used with VAX 6000 systems. For verification on VAX 7000/10000 systems, refer to Technical Tips.*

At the console prompt, you can boot the VAX Diagnostic Supervisor (VAX/DS) from the TK drive, or other media, to run standalone verification diagnostics.

Proceed as follows:

❶ Enter B VDS to boot VAX/DS. The system displays the prompt DS>.

  NOTE: *If B VDS is not defined, refer to console commands and system configurations for boot details.*

❷ Enter ATTACH DWMVA HUB DWMVA0 *n*, where *n* is the slot number in hexadecimal notation. This command establishes connection between the C3200 adapter and slot *n* of the XMI where the T2018 resides. The zero at the end of DWMVA indicates the device number of the DWMVA. The second device would be called DWMVA1. Each DWMVA device is tested separately if two DWMVA adapters are installed.

❸ Enter SELECT DWMVA0 to select the DWMVA adapter for testing.

❹ Enter LOAD EVCLA to load EVCLA into memory.

❺ Enter SET TRACE,HALT to print out the test sequence and to halt on error.

❻ Enter START to start the DWMVA level 3 diagnostic program. The first 18 tests of the EVCLA are run on the T2018. The remaining tests are run on both modules, T2018 and C3200.

❼ When the diagnostic prompt returns, type EXIT to exit VAX/DS.

  NOTE: *The supervisor runs 36 tests. Test 37 (VME DC power test) must be selected manually. To run test 37, enter ST/SE:MANUAL (instead of EXIT) when the DS> prompt returns and follow the program instructions.*

If EVCLA reports no errors, the user verification procedure is complete and acceptance criteria have been met.

Example 3–1 shows a typical run of the EVCLA tests.

Example 3–1: Running EVCLA

```
>>> B VDS ❶

  DS> ATTACH DWMVA HUB DWMVA0 4 ❷

  DS> SELECT DWMVA0 ❸

  DS> LOAD EVCLA ❹

  DS> SET T,H ❺

  DS> START ❻

.. Program: VAX DWMVA Level 3 Diagnostic, revision 1.0, 37 tests,
at 13:56:29.66.
Testing: _DWMVA0

Test 1: Registers Integrity Test
Test 2: XMI Parity Checker Test
Test 3: PMREs Integrity Test
Test 4: T2018 Loopback Test
Test 5: PMRs ECC Test
Test 6: DMA Data Buffers Test
Test 7: Data NO ACK and Interrupt Test
Test 8: Addressing Modes Test
Test 9: DMA ECC and Interrupt Test
Test 10: Retry Timeout and Interrupt Test
Test 11: Nonexistent Memory Test
Test 12: Timeout Counter Test
Test 13: Invalid PFN and Interrupt Test
Test 14: XMI Parity Error Interrupt Test
Test 15: XMI Write Sequence Error Interrupt Test
Test 16: IBUS DMA C/A Buffers Parity Error and Interrupt Test
Test 17: Internal Error and Interrupt Test
Test 18: I/O Write Fail and Interrupt Test
Test 19: IBUS Integrity and Early Loopback Test
Test 20: C3200 CSR Register Test
Test 21: C3200 Access Register and Accessed Registers Test
Test 22: C3200 Register Dual Address Test
Test 23: SWAP Ram Addressing Verification Test
Test 24: SWAP Ram Data Cell Integrity Test
Test 25: Address Building Test
Test 26: ITV Data Path and ITV Buffer Cell Integrity Test
Test 27: Little to Big Endian Format Test
Test 28: Location Monitor Test/External Check
Test 29: VTI Data Path/Control and VTI Buffer Cell Integrity Test
Test 30: Big to Little Endian Format Test
Test 31: DMA Read Transaction Test
Test 32: VME Transaction Timeout Error Test
Test 33: XVME Arbitration Test
Test 34: T2018 Originated Interrupt Test
Test 35: VME Interrupt Test
```

Example 3–1 Cont'd on next page

Example 3–1 (Cont.):   Running EVCLA

```
Test 36: C3200 Error Interrupts Test
 .. End of run, 0 errors detected, pass count is 1,
 time is  6-MAY-1991 13:59:55.42

 DS> EXIT ❼
```

Chapter 4

Advanced Troubleshooting

This chapter describes how to run the EVCLC diagnostic program. The procedure requires use of a Radstone PME 68-25 processor board that has been customized for EVCLC (Digital part number FC-10169-AC).

NOTE: *EVCLC is only used with VAX 6000 systems. For advanced troubleshooting on VAX 7000/10000 systems, refer to Technical Tips.*

4.1 Installing the Diagnostic Board

To install the Radstone 68-25 board in the BA62 enclosure (or other VME cabinet), proceed as follows:

1. Power down the BA62 enclosure or compatible expansion cabinet.

   NOTE: *The red LED on the T2018 module lights when the BA62 enclosure is powered down. Running the diagnostic EVCLC initializes the module.*

2. Make sure you are wearing a properly grounded antistatic wrist strap.

3. Remove the rear panel of the enclosure by grasping the panel at bottom edge and pulling the panel straight back.

4. Loosen the three captive screws securing the bulkhead door assembly to the rear of the enclosure. Then swing the bulkhead door assembly to the left (see Figure 2–4).

5. Locate the slot of the 6U card cage where the Radstone board is to be installed and make sure that the IACK and BG0–BG3 jumpers on the slot are pulled out. The Radstone 68-25 diagnostic board is set to VME address 0000 0000.

   CAUTION: *Only the C3200 module and the Radstone 68-25 board should be connected to the VME backplane when running the EVCLC tests. All other VME options should be removed and IACK and BG0–BG3 jumpers should be installed in their respective backplane slots. To remove a module from the 6U card cage, press outward on the ejectors until the module is released; then pull the module out.*

6. Grasp the Radstone module from the top and the bottom of the handle, align it with the upper and lower card guides of the selected slot, and insert it into the slot. Carefully slide the module in by pressing on the upper and lower ejectors of the handle until the connectors are fully seated.

7. Secure the module in the card cage by tightening the screws on the module handle.

8. Power up the BA62 enclosure (VME subsystem).

4.2 Running EVCLC

After EVCLA has been run, do not exit. Then run EVCLC as follows:

❶ At the DS> prompt, enter LOAD EVCLC to load the 27 test routines of EVCLC into memory.

❷ Enter START to start the DWMVA level 3 diagnostic program.

❸ When the DS> prompt returns, type EXIT to exit VAX/DS.

Example 4–1 shows a typical run of the EVCLC tests.

Example 4–1: Running EVCLC

```
DS> LOAD EVCLC ❶

DS> START ❷

.. Program: VAX DWMVA Level 3 Diagnostic, revision 0.1, 27 tests,
at 09:59:26.58.
Testing: _DWMVA0

Test 1: Inbound Byte Writes(XMI to Radstone) Test
Test 2: Inbound Word Writes(XMI to Radstone) Test
Test 3: Inbound Longword Writes (XMI to Radstone) Test
Test 4: Inbound IRead/UWrite Testing
Test 5: BERR Testing Subtest
Test 6: Outbound (R2X) Byte Reads Test
Test 7: Outbound (R2X) Word Reads Test
Test 8: Outbound (R2X) Tri-Byte Reads Test
Test 9: Outbound (R2X) Longword Reads Test
Test 10: Outbound (R2X) DMA Byte Writes Test
Test 11: Outbound (R2X) DMA Word Writes Test
Test 12: Outbound (R2X) DMA Tri-Byte Writes Test
Test 13: Outbound (R2X) DMA Longword Writes Test
Test 14: Outbound (R2X) DMA RMW Bytes Test
Test 15: Outbound (R2X) DMA RMW Word Test
Test 16: Outbound (R2X) DMA RMW Longword Test
Test 17: Outbound (R2X) DMA Non-Block Byte Read Test
Test 18: Outbound (R2X) DMA Non-Block Word Read Test
Test 19: Outbound (R2X) DMA Non-Block Tri-Byte Read Test
Test 20: Outbound (R2X) DMA Non-Block Longword Read Test
Test 21: Outbound (R2X) DMA Non-Block Byte Write Test
Test 22: Outbound (R2X) DMA Non-Block Word Write Test
Test 23: Outbound (R2X) DMA Non-Block Tri-Byte Write Test
Test 24: Outbound (R2X) DMA Non-Block Longword Write Test
Test 25: Outbound (VME to XMI) RMW Error Testing Subtest
Test 26: Outbound (R2X) Read-Write-Read Testing Subtest
Test 27: Outbound Read-Write-Read Testing Subtest
.. End of run, 0 errors detected, pass count is 1,
   time is 5-JUN-1991 10:02:15.20

DS> EXIT ❸
```

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