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This document describes how to install RT-11 on a PDT-11/130 or PDT-11/150 processor and how to create, on a previously installed RT-11 system, an RT-11 system to run on a PDT-11/130 or PDT-11/150 processor.

RT-11/PDT-11 Installation Notes

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OPERATING SYSTEM AND VERSION: RT-11 V03B

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PREFACE

HOW TO USE THIS MANUAL

This manual introduces you to the RT-11/PDT-11 software kit. It describes how to back up the distribution media, build a working system, and perform the system generation process.

Chapter 1 gives you some general information about the devices, kits, and configurations. In addition, it guides you to the chapter that describes the specific procedures you must perform to install your particular system.

Before you begin, you should read the RT-11 Documentation Directory, which describes the other documents in the RT-11 library. Familiarity with the RT-11 system, as described in the RT-11 System User's Guide, is very helpful when you perform the procedures in this manual.

If you are a FORTRAN, BASIC, or FMS-11 user, build your FORTRAN, BASIC, or FMS-11 system after building the RT-11 system. See the appropriate installation manual for instructions.

If you are a PDT-11/130 user, you install DECTape II support before using this manual to install RT-11/PDT-11.

DOCUMENTATION CONVENTIONS

You should become familiar with certain symbolic conventions that this manual uses.

1. Examples consist of actual computer output whenever possible.
2. Unless the manual indicates otherwise, terminate all commands or command strings with a carriage return. Where necessary, this manual uses the symbol `(RET)` to represent a carriage return, `(LF)` to represent a line feed, `(SP)` for a space, `(ESC)` for an ESCAPE or ALTMODE, and `(TAB)` to represent a tab.
3. To produce several characters in system commands, you must type a combination of keys concurrently. For example, hold down the CTRL key and type C at the same time to produce the CTRL/C character. Key combinations such as this one are documented as `(CTRL/C)`, `(CTRL/D)`, etc.
4. In descriptions of command syntax, capital letters represent the command name, which you must type. Lowercase letters represent a variable for which you must supply a value.

5. The sample terminal dialogue provided in this document contains version numbers where they would normally appear. The version numbers given include xx in those fields that can vary from installation to installation. The exact contents of these fields are not of interest in the examples in this manual, as long as appropriate digits appear in the area indicated. The same is true for the FREE BLOCKS messages included in device directories.

If you submit an SPR to DIGITAL, you must include the complete version number.

CHAPTER 1

INTRODUCTION

To install an RT-11/PDT-11/130 or RT-11/PDT-11/150 system, you must perform a series of procedures described in this manual. Before you begin, however, you should:

- Familiarize yourself with the characteristics of your device
- Ascertain the type of software kit you received
- Identify the category to which your configuration belongs

The PDT-11/130 Intelligent Terminal uses the TU58 DECTape II magnetic tape cartridge as the system device and storage device. The PDT-11/150 Intelligent Terminal, on the other hand, uses the RX01 single-density flexible diskette as the system device and storage device. The permanent device name for either PDT-11 device is PDn:. The word "volume" in this manual refers to either a cartridge or a diskette. Instructions to write protect or write enable a volume refer to DECTape II volumes, since RX01 volumes do not provide a write protect feature.

The following sections describe PDT-11/130 and PDT-11/150 volume characteristics, software kits, and configurations.

NOTE

PDT-11 processors contain read only memory (ROM), which includes a device driver for single-density diskette or DECTape II devices. The PD monitor contains the module PD.MAC, which interfaces with the ROM. There is no PD handler named PD.SYS.

1.1 PDT-11/130 VOLUME CHARACTERISTICS

The PDT-11/130 Intelligent Terminal includes a random-access mass storage device that uses DECTape II magnetic tape data cartridges. RT-11 supports this device as a file-structured random access device and as a system device.

The following sections describe some general characteristics of PDT-11/DECTape II.

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1.1.1 Write Protect Feature

Each cartridge has a write protect tab (the word RECORD and an arrow are embossed on the tab). To write enable the cartridge, slide the tab in the direction of the arrow. Slide the tab in the other direction to write protect the cartridge. You can also remove the tab altogether to permanently write protect the cartridge.

1.1.2 Data Storage

Cartridges have two magnetic tape tracks. DECTape II writes data in the same direction on each track and stores data in data records. It writes data records in a specific sequence and pattern; to write an entire cartridge, for example, it:

1. Writes alternate data records on the first track
2. Rewinds to return to the beginning of tape (BOT) mark
3. Writes data records skipped on the first pass
4. Rewinds
5. Writes alternate data records on the second track
6. Rewinds
7. Writes data records skipped on the first pass of the second track

Figure 1-1 illustrates this interleaved format.

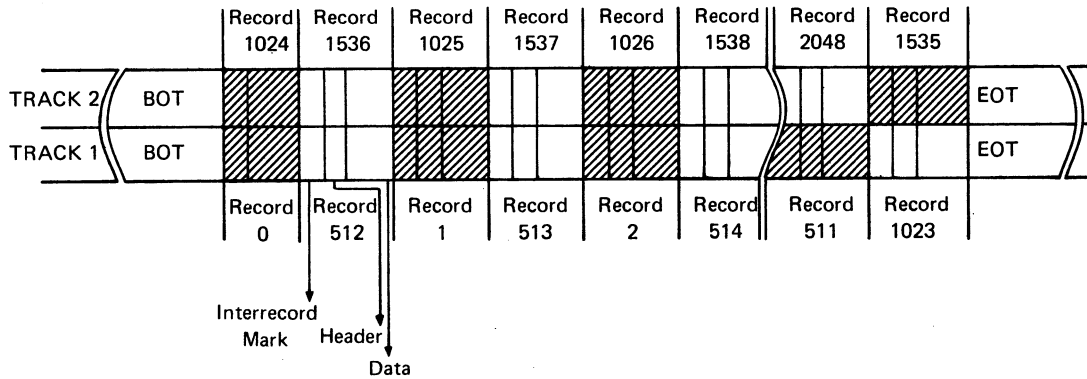


Figure 1-1 DECTape II Tape Format

RT-11 accesses blocks, which on DECTape II consist of four records. Each cartridge stores 512 blocks, each block containing 256 words (64 words per record).

In some circumstances, DECTape II's interleaved tape format may adversely affect performance. If, for instance, the monitor file happened to overlap from the end of tape to the beginning of tape, the number of rewinds would increase and, consequently, seek times would increase. Following the suggestion in Section 2.5.5 can help you to avoid such overlap.

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1.1.3 Directory

DECTape II is an RT-11 directory-structured device. The directory size is four segments, unless you change this default on initialization. RT-11 limits each directory segment to 72 files. If 72 files per device are adequate for your application, you should change the default directory size to 1 segment when you initialize your cartridges. Choosing this option on initialization will improve response time when you use the cartridges. Initialization procedures in this manual may include this option.

Directories and file data are interchangeable between DECTape II on the PDT-11/130 and DECTape II on PDP-11 processors running RT-11.

1.1.4 Vectors

The memory locations 260, 262, 264, and 266 are the standard PDT-11/DECTape II interrupt vectors. Location 260 contains the input interrupt entry point, location 262 contains the input interrupt routine's processor status word, location 264 contains the output interrupt entry point, and location 266 contains the output interrupt routine's processor status word. The RT-11 Advanced Programmer's Guide describes the importance of protecting vital memory locations like these.

1.1.5 .DSTATUS Value

PDT-11/DECTape II is identified by the octal value 36 in bits 7 - 0 of the status word of the .DSTATUS programmed request. See the RT-11 Advanced Programmer's Guide for a description of .DSTATUS.

1.2 PDT-11/150 VOLUME CHARACTERISTICS

The PDT-11/150 Intelligent Terminal includes a random-access mass storage device that uses single-density flexible diskettes. RT-11 supports this device as a file-structured random access device and as a system device.

The following sections describe some general characteristics of PDT-11/single-density flexible diskettes.

1.2.1 Data Storage

RT-11 stores data in blocks on single-density flexible diskettes. Each diskette stores 494 blocks, each block containing 256 words.

1.2.2 Directory

Single-density flexible diskette is an RT-11 directory-structured device. The directory size is four segments, unless you change this default on initialization. RT-11 limits each directory segment to 72 files. If 72 files per device are adequate for your application, you should change the default directory size to 1 segment when you initialize your diskettes. Choosing this option on initialization

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will improve response time when you use the diskettes. Initialization procedures in this manual may include this option.

Directories and file data are interchangeable between single-density flexible diskettes on the PDT-11/150 and RX01 single-density flexible diskettes on PDP-11 processors running RT-11.

1.2.3 Vectors

The memory locations 264 and 266 are the standard PDT-11/single-density flexible diskette interrupt vectors. Location 264 contains the interrupt entry point, and location 266 contains the interrupt routine's processor status word. The RT-11 Advanced Programmer's Guide describes the importance of protecting vital memory locations like these.

1.2.4 .DSTATUS Value

PDT-11/single-density diskette is identified by the octal value 37 in bits 7 - 0 of the status word of the .DSTATUS programmed request. See the RT-11 Advanced Programmer's Guide for a description of .DSTATUS.

1.2.5 Special Functions

The .SPFUN request allows you to read and write absolute sectors on PDT-11/single-density diskettes. The function code 377 allows a read, the function code 376 allows a write, and the code 375 allows a write with deleted data mark. The RT-11 Advanced Programmer's Guide describes how to use the .SPFUN request.

1.3 SOFTWARE KITS

DIGITAL offers four types of software kits for RT-11/PDT-11, as described in the following sections. Since the installation procedures differ according to software kit type, examine your Software Bill of Materials to ascertain which kit you have.

The Complete TU58 DEctape II Software Kit contains:

1. A set of ten DEctape II cartridges containing all the Version 3B RT-11 system components, including the single-job, base-line single-job, and foreground/background PD monitors (see the RT-11 System Generation Manual for a description of the various monitors). Two cartridges in this kit are bootable; you can boot cartridge number 1 on a PDP-11 processor or cartridge number 1-T on a PDT-11 processor.
2. A set of uncommented monitor source files.
3. The RT-11 Version 3B documentation.
4. PDT-11 updates to that documentation.
5. This manual.

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The Add-on TU58 DECTape II Software Kit contains:

1. Two DECTape II cartridges containing the Version 3B RT-11 single-job, base-line single-job, and foreground/background PD monitors (see the RT-11 System Generation Manual for a description of the various monitors).
2. All device handlers for the current system devices.
3. Any modules that include changes from previous Version 3B RT-11 modules.
4. A copy of the PIP utility program.
5. PDT-11 updates to Version 3B documents.
6. This manual.

The Complete RX01 Diskette Software Kit contains:

1. A set of ten single-density diskettes containing all the Version 3B RT-11 system components, including the single-job, base-line single-job, and foreground/background PD monitors (see the RT-11 System Generation Manual for a description of the various monitors). Two diskettes in this kit are bootable; you can boot diskette number 1 on a PDP-11 processor or diskette number 1-T on a PDT-11 processor.
2. A set of uncommented monitor source files.
3. The RT-11 Version 3B documentation.
4. PDT-11 updates to that documentation.
5. This manual.

The Add-on RX01 Diskette Software Kit contains:

1. Two single-density diskettes containing the Version 3B single-job, base-line single-job, and foreground/background PD monitors (see the RT-11 System Generation Manual for a description of the various monitors).
2. A set of uncommented monitor source files.
3. All device handlers for the current system devices.
4. Any modules that include changes from previous Version 3B RT-11 modules.
5. PDT-11 updates to Version 3B documents.
7. This manual.

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1.4 CONFIGURATION CATEGORIES

There are four categories of RT-11/PDT-11 configuration. Because installation procedures differ according to these categories as well as according to software kit type, you should read through the following paragraphs to identify the category to which your configuration belongs. Then, turn to the chapter for installing RT-11/PDT-11 on your configuration and perform the installation procedures.

1. Category 1: new user, PDT-11/130--If you are a new RT-11 user whose system device is PDT-11/DECTape II, your configuration belongs to Category 1. Perform the procedures in Chapter 2.
2. Category 2: RT-11 user creating a system for use on a PDT-11/130--If you have a previously installed RT-11 system and are using it to create an RT-11/PDT-11 system to run on your PDT-11/130 Intelligent Terminal, your configuration belongs to Category 2. Perform the procedures in Chapter 3.
3. Category 3: new user, PDT-11/150--If you are a new RT-11 user whose system device is PDT-11/single-density diskette, your configuration belongs to Category 3. Perform the procedures in Chapter 2.
4. Category 4: RT-11 user creating a system for use on a PDT-11/150--If you have a previously installed RT-11 system and are using it to create an RT-11/PDT-11 system to run on your PDT-11/150 Intelligent Terminal, your configuration belongs to Category 4. Perform the procedures in Chapter 3.

If your configuration belongs to Category 1 or 3, you can install RT-11 by simply bootstrapping the first volume, making backup copies of all the distribution volumes, and eliminating any unneeded components from the working copies of the system. If your system device is PDT-11/DECTape II, you cannot perform the system generation process. If your system device is PDT-11/single-density diskette, you can perform the system generation process but doing so is not a supported procedure. See Table 1-1.

On the other hand, if you are a Category 2 or 4 user (that is, you have an installed RT-11 system), you need only an add-on software kit. In this case, you must copy the distribution volumes to your previously installed RT-11 system. Then, use the previously installed RT-11 system to create a working system to run on the PDT-11 processor. If you want to build a customized system, you can, in most cases, perform the system generation process. (See Table 1-1.) DIGITAL supports performing the system generation process on a hard-disk-based system. Therefore, if your previously installed system is disk-based, you can perform system generation. If your previously installed system has RX01 Diskette as the only system device, you can perform system generation, but DIGITAL does not support the procedure (although it is described in the RT-11 System Generation Manual). If your installed system has DECTape II as the system device, you cannot perform the system generation process. See Sections 2-12 and 3-14 and the RT-11 System Generation Manual.

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Table 1-1
System Generation Support

User	System Device	Storage Device	DIGITAL Supports System Generation?		
			Yes	No	No, but you can attempt it if you follow the instructions in the <u>RT-11 System Generation Manual</u>
Has an installed RT-11/PDP-11 system and is creating an RT-11/PDT-11 system	Hard disk	Single-Density Diskette	X		
		DECTape II	X		
	Single-Density Diskette	Single-Density Diskette			X
Is installing an RT-11/PDT-11 system	DECTape II	DECTape II		X	
	Single-Density Diskette	Single-Density Diskette			X
	DECTape II	DECTape II		X	



CHAPTER 2

INSTALLING A CATEGORY 1 OR 3 SYSTEM

If you are a new RT-11 user who needs to install RT-11 on PDT-11, your configuration belongs to Category 1 or 3. RT-11 was distributed to you on PDT-11/130 or PDT-11/150 volumes. To install your system, perform the steps summarized in the following list. Sections 2.1 through 2.12 describe the procedures involved in each step.

1. Bootstrap the distribution volume
2. Preserve the distribution volumes
3. Install mandatory patches
4. Select the components you need in your working system
5. Plan the arrangement of components on volumes
6. Create the system from chosen components
7. Install the bootstrap on volumes that need to be bootable
8. Customize the system
9. Compress each volume
10. Preserve the working system
11. Test the working system
12. If appropriate, perform the system generation process

The following sections describe in detail the procedures you must perform to complete each step.

2.1 BOOTSTRAPPING THE DISTRIBUTION VOLUME

The first procedure you must perform to install RT-11 is to bootstrap the distribution volume.

Begin by ensuring that the processor is powered up but not running. Insert distribution volume number 1-T (write protected, if possible) in PDT-11 Unit 0 (which has the physical device name PD0:). Use the hardware bootstrap to boot the PDT volume.

RT-11 should respond with the following message if you have successfully bootstrapped the volume:

```
RT-11SJ V03B-00
(Followed by any startup file commands.)
```

INSTALLING A CATEGORY 1 OR 3 SYSTEM

Use the DATE command to set the date.

Type: DATE dd-mmm-yy

where dd-mmm-yy is the day, month, and year in the form 21-Feb-72

Response: .

2.2 PRESERVING THE DISTRIBUTION VOLUMES

The first operation you must perform with the running RT-11 system is to copy all the distribution volumes for backup. If machine failure or human error were to destroy the volumes, you would need the backup volumes.

Insert a blank volume (write enabled) in Unit 1. Then use the INITIALIZE command to initialize the blank volume. Use the BADBLOCKS option to cover any bad blocks that may be on your volume and the SEGMENTS:1 option to change the default directory size to 1 segment. Choosing 1 directory segment limits you to 72 files per volume but improves response time when you use the volume.

NOTE

If your volumes are diskettes, you can ignore instructions to write enable or write protect a volume. Diskettes are always write enabled. DECTape II provides a write protect feature but single-density diskette does not.

Type: INITIALIZE/BADBLOCKS/SEGMENTS:1 PD1:

Response: PD1:/Init are you sure?

Type: Y

There is a significant delay (as much as ten minutes) as the system scans the volume for bad blocks and creates a new directory. The monitor dot appears when this process is complete.

Response: .

Now remove the newly initialized volume and initialize eight additional blank volumes, leaving one write enabled, initialized, blank volume inserted in Unit 1.

The next step in the preservation process is to copy all the files from distribution volume number 1-T to the initialized blank volume, which becomes backup volume number 1.

As long as the volume you intend to copy is bootable (that is, it has the appropriate monitor file and a bootstrap) and contains certain system utility programs, you can boot RT-11 from that volume and use the COPY command. In this case, the COPY command, with the SYSTEM option and wildcards, copies all the files from the volume in Unit 0 to the one in Unit 1. Distribution volume number 1-T is bootable, but the rest of the volumes in your kit are not bootable because they lack the necessary components. Thus, these volumes require a different copy procedure. For volume number 1-T, however, the procedure is straightforward.

INSTALLING A CATEGORY 1 OR 3 SYSTEM

Type: COPY/SYSTEM PD0:*. * PD1:*. *

Response: Files copied:
PD0:aaaaaa.ttt to PD1:aaaaaa.ttt
.
.
.
PD0:zzzzzz.ttt to PD1:zzzzzz.ttt
.

Then copy the bootstrap on the volume.

Type: COPY/BOOT PD1:PDMNSJ.SYS PD1:

Response: .

Remove the newly created backup volume from Unit 1, write protect it, and label it "backup RT-11 V03B 1-T/9."

Because the remaining distribution volumes lack necessary system components, you cannot boot them. Therefore, to copy the remaining volumes, run RT-11 from distribution volume number 1-T in Unit 0 and use the DUP utility program.

Type: SET USR NOSWAP

Response: .

Insert an initialized blank volume (write enabled) in Unit 1.

NOTE

Ensure that the blank volumes that you use to back up distribution volumes do not have bad blocks. To ascertain whether a volume has bad blocks, use the command, DIRECTORY PD1:*.BAD. (Later, you can use a volume with bad blocks for data.)

Then, invoke the DUP utility program.

Type: R DUP

Response: *

Type: PD1:A=PD0:/I/W

Response: continue?

Replace the volume in Unit 0 with distribution volume number 2 (write protected, if possible). You do not need to copy distribution volume 1 since you have copied number 1-T.

Type: Y

There is a delay as RT-11 copies the files.

Response: Insert system disc, Are you ready?

INSTALLING A CATEGORY 1 OR 3 SYSTEM

Replace the volume in Unit 0 with distribution volume number 1-T (write protected).

Type: Y

Response: *

Remove the volume from Unit 1, label it "backup RT-11 V03B 2/9," write protect it, if possible, and insert another initialized blank volume in Unit 1.

Type: FD1:A=FD0:/I/W

Response: continue?

Replace the volume in Unit 0 with distribution volume number 3 (write protected, if possible).

Type: Y

Response: Insert system disc, Are you ready?

Replace the volume in Unit 0 with distribution volume number 1-T (write protected).

Type: Y

Response: *

Remove the volume from Unit 1, label it "backup RT-11 V03B 3/9," write protect it, if possible, and insert another initialized blank volume in Unit 1. Repeat these procedures to copy all the distribution volumes. Once you have copied all of them, you can return control to the monitor. Use the following procedure once DUP prompts you to replace the system volume.

Response: Insert system disc, Are you ready?

Replace the volume in Unit 0 with distribution volume number 1-T (write protected, if possible).

Type: Y

Response: *

Type:

Response: *

Now halt the processor. Replace distribution volume number 1-T with backup number 1 (write protected) in Unit 0. Write protect the distribution volumes and store them in a safe place. Use the backup copies to build a working system.

Use the hardware bootstrap to boot backup number 1.

Response: RT-11SJ V03B-00
(Followed by any startup file commands.)

INSTALLING A CATEGORY 1, OR 3, SYSTEM

Set the date.

Type: DATE dd-mmm-yy

where dd-mmm-yy is the day, month, and year in the form 21-Feb-72

Response: .

2.3 INSTALLING MANDATORY PATCHES

To ensure that RT-11 operates correctly, you must install mandatory patches at this point. Follow the instructions in the RT-11 V03B Software Dispatch Review (which is included in your software kit) to install them. The review publishes patches that correct software errors discovered since the software was released. Mandatory patches are critical to system or component operation; consequently, it is vital that you read this document and make the necessary patches. Refer to the RT-11 System User's Guide for information on the PATCH utility program.

NOTE

All components in your distribution kit include patches published through April 1979. You should not install any patches published before April 30, but you should install subsequent patches as usual.

2.4 SELECTING THE COMPONENTS YOU NEED IN YOUR WORKING SYSTEM

Because of the limited space available on volumes, you need to limit the components that you include in a working system. DIGITAL recommends that you include in your system only those components that are essential to your application. Therefore, you should decide which components you really need. To make this decision, study the space limitations you face, then consider the suggestions that follow.

2.4.1 Space Limitations

Before selecting components, you should become familiar with the space limitations. With RT-11 booted from Unit 0, examine the directories of each backup volume.

Type: DIRECTORY

There is a significant delay before the system responds.

Response: dd-mmm-yy
 filnam.typ n dd-mmm-yy
 .
 .
 .
 n Files, bbb blocks
 fff Free Blocks
 .

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NOTE

If the directory scrolls by too quickly to read, type CTRL/S to stop the display and CTRL/Q to restart it.

Insert backup volume number 2 (write protected, if possible) in Unit 1.

Type: DIRECTORY FD1:

After the directory prints, replace backup volume number 2 with backup volume number 3, and examine a directory of that volume. Use the same procedure to examine the directory of each backup volume.

The directories tell you how many blocks the components on each volume occupy and how much free space is available on the volume. Also, you can find the total free space on an initialized blank volume by obtaining a directory of it.

You should keep in mind the number of blocks various components occupy when you select the components to include in your working system. Also keep them in mind when you decide how to arrange these components on volumes. In addition, remember that you may need space for data storage on your system volume and other volumes in the working system.

2.4.2 Suggestions

Once you have examined the directories, select your components. The following suggestions may help you make your selections.

NOTE

These suggestions are included to help you decide which components you need in your system. The selection of components is a planning activity that may require much study before you are ready to continue with the next procedure, planning the arrangement of components on volumes (Section 2.5). Section 2.6 describes the actual procedure used to create the system that you plan.

2.4.2.1 Monitor - In general, you need only one monitor on a working system. If you need to use more than one monitor in an application, you should, because of space limitations, build a different system volume for each monitor you need.

2.4.2.2 File SWAP.SYS - You need the file SWAP.SYS on a system volume. SWAP.SYS serves as temporary storage for part of a program in memory when KMON, the USR, or both must swap over that program. When KMON or the USR are no longer needed, the system reads this external swap file back into main memory.

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2.4.2.3 Utility Programs - You do not need to include any system utility programs that you do not intend to use; but remember that most of the keyboard monitor commands need certain system programs in order to work. For example, PIP, DUP, and DIR are necessary for most of the keyboard commands to function. Appendix B of the RT-11 System User's Guide summarizes the keyboard monitor commands and lists the system utility programs that each command requires.

Refer to the RT-11 System User's Guide also for descriptions of the functions of the remaining utility programs. Since you will probably need to use EDIT, LINK, and HELP frequently, you may want them on the system volume. However, the utilities you use less frequently can occupy a second volume, which you can insert in and run from Unit 1 when you need those utilities.

If you intend to use the MACRO assembler, you need the file SYSMAC.SML on the system volume.

2.4.2.4 Default System Library - To use the LINK utility program, you may need the file SYSLIB.OBJ. The file SYSLIB.OBJ is the default system library, which the RT-11 linker searches to resolve any undefined globals at the end of a link operation. You must use the LIBR utility program to build SYSLIB.OBJ.

You build SYSLIB.OBJ from the system subroutines in the file SYSF4.OBJ using the the following command:

Type: LIBRARY/CREATE SYSLIB.OBJ SYSF4.OBJ

Response: .

Generally, SYSLIB for your application should contain the system subroutines found in SYSF4.OBJ, your installation-specific libraries of application subroutines, and the FORTRAN OTS routines. To add modules to SYSLIB from a file xxxxxx.OBJ, use the following command:

Type: LIBRARY/INSERT SYSLIB.OBJ xxxxxx.OBJ

Response: .

To create in-line code versions of GETSTR and PUTSTR, you must use the following procedure. The GETSTR and PUTSTR routines in SYSF4 are compiled as threaded code. If you generate your FORTRAN system for in-line code only, you must use in-line library subroutines as well. If you were to attempt to link FORTRAN in-line code object modules with the threaded code subroutines GETSTR and PUTSTR contained in SYSF4, undefined globals would result. To create in-line code versions, first compile the files GETSTR.FOR and PUTSTR.FOR that are in the distribution kit.

Type: FORTRAN/CODE:xxx GETSTR,PUTSTR

where xxx represents the type of object code to be generated. You select the default at FORTRAN installation time. The valid values are EAE (selects EAE hardware), EIS (selects EIS hardware), and FIS (selects FIS hardware).

You can then replace the threaded code modules in the library with the in-line code modules (created in the preceding) by using the following command:

Type: LIBRARY SYSLIB GETSTR/REPLACE,PUTSTR/REPLACE

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2.4.2.5 File **TT.SYS** - You must have **TT.SYS** on your system volume if you plan to use the SJ monitor. However, the FB monitor includes the TT handler and does not require the file **TT.SYS**.

2.4.2.6 Exercises - If you intend to perform the exercises in the Introduction to RT-11, you need the following components:

SWAP.SYS
PDMNSJ.SYS
PDMNFB.SYS
TT.SYS
LP.SYS (if your system includes a line printer)
DIR.SAV
PIP.SAV
DUP.SAV
LINK.SAV
EDIT.SAV
SRCCOM.SAV
LIBR.SAV
MACRO.SAV
CREF.SAV
SYSMAC.SML
ODT.OBJ
DEMOED.TXT
DEMOX1.MAC
DEMOSP.MAC

To do the FORTRAN exercises in the Introduction to RT-11, you also need:

FORTRA.SAV
SYSLIB.OBJ
DEMOF1.FOR

To do the BASIC exercises in the Introduction to RT-11, you also need:

BASIC.SAV

2.4.2.7 Source Files - You do not need any source files (except demonstration sources). You do need the demonstration sources to perform the exercises in Section 2.11 of this manual or in the Introduction to RT-11. Once you perform these exercises, the demonstration source files are no longer useful and you can delete them.

2.4.2.8 Other Files - In addition, you do not need:

1. VTMAC.MAC and VTHDLR.OBJ
2. A startup command file unless you want one
3. Handler files for any devices you do not have
4. TECO.SAV, VEG.TEC, INSERT.TEC, SORT.TEC, VT52.TEC, EDIT.TEC, or LOCAL.TEC unless you plan to use the TECO text editor

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2.5 PLANNING ARRANGEMENT OF COMPONENTS ON VOLUMES

Your system is constrained by system volume capacity. Therefore, you should plan the arrangement of your system components on volumes once you have decided what you need to include in your system. The suggestions summarized in the following list may help you plan an efficient arrangement. The sections that follow describe each suggestion.

1. Limit components on system volume
2. Create a separate utilities volume
3. Assign the default device to the data device
4. Create several system volumes
5. Add bad blocks (on cartridges) to avoid excessive rewinds
6. Build volumes for use with the Introduction to RT-11

NOTE

These suggestions are included to help you plan the arrangement of the components you have selected. This planning may require much study before you are ready to continue with the next procedure, actually creating the system you have planned (Section 2.6).

2.5.1 Limit Components On System Volume

Limit the system volume to only necessary and frequently used system components. Place on the system volume only one monitor file and only the handler files for devices actually in your configuration. For example, a typical PDT-11 system need have only:

SWAP.SYS
PDMNSJ.SYS
TT.SYS
LP.SYS (if your system includes a line printer)

If you use the foreground/background monitor, PDMNFB.SYS, you do not need TT.SYS because it is resident in that monitor.

However, if you intend to use the keyboard monitor commands, you need to include at least the utility programs PIP, DUP, and DIR, which are necessary for most of the keyboard commands to function. EDIT, LINK, and HELP are also components that many programmers use frequently.

2.5.2 Create a Separate Utilities Volume

Create a separate utilities volume for the utility programs you expect to use infrequently. If you use this technique, you will have a system volume that contains all the components necessary to execute the majority of keyboard commands and perform common program preparation functions. Then, when you need a seldom-used utility, you can insert the utilities volume instead of the data volume in Unit 1.

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You can run a non-overlaid utility directly from the utilities volume (or you can temporarily copy the utility to the system volume). To run a non-overlaid utility from the utilities volume, use the following commands.

Type: RUN xx1:aaaaaa **RET**

where xx is the physical device name and aaaaaa is the utility program's name

Response: *

Replace the utilities volume in Unit 1 with the data volume and issue the appropriate commands to the utility.

Response: *

Type: **CTRL/C**

Response: .

However, if you were to run an overlaid utility from Unit 1, the files it worked on would have to be on either the system volume or the utilities volume. Therefore, you should generally include the overlaid utilities on your system volume. The following is a list of the overlaid components:

- DUP
- MACRO
- LINK
- LIBR
- SYE
- PSE

ODT is also useful on the system volume to debug programs.

An example of this kind of arrangement of volumes into system volume and utilities volume follows:

System volume

- SWAP.SYS
- PDMNSJ.SYS
- TT.SYS
- LP.SYS
- BA.SYS
- PIP.SAV
- DUP.SAV
- DIR.SAV
- EDIT.SAV
- LINK.SAV
- LIBR.SAV
- ODT.OBJ
- HELP.SAV - required for the HELP command
- HELP.TEC - required for the HELP command
- HELP.TXT - required for the HELP command

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Utilities volume

BATCH.SAV
FILEX.SAV
PATCH.SAV
SRCCOM.SAV
DUMP.SAV
RESORC.SAV
PAT.SAV
FORMAT.SAV

2.5.3 Assign the Default Device to the Data Device

When you create your PDT-11 system and it is up and running, assign the default device DK: to the data device (Unit 1). Then, most temporary files, data files, etc., default to the second unit, minimizing demand for system device capacity.

The command to assign the default device is as follows:

Type: ASSIGN PD1: DK:

You can include this command in your startup command file (see the RT-11 System User's Guide) to assign the default device to PD1: whenever you boot the system. Note that the procedures in this chapter assume DK: is the system device. Be sure to make any adjustments in procedure if you assign the default.

2.5.4 Create Several System Volumes

Create several system volumes, each devoted to a particular function. You can then change the system volume as normal job flow changes the functions you need. To change system volumes, wait for a logical stopping point in the job flow. Do not arbitrarily remove the system volume in the middle of an operation.

2.5.5 Add Bad Blocks (on Cartridges) to Avoid Excessive Rewinds

If your PDT-11 volumes are DECTape II cartridges, you may encounter performance problems (slow response time) due to excessive rewinds of the magnetic tape. You can actually improve system performance by creating dummy bad blocks in strategic locations. Performance degradation occurs when a file (particularly a monitor file) overlaps from the end of tape to the beginning of tape--for example, it extends from the last portion of the second pass on track 1 to the first portion of the first pass on track 2. Slow response time results from the specific sequence and pattern in which DECTape II writes data records on the cartridge. Remember that DECTape II writes alternate data records on the first track (of two tracks on DECTape II volumes), rewinds, writes data records skipped on the first pass of the first track, rewinds, writes alternate data records on the second track, rewinds, and writes the records skipped on the first pass on the second track. (See Figure 1-1.)

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You can avoid this overlap by creating dummy bad blocks in three locations. (Figure 2-1 illustrates the locations of blocks on the tape.) Create a bad block at the beginning of the second pass on track 1 (block 128.), at the beginning of the first pass on track 2 (block 256.), and at the beginning of the second pass on track 2 (block 384.). In this way, you can prevent the system from writing across rewinds, since RT-11 requires contiguous free space in which to write files. However, this technique prevents you from creating any file over 127 blocks long and also increases fragmentation.

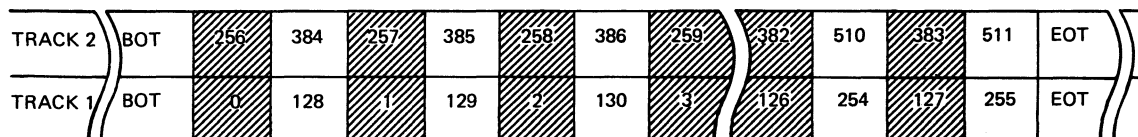


Figure 2-1 Block Locations on Tape

To create these dummy bad blocks, insert an initialized blank volume (write enabled) in Unit 1 and invoke the DUP utility program.

Type: R DUP RET

Response: *

Type: PD1:FIL1.BAD=/C:128.:1 RET

Response: *

Type: PD1:FIL2.BAD=/C:256.:1 RET

Response: *

Type: PD1:FIL3.BAD=/C:384.:1 RET

Response: *

Repeat this procedure on as many cartridges as you need for your working system. Return to the monitor.

Type: CTRL/C

Response: .

Then, when you build your system, use the volumes on which you have created these bad blocks.

NOTE

If you create these dummy bad blocks, you should consider them a permanent part of the cartridge (unless you reinitialize it). You can use the DELETE command to remove dummy bad blocks only if you have not compressed the cartridge with the SQUEEZE command. SQUEEZE renames bad block files in such a way that you cannot delete the files.

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2.5.6 Build Volumes for Use with the Introduction to RT-11

If you intend to perform the exercises in Introduction to RT-11, you need certain components in your working system. You need to build four volumes, as listed in the following:

System Volume

SWAP.SYS
PDMNSJ.SYS
PDMNFB.SYS
TT.SYS
LP.SYS (if appropriate)
PIP.SAV
DUP.SAV
DIR.SAV
LINK.SAV
EDIT.SAV
SRCCOM.SAV
LIBR.SAV
ODT.OBJ
MACRO.SAV
SYSMAC.SML
CREF.SAV
DEMOED.TXT
DEMOFL.FOR
DEMOXL.MAC
DEMOSP.MAC

FORTRAN Language Volume

SWAP.SYS
PDMNSJ.SYS
TT.SYS
LP.SYS (if appropriate)
PIP.SAV
DUP.SAV
DIR.SAV
EDIT.SAV
FORTRA.SAV
DEMOFL.FOR

LINK Volume

SWAP.SYS
PDMNSJ.SYS
LP.SYS (if appropriate)
TT.SYS
PIP.SAV
DUP.SAV
DIR.SAV
LINK.SAV
SYSLIB.OBJ

BASIC Volume

SWAP.SYS
PDMNSJ.SYS
LP.SYS (if appropriate)
TT.SYS
PIP.SAV
DUP.SAV
DIR.SAV
LINK.SAV
EDIT.SAV
BASIC.SAV

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2.6 CREATING THE SYSTEM FROM CHOSEN COMPONENTS

Once you have chosen your system components and have planned the best arrangement of them on volumes, you can create the working system. You can use either of two methods to create the working system:

1. You can delete files (of unwanted components) from the backup copies of the distribution volumes.
2. You can copy files (of chosen components) from the distribution backup copies to initialized blank volumes.

Obviously, if you intend to use most of the distributed components, it is quicker to delete unwanted ones than to copy chosen ones. When you use the delete method, you do not need additional blank volumes, as you do when you use the copy method. However, to use many of the suggestions for arranging components (Section 2.5), the copy method may be more efficient. The delete method has the additional disadvantage of fragmenting the free space on the volume.

NOTE

If you need to include the default system library (SYSLIB.OBJ) in your system (SYSLIB may be necessary if you use the LINK utility), you must first build it. See Section 2.4.2.4.

2.6.1 Deleting Files

To delete files, write enable backup volume number 1 and boot it in Unit 0. Delete from it any files that you do not need. For this procedure, be sure that you have not assigned PDI: to DK:.

Type: DELETE/SYSTEM PDO:filnam.typ,PDO:filnam.typ

where filnam.typ is the file name and type of the component you want to delete. You can specify up to six files in each command. Note that you need the /SYSTEM option to delete system files (with file type .SYS).

Response: Files deleted:
 PDO:filnam.typ ?

Type: Y

Response: PDO:filnam.typ ?

Type: Y

Response: .

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Or you could use the following command, to avoid typing numerous file specifications. The system queries you about all the files on the volume and you delete the ones you choose.

Type: DELETE/SYSTEM PDO:*.*(RET)

Response: Files deleted:
PDO:aaaaaa.ttt?

Type: Y(RET) to delete that specific file
N(RET) to include that specific file

Response: PDO:bbbbbb.ttt? (and so on)

When you delete system files, RT-11 issues the warning message ?PIP-W-Reboot. DIGITAL recommends that you reboot as warned.

When deleting from the remaining volumes, you must run RT-11 from the system volume and delete files from volumes inserted in the other unit. Insert backup volume number 2 (write enabled) in Unit 1, and delete any files from it that you do not need.

Type: DELETE/SYSTEM PD1:*.*(RET)

After you delete unneeded files from backup volume number 2, remove it from Unit 1, insert the next backup volume in Unit 1, and delete unwanted files. Repeat these steps for the remaining volumes.

2.6.2 Copying Files

To use the copy method of creating a system, start by initializing a number of blank volumes. Follow the same procedure that you used in Section 2.2. Insert a write enabled, blank volume in Unit 1 (with the system booted from Unit 0) and type INITIALIZE/BADBLOCKS/SEGMENTS:1 PD1:. Repeat the process to create as many initialized blank volumes as you need for the system that you have planned.

NOTE

If you want to create bad blocks on cartridges to avoid excessive rewinds (as described in Section 2.5.5), do so at this point.

Then, use the COPY command with the SYSTEM option to copy selected files from backup volume 1 to the volume that becomes your working system volume.

Type: COPY/SYSTEM PDO:filnam.tsf PD1:filnam.tsf(RET)

Response: *

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Or you can use the following command to avoid typing numerous file specifications.

Type: COPY/SYSTEM/QUERY PDO:*. * PD1:*. *

Response: Files copied:
PDO:aaaaaa.ttt to PD1:aaaaaa.ttt?

Type: Y to include a specific file
N to exclude a specific file

Response: PDO:bbbbbb.ttt to PD1:bbbbbb.ttt? (and so on)

The system queries you about all the files on the volume, and you choose the files it copies.

To copy files from nonbootable volumes, use the PIP utility program and swap volumes.

Leave backup volume number 1 in Unit 0, and use the SET command to set the USR to NOSWAP.

Type: SET USR NOSWAP

Response: .

Insert another initialized blank volume (write enabled) in Unit 1. Invoke PIP.

Type: R PIP

Response: *

Remove backup volume number 1 from Unit 0 and insert the next backup volume (write protected, if possible) from which you need to copy some files. To perform the copy operation, you must type a command string to PIP in the format "output files=input files" and with the /Y option so that PIP can copy system files. The following is the correct command string:

Type: PD1:*. */Y/Q=PDO:*. *

Response: Files copied:
PDO:aaaaaa.ttt to PD1:aaaaaa.ttt?

Type: Y to include a specific file
N to exclude a specific file

Response: PDO:bbbbbb.ttt to PD1:bbbbbb.ttt? (and so on)

PIP queries you about each file on the volume in Unit 0. You choose the files it copies. When PIP has queried about all the files on the volume in Unit 0, it responds with an asterisk.

Response: *

Then, remove the volume from Unit 0, and insert the next volume from which you need to copy files. Repeat the command string to PIP and choose the files PIP should copy. When you have copied all the files you have planned for the first working system volume, remove it and label it "RT-11 V03B 1/x" (where x is the number of volumes in your working system). Insert another initialized blank volume (write enabled) in Unit 1 and a volume from which you need to copy files to it in Unit 0. Repeat the command string to PIP and choose the files PIP should copy. Repeat these procedures to create all the volumes in the working system that you have planned.

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When you have created and labeled all the working system volumes, remove the volume from Unit 0 and again insert backup volume number 1.

Type:

Response: .

CTRL/C returns control to the monitor. Be careful not to type CTRL/C until you have replaced backup volume number 1 in Unit 0 (typing CTRL/C with the wrong volume in Unit 0 causes system failure).

2.7 INSTALLING THE BOOTSTRAP ON ANY VOLUMES THAT NEED TO BE BOOTABLE

Once you have created your system, you need to install the bootstrap on any volumes that must be bootable (that is, that you can use as the system volume). Generally, any volume that includes a monitor file should be bootable (but do not forget that the volume would need SWAP.SYS also).

If you have created your system by deleting files from distribution backups (Section 2.6.1), the bootstrap for the SJ monitor is already on the system volume. In all other cases, copy the bootstrap to the appropriate volumes. Insert in Unit 1 the volume on which you need to install the bootstrap.

Type: COPY/BOOT PD1:PDMNyy.SYS PD1:

where yy is either SJ or FB

Response: .

In this command, you need to identify the device on which the monitor that contains the bootstrap information resides, the name of that monitor file, and the device on which you need to install the bootstrap. This command copies bootstrap information from the monitor file to blocks 0 and 2 through 5 of the volume.

Then, insert working system volume number 1 in Unit 0 and use the hardware bootstrap to boot your working system.

Response: RT-11xx V03B-00
(Followed by any startup file commands.)
.

Set the date.

Type: DATE dd-mmm-yy

where dd-mmm-yy is the day, month, and year in the form 21-Feb-72

Response: .

2.8 CUSTOMIZING THE SYSTEM

Although the RT-11 components are suitable as distributed for most applications, you may want to make certain customizations to them. Table 2-1 summarizes the customizations that are available and directs you to the section in the RT-11 System Generation Manual that describes a particular customization and the procedure for implementing it.

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NOTE

Some RT-11 configurations can perform the system generation process to implement additional customizations. See Section 2.12.

Table 2-1
RT-11 Customizations

Customization	Section in System Generation Manual	Description
Changing default output device from line printer to terminal	2.4.12	If your configuration does not include a line printer, you can change the default output device (which certain monitor commands use) from line printer to terminal. To make this change, you must edit the startup command file.
Changing default SYSLIB device	2.4.13	You can change the device on which the default system library, SYSLIB.OBJ, resides by patching the linker.
Changing from 60-cycle clock rate to 50-cycle	2.4.6	To use a 50-cycle clock rate rather than the 60-cycle clock of the distributed monitors, you must patch the monitor.
Extending directory size	2.4.14	To change the size of a directory without reinitializing the disk or volume, you can use the supplied program.
Modifying BATCH to save space	2.4.19	If you need to save space, you can store certain system programs on DK: rather than on SY: and cause BATCH to access them there. Patch BATCH so that it invokes system programs with the monitor RUN command (which assumes DK: as the default) rather than with the R command (which always uses SY:).
Modifying listing page length in MACRO and CREF	2.4.11	If your line printer uses line printer paper that is not 10.5 inches long, or if you do not have a line printer, you can patch MACRO and CREF to change the listing page length from the standard 60 lines.
Running RT-11 in less memory than is available	2.4.10	If your application requires that RT-11 run in less memory than is available, you can install one of two patches to permit it to do so.
Setting upper limit on file size	2.4.9	If your application requires an upper limit to the size of files, you can patch the monitor to set the limit you require.

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2.9 COMPRESSING EACH VOLUME

DIGITAL recommends that you compress each volume to make its free space contiguous. Squeezing free space allows you to use space on the volume that would otherwise be too fragmented to be usable. However, if your volumes are cartridges and you create bad blocks to avoid excessive rewinds, the amount of contiguous free space possible is limited (refer to Section 2.5.5).

Continue to run RT-11 from Unit 0 and use the SQUEEZE command to compress free space. (The volume must be write enabled.) The squeeze operation does not move files with the .BAD file type.

Type: SQUEEZE PD0:

Response: PD0:/Squeeze are you sure?

Type: Y

The squeeze operation may take as long as 20 minutes.

Response: RT-11xx V03B-00x
(Followed by any startup file commands.)
.

The system automatically reboots when you compress a system volume, if you are running from that volume.

Then insert the next volume that you need to compress (write enabled) in Unit 1.

Type: SQUEEZE PD1:

Response: PD1:/Squeeze are you sure?

Type: Y

Response: .

Replace the volume in Unit 1 with the next one you need to compress and repeat this procedure for all the volumes you need to compress.

2.10 PRESERVING THE WORKING SYSTEM

Once you build a satisfactory working system, DIGITAL recommends that you preserve it on backup volumes.

Insert a blank volume (write enabled) in Unit 1 (with RT-11 still booted from Unit 0). Use the INITIALIZE/BADBLOCKS/SEGMENTS:1 command to initialize the blank volume. Then repeat the process to initialize the appropriate number of volumes.

Copy all the files in your working system. You can use the COPY/SYSTEM command to copy any bootable volumes. Remember that you must use PIP to copy the volumes that are not bootable (see Section 2.6.2). Also remember to copy the bootstrap to any volumes that need to be bootable (see Section 2.7).

Write protect (if possible) the backup volumes and store them in a safe place. If you ever need to restore the working system, you can make copies of the backup.

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2.11 TESTING THE WORKING SYSTEM

Once you have built and preserved the working system, you can execute the following demonstration to test the system. This demonstration does not serve as a comprehensive system exercise; but, because it uses several major system components, it serves as a minimal integrity check. Moreover, DIGITAL considers your system officially installed if the demonstration runs without error.

To execute this demonstration, your working system must include at least the following components:

```
SWAP.SYS
PDMNSJ.SYS
PDMNFB.SYS (if you do the foreground/background monitor exercise)
TT.SYS (for SJ monitor)
LP.SYS (if appropriate)
EDIT.SAV
MACRO.SAV
SYSMAC.SML
LINK.SAV
PIP.SAV
DUP.SAV
DIR.SAV
DEMOBG.MAC
DEMOFG.MAC
```

This demonstration consists of the single-job monitor exercise or both the single-job monitor exercise and the foreground/background monitor exercise.

2.11.1 Single-Job Monitor Exercise

For this exercise, you edit, assemble, link, and execute a small program (DEMOBG.MAC). When you execute DEMOBG, it displays a message on the terminal.

Write enable the system volume. Then, bootstrap the system.

```
Response: RT-11SJ V03B-00x
          (Followed by any startup file commands.)
          .
```

```
Type:    DATE dd-mmm-yy 
```

where dd-mmm-yy is the day, month, and year in the form 21-Feb-72

```
Response: .
```

Insert a write enabled, blank volume in Unit 1.

```
Type:    ASSIGN PD1: DK: 
```

```
Response: .
```

```
Type:    INITIALIZE/BADBLOCKS/SEGMENTS:1 PD1: 
```

```
Response: PD1:/Init are you sure?
```

```
Type:    Y 
```

```
Response: .
```

INSTALLING A CATEGORY 1 OR 3 SYSTEM

Display the directory of the system volume on the terminal. The directory varies according to your particular working system. As long as a directory prints, you need not worry if it matches the one in the following example.

Type: DIRECTORY/BRIEF/COLUMNS:1 SY:

Response:

```
      dd-mmm-yy
PDMNSJ.SYS
LP .SYS
TT .SYS
PATCH .SAV
EDIT .SAV
MACRO .SAV
SYSMAC.SML
LINK .SAV
ODT .OBJ
PIP .SAV
      *
      *
      *
xxx Files, bbb Blocks
fff Free blocks
      *
```

Next, use the text editor to modify the demonstration program, DEMOBG.MAC.

Type: EDIT SY:DEMOBG.MAC

Response: *

Type: F: .ASCII

Response: *

Type: OAH

Response: *

Type: EX

Response: .

Now, you need to assemble DEMOBG.MAC and obtain a listing. If your configuration includes a line printer, ensure that it is on-line and ready.

Type: ASSIGN LP: LST:

Response: .

If your configuration does not include a line printer, you can use the console terminal.

Type: ASSIGN TT: LST:

Response: .

INSTALLING A CATEGORY 1 OR 3 SYSTEM

If you are running on a system with 12K or more words of memory, assemble DEMOBG.MAC as follows:

Type: MACRO/LIST:LST: SY:DEMOBG RET

Response: (see Figure 2-2)

DEMOBG MACRO V03,01 24-FEB-78 00:32:22 PAGE 1

```

1          .TITLE DEMOBG
2          .IDENT /V03,01/
3          ; DEMONSTRATION PROGRAM TO PRINT DEMONSTRATION MESSAGE, THEN
4          ; RING BELL IF FG JOB SENDS A MESSAGE.
5
6          .MCALL .RCVDC,.PRINT
7
8          START: .RCVDC #AREA,#BUFFER,#400,#MSGIN ;POST REQUEST FOR MESSAGE
9                .PRINT #MSG ;PRINT DEMONSTRATION MESSAGE
10               BR . ;AND LOOP
11
12          ; COMPLETION ROUTINE ENTERED WHEN FG SENDS MESSAGE
13
14          MSGIN: .PRINT #BELL ;RING BELL IN RESPONSE TO MESSAGE
15                .RCVDC #AREA,#BUFFER,#400,#MSGIN ;POST ANOTHER MESSAGE REQUEST
16                RETURN ;AND RETURN FROM COMPLETION ROUTINE
17
18          ; ASCII MESSAGES
19          .NLIST BEX
20          RELL: .BYTE 7,200 ;MESSAGE THAT RINGS BELL
21
22          MSG: .ASCII /RT-11 DEMONSTRATION PROGRAM/<15><12>
23              .ASCII /IF INCORRECTLY EDITED,THIS IS THE LAST LINE./<15><12>
24              .ASCII /WELL DONE./
25              .BYTE 0
26
27          AREA: .BLKW 6 ;EMT ARGUMENT AREA
28          BUFFER: ;RCVDC MESSAGE AREA
29          .END START

```

DEMOBG MACRO V03,01 24-FEB-78 00:32:22 PAGE 1-1
SYMBOL TABLE

AREA	000240R	BUFFER	000254R	MSGIN	000044R	...V1 = 000003	...V2 = 000027
BELL	000110R	MSG	000112R	START	000002RG		

.ABS. 000000 000
000254 001

ERRORS DETECTED: 0

VIRTUAL MEMORY USED: 1513 WORDS (6 PAGES)
DYNAMIC MEMORY AVAILABLE FOR 56 PAGES
OK:DEMOBG,LST:DEMOBG*DK:DEMOBG

Figure 2-2 DEMOBG Assembly Listing

If you are running on a system with 8K words of memory, assemble DEMOBG.MAC as follows:

Type: MACRO SY:DEMOBG RET

Response: ERRORS DETECTED: 0

Type: MACRO/LIST:DEMOBG/NOBJECT SY:DEMOBG RET

Response: ERRORS DETECTED: 0

Type: COPY DEMOBG.LST LST: RET

Response: (see Figure 2-2)

INSTALLING A CATEGORY 1 OR 3 SYSTEM

Now, whether your system is a 12K or an 8K system, link and execute the program DEMOBG.

Type: LINK DEMOBG

Response: .

Type: RUN DEMOBG

Response: RT-11 DEMONSTRATION PROGRAM
IF INCORRECTLY EDITED, THIS IS THE LAST LINE.
WELL DONE.

Type:

Response: ^C
^C
.

If you incorrectly edited the file, you can repeat this exercise, although you can continue without doing so. If, however, you want to repeat it, begin by using the backup demonstration program.

Type: RENAME SY:DEMOBG.BAK SY:DEMOBG.MAC

Response: .

Then, repeat the editing procedure.

2.11.2 Foreground/Background Monitor Exercise

For this exercise, assemble a second program (DEMOFG.MAC), link it for the foreground, and execute it in conjunction with DEMOBG. This exercise requires 16K words of memory. DEMOFG is a small foreground program that sends a message every two seconds to DEMOBG (running in the background), telling it to ring the terminal bell. Besides printing the terminal message used in the single-job exercise, DEMOBG recognizes these messages and rings the bell once for each message sent.

Although DEMOFG is always active, sending messages to the background every two seconds, this exercise can execute other programs in the background besides DEMOBG. Only when DEMOBG is active, however, is the circuit complete and are messages successfully received and honored. During those periods when DEMOBG is not running, DEMOFG enters the messages in the monitor message queue. Once you restart DEMOBG in the background, the system immediately dequeues all the messages queued since the last forced exit, resulting in many successive bell rings. When the queue is empty, the normal send/receive cycle resumes and the bell rings every two seconds, as each current message is sent and honored.

Ensure that the RT-11 single-job monitor is running. Then boot the foreground/background monitor.

Type: BOOT PDMNFB.SYS

Response: RT-11FB V03B-00x
(Followed by any startup file commands.)
.

INSTALLING A CATEGORY 1 OR 3 SYSTEM

Type: ASSIGN PD1: DK: (RET)

Response: .

Now, enter the time of day.

Type: TIME hh:mm:ss (RET)

where hh:mm:ss is the hour, minutes, and seconds in the form 13:12:00 (1:12 p.m.)

Response: .

Assemble the foreground demonstration program, DEMOFG.MAC.

Type: MACRO SY:DEMOFG (RET)

Response: ERRORS DETECTED: 0

Link DEMOFG for the foreground.

Type: LINK/BACKGROUND DEMOFG (RET)

Response: .

Start DEMOFG as the foreground job.

Type: FRUN DEMOFG (RET)

Response: F>
FOREGROUND DEMONSTRATION PROGRAM SENDS A
MESSAGE TO THE BACKGROUND PROGRAM "DEMOBG"
EVERY 2 SECONDS, TELLING IT TO RING THE
BELL.

Type: (CTRL/B)

Response: B>

DEMOFG is running and queuing the message for DEMOFG every two seconds. Now execute DEMOFG in the background and receive the messages.

Type: RUN DEMOFG (RET)

(The bell rings quickly several times, then once every two seconds.)

Response: RT-11 DEMONSTRATION PROGRAM
IF INCORRECTLY EDITED, THIS IS THE LAST LINE.
WELL DONE.

Execute a DIRECTORY command in the background to obtain a directory listing.

Type: (CTRL/C)
(CTRL/C)

(The bell stops.)

Response: ^C
^C
.

INSTALLING A CATEGORY 1 OR 3 SYSTEM

Type: DIRECTORY

Response: dd-mmm-yy

(The directory of the device DK prints on the terminal.)

Rerun DEMOBG to collect all the foreground messages queued while the directory was printing.

Type: RUN DEMOBG

(The bell rings several times in rapid succession, then rings once every two seconds.)

Response: RT-11 DEMONSTRATION PROGRAM
IF INCORRECTLY EDITED, THIS IS THE LAST LINE.
WELL DONE.

Type:

Response: ^C
^C

(The bell stops.)

Now, stop the foreground program and remove it from memory.

Type:

Response: F>

Type:

Response: ^C
^C
B>

Type: UNLOAD FG

Response: .

2.12 PERFORMING THE SYSTEM GENERATION PROCESS

If you want to implement any system generation options (see Table 2-2), it may be possible to generate your own monitor. If your PDT-11 volumes are single-density diskettes, you can perform the system generation process, but doing so is not a supported procedure. If your PDT-11 volumes are DECTape II cartridges, you cannot perform the system generation process. See Table 1-1.

The RT-11 System Generation Manual describes how to perform this system generation process. However, before you turn to the system generation manual, you should note the changes that have been made to the SYSGEN dialogue to accommodate PDT-11.

INSTALLING A CATEGORY 1 OR 3 SYSTEM

The dialogue lists the devices that RT-11 Version 3B supports as system devices and asks you to choose one as your system device. The following addition has been made to the list of supported devices:

PD PDT Intelligent Terminal

After the list, the dialogue asks the following question:

What is the name of the system device [DD] (RK)?

Type: PD

Table 2-2
System Generation Options

Option	Description
Device I/O time-out support	Permits device handlers to do the equivalent of a mark time without doing a .SYNCH request; DECNET applications require this support.
Error logging support	Keeps a statistical record of all I/O operations on devices that are supported by this feature and detects and stores any errors that occur during I/O operations.
Escape sequence support	Permits your application to make special use of escape sequences (either DEC standard or ANSI standard).
Memory parity support	Causes the system to print an error message when a memory parity error occurs.
Multi-terminal support	Permits you to use two or more terminals.
SJ timer support	Configures the SJ monitor to include mark time and cancel mark time programmed requests and to support the fork process.

NOTE

To complete the system generation process as described in the RT-11 System Generation Manual, you must install the system you have generated. Backing up that system is a part of the installation procedure described in the RT-11 System Generation Manual.

CHAPTER 3

INSTALLING A CATEGORY 2 OR 4 SYSTEM

If you have a previously installed RT-11/PDP-11 system, your configuration belongs to Category 2 or 4. You must use the previously installed system to create an RT-11/PDT-11 system to run on the PDT-11/130 or PDT-11/150 processor. You create the PDT-11 system by copying a selection of components from both your installed system and the PDT-11 distribution volumes to PDT-11 volumes. You subsequently boot the newly created system on the PDT-11 processor.

CAUTION

Ensure that your previously installed system includes all published mandatory patches. This software will not function unless the previously installed system is properly patched.

Your previously installed system may have a hard disk as its system device with RX01 single-density diskette or DECTape II cartridge as a storage device. On the other hand, diskette or DECTape II may be your only mass storage device and serve as the system device. Where appropriate, procedures in this chapter include both the techniques you should use if your system device is single-density diskette or DECTape II and the techniques you should use if your system device is a hard disk.

To install your system, perform the steps summarized in the following list. Sections 3.1 through 3.14 describe the procedures involved in each step.

1. Bootstrap the previously installed system
2. Copy the distribution volumes to the system device
3. Preserve the distribution volumes
4. Install mandatory patches
5. Select the components you need in your working PDT-11 system
6. Plan the arrangement of components on volumes
7. Create the system from chosen components
8. Install the bootstrap on volumes that need to be bootable

INSTALLING A CATEGORY 2 OR 4 SYSTEM

9. Customize the system
10. Compress each volume
11. Preserve the working system
12. Bootstrap the PDT-11 processor
13. Test the working RT-11/PDT-11 system
14. If appropriate, perform the system generation process

The following sections describe in detail the procedures you must perform to complete each step.

3.1 BOOTSTRAPPING THE INSTALLED SYSTEM

The first procedure you must perform to install RT-11/PDT-11 is to bootstrap your previously installed RT-11 system.

Begin by ensuring that the previously installed PDP-11 system's processor is powered up but not running. Use the hardware bootstrap to boot the PDP-11 system.

RT-11 should respond with the following message if you have successfully bootstrapped the volume:

```
RT-11xx V03B-00x
(Followed by any startup file commands.)
.
```

Use the DATE command to set the date.

Type: DATE dd-mmm-yy

where dd-mmm-yy is the day, month, and year in the form 21-Feb-72

Response: .

3.2 COPYING THE DISTRIBUTION VOLUMES TO THE SYSTEM DEVICE

Once you have bootstrapped the previously installed system, you must copy certain files from both RT-11/PDT-11 distribution volumes to the system device.

The following files are new components that you need to add to the system.

```
DDMNSJ.SYS
DDMNFB.SYS
PDMNSJ.BL
PDMNSJ.SYS
PDMNFB.SYS
DD.SYS
DD.MAC
PD.MAC
```

INSTALLING A CATEGORY 2 OR 4 SYSTEM

In addition, you should copy the following changed components. These files supersede any versions of these components you may have. They include all patches published through April 30, 1979.

RK.MAC
DM.MAC
DS.MAC
DY.MAC
DP.MAC
DX.MAC
DT.MAC
RF.MAC
DL.MAC
BSTRAP.MAC
SYSTBL.CND
SYSGEN.CND
RESORC.SAV

3.2.1 Procedure If System Device Is Diskette or DECTape II

Insert distribution volume number 1 (write protected, if possible) in diskette Unit 1 or DECTape II Unit 1 (which has the physical device name DX1: or DD1:).

Type: COPY/SYSTEM/QUERY xx1:*. * xx0:*. *

where xx is the physical device name

Response: Files copied:
xx1:aaaaaa.ttt to xx0:aaaaaa.ttt?

Type: Y to include a specific file
N to exclude a specific file

Response: xx1:bbbbbb.ttt to xx0:bbbbbb.ttt? (and so on)

RT-11 queries you about all the files on the volume so that you can select the files it copies.

NOTE

Your previously installed system probably consists of several volumes. Therefore, you must copy components from the distribution to the appropriate volumes in your system. That is, you need to replace components (wherever they may be in your previously installed system) with the latest version of the components.

Once you have copied distribution volume number 1, replace it in Unit 1 with distribution volume number 2. Repeat the preceding procedure to copy the second distribution volume to the installed system. Then remove distribution volume number 2 from Unit 1.

INSTALLING A CATEGORY 2 OR 4 SYSTEM

3.2.2 Procedure If System Device Is Hard Disk

Insert distribution volume number 1 (write protected, if possible) in diskette Unit 0 or DEctape II Unit 0 (which has the physical device name DX0: or DD0:).

Type: COPY/SYSTEM/QUERY xx0:*. * xxn:*. *

where xx is the physical device name

Response: Files copied:
xx0:aaaaaa.ttt to xxn:aaaaaa.ttt?

Type: Y to include a specific file
N to exclude a specific file

Response: xx0:bbbbbb.ttt to xxn:bbbbbb.ttt? (and so on)

RT-11 queries you about all the files on the volume so that you can select the files it copies.

Once you have copied distribution volume number 1, replace it in Unit 0 with distribution volume number 2. Repeat the preceding procedure to copy the second distribution volume to the installed system. Then remove distribution volume number 2 from Unit 0.

3.3 PRESERVING THE DISTRIBUTION VOLUMES

Write protect (if possible) the distribution volumes and store them in a safe place. If machine failure or human error were to destroy the system, you would need the distribution volumes.

3.4 INSTALLING MANDATORY PATCHES

To ensure that RT-11 operates correctly, you must install mandatory patches at this point. Follow the instructions in the RT-11 V03B Software Dispatch Review (which is included in your software kit) to install them. The review publishes patches that correct software errors discovered since the software was released. Mandatory patches are critical to system or component operation; consequently, it is vital that you read this document and make the necessary patches. Refer to the RT-11 System User's Guide for information on the PATCH utility program.

NOTE

All components in your distribution kit include patches published through April 1979. You should not install any patches published before April 30, but you should install subsequent patches, as usual.

INSTALLING A CATEGORY 2 OR 4 SYSTEM

3.5 SELECTING THE COMPONENTS YOU NEED IN YOUR WORKING PDT-11 SYSTEM

Because of the limited space available on volumes, you need to limit the components that you include in a working system. DIGITAL recommends that you include in your RT-11/PDT-11 system only those components that are essential to that particular application. Since the components you need may be different from the components you needed on your previously installed system, you should decide which components are essential. To make this decision, study the space limitations you face, then consider the suggestions that follow.

3.5.1 Space Limitations

Before selecting components, you should become familiar with the space limitations. Examine your system volume's directory, if your system device is hard disk. If your system device is diskette or DECTape II, examine the directories of all the volumes in the system (but start with the system volume).

Type: DIRECTORY

There is a significant delay before the system responds.

```
Response:        dd-mmm-yy
                 filnam.txx n dd-mmm-yy
                 *
                 *
                 *
                 n Files, bbb blocks
                 fff Free Blocks
                 *
```

NOTE

If you have a video terminal and the directory scrolls by too quickly to read, type CTRL/S to stop the display and CTRL/Q to restart it.

If your system includes additional volumes, insert each volume in Unit 1.

Type: DIRECTORY

A directory tells you how many blocks the components on the volume occupy and how much free space is available. Also, you can find the total free space on an initialized blank volume by obtaining a directory of it.

You should keep in mind the number of blocks various components occupy when you select the components to include in your working system. Also keep size in mind when you decide how to arrange these components on volumes. In addition, remember that you may need space for data storage on your system volume and other volumes in the working system.

INSTALLING A CATEGORY 2 OR 4 SYSTEM

3.5.2 Suggestions

Once you have examined the directory or directories, select your components. The following suggestions may help you make your selections.

NOTE

These suggestions are included to help you decide which components you need in your system. The selection of components is a planning activity that may require much study before you are ready to continue with the next procedure, planning the arrangement of components on volumes (Section 3.6). Section 3.7 describes how to create the system that you plan.

3.5.2.1 Monitor - In general, you need only one monitor on a working system. If you need to use more than one monitor in an application, you should, because of space limitations, build a different system volume for each monitor you need.

3.5.2.2 File SWAP.SYS - You need the file SWAP.SYS on a system volume. SWAP.SYS serves as temporary storage for part of a program in memory when KMON, the USR, or both must swap over that program. When KMON or the USR are no longer needed, the system reads this external swap file back into main memory.

3.5.2.3 Utility Programs - You do not need to include any system utility programs that you do not intend to use; but remember that most of the keyboard monitor commands need certain system programs in order to work. For example, PIP, DUP, and DIR are necessary for most of the keyboard commands to function. Appendix B of the RT-11 System User's Guide summarizes the keyboard monitor commands and lists the system utility programs that each command requires.

Refer to the RT-11 System User's Guide also for descriptions of the functions of the remaining utility programs. You will probably need to use EDIT, LINK, and HELP frequently, and may want them on the system volume. However, the utilities that you will use less frequently can occupy a second volume, which you can insert in and run from Unit 1 when you need those utilities.

If you intend to use the MACRO assembler, you need the file SYSMAC.SML on the system volume.

3.5.2.4 Default System Library - To use the LINK utility program, you may need the file SYSLIB.OBJ. The file SYSLIB.OBJ is the default system library, which the RT-11 linker searches to resolve any undefined globals at the end of a link operation. You must use the LIBR utility program to build SYSLIB.OBJ.

INSTALLING A CATEGORY 2 OR 4 SYSTEM

You build SYSLIB.OBJ from the system subroutines in the file SYSF4.OBJ using the the following command:

Type: LIBRARY/CREATE SYSLIB.OBJ SYSF4.OBJ

Response: .

Generally, SYSLIB for your application should contain the system subroutines found in SYSF4.OBJ, your installation-specific libraries of application subroutines, and the FORTRAN OTS routines. To add modules to SYSLIB from a file xxxxxx.OBJ, use the following command:

Type: LIBRARY/INSERT SYSLIB.OBJ xxxxxx.OBJ

Response: .

To create in-line code versions of GETSTR and PUTSTR, you must use the following procedure. The GETSTR and PUTSTR routines in SYSF4 are compiled as threaded code. If you generate your FORTRAN system for in-line code only, you must use in-line library subroutines as well. If you were to attempt to link FORTRAN in-line code object modules with the threaded code subroutines GETSTR and PUTSTR contained in SYSF4, undefined globals would result. To create in-line code versions, first compile the files GETSTR.FOR and PUTSTR.FOR that are in the distribution kit.

Type: FORTRAN/CODE:xxx GETSTR,PUTSTR

where xxx represents the type of object code to be generated. You select the default at FORTRAN installation time. The valid values are EAE (selects EAE hardware), EIS (selects EIS hardware), and FIS (selects FIS hardware).

You can then replace the threaded code modules in the library with the in-line code modules (created in the preceding) by using the following command:

Type: LIBRARY SYSLIB GETSTR/REPLACE,PUTSTR/REPLACE

3.5.2.5 File TT.SYS - You must have TT.SYS on your system volume if you plan to use the SJ monitor. However, the FB monitor includes the TT handler and does not require the file TT.SYS.

3.5.2.6 Exercises - If you intend to perform the exercises in the Introduction to RT-11 on the RT-11/PDT-11 system, you need the following components:

- SWAP.SYS
- PDMNSJ.SYS
- PDMNFB.SYS
- TT.SYS
- LP.SYS (if your system includes a line printer)
- DIR.SAV
- PIP.SAV
- DUP.SAV
- LINK.SAV
- EDIT.SAV

INSTALLING A CATEGORY 2 OR 4 SYSTEM

SRCCOM.SAV
LIBR.SAV
MACRO.SAV
CREF.SAV
SYSMAC.SML
ODT.OBJ
DEMOED.TXT
DEMOX1.MAC
DEMOSP.MAC

To do the FORTRAN exercises in the Introduction to RT-11, you also need:

FORTRA.SAV
SYSLIB.OBJ
DEMOF1.FOR

To do the BASIC exercises in the Introduction to RT-11, you also need:

BASIC.SAV

3.5.2.7 **Source Files** - You do not need any source files (except demonstration sources). You do need the demonstration sources to perform the exercises in Section 3.13 of this manual or in the Introduction to RT-11. Once you perform these exercises, the demonstration source files are no longer useful and you can delete them.

3.5.2.8 **Other Files** - In addition, you do not need:

1. VTMAC.MAC and VTHDLR.OBJ
2. A startup command file unless you want one
3. Handler files for any devices you do not have
4. TECO.SAV, VEG.TEC, INSERT.TEC, SORT.TEC, VT52.TEC, EDIT.TEC, or LOCAL.TEC unless you plan to use the TECO text editor

3.6 PLANNING ARRANGEMENT OF COMPONENTS ON VOLUMES

Your system is constrained by PDT-11 system volume capacity. Therefore, you should plan the arrangement of your system components on volumes once you have decided what you need to include in your system. The suggestions summarized in the following list may help you plan an efficient arrangement. The sections that follow describe each suggestion.

1. Limit components on system volume
2. Create a separate utilities volume
3. Assign the default device to the data device
4. Create several system volumes
5. Add bad blocks (on cartridges) to avoid excessive rewinds
6. Build volumes for use with the Introduction to RT-11

INSTALLING A CATEGORY 2 OR 4 SYSTEM

NOTE

These suggestions are included to help you plan the arrangement of the components you have selected. This planning may require much study before you are ready to continue with the next procedure, actually creating the system you have planned (Section 3.7).

3.6.1 Limit Components on System Volume

Limit the system volume to only necessary and frequently used system components. Place on the system volume only one monitor file and only the handler files for devices actually in your configuration. For example, a typical PDT-11 system need have only:

SWAP.SYS
PDMNSJ.SYS
TT.SYS
LP.SYS (if your system includes a line printer)

If you use the foreground/background monitor, PDMNFB.SYS, you do not need TT.SYS because it is resident in that monitor.

However, if you intend to use the keyboard monitor commands, you need to include at least the utility programs PIP, DUP, and DIR, which are necessary for most of the keyboard commands to function. EDIT, LINK, and HELP are also components many programmers use frequently.

3.6.2 Create a Separate Utilities Volume

Create a separate utilities volume for the utility programs you expect to use infrequently. If you use this technique, you will have a system volume that contains all the components necessary to execute the majority of keyboard commands and perform common program preparation functions. Then, when you need a seldom-used utility, you can insert the utilities volume instead of the data volume in Unit 1. You can run a non-overlaid utility directly from the utilities volume or you can temporarily copy the utility to the system volume. To run a non-overlaid utility from the utilities volume, use the following commands:

Type: RUN xx1:aaaaaa

where xx is the physical device name and aaaaaa is the utility program's name

Response: *

Replace the utilities volume in Unit 1 with the data volume, and issue the appropriate commands to the utility.

Response: *

Type:

Response: .

INSTALLING A CATEGORY 2 OR 4 SYSTEM

However, if you were to run an overlaid utility from Unit 1, the files it worked on would have to be on either the system volume or the utilities volume. Therefore, you should generally include the overlaid utilities on your system volume. The following is a list of the overlaid components:

DUP
MACRO
LINK
LIBR
SYE
PSE

ODT is also useful on the system volume to debug programs.

An example of this kind of arrangement of volumes into system volume and utilities volume follows:

System volume

SWAP.SYS
PDMNSJ.SYS
TT.SYS
LP.SYS
BA.SYS
PIP.SAV
DUP.SAV
DIR.SAV
EDIT.SAV
LINK.SAV
LIBR.SAV
ODT.OBJ
HELP.SAV - required for the HELP command
HELP.TEC - required for the HELP command
HELP.TXT - required for the HELP command

Utilities volume

BATCH.SAV
FILEX.SAV
PATCH.SAV
SRCCOM.SAV
DUMP.SAV
RESORC.SAV
PAT.SAV
FORMAT.SAV

3.6.3 Assign the Default Device to the Data Device

When you create your PDT-11 system and it is up and running on the PDT-11 hardware, assign the default device DK: to the data device (Unit 1). Then, most temporary files, data files, etc., default to the second unit, minimizing demand for system device capacity.

The command to assign the default device is as follows:

Type: ASSIGN PD1: DK: (RET)

You can include this command in your startup command file (see the RT-11 System User's Guide) to assign the default device to PD1: whenever you boot the system. Note that the procedures in this chapter assume DK: is the system device. Be sure to make any adjustments in procedure if you assign the default.

INSTALLING A CATEGORY 2 OR 4 SYSTEM

3.6.4 Create Several System Volumes

Create several system volumes, each devoted to a particular function. You can then change the system volume as normal job flow changes the functions you need. To change system volumes, wait for a logical stopping point in the job flow. Do not arbitrarily remove the system volume in the middle of an operation.

3.6.5 Add Bad Blocks (on Cartridges) to Avoid Excessive Rewinds

If your volumes are DECTape II cartridges, you may encounter performance problems (slow response time) due to excessive magnetic tape rewinds. You can actually improve system performance by creating dummy bad blocks in strategic locations. Performance degradation occurs when a file (particularly a monitor file) overlaps from the end of tape to the beginning of tape--for example, it extends from the last portion of the second pass on track 1 to the first portion of the first pass on track 2. Slow response results from the specific sequence and pattern in which DECTape II writes data records on the cartridge. Remember that DECTape II writes alternate data records on the first track (of two tracks on DECTape II volumes), rewinds, writes data records skipped on the first pass of the first track, rewinds, writes alternate data records on the second track, rewinds, and writes the records skipped on the first pass on the second track. (See Figure 1-1.)

You can avoid this overlap by creating dummy bad blocks in three locations. (Figure 3-1 illustrates the locations of blocks on the tape.) Create a bad block at the beginning of the second pass on track 1 (block 128.), at the beginning of the first pass on track 2 (block 256.), and at the beginning of the second pass on track 2 (block 384.). In this way, you can prevent the system from writing across rewinds, since RT-11 requires contiguous free space in which to write files. However, this technique prevents you from creating any file over 127 blocks long and also increases fragmentation.

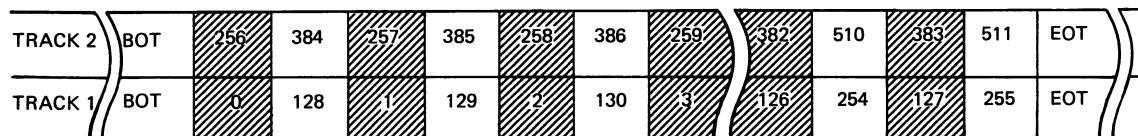


Figure 3-1 Block Locations on Tape

To create these dummy bad blocks, insert an initialized blank volume (write enabled) in Unit 1 and invoke the DUP utility program.

```
Type:      R DUP (RET)
Response:  *

Type:      DD1:FIL1.BAD=/C:128.:1 (RET)
Response:  *

Type:      DD1:FIL2.BAD=/C:256.:1 (RET)
Response:  *
```

INSTALLING A CATEGORY 2 OR 4 SYSTEM

Type: DD1:FIL3.BAD=/C:384.:1 **RET**

Response: *

Repeat this procedure on as many cartridges as appropriate for your working system. Return to the monitor.

Type: **CTRL/C**

Response: *

Then, when you build your system, use the volumes on which you have created these bad blocks.

NOTE

If you create these dummy bad blocks, you should consider them a permanent part of the cartridge (unless you reinitialize it). You can use the DELETE command to remove dummy bad blocks only if you have not compressed the cartridge with the SQUEEZE command. SQUEEZE renames bad block files in such a way that you cannot delete the files.

3.6.6 Build Volumes for Use with the Introduction to RT-11

If you intend to perform the exercises in Introduction to RT-11, you need certain components on your working system. You need to build four volumes, as listed in the following:

System Volume

SWAP.SYS
PDMNSJ.SYS
PDMNFB.SYS
TT.SYS
LP.SYS (if appropriate)
PIP.SAV
DUP.SAV
DIR.SAV
LINK.SAV
EDIT.SAV
SRCCOM.SAV
LIBR.SAV
ODT.OBJ
MACRO.SAV
SYSMAC.SML
CREF.SAV
DEMOED.TXT
DEMOF1.FOR
DEMOX1.MAC
DEMOSP.MAC

INSTALLING A CATEGORY 2 OR 4 SYSTEM

FORTRAN Language Volume

SWAP.SYS
PDMNSJ.SYS
TT.SYS
LP.SYS (if appropriate)
PIP.SAV
DUP.SAV
DIR.SAV
EDIT.SAV
FORTRA.SAV
DEMOFL.FOR

LINK Volume

SWAP.SYS
PDMNSJ.SYS
LP.SYS (if appropriate)
TT.SYS
PIP.SAV
DUP.SAV
DIR.SAV
LINK.SAV
SYSLIB.OBJ

BASIC Volume

SWAP.SYS
PDMNSJ.SYS
LP.SYS (if appropriate)
TT.SYS
PIP.SAV
DUP.SAV
DIR.SAV
LINK.SAV
EDIT.SAV
BASIC.SAV

3.7 CREATING THE SYSTEM FROM CHOSEN COMPONENTS

Once you have chosen your system components and have planned the best arrangement of them on volumes, you can create the RT-11/PDT-11 working system by copying those components to PDT-11 volumes.

The procedure you use to copy components depends on your previously installed system's configuration.

NOTE

If you need to include the default system library (SYSLIB.OBJ) in your system (SYSLIB may be necessary if you use the LINK utility) you must first build it. See Section 3.5.2.4.

INSTALLING A CATEGORY 2 OR 4 SYSTEM

3.7.1 Procedure If the System Device Is Diskette or DECTape II

If your system device is single-density diskette or DECTape II, start by initializing a number of blank volumes.

With RT-11 booted from Unit 0, insert a blank volume (write enabled) in Unit 1. Then use the INITIALIZE command to initialize the blank volume. Use the BADBLOCKS option to cover any bad blocks that may be on your volume and the SEGMENTS:1 option to change the default directory size to 1 segment. Choosing 1 directory segment limits you to 72 files per volume but improves response time when you use the volume.

NOTE

If your volumes are diskettes, you can ignore instructions to write enable or write protect a volume. Diskettes are always write enabled. DECTape II provides a write protect feature but diskette does not.

Type: INITIALIZE/BADBLOCKS/SEGMENTS:1 xx1:

where xx is the physical device name

Response: xx1:/Init are you sure?

Type: Y

There is a significant delay (as much as eight minutes) as the system scans the volume for bad blocks and creates a new directory. The monitor dot prints when this process is complete.

Response: .

Now remove the newly initialized volume and initialize several additional blank volumes, leaving one write enabled, initialized, blank volume inserted in Unit 1. This volume will become your RT-11/PDT-11 working system volume.

As long as the volume you intend to copy is bootable (that is, it has the appropriate monitor file and a bootstrap) and contains certain system utility programs, you can run RT-11 from that volume and use the COPY command.

Type: COPY/SYSTEM/QUERY xx0:*. * xx1:*. *

where xx is the physical device name

Response: Files copied:
xx0:aaaaaa.ttt to xx1:aaaaaa.ttt?

Type: Y to include a specific file
N to exclude a specific file

Response: xx0:bbbbbb.ttt to xx1:bbbbbb.ttt? (and so on)

RT-11 queries you about all the files on the volume, and you can choose which files it copies.

INSTALLING A CATEGORY 2 OR 4 SYSTEM

You probably need to copy RT-11 components that are not on the volume currently in Unit 0 to your RT-11/PDT-11 system. You will need some of these components on the PDT-11 system volume; consequently, you need to use a different copy technique that lets you run RT-11 from the volume in Unit 0 but insert another volume in Unit 0 long enough to copy components from it to the volume in Unit 1. Use the PIP utility program.

Type: SET USR NOSWAP

Response: .

Invoke PIP.

Type: R PIP

Response: *

Remove the volume from Unit 0 and insert the next volume (write protected, if possible) that contains files you need to copy. To perform the copy operation, you must type a command string to PIP in the format "output files=input files" and with the /Y option so that PIP can copy system files. The following is the correct command string:

Type: xx1:*.*/Y/Q=xx0:*. *

where xx is physical device name

Response: Files copied:
xx0:aaaaaa.ttt to xx1:aaaaaa.ttt?

Type: Y to include a specific file
N to exclude a specific file

Response: xx0:bbbbbb.ttt to xx1:bbbbbb.ttt? (and so on)

Once RT-11 has queried you about all the files on the volume in Unit 0, you can replace that volume with another that contains files you need to copy to the RT-11/PDT-11 system volume. When you have copied all the files you need to the volume in Unit 1, replace the previously installed system volume in Unit 0.

Type:

Response: .

CTRL/C returns control to the monitor. Be careful not to type CTRL/C until you have replaced the correct volume in Unit 0 (typing CTRL/C with the wrong volume in Unit 0 causes system failure).

Use this procedure to create the rest of the volumes in the RT-11/PDT-11 system that you have planned.

Then, use the SET command to set the USR SWAP.

Type: SET USR SWAP

Response: .

INSTALLING A CATEGORY 2 OR 4 SYSTEM

3.7.2 Procedure If the System Device Is a Hard Disk

If your system device is a hard disk, you can use the following technique to copy the selected components to PDT-11 volumes.

Insert a write enabled blank PDT-11 volume in diskette or DECTape II Unit 0. Then use the INITIALIZE command to initialize the blank volume. Use the BADBLOCKS option to cover any bad blocks that may be on your volume and the SEGMENTS:1 option to change the default directory size to 1 segment. Choosing 1 directory segment limits you to 72 files per volume but improves response time when you use the volume.

Type: INITIALIZE/BADBLOCKS/SEGMENTS:1 xx0:

where xx is physical device name

Response: xx0:/Init are you sure?

Type: Y

There is a significant delay (as much as eight minutes) as the system scans the volume for bad blocks and creates a new directory. The monitor dot prints when this process is complete.

Response: .

Now remove the newly initialized volume and initialize several additional blank volumes, leaving one write enabled, initialized, blank volume inserted in Unit 0.

Use the following command to copy selected components from your system volume to create a PDT-11 system volume.

Type: COPY/SYSTEM/QUERY xxn:*. * xx0:*. *

where xx is the physical device name

Response: Files copied:
xxn:aaaaa.ttt to xx0:aaaaa.ttt?

Type: Y to include a specific file
N to exclude a specific file

Response: xxn:bbbbbb.ttt to xx1:bbbbbb.ttt (and so on)

RT-11 queries you about all the files on the volume, and you can select the files it copies.

Once you have created the RT-11/PDT-11 system volume, remove it from Unit 0, and insert another initialized blank volume in Unit 0. Use the same command to copy other components to other initialized blank volumes. In this way, you can create all the volumes in the system you have planned.

INSTALLING A CATEGORY 2 OR 4 SYSTEM

3.8 INSTALLING THE BOOTSTRAP ON ANY VOLUMES THAT NEED TO BE BOOTABLE

Once you have created your system, you need to install the bootstrap on any volumes that must be bootable (that is, that you can use as the system volume). Generally, any volume that includes a monitor file should be bootable (but remember that the volume would also need the file SWAP.SYS).

Insert a volume that should be bootable in Unit 1.

Type: COPY/BOOT `xx1:PDMNyy.SYS` `xx1:RET`

where yy is either SJ or FB

Response: .

In this command, you need to identify the device on which the monitor that contains the bootstrap information resides, the name of that monitor file, and the device on which you need to install the bootstrap. This command copies bootstrap information from the monitor file to blocks 0 and 2 through 5 of the volume.

3.9 CUSTOMIZING THE SYSTEM

Although the RT-11 components are suitable as distributed for most applications, you may want to make certain customizations to them. Table 3-1 summarizes the customizations that are available and directs you to the section in the RT-11 System Generation Manual that describes a particular customization and the procedure for implementing it.

NOTE

Some RT-11 configurations can perform the system generation process to implement additional customizations. See Section 3-14.

Table 3-1
RT-11 Customizations

Customization	Section in System Generation Manual	Description
Changing default output device from line printer to terminal	2.4.12	If your configuration does not include a line printer, you can change the default output device (which certain monitor commands use) from line printer to terminal. To make this change, you must edit the startup command file.
Changing default SYSLIB device	2.4.13	You can change the device on which the default system library, SYSLIB.OBJ, resides by patching the linker.

(continued on next page)

INSTALLING A CATEGORY 2 OR 4 SYSTEM

Table 3-1 (Cont.)
RT-11 Customizations

Customization	Section in System Generation Manual	Description
Changing from 60-cycle clock rate to 50-cycle	2.4.6	To use a 50-cycle clock rate rather than the 60-cycle clock of the distributed monitors, you must patch the monitor.
Extending directory size	2.4.14	To change the size of a directory without reinitializing the disk or volume, you can use the supplied program.
Modifying BATCH to save space	2.4.19	If you need to save space, you can store certain system programs on DK: rather than on SY: and cause BATCH to access them there. Patch BATCH so that it invokes system programs with the monitor RUN command (which assumes DK: as the default) rather than with the R command (which always uses SY:).
Modifying listing page length in MACRO and CREF	2.4.11	If your line printer uses line printer paper that is not 10.5 inches long, or if you do not have a line printer, you can patch MACRO and CREF to change the listing page length from the standard 60 lines.
Running RT-11 in less memory than is available	2.4.10	If your application requires that RT-11 run in less memory than is available, you can install one of two patches to permit it to do so.
Setting upper limit on file size	2.4.9	If your application requires an upper limit to the size of files, you can patch the monitor to set the limit you require.

3.10 COMPRESSING EACH VOLUME

DIGITAL recommends that you compress each PDT-11 volume to make its free space contiguous. Squeezing free space allows you to use space on the volume that would otherwise be too fragmented to be usable. However, if your volumes are cartridges and you create bad blocks to avoid excessive rewinds, the amount of contiguous free space possible is limited (refer to Section 3.6.5). Also note that the squeeze operation does not move files with the .BAD file type.

This procedure depends on the type of previously installed RT-11 system you have.

INSTALLING A CATEGORY 2 OR 4 SYSTEM

3.10.1 Procedure If System Device Is Diskette or DECTape II

If single-density diskette or DECTape II is the system device, run RT-11 from Unit 0 of that device. Insert a volume of your PDT-11 working system in Unit 1. Ensure that the volume is write enabled.

Type: SQUEEZE xx1:

Response: xx1:/Squeeze are you sure?

Type: Y

There is a delay of as much as seven minutes.

Response: .

Repeat this procedure to squeeze each volume in your PDT-11 working system.

3.10.2 Procedure If System Device Is Hard Disk

If your previously installed RT-11 system includes a hard disk, you can run RT-11 from the disk and squeeze volumes in either unit of the single-density diskette or DECTape II drive.

Type: SQUEEZE xxn:

where xx is the physical device name

Response: xxn:/Squeeze are you sure?

Type: Y

There is a delay of as much as seven minutes.

Response: .

Repeat this procedure to squeeze each volume in your PDT-11 working system.

3.11 PRESERVING THE WORKING SYSTEM

Once you build a satisfactory working system, you must preserve it on backup volumes. Once again, the procedure depends on the type of previously installed system you have.

3.11.1 Procedure If System Device Is Diskette or DECTape II

With RT-11 booted from single-density diskette or DECTape II Unit 0, insert a blank volume (write enabled) in Unit 1. Use the INITIALIZE/BADBLOCKS/SEGMENTS:1 command to initialize the blank volume. Then repeat the process to initialize the appropriate number of volumes.

Now, to copy all the working system volumes, use PIP and swap volumes (as described in Section 3.7.1). You must use PIP rather than the COPY command in all cases because even the bootable volumes in your RT-11/PDT-11 working system are not bootable on the PDP-11 processor.

INSTALLING A CATEGORY 2 OR 4 SYSTEM

Set the USR NOSWAP.

Type: SET USR NOSWAP

Response: .

Type: R PIP

Response: *

Replace the volume in Unit 0 with the RT-11/PDT-11 volume you want to copy.

Type: `xx1:*.*/Y=xx0:*.*`

where xx is the physical device name

Response: *

Swap volumes and repeat the command string to copy all volumes. Replace the volume in Unit 0 with the system volume.

Type:

Response: .

Set the USR SWAP.

Type: SET USR SWAP

Response: .

Copy all the working system volumes in this way. Then, copy the bootstrap on any volumes that should be bootable. Insert a volume in diskette or DECTape II Unit 1.

Type: COPY/BOOT `xx1:PDMN99.SYS.` `xx1:`

Response: .

Store the backup volumes in a safe place. If you ever need to restore the working system, you can make copies of the backup.

3.11.2 Procedure If System Device Is Hard Disk

Insert the volume you want to copy (write protected, if possible) in single-density diskette or DECTape II Unit 0 and the blank volume (write enabled) in Unit 1. Use the INITIALIZE/BADBLOCKS/SEGMENTS:1 command to initialize the blank volume. Then repeat the process to initialize the appropriate number of volumes.

Copy all the files on the volume, using the COPY/SYSTEM command.

Type: COPY/SYSTEM `xx0:*.*` `xx1:*.*`

Response: .

INSTALLING A CATEGORY 2 OR 4 SYSTEM

Copy all the working system volumes in this way. Then copy the bootstrap on any volumes that should be bootable. Insert a volume in single-density diskette or DECTape II Unit 1.

Type: COPY/BOOT `xx1:PDMNSJ.SYS` `xx1:RET`

Response:

Store the backup volumes in a safe place. If you ever need to restore the working system, you can make copies of the backup.

3.12 BOOTSTRAPPING THE PDT-11 SYSTEM

Once you have created and preserved your working system, remove it from your previously installed RT-11/PDP-11 system and boot it on the PDT-11 system.

Begin by ensuring that the PDT-11 Intelligent Terminal is powered up but not running. Write protect (if possible) the RT-11/PDT-11 system volume and insert it in PDT-11 Unit 0. Use the hardware bootstrap to boot the PDT-11 volume. RT-11 should respond with the following message if you have successfully bootstrapped the volume.

```
RT-11xx U03B-00x
(Followed by any startup file commands.)
```

3.13 TESTING THE WORKING RT-11/PDT-11 SYSTEM

You can execute the following demonstration to test the RT-11/PDT-11 system on the PDT-11 hardware. This demonstration does not serve as a comprehensive system exercise; but, because it uses several major system components, it serves as a minimal integrity check. Moreover, DIGITAL considers your system officially installed if the demonstration runs without error.

To execute this demonstration, your working system must include at least the following components:

```
SWAP.SYS
PDMNSJ.SYS
PDMNFB.SYS (if you do the foreground/background monitor exercise)
TT.SYS (for SJ monitor)
LP.SYS (if appropriate)
EDIT.SAV
MACRO.SAV
SYSMAC.SML
LINK.SAV
PIP.SAV
DUP.SAV
DIR.SAV
DEMOBG.MAC
DEMOFG.MAC
```

This demonstration consists of the single-job monitor exercise or both the single-job monitor exercise and the foreground/background monitor exercise.

INSTALLING A CATEGORY 2 OR 4 SYSTEM

3.13.1 Single-Job Monitor Exercise

For this exercise, you edit, assemble, link, and execute a small program (DEMOBG.MAC). When you execute DEMOBG, it displays a message on the terminal.

If the RT-11/PDT-11 system is not running, bootstrap it. Ensure that the system volume is write enabled.

Response: RT-11SJ V03B-x00x
(Followed by any startup file commands.)
.

Type: DATE dd-mmm-yy

where dd-mmm-yy is the day, month, and year in the form 21-Feb-72

Response: .

Insert a write enabled, blank volume in Unit 1.

Type: ASSIGN PD1: DK:

Response: .

Type: INITIALIZE/BADBLOCKS/SEGMENTS:1 PD1:

Response: PD1:/Init are you sure?

Type: Y

Response: .

Display the directory of the system volume on the terminal. The directory varies according to your particular working system. As long as a directory prints, you need not worry if it matches the one in the following example.

Type: DIRECTORY/BRIEF/COLUMNS:1 SY:

Response:

```
dd-mmm-yy
PDMNSJ.SYS
LP .SYS
TT .SYS
PATCH .SAV
EDIT .SAV
MACRO .SAV
SYSMAC.SML
LINK .SAV
ODT .OBJ
PIP .SAV
.
.
.
xxx Files, bbb Blocks
fff Free blocks
.
```


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Next, use the text editor to modify the demonstration program, DEMOGB.MAC.

Type: EDIT SY:DEMOGB.MAC

Response: *

Type: F; .ASCII

Response: *

Type: OAD

Response: *

Type: EX

Response: .

Now, you need to assemble DEMOGB.MAC and obtain a listing. If your configuration includes a line printer, ensure that it is on-line and ready.

Type: ASSIGN LP: LST:

Response: .

If your configuration does not include a line printer, you can use the console terminal.

Type: ASSIGN TT: LST:

Response: .

If you are running on a system with 12K or more words of memory, assemble DEMOGB as follows:

Type: MACRO/LIST:LST: SY:DEMOGB

Response: (see Figure 3-2)

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```

1
2
3
4
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11
12
13
14
15
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17
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20
21
22
23
24
25
26
27
28
29

```

```

.TITLE DEMORG
.IDENT /V03,01/
; DEMONSTRATION PROGRAM TO PRINT DEMONSTRATION MESSAGE, THEN
; RING BELL IF FG SENDS A MESSAGE.

.MCALL .RCVOC,.PRINT

START: .RCVOC #AREA,#BUFFER,#400,#MSGIN ;POST REQUEST FOR MESSAGE
.PRINT #MSG ;PRINT DEMONSTRATION MESSAGE
BR . ;AND LOOP

; COMPLETION ROUTINE ENTERED WHEN FG SENDS MESSAGE

MSGIN: .PRINT #BELL ;RING BELL IN RESPONSE TO MESSAGE
.RCVOC #AREA,#BUFFER,#400,#MSGIN ;POST ANOTHER MESSAGE REQUEST
RETURN ;AND RETURN FROM COMPLETION ROUTINE

; ASCII MESSAGES
.NLIST BEX
RELL: .BYTE 7,200 ;MESSAGE THAT RINGS BELL

MSG: .ASCII /RT-11 DEMONSTRATION PROGRAM/<15><12>
.ASCII /IF INCORRECTLY EDITED,THIS IS THE LAST LINE./<15><12>
.ASCII /WELL DONE./
.BYTE 0

AREA: .BLKW 6 ;EMT ARGUMENT AREA
BUFFER: ;RCVOC MESSAGE AREA

.END START

```

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SYMBOL TABLE

AREA	000240R	BUFFER	000254R	MSGIN	000044R	...V1 = 000003	...V2 = 000027
BELL	000110R	MSG	000112R	START	000000RG		

.ABS. 000000 000
000254 001
ERRORS DETECTED: 0

VIRTUAL MEMORY USED: 1513 WORDS (6 PAGES)
DYNAMIC MEMORY AVAILABLE FOR 56 PAGES
OK:DEMORG,LST:DEMORG=OK:DEMORG

Figure 3-2 DEMORG Assembly Listing

If you are running on a system with 8K words of memory, assemble DEMORG as follows:

Type: MACRO SY:DEMORG RET

Response: ERRORS DETECTED: 0
.

Type: MACRO/LIST:DEMORG/NOBJECT SY:DEMORG RET

Response: ERRORS DETECTED: 0
.

Type: COPY DEMORG.LST LST: RET

Response: (see Figure 3-2)

INSTALLING A CATEGORY 2 OR 4 SYSTEM

Now, whether your system is a 12K or an 8K system, link and execute the program DEMOBG.

Type: LINK DEMOBG

Response: .

Type: RUN DEMOBG

Response: RT-11 DEMONSTRATION PROGRAM
IF INCORRECTLY EDITED, THIS IS THE LAST LINE.
WELL DONE.

Type:

Response: ^C
^C
.

If you incorrectly edited the file, you can repeat this exercise, although you can continue without doing so. If, however, you want to repeat it, begin by using the backup demonstration program.

Type: RENAME SY:DEMOBG.BAK SY:DEMOBG.MAC

Response: .

Then, repeat the editing procedure.

3.13.2 Foreground/Background Monitor Exercise

For this exercise, assemble a second program (DEMOFG.MAC), link it for the foreground, and execute it in conjunction with DEMOBG. This exercise requires 16K words of memory. DEMOFG is a small foreground program that sends a message every two seconds to DEMOBG (running in the background), telling it to ring the terminal bell. Besides printing the terminal message used in the single-job exercise, DEMOBG recognizes these messages and rings the bell once for each message sent.

Although DEMOFG is always active, sending messages to the background every two seconds, this exercise can execute other programs in the background besides DEMOBG. Only when DEMOBG is active, however, is the circuit complete and are messages successfully received and honored. During those periods when DEMOFG is not running, DEMOFG enters the messages in the monitor message queue. Once you restart DEMOBG in the background, the system immediately dequeues all the messages queued since the last forced exit, resulting in many successive bell rings. When the queue is empty, the normal send/receive cycle resumes and the bell rings every two seconds, as each current message is sent and honored.

Ensure that the RT-11 single-job monitor is running. Then boot the foreground/background monitor.

Type: BOOT PDMNFB.SYS

Response: RT-11FB V03B-00x
(Followed by any startup file commands.)
.

INSTALLING A CATEGORY 2 OR 4 SYSTEM

Type: ASSIGN PD1: DK:

Response: .

Now, enter the time of day.

Type: TIME hh:mm:ss

where hh:mm:ss is the hour, minutes, and seconds in the form 13:12:00
(1:12 p.m.)

Response: .

Assemble the foreground demonstration program, DEMOFG.MAC.

Type: MACRO SY:DEMOFG

Response: ERRORS DETECTED: 0
.

Link DEMOFG for the foreground.

Type: LINK/BACKGROUND DEMOFG

Response: .

Start DEMOFG as the foreground job.

Type: FRUN DEMOFG

Response: F>
FOREGROUND DEMONSTRATION PROGRAM, SENDS A
MESSAGE TO THE BACKGROUND PROGRAM "DEMOBG"
EVERY 2 SECONDS, TELLING IT TO RING THE
BELL.

Type:

Response: B>

DEMOFG is running and queuing the message for DEMOFG every two
seconds. Now execute DEMOFG in the background and receive the
messages.

Type: RUN DEMOFG

(The bell rings quickly several times, then once every two seconds.)

Response: RT-11 DEMONSTRATION PROGRAM
IF INCORRECTLY EDITED, THIS IS THE LAST LINE.
WELL DONE.

Execute a DIRECTORY command in the background to obtain a directory
listing.

Type:

(The bell stops.)

Response: ^C
^C
.

INSTALLING A CATEGORY 2 OR 4 SYSTEM

Type: DIRECTORY

Response: dd-mmm-yy

(The directory of the device DK prints on the terminal.)

Rerun DEMOGB to collect all the foreground messages queued while the directory was printing.

Type: RUN DEMOGB

(The bell rings several times in rapid succession, then rings once every two seconds.)

Response: RT-11 DEMONSTRATION PROGRAM
IF INCORRECTLY EDITED, THIS IS THE LAST LINE.
WELL DONE.

Type:

Response: ^C
^C
.

(The bell stops.)

Now, stop the foreground program and remove it from memory.

Type:

Response: F>

Type:

Response: ^C
^C
E>

Type: UNLOAD FG

Response: .

3.14 PERFORMING THE SYSTEM GENERATION PROCESS

If you want to implement any system generation options (see Table 3-2), it may be possible to generate your own monitor. DIGITAL supports performing the system generation process on a hard-disk-based system. If single-density diskette is your system device, you can perform system generation, although it is not a supported procedure. If your system device is DECTape II, you cannot perform system generation. (See Table 1-1.) The RT-11 System Generation Manual describes how to perform this system generation process.

However, before you turn to the system generation manual, you should note the changes that have been made to the SYSGEN dialogue to accommodate PDT-11 support.

INSTALLING A CATEGORY 2 OR 4 SYSTEM

The dialogue lists the devices that RT-11 Version 3B supports as system devices and asks you to choose one as your system device. The following addition has been made to the list of supported devices.

PD PDT Intellisent Terminal

After the list, the dialogue asks the following question:

What is the name of the system device [DD] (RK)?

Type: PD

Table 3-2
System Generation Options

Option	Description
Device I/O time-out support	Permits device handlers to do the equivalent of a mark time without doing a .SYNCH request; DECNET applications require this support.
Error logging support	Keeps a statistical record of all I/O operations on devices that are supported by this feature and detects and stores any errors that occur during I/O operations.
Escape sequence support	Permits your application to make special use of escape sequences (either DEC standard or ANSI standard).
Memory parity support	Causes the system to print an error message when a memory parity error occurs.
Multi-terminal support	Permits you to use two or more terminals.
SJ timer support	Configures the SJ monitor to include mark time and cancel mark time programmed requests and to support the fork process.

NOTE

To complete the system generation process as described in the RT-11 System Generation Manual, you must install the system you have generated. Backing up that system is a part of the installation procedure described in the RT-11 System Generation Manual.

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