

DEC OSF/1

Realtime Installation Guide

Order Number: AA-PJTYA-TE

Revision/Update Information: This is a new manual.

Operating System and Version: DEC OSF/1 Version 1.0 or higher.

This guide describes how to install the DEC OSF/1 V1.0 Realtime Options. This document applies to DEC OSF/1 Version 1.0 and all maintenance updates throughout that version.

First Printing, January 1992

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S1691

This document is available on CDROM

This document was prepared with VAX DOCUMENT, Version 1.2.

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About This Guide

This guide describes the installation procedures for installing the DEC OSF/1 Realtime Options software on a DEC OSF/1 system. It describes how to prepare the system for installation, install the software, and how to configure the system following software installation.

Keep this document with your distribution kit. You will need it to install maintenance updates or to reinstall the DEC OSF/1 Realtime Options, should that be necessary.

Audience

The audience for this guide is any person installing the DEC OSF/1 Realtime Options on a DEC OSF/1 system. This guide assumes that:

- You or a Digital Field Service representative has checked the hardware to ensure that it works properly.
- You have read the documentation supplied with your hardware.
- You have read the DEC OSF/1 *Release Notes*.
- You know the location and function of the controls and indicators on your hardware.
- You understand how to load and unload installation media and know which disks are needed during the installation.
- You know the names and unit numbers of your tape and disk devices.
- You have a basic understanding of the file system and commands.

Structure of This Guide

This manual has three chapters and one appendix, as follows:

- Chapter 1 describes the operating system and hardware required for installing for the DEC OSF/1 Realtime Options as well as related procedures to be completed prior to the installation.
- Chapter 2 describes the installation procedures.
- Chapter 3 describes the configuration procedures that must follow the software installation.
- Appendix A contains a listing showing a sample installation of the DEC OSF/1 Realtime Options.

Related Documents

In addition to this guide, users of the DEC OSF/1 Realtime Options may need to refer to the following documents:

- *DEC OSF/1 Guide to Realtime Programming*
- *Guide to Installing DEC OSF/1, Version 1.0*
- *Guide to System Administration*
- Online Reference Pages
- DEC OSF/1 *Release Notes*
- *System and Network Setup and Configuration Guide*

Conventions

The following conventions are used in this guide:

Convention	Meaning
%	The default user prompt is the user's system name followed by a right angle bracket. In this manual, a percent sign (%) is used to represent this prompt.
#	A number sign is the default superuser prompt.
>> CPU <i>nn</i> >>	The console subsystem prompt is two right angle brackets. On a system with more than one central processing unit (CPU) the prompt displays two numbers: the number of the CPU, and the number of the processor slot containing the board for that CPU.

Convention	Meaning
user input	This bold typeface is used in interactive examples to indicate typed user input.
system output	In text, this typeface indicates the exact name of a command, option, partition, pathname, directory, or file. This typeface is used in interactive examples to indicate system output. It is also used in code examples and other screen displays.
<i>variable</i>	This typeface indicates variable information, such as user-supplied information in commands, syntax, or example text.
...	Horizontal ellipsis indicates that the preceding item can be repeated one or more times. It is used in syntax descriptions and function definitions.
.	Vertical ellipsis indicates that a portion of an example that would normally be present is not shown.
UPPERCASE lowercase	The system differentiates between lowercase and uppercase characters. Literal strings that appear in text, examples, syntax descriptions, and function definitions must be typed exactly as shown.
cat(1)	Cross-references to the online reference pages include the appropriate section number in parentheses. For example, a reference to cat(1) indicates that you can find the material on the cat command in Section 1 of the online reference pages.

Preparing for the DEC OSF/1 Realtime Options Installation

Before starting the installation procedures described in Chapter 2, complete the preparations outlined in this chapter. This will make your installation run smoothly and help you determine the following:

- Whether the system on which you plan to install the DEC OSF/1 Realtime Options meets the hardware, software, and disk space requirements.
- Which optional subsets you should install.
- How much disk space you will need.
- Whether you have to back up your system disk.

In addition to this manual, you may want to refer to the *Guide to Installing DEC OSF/1, Version 1.0* and the *Guide to System Administration* for information concerning the base system installation and system configuration.

1.1 Preinstallation Requirements

This section discusses preinstallation requirements for the DEC OSF/1 Realtime Options.

Installing the DEC OSF/1 Realtime Options takes about 15 minutes.

1.1.1 Backing Up Your System Disk

Digital recommends that you back up your system disk before installing any software. Use the backup procedures established at your site. For details on performing a system disk backup, see the *Guide to System Administration*.

1.1.2 Checking Login Privileges

You must be able to log in as `superuser` on the system where you are installing the DEC OSF/1 Realtime Options. Only when you are logged in as `superuser` do you have sufficient privileges to install the realtime software.

1.1.3 Hardware Requirements

To perform the installation, you need the following hardware:

- Software distribution device
You need a distribution device that corresponds with the software distribution media. For example, if you have a TK50 software kit, you need a TK50 tape drive. You must know how to load the media on the appropriate drive. The documentation for the tape or disk drive that you are using explains how to load media.
- Terminal
You can use either a hardcopy or video terminal to communicate with the operating system and respond to prompts from the installation procedure.

1.1.4 Software Requirements

The DEC OSF/1 Realtime Options software requires that the DEC OSF/1 Operating System Software already be installed. In addition, the DEC OSF/1 Realtime Options requires the following software subsets to be loaded on the system:

- OSFBASE100 which is named "Base System"
- OSFBIN100 which is named "Standard Kernel Object Files"
- OSFBINCOM100 which is named "Header and Kernel Common Files"

If the base system software kit includes a Mandatory Update for the base system, install this before you begin installation of the DEC OSF/1 Realtime Options.

To install the optional realtime reference pages, make sure the following DEC OSF/1 subsets are installed on the system:

- OSFDCMT100 which is named "Document Preparation for Reference Pages"
- OSFMANOS100 which is named "Manpages for Admin/Users"
- OSFMANOP100 which is named "Manpages for Programmers"

If you are installing the DEC OSF/1 Realtime Options in a local (node-specific) environment, perform the following steps to determine whether the preceding subsets are loaded:

1. Log in as `superuser` to the system where you plan to install the DEC OSF/1 Realtime Options.

2. Enter the following command:

```
# /usr/sbin/setld -i | more
```

Check the displayed rows for the relevant subset names and for any related Mandatory Update names. The word `installed` appears in a column after the subset identifier code when a subset is loaded. If the word `installed` does not appear (the second column in a row is blank), the subset or update is not loaded. In this case, you must load the missing software before installing the DEC OSF/1 Realtime Options.

1.1.5 Determining Which Subsets to Load

You must decide which realtime files you want to load. The realtime files have the following titles:

- ORTBIN100 which is named "Realtime Files"
- ORTDEV100 which is named "Realtime Development Files"
- OSFMANRT100 which is named "Reference Pages for Realtime"

1.1.6 Determining Disk Space Requirements

The disk space requirements discussed in this section apply to the disks on which the realtime files will reside.

Table 1–1 lists the disk space requirements for loading the DEC OSF/1 Realtime Options on a system running the DEC OSF/1 Operating System Software. This table specifies disk space requirements by file for the convenience of those doing installations on systems where file systems are mount points for different disk partitions.

Table 1–1 Worksheet for Subset Sizes (Kilobytes Required)

Subset Title	Subset Name	/usr/sys
ORTBIN100	Realtime Files	53300
ORTDEV100	Realtime Development Files	
OSFMANRT100	Reference Pages for Realtime	260
Totals:		53060

Note

Need to check these numbers

Using the disk space requirements listed in Table 1–1, total the values for the subsets that you plan to load in each file system.

Compare the space required for subsets with the free space currently on the disks where the realtime files will reside.

To determine the current amount of free space for a directory path, log in to the system where you plan to install the DEC OSF/1 Realtime Options. Check which file systems are mounted and where they are by displaying the file `/etc/fstab`. For example:

```
# more /etc/fstab
/dev/rz0a    /          ufs rw 0 1
/dev/rz0g    /usr       ufs rw 0 2
/dev/rz0b    /paging    ufs rw 0 3
```

This display indicates that `/usr` (mounted to `/dev/rz0g`) is the only mount point that affects where the realtime files will reside; the system has only one local disk drive and the `/usr/sys` file system resides in the `g` partition of the disk on that drive.

Enter the `df` command to determine total space and free space for the one or two file systems where the realtime files will reside. Based on the previous display of the `/etc/fstab` file, which shows that only `/usr` is a mount point, you would only need to inspect free space in the `/usr` file system:

```
# df /usr
Filesystem    Total    kbytes    kbytes    %
node          kbytes    used      free      used  Mounted on
/dev/rd0g      122598    54447     55892     49%   /usr
```

The previous display indicates that there are 55892 Kb free. This free space should meet the subset requirements listed in Table 1–1 for the `/usr/sys` file system.

1.1.7 Deleting the OSFBIN Subset

The OSFBIN subset and mandatory update subsets contain object files needed to build the default kernel. You may decide to delete these subsets to reclaim disk space after the kernel is built. Deleting these subsets may be necessary, for example, to reclaim enough disk space to install and build the realtime kernel and associated options.

The installation procedures associated with some optional DEC OSF/1 subsets and with layered products check for lock files to make sure that the DEC OSF/1 operating system is installed on the system. To ensure that these files are found in subsequent installations, use the following command after deleting OSFBIN:

```
# touch /usr/.smdb/OSFBIN100.lk
```

Note

You must reinstall the OSFBIN subset and mandatory update subsets if, in the future, you need to rebuild the default kernel. In this case, you must delete the lock file that you created manually before you attempt to reinstall the subsets.

1.2 Stopping the Installation

You can stop the installation procedure at any time by using Ctrl/C. However, files created up to that point are not deleted. You must delete these files interactively.

1.3 Error Recovery

If errors occur during the installation, the system displays failure messages. If the installation fails due to insufficient disk space, the installation procedure displays the following message:

```
There is not enough file system space for subset Realtime
Realtime will not be loaded.
```

Errors can occur during the installation if any of the following conditions exist:

- The operating system version is incorrect
- The prerequisite software version is incorrect
- The system parameter values for successful installation are insufficient

For explanations of error messages generated by these conditions, see the base system documentation on system messages, recovery procedures, and base system software installation. If you are notified that any of these conditions exist, take the appropriate action described in the message. For information on system requirements, see Section 1.1.4, above.

Installing the DEC OSF/1 Realtime Options

This chapter gives a step-by-step description of the installation procedure. Before you start, read Chapter 1, which describes the optional software subsets and the applicable requirements.

The DEC OSF/1 Realtime Options can be installed locally from tape or CDROM optical disc. Section 2.1 explains how to do a local installation.

2.1 Installing DEC OSF/1 Realtime Options Locally

This section explains how to start a local installation procedure and how to respond to installation procedure prompts.

This procedure loads the realtime files on a disk that belongs to the system where you perform the installation.

2.1.1 Starting the Installation Procedure

If you are installing the DEC OSF/1 Realtime Options from tape media, start with Section 2.1.1.1.

If you are installing the DEC OSF/1 Realtime Options from a CDROM optical disc, start with Section 2.1.1.2.

2.1.1.1 Using TK50 Distribution Media

If you are installing the DEC OSF/1 Realtime Options from tape media, start the installation procedure as follows:

1. Mount the media labeled “DEC OSF/1 V1.0 Realtime Options” on the appropriate tape drive.
2. Log in as `superuser` (login name `root`) to the system where you are installing the realtime software.
3. Make sure that you are at the root (`/`) directory by entering the following command:

```
# cd /
```

4. Enter a `setld` command that specifies the `-l` (load) function and the device special file name for the tape drive where the media is mounted. For example, to load a TK50, enter the following command:

```
# /usr/sbin/setld -l /dev/rmt0h
```

The installation procedure displays the following information and prompt:

```
Please make sure your installation tape is mounted and on-line.  
Are you ready (y/n)? y
```

After all tape rewind and wind operations are complete and the tape drive indicates online status, enter `y`.

See Section 2.1.2 to continue the installation.

2.1.1.2 Using CDROM Consolidated Distribution Media

If you are installing the DEC OSF/1 Realtime Options from a CDROM optical disc, start the installation procedure as follows:

1. Mount the media labeled “DEC OSF/1 V1.0 Operating System and Realtime Options” on the appropriate drive.
2. Log in as `superuser` (login name `root`) to the system where you are installing the realtime software.
3. Specify the `/mnt` directory to be the mount point for the distribution file system on the drive. If your drive is `rz1c`, enter the following command:

```
# mount -r -d /dev/rz1c /mnt
```

4. Enter a `setld` command that requests the load function and identifies the directory in the mounted file system where the DEC OSF/1 Realtime Options are located.

The directory location for these subsets is `/mnt/RISC/RT`. For example, if you load the DEC OSF/1 Realtime Options onto a RISC system, enter the following command:

```
# /usr/sbin/setld -l /mnt/RISC/RT
```

See Section 2.1.2 to continue the installation.

2.1.2 Responding to Installation Procedure Prompts

This section explains the installation procedure prompts and displays.

2.1.2.1 Selecting Subsets

After you enter the `setld` command for local (node-specific) installations, the installation procedure displays the subset names and asks you to specify which subsets you want to load:

```
*** Enter Subset Selections ***
```

The following subsets are mandatory and will be installed automatically:

```
* Realtime Files                *Realtime Development Files
```

The subsets listed below are optional:

1. Reference Pages for Realtime
2. All of the Above
3. Mandatory subsets only
4. Exit without installing subsets

Enter one or more choices, for example, 1, 2:

If you specify more than one number at the prompt, separate the numbers with a space, not a comma.

Next, the script lets you verify your choice. For example, if you enter 2 in response to the previous prompt, you will see the following display:

You are installing the following subsets:

```
Realtime Files                Realtime Development Files
Reference Pages for Realtime
```

Is this correct? (y/n):

If the displayed subsets are not the ones you intended, enter `n`. In this case, the subset selection menu is again displayed, and you can correct your choice of optional subsets.

If the displayed subsets are the ones you want to load, enter `y`.

The procedure displays messages that the installation is proceeding.

2.1.2.2 Monitoring Displays During the Subset Loading Process

Chapter 3 discusses the postinstallation requirements specified in the procedure's final informational messages.

If, during the installation, you encounter errors from the `setld` utility, see the Diagnostics section of the online `setld` reference page for an explanation of the error and the appropriate action to take.

If the verification process fails, you can look in the file `/var/adm/smlogs/fverify.log` to find information that helps you diagnose the problem. For additional information, consult the reference pages for `fverify` and `setld`.

Completing the Installation

This chapter explains what you need to do following the installation to make the DEC OSF/1 Realtime Options ready for use.

3.1 Reconfiguring the Kernel to Support Realtime

When you install the DEC OSF/1 Realtime Options, you must reconfigure the initial system to align it to meet the conditions unique to realtime programming. The `doconfig` utility lets you configure the operating system automatically or manually.

This chapter explains how to configure the system using the `doconfig` utility. If you prefer to build the kernel manually or if you require additional information, see the DEC OSF/1 *Guide to System Administration*.

To build and run a working realtime kernel, the system depends on the presence of realtime files in the `/usr/sys` directory. When installation is complete, this directory contains the files that define the kernel configuration for the DEC OSF/1 Realtime Options.

To modify a configuration file you can either copy a generic file or you can edit a file. The following procedure explains how to edit an existing configuration file. If you need to use another method, see the DEC OSF/1 *Guide to System Administration*.

3.1.1 Starting the Reconfiguration Procedure

The `doconfig` shell script modifies a copy of the configuration file for a new system kernel. You specify the name of the configuration file on the command line. Throughout this chapter, the name `BITK24` is used in examples. When you use the `doconfig` utility, you must supply your own file name.

Whether the configuration file is built or not, the script lets you edit, configure, and build until both the configuration and the kernel build and run without errors. Additional runs of the `doconfig` utility can be made to tune the configuration further.

To use the doconfig utility, follow these steps:

1. Log in as superuser.
2. If you are modifying your existing configuration file, make a copy of it with another file name. For example, if your host name is BITK24, do the following:

```
# cd /sys/conf
# cp BITK24 BITK24.RT
```
3. Edit the new configuration file to include the kernel options, system parameters, or other changes you want to bring forward from the old configuration file. Refer to Section 3.1.2 for a list of the options you should add to the options list.

```
# vi BITK24.RT
```
4. Write the changes to the new configuration file and end the editing session.

3.1.2 Enabling DEC OSF/1 Realtime Options

To build a realtime kernel, you must include the DEC OSF/1 Realtime Options when you edit the configuration file. To take advantage of any of the realtime functionality, you must add ALL of the realtime options to your configuration file.

Uncomment the following options in the configuration file option list during your editing session.

```
options      RT
options      RT_PREEMPT
options      RT_SCHED
options      RT_SCHED_RQ
options      RT_SCHED_OPT
options      RT_PML
options      RT_TIMER
options      UNIX_LOCKS
```

By including these options, you automatically create a kernel with realtime features. You must include all of the above options or none of them.

3.1.3 Enabling the Preemptive Kernel

To select a preemptive kernel, include the preemption option when you edit the configuration file. Although this option is not required for using realtime software, to take full advantage of the realtime functionality available with DEC OSF/1, use the preemptive kernel option.

To select the preemptive kernel, include the following option in your edit:

```
options      RT_PREEMPT_OPT
```

3.1.4 Building a new Kernel

To run the `doconfig` utility, issue the following command:

```
# /usr/sbin/doconfig -c BITK24.RT
```

The `doconfig` utility creates a special device file and a log file, and builds a new realtime kernel with the name you specified earlier in the process. (If you use the `-c` option, specify the name of the existing configuration file without specifying the pathname. This file should exist in the `/sys/conf` directory.)

The `doconfig` utility will build a new kernel named `vmunix` and place it in the directory `/sys/BITK24.RT`.

The `doconfig` utility will build the new kernel. When the `doconfig` utility finishes, it prints a message showing the path and location of the new `vmunix` kernel. To test the new kernel, see Section 3.1.5

Refer to the `doconfig` reference page for details on the `doconfig` command and its options.

3.1.5 Testing the New Realtime Kernel

When the automatic configuration process is complete, you can test the new realtime kernel by performing the following steps:

1. Put the newly created kernel in the `root` directory and set protections. For example, to put the kernel created in the sample configuration into the `root` directory, issue the following commands:

```
# mv /vmunix /vmunix.base
# mv /sys/BITK24.RT/vmunix /vmunix
# chmod 755 /vmunix
```

2. Reboot or shutdown the system. Use one or the other of the following commands:

```
# /sbin/reboot
```

or

```
# shutdown -r
```

If you have problems booting your new realtime kernel, you may have errors in your configuration file. Use the original kernel you copied to `/sys/vmunix.base`, while you correct any errors in the new configuration file.

A

Sample Listing for the DEC OSF/1 Realtime Options Installation

This appendix provides a listing for a sample installation of the DEC OSF/1 Realtime Options using a TK50 tape. The `setld` command installs the DEC OSF/1 Options.

```
# /usr/sbin/setld -l /dev/nrmt0h
```

Please make sure your installation tape is mounted and on-line.

Are you ready (y/n)? **y**

Positioning Tape

*** Enter Subset Selections ***

The following subsets are mandatory and will be installed automatically:

* Realtime Files * Realtime Development Files

The subsets listed below are optional:

1. Reference Pages for Realtime
2. All of the Above
3. Mandatory subsets only
4. Exit without installing subsets

Enter one or more choices, for example 1, 2: **2**

You are installing the following subsets:

Realtime Files Realtime Development Files
Reference Pages for Realtime

Is this correct? (y/n): **y**

Realtime Files (ORTBIN100)

Copying from /dev/nrmt0h (tape)

Working....Mon Dec 23 10:51:30 EDT 1991

Working....Mon Dec 23 10:53:38 EDT 1991

Working....Mon Dec 23 10:55:41 EDT 1991

Working....Mon Dec 23 10:57:45 EDT 1991

```
Verifying
  Working....Mon Dec 23 10:58:16 EDT 1991

Realtime Development Files (ORTDEV100)
Copying from /dev/nrmt0h (tape)
Verifying

Reference Pages for Realtime (ORTMANRT100)
Copying from /dev/nrmt0h (tape)
Verifying
Rewinding Tape...
  Working....Mon Dec 23 11:06:01 EDT 1991
#
```