

# MEMORY CHANNEL<sup>TM</sup>

## User's Guide

Order Number: EK-PCIRM-UG. B01

This book presents the hardware, installation, and verification information needed to install and prepare a MEMORY CHANNEL cluster for booting an operating system.

**Digital Equipment Corporation**  
**Maynard, Massachusetts**

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# Preface

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## Intended Audience

This manual is written for customers with MEMORY CHANNEL cluster hardware. It includes information on configuration, installation, verification, and troubleshooting.

## Document Structure

This manual uses a structured documentation design. Topics are organized into small sections for efficient reference. Each topic begins with an abstract. You can quickly gain a comprehensive overview by reading only the abstracts. Next is an illustration or example, which also provides quick reference. Last in the structure is descriptive text or instructions.

This manual has four chapters, as follows:

- **Chapter 1, Hardware and Configuration**, describes the MEMORY CHANNEL hardware, option kits, and configuration requirements.
- **Chapter 2, Installation**, shows how to install the MEMORY CHANNEL PCI adapter and hub.
- **Chapter 3, Verification**, shows how to verify the installation of the hardware prior to installing the operating system or scientific application.
- **Chapter 4, Troubleshooting**, instructs how to proceed if problems arise.

## Conventions

The AlphaServer 2100 console output is used as the default console in examples. Changes for other supported systems' consoles are noted only when the output varies considerably from the default example. For additional information on your systems' consoles, refer to your system user's guides.

## For More Information

### MEMORY CHANNEL Hardware Documentation

P/N	Title
EK-PCIRM-UG	<i>User's Guide</i>
EK-PCIRM-SV	<i>Service Information</i>
AK-R2V9A-CA	<i>Service Information (diskette)</i>

### Online Documentation Related to MEMORY CHANNEL Systems

Address or URL	Title
<a href="http://www.digital.com/info/alphaserver/products.html">http://www.digital.com/info/alphaserver/products.html</a> or <a href="ftp://ftp.digital.com/pub/Digital/Alpha/systems/as**00/docs">ftp://ftp.digital.com/pub/Digital/Alpha/systems/as**00/docs</a>	Click on the system of your choice; then click on the "technical resources" hot spot.
<a href="http://ftp.digital.com/pub/Digital/Alpha/firmware">http://ftp.digital.com/pub/Digital/Alpha/firmware</a> or <a href="ftp://ftp.digital.com/pub/Digital/firmware">ftp://ftp.digital.com/pub/Digital/firmware</a>	Firmware information for the AlphaServer systems
<a href="http://www.digital.com/info/SOC">http://www.digital.com/info/SOC</a>	<i>Systems &amp; Options Catalog</i> , a hardware ordering and configuration guide



## Digital UNIX Documentation Related to MEMORY CHANNEL

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P/N	Title
AA-QL8KA-TE	TruCluster Software™ <i>Release Notes</i>
AA-QL8LA-TE	TruCluster Software <i>Hardware Configuration</i>
AA-QL8MA-TE	TruCluster Software <i>Software Installation and Configuration</i>
AA-QL8NA-TE	TruCluster Software <i>Cluster Administration</i>
AA-QL8PA-TE	TruCluster Software <i>Application Programming Interfaces</i>
AA-QTN4A-TE	TruCluster Software <i>Digital UNIX Driver for MEMORY CHANNEL</i>
EK-BA350-CG	<i>StorageWorks™ Solutions: Configuration Guide</i>
EY-4326-51	<i>Oracle7™ Parallel Server</i>

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## OpenVMS Documentation Related to MEMORY CHANNEL

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P/N	Title
AA-Q28LB-TK	<i>Guidelines for OpenVMS Cluster Configurations</i>
AA-QSBTB-TE	<i>OpenVMS Version 7.1 Release Notes</i>

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## DECevent Documentation

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P/N	Title
AA-QAA6B-TE	<i>DECevent Release Notes for Digital UNIX Users</i>
AA-QAA4C-TE	<i>DECevent Analysis and Notification Utility for Digital UNIX User and Reference Guide</i>
AA-Q73LD-TE	<i>DECevent Analysis and Notification Utility for OpenVMS User and Reference Guide</i>
AA-QAA5C-TE	<i>DECevent Event Management Utility for Digital UNIX Installation Guide</i>
AA-Q73JD-TE	<i>DECevent Event Management Utility for OpenVMS Installation Guide</i>
AA-QAA3C-TE	<i>DECevent Translation and Reporting Utility for Digital UNIX User and Reference Guide</i>
AA-Q73KD-TE	<i>DECevent Translation and Reporting Utility for OpenVMS User and Reference Guide</i>
AA-QE26B-TE	<i>The DECevent Graphical User Interface User's Guide</i>

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# Chapter 1

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## Hardware and Configuration

This chapter introduces the MEMORY CHANNEL (MC) technology and describes the hardware components. Sections include:

- MEMORY CHANNEL Hardware
- Option Kits
- Hub Modes
- Multi-Channel Configurations
- System Configuration Requirements



**Check your system requirements  
before installing hardware (see Section 1.5).**

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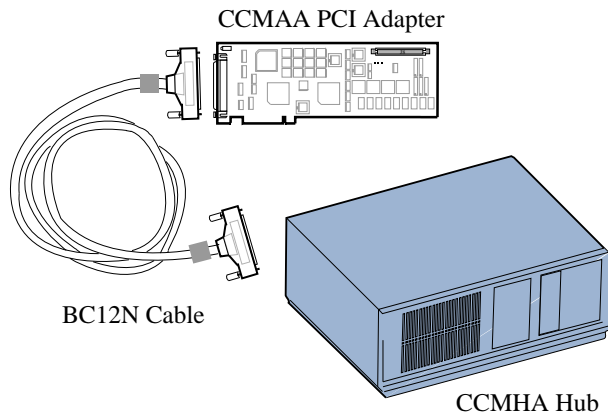
## 1.1 MEMORY CHANNEL Hardware

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The MEMORY CHANNEL hardware has three main components: the CCMAA PCI adapter, the CCMHA hub, and the BC12N link cable.

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Figure 1-1 Memory Channel Hardware



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- The CCMAA PCI adapter is a standard PCI module supported on servers with PCI. At least one CCMAA adapter is installed in each cluster member's PCI bus.
- The BC12N cable connects each CCMAA adapter to the CCMHA hub in standard hub mode (three or more systems) or to another CCMAA in virtual hub mode (two systems only). The cable is 10 feet long and is a 100 wire cable (50 twisted pairs).
- The CCMHA hub is a PC-class enclosure with a motherboard, linecards, power supply, and cooling system. One linecard is dedicated to each member of the cluster. Currently, the hub supports up to eight nodes.

## 1-2 MEMORY CHANNEL User's Guide

**Table 1-1 Environmental Specifications**

Temperature	0° to 40° C operating, -20° to 95°C storage
Humidity	Up to 95% RH noncondensing

**Table 1-2 Electrical Specifications**

Input Voltage (nominal)	100–120 V <sub>ac</sub>	220–240 V <sub>ac</sub>
Input frequency	50–60 Hz	50–60 Hz
Peak input current (steady state)	3.0 +2.0 (Aux) A	1.5 +1.0 (Aux) A
Power consumption (typical)	140 W	140 W
AC receptacle output current (nominal)	2 A	1 A

**Table 1-3 CCMHA Acoustics**

Sound Power Level L <sub>W</sub> A <sub>d</sub> B		Sound Pressure Level L <sub>p</sub> A <sub>m</sub> dBA	
Idle	Operate	Idle	Operate
5.0	5.0	36	36

Current values for specific configurations are available from Digital Equipment Corporation representatives.

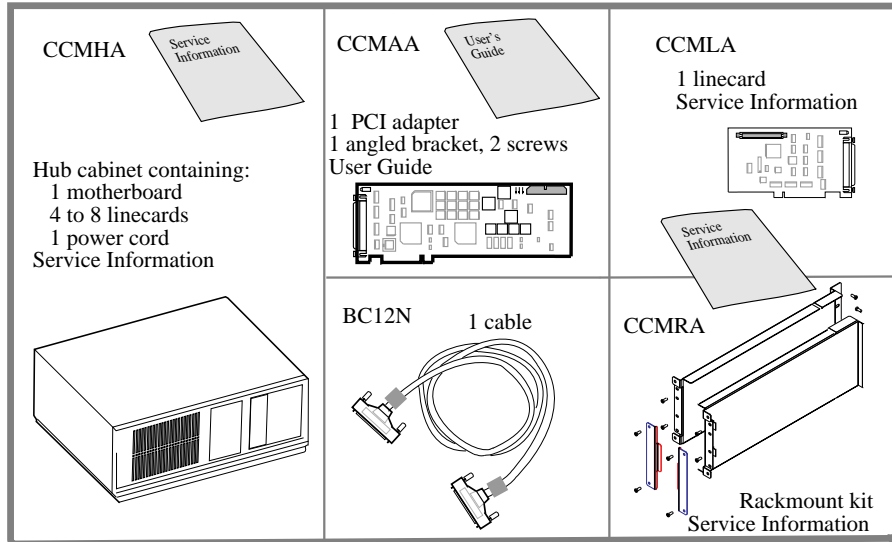
1 B = 10 dBA

Declared values per ISO 9296 and ISO 7779.

## 1.2 Option Kits

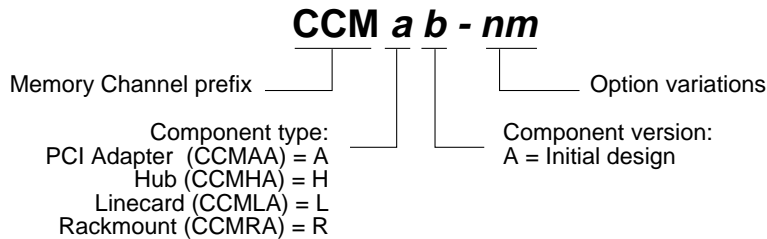
The MC hardware is available in five option kits: the hub (CCMHA), the PCI adapter (CCMAA), the hub linecard (CCMLA), a cable (BCI2N), and a rackmount kit (CCMRA).

Figure 1-2 Basic Option Kits



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Figure 1-3 Option Kit Numbering



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### 1-4 MEMORY CHANNEL User's Guide

You will use two or more of these kits when installing or upgrading a system:

- CCMAA MC PCI adapter, one needed for each system in the cluster. Comes with a straight extender installed on the card. An angled bracket with two screws is also enclosed and is used instead of the straight extender for some PCI slots.
- CCMLA Hub linecard. The hub ships with four linecards installed. One linecard is needed for each system in a cluster of three or more nodes. Extra linecards can be ordered and installed in the hub for troubleshooting and failover.
- CCMHA Hub, required for a cluster of three or more nodes. Ships with four linecards installed. Includes a power supply, fan, and additional logic.  
In a two-node system the hub is not required. You can connect two systems with two CCMAA adapters, cabling them directly together with one cable.
- CCMRA Rackmount kit for installing a CCMHA hub in a 19” metric or English rackmount cabinet. Contact your local Digital Customer Support Center for installation.
- BC12N A link cable with sleeved ferrite beads. You need one cable for virtual hub mode, and one per system for standard hub mode, using a CCMHA hub (see Section 1.3, Hub Modes). The recommended length is 10 feet (BC12N-10).

With these kits you will receive one of these hardware books:

- EK-PCIRM-UG *MEMORY CHANNEL User's Guide*
- EK-PCIRM-SV *MEMORY CHANNEL Service Information*

***For more information:***

*Digital Systems and Options Catalog*

## 1.3 Hub Modes

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There are two basic modes of operation. Virtual hub mode (VH mode) is two systems connected directly with no hub. Standard hub mode is two or more systems connected through a hub. CCMAA adapter jumper positions vary for these two modes.

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Figure 1-4 Virtual Hub Mode

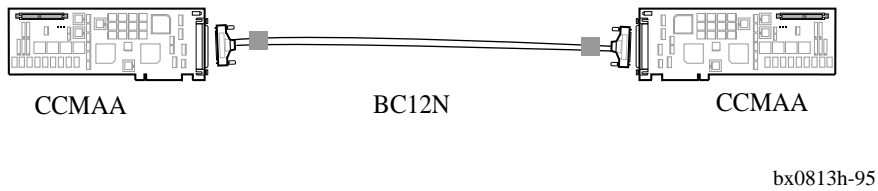
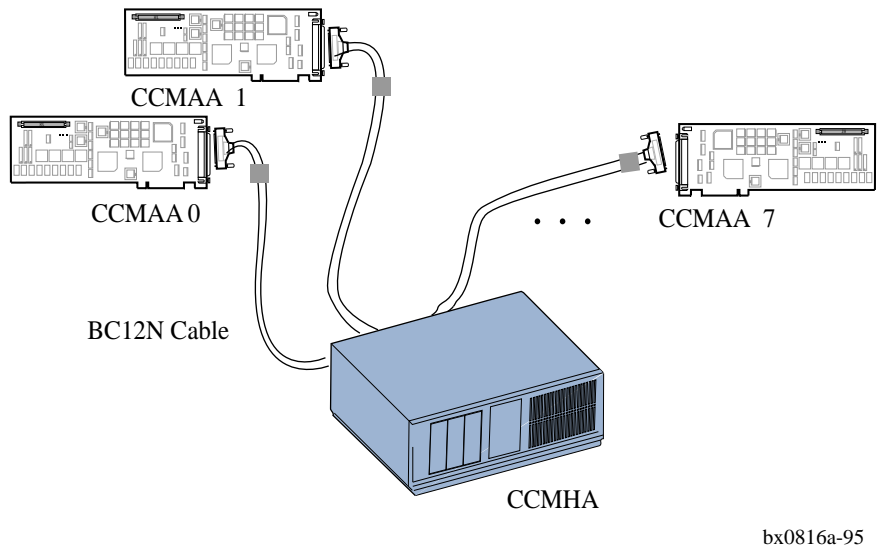


Figure 1-5 Standard Hub Mode



The CCMAA adapter's jumpers are set differently for each mode. See Section 2.3, Set Hub Mode Jumpers on CCMAA Adapters.



Depending on your operating system, a multi-channel configuration may be dual active paths (OpenVMS) or redundant paths for failover (Digital UNIX). See Section 1.4, Multi-Channel Configurations.

### 1.3.1 Virtual Hub Mode

Hardware	Single-Channel Configuration	Multi-Channel Configuration
Max. systems	Two	Two
CCMAA per system	One	Two
CCMAA jumpers	Must be set on each CCMAA adapter; one set to be the virtual hub (VH0) and one set to be the slave (VH1); see Section 2.3, Set Hub Mode Jumpers on CCMAA Adapters.	
BC12N cables	One	Two
CCMHA hub	None	None
CCMLA linecards	None	None

### 1.3.2 Standard Hub Mode

Hardware	Single-Channel Configuration	Multi-Channel Configuration
Max. systems	Eight <sup>1</sup>	Eight <sup>1</sup>
CCMAA per system	One	Two
CCMAA jumpers	Both adapters set to standard mode; see Section 2.3, Set Hub Mode Jumpers on CCMAA Adapters.	
BC12N cables	Same number as systems	Twice the number of systems
CCMHA hub	One	Two
CCMLA linecards	Same number as systems	Twice the number of systems

<sup>1</sup>Operating system configuration restrictions differ. Check your operating system documentation.

## 1.4 Multi-Channel Configurations

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Each system or node may be configured with two MEMORY CHANNEL adapters and two hubs to provide a multi-channel configuration for high availability.

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Figure 1-6 Virtual Hub Multi-Channel Configuration

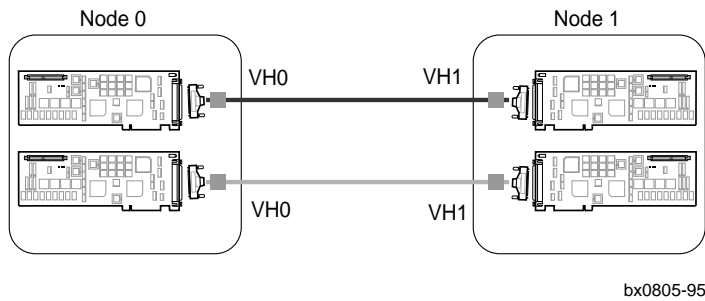
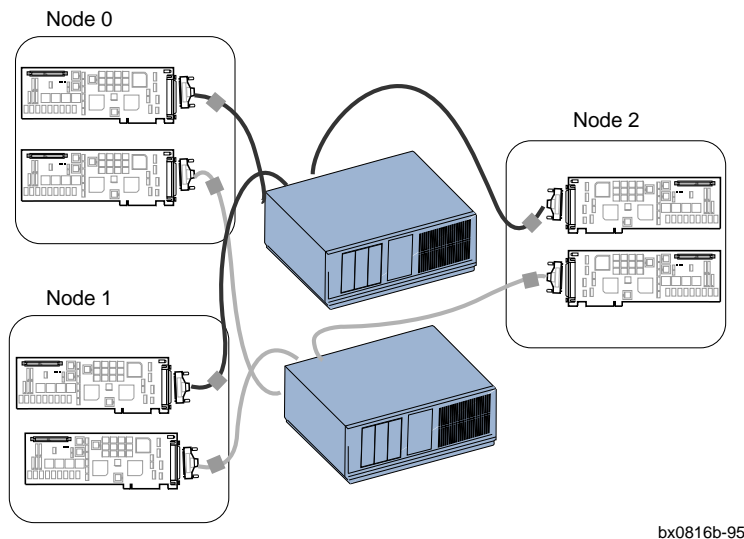


Figure 1-7 Standard Hub Mode Multi-Channel Configuration



In a virtual hub multi-channel configuration, each of the two CCMAAs in one system must have jumpers set the same, both to VH0 or both to VH1, as shown in Figure 1-5. (See Section 2.3, Set Hub Mode Jumpers on CCMAA Adapters.)

If you have two CCMAA adapters in each system, each CCMAA must be connected to different hubs. That is, you may not connect one system's PCI bus to the same hub twice. However, you may connect a multi-channel (dual rail) configuration, virtual or standard.

The operation of the multi-channel configuration depends on your operating system. When your system powers up, both CCMAA adapters come online. When your operating system boots, the operating system controls the status of the adapters.

### **Digital UNIX Operating System**

When Digital UNIX boots, one MC channel and its CCMAAs become active; the other rail and its CCMAAs remain idle, ready for failover. Digital UNIX takes the node IDs of the cluster members from the cabling and jumper settings. In virtual hub mode, node ID is determined by the CCMAA jumper settings.

Likewise, in a standard hub mode redundant configuration, each system must maintain its node ID. To accomplish this, cable both CCMAAs in each system to the same linecard slot on each hub backplane. Node ID in standard hub mode is determined by the linecard slot to which the adapter is connected. When systems are cabled to each hub in the same way, on failover, node ID will not change.

### **OpenVMS**

When OpenVMS boots, both MC channels are active initially with potential dynamic load balancing. If there is a failover, dynamic load balancing will be restored when all members of the cluster are rebooted.

## 1.5 System Configuration Requirements

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Your system-level applications or operating systems may place restrictions on the hardware not covered here. Check your system documentation and release notes. See also Section 1.6, Operating System Requirements.

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### 1.5.1 AlphaServer 1000/1000A Requirements

- Console firmware must be at 4.6 Rev or higher.
- Runs OpenVMS operating system only.
- For the AlphaServer 1000A, CCMAA adapters must be in PCI slots 11, 12 and 13, the top three slots.

### 1.5.2 AlphaServer 2000/2100 Requirements

- Console firmware minimum revision is 4.3 for Digital UNIX and 4.6 for OpenVMS.
- Check your system for MEMORY CHANNEL readiness as shown in Example 1-1.

#### Example 1-1 Checking the AlphaServer 2000/2100 for MC Readiness

```
P00>>> examine -b econfig:20008 ❶  
econfig:                20008 04 ❷
```

- ❶ At the console prompt, enter **examine -b econfig:20008**.
- ❷ If a hexadecimal value of **04** or greater is returned, your I/O module supports MEMORY CHANNEL.

If you receive a value of less than four, contact your local Digital Support Service Center for an upgrade. If your system is not hardware-ready for MEMORY CHANNEL and you install MC hardware and power up, console error message #1 will result (see Section 4.1).

### 1.5.3 AlphaServer 2100A Requirements

- Console firmware minimum revision is 4.3 for Digital UNIX and 4.6 for OpenVMS.

- CCMAA adapter must be installed in one of the bottom four slots (see Figure 2-4). CCMAA adapters may not be installed in slots 0 through 3 or at power-up MEMORY CHANNEL console error message #3 will result (see Section 4.1).

### 1.5.4 AlphaServer 4000/4100 Requirements

- Console firmware minimum revision is V2.0-3.

Under Digital UNIX V4.0A with TruCluster Software V1.4

- For a single-channel configuration, the CCMAA adapter may be in any PCI slot.
- For a redundant configuration, the second CCMAA adapter must be on the same PCI bus as the first adapter, and in a higher slot number than the first adapter.

Under Digital UNIX V3.2G with TruCluster Software V1.0

- For a single-channel configuration, the CCMAA adapter must be in PCI 0, slot 2.
- For a redundant configuration, the CCMAA adapters must be in PCI 0, slots 2 and 3.

Under OpenVMS

- The CCMAA adapter(s) may be in any PCI slot.

### 1.5.5 AlphaServer 8200/8400 Requirements

- Console firmware minimum revision is 2.3 for Digital UNIX and 4.0-4 for OpenVMS.
- In a DWLPA, CCMAA adapters must be installed in PCI slots 0 through 7. No slot restrictions in the DWLPB.
- Under Digital UNIX with multi-channel configurations, both CCMAA adapters must be in the same DWLPA/DWLPB card cage.
- Under OpenVMS with multi-channel configurations, only one CCMAA adapter may be in a DWLPA. You may have two CCMAAs in a DWLPB, one in a DWLPA and one in a DWLPB, or one CCMAA in each of two DWLPAs.

### 1.5.6 Additional AlphaServer Requirements

For a current list of all supported systems, refer to the *Digital Systems and Options Catalog*. Check your MEMORY CHANNEL release notes for any additional requirements.

***For more information:***

*Section 1.6, Operating System Requirements*  
*Section 2.4, Install the CCMAA Adapters*

## 1.6 Operating System Requirements

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**Your operating system may place restrictions on the hardware not covered here. Check your software documentation and release notes. See also Section 1.5, System Configuration Requirements.**

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### 1.6.1 Digital UNIX Requirements

- Version 3.2D or higher.
- When installing the Digital UNIX TruCluster Software, each system must have a KZPSA SCSI adapter and shared SCSI devices.
- Unique SCSI ID, cable length limitations, and required slots are described in the TruCluster Software *Hardware Configuration* guide.

### 1.6.2 OpenVMS Requirements

- Version 7.1 or higher.
- Each system must have an adapter (CI, DSSI, SCSI) for booting a system disk. The expected configurations are a shared-SCSI bus, or a CI device with HSJ disk servers.

***For more information:***

*Section 1.5, System Configuration Requirements*  
*Section 2.4, Install the CCMAA Adapters*  
*TruCluster Software Hardware Configuration*  
*Guidelines for OpenVMS Cluster Configurations*

# Chapter 2

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## Installation

This chapter describes the installation of MEMORY CHANNEL hardware. Sections include:

- Overview
- Prepare the Systems
- Set Hub Mode Jumpers on CCMAA Adapters
- Install the CCMAA Adapters
  - Determine PCI Slot Position
  - Install Adapter and Check Placement
- Install the CCMHA Hub
- Cable
- Power Up and Check Status LEDs

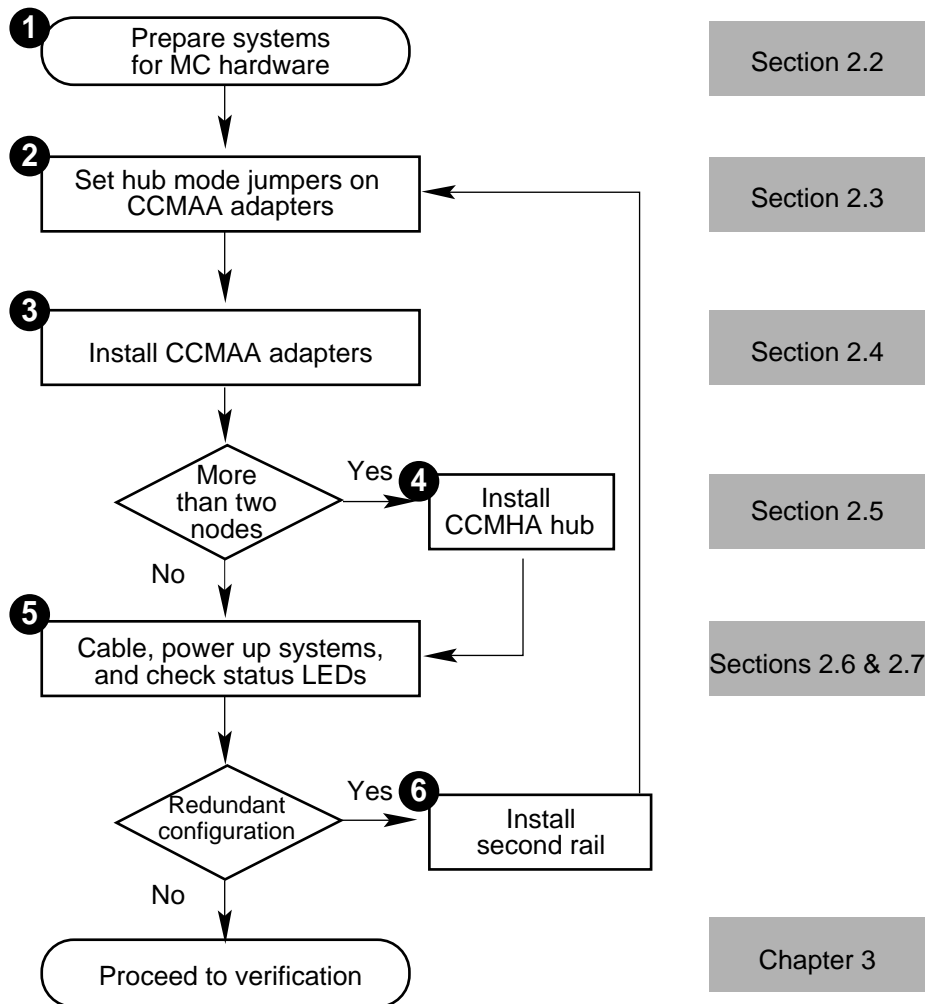
## 2.1 Overview

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The recommended cable length requires the systems in an installed MEMORY CHANNEL cluster to be within 3.05 m (10 feet) of the hub, virtual or CCMHA.

---

Figure 2-1 Installation Overview



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This chapter describes the complete MC hardware installation. An overview of these steps is shown in Figure 2-1, and the steps include:

- ❶ Prepare systems for MC hardware (see Section 2.2):
  - Power off all systems.
  - Position the systems within 10 feet of the hub (virtual or CCMHA).
  - Open the system cabinets for access to the PCI.
- ❷ Set the jumpers on the CCMAA PCI adapters for your system's hub mode (see Section 2.3).
- ❸ Install the CCMAA adapters in each system's PCI (see Section 2.4).
  - Determine PCI slot position.
  - Determine correct module extension; change if needed.
- ❹ For a cluster of three or more nodes, install the hub (see Section 2.5). Check the input voltage selection switch on the hub.
- ❺ Cable and power up systems and hub (see Section 2.6). Check status LEDs (see Section 2.7).
- ❻ If you are installing a multi-channel configuration, install the second set of cluster hardware now.

Proceed to verification.

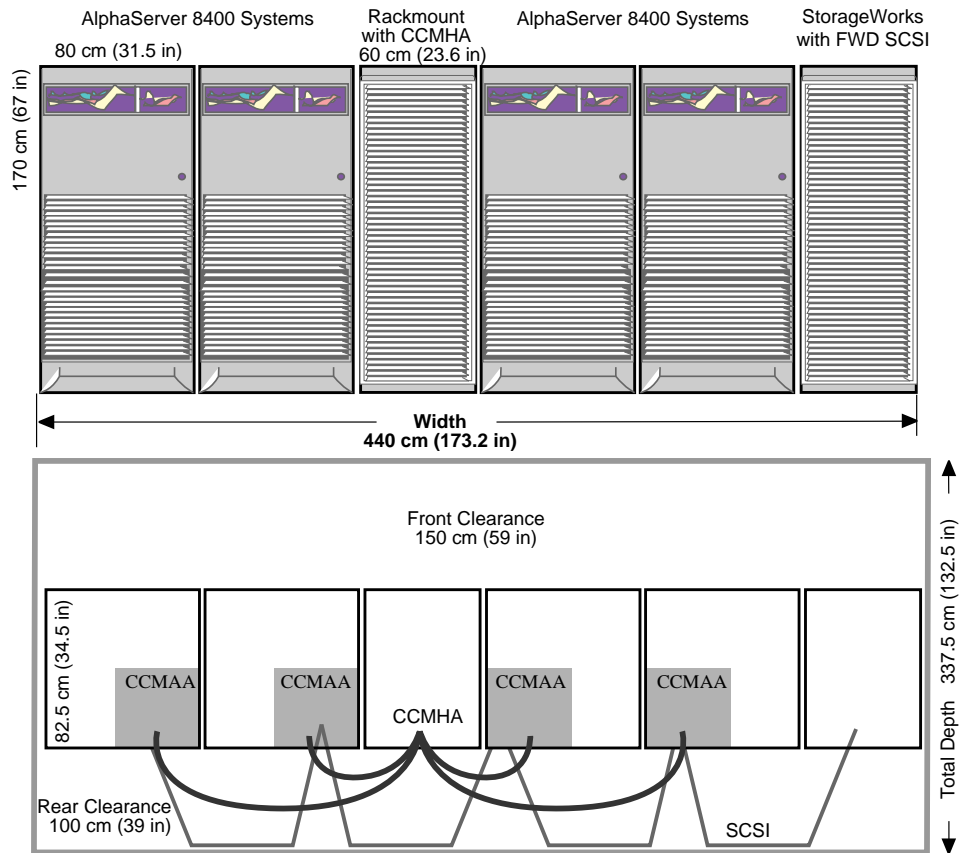
***For more information:***

*Digital Systems and Options Catalog*  
*Your system's AlphaServer Installation Guide*  
*TruCluster Software Hardware Configuration*  
*Guidelines for OpenVMS Cluster Configurations*

## 2.2 Prepare the Systems

Perform an orderly shutdown of all systems. Position the systems within 3.05 m (10 feet) of the hub, and open each cabinet to access the PCI card cage.

**Figure 2-2 Sample Configuration:  
Four-Node AlphaServer 8400 MC Cluster with SCSI**



bx0830a-94

## 1 Shut down systems

1. Perform an orderly shutdown of the operating system.
2. Switch the system control panel to Off.
3. Shut off power within the system by setting the AC On/Off switch on each power supply to Off, or set the circuit breaker to Off, depending on the system's design.
4. Unplug the system power cord.

## 2 Position systems

Determine your configuration footprint and clearances. The CCMHA hub may be rackmounted or standalone.

If your operating system has additional hardware support requirements, plan for cabling limitations.

The BC12N-10 cable is 3.05 m (10 feet) long. Systems must be close enough to cable the backplanes to one another or to the hub.

## 3 Remove system panels

Open your system cabinet to access the PCI slots.

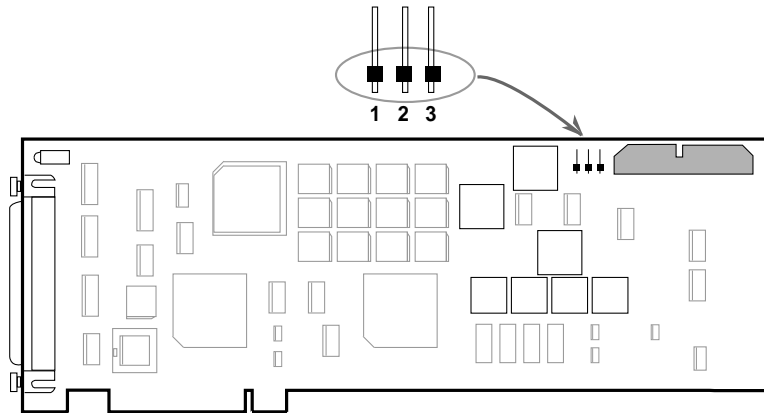
***For more information:***

*Digital Systems and Options Catalog*  
Your system's *AlphaServer Installation Guide*  
Your operating system configuration requirements

## 2.3 Set Hub Mode Jumpers on CCMAA Adapters

Each CCMAA adapter has hub mode jumpers. You must set the jumper pins differently for virtual hub mode and standard mode.

Figure 2-3 Setting the CCMAA Hub Mode Jumpers



bx0853-96

1	2	3	
			<b>Standard Hub Mode (with hub hardware)</b> All Nodes: Jumper middle and left pins
			<b>Virtual Hub Mode (no hub present)</b>
			Node 0: Jumper middle and right pin (VH0) Node 1: No jumpers set (VH1)

bx0853e-96

Whenever you install a CCMAA adapter, you must set the jumpers for the hub mode your configuration requires. The jumper numbers are on the adapter next to the jumpers.

1. Use an ESD ground strap when handling the modules.
2. Unpack the CCMAA PCI adapter.
3. Hold the adapter by the edges and set it on a secure, static-free surface.
4. Set the CCMAA jumpers for your configuration to either standard mode (with a hub) or virtual hub mode (two systems only). If you are installing a redundant configuration under Digital UNIX, both the first and second CCMAA adapters are jumpered the same way within a system.

Jumpers are located in the corner of the CCMAA adapter near the connector as shown in Figure 2-3.

### 2.3.1 Standard Hub Mode

In a cluster with a hub, all CCMAA adapters must have the same jumper configuration.

If you are upgrading from a two-node virtual hub to a standard mode configuration with a CCMHA, check and change the jumpers on all CCMAA adapters.

### 2.3.2 Virtual Hub Mode

In VH mode, two systems are cabled together directly without a hub.

In VH mode, each CCMAA adapter must be jumpered differently, and the jumpering determines the node ID.

***For more information:***

*MEMORY CHANNEL Service Information*

## 2.4 Install the CCMAA Adapters

### 2.4.1 Determine PCI Slot Position

---

**Determine the PCI slot for CCMAA installation carefully. Systems with multi-channel MEMORY CHANNEL hardware must have the first module (mca0) in the lower slot position.**

---

**Table 2-2 CCMAA PCI Slot Position by System**

AlphaServer	CCMAA PCI Slot Position
1000	Any PCI slot
1000A	Slots 11, 12, 13
2000 family	See Table 2-1
4000/4100	<u>OpenVMS</u> : Any PCI slot <u>Digital UNIX</u> : 4.0A with TruCluster V1.4: Any PCI slot <sup>1</sup>
8200/8400	In a DWLPA, CCMAA adapters must be installed in slots 0 to 7. No slot restrictions in the DWLPB. <u>OpenVMS</u> : Only one CCMAA adapter may be in a DWLPA. You may have two CMAAs in a DWLPB, one in a DWLPA and one in a DWLPB, or one CCMAA in each of two DWLPAs. <u>Digital UNIX</u> : Both CCMAA adapters must be in the same DWLPA/DWLPB, with the first adapter (mca0) in the lower slot.

### 1 Determine PCI slot position in each system

You will check slot positions in Section 2.4.1, and during verification in Section 3.7.

For Digital UNIX in a multi-channel configuration, the first CCMAA adapter (to be mca0) must be in the lowest available slot the console sees. The second CCMAA (mcb0) adapter must be in the higher slot. This must be consistent across all members of the MC cluster. All mca0's are attached to one hub, all mcb0's are attached to the second hub.

For OpenVMS in a multi-channel configuration, the only restriction is that both CCMAAs from one system may not be attached to the same hub. The placement of

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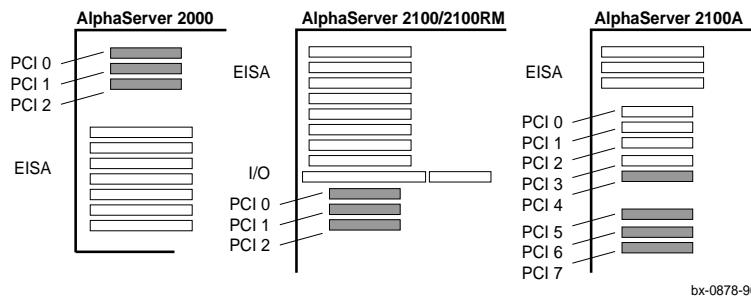
<sup>1</sup> If you are running Digital UNIX V3.2G with TruCluster V1.0, the CCMAA must be in PCI0, slots 2 and 3.

the CCMAAs in the PCI bus relative to their hub connection is not important to OpenVMS.

## 2 AlphaServer 2000/2100 family: check console slot positions

The console on the AlphaServer 2100 rackmount system “counts” the physical slots in opposite order from the 2000 family standalone systems. The standalone’s bottom PCI slot is slot 8, while in the rackmount this same physical slot is slot 6. Figure 2-4 shows you the AlphaServer 2000 family’s available slot positions at the bulkhead. Table 2-1 shows how these consoles count the slots differently.

**Figure 2-4 Bulkheads for AlphaServer 2000/2100/2100RM/2100A**



bx-0878-96

**Table 2-1 Console ID and Bulkhead Numbers for AlphaServer 2000s**

Bulkhead	2000	2100	2100 RM	2100A
PCI 0	Slot 1	Slot 6	Slot 8	Do not install CCMAA
PCI 1	Slot 2	Slot 7	Slot 7	Do not install CCMAA
PCI 2	Slot 3	Slot 8	Slot 6	Do not install CCMAA
PCI 3	—	—	—	Do not install CCMAA
PCI 4	—	—	—	Slot 6
PCI 5	—	—	—	Slot 7
PCI 6	—	—	—	Slot 8
PCI 7	—	—	—	Slot 9

## 3 Change the CCMAA adapter extender plate, if necessary

The adapter comes with a straight extender installed. Some systems require changing the extender to the angled bracket. Look at the physical slot you have chosen and change the extender plate if necessary.

## 2.4.2 Install Adapter and Check Placement

---

**Install the CCMAA adapter(s) in the PCI slots determined in Section 2.4.1. Secure the adapter's end connector to the system cabinet by securing the screws to the PCI bulkhead. Check placement using console commands. Attach the BC12N cable to the CCMAA connector.**

---

### Example 2-1 Set Bus Probe Algorithm and Confirm Placement

```
P00>>> show bus_* ❶
bus_probe_algorithm    new ❷

P00>>> init ❸
VMS PALcode X5.56-4, OSF PALcode X1.45-9

starting console on CPU 0
Testing Memory bank 0
Testing Memory bank 1
Configuring Memory Modules
probing hose 0, PCI
probing PCI-to-EISA bridge, bus 1
bus 0, slot 0 -- ewa -- DECchip 21040-AA
bus 0, slot 1 -- pka -- NCR 53C810
bus 1, slot 6 -- vga -- Compaq Qvision
bus 0, slot 6 -- pkb -- DEC KZPSA
bus 0, slot 7 -- mca -- DEC PCI MC ❹
bus 0, slot 8 -- mcb -- DEC PCI MC ❹
AlphaServer 2100 Console V4.6-201, built on Aug 15 1995 at
11:54:23
```



## 1 Install CCMAA adapter

If you are installing a multi-channel configuration, label each end of the cables with the system and adapter they connect (for example, “Node 1/mca0” and “Node 1/mcb0”). This labeling will save you time with checking for crossed rails as well as any future maintenance of the cluster.

1. Secure the CCMAA adapter(s) at the backplane, tightening the screw to hold it. This connects the module to ground.
2. Attach the labeled cable to the CCMAA adapter at the bulkhead.
3. If you are installing a multi-channel configuration, install and cable the second cluster now.
4. Replace system panels.

## 2 Check placement on PCI bus

- ❶ Check the bus probe algorithms on all systems by entering the **show bus\_\*** command.
- ❷ For AlphaServer 2000 Family: On each node, set bus algorithm to **new**. (It is not necessary to do this for other systems; the bus algorithm is already programmed to poll modules from the lowest to highest slot position.)
- ❸ Enter an **initialize** command to start power-up test.
- ❹ Check the placement of the CCMAA adapters . Both should report to the console here. Check that the adapter designated mca0 is in the lower slot. Check placement against system requirements (see 1 above).

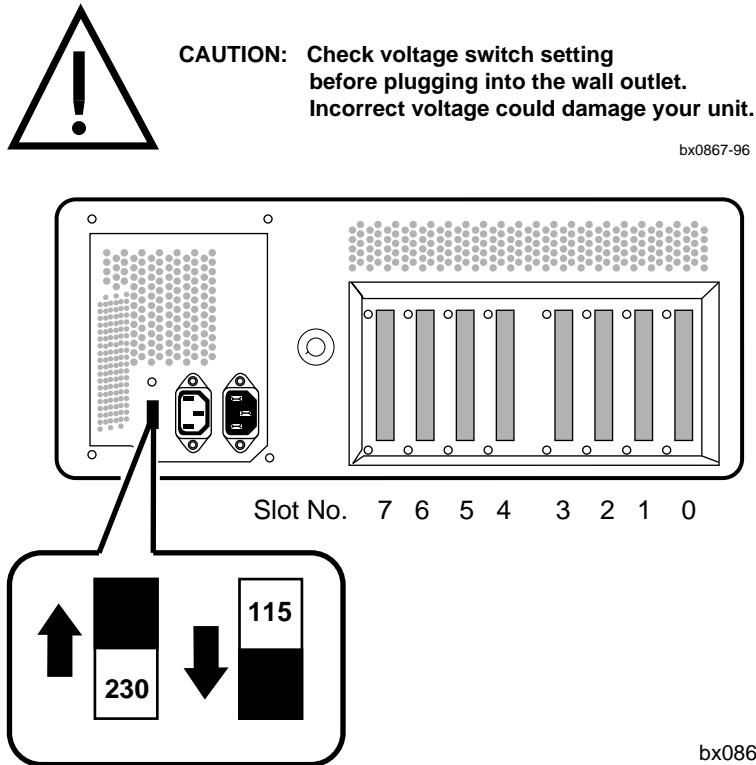
## 2.5 Install the CCMHA Hub

---

If you have three or more systems, you will install a CCMHA hub. Unpack the hub, attach the power cord, check power switch setting, and plug in. Power up and check LED status on the bulkhead and control panel. Prepare to cable.

---

Figure 2-5 Hub (Rear View)

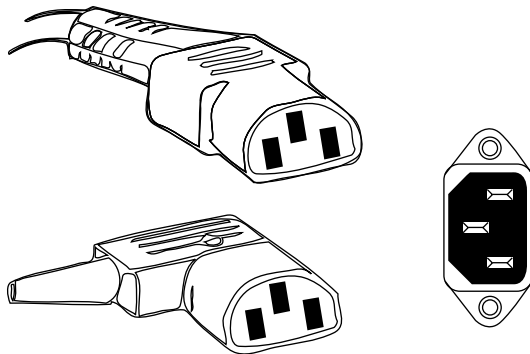


The CCMHA hub has two revisions. Early models have an automatic voltage sensing power supply, so these hubs will not have a voltage switch as shown. The power supply automatically ranges to your voltage input. Later models of the CCMHA have the voltage switch as shown.

If you are *not* installing a CCMHA hub, proceed to Section 2.6. In a two-node cluster, the hub is not required but may be used. The hub *is* required for three or more systems.

1. Position the cabinet horizontally as shown in Figure 2-5, allowing for clearance. The front must be clear to allow for airflow through the bezel.
2. Insert the power cord into the rear bulkhead.

**Figure 2-6 Power Cord**



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3. Check the voltage selection switch.

Most hubs will have a voltage selection switch that must be in the proper position for your electrical service from the wall outlet. Locate this switch on the back hub panel next to the power cord receptacle, and check that it is switched to your service (115V or 230V). To change the voltage selection, insert a sharp point and slide.

Some model hubs do not have a switch; these contain a self-regulating power supply and no selection is required. Proceed to the next step.

4. Plug the power cord into a grounded outlet. Power on the hub by pushing the power switch in on the front of the hub.
5. Check the linecards' LEDs on the back of the hub. The left Hub OK LED will be amber, the right CCMAA OK LED will be off (see Figure 2-8, Checking Status LEDs).

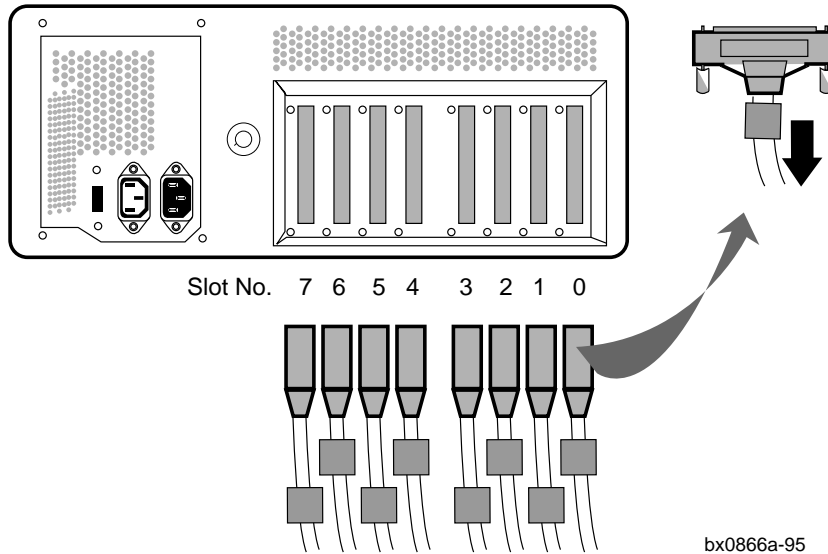
## 2.6 Cable

---

Console system node ID is determined in standard hub mode by the slot number of the linecard cabled. For example, node 0 is cabled to the CCMHA hub at slot 0. Cable your nodes from the lowest slot number to the highest.

---

Figure 2-7 Cabling BC12N to the CCMHA Hub



Console system node ID is determined in standard hub mode by the slot number of the linecard cabled. Digital UNIX uses this console ID information directly, while OpenVMS assigns its own node ID.

### 2.6.1 Virtual Hub Mode

You set the systems' node IDs when you set the CCMAA jumper settings for virtual hub mode. The virtual hub reports as node 0 and the other system reports as node 1 (see Figure 2-3, Setting the CCMAA Hub Mode Jumpers). Cable the two systems together and proceed.

### 2.6.2 Standard Hub Mode

Slot number on the hub determines console system node ID. The BC12N cable in slot 0 attaches to the system that reports as node 0. Slot 1 reports that system as node 1, and so on.

Attach the BC12N cables to the hub, starting from the lowest node at the right proceeding to the highest node on the left. If you have less than five cables, leave an open slot between cables for ease of maintenance.

For more than four cables, you may need to slide the ferrite beads along the cables to fit the cables into the hub slots (see Figure 2-7). Keep the ferrite bead as close to the connector as possible.

### 2.6.3 Multi-Channel Configurations

Install your first CCMAA adapter in the lowest PCI slot available in each system; install the second CCMAA adapter in the next higher slot in each system.

#### **Multi-Channel Virtual Hub Mode**

Both CCMAA adapters in the master system (which is acting as the virtual hub, running the clock for the cluster) must have the jumpers set to VH0 position, and both CCMAAs in the second system must have the jumpers set to VH1. (See Section 2.3, Set Hub Mode Jumpers on CCMAA Adapters.)

#### **Multi-Channel Standard Hub Mode**

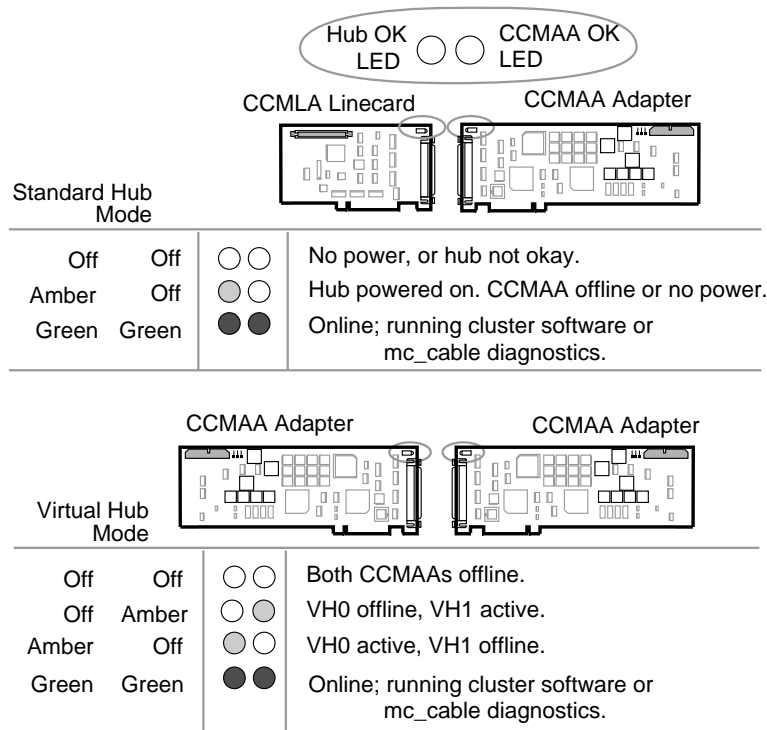
Digital UNIX takes the node IDs from cabling, so you must cable the redundant hub in the same way as the primary hub, with slot 0 connected to node 0's redundant CCMAA, slot 1 connected to node 1's redundant CCMAA, and so on, up to node 7.

OpenVMS does not *require* each system to be connected to the same slot number on each hub. However, cabling each system to the same slot number on each hub can facilitate troubleshooting and maintenance.

## 2.7 Power Up and Check Status LEDs

**Power up each system. Check the status LEDs on the CCMAA adapters and the CCMLA linecards, if present.**

**Figure 2-8 Checking Status LEDs**



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As the systems power up, LEDs report status on the CCMLA linecards in the hub and on the CCMAA adapter in the PCI. Each of these adapters has two LEDs, a Hub OK LED on the left, and a CCMAA OK LED on the right. Each LED has three states: off, amber, and green.

The Hub OK LED turns amber as soon as the hub is powered on. When software begins a handshake sequence between the CCMLA and CCMAA, both LEDs turn green. This sequence can be initiated by the mc\_cable diagnostic or by booting the operating system. Proceed to verification.

# Chapter 3

---

## Verification

This chapter describes MEMORY CHANNEL hardware verification using diagnostics. Sections include:

- Overview
- Verify Console Supports MEMORY CHANNEL
- Update Console, If Required
- Run the mc\_diag Diagnostic
- Run the mc\_cable Diagnostic (Single-Channel Configuration)
- Run the mc\_cable Diagnostic (Multi-Channel Configuration)
- Check for Crossed Rails (Multi-Channel Configuration)
- Prepare to Boot Your Operating System

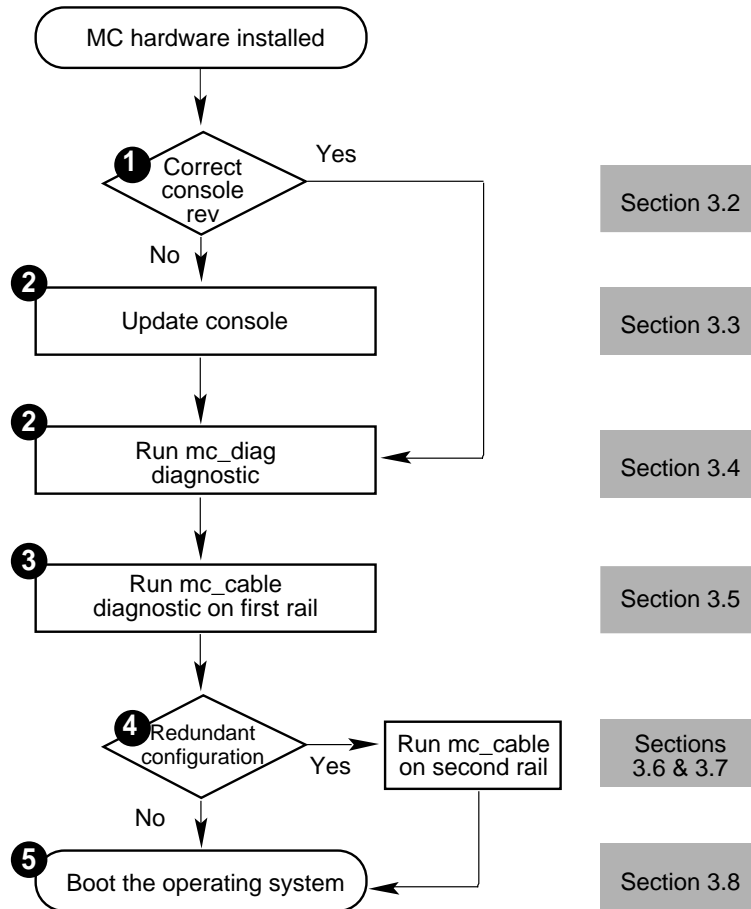
## 3.1 Overview

---

To verify the installation, first make sure the version of each console program supports MEMORY CHANNEL. If not, update the console. Next, check that the console reports the CCMAA adapters in the system's PCI. Then proceed with MC diagnostics.

---

Figure 3-1 Verification Overview



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- ❶ Check that each system console supports MEMORY CHANNEL. The method to verify support differs between machines.  
See Section 3.2, Verify Console Supports MEMORY CHANNEL.  
  
Upgrade the console to the required revision, if needed.  
See Section 3.3, Update Console, If Required.
- ❷ Run **mc\_diag** on each system to check the CCMAA adapter.  
See Section 3.1, Run the mc\_diag Diagnostic.
- ❸ Run **mc\_cable** on each system to check the cables, the CCMHA linecards, and connections. See Sections 3.5 and 3.6, Run the mc\_cable Diagnostic.
- ❹ If you are installing a multi-channel system, power off one of the hubs and check the mc\_cable output for crossed rails. See Section 3.7, Check for Crossed Rails (Multi-Channel Configuration).
- ❺ Set any console parameters required by your operating system prior to installing or booting the operating system. See Section 3.8, Prepare to Boot Your Operating System.

## 3.2 Verify Console Supports MEMORY CHANNEL

---

Using console commands, check that MC diagnostic commands are supported in each system console. If they are not, update the console firmware.

---

### Example 3-1 Verify MC Diagnostics in Console

```
P00>>> init ①
P00>>> ls mc_* ②
          mc_cable    mc_diag
P00>>>

P00>>> ls mc_*
no files found ③
```

### AlphaServer 4000/4100 and 8200/8400:

```
Pnn>>> init ①
Pnn>>> load mc_diag ②
Pnn>>>

Pnn>>> load mc_diag
Overlay mc_diag not found ③
```

Bring each system to the console prompt, or halt the system by pressing the Halt button on the control panel. The console prompt appears on the screen.

- ❶ Initialize your system to reset the registers.
- ❷ Enter the command shown for your system.  
In the AlphaServer 4000/4100 and 8200/8400 systems, MEMORY CHANNEL diagnostics are latent in recent consoles and this command activates them. For other systems, enter **ls** to list the commands.

If the system output is as shown at ❷, your system is ready for testing MEMORY CHANNEL. Proceed to Section 3.4, Run the mc\_diag Diagnostic.

- ❸ If the MEMORY CHANNEL diagnostics are not present, you will receive one of these error messages. This indicates that you need to update your console. Proceed to Section 3.3, Update Console, If Required.

### 3.3 Update Console, If Required

---

**Find the most recent console file for your system from the AlphaServer Firmware Update CD (AG-PTMW\*-BS) or on the Internet (see Table 3-1). Follow the instructions for your system to update your console.**

---

**Table 3-1 AlphaServer Firmware Internet Locations**

Source	Address
ftp	<a href="ftp://ftp.digital.com/pub/Digital/Alpha/firmware">ftp://ftp.digital.com/pub/Digital/Alpha/firmware</a>
WWW	<a href="http://ftp.digital.com/pub/Digital/Alpha/firmware">http://ftp.digital.com/pub/Digital/Alpha/firmware</a>

AlphaServer firmware is now available online. You can locate the files as shown in Table 3-1. The most recent firmware (if released since the last CD) is found at:

<ftp://ftp.digital.com/pub/Digital/Alpha/firmware/interim/>

The files are structured similarly to those on the firmware CD, and are separated by CD release. For example, the contents of the V3.4 firmware CD are located at:

<ftp://ftp.digital.com/pub/Digital/Alpha/firmware/v3.4/>

If you are using the AlphaServer Firmware CD, read the following files in the CD [DOC] directory:

*alpha\*\_v\*([\\_fw\\_relnotes.ps](#) or [alpha\\*\\_v\\*\\*\\_fw\\_relnote.txt](#)*

where \* = the model number of your AlphaServer and

\*\* = the highest version level on the disk

Whether you are working from the Internet or from the firmware CD, the steps for updating your console are described in detail. The overview of the steps includes:

1. Copy (via FTP) the Firmware Release Notes for your system from the Internet area:  
ftp://ftp.digital.com/pub/Digital/firmware/v3.4/doc.
2. Print and read the release notes. The release notes provide the name(s) of the firmware update utility file(s) you need to run on your Alpha system, and they walk you through the firmware update procedure.
3. Copy the firmware update utility file(s) to your local disk from the appropriate directory:  
ftp://ftp.digital.com/pub/Digital/firmware/v3.4/xxx/  
where xxx is a subdirectory designated for your system.
4. After you have copied the desired update utility files from the Internet, you can use the files on your system in a variety of ways, depending on your particular target Alpha system. The five methods supported on specific Alpha systems include BOOTP net, MOP net, FAT floppy, boot floppy, and system disk.

***For more information:***

*AlphaServer 2X00 Loadable Firmware Update Utility  
User Guide and Release Notes*

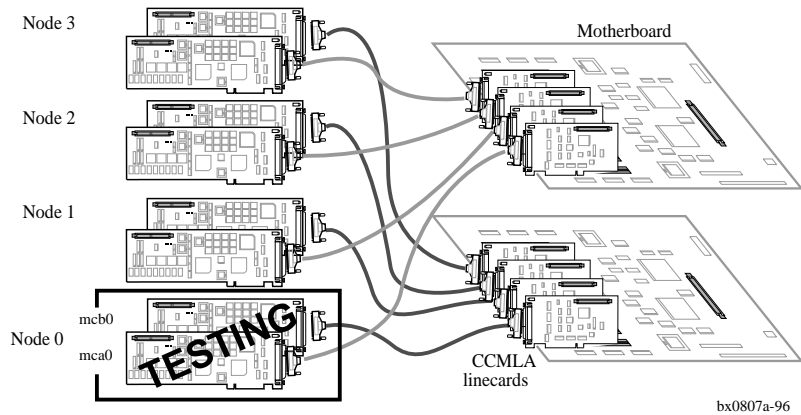
## 3.4 Run the mc\_diag Diagnostic

---

Mc\_diag tests the internal logic of the CCMAA adapter up to the connector. The output of this diagnostic is the same for virtual and standard hub modes. Enter the mc\_diag command on each system. In multi-channel configurations, both modules are tested in each system.

---

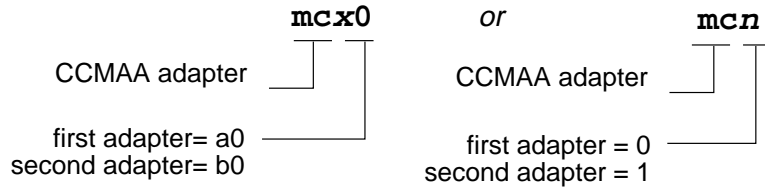
Figure 3-2 Testing the CCMAA Adapters



### Example 3-2 Running mc\_diag on Each System

```
P00>>> init ❶  
P00>>> mc_diag ❷  
Testing MC-Adapter(s)  
Adapter mca0, Passed ❸  
Adapter mcb0, Passed ❹  
❺  
  
P00>>>
```

- ❶ Initialize your system to reset the registers.
- ❷ Enter the console command **mc\_diag**.  
Run this diagnostic on each system to test the CCMAA adapters. These diagnostics test internal logic of the CCMAA adapter up to the connector.
- ❸ The first CCMAA adapter that the console found, mca0, passed.
- ❹ If a second adapter is installed in the system, the diagnostic tests and reports status of the second CCMAA here.
- ❺ Console notation for reporting adapters may be a three or four place notation, to be read as shown here.



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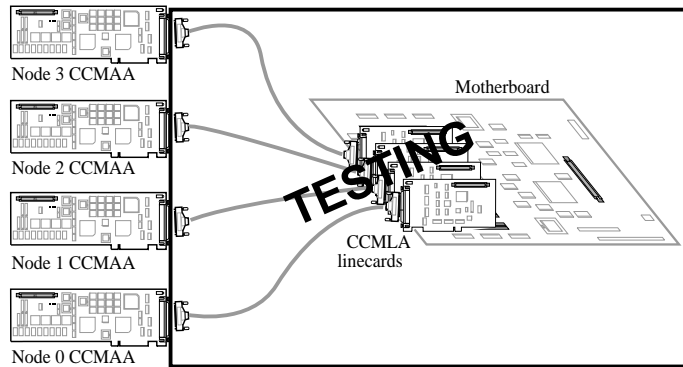
### 3.5 Run the mc\_cable Diagnostic (Single-Channel Configuration)

---

**Mc\_cable tests from the CCMAA connector, over the cables, and through the linecards to other cluster members. Run on each system at the same time.**

---

Figure 3-3 Testing the Cables, Hub Linecards, and Motherboard



bx0809-96

#### Example 3-3 Running mc\_cable on Node 1, Single-Channel Configuration in Standard Hub Mode

```
P00>>> init ❶  
P00>>> mc_cable ❷  
  to exit MC_CABLE, type <CTRL/C>  
mca0 node id 1 is online ❸  
No Response from node 0 on mca0  
No Response from node 2 on mca0  
No Response from node 3 on mca0  
No Response from node 4 on mca0  
No Response from node 5 on mca0  
No Response from node 6 on mca0  
No Response from node 7 on mca0  
Response from node 3 on mca0 ❹  
Response from node 0 on mca0 ❺
```



```
Response from node 2 on mca0
^C
P00>>>
```

⑥  
⑦

The mc\_cable diagnostic tests the cables between systems and the logic that connects them in the hub, including the linecards. In a virtual hub system, it tests the cable and the virtual hub logic. Mc\_cable reports changes in cable status and continues to run until it is halted using Ctrl/C (^C).

The example shown is a four-node single-channel configuration, standard hub mode. (An example of a two-node virtual hub mode configuration is given in Example 4-5.)

- ① Enter an **initialize** command to reset the registers.
- ② Enter the **mc\_cable** command.
- ③ The CCMAA adapter on node 1 is online. The diagnostic scans for responses from other nodes. Here, no other systems have yet responded.
- ④ The CCMAA adapter from node 3 responds to node 1. This means that node 3 is online running mc\_cable, and node 1 recognizes node 3's response and reports it. If you were to look at node 3's output of mc\_cable, it would at this point be reporting node 3 online with node 1 responding, each system showing one adapter.

As you bring each system up and run mc\_cable, each system's output will report response from the additional nodes as they join the cluster.

- ⑤ Next, node 0 joins the cluster running mc\_cable. The order of the nodes reporting reflects the order in which you started up the mc\_cable diagnostic on each respective system.
- ⑥ Node 2 joins the cluster.

When you have started mc\_cable on all nodes, check each system's output. Each system's mc\_cable output should show its own CCMAA adapter online and be reporting response from all the other nodes.

- ⑦ To exit mc\_cable, enter a Ctrl/C. The console prompt returns.

**For more information:**

Chapter 4, Troubleshooting

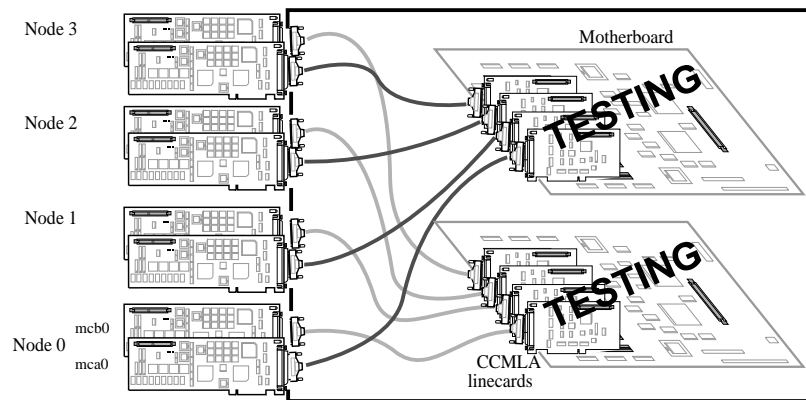
## 3.6 Run the mc\_cable Diagnostic (Multi-Channel Configuration)

---

**In a multi-channel configuration, mc\_cable tests the first CCMAA adapter, polls the hub, and then tests the second CCMAA.**

---

Figure 3-4 Testing a Multi-Channel Configuration with mc\_cable



bx0808a-96

### Example 3-4 Running mc\_cable on Node 1, Multi-Channel Configuration

```
P00>>> init 1
P00>>> mc_cable 2
    to exit MC_CABLE, type <CTRL/C>
mca0 node id 1 is online 3
No Response from node 0 on mca0
No Response from node 2 on mca0
No Response from node 3 on mca0
No Response from node 4 on mca0
No Response from node 5 on mca0
No Response from node 6 on mca0
No Response from node 7 on mca0
mcb0 node id 1 is online 4
```

```

No Response from node 0 on mcb0
No Response from node 2 on mcb0
No Response from node 3 on mcb0
No Response from node 4 on mcb0
No Response from node 5 on mcb0
No Response from node 6 on mcb0
No Response from node 7 on mcb0
Response from node 3 on mca0           ⑤
Response from node 3 on mcb0         ⑤
Response from node 0 on mca0         ⑥
Response from node 0 on mcb0         ⑥
Response from node 2 on mca0         ⑦
Response from node 2 on mcb0         ⑦
^C                                     ⑧
P00>>>

```

The example shown is a four-node multi-channel configuration, standard hub mode.

- ① Enter an **initialize** command to reset the registers.
  - ② Enter the **mc\_cable** command.
  - ③ The first CCMAA adapter, mca0, on node 1 is online. The diagnostic scans for responses from other nodes. Here, no other systems have yet responded.
  - ④ The second CCMAA adapter, mcb0, on node 1 is online. The diagnostic scans for other nodes responding. None found yet.
  - ⑤ Two CCMAA adapters from node 3 respond to node 1. This means that node 3 is online running mc\_cable, and node 1 recognizes node 3's response and reports it.
  - ⑥ Next, node 0 joins the cluster running mc\_cable.
  - ⑦ Node 2 joins the cluster.
- When you have started mc\_cable on all nodes, check each system's output. Each system's mc\_cable output should show its own CCMAA adapter online and be reporting response from all the other nodes.
- ⑧ To exit mc\_cable, enter a Ctrl/C. The console prompt returns.

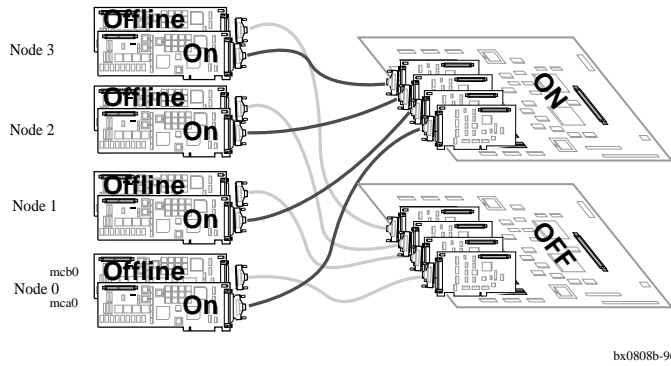
**For more information:**

Chapter 4, Troubleshooting

### 3.7 Check for Crossed Rails (Multi-Channel Configuration)

**With mc\_cable running on all systems, turn off the second hub and check output. If all CCMAA adapters designated mcb0 go offline, no rails are crossed.**

Figure 3-5 Testing for Crossed Rails with mc\_cable



bx0808b-96

#### Example 3-5 Checking Cabling for Crossed Rails

##### Node 1 comes online first under mc\_cable

```
P00>>> mc_cable ❶
mca0 node id 1 is online
No Response from node 0 on mca0
No Response from node 2 on mca0
No Response from node 3 on mca0
No Response from node 4 on mca0
No Response from node 5 on mca0
No Response from node 6 on mca0
No Response from node 7 on mca0
mcb0 node id 1 is online
No Response from node 0 on mcb0
No Response from node 2 on mcb0
No Response from node 3 on mcb0
No Response from node 4 on mcb0
No Response from node 5 on mcb0
```

##### Node 3 comes online second

```
P00>>> mc_cable ❶
mca0 node id 3 is online
No Response from node 0 on mca0
Response from node 1 on mca0
No Response from node 2 on mca0
No Response from node 4 on mca0
No Response from node 5 on mca0
No Response from node 6 on mca0
No Response from node 7 on mca0
mcb0 node id 3 is online
No Response from node 0 on mcb0
Response from node 1 on mcb0
No Response from node 2 on mcb0
No Response from node 4 on mcb0
No Response from node 5 on mcb0
```

```

No Response from node 6 on mcb0
No Response from node 7 on mcb0
Response from node 3 on mca0
Response from node 3 on mcb0
Response from node 0 on mca0
Response from node 0 on mcb0
Response from node 2 on mca0
Response from node 2 on mcb0
mcb0 is offline ②

```

---

**Node 0 comes online third**

```

P00>>> mc_cable ①
mca0 node id 0 is online
Response from node 1 on mca0
NoResponse from node 2 on mca0
Response from node 3 on mca0
No Response from node 4 on mca0
No Response from node 5 on mca0
No Response from node 6 on mca0
No Response from node 7 on mca0
mcb0 node id 0 is online
Response from node 1 on mcb0
No Response from node 2 on mcb0
Response from node 3 on mcb0
No Response from node 4 on mcb0
No Response from node 5 on mcb0
No Response from node 6 on mcb0
No Response from node 7 on mcb0
Response from node 2 on mca0
Response from node 2 on mcb0
mcb0 is offline ②

```

```

No Response from node 6 on mcb0
No Response from node 7 on mcb0
Response from node 0 on mca0
Response from node 0 on mcb0
Response from node 2 on mca0
Response from node 2 on mcb0
mcb0 is offline ②

```

---

**Node 2 comes online fourth**

```

P00>>> mc_cable ①
mca0 node id 1 is online
Response from node 0 on mca0
Response from node 1 on mca0
Response from node 3 on mca0
No Response from node 4 on mca0
No Response from node 5 on mca0
No Response from node 6 on mca0
No Response from node 7 on mca0
mcb0 node id 1 is online
Response from node 0 on mcb0
Response from node 1 on mcb0
Response from node 3 on mcb0
No Response from node 4 on mcb0
No Response from node 5 on mcb0
No Response from node 6 on mcb0
No Response from node 7 on mcb0
mcb0 is offline ②

```

① Run **mc\_cable** on all nodes. Check that each system sees all nodes. In this example, each node comes online with both mca0 and mcb0 CCMAA adapters, and when all systems are running mc\_cable, all systems report response from all other CCMAA adapters in the cluster.

② Now, turn off the second hub, which should be connected to all CCMAA adapters in the second position, or the higher slot numbers reporting as mcb0. Each system should report that its own mcb0 is offline.

If any system reports an **mca0** as offline (instead of an mcb0), then this system has crossed rails. Switch the BC12N cables on the backplane of the system with crossed rails, restore power to the hub, and then turn it off again to check new cabling.

## 3.8 Prepare to Boot Your Operating System

---

**You have verified that all MC components report under diagnostics. Check your operating system requirements for any additional hardware devices it may require to be installed and console parameters that need to be set.**

---

### Example 3-6 Verification of AlphaServer 2100RM Configuration

```
P00>>> sho conf ❶
                Digital Equipment Corporation
                AlphaServer 2100 4/200

SRM Console V4.6-201   VMS PALcode V5.56-4, OSF PALcode X1.45-9

Component   Status   Module ID
CPU 0              P       B2020-AA DECchip (tm) 21064-3
CPU 2              P       B2020-AA DECchip (tm) 21064-3
Memory 1          P       B2021-CA 128 MB
Memory 3          P       B2021-BA 64 MB
I/O
                B2110-AAp
                dva0.0.0.1000.0   RX26/RX23
Slot Option      Hose 0, Bus 0, PCI
0  DECchip 21040-AA  ewa0.0.0.0.0   08-00-2B-E6-08-E5
1  NCR 53C810       pka0.7.0.1.0   SCSI Bus ID 7
                dka200.2.0.1.0   RZ28
                dka500.5.0.1.0   RRD43
2  Intel 82375EB    Bridge to Bus 1, EISA
6  DEC PCI MC ❷     Rev: b, mca0 ❷
8  DEC KZPSA ❸     pkb0.0.0.8.0   SCSI Bus ID 0
                dkb100.1.0.8.0   RZ26
                dkb200.2.0.8.0   RZ26

Slot Option      Hose 0, Bus 1, EISA
8  Compaq Qvision
```

```

P00>>> set bus_probe_algorithm new      ④

P00>>> show version                      ⑤
version                                V4.6-201 Aug 15 1996 11:54:23

P00>>> boot                              ⑥

```

You have run the mc\_cable diagnostic to verify that the console program recognizes all installed MC components. If your operating system has additional hardware requirements, install and verify these components now. Refer to your operating system documentation for instructions.

- ① In this example, the **show configuration** command is run on an AlphaServer 2100 RM system with two CPUs and two memories.
- ② The system has one CCMAA adapter in slot 6. The console sees this adapter as mca0.
- ③ One KZPSA resides in slot 8. Digital UNIX requires a KZPSA adapter to run TruCluster.
- ④ For Digital UNIX, set bus algorithm to **new**.  
For OpenVMS: set bus algorithm to **old**.  
Additional environment variables may be set. See your operating system documentation and the *Software Product Description* for more information.
- ⑤ The **show version** command checks the console firmware level. This information also is at the beginning of the **show configuration** command.
- ⑥ To boot the operating system, enter **boot** or **b** at the console prompt.

**For more information:**

TruCluster Software *Hardware Configuration*  
*Guidelines for OpenVMS Cluster Configurations*  
*Software Product Description*  
 Your *AlphaServer Owner's Guide*  
 Your operating system documentation and release notes





# Chapter 4

---

## Troubleshooting

This chapter describes basic MEMORY CHANNEL troubleshooting procedures. Topics covered include:

- Console Error Messages and Overview
- Troubleshooting with mc\_diag
- Troubleshooting with mc\_cable
  - Understanding mc\_cable
  - Changes Reported by mc\_cable
- Using Virtual Hub Mode to Troubleshoot
- Cable Troubleshooting
- CCMAA Troubleshooting Checklist
- Operating System Errors
- Boot Problems

***For more information:***

Your AlphaServer system's *User's Guide*  
Your AlphaServer system's *Service Information*

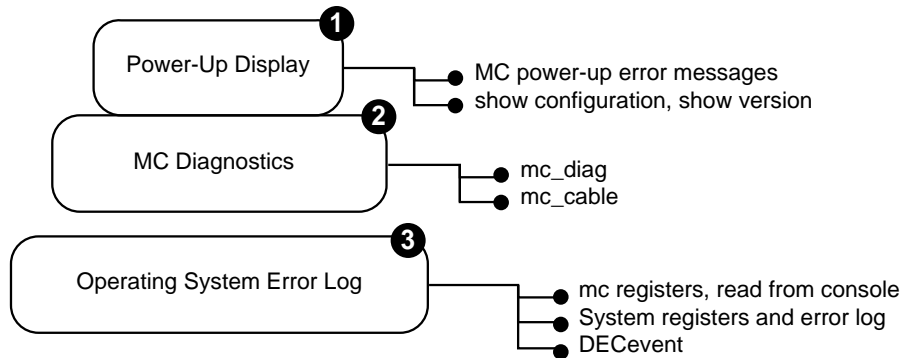
## 4.1 Console Error Messages and Overview

---

In addition to the physical installation of the hardware, you can check three main areas where troubleshooting information is collected.

---

Figure 4-1 Troubleshooting Overview



bx-0844-96

### Example 4-1 Console Error Messages at Power-Up

```
①
*****
** Memory Channel hardware requirement ERROR # 1 **
** See release notes, or Memory Channel User's Guide **
*****

②
*****
** Memory Channel hardware requirement ERROR # 2 **
** See release notes, or Memory Channel User's Guide **
*****

③
*****
** Memory Channel hardware requirement ERROR # 3 **
** See release notes, or Memory Channel User's Guide **
*****
```

### 4-2 MEMORY CHANNEL User's Guide

Three levels of troubleshooting information are available:

- ① At power-up, the console checks the hardware revision levels of the system required for MC clusters. If the system hardware does not support MC clusters, the console will report one of three error messages. Internal test of MC module logic is not done during power-up. Contact your local Digital Customer Support Service Center.
  - ① **For AlphaServer 2000/2100:** An upgrade is needed. Contact your local Digital Customer Support Service Center.
  - ② **For AlphaServer 8200/8400:** In a DWLPA, CCMAA adapters must be installed in PCI slots 0 through 7. No slot restrictions in the DWLPB. Under Digital UNIX with multi-channel configurations, both CCMAA adapters must be in the same DWLPA/DWLPB card cage. Under OpenVMS with multi-channel configurations, only one CCMAA adapter may be in a DWLPA. You may have two CCMAAs in a DWLPB, one in a DWLPA and one in a DWLPB, or one CCMAA adapter in each of two DWLPAs. If the error message persists, an upgrade is needed. Contact your local Digital Customer Support Service Center.
  - ③ **For AlphaServer 1000A/2100A:** Check your CCMAA modules. They must be installed before the bridge.

The **show configuration** console command can be used to confirm that the CCMAA modules are reporting to the system console. The **show version** command reports the installed console firmware revision level.

- ② The MC diagnostics, **mc\_cable** and **mc\_diag**, check most of the logic of the MC hardware. These two diagnostics are invoked only at the system console and do not execute during power-up. See Section 4.2, Troubleshooting with mc\_diag, and Section 4.3, Troubleshooting with mc\_cable.

The diagnostics check the cables (see Section 4.5, Cable Troubleshooting). And by changing your mode from standard to virtual hub, you can troubleshoot components. See Section 4.6, CCMAA Troubleshooting.

- ③ Registers specific to MC can be read from console level, and these registers report errors in the system error log. Each operating system supporting MEMORY CHANNEL has an error log. DECEvent is designed for Digital field service to analyze the system error log. See Section 4.7, Operating System Errors.

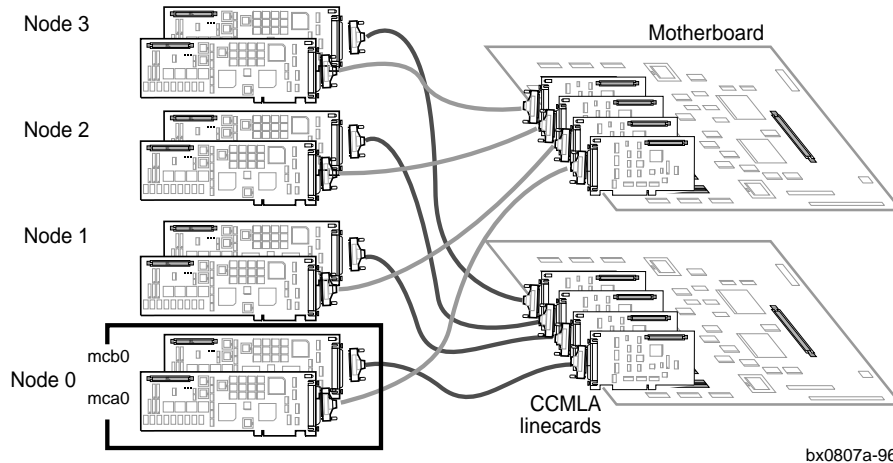
## 4.2 Troubleshooting with mc\_diag

---

**Mc\_diag tests the internal logic of the CCMAA adapter up to the connector. On a system in a multi-channel configuration, mc\_diag tests both CCMAA adapters in the system. Error messages indicate replacement.**

---

**Figure 4-2 Troubleshooting the CCMAA Adapter with mc\_diag**



### Example 4-2 Errors with mc\_diag

```
P00>>> init
P00>>> mc_diag
Testing MC-Adapter(s)
Adapter mca0, Passed ❶
```

#### Possible error messages

```
Adapter mcb0 failed T-33 ❷
Adapter mcb0 failed T-12 ❷
```

#### Possible error in entering command

```
P00>>> run mc_diag ❸
loading ARC firmware
```

The `mc_diag` diagnostic tests all CCMAA adapters in a system. In this example, two CCMAA adapters are tested, and the second CCMAA fails.

- ❶ The first CCMAA adapter on this node passed the internal logic tests and reports to the console. If an installed CCMAA does not report here, assume the console does not see it and check installation (see Section 4.6, CCMAA Troubleshooting).
- ❷ These error messages indicate that the CCMAA noted failed the internal logic tests. If you receive either error message, replace the failing adapter.
- ❸ Here, the command was entered incorrectly. The word **run** should not have been entered. The system will hang while it looks for an ARC utility.

If you enter `mc_diag` and the console prompt returns with no written response at all, the CCMAA adapter is not reporting. Check the adapter's physical installation, its seating in the PCI, the cable connections, and run the diagnostic again.

## 4.3 Troubleshooting with mc\_cable

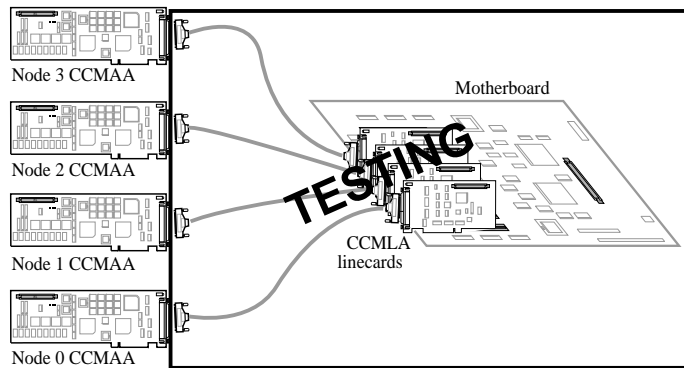
### 4.3.1 Understanding mc\_cable

---

The `mc_cable` diagnostic reports changes in cluster status as they occur, and it continues to run until halted using `Ctrl/C (^C)`. Run it on all nodes at the same time.

---

**Figure 4-3 Testing the Cables, Hub Linecards, and Motherboard**



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#### Example 4-3 Running mc\_cable on Node 1

```
P00>>> init
P00>>> mc_cable
```

To exit MC\_CABLE, type <CTRL/C>

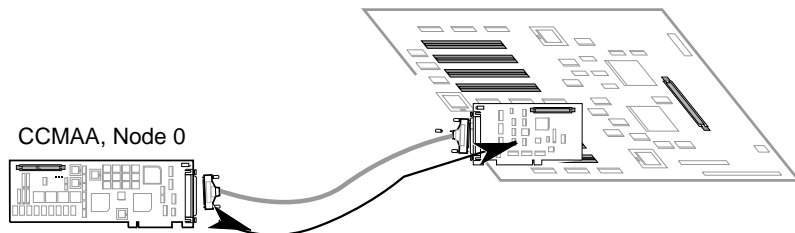
```
mca0 node id 0 is online ❶
No Response from node 1 on mca0
No Response from node 2 on mca0
No Response from node 3 on mca0
No Response from node 4 on mca0
No Response from node 5 on mca0
No Response from node 6 on mca0
No Response from node 7 on mca0 ❷
mcb0 node id 0 is online ❸
Response from node 3 on mca0
```

#### 4-6 MEMORY CHANNEL User's Guide

The diagnostic runs first through all the mca0 connections, and then moves to check all the mcb0 connections. Next, it reports any change states that have occurred since the first polling of the CCMAA adapter paths.

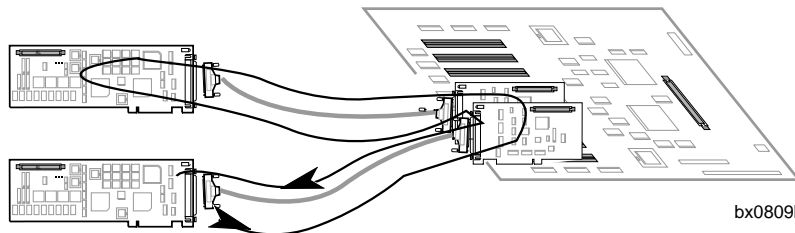
If the node cannot go online and **mc\_cable** hangs, first check the jumper positions. The CCMAA adapters may not be set for the correct hub mode. Next, move the cable to another CCMAA on another node and see if this CCMAA can come online. If not, replace the cable.

- 1 The first (mca0) CCMAA adapter on node 0 reports online. At this point, the diagnostic has run through the CCMAA adapter, and tested the cable and the linecard. The diagnostic has checked that the CCMAA signal can reach the hub or the virtual hub mode partner node. So far, no response has been received from another node.



bx0809a-95

- 2 Next, the diagnostic looks for other nodes that are online running mc\_cable. It checks each CCMLA linecard position on the motherboard and reports if a CCMAA can be reached. Expect to receive notice that other nodes are not yet responding when you first start mc\_cable. As other nodes join, notice of their reporting is given. When other nodes respond, the data is flowing through the MC hardware as shown below.



bx0809b-95

- 3 Now the diagnostic checks the second adapter, if present, and all of its connections in the multi-channel cluster.

## 4.3.2 Changes Reported by mc\_cable

---

**When all components have reported, mc\_cable will report any changes in the cluster status.**

---

### **Example 4-4 Change States Reported by mc\_cable**

```
mca0 is offline           ❶  
mca0 node id 0 is online ❷  
Response from node 3 on mca0 ❸  
No Response from node 3 on mca0 ❹
```

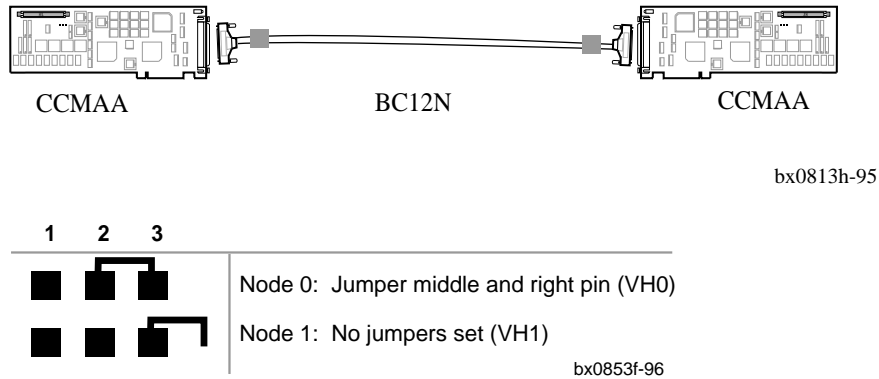


- ❶ Here, node 0's CCMAA mca0 adapter has gone offline but mc\_cable continues to run, listening for MC cluster status. The connection has been lost between the CCMAA adapter and the CCMHA hub.
  - Check that the hub has power.
  - Check the cable connections.
  - Check the cable connector pins.
- ❷ Node 0's CCMAA mca0 adapter has come back online. Mc\_cable reports its presence.
- ❸ When an adapter running mc\_cable goes offline and then comes back online, it re-polls its cluster to see what nodes are reporting. Here, node 3's response is reported again by node 0 when node 0's CCMAA mca0 adapter comes back online.
- ❹ Node 3 has stopped reporting. Possible condition is that node 3's mc\_cable was halted.

## 4.4 Using Virtual Hub Mode to Troubleshoot

**In a standard hub mode, to isolate problems with hardware, change the jumpers on the CCMAAs you wish to test and cable them in virtual hub mode.**

Figure 4-4 Troubleshooting in Virtual Hub Mode



Example 4-5 Running mc\_cable in Virtual Hub Mode

Node 0, VH0 comes online first	Step	Node 1, VH1 comes online second
P00>>> init	<b>1</b>	P00>>> init
P00>>> mc_cable	<b>2</b>	
mca0 node id 0 is online	<b>3</b>	
No Response from node 1 on	<b>4</b>	
mca0	<b>5</b>	P00>>> mc_cable
Response from node 1 on mca0	<b>6</b>	mca0 node id 1 is online
	<b>7</b>	Response from node 0 on mca0
	<b>8</b>	mca0 is offline
^C		^C

With a standard hub system of three or more nodes, you can check cluster components by switching two of the nodes to a virtual hub configuration and running the `mc_diag` and `mc_cable` diagnostics. This eliminates the hub and tests both adapters and cables, allowing you to isolate problems more completely.

You must change the CCMAA jumpers when changing between standard and virtual hub mode.

- ❶ Enter an **initialize** command to clear the registers on both systems.
- ❷ Enter **mc\_cable** on node 0.
- ❸ The CCMAA adapter on node 0 immediately reports online. The diagnostic has checked that the CCMAA signal can reach the virtual hub mode partner, node 1. So far, no response has been received because node 1 is not yet online running the `mc_cable` diagnostic.
- ❹ Expect to receive notice on node 0 that the other node is not yet responding when you first start `mc_cable`. Proceed to node 1 and enter **mc\_cable**.
- ❺ When node 1 comes online running `mc_cable`, notice of its response is given to node 0.
- ❻ Node 1 receives response back from node 0. The data is flowing through the MC hardware and all components are verified.
- ❼ Entering a Ctrl/C on node 0 results in node 1's `mca0` CCMAA adapter reporting offline.
- ❽ Entering a Ctrl/C on node 1 stops `mc_cable` on this node. No notice is given on node 0 because it is already offline.

If node 1 does not report, replace the cable and try again.

If the diagnostic still does not run successfully, reset the jumpers and connect to another CCMAA adapter and run it again. A failure here suggests that node 0's CCMAA is at fault and needs to be replaced. Contact your local Digital Customer Support Service Center.

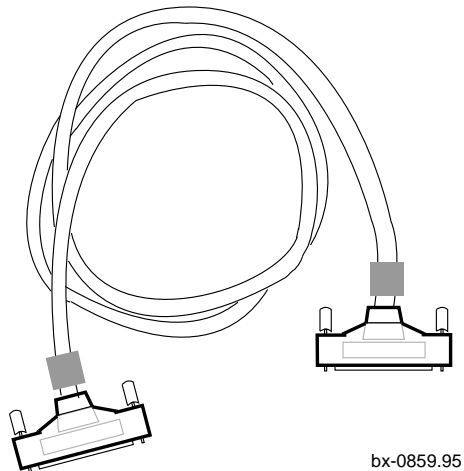
## 4.5 Cable Troubleshooting

---

Cable function is tested by `mc_cable`. Cable errors can be introduced through improper handling of the cable pins.

---

**Figure 4-5 BC12N Cable**



Cables are functioning correctly when the `mc_cable` diagnostic runs without errors (see Section 4.3, Troubleshooting with `mc_cable`).

The 100 pins on the connectors can be bent by improper handling. Rocking the connector across its shortest axis may cause the pins to bend, and bent pins can result in improper signals or grounding, which can cause errors.

- Inspect the cable connections for bent pins.
- Check that the connectors are firmly connected to their receptacles with the screws tightened. Loose connections can also cause intermittent errors.
- Check system positions for pulling on the cables. The cables can be taut but not tight between connections.

## 4.6 CCMAA Troubleshooting Checklist

Typical troubleshooting conditions are listed with suggested action and where to find the instructions in this manual.

CCMAA is functioning correctly when both LEDs blink on during module reset. Prior to going online, in virtual hub mode, both LEDs are off. In standard mode, the Hub OK LED is amber, and the CCMAA LED is off.

Symptom	Suggested Action	Section
Does not report to console	<ul style="list-style-type: none"> <li>Reseat the adapter, or place it in another PCI slot. If it still does not report, replace the CCMAA adapter.</li> </ul>	2.4
Does not report online to mc_cable	<ul style="list-style-type: none"> <li>Jumpers must be set for the hub mode used.</li> <li>Check jumper positions.</li> <li>Check cable.</li> <li>Check power to CCMHA hub; it may be off.</li> <li>Check seating of module in PCI.</li> <li>Virtual hub mode:               <ul style="list-style-type: none"> <li>Run mc_cable on the other node.</li> </ul> </li> <li>Multi-channel configuration:               <ul style="list-style-type: none"> <li>Check for crossed rails.</li> </ul> </li> </ul>	2.3 4.5 2.5 2.4 3.5 3.7
Does not respond to mc_cable running on another node	<ul style="list-style-type: none"> <li>Check jumpers on all CCMAA adapters. Must be in correct hub mode.</li> <li>Check cable connection; make sure the cable is attached finger-tight.</li> <li>Check the cable by moving it to a different linecard and running mc_cable again.</li> <li>Change to virtual hub mode and check the cable.</li> <li>Not screwed into the PCI bulkhead tightly enough. The module must be seated firmly to make a good connection.</li> <li>Check cables.</li> </ul>	2.3 4.5 4.5 4.4 2.4 4.5
Reports intermittently	<ul style="list-style-type: none"> <li>An internal logic failure. Replace adapter.</li> <li>Check the CCMAA jumpers for correct setting.</li> </ul>	2.4 2.3
Fails mc_diag	<ul style="list-style-type: none"> <li>Check the cable connections and pins</li> <li>Check the LED on the CCMLA linecard.</li> </ul>	4.5 2.7
HUB OK LED off standard hub mode	<ul style="list-style-type: none"> <li>Reseat CCMAA in PCI slot.</li> <li>Remove cable; if LEDs stay on and not blinking, replace CCMAA adapter.</li> </ul>	2.4 2.7
Both LEDs stay amber after power-up		

## 4.7 Operating System Errors

Errors may be detected by the operating system. In that case, consider the following:

- MC errors logged to event logger.
- Fatal errors will cause the node to go offline.
- Other nodes will detect the failing node and log the event.
- Check the error logs from all nodes in the cluster.

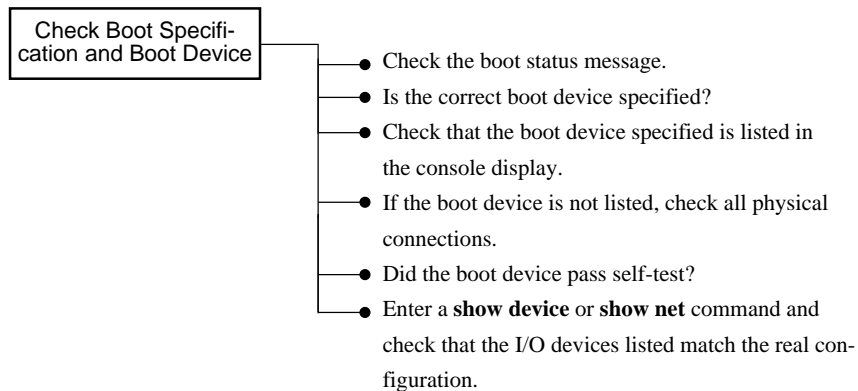
## 4.8 Boot Problems

---

**Check your system user's guide and your operating system manual for full booting information. A basic troubleshooting checklist is given here.**

---

If there are problems booting, troubleshoot as follows:



BX0527-94

Check your operating system error log for further information.

***For more information:***

*MEMORY CHANNEL Service Information*

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