



OpenVMS Systems Operations Guide:  
VAX 6000 Systems

EK-V6000-OG. A01

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## About This Guide

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This document is a quick reference guide to basic VAX 6000 systems operations. It summarizes in one place basic information concerning such system tasks as booting and console operation as they relate to VAX 6000 systems.

### Intended Audience

This guide is designed primarily for the following:

- System software support personnel
- Digital Services personnel
- System managers
- Instructors and participants in certain OpenVMS operating system courses:
  - Systems Troubleshooting
  - System and Network Management I, II, and III

### Document Scope

This guide describes various aspects of VAX 6000 systems operations including:

- System overview
- Operators control panel
- Console command language
- System power-up and power-down procedures
- System boot and backup procedures





# 1

## System Overview

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### 1.1 Introduction

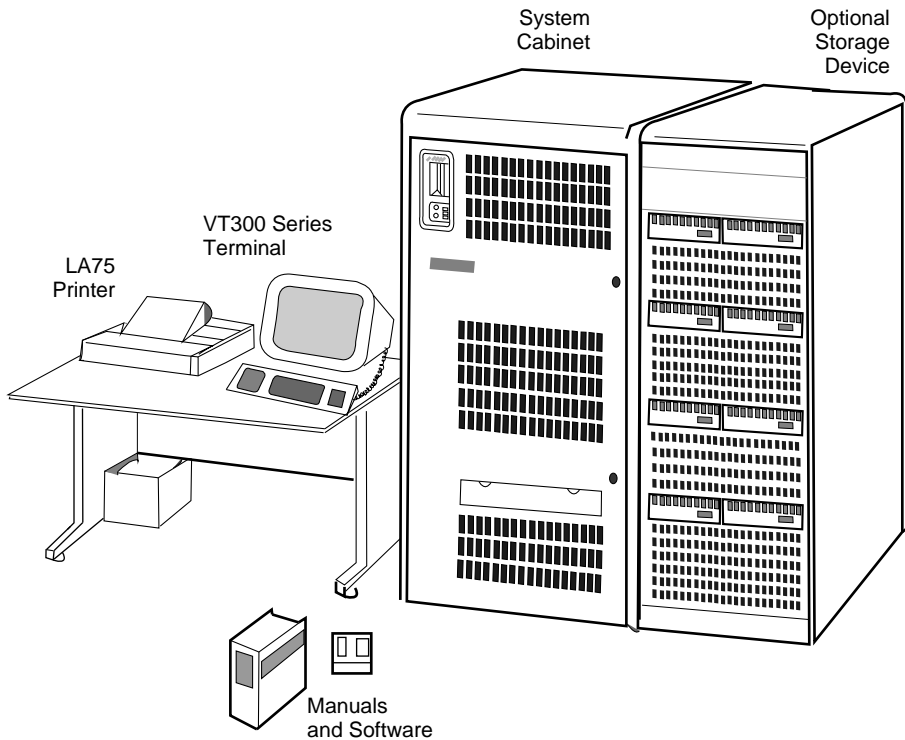
VAX 6000 systems are designed for growth and can be configured for many different applications. Each model in the VAX 6000 series:

- Supports multiple users in a time-sharing environment
- Supports a full range of VAX applications and operating systems
- Functions as a standalone system, a member of a VAXcluster system, a boot node of a local area VAXcluster system, or as a VAX file server for workstations
- Allows for expansion of processors, memory, and I/O
- Supports scalar processors
- Supports vector processors (models 400 and 500)
- Implements symmetric multiprocessing where all processors have equal access to memory
- Incorporates a high-bandwidth system bus designed for multiprocessing
- Performs automatic self-test on power-up, reset, reboot, or system initialization

## 1.2 System Cabinet

Figure 1-1 shows a typical VAX 6000 system cabinet configuration.

Figure 1-1 Typical System



GSF\_000030\_10\_MPS

The system cabinet may house a console load device, an XMI card cage (which contains the processors, memories, and I/O adapters), two optional VAXBI card cages, optional disk drives, and the system control panel. The console load device is used for installing operating systems, software, and some diagnostics. The load device may be an Ethernet based compact disk server or an in-cabinet tape drive. The console terminal is used for booting and for system management operations.

### **1.3 Console Terminal**

The system console can be either a video or hardcopy terminal. The console provides the operator with the means to control and monitor system operations. You can also keep a record of an installation or upgrade either by using a hardcopy console terminal or by attaching a printer to the console video terminal (if it has that capability).

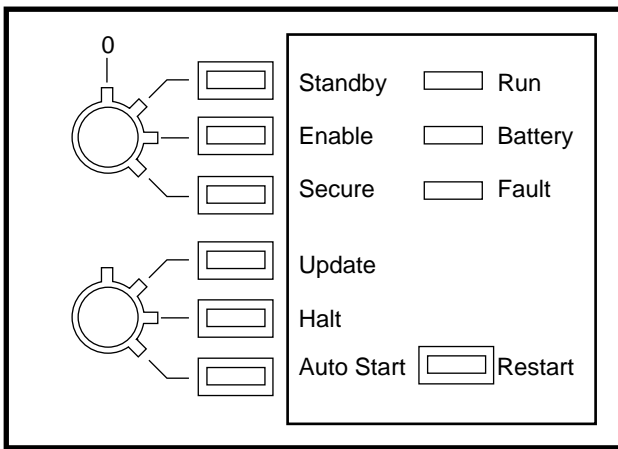
### **1.4 Operator Control Panel**

The control panel is located in the upper left corner of the front of the system cabinet.

See Figure 1-2. The control panel includes:

- An upper, 4-position keyswitch
- A lower, 3-position keyswitch
- Six lights that correspond to the settings of the keyswitches
- A Restart button
- Three status indicator lights

Figure 1-2 Operator Control Panel



GSF\_000030\_04\_MPS

### 1.4.1 Keyswitches

The upper keyswitch of the control panel controls system power on and power off operations. The lower keyswitch controls access to the console terminal and enables or disables automatic restart after a power failure.

To change the keyswitch setting, insert the key and turn it to the desired setting. After you select a switch setting, the corresponding light to the right of the switch glows. There is no light for the Off (0) position.

Table 1-1 lists the settings for the upper keyswitches and Table 1-2 lists the settings for the lower key switches.

**Table 1-1 Upper Keyswitch Settings**

<b>Position</b>	<b>Effect</b>	<b>Light Color</b>
Off	Shuts off all power except to the battery backup.	No light
Standby	Supplies power only to the power supply, blower, and memory. Used for system maintenance.	Red
Enable	Supplies power to the whole system. You can use the console terminal in console mode, or use the Restart button.	Yellow
Secure	Supplies power to the whole system. Used for normal system operation. You cannot use the Restart button or the console terminal in console mode.	Green

**Table 1-2 Lower Keyswitch Settings**

<b>Position</b>	<b>Effect</b>	<b>Light Color</b>
Update	Displays the console prompt at the console terminal. Used to modify the Electrically Erasable Programmable Read-Only Memory (EEPROM).	Red
Halt	Causes the system to halt rather than restart following a power failure or error halt.	Yellow
Auto Start	Allows the system to reboot automatically after a power failure or error halt.	Green

### 1.4.2 Restart Button

Depending on the position of the keyswitches, pressing the Restart button boots the system, runs self-tests, or does both. Table 1-3 describes various keyswitch settings and the corresponding function of the Restart button.

**NOTE**

**The upper keyswitch must be in the Enable position for the Restart button to function.**

**Table 1-3 Restart Button Functions**

<b>Upper Keyswitch</b>	<b>Lower Keyswitch</b>	<b>Function</b>
Enable	Auto Start	Runs self-tests. If the system passes the self-test, it reboots.
Enable	Update or Halt	Runs self-tests, halts, and displays the console prompt (>>>).
Standby or Secure	Any position	None.

### 1.4.3 Status Indicators

There are three status indicator lights on the control panel: Run, Battery, and Fault. Table 1-4 describes the functions of these lights.

**Table 1-4 Status Indicator Lights**

<b>Light</b>	<b>Color</b>	<b>State</b>	<b>Meaning</b>
Run	Green	On	System is executing operating system instructions.
		Off	System is in console mode or turned off.
Battery	Green	On	Battery backup unit is fully charged.
		Flashing once per second	Battery backup unit is charging.
		Flashing 10 times per second	Battery backup unit is supplying power to the system.
		Off	System either does not have a battery backup unit or is turned off.
Fault	Red	On	Self-test in progress. If this light remains on, there is a hardware fault (see your computer-specific owner's manual).
		Off	Self-test is finished or the system is turned off.

## **1.5 System Architecture**

### **1.5.1 Processor Nodes**

A processor node is a single-board scalar processor or a scalar/vector processor pair. The central processor unit (CPU) is comprised of two chips, one of which is a floating-point accelerator. A write-back cache subsystem improves system performance. In a multiprocessing system one scalar processor becomes the boot processor during power-up, and that boot processor loads the operating system and handles communication with the operator console. The other processors become secondary processors and receive system information from the boot processor.

### **1.5.2 Memory Nodes**

A memory node is one memory module. Memory is a global resource equally accessible by all processors on the XMI. Each memory module may have 32, 64, or 128 Mbytes of memory consisting of ECC and control logic. The memories are automatically interleaved. An optional battery backup unit protects memory in case of power failure. The system supports up to eight memories.

### **1.5.3 I/O Nodes**

VAX 6000 systems support the following I/O adapter nodes: CIXCD, DEC LANcontroller 400 (DEMNA), DWMBB, and the KDM70.



# 2

## System Operation

---

### 2.1 System Power-Up

Power up the system by pushing in the handle on the H405 power controller. Then monitor the LED indications on the H7206 power and logic unit. The nine LEDs visible through the slot on the H7206 panel provide fault indications for the power regulators and for certain other faults such as overtemperature.

LEDs 2 through 6 are latching and therefore detect momentary faults. These LEDs are reset to Off by cycling the keyswitch to Off then back to Standby or Enable. These LEDs can also be reset by pressing and releasing the reset switch located beneath the LED indicators.

If an LED does not turn off after one of these reset procedures, then you have not corrected the problem that is causing the LED to light.

**Table 2-1 H7206 Diagnostic LEDs**

LED	Condition	Color	Meaning
1	On	Green	+14V bias is okay
2	On	Red	XMI — H7215 fault
3	On	Red	XMI — H7214 fault
4	On	Red	XMI — H7242 fault
5	On	Red	VAXBI — H7215 fault
6	On	Red	VAXBI — H7214 fault

**Table 2-1 (Continued) H7206 Diagnostic LEDs**

<b>LED</b>	<b>Condition</b>	<b>Color</b>	<b>Meaning</b>
7	On	Red	H7214 or H7242 installed incorrectly
8	On	Red	XMI-1 module in the XMI-2 card cage
9	On	Red	Fault (airflow, interlock, overtemperature)

## 2.2 System Boot

The boot program reads the virtual memory boot program (VMB) from the boot device. VMB in turn boots the operating system.

**Table 2-2 Boot Procedure**

<b>Step</b>	<b>Procedure</b>
1	You enter BOOT command from the console terminal in console mode. The BOOT command specifies the boot device and the path needed to reach it.
2	System reinitializes and performs self-test.
3	Boot primitive is invoked from console ROM on the boot processor. Boot primitive reads the bootblock from the specified boot device and transfers control to the bootblock.
4	The bootblock contains code and a pointer to VMB. The bootblock loads VMB into the first 256-Kbyte block of available memory.
5	Once VMB is loaded into memory, the bootblock transfers control to VMB, which in turn starts the operating system.

## 2.3 System Shut-Down

To halt the system after the procedure completes, press Ctrl/P.

### 2.3.1 Emergency Shutdown with CRASH Commands

#### NOTE

**Use this emergency shutdown procedure only if the system is hung and you cannot log in to SYSTEM to use SHUTDOWN or OPCCRASH.**

To force your VAX computer to fail, do the following:

1. Set the upper keyswitch to Enable.
2. Press Ctrl/P to put the system in console mode.
3. Enter the following commands. The system displays a value in response to each of the EXAMINE commands. For example:

```
>>> E/I 0
          I      00000000      7FFE7CE0
>>> E/I 1
          I      00000001      7FFE9D88
>>> E/I 2
          I      00000002      7FFED04E
>>> E/I 3
          I      00000003      0001FACB
>>> E/I 4
          I      00000004      80631200

>>> E PSL
04030004
>>> D PSL 041F0000
>>> D PC  FFFFFFFF
```

Depositing these values in the program counter (PC) and the processor status longword (PSL) causes an exception condition that sends the contents of memory to a dump file on the system disk.

4. Enter the following command and press Return:

```
>>> C
```

## 2-4 System Operation

5. The system displays a fatal bugcheck message, and other messages, similar to the following:

```
**** FATAL BUG CHECK, VERSION = 5.4 INVEXCEPTN, Exception while above ASTDEL
or on interrupt stack

CRASH CPU: 02          PRIMARY CPU: 02

ACTIVE/AVAILABLE CUP MASKS: 00000016/00000016

CURRENT PROCESS = NULL

REGISTER DUMP
R0 = 0000001F
.
.
.
**** MEMORY DUMP COMPLETE....
>>>
```

6. If the system does not reboot automatically, reboot it.
7. After the system reboots, you can examine the dump file. Log in to the SYSTEM account.
8. Enter the following commands. Press Return after each one.

```
$ ANALYZE/CRASH SYS$SYSTEM:SYSDUMP.DMP
SDA> SHOW CRASH
```

For more information about the System Dump Analyzer (SDA), see the *VMS System Dump Analyzer Utility Manual*.

# 3

## Console Commands

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### 3.1 Console Modes

The console subsystem runs in two modes: program mode and console mode.

<b>Mode</b>	<b>Console Function</b>
Program	OpenVMS operating system controls the console subsystem. The Run light on the control panel glows. In program mode, you can enter DCL commands, run programs, and receive system messages.
Console	OpenVMS operating system is not running and the system is halted. (You can halt the system yourself by pressing Ctrl/P). The console terminal displays the console prompt (>>>) and the Run light on the control panel is off. If the upper keyswitch is not set to Secure, you can control and monitor system operations by entering console commands.

### 3.2 Control Characters

The following control characters have special meaning when the console is running in console mode:

**Table 3-1 Console Control Characters**

<b>Character</b>	<b>Function</b>
<code>BREAK</code>	Increments the console baud rate, if enabled.
<code>Ctrl/C</code>	Causes the console to abort processing of a command.
<code>Ctrl/O</code>	Causes console to discard output to the console terminal until the next <code>Ctrl/O</code> is entered.
<code>Ctrl/P</code>	In console mode, acts like <code>Ctrl/C</code> . In program mode, causes the boot processor to halt and begin running the console program.
<code>Ctrl/Q</code>	Resumes console output that was suspended with <code>Ctrl/S</code> .
<code>Ctrl/R</code>	Redisplays the current line.
<code>Ctrl/S</code>	Suspends console output on the console terminal until <code>Ctrl/Q</code> is typed.
<code>Ctrl/U</code>	Discards all characters on the current line.
<code>DELETE</code>	Deletes the previously typed character.
<code>ESC</code>	Suppresses any special meaning associated with a given character.
<code>RETURN</code>	Carriage return; ends a command line.

### 3.3 Command Language Syntax

The console command line can contain up to 80 characters. Commands can be abbreviated and some commands accept qualifiers. The command parser compresses multiple tabs and spaces. Numbers are represented in hexadecimal notation.

**Table 3-2 Console Command Parameters**

<b>Command Parameter</b>	<b>Attribute or Action</b>
Length	80 characters maximum.
Abbreviation	Varies with the command; usually the shortest unique combination of letters.
Multiple adjacent spaces	Treated as a single space.
Multiple adjacent tabs	Treated as a single space.

**Table 3-2 (Continued) Console Command Parameters**

<b>Command Parameter</b>	<b>Attribute or Action</b>
Qualifier(s)	Can appear after the command keyword or after any symbol or number in the command; are preceded by a slash (/).
Numbers	Most appear in hexadecimal format.
No characters	Treated as a null command; no action taken.

The console command parser accepts commands up to 80 characters long, not including the terminating carriage return or any characters you delete as you enter the command. Commands longer than 80 characters cause an error message of the form:

```
?0036 Command too long.
```

You can abbreviate commands and some qualifiers by dropping characters from the end of the word. You must enter the minimum number of characters to identify the keyword unambiguously. In the command reference sections that follow, characters that you can omit appear within square brackets ([ ]).

Multiple adjacent spaces and tabs are compressed and treated as a single space. The program ignores leading and trailing spaces.

You can use command qualifiers after the command keyword or after any symbol or number in the command.

Most numbers in console commands are in hexadecimal notation. However, the console program does accept decimal notation for console baud rate, register names (R0, R1, and so on), and vector registers.

You can use uppercase or lowercase characters for input. The console program converts all lowercase characters to uppercase.

A command line with no characters is a null command. The console program takes no action and does not issue an error message. The console prompt returns.

### 3.4 Console Command Summary

Table 3-3 lists the console commands. Table 3-4 describes the console commands used in this supplement. For more information on the console subsystem and the console commands, refer to the documentation supplied with the system.

**Table 3-3 Console Command List**

BOOT	REPEAT	START
CLEAR EXCEPTION	RESTORE EEPROM	STOP
CONTINUE	SAVE EEPROM	TEST
DEPOSIT	SET BOOT	UNJAM
EXAMINE	SET CPU	UPDATE
FIND	SET LANGUAGE	Z
HALT	SET MEMORY	!
HELP	SET TERMINAL	
INITIALIZE	SHOW	

**Table 3-4 Commonly Used Console Commands**

<b>Command</b>	<b>Definition</b>
BOOT	Starts the process that loads system software into memory. Use the abbreviation B for the BOOT command.
DEPOSIT	Puts a value in the specified register or memory location.
EXAMINE	Displays the contents of the specified register or memory location.
SET BOOT	Equates a boot command to a nickname.
SHOW CONFIGURATION	Displays hardware and self-test information about the system.



### 3.5 BOOT Command Description

The BOOT command syntax is:

```
B[oot][/qualifier] [<parameter>]
```

The *qualifier* includes a variable which is a node number, a value to be loaded into a register, or the name of a file when using the */FILENAME* qualifier. A variable is a required argument to the qualifier. If you do not specify a variable, you receive an error message in the form:

```
?0021 Illegal command
```

In the syntax *<parameter>* can be a string of the form *ddnn*. The variable *dd* is a 2-character mnemonic for the device type (MU for tape, DU or DI for disk, EX or ET for Ethernet, or CSA1 for the in-cabinet console load device), and *nn* is a 1- or 2-digit hexadecimal number for the boot device. The *nn* portion of the boot device is ignored if the */R3* qualifier is used.

You can also use *<parameter>* as a 1- to 4-character name of a saved boot specification that you have created. Your saved specification needs to supply values for the boot device and other qualifiers, if required. You can override any saved qualifier value by specifying the qualifier with a new value.

If you omit *<parameter>*, the program uses the default saved boot specification. You define a default saved boot specification by using the reserved name *DEFAULT* and the *SET BOOT* command. Use unique names when you name your saved boot specifications. To avoid confusion, choose names for saved boot specifications that are distinct from the actual device names.

When you have successfully specified the command, your console terminal waits while the system initializes itself and performs self-test. When the operating system comes up, your console terminal displays the login banners of the operating system, and your console terminal is then operating in program mode.

## 3-6 Console Commands

### 3.6 Sample Console Session

```
#123456789 0123456789 0123456789 0123456789 012345# ①
F  E  D  C  B  A  9  8  7  6  5  4  3  2  1  0  NODE #
      A  A  .  .  M  M  M  .  M  V- -P  P  P  P  TYP ②
      +  +  .  .  +  +  +  .  +  +  +  +  +  +  STF
      .  .  .  .  .  .  .  .  .  .  E  E  E  E  B  BPD
      .  .  .  .  .  .  .  .  .  .  +  +  +  +  +  ETF
      .  .  .  .  .  .  .  .  .  .  E  E  E  E  B  BPD

      .  .  .  .  A4 A3 A2 .  A1 .  .  .  .  .  ILV
      .  .  .  .  64 64 64 .  64 .  .  .  .  .  256 Mb

Console = V1.00 RBDs = V1.00  EEPROM = 1.00/1.00  SN = SG01234567

>>> EX/N:3 R0 ③
      G 00000000 FFFFFFFF
      G 00000001 E0140648
      G 00000002 00000000
      G 00000003 00000010

>>> SHOW CONFIGURATION ④
      Type      Rev
1+ KA65A (8080) 0006
2+ KA65A (8080) 0006
3+ KA65A (8080) 0006
4+ KA65A (8080) 0006
5+ FV64A (0000) 0001
6+ MS65A (4001) 0084
8+ MS65A (4001) 0084
9+ MS65A (4001) 0084
A+ MS65A (4001) 0084
D+ CIXCD (0C05) 1652
E+ DEMNA (0C03) 0601

>>> BOOT /XMI:D/R5:70000000/NODE:0E02 DU0 ⑤
      [self-test results appear]

* Initializing adapter ⑥
* Specified adapter initialized successfully
* Connecting to boot disk
?0018 Specified unit offline - Unit unknown, online to
another controller or port disabled via A, B switches
?0006 Halt instruction executed in kernel mode.
PC = E00C2329
PSL = 041F0600
ISP = 000002F0

Bootstrap failed due to previous error.

>>> BOOT /XMI:D/R5:70000000/NODE:0E02 DU0 ⑦
      [self-test results appear, then the operating system banner]
```

- ❶ At power-up, the system performs self-test and displays the results.
- ❷ The TYP line in the sample self-test display indicates that XMI slot 5 is a vector processor attached to the scalar processor at node 4. The dashed lines indicate that the vector processor (V-) and the scalar processor (-P) are paired.
- ❸ The console prompt indicates that the terminal is in console mode. Enter an EXAMINE command to examine the contents of register 0 and three additional registers. Output displays the contents for R0, R1, R2, and R3, respectively.
- ❹ Enter a SHOW CONFIGURATION command to show the hardware configuration. Operator looks at configuration to find the disk controller to know the correct qualifiers to enter with the BOOT command.

System response indicates devices' XMI node numbers, self-test status, device types, and contents of the revision register of the device.

- ❺ Enter BOOT command, using the CIXCD adapter at XMI node D to locate the disk (DU0), the boot device, in a VAXcluster. Boots from an HSC controller that is dual-ported at unit numbers 0E and 02 with a system root of SYS7.
- ❻ System issues status and error messages. An error occurred during connection to the boot disk, so a halt instruction is executed. You may assume an error in specifying the device or in the device itself. In this case, there was no disk pack in the disk drive. Error is corrected.
- ❼ BOOT command is reissued. The operating system begins to boot and presents its banner to the console terminal.



# 4

## System Boot Procedures

---

### 4.1 Booting from a Local Disk Drive

To boot the system from a local disk, enter the BOOT command in the following format:

```
>>> BOOT [/R5:a] /XMI:b /BI:c [/R3:d] DUu
```

Table 4–1 lists the BOOT command qualifiers.

**Table 4–1 Boot Command Qualifiers (Local Disks)**

Qualifier	Function
/R5:a	Deposits a value ( <i>a</i> ) into R5. This value affects the execution of VMB.EXE. The /R5 qualifier is optional.
/XMI:b	Specifies the XMI node number ( <i>b</i> ) of the node being accessed. Defaults to the lowest numbered I/O device.
/BI:c	Specifies the VAXBI node number ( <i>c</i> ) of the node being accessed. Defaults to 0.
/R3:d	Required only if you are using Volume Shadowing phase I (see the <i>VAX Volume Shadowing Manual</i> for more information). If you are using Volume Shadowing phase II, you do not need this qualifier, but you must set several SYSGEN parameters, as described in the <i>VMS Volume Shadowing Manual</i> .
u	Specifies the unit number of the drive holding the system disk.

**Example:**

The following command specifies to boot from a local disk with a unit number of 1. The disk is connected to VAXBI node 2 of XMI node 3.

```
>>> BOOT/XMI:3/BI:2 DU1
```

## 4.2 Booting from an HSC Disk Drive

To boot the system from an HSC disk drive, use the following procedure:

1. If you have a CIBCA-A adapter and are booting over the CI, insert the console tape cartridge into the console drive.
2. If the OpenVMS operating system is not running, go to step 3.

If the OpenVMS operating system is running, log in to the SYSTEM account. Enter the following command and press Return:

```
$ @SYS$SYSTEM:SHUTDOWN
```

Answer the questions. When the procedure asks if an automatic system reboot should be performed, press Return for NO. When the system shuts down, the procedure displays the following message:

```
SYSTEM SHUTDOWN COMPLETE -- USE CONSOLE TO HALT SYSTEM
```

3. Press Ctrl/P to put the system in console mode.
4. Enter the BOOT command in the following format:

```
>>> BOOT [/R5:a] /XMI:b /BI:c [/R3:d] /NODE:e DUu
```

Table 4-2 lists the BOOT command qualifiers.

**Table 4-2 Boot Command Qualifiers (HSC Disks)**

<b>Qualifier</b>	<b>Function</b>
/R5:a	Deposits a value ( <i>a</i> ) into R5. This value affects the execution of VMB.EXE. The /R5 qualifier is optional.
/XMI:b	Specifies the XMI node number ( <i>b</i> ) of the node being accessed. Defaults to the lowest numbered I/O device.
/BI:c	Specifies the VAXBI node number ( <i>c</i> ) of the node being accessed and must be used with the /XMI qualifier. Defaults to 0.
/R3:d	Required only if you are using Volume Shadowing phase I (see the <i>VAX Volume Shadowing Manual</i> for more information). If you are using Volume Shadowing phase II, you do not need this qualifier, but you must set several SYSGEN parameters, as described in the <i>VMS Volume Shadowing Manual</i> .
/NODE:e	Specifies the HSC node number ( <i>e</i> ) of the node being accessed. The HSC node number is hexadecimal. You can specify a maximum of two HSC node numbers (if two HSCs are available).
u	Specifies the unit number of the drive holding the system disk.

**Example:**

The following command specifies to boot from an HSC disk with a unit number of 1. The disk is connected to VAXBI node 2 of XMI node 3 and is available to two HSCs, node numbers 0E and 02.

```
>>> BOOT/XMI:3/BI:2/NODE:0E02 DU1
```

Specifying two HSCs gives the system an alternate route in case one is disabled.

### 4.3 Performing a Conversational Boot

A conversational boot is most commonly used in research and development environments and during software upgrades. Perform a conversational boot when you want to stop the boot process before it completes. The boot process stops after it loads SYS\$SYSTEM:SYSBOOT.EXE and displays the SYSBOOT> prompt.

At the SYSBOOT> prompt you can enter certain SYSGEN commands to do the following:

- Look at system parameter values
- Change system parameter values
- Specify another parameter file
- Specify another system startup command procedure
- Select the default system parameter file if you modified system parameters to values that render the system unbootable
- Specify a minimum startup

There are several ways to perform a conversational boot. The following procedure is the most direct:

1. If you have a CIBCA-A adapter and are booting over the CI, insert the console tape cartridge into the console drive.
2. If the OpenVMS operating system is not running, go to step 3.

If the OpenVMS operating system is running, log in to the SYSTEM account. Enter the following command and press Return:

```
$ @SYS$SYSTEM:SHUTDOWN
```

Answer the questions. When the procedure asks if an automatic system reboot should be performed, press Return for NO. When the procedure is finished, it displays the following message:

```
SYSTEM SHUTDOWN COMPLETE - USE CONSOLE TO HALT SYSTEM
```

3. Press Ctrl/P to put the system in console mode.



4. To begin the conversational boot, enter the following command at the console-mode prompt (>>>):

```
>>> BOOT /R5:1 /XMI:a /BI:b [/R3:c] [/NODE:d] DUu
```

where:

- *a* is the XMI node number of the system disk.
  - *b* is the VAXBI node number of the system disk.
  - *c* pertains to Volume Shadowing. This qualifier is required only if you are using Volume Shadowing phase I (see the *VAX Volume Shadowing Manual* for more information). If you are using Volume Shadowing phase II, you do not need this qualifier, but you must set several SYSGEN parameters, as described in the *VMS Volume Shadowing Manual*.
  - *d* is the HSC node number of the node being accessed. The /NODE qualifier is not necessary if you are booting from a local disk. The HSC node number is in hexadecimal. You can deposit a maximum of two HSC node numbers (if two HSCs are available).
  - *u* is the unit number of the drive holding the system disk.
5. When you finish using SYSGEN commands, enter the CONTINUE command to complete the BOOT process.

## 4.4 Automatic Restart

The OpenVMS operating system can restart automatically from the default boot device designated in ROM (read-only memory). This section describes the two types of automatic restarts: warm (Section 4.4.1) and cold (Section 4.4.2).

To manually restart the system using the Restart button, see Section 1.4.2.

#### 4.4.1 Warm Start

If you set the lower keyswitch on your VAX 6000 series console to Auto Start, the system will restart automatically under the following conditions:

- When the system power comes on after a power failure
- After an error halt

This type of automatic restart is known as a *warm start* because the backup battery unit supplies enough power to preserve the contents of memory.

#### 4.4.2 Cold Start — Setting a Default Disk

If you shut down the system and then specify Y at the auto reboot prompt, the system will restart automatically only if you have designated a default boot device prior to the shutdown. This type of automatic restart is known as a *cold start* because the memory is reinitialized before the system reboots.

To specify a default boot device, use the SET BOOT command in the following format:

```
>>> SET BOOT DEFAULT ddu
```

For example, to define DU0 as the default boot device, enter the following:

```
>>> SET BOOT DEFAULT DU0
```

Because the /XMI and /BI qualifiers are not specified, the system uses their default values.

The next time you enter the BOOT command, the system will boot from the designated default boot device. To clear the default designation, enter the following:

```
>>> SET BOOT DEFAULT
```

#### NOTE

**To use any SET command, the lower keyswitch must be in the Update position.**

## 4.5 Booting from [SYSF] During an Upgrade

In the future, you might want to upgrade to the most recent version of the OpenVMS operating system. During the upgrade procedure you must boot from the [SYSF] directory. To boot from [SYSF], do the following:

1. If you have a CIBCA-A adapter and are booting over the CI, insert the console tape cartridge into the console drive.
2. Press Ctrl/P to put the system in console mode.
3. Enter the BOOT command in the following format:

```
>>> BOOT /R5:F0000000 /XMI:a /BI:b [/R3:c] [/NODE:d] DUu
```

where:

- *a* is the XMI node number of the system disk.
- *b* is the VAXBI node number of the system disk.
- *c* pertains to Volume Shadowing. This qualifier is required only if you are using Volume Shadowing phase I (see the *VAX Volume Shadowing Manual* for more information). If you are using Volume Shadowing phase II, you do not need this qualifier, but you must set several SYSGEN parameters, as described in the *VMS Volume Shadowing Manual*.
- *d* is the HSC node number of the node being accessed. The /NODE qualifier is not necessary if you are booting from a local disk. The HSC node number is in hexadecimal. You can deposit a maximum of two HSC node numbers (if two HSCs are available).
- *u* is the unit number of the drive holding the system disk.

### Example:

The following command specifies to boot from [SYSF] of an HSC disk with a unit number of 1. The disk is connected to VAXBI node 2 of XMI node 3 and is available to two HSCs, node numbers 0E and 02.

```
>>> BOOT/R5:F0000000/XMI:3/BI:2/NODE:0E02 DU1
```

## 4.6 Booting from a Different Directory on the System Disk

The OpenVMS operating system is installed in the system root directory named [SYS0]. You can use VMSKITBLD, as described in the *Guide to Setting Up a VMS System*, to add a copy of the OpenVMS operating system to another system root directory on the system disk.

To boot from a different directory on the system disk, use the following procedure:

1. If you have a CIBCA-A adapter and are booting over the CI, insert the console tape cartridge into the console drive.
2. If the OpenVMS operating system is not running, go to step 3.

If the OpenVMS operating system is running, log in to the SYSTEM account. Enter the following command and press Return:

```
$ @SYS$SYSTEM:SHUTDOWN
```

Answer the questions. When the procedure asks if an automatic system reboot should be performed, press Return for NO. When the procedure is finished, it displays the following message:

```
SYSTEM SHUTDOWN COMPLETE - USE CONSOLE TO HALT SYSTEM
```

3. Press Ctrl/P to put the system in console mode.
4. Enter the BOOT command in the following format:

```
>>> BOOT /R5:a0000000 /XMI:b /BI:c [/R3:d] [/NODE:e] DUu
```

where:

- *a* is the name of the root directory from which you want to boot.
- *b* is the XMI node number of the system disk.
- *c* is the VAXBI node number of the system disk.
- *d* pertains to Volume Shadowing. This qualifier is required only if you are using Volume Shadowing phase I (see the *VAX Volume Shadowing Manual* for more information). If you are using Volume Shadowing phase II, you do not need this qualifier, but you must set several SYSGEN parameters, as described in the *VMS Volume Shadowing Manual*.

- *e* is the HSC node number of the node being accessed. The /NODE qualifier is not necessary if you are booting from a local disk. The HSC node number is in hexadecimal. You can deposit a maximum of two HSC node numbers (if two HSCs are available).
- *u* is the unit number of the drive holding the system disk.

**Example:**

The following command specifies to boot from [SYSC] of an HSC disk with a unit number of 1. The disk is connected to VAXBI node 2 of XMI node 3 and is available to two HSCs, node numbers 0E and 02.

```
>>> BOOT/R5:C0000000/XMI:3/BI:2/NODE:0E02 DU1
```

## 4.7 Using SET BOOT

Instead of entering the whole BOOT command every time you boot the system, you can equate the command to a “nickname.” Nicknames can be up to four characters long.

To give a BOOT command a nickname, enter the SET BOOT command in the following format:

```
>>> SET BOOT nickname [boot-parameters]
```

For example, to assign a nickname to the BOOT command string: BOOT/XMI:2/BI:2 DU0, enter the following command:

```
>>> SET BOOT WORK /XMI:2/BI:2 DU0
```

The next time you want to boot from DU0, you can enter the following command:

```
>>> BOOT WORK
```

To clear the value of the nickname, enter the following command:

```
>>> SET BOOT nickname
```

### NOTES

**To use any SET command, the lower keyswitch must be in the Update position.**

**Avoid using nicknames that can be confused with the name of an actual boot device. For example, you would not want to use DU0 as a nickname if there is a drive on the system named DU0.**

## 4.8 If the System does not Boot

If the system does not boot because a hardware problem occurs, a question mark (?) usually precedes the error message displayed on the console terminal. Examples of hardware problems are a read error on a disk drive or a console tape cartridge, or a machine check error. If you suspect a hardware problem, do the following:

- Consult the system hardware manuals.
- Contact your Digital Services representative.

When the operating system is loaded into memory, a message similar to the following appears on the terminal screen:

```
%SET-I-INTSET, login interactive limit=64, current interactive value = 0
19-JUN-1990 15:00:00.00
  SYSTEM      job terminated at 19-JUN-1990 15:00:00.00

Accounting information:
Buffered I/O count:      133      Peak working set size:      401
Direct I/O count:       12      Peak pagefile size:         2379
Page faults:            325      Mounted volumes:            0
Charged CPU time: 0 00:00:55.23  Elapsed time:      0 00:01:31.24
```

If the system does not display this message, a software problem might have occurred. If you suspect a software problem, do the following:

- Try booting the system again.
- Place a backup copy of the system disk into another drive and try to boot from it.





# 5

## System Backup Procedures

---

### 5.1 Introduction

Use standalone BACKUP to make a complete backup of the system disk. Standalone BACKUP is a subset of the OpenVMS Backup Utility that runs without the support of the entire OpenVMS operating system.

You should back up the system disk for the following reasons:

- In case a problem occurs during a OpenVMS upgrade or update, or during the installation of other software products. *Before* you attempt any of these procedures, you should back up the system disk. If a problem occurs, you can restore the backup copy of the system disk.
- To prevent loss of system files if they are accidentally deleted. *After* you install or upgrade the OpenVMS operating system, or any other software products, you should back up the system disk. If a system file is deleted and renders the system disk inoperable, you can restore the backup copy and continue to use the system.
- In case the drive that holds the system disk malfunctions. If you have a backup copy of the OpenVMS operating system, you can restore it to a functioning disk and continue to use the system.
- To eliminate disk fragmentation, which happens when files are stored noncontiguously on the disk. The BACKUP command creates a copy on which files are stored contiguously.

## 5.2 Using Standalone BACKUP

Depending on the distribution media you received, standalone BACKUP exists either on a tape cartridge or a compact disc. You can install standalone BACKUP on the system disk (which Digital recommends because booting standalone BACKUP from the system disk saves time) using either of these media. However, you should also retain the original compact disc or tape cartridge, or make a copy of standalone BACKUP on another tape cartridge, in case the system disk becomes damaged. The following sections describe standalone BACKUP installation and booting procedures for the system disk, tape cartridge, and compact disc.

### 5.2.1 Installing Standalone BACKUP on the System Disk

Digital has established [SYSE] on the system disk as the default directory for standalone BACKUP. To install standalone BACKUP in [SYSE], use the following procedure:

1. Log in to the SYSTEM account.
2. Enter the following command and press Return:

```
$ @SYS$UPDATE:STABACKIT SYS$SYSDEVICE:
```

The procedure places the files in the directories [SYSE.SYSEXEXE] and [SYSE.SYS\$LDR] on the system disk. It lists the files as they are copied. When the procedure finishes, it displays the following message:

```
The kit is complete.
```

3. To boot standalone BACKUP from the system disk, go to Section 5.2.2.

### 5.2.2 Booting Standalone BACKUP from the System Disk

To boot standalone BACKUP from the system disk, follow these steps:

1. If your system has a CIBCA-A, insert the console tape cartridge into the console drive.
2. If the OpenVMS operating system is not running, go to step 3.

If the OpenVMS operating system is running, log in to the SYSTEM account. Enter the following command and press Return:

```
$ @SYS$SYSTEM:SHUTDOWN
```

Answer the questions. When the procedure asks if an automatic system boot should be performed, press Return for NO. When the procedure is finished, it displays the following message:

```
SYSTEM SHUTDOWN COMPLETE -- USE CONSOLE TO HALT SYSTEM
```

3. Press Ctrl/P to halt the system.
4. Enter the BOOT command in the following format:

```
>>> B /R5:E0000000 /XMI:a /BI:b [/NODE=c] DUu
```

where:

- *a* is the XMI node number of the system disk.
- *b* is the VAXBI node number of the system disk.
- *c* is the HSC node number of the node being accessed. You do not need to specify the /NODE qualifier if you are booting from a local disk.
- *u* is the unit number.

5. Standalone BACKUP displays the following message:

```
VAX/VMS Version V5.4 Major version id = 1 Minor version id = 0
```

6. The procedure asks you for the date and time. Enter the date and time using the 24-hour clock format and press Return. For example:

```
PLEASE ENTER DATE AND TIME (DD-MMM-YYYY HH:MM) 19-JUN-1990 15:00
```

7. The procedure displays a list of the local devices on your system and, if you have them, HSC- and MSCP-served devices. For example:

```
Available device  MINE$DUA0:           device type RA81
Available device  MINE$DJA3:           device type RA60
.
.
.
```

Check the list of devices. If the list is incomplete, make sure that all the drives are properly connected to the system. See your hardware manuals for details.

8. When standalone BACKUP finishes booting, it displays an identification message followed by the dollar sign prompt (\$):

```
%BACKUP-I-IDENT, Standalone BACKUP V5.4; the date is 19-JUN-1990 15:30
$
```

### 5.2.3 Installing Standalone BACKUP on a Tape Cartridge

You should have received standalone BACKUP on the tape cartridge or compact disc included in your distribution kit. Digital recommends that you keep a copy of standalone BACKUP on another tape cartridge in case the system disk, original distribution compact disc, or original distribution tape cartridge becomes damaged, or in case you need to make extra copies. To install standalone BACKUP on a tape cartridge, use the following procedure:

1. Obtain one blank tape cartridge. Write a name on the paper label that identifies the contents of that tape cartridge. For example, you could use the name S/A BKUP V5.4 to indicate that the tape cartridge contains a copy of the Version 5.4 standalone BACKUP kit. Insert the label into the label slot.
2. Make sure the tape cartridge is write-enabled.
3. Insert the tape cartridge into the drive.
4. Log in to the SYSTEM account.
5. Enter the following command and press Return:

```
$ @SYS$UPDATE:STABACKIT
```

6. The procedure asks you for the name of the target device. Enter the device name of the tape cartridge drive and press Return. For example:

```
Enter the name of the device on which to build the kit: MUC6:
```

7. After you enter the name of the target device, the procedure displays several informational messages and the following message:

```
Please place the scratch tape cartridge in drive _MUC6:  
This volume will receive the volume label SYSTEM.
```

```
Enter "YES" when ready:
```

When you are ready to continue, enter Y (for YES) and press Return.

8. The system displays verification messages informing you that files are being copied. When standalone BACKUP is installed, the procedure displays a message similar to the following:

```
Ending time 19-JUN-1990 16:44:29.90  
Starting time 19-JUN-1990 16:30:39.05
```

```
The Kit is complete.
```

```
$
```

9. Remove the tape cartridge from the tape cartridge drive.
10. Write-protect the tape cartridge and store it in a safe place.

### 5.2.4 Booting Standalone BACKUP from a Tape Cartridge

If the system disk containing standalone BACKUP should become unusable, you can boot standalone BACKUP from a tape cartridge. Booting standalone BACKUP from a tape cartridge takes approximately 15 minutes. You need a tape cartridge that contains standalone BACKUP (either the original distribution tape cartridge or a copy). To boot standalone BACKUP from a tape cartridge, use the following procedure:

1. If the OpenVMS operating system is not running, go to step 2.

If the OpenVMS operating system is running, log in to the SYSTEM account. Enter the following command and press Return:

```
$ @SYS$SYSTEM:SHUTDOWN
```

Answer the questions. When the procedure asks if an automatic system boot should be performed, press Return for NO. When the procedure is finished, it displays the following message:

```
SYSTEM SHUTDOWN COMPLETE -- USE CONSOLE TO HALT SYSTEM
```

2. Press Ctrl/P to halt the system.
3. If your system has a CIBCA-A, insert the console tape cartridge into the console drive.
4. Enter the following command and press Return:

```
>>> B CSA1
```

5. The procedure displays a self-test message similar to the following:

```
F  E  D  C  B  A  9  8  7  6  5  4  3  2  1  0  NODE #
A  A  .  .  .  M  M  M  M  .  P  P  P  P  TYP
O  O  .  .  .  +  +  +  +  .  +  +  +  STF
.  .  .  .  .  .  .  .  .  .  E  E  E  B  BPD
.  .  .  .  .  .  .  .  .  .  +  +  +  +  ETF
.  .  .  .  .  .  .  .  .  .  E  E  E  B  BPD

.  .  .  .  .  .  .  .  .  .  .  .  .  .  XBI D -
.  .  .  .  .  .  .  .  .  +  .  +  .  .  +  .  XBI E +

.  .  .  .  .  A4  A3  A2  A1  .  .  .  .  ILV
.  .  .  .  .  32  32  32  32  .  .  .  .  128 Mb
```

```
ROM = 1.0  EEPROM = 1.0/1.0  SN = NIO128
```

```
Loading system software.
```

```
Please remove the volume "CONSOL" from the console device.
```

```
Insert the first standalone system volume and enter "YES" when ready:
```

6. If the console tape cartridge is in the console drive, remove it. Insert the tape cartridge that contains standalone BACKUP. When you are ready to continue, enter Y and press Return.

Standalone BACKUP displays a message similar to the following:

```
Resuming load operation on volume 'SYSTEM', please stand by...
VAX/VMS Version V5.4 Major version id = 1 Minor version id = 0
```

7. The procedure asks you for the date and time. Enter the date and time using the 24-hour clock format and press Return. For example:

```
PLEASE ENTER DATE AND TIME (DD-MMM-YYYY HH:MM) 19-JUN-1990 15:00
```

8. The procedure displays a list of the local devices on your system and, if you have them, HSC and MSCP served devices. For example:

```
Available device  MINE$DUA0:          device type RA81
Available device  MINE$DJA3:          device type RA60
.
.
.
```

Check the list of devices. If the list is incomplete, make sure that all the drives are properly connected to the system. See your hardware manuals for details.

9. When standalone BACKUP finishes booting, it displays an identification message followed by the dollar sign prompt (\$):

```
%BACKUP-I-IDENT, standalone BACKUP V5.4; the date is 19-JUN-1990 15:30
$
```

10. Remove the tape cartridge containing standalone BACKUP from the tape cartridge drive.

### 5.2.5 Booting Standalone BACKUP from a Remote Compact Disc

If the system disk containing standalone BACKUP should become unusable, you can boot standalone BACKUP from a remote compact disc (CD). You will need the distribution compact disc (which contains standalone BACKUP) supplied in your original OpenVMS kit.

#### NOTE

**The following procedure applies *only* to VAX 6000 series computers capable of booting from a remote compact disc drive, such as an Ethernet based InfoServer system equipped with RRD40 compact disc drives. To make sure your VAX 6000 series system has this capability, review all relevant cover letters and the *OpenVMS Release Notes*.**

To boot standalone BACKUP from a remote compact disc, use the following procedure:

1. If the OpenVMS operating system is not running, go to step 2.

If the OpenVMS operating system is running, log in to the SYSTEM account. Enter the following command and press Return:

```
$ @SYS$SYSTEM:SHUTDOWN
```

Answer the questions. When the procedure asks if an automatic system boot should be performed, press Return for NO. When the procedure is finished, it displays the following message:

```
SYSTEM SHUTDOWN COMPLETE -- USE CONSOLE TO HALT SYSTEM
```

2. Press Ctrl/P to halt the system.
3. Place the OpenVMS distribution compact disc in the remote compact disc drive (in this case, an RRD40 compact disc drive connected to an Ethernet based InfoServer system). If your system contains a CIBCA-A, make sure the console tape cartridge is in the console drive.
4. Make sure your system is physically connected to the *same* Ethernet cable as the InfoServer.



5. Enter the following command and press Return:

```
>>> SHOW ETHERNET
```

In this example, the system displays information about the Ethernet controllers present on the XMI and VAXBI buses, using the following format:

```
XMI:x BI:y nn-nn-nn-nn-nn
```

where:

- *x* is the XMI node value.
  - *y* is the VAXBI node value.
  - *nn-nn-nn-nn-nn* is the hexadecimal representation of the Ethernet controller's unique address. Keeping a list of each Ethernet address and corresponding processor (CPU) with that address can help you find which systems are generating specific messages.
6. To boot standalone BACKUP on a VAX 6000 series system from across the Ethernet, enter the following command, specifying the XMI and VAXBI values displayed previously by the SHOW ETHERNET command. Then, press Return. For example:

```
>>> BOOT/XMI:D/BI:6/R5:100 ET0
```

Note in the previous example of booting standalone BACKUP that ET0 represents the Ethernet port to the boot device.

```
>>> BOOT/XMI:D/R5:100 EX0
```

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7. The procedure displays a self-test message similar to the following:

```
F  E  D  C  B  A  9  8  7  6  5  4  3  2  1  0  NODE #
A  A  .  .  .  M  M  M  M  .  P  P  P  P  TYP
O  O  .  .  .  +  +  +  +  .  +  +  +  +  STF
.  .  .  .  .  .  .  .  .  E  E  E  B  BPD
.  .  .  .  .  .  .  .  .  +  +  +  +  ETF
.  .  .  .  .  .  .  .  .  E  E  E  B  BPD

.  .  .  .  .  .  .  .  .  .  .  .  .  .  XBI D -
.  .  .  .  .  .  .  .  .  +  +  .  .  +  .  XBI E +

.  .  .  .  .  A4  A3  A2  A1  .  .  .  .  ILV
.  .  .  .  .  32  32  32  32  .  .  .  .  128 Mb

ROM0 = 2.00 ROM1 = 2.00  EEPROM = 1.00/1.00  SN = NIO128
Loading system software.
```

(Note that ROM version numbers will be different for VAX 6000 series systems with upgraded console ROMs.)

8. After the system displays its self-test message, it prompts you for a file name, as follows:

Filename:

9. In response to the prompt, enter the following and press Return:

Filename: ISL\_LVAX

Several informational console messages are displayed.

10. The system then displays the following:

Ethernet Initial System Load Function

Function ID	Function
1	- Display Menu
2	- Help
3	- Choose Service
4	- Stop

Enter a function ID value:

This display indicates that the Initial System Load (ISL) image is loaded, which means you can now locate the InfoServer services present on your Ethernet. In this example, the service is the RRD40 compact disc drive (connected internally or externally to the InfoServer).

11. Continue the procedure by entering 3 (for Function ID item number 3, Choose Service) and then pressing Return:

```
Enter a function ID value: 3
```

The next display is as follows:

```
Service options:
  1 = Find Service
  2 = Enter Known Service Name
=>
```

```
Service options:
  1 = Find Service
  2 = Enter Known Service Name
=>1
```

Working

12. After the ISL image completes its search, the system displays the list of known service names. For example:

```
Servers found:: 1
Service Names Format:
  Service Name
  Server Name
  Ethernet ID

#1
VMS052
DIS_08002b150589
08-00-2b-15-05-89

#2
VMS054
DIS_08002b150589
08-00-2b-15-05-89
Enter a number =>
```

5-12 System Backup Procedures

13. To boot standalone BACKUP from the OpenVMS Version 5.4 distribution compact disc, enter 2 and then press Return:

```
Servers found:: 1
.
.
.
#2
VMS054
DIS_08002b150589
08-00-2b-15-05-89
Enter a number =>2
```

14. The procedure asks you for the date and time. Enter the date and time using the 24-hour clock format and press Return. For example:

```
VAX/VMS Version V5.4 Major version id = 1 Minor version id = 0
PLEASE ENTER DATE AND TIME (DD-MMM-YYYY HH:MM) 19-JUN-1990 15:00
```

15. The procedure displays a list of the local devices on your system and, if you have them, HSC and MSCP served devices. For example:

```
Configuring devices . . .
Available device DAD1:           device type RRD40
Available device $DUA0:         device type RA81
Available device MINE$DJA3:     device type RA60
.
.
.
Enter "YES" when all needed devices are available:
```

Note that DAD1: is the device name of the InfoServer service you are booting from, in this case an RRD40 compact disc (connected to the InfoServer) containing the OpenVMS Version 5.4 distribution compact disc. If that device or other devices fail to appear in the list, make sure that all the drives are properly connected to the system before you enter YES at the prompt. See your hardware manuals for details.

16. When standalone BACKUP finishes booting, it displays an identification message followed by the dollar sign prompt (\$):

```
%BACKUP-I-IDENT, Stand-alone BACKUP V5.4; the date is 19-JUN-1990 15:10
$
```

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