
Educational Services



MS650-AF/PF/BH/BJ
MOS Memory Option
Installation Guide
EK-MS650-IN-005

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About This Guide

This installation guide provides step-by-step instructions for installing the MS650-AF, MS650-BF, MS650-BH or MS650-BJ memory option kit in a BA200/BA430 series microsystem enclosure. The kit is designed for use in BA200 or BA430 series enclosure only.

Intended Audience

This document is intended only for qualified self-maintenance customers who have purchased a microsystems maintenance kit or for Digital Services personnel.

For the Self-Maintenance Customer

If you are not qualified to perform the installation of the MS650 memory option kit, call Digital Services to schedule an installation.

CAUTION

If you install the MS650-AF, MS650-BF, MS650-BH or MS650-BJ option kit yourself, make sure you are wearing an antistatic wrist strap connected to a grounded antistatic work surface before you handle any modules. The system modules can be damaged by static discharge.

Also make sure the bus grant continuity path is intact after the installation. There cannot be any empty backplane slots between modules.

To install the MS650-AF, MS650-BF, MS650-BH or MS650-BJ option kit, first read the Configuration information provided in Chapter 2 then carefully follow the installation procedure in Chapter 3. If you have problems performing the installation, refer to the FRU isolation procedures outlined in Chapter 4 and see the appropriate *Systems Maintenance Guide* for testing and troubleshooting procedures. If you still have problems, call Digital Services for assistance.

For Digital Services

Take precautions against static when unpacking and installing the module. Use the groundstrap and antistatic mat found in the Static-Protective Field Service Kit (PN 29-26246-00). The antistatic kit is part of the Field Service Tool Kit, not the option kit.

Warnings, Cautions, and Notes

Warnings, cautions, and notes appear throughout this guide. They have the following meanings.

Warnings	Provide information to prevent personal injury.
Cautions	Provide information to prevent damage to equipment or software.
Notes	Provide general information about the current topic.

Related Documents

Table 1 Related Documentation

Document	Order Number
MicroVAX Systems Maintenance Guide ¹	EK-001AA-MG
MicroVAX 3500 and MicroVAX 3600 Systems Maintenance Update ¹	EK-159AA-UD
MDM User's Guide	AA-FM7AB-DN
DECSYSTEM 5400 TECH INFO	EK-323AA-TI
KN210 CPU Module Set System Maintenance	EK-329AA-MG
MicroVAX 3300 Tech Info	EK-020AA-IS
MicroVAX 3400 Tech Info	EK-163AA-IS
KA640 CPU System Maintenance	EK-179AA-MG
MicroVAX 3500 Tech Info	EK-030AB-IS
MicroVAX 3600/3602 Tech Info	EK-035AB-IS
KA650 CPU System Maintenance	EK-180AA-MG
MicroVAX 3800/3900 VAXserver 3800/3900 Tech Info	EK-167AA-IS
KA655 System Maintenance Guide	EK-306AA-MG
VAX 4000 Model 200 Technical Manual	EK-396AA-TM
KA660 CPU System Maintenance	EK-398AA-MG

¹These documents are included in the MicroVAX Systems Maintenance Kit

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Product Description

1.1 MS650 Memory Options

There are four different MS650 memory options available. The MS650-AA/AF and MS650-BB/BH options are 8-MByte memory modules, the MS650-BA/BF is a 16-MByte memory module and the MS650-BC/BJ is a 32-MByte memory module. These modules are quad-sized "M-series" options designed for use in BA200/BA430 series enclosures. Table 1-1 lists all of the MS650 options and Table 1-2 lists the various applications of the memory options.

Table 1-1 MS650 Memory Options

Field Option	Capacity	Module Part Number	Base Option
MS650-AF	8MB	M7621-AA	MS650-AA
MS650-BH	8MB	M7622-BA	MS650-BB
MS650-BF	16MB	M7622-AA	MS650-BA
MS650-BJ	32MB	M7622-CA	MS650-BC

Table 1-2 MS650 Memory Option - System Applications

CPU	System	Memory Option			
		MS650-AA/AF	MS650-BB/BH	MS650-BA/BF	MS650-BC/BJ
KA640	MV3300 /3400	X	X	X	X
KA650	MV3500 /3600	X	X	X	X
KA655	MV3800 /3900		X	X	X
KA660	MV4000-200		X	X	X
KN210	DECstn5400		X	X	

Digital Equipment, in an effort to keep our product line current with leading edge technologies, are constantly reviewing and improving our product lines to provide you, our customer, the very best in value and product reliability. To this end, Digital Equipment has redesigned the MS650-BA/BF and MS650-BB/BH option to take advantage of the changing technology. These redesigned MS650 options can be mixed and matched with the original -BF/-BH options and are functionally equivalent.

1.2 MS650-AA/AF Description

The MS650-AA/AF (M7621-AA) is a quad-height module that provides 8 Mbytes of non-pagemode MOS memory. Memory is arranged in a 39 bitwide array, with 32 bits of data and 7 bits of error correction code (ECC). The MS650-AA/AF uses 256K dynamic RAMs (DRAMs) in a zigzag in-line packaging (ZIP) configuration. ZIP packaging allows twice as many DRAMs to be mounted on a circuit board as conventional DIP packaging.

NOTE

The MS650-AA/AF module only supports the KA640/KA650 CPUs.

1.3 MS650-BB/BH Description

The MS650-BB/BH (M7622-BA) is a quad-height module that provides 8 Mbytes of pagemode MOS memory. Memory is arranged in a 39 bitwide array with 32 bits of data and 7 bits of ECC. The MS650-BB/BH comes in two versions. The first version uses 78 1-Mbit DRAMs in surface mount packaging. The second version uses 20 4-Mbit DRAMs. Both versions contain 8 Mbytes, but the second version uses fewer components because of the higher density DRAM technology.

1.4 MS650-BA/BF Description

The MS650-BA/BF (M7622-AA) is a quad-height module that provides 16 Mbytes of pagemode MOS memory. Memory is arranged in a 39 bitwide array with 32 bits of data and 7 bits of ECC. The MS650-BA/BF comes in two versions. The first version uses 156 1-Mbit DRAMs in surface mount packaging. The second version uses 40 4-Mbit DRAMs. Both versions contain 16 Mbytes but the second version uses fewer components because of the higher density DRAM technology.

1.5 MS650-BC/BJ Description

The MS650-BC/BJ (M7622-CA) is a quad-height module that provides 32 Mbytes of pagemode MOS memory on a single card. Memory is arranged as two 39 bitwide arrays consisting of 32 bits of data and 7 bits of ECC. The MS650-BC/BJ uses 80 4-Mbit DRAMs.

NOTE

The Memory architecture is such that the MS650-BC/BJ 32Mbyte memory option appears to a CPU as two individual MS650-BA/BF (16Mbyte) options occupying 2 backplane slots.

NOTE

The MS650-BC/BJ is *not* supported in the DECsystem 5400.

CAUTION

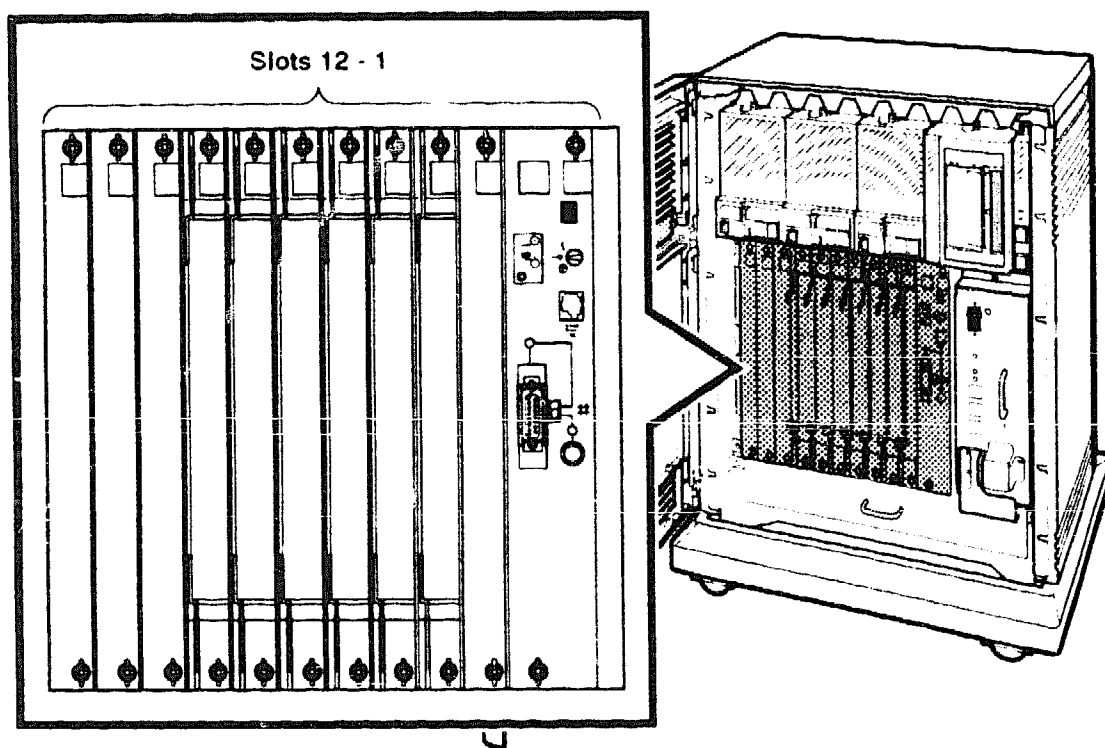
MS650-BC/BJ options may cause misleading memory configuration reports and/or incorrect Field Replaceable Unit (FRU) reports by diagnostics or Error Reporting Facility (ERF). Refer to *Chapter 4* for more details.

1.6 System Enclosures for MS650 Installation

The MS650 memory option installs in BA400 and BA200 series system enclosures. Figure 1-1 shows an example of a BA400 series system enclosure.

1.6.1 BA400 Series System Enclosure

Figure 1-1 BA400 Series Enclosures



MLO-005503

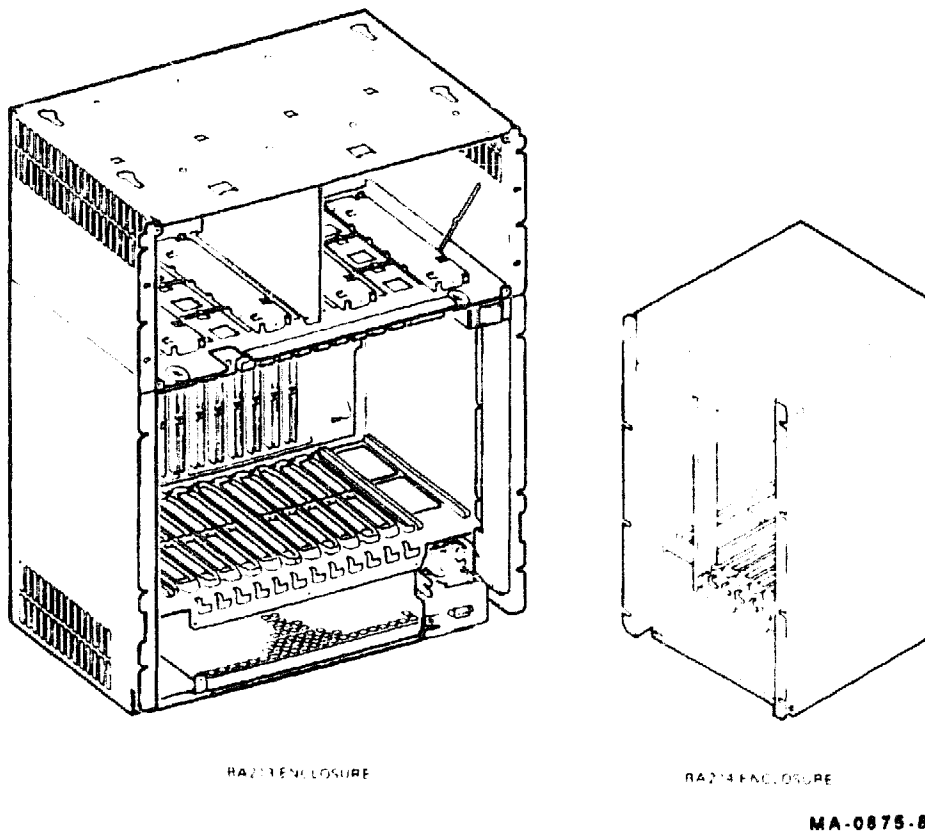
1.6.2 BA200 Series System Enclosure

This section describes the BA200 series enclosure.

The BA200 series enclosure has a 6- or 12-slot Q-CD bus backplane.

Figure 1-2 shows the 12-slot BA213 and the 6-slot BA214 enclosure chassis. The BA213 has two modular power supplies, and the BA214 has one power supply.

Figure 1-2 BA200 Series Enclosures



The backplane implements the Q-CD bus on the AB rows of each slot. The CD interconnect is implemented on the CD rows of each slot. Fixed disk drives face the rear of the enclosure, providing easy access to the drive signal and power cables. A TK tape drive faces the front of the enclosure.

The major difference between the BA200 series enclosure and other microsystem enclosures is the way you connect external devices to the system. Modules in the BA200 series enclosure connect directly to external devices through I/O connectors on the module handles. Other enclosures require an insert panel and internal cabling between the option module and the device.

There are two main differences between the modules used in the BA200 series enclosure and the modules used in the other microsystem enclosures.

- Option modules with external I/O connectors have attached bulkhead handles. These handles replace the insert panels and internal cabling found in the BA23 and BA123 enclosures.
- Non-I/O modules (such as memory modules) have blank bulkhead covers.

In addition, BA200/BA430 series enclosures use a special I/O connecting cover that fits over the CPU module and the first memory module. The cover has a ribbon cable that plugs into the console SLU and power-up configuration connectors on the CPU.

The module handles and blank covers form an electrical seal that complies with regulations for electromagnetic interference (EMI) for (1) keeping radio frequency interference generated by the system in the enclosure, and (2) keeping external radio frequencies from entering the enclosure. The module handles and blank covers also help guarantee proper airflow.

For more information: See the appropriate *Systems Maintenance Guide* to learn more about BA200/BA430 series enclosures.

2

MS650 Configuration

2.1 Overview

As indicated in Table 1-2, the MS650 memory options are used in a variety of MicroVAX, VAX, and DECsystem enclosures. It is important to note that not all systems support all MS650 memory options. This chapter will outline the valid configuration possibilities.

2.2 Configuration Rules

Consider these three important rules when configuring the MS650 memory options:

1. The *maximum* amount of memory supported is **64 MBytes**.
2. The number of available memory slots in the system enclosure (may be 2, 3 or 4).
3. The number of *board equivalents* installed must not exceed 4
Section 2.4.

Rule 1 is an architectural limit for the MicroVAX/MS650 design which is 64MBytes of physical address space. *Rule 2* depends on the system enclosure and the number of memory slots available. This varies from system to system. The board equivalent rule, *rule 3*, is explained in more detail in Section 2.4. This rule applies to KA640-based systems (MicroVAX 3300/3400) as well as systems with the 32-MByte MS650-BC /BJ installed.

Figure 2-1 outlines the various memory configurations available. This chart takes into consideration all of the previous configuration rules. To use the chart, first select your system type along the top axis; then determine the number of 32-Mbyte MS650-BC/BJ options to be installed. The intersecting box will provide the configuration guideline.

Figure 2-1 MS650 Configuration Guidelines

MS650 Memory Configuration Guidelines

Number of 32MB MS650-BJs Installed	CPU/System Type and Number of Memory Slots Available		
	KA640 - MV3300/3400 (3 Memory Slots)	MV3500 / 3600 / 3800 / 3900, VAX4000-200, DECsys5400 (3 Memory Slots)	(4 Memory Slots)
0	Install any combination of 8MB and/or 16MB modules up to a maximum of 3 modules 4MB to 52MB	Install any combination of 8MB ¹ and/or 16MB modules up to a maximum of 3 modules 8MB to 48MB	Install any combination of 8MB ¹ and/or 16MB modules up to a maximum of 4 modules 8MB to 64MB
1	Install one 32MB module ² and up to 1 additional 8MB or 16 MB module 36MB to 52MB	Install one 32MB module ² and up to 2 additional 8MB ¹ or 16 MB module(s) 32MB to 52MB	Install one 32MB module ² and up to 2 additional 8MB ¹ or 16 MB module(s) 32MB to 64MB
2	Not recommended as only 1/2 of the second 32MB module will be utilized by the system. 52MB	Install two 32MB modules and nothing else for a maximum configuration of 64 MB 64MB	Install two 32MB modules and nothing else for a maximum configuration of 64 MB. 64MB

FootNotes: ¹ The 8MB MS650-AA/AF (M7621-AA) cannot be used in the MV3800/3900/4000-200 systems

² The 32MB MS650-BC/BJ (M7622-CA) must be installed as the last memory module (furthest from CPU)

2.3 Module Placement

The MS650 Memory Options are installed in the allocated memory option slots in the Q/CD backplane. MS650 modules connect to the CPU through a 50-pin cable and the MS650 private memory interconnect (PMI) (the CD section of backplane slots 1 through 3,4 or 5 in the BA200/BA430 series enclosures). The cable connects the CPU to the corresponding J connector(s) on the MS650 module(s).

MS650 Memory modules are installed in the backplane slots directly adjacent to the CPU module (to the left of the CPU module, viewing the backplane from the module side).

The memory modules must be installed in *contiguous* backplane slots (no empty slots between memory modules). Furthermore, there should be no empty backplane slots between the memory and other options.

The 32-MByte MS650-BC/BJ (M7622-BC) module must be installed as the memory module furthest from the CPU module.

2.4 Board Equivalent Configuration Rule

The architecture of the MS650 and its supporting CPU processors is such that it will support a maximum of 4 *board equivalents*. A board equivalent is a term used to describe a section of memory which is equivalent to a single board. Each memory option is assigned a board equivalent. In addition, the KA640 CPU module, which contains 4-MByte of memory *on board*, is also assigned a board equivalent. The following table lists the various options and their relative board equivalents.

Table 2-1 Board Equivalent

Option	Capacity	Board Equivalent
KA640 CPU	4-MByte	1
MS650-AA/AF	8-MByte	1
MS650-BA/BF	16-MByte	1
MS650-BB/BH	8-MByte	1
MS650-BC/BJ	32-MByte	2

Given the architectural limit of 4 board equivalents per system, and the information provided in Table 2-1, you can determine valid configurations.

Example 1

A MicroVAX 3300 system with a KA640 CPU (4-MByte on-board) and one MS650-AA/AF (8-MByte module) wants to add-on two additional 8-Mbyte MS650-BB/BH modules. The existing configuration (KA640 and MS650-AA/AF) totals 2 board equivalents and the add-ons (2 MS650-BB/BH modules) total 2 more for a grand total of 4 board equivalents. This is a valid configuration (Table 2-1).

Example 2

A MicroVAX 3800 system with a KA655 CPU and one 16-MByte MS650-BA/BF and two 8-MByte MS650-BB/BH modules wants to add-on a 32-MByte MS650-BC/BJ. The existing configuration totals 3 board and equivalents and the proposed MS650-BC/BJ would bring the total to 5 board equivalents which is invalid. In this case, the best option would be to install the add-on 32-MByte MS650-BC/BJ with the 16-MByte MS650-BA/BF and only one of the 8-MByte MS650-BB/BH modules (for a total memory capacity of 54 MBytes).

3

Installation

This chapter provides step-by-step procedures for unpacking, inspecting, and installing the MS650-AF, MS650-BF, MS650-BH or MS650-BJ memory option kit in a system enclosure. Figure 3–1 provides a step-by-step overview of the installation process.

WARNING

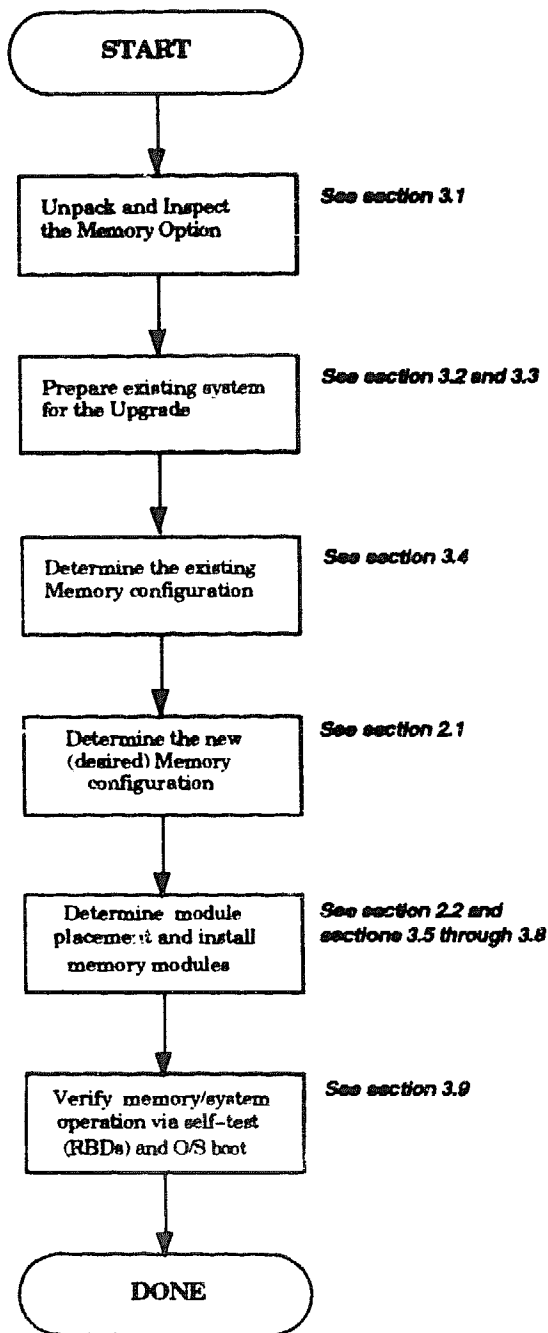
The following installation instructions provide specific directions for the safe installation of the module kit. To protect yourself from possible shock or energy hazards, do not try to access or disassemble parts of the equipment other than those specified. Refer other servicing to qualified personnel.

3.1 Unpacking the Option Kit

Unpack the shipment and check the contents as follows. If any item is missing or damaged:

- contact the customer's sales representative.
 - contact the customer's delivery agent.
1. Look for external damage on the shipping container, such as dents, holes, or crushed corners.
 2. Do not dispose of the packing material until you have installed the module and tested the system successfully.

Figure 3-1 MS650 Installation Process



3. Put on your antistatic wrist strap. Attach the alligator clip to the metal chassis of the cabinet. Place the antistatic mat on your work surface. The ground strap has a snap that connects to the mat.

4. Use Table 3-1 to identify the contents of the MS650-AF, MS650-BF, MS650-BH or MS650-BJ option kit. The numbers in the left column of the table correspond to the numbered items in Figure 3-2.

If you have only a 5-drop CPU interconnect assembly (PN 17-01898-03), one end should always be connected to the CPU, and the other end should always be connected to a memory module. Otherwise, the connector acts as an antenna.)

Figure 3-2 MS650-AF/BF/BH/BJ Option Kit Contents

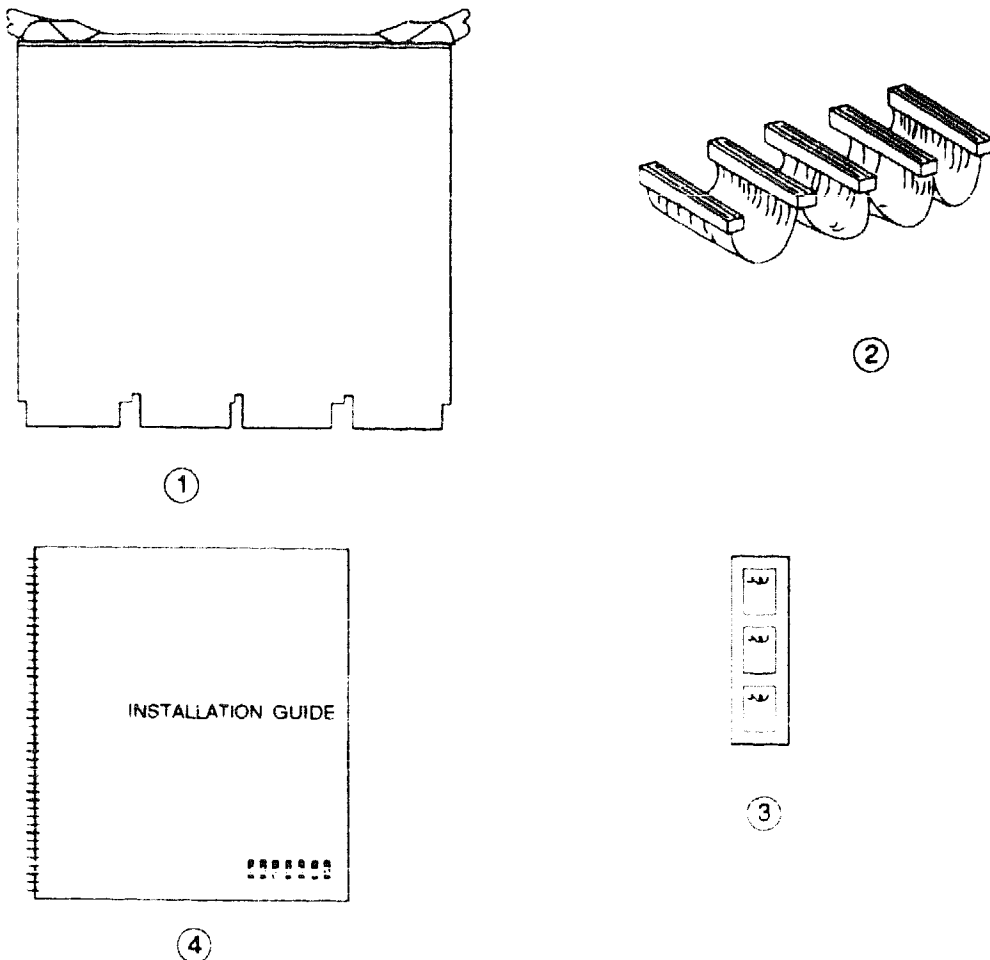


Table 3-1 MS650-AF/BF/BH/BJ Option Kit Checklist

	Part Description	MB	Part Number
①	MS650-AA memory module	8 MB	M7621-AA ¹
	MS650-BA memory module	16 MB	M7622-AA
	MS650-BB memory module	8 MB	M7622-BA
	MS650-BC memory module	32 MB	M7622-CA
②	CPU interconnect cable assembly		17-01898-03 (5-drop) ²
③	Printed adhesive labels for modules		
	MS650-AF		36-26883-42
	MS650-BF		36-26883-43
	MS650-BH		36-26883-B8
	MS650-BJ		36-26883-C5
④	Installation guide		EK-MS650-IN

¹Used only on KA640, KA650

²Other CPU interconnect cable assemblies: 17-01898-01 (3-drop), 17-01898-02 (4-drop, used only on KA640, KA650)

NOTE

The option kit will contain only the label for the ordered option.

5. Remove the MS650 module from the antistatic bag.
6. Inspect the module for shipping damage. Carefully check for cracks, breaks, and loose components.

3.2 Software Backup and Operating System Shutdown

It is the customer's responsibility to perform a software backup and shut down the operating system software.

Make sure the customer has done this before you continue.

3.3 Testing the Existing System

You need to gain access to the system controls before you can test the existing system. Refer to the system documentation for procedures to help you gain access to the system controls. Test the existing system as follows.

1. Turn the ☐ power switch on (1).
2. Insert the MicroVAX Diagnostic Monitor (MDM) diagnostic tape cartridge into the tape drive. Set the break/enable switch to the enable position (up or dot inside circle). If the system is powered off, then set the power switch to the on (1) position. The system will run the power up tests. If the system is at the chevron (>>>) prompt, then press the restart/run button, the system will run the power up tests. Remember to reset the break/enable switch to the disable position (down or dot outside circle) after testing.
3. Test the existing system to make sure it is running properly. See the appropriate *Systems Maintenance Guide* for information on testing and troubleshooting. Chapter 3 of this guide also has information on testing and troubleshooting.
4. After the successful completion of the test, remove the tape cartridge and turn the ☐ power switch off (0). Unplug the ac power cord from the wall outlet.

CAUTION

Always remove the tape cartridge before turning power off.

3.4 Checking the Existing Configuration

CAUTION

Only qualified service personnel should remove or install modules.

Remove the appropriate panels to gain access to the modules installed in the backplane, using the procedures outlined in the designated *Systems Maintenance Guide* for the system enclosure (Table 1).

Determine the module number (or option type) of each memory module installed in the system. Use this information, along with the guidelines in Figure 2-1 to determine the desired memory configuration and module placement.

3.5 Configuring the MS650 Module

You do not set any jumpers or switches on the MS650 module. The memory address for the MS650 depends on the module's position in the backplane.

3.6 Relocating Modules

CAUTION

Only qualified service personnel should remove or install modules.

Install the new MS650 module in the slot to the left of the last memory module already installed. If that slot contains a grant continuity card, you must remove the card according to the procedure in Section 3.6.1. If the slot contains a module, you must relocate modules, keeping their original order in the backplane (Section 3.6.1 and Section 3.6.2).

Install memory modules in appropriately identified Q/CD slots. These will be slot 2 to 3, 4 or 5, depending on your system enclosure. If no memory modules are installed in any of these slots, you can use them for other modules.

3.6.1 Modules with Blank Covers

Use the following procedure to remove and install modules with blank covers.

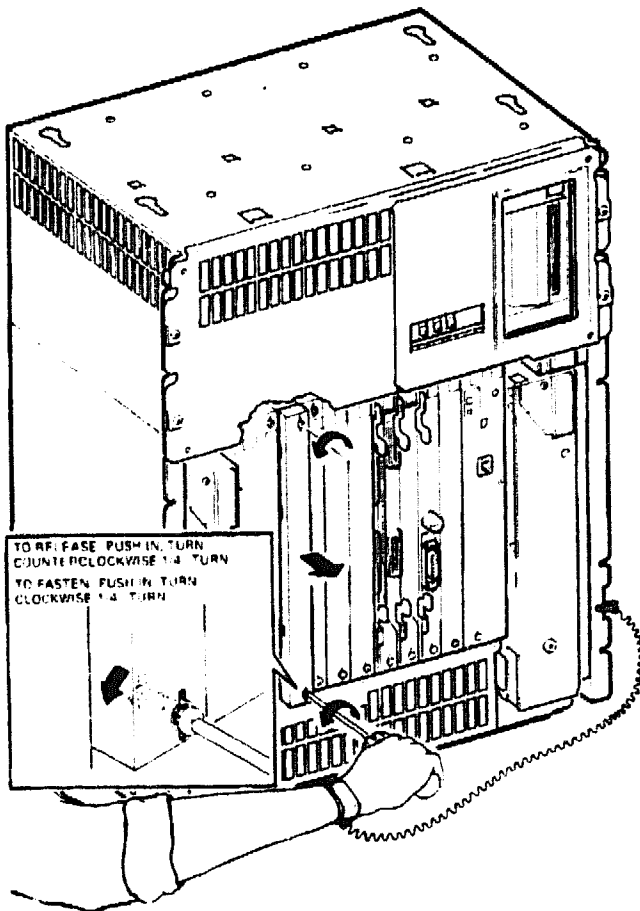
CAUTION

Make sure you are wearing a grounded antistatic wrist strap when you remove or install modules.

1. Release the two 1/4-turn captive screws that hold the blank cover to the card cage (Figure 3-3).
2. Pull the blank cover away from the card cage.
3. Note the orientation of any internal cables connected to the module. Some connectors are not keyed. Carefully label and disconnect the internal cables.
4. Unlock the module's release levers by simultaneously pulling up on the top lever and pulling down on the bottom lever. For a module with a plastic handle, pull out on the plastic handle.
5. Carefully pull the module out of the card cage. Be careful not to disturb any switchpacks on the module.
6. Inspect the EMI and EOS clips on the handle and on any gap fillers attached to the handle.

7. Install the module in its new location by reversing the steps in this procedure. Do not fasten the 1/4-turn screws yet⁺.

Figure 3-3 Releasing the Captive Screws



NOTE
THIS ILLUSTRATION SHOWS HOW TO RELEASE
CAPTIVE SCREWS ON ALL BLANK COVERS AND
BULKHEAD HANDLES

MA-0810-87

3.6.2 Modules with Handles

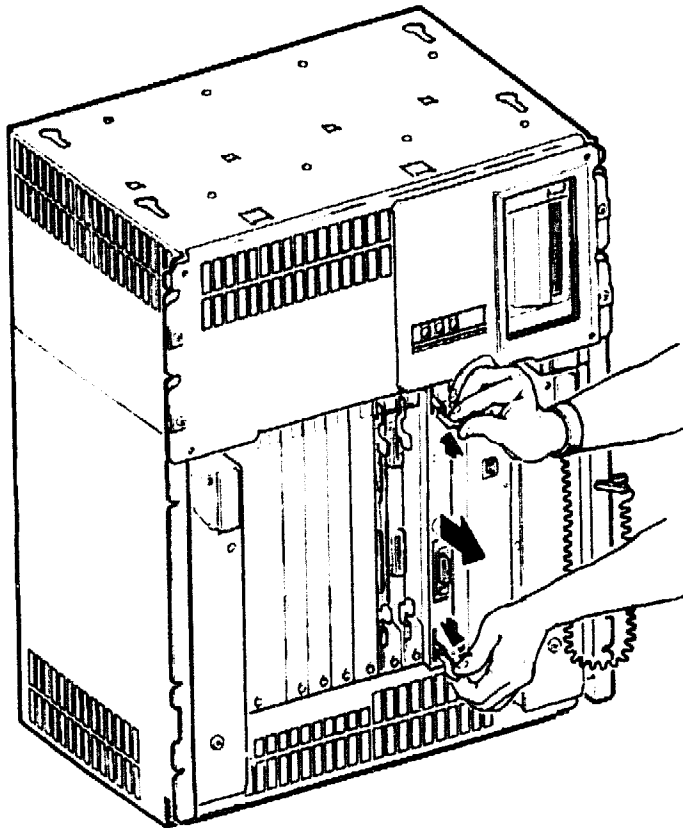
Use the following procedure to remove and install modules with handles.

CAUTION

Make sure you are wearing a grounded antistatic wrist strap when you remove or install modules.

1. Note the orientation of external cables connected to the module. **Carefully** label and then disconnect the cables.
2. Release the two 1/4-turn captive screws that hold the module's handle to the card cage (Figure 3-3).
3. Unlock the release levers by simultaneously pulling up on the top lever and pulling down on the bottom lever (Figure 3-4).
4. Pull out on the module's handle and remove the module from the card cage. Be careful not to disturb any switch packs on the module.
5. Inspect the EMI and EOS clips on the handle and on any gap fillers attached to the handle.
6. Install the module in its new location by reversing the steps in this procedure. Do not fasten the 1/4-turn screws yet.

Figure 3-4 Unlocking the Release Levers



NOTE
THIS ILLUSTRATION SHOWS HOW TO
UNLOCK RELEASE LEVERS ON ALL
MODULES WITH ATTACHED HANDLES

MA-0500-07

3.7 Installing the MS650 Module

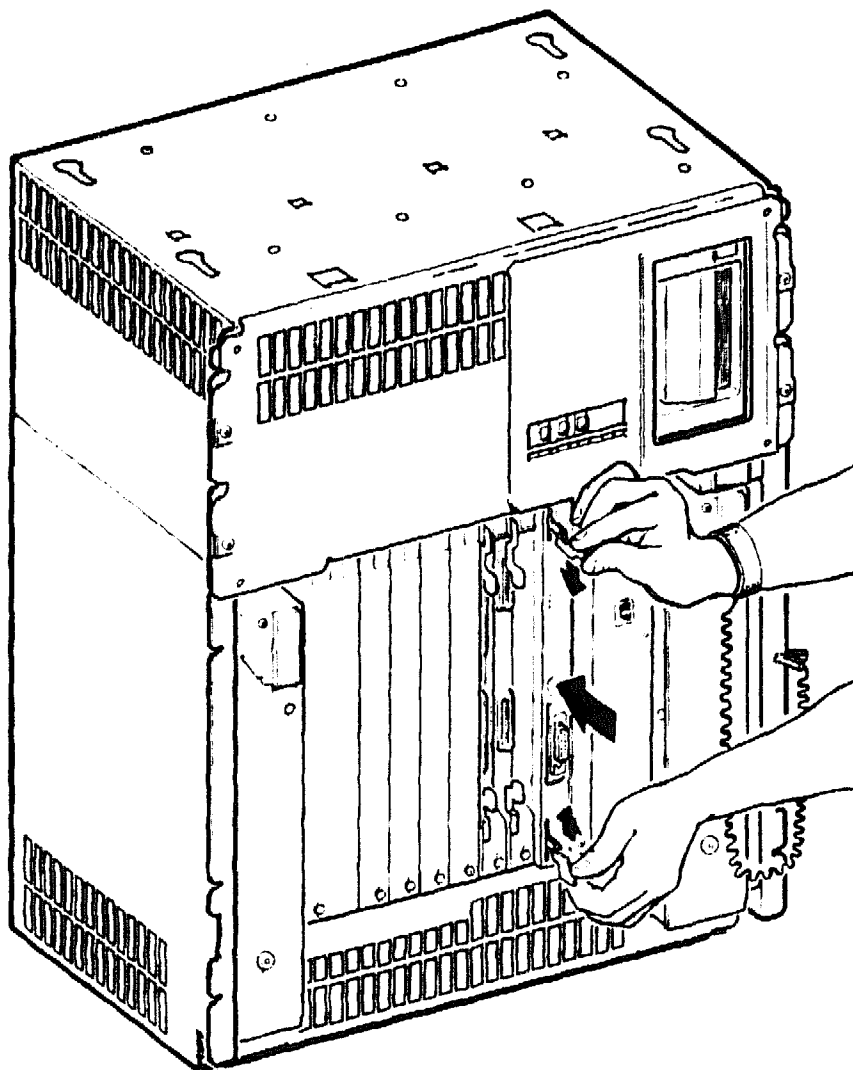
Install the MS650-AF (M7621-AA), MS650-BF (M7622-AA), MS650-BH (M7622-BA) or MS650-BJ (M7622-CA) module as follows.

1. Release the two 1/4-turn captive screws that hold the CPU cover to the card cage.
2. There will be one or two cables that connect the CPU cover to the CPU module in slot 1. Disconnect the cables from the CPU module.
3. Pull the CPU cover away from the card cage.
4. Remove the blank covers from all installed memory modules.
5. Remove the M9047 grant continuity card or other special-function module from the slot for the MS650 (Section 3.6).
6. Open the release levers on the MS650 you are installing.
7. Insert the MS650 in the slot to the left of the last memory module. Lock the module in place by simultaneously pushing down on the top release lever and pulling up on the bottom release lever (Figure 3-5).

NOTE

If a MS650-BJ module is used, it must be installed as the memory module *furthest* from the CPU module.

Figure 3-5 Locking the Release Levers



NOTE

THIS ILLUSTRATION SHOWS HOW TO LOCK
RELEASE LEVERS AND INSERT ALL MODULES
WITH ATTACHED HANDLES

MA-0580-87

8. An interconnect cable assembly connects the CPU module in slot 1 to the memory modules already installed.

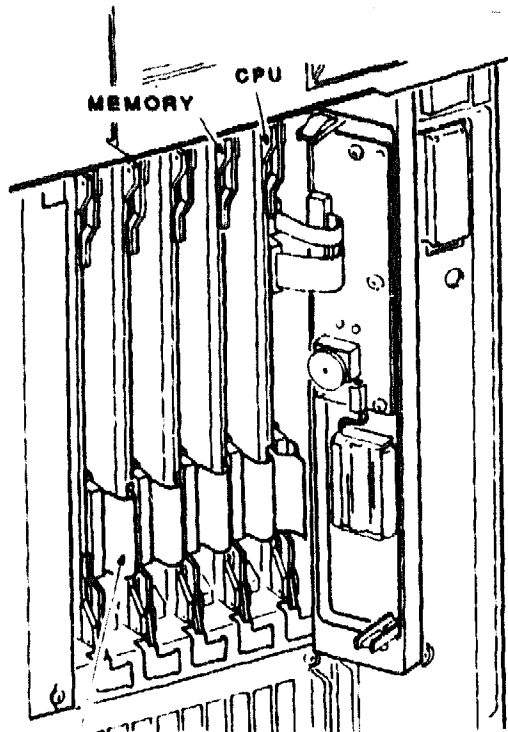
NOTE

If the total memory modules after this installation is two, continue using the cable assembly that comes with the system. Keep the new cable assembly for future use.

- a. Disconnect the interconnect cable assembly from the CPU and from the installed memory modules.
- b. Connect one end of the new cable assembly to the J3 connector on the CPU.
- c. Connect the new cable assembly to the J connector on each memory module (Figure 3-6).

The new cable assembly has connectors for four memory modules. If you have three memory modules, connect the end connector to the last memory module and leave one of the middle connectors open.

Figure 3-6 CPU/Memory Interconnect Cable



**CPU/MEMORY CABLE
(4 MEMORY MODULES SHOWN)**

MA-1342-87

9. To identify the module, place the **MS650-AF, MS650-BF, MS650-BH or MS650-BJ** module label (supplied in the option kit) in the depression at the top left of the blank cover.
10. Reconnect the two cables on the back of the CPU cover to the CPU module.
11. Reinstall the CPU cover.

CAUTION

If the CPU cover has a filler gap assembly (PN 70-24505-01) attached to the left side it must be removed or damage to the interconnect cable assembly will result from reinstalling the CPU cover.

12. Attach the blank covers for all memory modules to the card cage. Do not fasten the 1/4-turn captive screws yet.

3.8 Verifying the Ground Connections

When you install a module with a blank cover or flush handle next to a recessed-handle module, you *must* install a gap filler assembly (PN 70-24505-01) between the modules to meet FCC regulations. Without the gap filler, circuitry on the recessed-handle module is exposed. Each gap filler assembly includes one gap filler and two screws. Use as many of the assemblies as you need for your configuration. You may not need any.

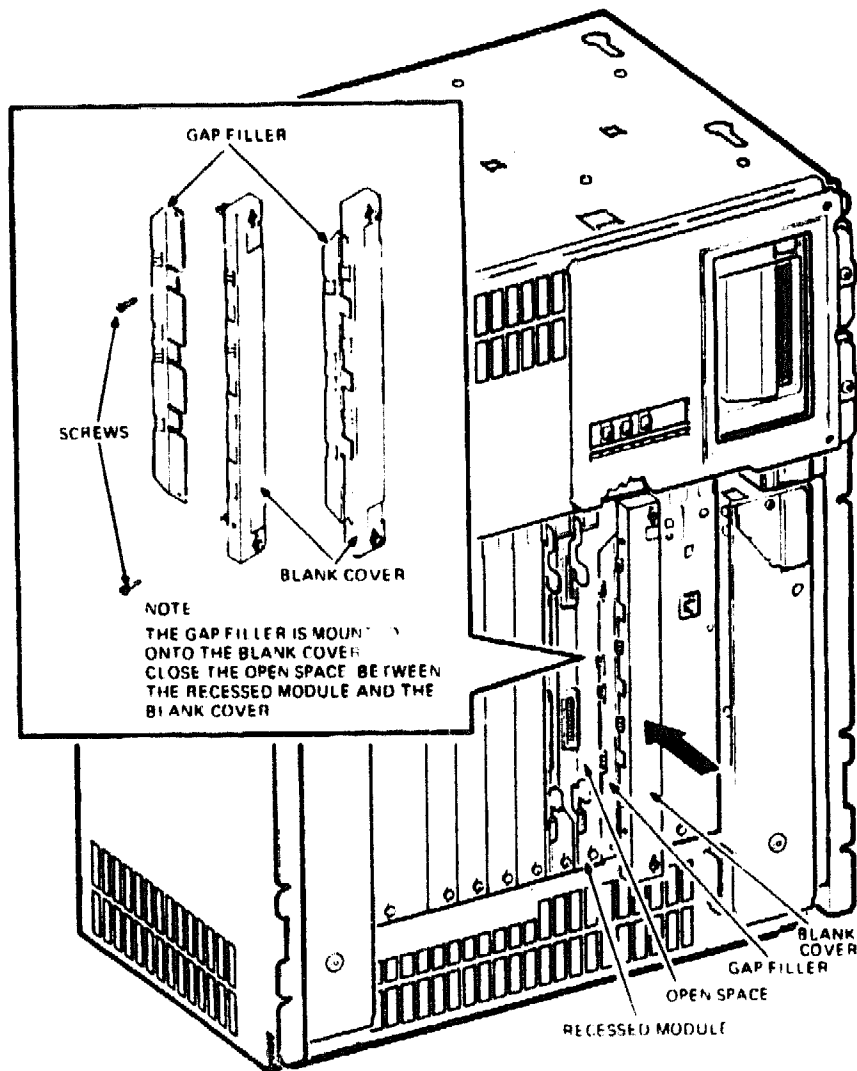
Check that the ground connections are correctly in place as follows.

1. Check the backplane to see if a recessed-handle module is next to a module with a blank cover or a flush handle.
2. If so, make sure a gap filler assembly is installed on the side of the blank cover or flush handle that is next to the recessed-handle module (Figure 3-7).

NOTE

There should not be any open spaces between the modules in the backplane.

3. If there are no open spaces, you do not need the gap filler assembly. Fasten the 1/4-turn captive screws on all handles and covers in the backplane.

Figure 3-7 Ground Connections

MA-0610-07

4. Install the gap filler assembly, if needed, as follows.
 - a. Fit the gap filler (PN 70-24505-01) onto the side of the blank cover or flush-handle module that is next to the recessed-handle module. Make sure the gap filler's tabs fit into the tab indentations on the blank cover or flush handle (Figure 3-8). Use the two screws that

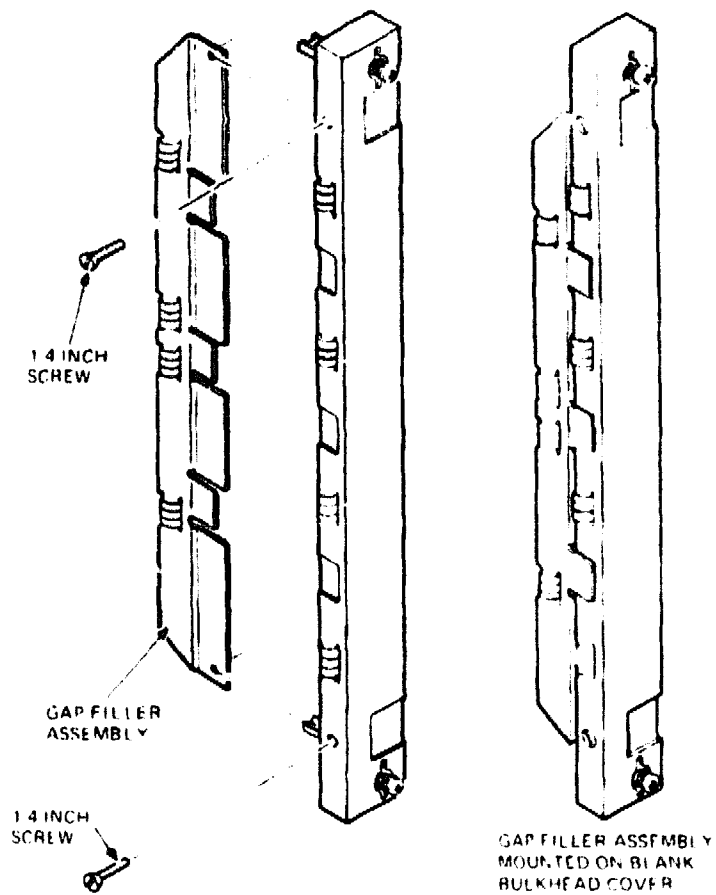
come with the assembly to attach the gap filler at the top and bottom.

- b. If you have a blank cover, place the blank cover with the gap filler over the card cage slot.**

If you have a flush-handle module, insert the module into the card slot.

- c. Make sure there is correct ground (no open spaces) between the two modules.**
- d. Fasten the 1/4-turn captive screws on all handles and covers in the backplane.**

Figure 3-8 Attaching the Gap Filler Assembly



MA-0568A-87

To complete the MS650 installation, you should test the new system configuration and reconnect any external devices. Refer to the system specific System Maintenance Manual for memory acceptance procedures. Refer to Table 1.

3.9 Reconnecting External Devices and Covers

1. **Carefully** reconnect any external devices you may have disconnected from modules. Make sure you reconnect the external cables to their correct modules.
2. Install any covers you removed to gain access to the modules.

3.10 Installation Verification

Upon completion of the physical installation procedure, the functional operation of the system and memory must be verified using the following steps.

1. Power-On the system and verify that all power on self tests pass.
2. If desired, run the appropriate MDM diagnostics to verify the operation of the memory subsystem (refer to the designated *Systems Maintenance Guide* for the system enclosure as listed in Table 1).
3. At the console prompt, issue the **SHOW MEMORY** command to verify that the total memory capacity shown is the same as what was installed.
4. Have the customer bring up the operating system software.
5. If running VMS, log into an account and enter the **SHOW MEMORY** VMS/DCL command to once again verify the memory configuration.

The installation procedure is now complete.

4

FRU Isolation

4.1 Overview

This chapter provides an overview of the module isolation algorithm to use when the 32-MByte MS650-BC/BJ memory option is installed in the system. Due to the board equivalent assignment for the MS650-BC/BJ (Section 2.4), module callout information for systems with this option installed *may be inaccurate*. This chapter provides the necessary translation information to compensate for this deficiency.

Systems that do *not* have any 32-MByte MS650-BC/BJ memory modules installed do not require any translation tables. The module callout for these systems will be accurate.

To summarize, the 32-MByte MS650-BC/BJ memory option logically appears to the system as *two* physical 16-MByte memory modules. As a result, any console, diagnostic or VMS/ERF module callout for the 32-MByte option will be misleading.

For all systems, memory modules are identified by *bank*, where there can be up to a maximum of 16 banks installed in any given system.

4.2 MS650-BC/BJ Module Identification Algorithm

The following tables provide the mapping of MS650 *bank* to MS650 *module* for systems with the 32-MByte MS650-BC/BJ installed. The first half of table is for the KA640-based systems (MicroVAX 3300/3400) and the second half is for all other systems (MicroVAX 3500/3600/3800/3900/VAX4000-200).

Table 4-1 MS650-BC/BJ Bank-To-Module Translation

B/P Slot ¹			Memory Bank			
2	3	4	0-3	4-7	8-11	12-15
KA640/MV3300/3400 Systems						
32MB	-	-	KA640	2	2	-
8MB	32MB	-	KA640	2	3	3
16MB	32MB	-	KA640	2	3	3
MV3500/3600/3800/3900/VAX4000-200						
32MB	-	-	2	2	-	-
8MB	32MB	-	2	3	3	-
8MB	8MB	32MB	2	3	4	4
16MB	32MB	-	2	3	3	-
16MB	16MB	32MB	2	3	4	4
8MB	16MB	32MB	2	3	4	4
32MB	32MB	-	2	2	3	3

¹The CPU Module is installed in Slot 1

To use Table 4-1, use the following steps:

1. Determine the system (CPU) type (Is it a KA640 ?) then use that half of the table.
2. Lookup the memory configuration that matches the first three columns of the table.
3. For a given *bank* listed in the top header (for example, Bank 0-3, 4-7, etc), find the module slot indicated in the chart.

For example, a MV3900 system with a 16MB and 32MB module installed would translate thus: Banks 0-3/Slot 2; Banks 4-7/Slot 3; Banks 8-11/Slot 3.

4.3 VMS/ERF Report

This section provides a sample report from the VMS Operating System Error Reporting Facility (ERF program) and illustrates how to translate the module callout information based on Table 4-1. In this example, the KA650 system has an 8-MByte and 32-MByte memory module installed.

Figure 4-1 ERF Example

```

V A X / V M S          SYSTEM ERROR REPORT          COMPILED 26-FEB-1992 15:47:11
                                                           PAGE 1.

***** ENTRY          147. *****
ERROR SEQUENCE 49235.          LOGGED ON:          SID 0A000112
DATE/TIME 8-FEB-1992 16:53:20.65          SYS_TYPE 01000000

CORRECTED MEMORY ERROR KA650 CPU FW REV# 19.  CONSOLE FW REV# 0.0

TOTAL NUMBER OF CORRECTED MEMORY EVENTS = 16.

CORRECTED EVENT 01.

MEMCSR16          20A8F640

MEMCSR17          0000104B

MEMCSR10          80800017
MEMCON          0A3E0FF3
Correct BANK ID

CORRECTABLE ECC ERROR
PHYSICAL PAGE ADDR = 0547B(X)
ECC ERROR SYNDROME = 40(X)
_CHECK BIT IN ERROR = 38.

ECC ENABLED
CRD INTERRUPT ENABLED
MAIN MEM CYCLE SELECT = 5/3

MEMORY MODULE TYPE = MS650 (16 MB)
SYSTEM BANK = 08.

MEMORY CONFIGURATION:
_BANKS ENABLED = 0000111111110011
_MEMORY MODULE #1. - MS650 (8 MB)
_MEMORY MODULE #2. - MS650 (16 MB)
_MEMORY MODULE #3. - MS650 (16 MB) — MS650 32 MB
MEMORY ERROR STATUS:
_MEMORY MODULE #3. ← Incorrect
_PHYSICAL BANK = 06.

```

From the ERF example, you will note that the memory configuration reported as part of the **MEMCON** decode is incorrectly listed as an 8MB module and two 16MB modules. Recall that the 32MB MS650-BC/BJ *appears* as two 16MB modules to the system.

Also note from the example that the indicted memory, *_MEMORY MODULE #3*, (which is installed in slot 4) is *incorrect*.

To properly determine the correct memory module indicted, you must first determine the failing bank number. There are two places in the report where the correct bank ID is reported:

1. The bank identified in *MEMCON <27:24>* displayed in hexadecimal (in the example the bank is **A**).
2. The suffix of the third *MEMCSR* in the report, displayed in decimal (in the example the bank is **10**, *MEMCSR10*).

Once the correct bank is determined, refer to Table 4-1 for a configuration of 8MB/32MB, to determine the correct module slot. In the example shown, for a configuration of 8MB/32MB, bank 10 (A, hexadecimal) translates to slot 3 which is the 32MB module.