

# DIGITAL Alpha VME 5/352 and 5/480 Single-Board Computers

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## Installation Guide

Order Number: EK-VME54-IG. B01

This guide explains how to install DIGITAL Alpha VME 5/352 and 5/480 single-board computers (SBCs).

**Revision/Update Information:**

This guide supersedes the *DIGITAL Alpha VME 5/352 and 5/480 Single-Board Computers Installation Guide*, EK-VME54-IG. A01.

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# Preface

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## Purpose of this Guide

This guide explains how to install and troubleshoot your Alpha VME 5/352 or 5/480 SBC.

## Intended Audience

This guide is for system integrators, field and manufacturing technicians, and support specialists who need to install the SBCs and diagnose problems. The guide assumes that readers have prerequisite knowledge and experience with the following:

- CPU modules and SBCs and how to assemble and disassemble them
- VMEbus design and specifications

## Structure of this Guide

This guide consists of three chapters and two appendixes organized as follows:

- Chapter 1, *Preparing for the Installation*, explains how to unpack and verify your kit contents and check for ordered options. It also helps you get acquainted with the SBC's major components.
- Chapter 2, *Installing the SBC*, provides step-by-step instructions on how to install the SBC.
- Chapter 3, *Finishing the Installation*, explains how to power on the SBC, monitor diagnostics, configure the system, and boot an operating system.
- Appendix A, *Cables and Connectors*, lists cables and connectors you may need for the installation.
- Appendix B, *Troubleshooting*, introduces SROM and flash ROM diagnostics. This appendix also provides tips on troubleshooting your SBC and systems that include a PMC I/O companion card.

## Conventions

This section defines terminology, abbreviations, and other conventions used in this guide.

## Abbreviations

- Binary multiples

The abbreviations K, M, and G (kilo, mega, and giga) represent binary multiples and have the following values:

Abbreviation	Binary Multiple
K	$2^{10}$ (1024)
M	$2^{20}$ (1,048,576)
G	$2^{30}$ (1,073,741,824)

For example:

2 KB	= 2 kilobytes	= $2 \times 2^{10}$ bytes
4 MB	= 4 megabytes	= $4 \times 2^{20}$ bytes
8 GB	= 8 gigabytes	= $8 \times 2^{30}$ bytes

## Addresses

Unless otherwise noted, addresses and offsets are hexadecimal values.

## Bit Notation

Multiple-bit fields can include contiguous and noncontiguous bits contained in angle brackets (<>). Multiple contiguous bits are indicated by a pair of numbers separated by a colon (:). For example, <9:7,5,2:0> specifies bits 9, 8, 7, 5, 2, 1, and 0. Similarly, single bits are frequently indicated with angle brackets. For example, <27> specifies bit 27.

## Caution

Cautions indicate potential damage to equipment or loss of data.

## Keyboard Keys

The following keyboard key conventions are used throughout this guide.

Convention	Example
Control key sequences are represented as Ctrl/x. Press Ctrl while you simultaneously press the x key.	Ctrl/C
In plain text, key names match the name on the actual key.	Return key
In tables, key names match the name of the actual key and appear in square brackets ([ ]).	[Return]

## Names and Symbols

The following table lists typographical conventions used for names of various items throughout this guide.

Items	Example
Commands	<b>boot</b> command
Command arguments	<i>address</i> argument
Command options	<b>-sb</b> option
Environment variables	AUTO_ACTION
Environment variable values	HALT
Files and pathnames	<i>/usr/foo/bar</i>
Pins	LIRQ pin
Variables	<i>n, x, mydev</i>

### Note

Notes emphasize particularly important information.

### Numbering

Numbers are decimal or hexadecimal unless otherwise indicated. The prefix 0x indicates a hexadecimal number. For example, 19 is decimal, but 0x19 and 0x19A are hexadecimal (see also Addresses). Otherwise, the base is indicated by a subscript; for example,  $100^2$  is a binary number.

## For More Information

For more information, refer to the following:

- Your supplier
- A DIGITAL Field Applications Engineer
- The DIGITAL OEM web site at <http://www.digital.com/oem>.

- The following DIGITAL Alpha VME 5/352 and 5/480 SBC documentation, which is available on the DIGITAL OEM web site:

<b>Document</b>	<b>Order Number</b>	<b>Description</b>
<i>DIGITAL Alpha VME 5/352 and 5/480 Board Computer Family Data Sheet</i>		Describes the DIGITAL Alpha 5/352 and 5/480 SBCs, highlighting product features and specifications.
<i>DIGITAL Alpha VME 5/352 and 5/480 Single Board Computers Cover Letter</i>	EK-VME54-CL	Highlights important product information and explains how to acquire the <i>DIGITAL Alpha VME 5/352 and 5/480 Single Board Computers User Manual</i> and <i>DIGITAL Alpha VME 5/352 and 5/480 Single Board Computers Technical Reference</i> .
<i>DIGITAL Alpha VME 5/352 and 5/480 Single Board Computers Warranty and Parts Information</i>	EK-VME54-WI	Explains the warranty of your DIGITAL Alpha VME 5/352 or 5/480 SBC and provides parts information for ordering.
<i>DIGITAL Alpha VME 5/352 and 5/480 Single Board Computers Installation Guide (this document)</i>	EK-VME54-IG	Explains how to install your DIGITAL Alpha VME 5/352 or 5/480 SBC. Use this guide if you need to adjust jumper settings or remove and reinstall field replaceable units (FRUs).
<i>DIGITAL Alpha VME 5/352 and 5/480 Single Board Computers User Manual</i>	EK-VME54-UM	Introduces the product by discussing product specifications and requirements and describing the module and functional components. This manual also explains how to use the console firmware and discusses diagnostics and troubleshooting.
<i>DIGITAL Alpha VME 5/352 and 5/480 Single Board Computers Technical Reference</i>	EK-VME54-TM	This manual discusses system address mapping, the VME interface, system registers, and system interrupts.

- The following DIGITAL documentation:

<b>Document</b>	<b>Order Number</b>
<i>Alpha AXP Architecture Reference Manual</i>	EY-T132E-DP
<i>Alpha Architecture Handbook</i>	EC-QD2KB-TE
<i>Alpha Microprocessors SRAM Mini-Debugger User's Guide</i>	EC-QHUXB-TE
<i>Answers to Common Questions about PALcode for Alpha AXP Systems</i>	EC-N0647-72
<i>Digital Semiconductor Alpha 21164 Microprocessor Product Brief</i>	EC-QP97C-TE
<i>Digital Semiconductor 21052 PCI-PCI Bridge Data Sheet</i>	EC-QHURB-TE
<i>Digital Semiconductor 21164 Alpha Microprocessor Data Sheet</i>	EC-QP98B-TE
<i>Digital Semiconductor 21172 Core Logic Chipset Product Brief</i>	EC-QUQHA-TE

<b>Document</b>	<b>Order Number</b>
<i>Digital Semiconductor 21164 Alpha Microprocessor Hardware Reference Manual</i>	EC-QP99B-TE
<i>Digital Semiconductor 21172 Core Logic Chipset Technical Reference Manual</i>	EC-QUQJA-TE
<i>DIGITAL UNIX Guide to Real-time Programming</i>	AA-PS33D-TE
<i>DIGITAL UNIX: Writing PCI Bus Device Drivers</i>	AA-Q7RQC-TE
<i>DIGITAL UNIX: Writing VMEbus Device Drivers</i>	AA-Q057G-TE
Manpages on the VxWorks Real-Time Tools for Alpha CD-ROM	Not applicable
<i>PALcode for Alpha Microprocessors System Design Guide</i>	EC-QFGLC-TE

- The following specifications, which are available through the indicated vendor or organization:

<b>Document</b>	<b>Vendor or Organization</b>
<i>CY7C9640 Specification</i>	Cypress Semiconductor Corp.
<i>Intel 82378ZB PCI-ISA Bridge Chip Specification</i>	Intel Corp.
<i>PCI Local Bus Specification Rev 2.1</i>	PCI Special Interest Group
<i>Super I/O FDC37C6656T Specification</i>	Standard Microsystems Corp.
<i>Symbios 53C810 SCSI Controller Specification</i>	Symbios
<i>TOY clock DS1386 Specification</i>	Dallas Semiconductor
<i>VIC64 Specification</i>	Cypress Semiconductor Corp.



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## Preparing for the Installation

This chapter explains how to prepare for a DIGITAL Alpha VME 5/352 or 5/480 SBC installation. The chapter explains:

- How to unpack kit contents, Section 1.1
- How to verify kit contents, Section 1.2
- How to check for ordered options, Section 1.3
- Your SBC's major kit components, Section 1.4
- Power requirements, Section 1.5
- How to identify a VME chassis and required backplane slots, Section 1.6

### 1.1 Unpacking Kit Contents

Start preparing for your installation by unpacking your Alpha VME 5/352 or 5/480 SBC kit.

1. Verify that the order numbers on the labels on your kit carton match the numbers for the product you ordered. If the order numbers do not match, contact your DIGITAL Customer Support Center in your geography.
2. Remove the top layer of packing foam.
3. Remove all items from the kit carton.
4. Locate and put on the antistatic wrist strap.
5. Clip the wire attached to the wrist strap to the frame of your VME chassis.
6. Remove the hardware components from the conductive plastic bags in which they were packaged and place the components on the bags.

**Note**

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Store the original packing material in case a factory return is necessary.

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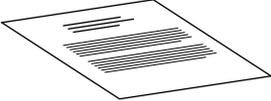
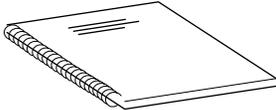
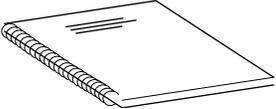
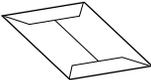
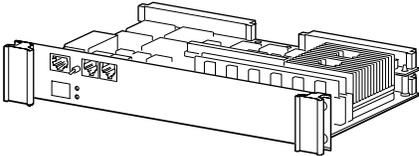
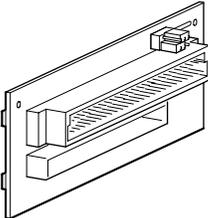
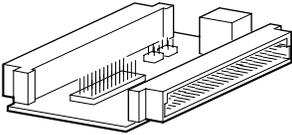
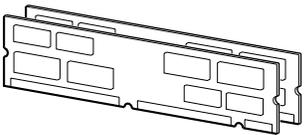
### 1.2 Verifying Kit Contents

Table 1–1 lists Alpha VME 5/352 and 5/480 SBC kit contents. Verify that the material you unpacked matches the contents listed in the table. Your kit may also include software or software licenses, depending on what you ordered.

If you ordered DIGITAL memory for your Alpha VME 5/352 or 5/480 SBC, your kit will also include that memory. Four memory connectors on the CPU module constitute a single bank and require that all DIMMs be of the same size, speed,

and architecture. Each memory module kit consists of two DIMMs. You have the option of using either one or two of a given memory module kit listed in Table 1-1.

**Table 1-1 Alpha VME 5/352 and 5/480 SBC Kit Contents**

Part	Part Name	Part Number
	Cover Letter	EK-VME54-CL
	Warranty and Parts Information	EK-VME54-WI
	Installation Guide	EK-VME54-IG
	Antistatic wrist strap	12-36175-01
	CPU and I/O assembly	70-3-3394-01 (5/480) 70-3-3394-02 (5/352)
	Primary breakout module (type 1) <sup>1</sup>	54-24663-01
	Secondary breakout module (type 2)	54-24729-01
	Memory DIMMs <sup>2</sup>	
	2 X 8 MB	EBXMA-DC
	2 X 16 MB	EBXMA-EC
	2 X 32 MB	EBXMA-FC
	2 X 64 MB	EBXMA-GC
	2 X 128 MB	EBXMA-HC

<sup>1</sup> Installation is necessary for the operation of an Alpha VME 5/352 or 5/480 SBC.

<sup>2</sup> Optional memory, which is ordered separately, will be included in your kit or packed separately, depending on how the memory was purchased.

## 1.3 Checking for Ordered Options

In addition to the base product kit, you may need other hardware options, depending on how you plan to use the Alpha VME 5/352 or 5/480 SBC. You need to order these options separately.

Other hardware options include a PMC I/O companion card for expanding the I/O capabilities of your SBC.

You may need to attach a local disk. To do this you need to use and properly terminate a 50-pin IDC SCSI cable. The exact cable requirements depend upon the enclosure, disk mounting, and so forth. A PC “internal SCSI” cable will work if you are connecting to an internal disk and the cable has a SCSI terminator, or if the last disk (or other SCSI device) has an internal terminator.

To attach a printer to the parallel port of the secondary breakout module (54–24729–01), you need to use a standard parallel port printer cable that has a 26-pin IDC connector on one end.

Table 1–2 lists Alpha VME 5/352 and 5/480 SBC options. Check that you received the options you ordered.

**Table 1–2 Alpha VME 5/352 and 5/480 SBC Options**

<b>Part Name</b>	<b>Part Number</b>
<b>Hardware Options</b>	
PMC I/O companion card	EBV1P-AA
Serial-line cable for console and auxiliary terminals	
2 ft. cable	BC16E-06
6 ft. cable	BC16E-05
10 ft. cable	BC16E-02
25 ft. cable	BC16E-03
50 ft. cable	BC16E-04
100 ft. cable	BC16E-11
IEEE 802.3 twisted-pair transceiver to ThinWire	DETTR-AA
IEEE 802.3 twisted-pair transceiver to twisted-pair	DETTR-BB
10BASET loopback connector	H4082-AA
<b>Documentation<sup>1</sup></b>	
User Manual	EK-VME54-UM
Technical Reference	EK-VME54-TM

<sup>1</sup> Also available on the worldwide web at <http://www.digital.com/oem>.

## 1.4 Getting Familiar with Your SBC’s Major Components

This section helps you get familiar with the major components of an Alpha VME 5/352 or 5/480 SBC. Sections 1.4.1 through 1.4.7 describe the:

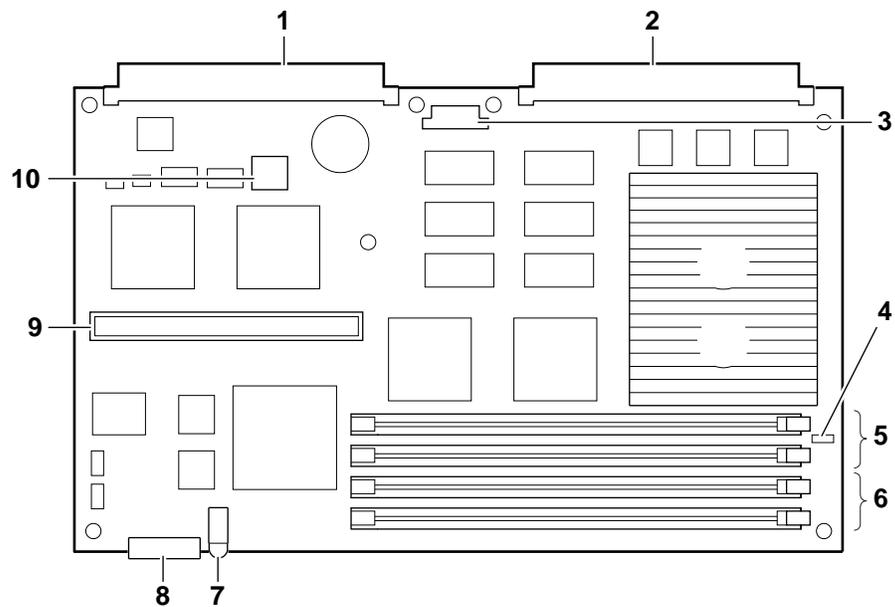
- CPU module, Section 1.4.1
- I/O module, Section 1.4.2

- CPU and I/O assembly controls and indicators, Section 1.4.3
- Memory modules, Section 1.4.4
- Primary breakout module, Section 1.4.5
- Secondary breakout module, Section 1.4.6
- PMC I/O companion card, Section 1.4.7

### 1.4.1 CPU Module

The CPU module is the compute engine of Alpha VME 5/352 and 5/480 SBCs. Figure 1–1 shows the layout and primary components.

**Figure 1–1 CPU Module Layout**



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The numeric callouts in the figure identify the following key components:

- 1 P1 VMEbus connector
- 2 P2 VMEbus connector
- 3 64-bit PCI connector (not used)
- 4 J11 bus grant pass-through jumper
- 5 Connectors for memory DIMMs 2 and 3
- 6 Connectors for memory DIMMs 0 and 1
- 7 Power and VME slave activity/watchdog timeout LED
- 8 Status display
- 9 I/O module connector
- 10 SRAM

## 1.4.2 I/O Module

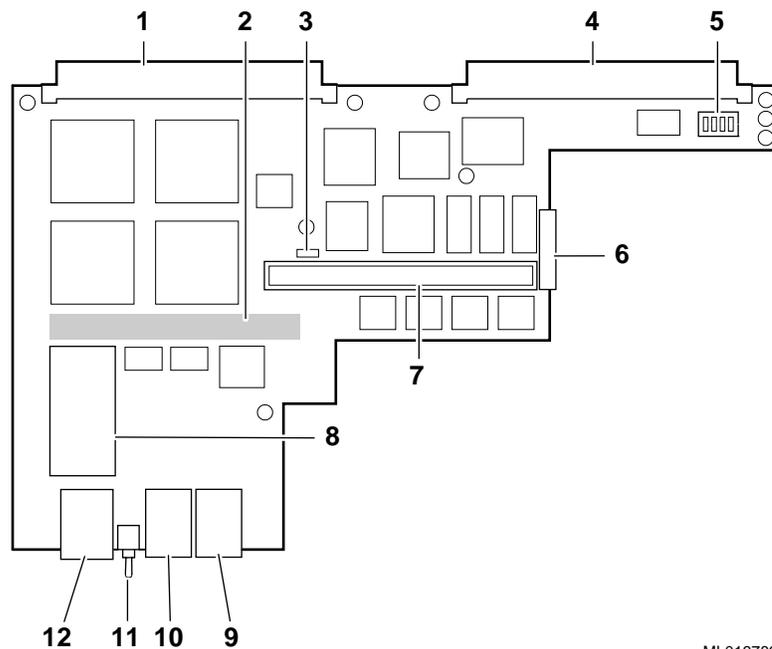
The I/O module is a required second tier module that handles all I/O activity for the Alpha VME 5/352 and 5/480 SBCs. This module plugs into the I/O module connector on the CPU module.

### Note

The I/O module is attached to the CPU module when you receive it. Disassemble the CPU and I/O assembly only if you need to replace the SRAM.

Figure 1-2 shows the layout and primary components.

**Figure 1-2 I/O Module Layout**



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The numeric callouts in the figure identify the following key components:

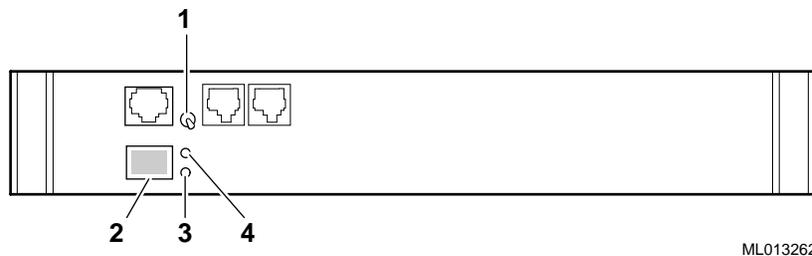
- 1 P1 VMEbus connector
- 2 Connector to CPU module (on the back of the I/O module)
- 3 Debug jumper (for use with Serial ROM Mini-Console only)
- 4 P2 VMEbus connector
- 5 Configuration switchpack
- 6 Caterpillar insulation strip
- 7 PMC I/O companion card connector
- 8 Nonvolatile RAM/time-of-year (TOY) clock
- 9 Auxiliary serial port

- 10 Console serial port
- 11 Reset/Halt switch
- 12 Twisted-pair Ethernet connector

### 1.4.3 CPU and I/O Assembly Controls and Indicators

The CPU and I/O modules are delivered as a single assembly. The modules are attached and share a single front panel. Figure 1–3 shows the controls and indicators on that front panel and Table 1–3 describes their functions.

**Figure 1–3 Controls and Indicators**



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**Table 1–3 Controls and Indicators**

Callout	Control or Indicator	Description
1	Reset/Halt switch	A switch that resets the SBC when pressed in the Reset (up) direction and halts the operating system when pressed in the Halt (down) direction. A reset operation starts SRAM execution the same way as when you power on the system. When you use the Halt switch, the SBC enters console mode.  <b>Caution:</b> Keep in mind that reset and halt operations can cause loss of data. <sup>1</sup>
2	Status display	A display that shows which test is running during power-on self-test (POST) diagnostics. When the POST diagnostics are complete, the display is under control of the operating system or an application program.
3	VME Slave Activity/Watchdog Timeout LED	An amber LED with two functions. The LED flashes when the SBC is accessed as a slave by another device on the VMEbus. The LED lights continuously when the watchdog timer has timed out.  <b>Note:</b> The LED can appear to light continuously when the module is receiving slave accesses. Since the LED glows for 1/3 of a second each time it flashes, three slave accesses per second could make the LED light continuously.
4	Power LED	A green LED that is lit when the power is on.

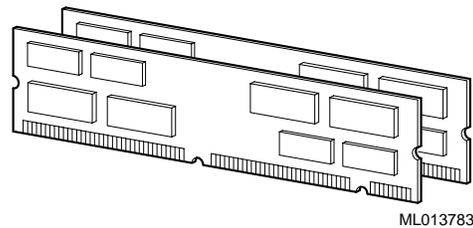
<sup>1</sup>See your operating system documentation for information on how to recover from reset and halt operations.

## 1.4.4 Memory Modules

The Alpha VME 5/352 and 5/480 SBCs support memory configurations that range from 16 to 512 MB of dynamic random access memory (DRAM). This memory is accessible from the CPU, PCI bus, and VMEbus.

You can plug either two or four dual integrated memory modules (DIMMs), ranging from 8 MB to 128 MB, into the memory connectors on the CPU module. Figure 1-4 shows a typical memory module.

**Figure 1-4 Memory Module**



The number of DIMMs you use determines the memory bus bandwidth, and consequently the overall speed of data write and read operations to and from memory. DIGITAL recommends that you use four DIMMs to achieve maximum performance. No jumper changes are required. The system automatically configures memory based on the DIMMs you install. The following table shows the width of the memory bus and its performance when you use two and four DIMMs:

Number of DIMMs	Bus Width	Memory Bandwidth
2	128 bits	210 MB/s
4	256 bits	355 MB/s

Error correction code (ECC) is provided for single-bit errors and error detection is provided for double-bit errors. For details on how the operating system reports and handles ECC errors, see your operating system documentation.

In addition to the requirement of using either two or four DIMMs, all DIMMs you use must be identical in size (number of MB), speed, and architecture (EDO).

### Note

DIGITAL memory DIMMs are supplied in pairs. DIGITAL may source the pairs of DIMMs from different memory vendors. To ensure proper operation of your SBC, you must install the DIMMs as supplied pairs in memory connectors 0 and 1 or 2 and 3. If you choose to use only two DIMMs, you must populate memory connectors 0 and 1.

Table 1–4 shows valid DIMM combinations.

**Table 1–4 Valid DIMM Combinations**

Memory Size (MB)	DIMM 0 (MB)	DIMM 1 (MB)	DIMM 2 (MB)	DIMM 3 (MB)
16	8	8		
32	8	8	8	8
32	16	16		
64	16	16	16	16
64	32	32		
128	32	32	32	32
128	64	64		
256	64	64	64	64
256	128	128		
512	128	128	128	128

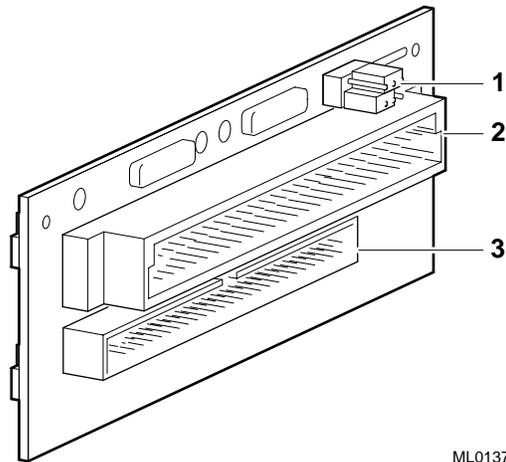
### 1.4.5 Primary Breakout Module

The primary breakout module is a required module that plugs into your VMEbus backplane behind the slots occupied by your Alpha VME 5/352 or 5/480 SBC CPU and I/O modules. This breakout module supplies additional power to the CPU module by way of the VMEbus P2 connector and provides:

- A connector for attaching a SCSI bus
- Additional P2 options, such as the secondary breakout module
- SCSI termination control
- A connection for and control of a watchdog timeout signal
- A connector to Alpha VME external timing signals

Figure 1–5 shows the primary breakout module.

**Figure 1–5 Primary Breakout Module**



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The numeric callouts in the figure identify the following key components:

- 1 SCSI termination and watchdog reset signal jumpers
- 2 Connector for the secondary breakout module or an external monitoring device
- 3 SCSI cable connector

A reset input signal on pin C10 of the primary breakout module's VMEbus P2 connector is available for resetting the SBC. This signal is low during normal operation and high during a watchdog timer reset in parallel with the Reset switch on the SBC's front panel. Because pin C10 is a nonbuffered input pin, you should use shielded wiring to apply the reset input signal.

#### **Caution**

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You must use the primary breakout module included in your Alpha VME 5/352 or 5/480 SBC hardware kit. Applying power to a DIGITAL Alpha VME 5/352 or 5/480 SBC **WITHOUT** that primary breakout module in place, or **WITH** the breakout module included with the AXPvme 160, 166, or 230 (part number 54-22605-01) in place, may damage your backplane, the Alpha VME 5/352 or 5/480 SBC, or both.

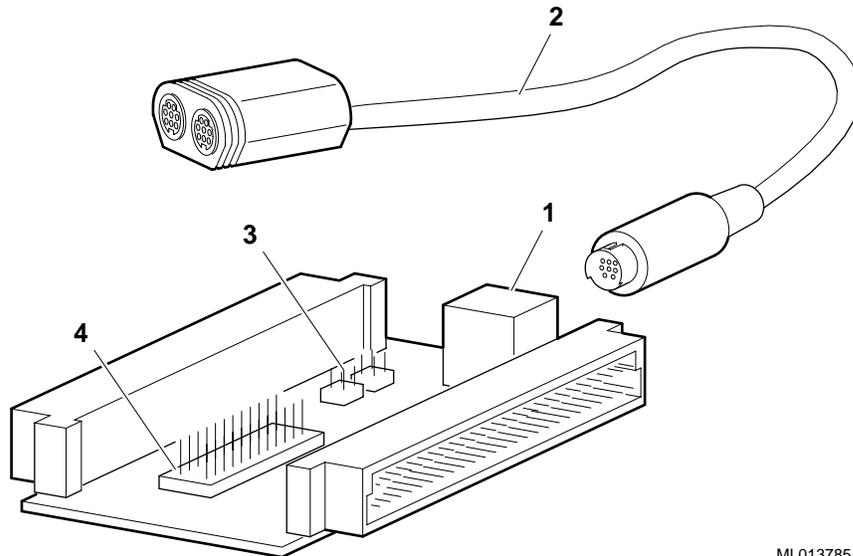
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### **1.4.6 Secondary Breakout Module**

The secondary breakout module is an optional module that connects to the primary breakout module. Connectors on the secondary breakout module include a PS/2 keyboard and mouse Y-cable connector and a parallel port connector. The primary use of this module is to add a serial-line (keyboard and mouse) connector and parallel port to the rear of the VME chassis.

Figure 1–6 shows the secondary breakout module.

**Figure 1–6 Secondary Breakout Module**



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The numeric callouts in the figure identify the following key components:

- 1 PS/2 keyboard and mouse connector
- 2 PS/2 keyboard and mouse Y-cable (supplied in PMC I/O companion card kits, EBV1P)
- 3 Keyboard and mouse jumper
- 4 Parallel port

**Note**

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The Alpha VME 5/352 and 5/480 SBCs support a PS/2-type 101-compatible keyboard and mouse.

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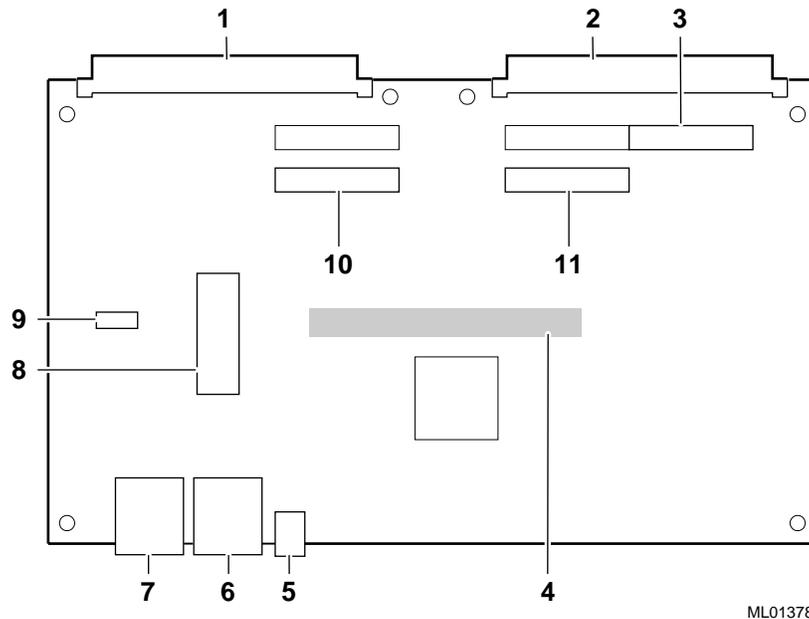
### 1.4.7 PMC I/O Companion Card

The PMC I/O companion card is an optional third tier module that plugs into a connector on the I/O module. Using the PMC I/O companion card, you can expand your SBC's I/O capabilities by adding interfaces, such as a second Ethernet interface or a graphics card. Primary components on the companion card include connectors for two PMC options, a PCI-to-PCI bridge chip, keyboard and mouse connectors, two VMEbus connectors, and a VMEbus P2 signal connector. The VMEbus P2 signal connector provides a way of sending I/O signals from a PMC option to a device attached to the VMEbus P2 connector instead of to the front panel of the PMC option card.

To use the PMC I/O companion card, you must have three adjacent slots available in your VME chassis.

Figure 1–7 shows the layout of the card.

**Figure 1-7 PMC I/O Companion Card Layout**



The numeric callouts in the figure identify the following key components:

- 1 P1 VMEbus connector
- 2 P2 VMEbus connector
- 3 VMEbus P2 signal connector for PMC option 1
- 4 I/O module connector (on the back of the PMC I/O companion card)
- 5 Power LED
- 6 Keyboard connector
- 7 Mouse connector
- 8 Diskette drive connector
- 9 Signaling level jumper (jumper **MUST** be set to 5.0 V)
- 10 PMC option 2 connector
- 11 PMC option 1 connector

**Note**

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The Alpha VME 5/352 and 5/480 SBCs support a PS/2-type 101-compatible keyboard and mouse.

---

The 34-pin diskette drive connector (see item 8 in Figure 1-7) provides a way of attaching a diskette drive (for example, an RX23 or RX26). To use this connector, you must make or buy a cable that is best suited for your application. **DIGITAL** supplies only the pin assignments for the connector.

## 1.5 Understanding Power Requirements

The Alpha VME 5/352 and 5/480 SBCs require power voltages of +5 V and  $\pm 12$  V. The VME backplane provides the power to the logic of the SBCs through the P1 and P2 VMEbus connectors. The primary power for the SBCs is 5 V, which is provided by the P1 and P2 VMEbus connectors on the CPU module and the P2 VMEbus connector on the I/O module. The primary breakout module augments the current capacity of the backplane's etch and connectors by shunting power from the I/O module connectors to the CPU module connectors.

The two DC-to-DC converters — 5 V to 2.5 V and 5 V to 3.3 V — provide power for CPU module and I/O module operation. The 5 V to 2.5 V converter provides power for the Alpha 21164 core logic. The 5 V to 3.3 V converter provides power for the 21172 core logic chipset, SRAM, DRAMs, SCSI chip, and Ethernet controller. Both converters operate in an 85% to 95% conversion efficiency range, requiring no heat sink.

The required primary breakout module, which is installed on the rear of the VME backplane directly behind the slots occupied by the CPU and I/O module assembly, provides additional current to the CPU module from the I/O module.

An optional +5 V STANDBY is available to provide power for the time-of-year (TOY) clock and NVRAM chip.

Table 1–5 provides the power ratings for the various voltage supplies supported by the Alpha VME 5/352 and 5/480 SBCs.

**Table 1–5 Input Power Requirements**

Voltage Supply	Tolerance	Maximum Ripple	5/352 Idle Current	5/352 Peak Current	5/480 Idle Current	5/480 Peak Current
+5 V	+0.25 V –0.125 V	50 mV	9 A	13 A	11 A	15 A
+12 V	+0.60 V –0.36 V	50 mV	150 mA	250 mA	150 mA	250 mA
+5 V STDBY	+0.25 V –0.125V	50 mV	25 mA	50 mA	25 mA	50 mA
-12 V	+ 0.36 V –0.60V	50 mV	150 mA	250 mA	150 mA	250 mA

The peak current shown in Table 1–5 assumes an Alpha VME 5/480 SBC is populated with 512 MB of DRAM.

### Warning

The +5 V tolerance and ripple specifications shown in Table 1–5 must be met when supplying the peak current specified. If they are not met, undefined operation will result.

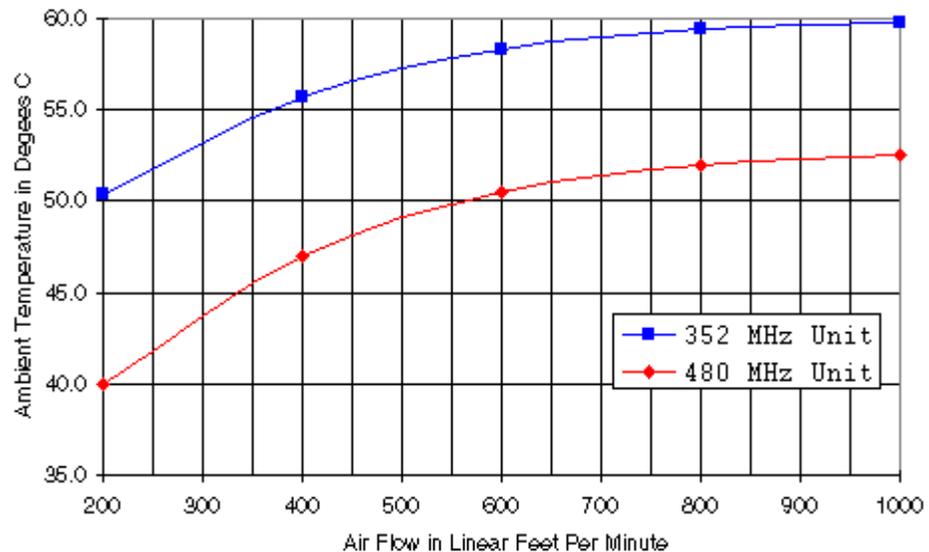
## 1.6 Identifying the VME Chassis and Backplane Slots

Before you can begin the installation, you must have a VME chassis with at least two adjacent empty backplane slots. If you need to use the optional PMC I/O companion card, the chassis must have three adjacent empty slots. Once you locate a chassis with the required empty slots, identify the slots to be used for the installation.

### 1.6.1 VME Chassis Requirements

The Alpha VME 5/352 and 5/480 SBCs provide a heat sink for CPU thermal control. The amount of cooling required is defined by the operating environment to which the SBC assembly is subjected. The curves shown in Figure 1–8 define the amount of ambient air the SBC assembly requires in linear feet per minute at various ambient temperatures. Actual cooling depends on the turbulence in the air stream as it enters the assembly volume. If you operate your Alpha 5/352 or 5/480 SBC in an enclosure that is not fully assembled, be sure the air flow to and around the SBC meets or exceeds the requirements indicated by the curves.

**Figure 1–8 Required Air Flow Relative to Ambient Temperature**



**Note**

The maximum temperature, when measured between the heat sink studs on the base of the heat sink, must be less than 68° C.

### 1.6.2 Backplane Considerations

Alpha VME 5/352 and 5/480 SBCs provide CPU and I/O functionality through a 2-module configuration. The VMEbus functions are generated on the I/O module. This module occupies the  $n+1$  backplane slot, which is to the immediate right of the slot occupied by the CPU module. To ensure proper operation of the 2-module configuration, you must address the backplane considerations discussed in

Section 1.6.2.1 or 1.6.2.2. Section 1.6.2.1 discusses considerations that apply when the Alpha VME SBC is being used as system controller. Section 1.6.2.2 discusses considerations that apply when the SBC is not being used as system controller.

### 1.6.2.1 When the Alpha VME SBC is Used as System Controller

When an Alpha VME 5/352 or 5/480 SBC is the system controller in an application, set configuration switch 4 on the I/O module to the Closed position, as explained in Section 2.2. You must take additional action, depending on the type of VMEbus backplane you are using:

- **Passive backplanes**

If you are using a passive backplane make sure:

- The backplane's bus grant jumpers for slot two are not installed
- The J11 bus grant pass-through jumper on the Alpha VME 5/352 or 5/480 SBC CPU module is not installed

- **Backplanes that grant bus access mechanically**

Some VMEbus backplanes grant bus access mechanically. For these backplanes, you do not need to set switches or jumpers. Bus grants are provided automatically.

If you are using this type of backplane, make sure the J11 bus grant pass-through jumper on the Alpha VME 5/352 or 5/480 SBC CPU module is not installed.

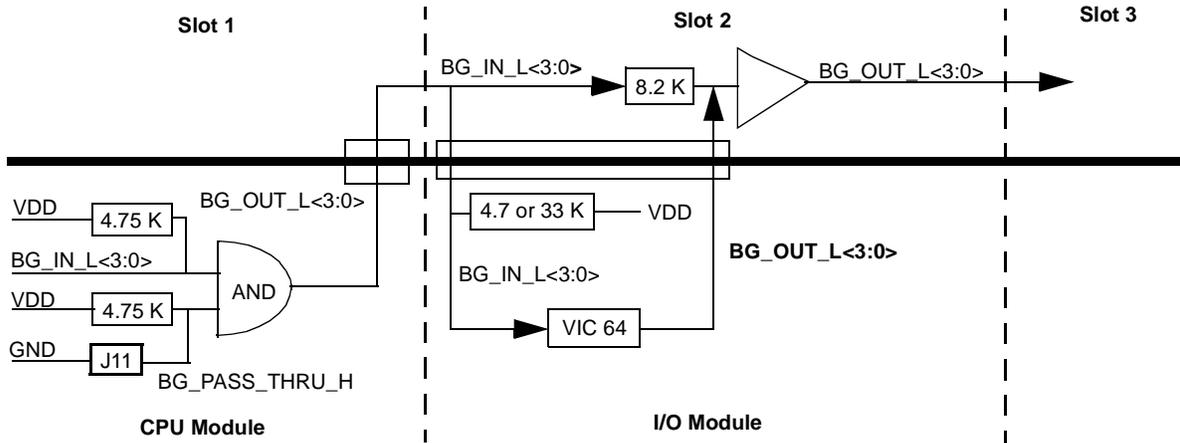
- **Backplanes that use active buffer, OR, NAND, or AND devices**

Backplanes that use active buffer OR, NAND, or AND devices may not work properly with the Alpha VME 5/352 and 5/480 SBC 2-module configuration. These backplane architectures employ active bus grant techniques that do not allow the 2-module SBC to operate as system controller. In fixed installations, contact your backplane vendor to determine how to defeat the active grant techniques.

**Backplanes that use active buffer devices**

For backplanes that use active buffer devices, make sure the J11 bus grant pass-through jumper on the Alpha VME 5/352 or 5/480 SBC CPU module is not installed. In this configuration, the CPU module in slot 1 actively drives the BG\_IN\_L<3:0> signal of the I/O module in slot 2 to high as shown in Figure 1-9.

**Figure 1–9 Active Buffer Backplane**



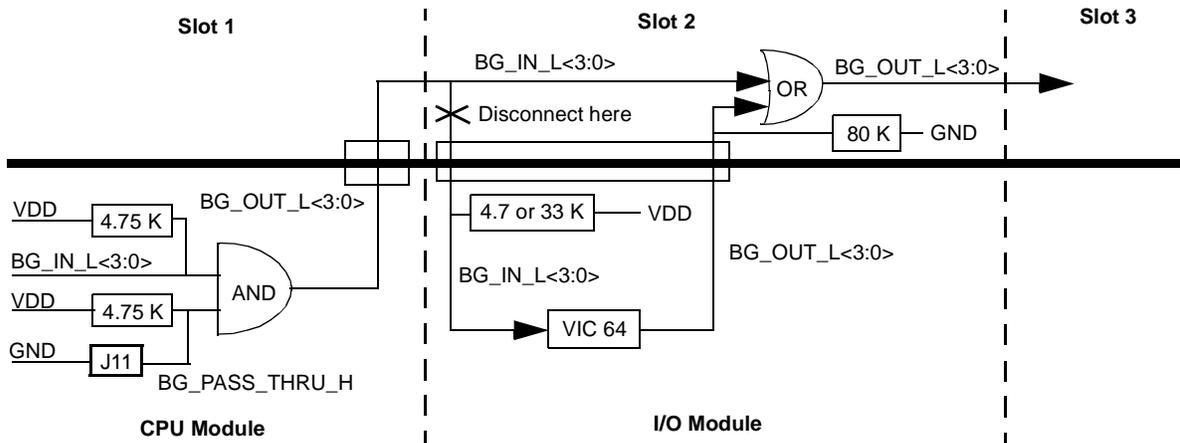
**Backplanes that use OR Devices**

For active backplanes that use the OR gate circuit configuration shown in Figure 1–10, you must:

- Install the J11 bus grant pass-through jumper.
- On the backplane, disconnect the BG\_IN\_L<3:0> signals from the backplane to the I/O module.

In this circuit configuration, the CPU module drives the BG\_IN\_L<3:0> signal low, enabling the backplane OR gate. The VIC 64 chip on the I/O module in slot 2 needs this signal input to be high. By disconnecting the BG\_IN\_L<3:0> signals from the backplane to the I/O module, you cause the passive pullups on the I/O module to pull the VIC 64 BG\_IN\_L<3:0> signals high.

**Figure 1–10 Active OR Backplane**



### 1.6.2.2 When the Alpha VME SBC is Not Used as System Controller

When an Alpha VME 5/352 or 5/480 SBC is not the system controller in an application:

- Set configuration switch 4 on the I/O module to the Open position, as explained in Section 2.2.
- Do not install the J11 bus grant pass-through jumper.

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## Installing the SBC

This chapter walks you through the steps for installing an Alpha VME 5/352 or 5/480 SBC.

### Caution

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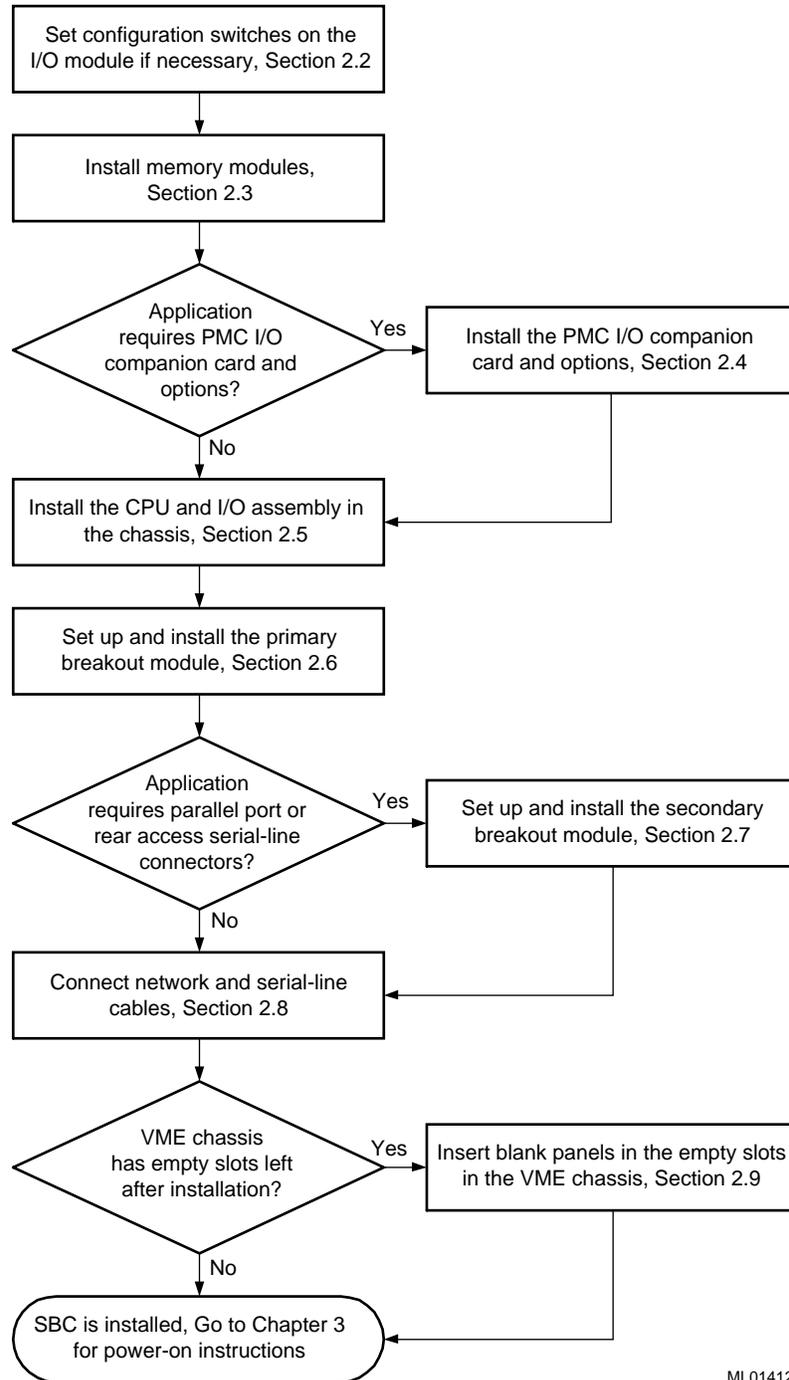
Static electricity can destroy the circuits on the modules in your Alpha VME 5/352 or 5/480 SBC kit. When you handle modules wear the anti-static wriststrap with the wire clipped to the frame of your VME chassis. Also, place the modules on top of the conductive plastic bags they came in while you work.

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## 2.1 Installation at a Glance

Figure 2–1 shows a flow diagram of the installation process.

**Figure 2–1 Installation at a Glance**

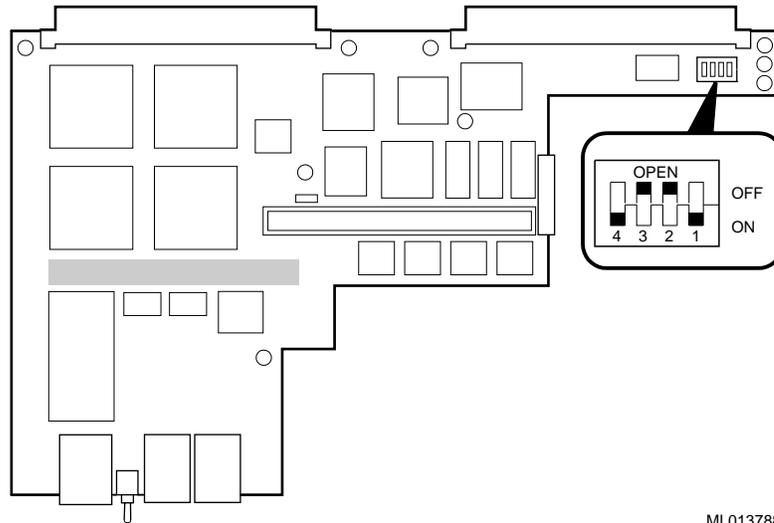


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## 2.2 Setting Configuration Switches on the I/O Module

The first step to installing an Alpha VME 5/352 or 5/480 SBC is to set the configuration switches on the I/O module. Figure 2-2 shows the location of the configuration switches. Use the information in Tables 2-1 through 2-3 to set the switches based on your system needs.

**Figure 2-2 Setting I/O Module Configuration Switches**



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**Table 2-1 I/O Module Configuration Switches**

Switch	Setting	Function
1	Closed	Supplies +5 V from the VMEbus +5 V Standby signal to the time-of-year (TOY) clock and the nonvolatile random-access memory (NVRAM) to supplement the internal battery when the SBC's power is turned off.
	Open	Does not supply power from the VMEbus +5 V Standby signal. The internal battery lasts for about 10 years with the SBC's power turned off.
2	Closed	Enables the writing of flash ROMs under program control.
	Open	Disables the writing of flash ROMs.
3	Closed	Enables the VMEbus Reset signal for resetting the SBC.
	Open	Disables the VMEbus Reset signal.
4	Closed	The SBC is the VMEbus system controller.
	Open	The SBC is not the VMEbus system controller.

**Table 2–2 Switch Settings for Modules in Slots 1 and 2 (System Controller)**

Switch	Setting
1	Closed
2	Open
3	Open <sup>1</sup>
4	Closed <sup>1</sup>

<sup>1</sup> These switches must be in the indicated positions for reliable system operation during a VMEbus Reset.

**Table 2–3 Switch Settings for Modules in Slots Other Than Slots 1 and 2**

Switch	Setting
1	Closed
2	Open
3	Closed <sup>1</sup>
4	Open <sup>1</sup>

<sup>1</sup> These switches are required to be in the indicated positions (one opened, one closed) for reliable system operation during a VMEbus Reset.

## 2.3 Installing the Memory Modules

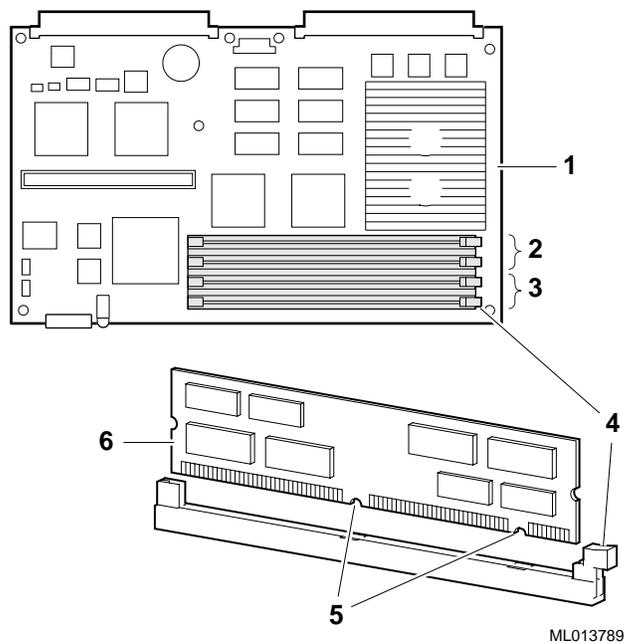
After you set the configuration switches on the I/O module, install your memory modules. You can install either two or four DIMMs of the same size, speed, and architecture (see Section 1.4.4).

To install the DIMMs:

1. Locate the memory connectors on the CPU module. If you choose to install only two DIMMs, you must install them in connectors 0 and 1.
2. Align pin 1 of the memory module with pin 1 on the connector. The position of the orientation notches on the module assure proper connectivity.
3. Firmly press the memory module into the connector.
4. Repeat steps 2 and 3 for other memory modules being installed.

Refer to Figure 2–3 as necessary.

**Figure 2–3 Installing Memory Modules**



The numeric callouts in the figure identify the following:

- 1 SBC CPU module
- 2 Memory connectors for DIMMs 2 and 3
- 3 Memory connectors for DIMMs 0 and 1
- 4 A memory connector and eject lever
- 5 Orientation notches
- 6 A memory module

See Section 1.4.4 for more information on valid memory configurations.

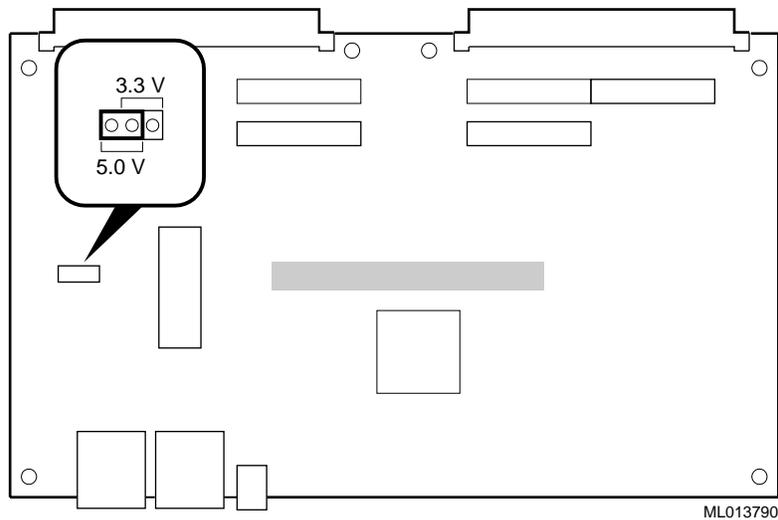
## 2.4 Installing a PMC I/O Companion Card and Options

If your SBC requires the use of a PMC I/O companion card and options, you must install them next. This section explains how to install those components. If you are not using a PMC I/O companion card, proceed to Section 2.5.

1. Set the PMC I/O companion card jumpers.

Set the jumpers on the PMC I/O companion card as shown in Figure 2–4 to provide either a 3.3 V or 5.0 V signaling level to both option slots. Both option slots must use the same signaling level.

**Figure 2–4 Setting PMC I/O Companion Card Jumpers**



2. Install PMC I/O options.  
Install any PMC I/O options that your system requires onto the PMC I/O companion card.
3. Install the nylon standoffs in the I/O module as shown in Figure 2–5.
4. Connect the PMC I/O companion card to the I/O module.

### Caution

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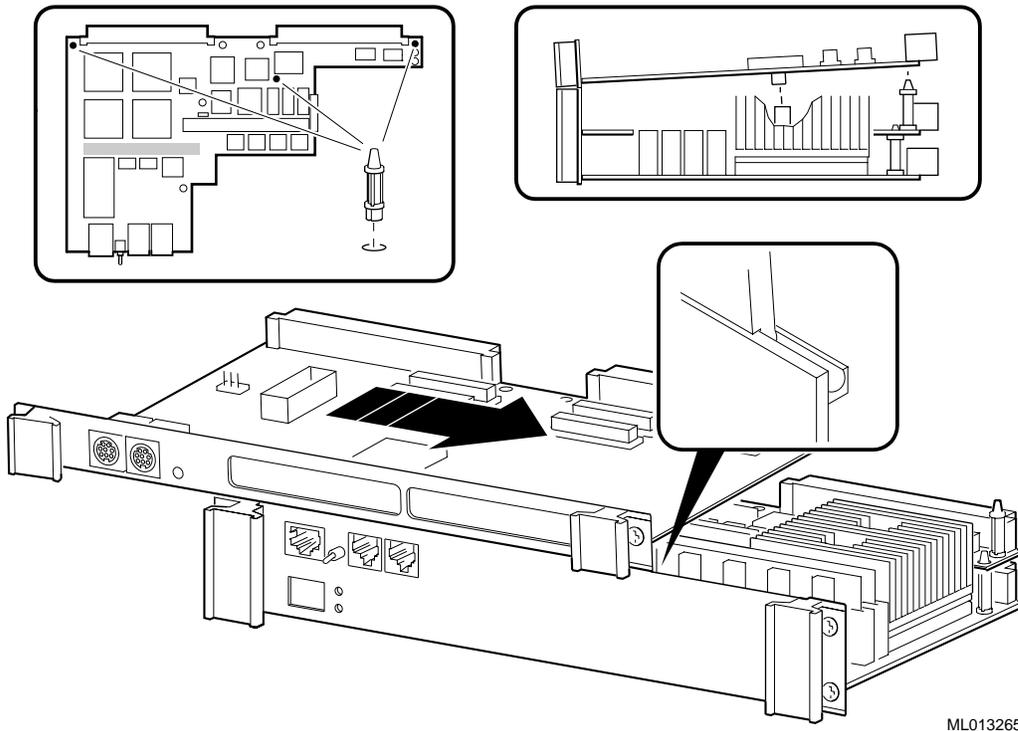
Perform the following steps cautiously to avoid damaging the modules.

---

Connect the PMC I/O companion card to the I/O module as follows:

- a. Align the ball connector on the bottom edge of the PMC I/O companion card handle with the slot on the top edge of the I/O module handle as shown in Figure 2–5. Note the orientation of the heat sink.

**Figure 2-5 Connecting the PMC I/O Companion Card to the I/O Module**



- b. Raise the PMC I/O companion card at a slight angle from the I/O module and slide the connecting edges together until the connector on the bottom of the PMC I/O companion card is aligned with its mating connector on the top side of the I/O module as shown in Figure 2-5.

**Caution**

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You must align the connector precisely. If the alignment is not precise, the force required for normal connector mating is sufficient to damage the connector housing and pins.

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- c. Carefully press down on both sides of the I/O module connector, causing the I/O module and PMC I/O companion card connectors to mate and the standoffs to anchor as shown in Figure 2-5.

## 2.5 Installing the CPU and I/O Modules in the VME Chassis

Once you have the CPU, I/O, and PMC I/O companion card (if applicable) modules connected, you must install the assembled components in a VME chassis. Figure 2-6 shows how to install a 2-slot assembly consisting of the CPU and I/O modules. Figure 2-7 shows how to install a 3-slot assembly that includes the CPU, I/O, and PMC I/O companion card modules.

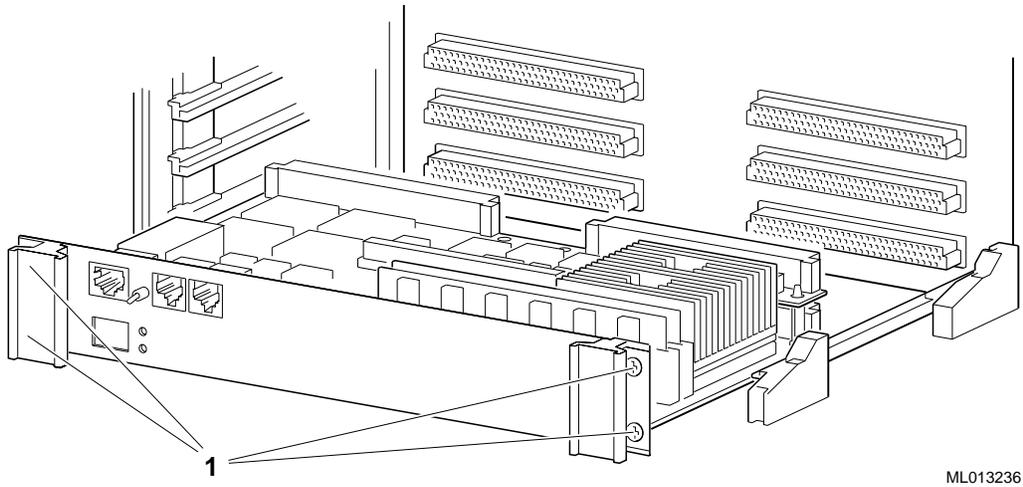
### Caution

DIGITAL recommends that you back out the captive screws on the front panel until they are fully engaged by the press-fit shoulder washer before seating the SBC assembly in the VME chassis. If you do not retract the screws completely:

- The Alpha VME module will not seat properly.
- The press-fit shoulder washer that holds the screw washer in place might become disengaged if you apply excessive pressure to the front panel.

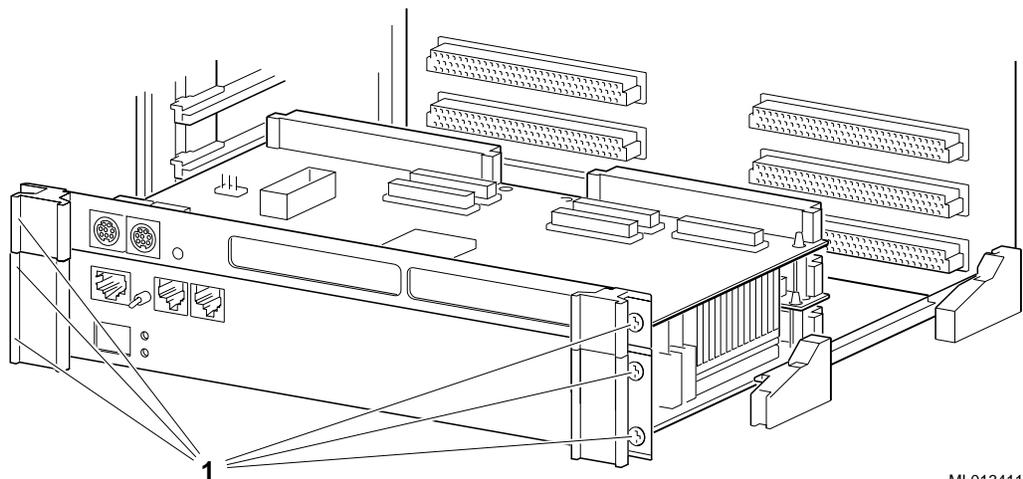
Secure the screws on the handles as indicated by the numeric callout 1 in the figure that applies to your installation.

**Figure 2-6 Installing a 2-Slot SBC Module Assembly**



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**Figure 2-7 Installing a 3-Slot SBC Module Assembly**



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The PMC I/O companion card option is shipped with an ejection handle coupling, which binds the ejection handles of the CPU and I/O assembly and PMC I/O companion card for smoother ejection. Figure 2–7 shows the ejection handles without this coupling.

## 2.6 Setting Up and Installing the Primary Breakout Module

Once the SBC assembly is installed in the VME chassis, set up and install the Alpha VME 5/352 and 5/480 SBC primary breakout module (part number 54-24663-01).

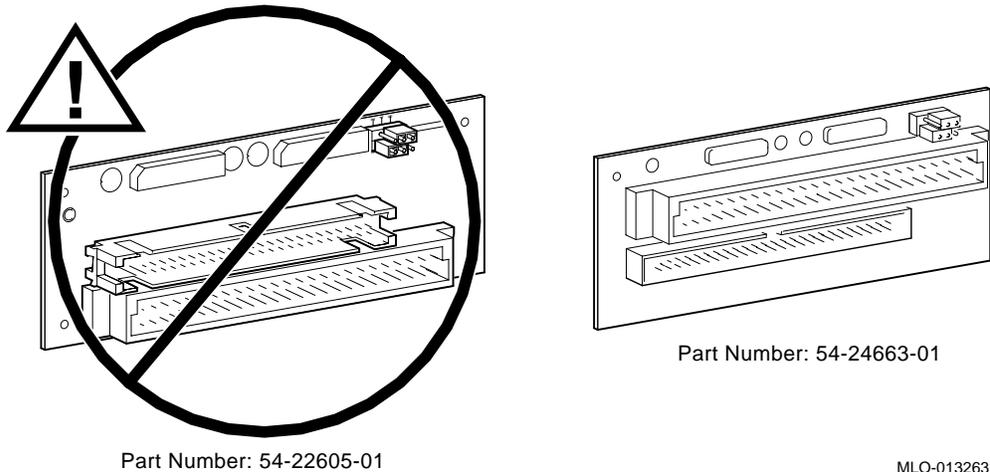
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### Caution

You must install the primary breakout module included in your Alpha VME 5/352 or 5/480 SBC hardware kit (see Figure 2–8). Applying power to a DIGITAL Alpha VME 5/352 or 5/480 SBC **WITHOUT** that primary breakout module in place, or **WITH** the breakout module included with the AXPvme 160, 166, or 230 (part number 54-22605-01) in place, will damage your backplane, the Alpha VME 5/352 or 5/480 SBC, or both.

---

Figure 2–8 Identifying the Primary Breakout Module



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### Note

Sufficient space must exist on the back of the VME Alpha VME 5/352 and 5/480 slots being used to install the primary breakout module. This breakout module requires a minimum of 38.1 mm (1.5 in) clearance behind the VME backplane.

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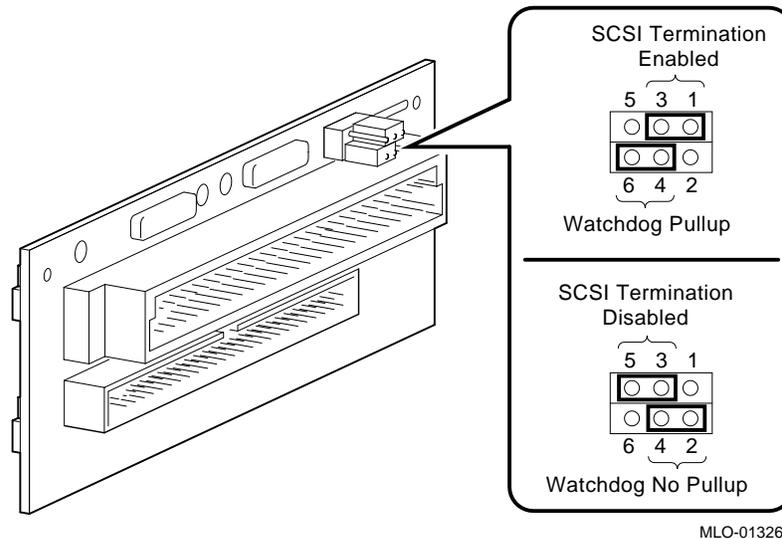
To set up and install the primary breakout module:

1. Enable or disable SCSI bus termination.

Enable or disable SCSI bus termination by setting the SCSI termination jumper on the primary breakout module (see Figure 2–9). The SCSI bus must be terminated at *each* end. In most installations, the primary breakout module resides at one end of the SCSI bus and the far end of the SCSI ribbon cable is the other end of the SCSI bus. In this case, enable the SCSI termination by placing the jumper across pins 1 and 3 (default).

If the primary breakout module is not at the end of the SCSI bus, disable SCSI termination by placing the jumper across pins 3 and 5.

**Figure 2–9 Setting the Primary Breakout Module Jumpers**



2. Enable or disable the external watchdog reset signal.

The Alpha VME 5/352 and 5/480 SBCs supply an external watchdog reset signal that you can connect to a monitoring device. You enable or disable this signal by setting the watchdog signal jumper on the primary breakout module (see Figure 2–9). If you do not connect a monitoring device, the setting of the jumper makes no difference.

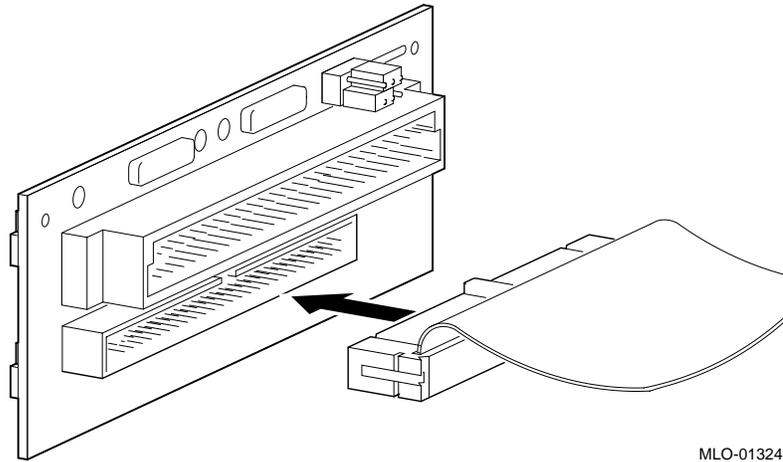
Setting the jumper across pins 4 and 6 (default) provides an internal 2 kOhm to +5 V pullup for the watchdog reset signal. Setting the jumper across pins 2 and 4 provides no pullup. This allows you to attach a monitoring device that operates at a different voltage level. The monitoring device must provide voltage and a pullup resistor that do not exceed the output specifications of a 74LS05 component. The monitoring device must also be connected to the same ground reference as the Alpha VME 5/352 or 5/480 SBC.

The external watchdog reset signal is on pin C10 of the VMEbus P2 connector on the primary breakout module. This signal is low during normal operation and high during a watchdog timer reset (provided that pullup power is connected).

3. Connect the SCSI cable to the primary breakout module.

If your Alpha VME 5/352 or 5/480 SBC uses SCSI devices, connect the SCSI cable to the breakout module as shown in Figure 2–10.

**Figure 2–10 Connecting the SCSI Cable to the Primary Breakout Module**



4. Install the primary breakout module.

Connect the primary breakout module to the rear of the VME backplane directly behind the slots in which your CPU and I/O module assembly is installed. Figure 2–11 shows how to make this connection.

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**Caution**

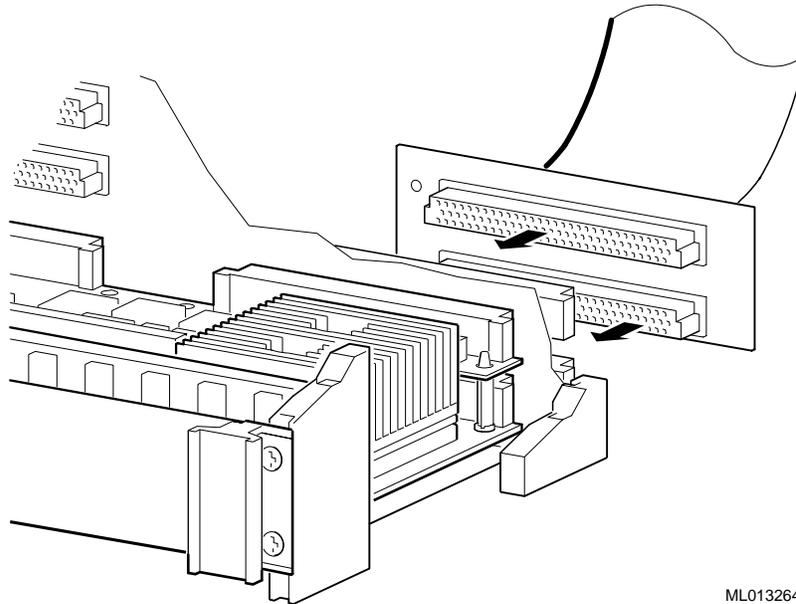
Running an Alpha VME 5/352 or 5/480 SBC when it is not in the same slots as the correct primary breakout module will damage your backplane, the Alpha VME 5/352 or 5/480 SBC, or both.

Never insert a module assembly other than that of an Alpha VME 5/480, 5/352, 4/288, or 4/224 into a slot opposite the primary breakout module. The primary breakout module feeds power to several of the user-defined pins on the P2 backplane connector. This may damage another VME module.

DIGITAL recommends that you record the slot number and type of breakout module to ensure that Alpha VME 5/352 and 5/480 SBCs are always installed in a slot with the appropriate primary breakout module.

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**Figure 2–11 Installing the Primary Breakout Module**



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## 2.7 Setting Up and Installing the Secondary Breakout Module

You have the option of installing a secondary breakout module that provides keyboard/mouse and parallel ports at the rear of your VME chassis.

### Note

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The secondary breakout module requires a minimum of 55 mm (2.13 in) clearance behind the primary breakout module. This distance does not allow for clearance for additional P2 connections. You must add additional clearance if you use additional connections.

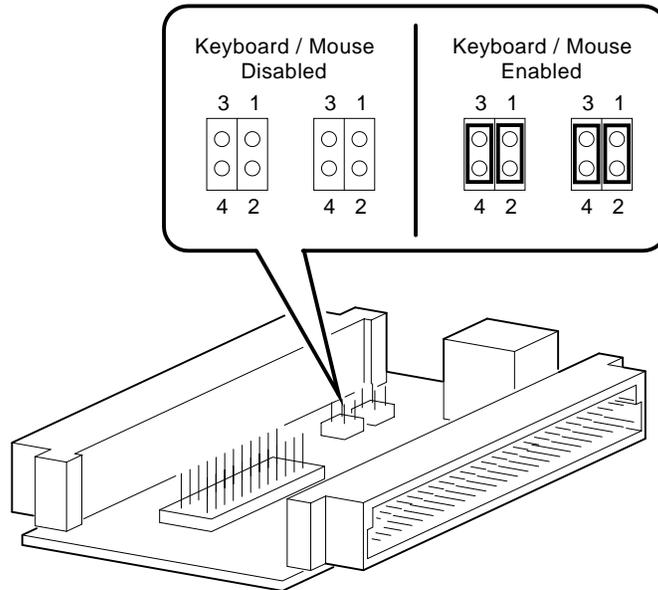
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To set up and install the secondary breakout module:

1. Set the secondary breakout module jumpers.

To use the keyboard/mouse port on the secondary breakout module, you must set the module's jumpers as shown in Figure 2–12.

**Figure 2–12 Setting the Secondary Breakout Module Jumpers**

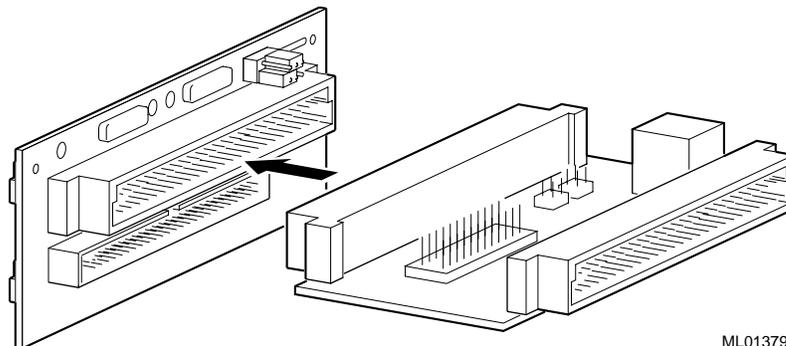


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2. Connect the secondary and primary breakout modules.

Connect the secondary breakout module to the primary breakout module as shown in Figure 2–13.

**Figure 2–13 Connecting the Secondary and Primary Breakout Modules**



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## 2.8 Connecting Network and Serial-Line Cables

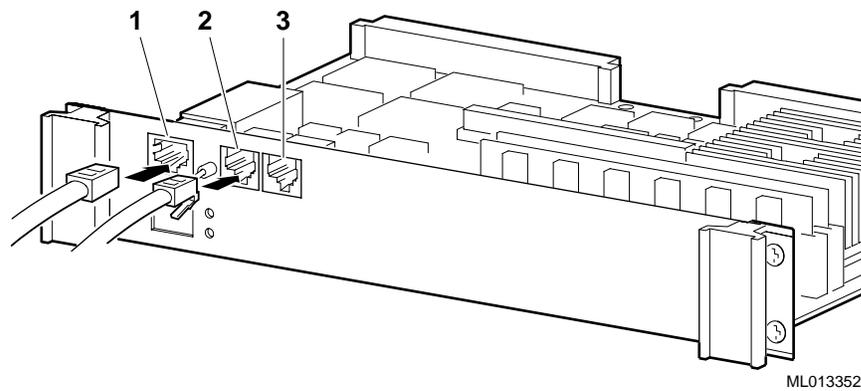
After you install all the required hardware components, connect any network and serial-line cables to be used. As shown in Figure 2–14:

- 1 Connect a twisted-pair network cable to the Ethernet connector (labeled #). If necessary, you can acquire a device, such as the DIGITAL P/N DETTR-AA adaptor, to convert from twisted-pair to ThinWire networking.
- 2 Connect the console terminal cable to the console serial-line connector (labeled con). See Appendix A for a list of cables and connectors.
- 3 Connect the auxiliary terminal cable to the auxiliary serial-line connector (labeled aux), if the cable is needed.

Set up the console terminal or terminal emulator on your PC to use the following parameters:

- Send/receive 9600 baud
- DEC VT100 (ANSI)
- Eight (8) bit data word
- No parity
- One (1) stop bit
- Xon/Xoff

**Figure 2-14 Connecting Network and Serial-Line Cables**



## 2.9 Inserting Blank Panels

To improve airflow and reduce electromagnetic interference (EMI) radiation, insert blank panels into the vacant slots of the VME chassis. If you are not using a PMC I/O companion card and the slot adjacent to Alpha VME 5/352 or 5/480 SBC is empty, insert a blank panel into at least that slot.

### **Note**

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Blank panels for a VME chassis are not supplied or sold by DIGITAL.

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## Finishing the Installation

This chapter explains how to finish the installation of a DIGITAL Alpha VME 5/352 or 5/480 SBC. The chapter explains how to:

- Power on the SBC, Section 3.1
- Monitor the power-on self-test diagnostics, Section 3.2
- Configure the system, Section 3.3
- Boot an operating system, Section 3.4

### 3.1 Powering on the SBC

After installing all the necessary hardware components, turn on the power to the Alpha VME 5/352 or 5/480 SBC. When you turn power on, the Power LED lights and the SBC runs its power-up self-test (POST).

### 3.2 Monitoring the Power-On Self-Test Diagnostics

Your SBC invokes POST diagnostics when you apply power to or reset the system. In this mode, a sequence of diagnostics is executed without operator intervention.

Once the SROM code has been loaded into the 8 KB internal instruction cache, the core logic and memory are initialized in preparation for starting the console firmware. During this phase of console startup, the system automatically invokes several more diagnostics and executes them without operator intervention.

During SROM initialization, the Power LED shows a countdown indicating the progress of the initialization. The console serial output also reports this countdown. The SROM initialization and console tests execute and display output as shown in Table 3-1.

**Table 3-1 SROM Initialization and Console Tests**

Initialization Procedures	LED Display	Console Display
Read the SROM and initialize the CPU, the CIA chip, the PCI bus, COMM1 port, and the SIO chip.	8	8..
Detect the CPU speed, initialize the CPU and CIA Bcache registers, and turn off the Bcache.	7	7..

**Table 3–1 SRAM Initialization and Console Tests**

<b>Initialization Procedures</b>	<b>LED Display</b>	<b>Console Display</b>
Initialize CIA memory control registers, wake up the DRAMs, and determine the amount of memory that is installed.	6	6..
Enable the Dcache and Bcache. Disable ECC reporting, read from memory, and then write back to memory with a good ECC. Clear the CPU and CIA error registers.	5 4	5.. 4..
Write to memory (data=address), read from memory, and compare. Check the ECC error status. Load the SRM console and perform a checksum.	2	2..
Enable all Scache. Set and flush the Icache.	1	1..
Jump to the console.	0	starting console on CPU 0
Initialize console, test memory and NVRAM, and probe the PCI bus		See sample output below
Perform console SCSI test.	A	SCSI Tests...
Perform console heartbeat test.	B	Heartbeat Test...
Perform console interval timer tests.	C	Interval Timer Tests...
Perform console TOY clock tests.	D	Time-of-Year Test...
Perform console serial com port tests.	E	
Perform console Ethernet ROM tests.	F	Ethernet ROM Tests...
Perform console internal loopback tests.	G	NI Loopback Test...
Perform console watchdog test.	H	Watchdog Test...
Perform console VIP/VIC65 tests.	I	VIP Tests...
		>>>

A sample of actual console output follows. Note that the SRAM version, CPU speed, memory size, cache size, and SRM version appear in boldface type. You should record and store this information for safekeeping. You will be asked for this in the event that you call for support.

```
Alpha VME 5xxx V1.0
8..7..6..5..4..2..1..starting console on CPU 0
initialized idle PCB
```

```

initializing semaphores
initializing heap
initial heap 200c0
memory low limit = 12c000
heap = 200c0, 17fc0
initializing driver structures
initializing idle process PID
XDELTA not enabled.
initializing file system
initializing time data structures
lowering IPL
CPU 0 speed is 2.08 ns (481MHz)
64 Meg of system memory
2MB Bcache
probing hose 0, PCI
bus 0, slot 1 -- ewa -- DECchip 21040-AA
bus 0, slot 2 -- pka -- NCR 53C810
entering idle loop
SCSI Tests...
Heartbeat Tests...
Interval Timer Tests...
Time-of-Year Test...
Ethernet ROM Tests...
NI Loopback Test...
Watchdog Test...
VIP Tests...
.....

```

Alpha VME 5/480 Common Console **v0.0-1**, built on Feb 14 1997 at 12:55:07

Failures detected beyond the SROM do not halt the reset sequence. Instead, the display freezes at the first failing test, and the sequence attempts to continue to console mode. An attempt is also made to write the diagnostic log to the console terminal.

You can affect the POST sequence by using certain user-selectable, control parameters (implemented as environment variables) that allow the initialization to continue, despite the existence of some errors that you may not wish to treat as fatal.

The time it takes for the diagnostics tests to complete varies depending on the amount of memory installed in the system. The more memory that is installed the longer it takes for the tests to complete. For a system with 64 MB of memory, the tests take about 30 seconds.

For more information on POST diagnostics and the parameters you can set in the SRM console, see the *DIGITAL Alpha VME 5/352 and 5/480 Single-Board Computers User Manual*.

### 3.3 Configuring the System

When the POST diagnostics finish, the SBC enters console mode (>>>>). While in console mode, you may want to check and possibly modify your system configuration. The configuration is determined by the current settings of environment variables and other system parameters. Environment variables pass information between the console and operating system. You can examine and set the values of environment variables by using the console commands **show** and **set**.

For example, you might need to set the environment variable `BOOTDEF_DEV` to specify the device from which bootstrapping is to be attempted when no path is specified by a `BOOT` command.

For more information about using the console and for a complete listing of environment variables, see the *DIGITAL Alpha 5/352 and 5/480 Single-Board Computer User Manual*.

## 3.4 Booting an Operating System

Once you have successfully powered on the SBC, boot an operating system. For information on booting DIGITAL UNIX, see the *DIGITAL UNIX Installation Guide*. For information on booting VxWorks for Alpha, see the *VxWorks: DIGITAL Alpha VME Single-Board Computers Hardware Supplement*, *VxWorks Programmer's Guide*, and *VxWorks Programmer's Guide Supplement for Alpha Systems*.

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## Cables and Connectors

Table A-1 lists the cables and connectors you may need to complete the installation of your Alpha VME 5/352 or 5/480 SBC.

**Table A-1 Cables and Connectors**

<b>Cable or Connector</b>	<b>Part Number</b>
Adapter from MMJ cable connector to 9-pin communication port on PCs and laptops	DEC H-8571J
Bulkhead mount connector <sup>1</sup>	AMP 745492-2
Offset MMJ terminal cable – 2 feet	DEC BC16E-02
Offset MMJ terminal cable – 10 feet	DEC BC16E-10
Offset MMJ terminal cable – 15 feet	DEC BC16E-15
Offset MMJ female-to-female coupling	DEC H8572-00
Offset MMJ-to-10 pin communications connector	DEC H8571-J
Printer port connector <sup>2</sup>	AMP 1-111623-6
SCSI mating connector <sup>3</sup>	AMP 1-111623-1
Serial-line cable for console and auxiliary terminals	
2 ft. cable	BC16E-06
6 ft. cable	BC16E-05
10 ft. cable	BC16E-02
25 ft. cable	BC16E-03
50 ft. cable	BC16E-04
100 ft. cable	BC16E-11
VME P2 connector (for breakout module extensions)	AMP 535032-4

<sup>1</sup>Converts an MMJ terminal cable to a standard 9-pin cable. Requires minor wiring.

<sup>2</sup>Mates with the connector on the secondary breakout module.

<sup>3</sup>Mates with the connector on the primary breakout module.



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## Troubleshooting

The DIGITAL Alpha VME 5/352 and 5/480 SBCs include extensive diagnostic capabilities that execute when you power on the system. These include both SROM and flash ROM code. This appendix:

- Briefly discusses SROM and flash ROM diagnostics, Sections B.1 and B.2
- Provides guidance on troubleshooting systems that include a PMC I/O companion card, Section B.3
- Briefly discusses use of the dot matrix display by operating systems and applications, Section B.4
- Provides troubleshooting tips, Section B.5

For details about system diagnostics, see the *DIGITAL Alpha VME 5/352 and 5/480 Single-Board Computers User Manual*.

### B.1 SROM Diagnostics

SROM diagnostics execute when you power on the system and display decreasing numeric codes (8, 7, ...1) on the dot matrix display to indicate status. All SROM tests must pass successfully before the flash ROM and console diagnostics run. If one or more SROM diagnostics fail, the flash ROM and console diagnostics are not loaded and a single right angle bracket prompt (SROM>) appears on the console terminal. The code of the failing diagnostic appears on the dot matrix display. In some cases, additional information appears on the console terminal.

### B.2 Flash ROM Diagnostics

When the SROM diagnostics complete successfully, the flash ROM diagnostics are loaded, decompressed, and executed. Flash ROM diagnostics use an ascending (A, B,..., I) character-based code to indicate progress. If one or more flash ROM-based diagnostics fail, the code representing the first error remains on the dot matrix display and alternates between dim and bright intensity.

If all SROM and flash ROM diagnostics pass, and you have not set any AUTO\_ACTION environment variables, the console prompt (>>>) appears on the console terminal, and a “rotating bar” appears on the dot matrix display.

## B.3 Troubleshooting Systems that Include a PMC I/O Companion Card

A problem in the PMC I/O companion card that hangs the PCI bus signal lines could cause diagnostics to report problems throughout the I/O subsystem and in the PCI controller of the processor chip. If you have a PMC I/O companion card installed and you are experiencing diagnostic failures, remove it and rerun the POST diagnostics.

## B.4 Operating System and Application Use of the Dot Matrix Display

Operating system and application software can use the dot matrix display. Once the system boots, the dot matrix display is no longer under control of the console code and can change. The console automatically clears the display before booting an image.

## B.5 Troubleshooting Your SBC

Table B–1 lists symptoms and corrective actions you can use to troubleshoot Alpha VME 5/352 and 5/480 SBCs. See the *DIGITAL Alpha VME 5/353 and 5/480 Single-Board Computers User Manual* for more information on system diagnostics.

**Table B–1 Troubleshooting Your SBC**

Symptom	Corrective Action
No LEDs are lit and a prompt does not appear on the console.	Check the power source. If 5 V power is out of specification, the SBC is held in reset. Check that all modules are seated properly.
The green LED is lit and the number 4 appears on the dot matrix display when you power on the system.	Check the seating of the memory modules.
The green LED is lit and the number 0 appears on the dot matrix display when you power on the system.	Ensure that the console terminal is not in “hold screen” mode.
The green LED is lit and a flashing A appears on the dot matrix display when you power on the system.	Check the SCSI termination, the seating of the Alpha VME 5/352 and 5/480 SBC CPU and I/O module assembly, the seating of the breakout modules, the seating of the SCSI cable, and the seating of all SCSI devices.
The green LED is lit and a flashing D appears on the dot matrix display when you power on the system.	Check that the TOY Clock/NVRAM device is seated properly.
The green LED is lit and a flashing F appears on the dot matrix display when you power on the system.	Check the seating of the network address ROM.

**Table B-1 Troubleshooting Your SBC (Continued)**

<b>Symptom</b>	<b>Corrective Action</b>
The green LED is lit and a flashing G appears on the dot matrix display when you power on the system.	Check the seating of the twisted-pair cable and the nearest network transceiver.
The green LED is lit and a flashing I appears on the dot matrix display when you power on the system.	Check the seating of the Alpha VME 5/352 and 5/480 SBC CPU and I/O module assembly, the seating of the breakout modules, and the seating of all VME devices.
Diagnostics pass but the SCSI tests take more than 10 seconds to complete.	Check the SCSI termination, the seating of the Alpha VME 5/352 and 5/480 SBC CPU and I/O module assembly, the seating of the breakout modules, the seating of the SCSI cable, and the seating of all SCSI devices.
Diagnostics pass but there are no (or unreadable) characters displayed on the console.	Check the console terminal connections and settings (9600 baud, 8-bits, no parity). The terminal should be plugged into the console (CON) port.

