March 1979

This document describes how to install RT-11 with DECtape II
as the system device, RT-11 with disk as the system device and
DECtape II as the storage device, and DECtape II support in a
previously installed RT-11 system.

RT-11/DECtape II
Installation Notes

Order No. AA-H280A-TC

digital equipment corporation · maynard, massachusetts

The postage-prepaid READER'S COMMENTS form on the last page of this document requests the user's critical evaluation to assist us in preparing future documentation.

The following are trademarks of Digital Equipment Corporation:

DIGITAL	DECsystem-10	MASSBUS
DEC	DECtape	OMNIBUS
PDP	DIBOL	OS/8
DECUS	EDUSYSTEM	PHA
UNIBUS	FLIP CHIP	RSTS
COMPUTER LABS	FOCAL	RSX
COMTEX	INDAC	TYPESET-8
DDT	LAB-8	TYPESET-11
DECCOMM	DECSYSTEM-20	TMS-11
ASSIST-11	RTS-8	ITPS-10
VAX	VMS	SBI
DECnet	IAS	

CONTENTS

CONTENTS (Cont.)

FIGURES

CONTENTS (Cont.)

PREFACE

HOW TO USE THIS MANUAL

This manual introduces you to the RT-11/DECtape II 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 device, kits, and configurations. In addition, it guides you to the chapter that describes the 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 or BASIC user, you build your FORTRAN or BASIC system after building the RT-11 system. If you are a PDT-11 user, you install your RT-11/PDT-11 system after you install DECtape II support. See the appropriate installation manual for instructions.

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/O), 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 the TU58 DECtape II RT-11 system, you must perform a series of procedures described in this manual. Before you begin, however, you should:

- Familiarize yourself with the characteristics of this device

- Ascertain the type of software kit you received

- Identify the category to which your configuration belongs

The following sections describe DECtape II characteristics, software kits, and configurations.

1.1 DECTAPE II CHARACTERISTICS

DECtape II is 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 DECtape II. Its permanent device name is DDn:.

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.
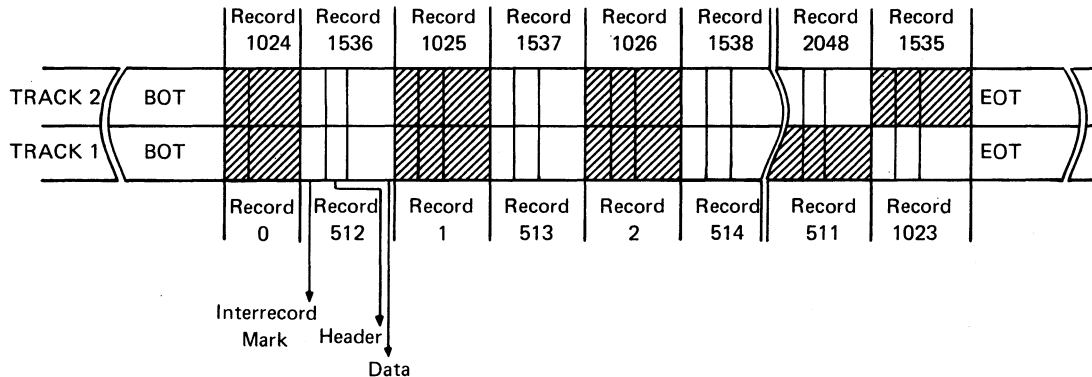
Figure 1-1   DECtape II Tape Format

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.

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.

1.1.4 Vectors and CSR

The memory locations 300, 302, 304, and 306 are the standard DECtape II interrupt vectors. Location 300 contains the input interrupt entry point, location 302 contains the input interrupt routine's processor status word, location 304 contains the output interrupt entry point, and location 306 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. The CSR address for the DECtape II controller is 176500.

1.1.5 .DSTATUS Value

DECtape II is identified by the octal value 34 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 SOFTWARE KITS

DIGITAL offers two types of software kits for DECtape II, as described in the following sections. Since the installation procedures depend on software kit type, examine your Software Bill of Materials to ascertain whether you have the complete software kit or the add-on software kit.

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 DECtape II handler and two monitors (single-job, foreground/background) with DECtape II as the system device (see the RT-11 System Generation Manual for a description of the various monitors). Two cartridges in this kit are bootable; cartridge number 1 is bootable on your processor and cartridge number 1-T is bootable on a PDT-11 Intelligent Terminal.

2. A set of uncommented monitor source files.

3. The RT-11 Version 3B documentation.

4. DECtape II updates to that documentation.

5. This manual.

The Add-on TU58 DECtape II Software Kit contains:

1. Two DECtape II cartridges containing the Version 3B single-job and foreground/background monitors with DECtape II as the system device (see the RT-11 System Generation Manual for a description of the various monitors).

2. All device handlers for the current system devices.

3. The DECtape II handler.

4. Any modules that include changes from previous Version 3B RT-11 modules.

5. A copy of the PIP utility program.

6. The DECtape II updates to Version 3B documents.

7. This manual.

1.3 CONFIGURATION CATEGORIES

There are three categories of DECtape II 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
on your configuration and perform the installation procedures.

1. Category 1: new user, DECtape II is system device--If you
   are a new RT-11 user whose only mass storage device is
   DECtape II, your configuration belongs to Category 1.
   Perform the procedures in Chapter 2.

2. Category 2: new user, DECtape II is storage device--If you
   are a new RT-11 user with a disk (such as RK06 or RK07) as
   the system device and DECtape II as a storage device, yours
   is a Category 2 configuration. Perform the procedures in
   Chapter 3.

3. Category 3: RT-11 user, adding DECtape II support--If you
   are a category 3 user, you have a previously installed RT-11
   system and are adding DECtape II support. Perform the
   procedures in Chapter 4.

If your configuration includes DECtape II as its only mass storage
device (Category 1), you install RT-11 by simply bootstrapping the
first cartridge, copying the distribution kit, and eliminating any
unneeded components from the working copies of the system. DIGITAL
does not support performing the system generation process on this
configuration.

On the other hand, if your configuration includes a disk that will
serve as the system device (Category 2), you must copy all the
components you need to your disk. You can then perform the system
generation process, if necessary, to permanently install DECtape II
support and to get support for system generation options you need.
(See Section 3.12 and the RT-11 System Generation Manual.)

If you are a Category 3 user (that is, you have an installed RT-11
system), you need only the add-on software kit. In this case, you
must boot the first DECtape II cartridge, copy the DECtape II device
handler and changed modules to your system volume, boot the system
volume, and install the DECtape II handler. If you want to
permanently install DECtape II support, you can perform the system
generation process (see Section 4.7 and the RT-11 System Generation
Manual.)

CHAPTER 2

INSTALLING A CATEGORY 1 SYSTEM

If you are a new RT-11 user whose only mass storage device is DECtape II, your configuration belongs to Category 1. You need to install RT-11, which was distributed to you on DECtape II, to run on DECtape II. To install your system, perform the steps summarized in the following list. Sections 2.1 through 2.11 describe the procedures involved in each step.

1. Bootstrap the distribution cartridge

2. Preserve the distribution cartridges

3. Install mandatory patches

4. Select the components you need in your working system

5. Plan the arrangement of components on cartridges

6. Create the system from chosen components

7. Install the bootstrap on cartridges that need to be bootable

8. Customize the system

9. Compress each cartridge

10. Preserve the working system

11. Test the working system

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

2.1 BOOTSTRAPPING THE CARTRIDGE

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

Begin by ensuring that the processor is powered up but not running. Insert distribution cartridge number 1 (write protected) in DECtape II Unit 0 (which has the physical device name DD0:). Use the hardware bootstrap to boot the DECtape II cartridge. Refer to the <u>Introduction to RT-11</u> if you need help with bootstrapping procedures.

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

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

Use the DATE command to set the date.

Type: DATE dd-mmm-yy (RET)

Response: .

2.2 PRESERVING THE DISTRIBUTION CARTRIDGES

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

Insert a blank cartridge (write enabled) in Unit 1.   Then use the
INITIALIZE command to initialize the blank cartridge.   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 DD1: (RET)

Response: DD1:/Init are you sure?

Type: Y (RET)

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

Response: .

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

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

As long as the cartridge 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 cartridge and
use the COPY command. In this case, the COPY command, with the SYSTEM
option and wildcards, copies all the files from the cartridge in Unit
0 to the one in Unit 1. Distribution cartridge number 1 is bootable,
but the rest of the cartridges in your kit are not bootable because
they lack the necessary components. Thus, these cartridges require a
different copy procedure. For cartridge number 1, however, the
procedure is straightforward.

Type: COPY/SYSTEM DD0:*.* DD1:*.* (RET)

Response: Files copied:
           DD0:aaaaaa.ttt to DD1:aaaaaa.ttt
                    .
                    .
                    .
           DD0:zzzzzz.ttt to DD1:zzzzzz.ttt
           .

Then copy the bootstrap on the cartridge.

Type: COPY/BOOT DD1:DDMNSJ.SYS DD1: (RET)

Response: .

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

The remaining distribution cartridges lack necessary system components to permit you to boot them. Therefore, to copy the remaining cartridges, you must continue to run RT-11 from distribution cartridge number 1 in Unit 0 and use the DUP utility program.

Type: SET USR NOSWAP (RET)

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

                              NOTE

              Ensure that the blank cartridges that
              you use to back up distribution
              cartridges do not have bad blocks. To
              ascertain whether a cartridge has bad
              blocks, use the command, DIRECTORY
              DD1:*.BAD. (Later, you can use a
              cartridge with bad blocks for data.)

Type: R DUP (RET)

Response: *

Type: DD1:A=DD0:/I/W (RET)

Response: continue?

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

Type: Y (RET)

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

Response: Insert system disc, Are you ready?

Replace the cartridge in Unit 0 with distribution cartridge number 1 (write protected).

Type: Y (RET)

Response: *

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

Type: DD1:A=DD0:/I/W (RET)

Response: continue?

Replace the cartridge in Unit 0 with distribution cartridge   number   3
(write protected).

Type: Y (RET)

Response: Insert system disc, Are you ready?

Replace the cartridge in Unit 0 with distribution cartridge   number   1
(write protected).

Type: Y (RET)

Response: *

Remove the cartridge from Unit 1, label it "backup RT-11 V03B 3/9,"
write protect it, and insert another initialized blank cartridge in
Unit 1.   Repeat these procedures to copy all the distribution
cartridges.   Once you have copied all of them, you can return 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 cartridge in Unit 0 with distribution cartridge   number   1
(write protected).

Type: Y (RET)

Response: *

Type: (CTRL/C)

Response: .

Now halt the processor. Replace distribution cartridge number 1 with
backup number 1 (write protected) in Unit 0. Write protect the
distribution cartridges 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.)
          .

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 cartridges, you need to 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. Examine the directories of each backup cartridge.

Type: DIRECTORY(RET)

There is a significant delay before the system responds.

Response: dd-mmm-yyy
           filnam.typ 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, use CTRL/S to stop the display and
CTRL/Q to restart it.

Insert backup cartridge number 2 (write protected) in Unit 1.

Type: DIRECTORY DD1:(RET)

After the directory prints, replace backup cartridge number 2 with
backup cartridge number 3, type DIRECTORY DD1:, and so on until you
have examined a directory of each backup cartridge.

The directories tell you how many blocks the components on each
cartridge occupy and how much free space is available on the
cartridge. Also, you can find the total free space on an initialized
blank cartridge by obtaining a directory of it. (A cartridge normally
contains 512 blocks.)

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 cartridges. In addition, remember that you may need space for data storage on your system volume and other cartridges in the working system.

2.4.2 Suggestions

Once you have examined the directories, 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 to create the system you plan.

2.4.2.1 **Monitor** – In general, you need only one monitor on a working system. Because of space limitations, if you need to use more than one monitor in an application, you should 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.

2.4.2.3 **Utility Programs** – You do not need to include any system utility programs 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 probably need to use EDIT, LINK, and HELP frequently, and may want them on the system volume. However, the utilities you use less frequently can occupy a second cartridge, 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 following command:

Type: LIBRARY/CREATE SYSLIB.OBJ SYSF4.OBJ (RET)

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 (RET)

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 (RET)

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 you created (in the preceding) by using the following command:

Type: LIBRARY SYSLIB GETSTR/REPLACE,PUTSTR/REPLACE (RET)

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 <u>Introduction to RT-11</u>, you need the following components:

    SWAP.SYS
    DDMNSJ.SYS
    DDMNFB.SYS
    TT.SYS
    LP.SYS (if appropriate)
    other handlers if appropriate
    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 FORTRAN exercises in the Introduction to RT-11, you also need:

    FORTRA.SAV
    SYSLIB.OBJ
    DEMOF1.FOR

To do 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 unless you write applications that use a VT11/VS60

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

2.5 PLANNING ARRANGEMENT OF COMPONENTS ON CARTRIDGES

Your system is constrained by system volume capacity. Therefore, you should plan the arrangement of your system components on cartridges 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 cartridge

3. Assign the default device to the data device

4. Create several system cartridges

5. Add bad blocks to avoid excessive rewinds

6. Build cartridges for use with the <u>Introduction to RT-11</u>

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 DECtape II cartridge system need have only:

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

The DECtape II handler (DD.SYS) is included in the monitor DDMNSJ.SYS. If you use the foreground/background monitor DDMNFB.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 Cartridge

Create a separate utilites 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). You would use the following commands to run a non-overlaid utility from the utilities volume.

Type: RUN xx1:aaaaaa(RET)

where xx is the device and aaaaaa is the name of the utility

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
        DDMNSJ.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

2.5.3 Assign the Default Device to the Data Device

When you create your RT-11 system and it is up and running, assign the default device DK: to the data device (Unit 1 or another peripheral device). 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 DD1:   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 DD1: 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 Cartridges

Create several system cartridges, each devoted to a particular function. You can then change the system cartridge 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 cartridge in the middle of an operation.

2.5.5 Add Bad Blocks to Avoid Excessive Rewinds

You can actually improve system performance (response time) 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 cartridges), 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 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. It also increases fragmentation.

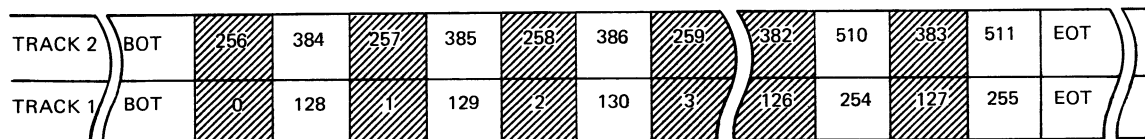| TRACK 2	BOT	256	384	257	385	258	386	259	382	510	383	511	EOT
TRACK 1	BOT	0	128	1	129	2	130	3	126	254	127	255	EOT

Figure 2-1 Block Locations on Tape

To create these dummy bad blocks, insert an initialized blank cartridge (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: *

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 cartridges on which you have created these bad blocks.

<div align="center">NOTE</div>

> 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.

2.5.6 Build Cartridges 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 cartridges, as listed in the following:

System Volume

SWAP.SYS
DDMNSJ.SYS
DDMNFB.SYS
TT.SYS
LP.SYS (if appropriate)
PIP.SAV
DUP.SAV
DIR.SAV
LINK.SAV
EDIT.SAV
SRCCOM.SAV

System Volume (Cont.)

LIBR.SAV
ODT.OBJ
MACRO.SAV
SYSMAC.SML
CREF.SAV
DEMOED.TXT
DEMOF1.FOR
DEMOX1.MAC
DEMOSP.MAC

FORTRAN Language Volume

SWAP.SYS
DDMNSJ.SYS
TT.SYS
LP.SYS (if appropriate)
PIP.SAV
DUP.SAV
DIR.SAV
EDIT.SAV
FORTRA.SAV
DEMOF1.FOR

LINK Volume

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

BASIC Volume

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

2.6 CREATING THE SYSTEM FROM CHOSEN COMPONENTS

Once you have chosen your system components and have planned the best arrangement of them on cartridges, 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 cartridges.

2. You can copy files (of chosen components) from the distribution backup copies to initialized blank cartridges.

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 cartridges, as you do when you use the copy method. However, to use many of the suggestions for arranging components (Section 2.4), the copy method may be more efficient. The delete method has the additional disadvantage of fragmenting the free space on the cartridge.

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 cartridge 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 DD1: to DK:.

Type: DELETE/SYSTEM filnam.typ,filnam.typ (RET)

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:
           DK:filnam.typ ?

Type: Y (RET)

Response: DK:filnam.typ ?

Type: Y (RET)

Response: .

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 *.* (RET)

Response: Files deleted:
          aaaaaa.ttt?

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

Response: 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.

Now insert backup cartridge number 2 (write enabled) in Unit 1, and delete any files from it that you do not need.

Type: DELETE/SYSTEM DD1:*.* (RET)

This time, you must specify the device. When you delete files from backup cartridge number 1 (which is the system volume), you do not need to specify the device, since the default DK: is the system device (unless you assign it otherwise). When deleting from the remaining cartridges, you must run RT-11 from the system volume and delete files from cartridges inserted in the other unit.

Now, remove backup cartridge number 2 from Unit 1, insert the next backup cartridge in Unit 1, and delete unwanted files. Repeat these steps for the remaining cartridges.

2.6.2 Copying Files

To use the copy method of creating a system, start by initializing a number of blank cartridges. Follow the same procedure that you used in Section 2.2. Insert a write enabled, blank cartridge in Unit 1 (with the system booted from Unit 0 and the system cartridge write protected) and type INITIALIZE/BADBLOCKS/SEGMENTS:1 DD1:. Repeat the process to create as many initialized blank cartridges as you need for the system you have planned.

                                  NOTE

                  If you want to create bad blocks 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 cartridge 1 to the cartridge that becomes your working system volume.

Type: COPY/SYSTEM filnam.typ DD1:filnam.typ (RET)

Response: .

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

Type: COPY/SYSTEM/QUERY *.* DD1:*.* (RET)

Response: Files copied:
          DK:aaaaaa.ttt to DD1:aaaaaa.ttt?

Type: Y (RET) to include a specific file
         N (RET) to exclude a specific file

Response: DK:bbbbbb.ttt to DD1:bbbbbb.ttt? (and so on)

The system queries you about all the files on the volume. You choose which files it copies.

To copy files from nonbootable cartridges, use PIP and swap cartridges.

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

Type: SET USR NOSWAP (RET)

Response: .

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

Type: R PIP(RET)

Response: *

Remove backup cartridge number 1 from Unit 0 and insert the next backup cartridge (write protected) 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: DD1:*.*/Y/Q=*.*(RET)

Response: Files copied:
           DK:aaaaaa.ttt to DD1:aaaaaa.ttt?

Type: Y(RET) to include a specific file
           N(RET) to exclude a specific file

Response: DK:bbbbbb.ttt to DD1:bbbbbb.ttt? (and so on)

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

Response: *

Then, remove the cartridge from Unit 0, and insert the next cartridge 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 cartridge, remove it and label it "RT-11 V03B 1/x" (where x is the number of cartridges in your working system). Insert another initialized blank cartridge (write enabled) in Unit 1 and a cartridge 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 cartridges in the working system you have planned.

When you have created and labeled all the cartridges, remove the cartridge from Unit 0 and again insert backup cartridge number 1.

Type: (CTRL/C)

Response: .

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

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

Once you have created your system, you need to install the bootstrap on any cartridges that must be bootable (that is, that you can use as the system volume). Generally, any cartridge that includes a monitor file should be bootable (but do not forget that the cartridge would need the file 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 cartridge. In all other cases, copy the bootstrap to the appropriate cartridges:

Type: COPY/BOOT DD1:DDMNyy.SYS DD1:(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 cartridge.

Then insert working system cartridge number 1 in Unit 0 and boot your working system.

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 to you (if appropriate) 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

Other RT-11 configurations can perform the system generation process to implement additional customizations. However, DIGITAL does not support performing system generation on DECtape II-based systems.

Table 2-1
RT-11 Customizations

Customization	Section in System Generation Manual	Description
Changing CSR addresses in FORMAT utility program	2.4.17	If any devices that FORMAT supports are installed at nonstandard addresses, you must patch FORMAT to change the addresses.
Changing default output device from line priniter 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.

Table 2-1 (Cont.)
RT-11 Customizations

Customization	Section in System Generation Manual	Description
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.
Changing location of VT11/VS60 floating vectors	2.4.7	If you add a DL11 device or RL01 disk (or certain others) to a configuration that includes a VT11 or VS60, you must patch the monitor to move the VT11 or VS60 vector addresses.
Changing RJS03 support to RJS04	2.4.4	RT-11 RJS03/4 support is initialized for RJS03 when distributed. To use RJS04, you must patch the DS monitor files and the DS handler to change the monitors' device size tables and the handler's device size entry.
Changing RP02 support to RP03	2.4.5	RT-11 RP11 support is initialized for RP02 when distributed. To use RP03, you must patch the DP monitors and handler.
Customizing the editor	2.4.8	<u>Size of text window:</u> In certain applications using VT11/VS60 terminals, the text window overflows onto the scrolled editing commands, making a portion of the screen difficult to read. You can alleviate this problem by patching EDIT to reduce the size of the text window. <u>Terminals with nonstandard ESCAPE code:</u> If you have a terminal with nonstandard ESCAPE code (that is, the terminal generates 175 octal or 176 octal rather than 33 octal), you must patch EDIT so that it operates correctly.
Establishing fill characters	2.4.1	The LA30S DECwriter requires filler characters to follow each carriage return, and the 600, 1200, and 2400 baud VT05 terminals require filler characters to follow each line feed. If your configuration includes any of these terminals, you must install a patch.

Table 2-1 (Cont.)
RT-11 Customizations

Customization	Section in System Generation Manual	Description
Extending directory size	2.4.14	To change the size of a directory without reinitializing the disk or cartridge, you can use the supplied program.
Installing other devices	2.4.2	Card reader: If you need card reader support, you can edit the startup command file to install that support whenever you reboot. High-speed paper tape: If you need high-speed paper tape support, you can edit the startup command file to install that support whenever you reboot. Hardware magtape: If you need hardware magtape support, you can rename the hardware handler to MT.SYS or MM.SYS and reboot the system. Setting magtape parity and density: If you need to set magtape parity or density (other than the standard 800 bpi, odd parity), you can use the monitor SET command.
Modifying BATCH to save disk space	2.4.19	If you need to save disk 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.

(continued on next page)

Table 2-1 (Cont.)
RT-11 Customizations

Customization	Section in System Generation Manual	Description
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.
Specifying number of RF11 platters	2.4.3	RT-11 RF11 fixed-head disk support is initialized for one platter when distributed. To use more than one platter, patch the RF monitor files and RF handler to change the monitors' device size tables and the handler's device size entry.
Using CAPS-11 to load files	2.4.18	If you need to use CAPS-11 to load RT-11 files, you must patch the cassette handler, CT.SYS, to alter header records.

2.9 COMPRESSING EACH CARTRIDGE

DIGITAL recommends that you compress each cartridge to make its free space contiguous. Squeezing free space allows you to use space on the cartridge that would otherwise be too fragmented to be usable. However, if 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 cartridge must be write enabled.) The squeeze operation does not move files with the .BAD file type.

Type: SQUEEZE DD0:(RET)

Response: DD0:/Squeeze are you sure?

Type: Y(RET)

The squeeze operation may take as long as seven minutes.

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

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

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

Type: SQUEEZE DD1:(RET)

Response: DD1:/Squeeze are you sure?

Type: Y (RET)

Response: .

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

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

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

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

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
        DDMNSJ.SYS
        DDMNFB.SYS (if you do the foreground/background monitor exercise)
        TT.SYS (for SJ monitor)
        LP.SYS
        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 (RET)

Response: .

> If your system configuration includes a VT11 or VS60 display processor and scope and has more than 8K words of memory, shift system output to the display scope.
>
> Type: GT ON(RET)
>
> Verify that the scope is on by turning the BRIGHTNESS knob to an adequate level.
>
> You still enter commands at the keyboard, but the echo is on the screen.
>
> Response: .

Insert a write enabled, blank cartridge in Unit 1.

Type: ASSIGN DD1: DK:(RET)

Response: .

Type: INITIALIZE/BADBLOCKS/SEGMENTS:1 DD1:(RET)

Response: DD1:/Init are you sure?

Type: Y(RET)

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:(RET)

Response:

```
      dd-mmm-yy
     DDMNSJ.SYS
     DD    .SYS
     LP    .SYS
     PP    .SYS
     PR    .SYS
     TT    .SYS
     PATCH .SAV
     EDIT  .SAV
     MACRO .SAV
```

```
SYSMAC.SML
LINK  .SAV
ODT   .OBJ
PIP   .SAV
       .
       .
       .
xxx Files, bbb Blocks
fff Free blocks
   .
```

> If you have shifted system output to a scope and
> the directory scrolls by too quickly to read, use
> CTRL/S to stop the display and CTRL/Q to restart
> it.

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

Type: EDIT SY:DEMOBG.MAC (RET)

Response: *

Type: F; (TAB) .ASCII (ESC) (ESC)

Response: *

Type: OAD (ESC) (ESC)

Response: *

Type: EX (ESC) (ESC)

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: (RET)

Response: .

> If your configuration does not include a line
> printer, you can use the console terminal.
>
> Type: ASSIGN TT: LST: (RET)
>
> Response: .

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  000000                          START:: .RCVDC   #AREA,#BUFFER,#400,#MSGIN ;POST REQUEST FOR MESSAGE
     9  000034                                  .PRINT   #MSG                     ;PRINT DEMONSTRATION MESSAGE
    10  000042   000777                         BR       .                        ;AND LOOP
    11
    12                                  ;       COMPLETION ROUTINE ENTERED WHEN FG SENDS MESSAGE
    13
    14  000044                          MSGIN:  .PRINT   #BELL                    ;RING BELL IN RESPONSE TO MESSAGE
    15  000052                                  .RCVDC   #AREA,#BUFFER,#400,#MSGIN ;POST ANOTHER MESSAGE REQUEST
    16  000106   000207                         RETURN                           ;AND RETURN FROM COMPLETION ROUTINE
    17
    18                                  ;       ASCII MESSAGES
    19                                          .NLIST   BEX
    20  000110   007    200             BELL:   .BYTE    7,200                    ;MESSAGE THAT RINGS BELL
    21
    22  000112   122    124    055      MSG:    .ASCII   /RT-11 DEMONSTRATION PROGRAM/<15><12>
    23  000147   111    106    040              .ASCII   /IF INCORRECTLY EDITED,THIS IS THE LAST LINE./<15><12>
    24  000225   127    105    114              .ASCII   /WELL DONE./
    25  000237   000                            .BYTE    0
    26
    27  000240                          AREA:   .BLKW    6                        ;EMT ARGUMENT AREA
    28  000254                          BUFFER:                                   ;RCVDC MESSAGE AREA
    29           000000'                         .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   000000RG

. ABS.  000000         000
        000254         001
ERRORS DETECTED:  0

VIRTUAL MEMORY USED:  1513 WORDS  ( 6 PAGES)
DYNAMIC MEMORY AVAILABLE FOR  56 PAGES
DK: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/NOOBJECT SY:DEMOBG (RET)

Response: ERRORS DETECTED: 0

Type: COPY DEMOBG.LST LST: (RET)

Response: (see Figure 2-2)

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

Type: LINK DEMOBG (RET)

Response: .

Type: RUN DEMOBG (RET)

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

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

Response: ^C
          ^C
          .

> If your configuration includes a graphics display,
> turn it off at this point.
>
> Type: GT OFF (RET)
>
> Response: . (on console terminal)

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 (RET)

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 and a clock. 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 DDMNFB.SYS (RET)

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

                    If your configuration includes a VT11 or VS60
                    display processor and scope, shift system output
                    to the display scope.

                    Type: GT ON (RET)

                    Verify that the scope is on by turning the
                    BRIGHTNESS knob to an adequate level.

                    You still enter commands at the keyboard, but the
                    echo is on the screen.

                    Response: .

Leave in Unit 1 the cartridge that you used in the single-job monitor
exercise.

Type: ASSIGN DD1: 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/FOREGROUND 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 DEMOBG every two seconds. Now execute DEMOBG in the background and receive the messages.

Type: RUN DEMOBG (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
          .

Type: DIRECTORY (RET)

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 (RET)

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

Response: ^C
          ^C
          .

(The bell stops.)

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

Type: (CTRL/F)

Response: F>

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

Response: ^C
          ^C
          B>

Type: UNLOAD FG (RET)

Response: .

> If your configuration includes a VT11 or VS60
> graphics display, turn it off.
>
> Type: GT OFF (RET)
>
> Response: .

CHAPTER 3

INSTALLING A CATEGORY 2 SYSTEM

If you are a new RT-11 user with a disk (such as RK06 or RK07) as the system device and DECtape II as a storage device, your configuration belongs to Category 2. RT-11 was distributed to you on DECtape II to run on your disk. To install your RT-11 system, you must perform the steps summarized in the following list. Sections 3.1 through 3.12 describe the procedures involved in each step.

1. Bootstrap the cartridge

2. Create the system on the disk

3. Preserve the distribution cartridges

4. Install mandatory patches

5. Select the components you need in the working system

6. Delete unneeded components from the disk

7. Customize the system

8. Compress the disk

9. Install the DECtape II device handler

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.

NOTE

To improve DECtape II performance after your disk-based system is up and running, you can use the procedure in Section 2.5.5 for avoiding excessive tape rewinds.

3.1 BOOTSTRAPPING THE CARTRIDGE

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

Begin by ensuring that the processor is powered up but not running. Insert distribution cartridge number 1 in DECtape II Unit 0 (which has the physical device name DD0:). Use the hardware bootstrap to boot the DECtape II cartridge. Refer to the Introduction to RT-11 if you need help with bootstrapping procedures.

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

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

Use the DATE command to set the date.

Type: DATE dd-mmm-yy (RET)

where dd-mmm-yy is the day month and year

Response: .

3.2 CREATING THE SYSTEM ON THE DISK

The next step in the installation procedure is to create an RT-11 system on your disk. Start by copying all the files on distribution cartridge number 1 to your disk.

To begin, initialize the disk and replace (using the command INITIALIZE/REPLACE) or cover (using the command INITIALIZE/BADBLOCKS) bad blocks. You have a choice of replacing or covering bad blocks if your disk is RK06, RK07, or RL01 (see the RT-11 System User's Guide). If your disk is another type, you should use INITIALIZE/BADBLOCKS to cover bad blocks.

Type:

          INITIALIZE/REPLACE xxn: (RET)

or

          INITIALIZE/BADBLOCKS xxn: (RET)

where xxn: is the permanent device name for your disk

Response: xxn:/Init are you sure?

Type: Y (RET)

Response: .

There is a significant delay as the system scans the disk for bad blocks and creates a directory.

Type: COPY/SYSTEM *.* xxn:*.*(RET)

where xx is the physical device name for your disk

Response: Files copied:
        DK:aaaaaa.ttt to xxn:aaaaaa.ttt
        DK:bbbbbb.ttt to xxn:bbbbbb.ttt
                        .
                        .
        DK:zzzzzz.ttt to xxn:zzzzzz.ttt
        .

Insert distribution cartridge number 2 (write protected) in DECtape II
Unit 1, and copy all the files on it to your disk.

Type: COPY/SYSTEM DD1:*.* xxn:*.*

Response: Files copied:
        DD1:aaaaaa.ttt to xxn:aaaaaa.ttt
        DD1:bbbbbb.ttt to xxn:bbbbbb.ttt
                        .
                        .
        DD1:zzzzzz.ttt to xxn:zzzzzz.ttt
        .

Insert distribution cartridge number 3 (write protected) in Unit 1 and
repeat this command. Copy all the distribution cartridges to disk in
this way. Be sure to write protect each cartridge before you insert
it.

                              NOTE

            For optimal system performance, copy the
            distribution cartridges in order.

Next, copy the bootstrap to the disk.

Type: COPY/BOOT xxn:xxMNSJ.SYS xxn: (RET)

where xx is physical device name for your disk

Response: .

Now, use the hardware bootstrap to boot RT-11 from your disk.

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

3.3 PRESERVING THE DISTRIBUTION CARTRIDGES

Write protect the distribution cartridges and store them in a safe
place. If machine failure or human error were to destroy the
components you copied to your disk, you would need the distribution
cartridges to rebuild the system.

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 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.

3.5 SELECTING THE COMPONENTS YOU NEED IN YOUR WORKING SYSTEM

You may not need to include all the distributed RT-11 components (which you copied to your disk) in your 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 and consider the following suggestions.

3.5.1 Space Limitations

Before selecting components, you should become familiar with the space limitations. Examine your system volume directory. It tells you how many blocks the components occupy and how much free space is available on the disk.

Type: DIRECTORY (RET)

Response: dd-mmm-yyy
            filnam.typ 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.

You should keep in mind the number of blocks various components occupy when you select the components you intend to include in your working system. Also keep in mind the possibility that you need space for data storage on your system volume.

3.5.2 Suggestions

Once you have examined the directory, 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, deleting unneeded components from the disk (Section 3.6).

3.5.2.1 Monitor

3.5.2.1 **Monitor** - In general, you need only one monitor on a particular working system. If necessary to your application, you can have more than one monitor on the same volume, but this practice consumes disk space that may be more useful for data storage.

3.5.2.2 File SWAP.SYS

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

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 user's guide also for descriptions of the functions of the rest of the utility programs.

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

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.

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

Type: LIBRARY/CREATE SYSLIB.OBJ SYSF4.OBJ(RET)

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(RET)

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(RET)

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 you created (in the preceding) by using the
following command:

Type: LIBRARY SYSLIB GETSTR/REPLACE,PUTSTR/REPLACE(RET)

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 **Device Handlers** - The disk handler is included in the disk
monitor, but you need the DECtape II handler, DD.SYS.

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

    SWAP.SYS
    xxMNSJ.SYS
    xxMNFB.SYS
    TT.SYS
    LP.SYS (if appropriate)
    handlers for devices on your system (including DD.SYS)
    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 FORTRAN exercises in the <u>Introduction to RT-11</u>, you need:

>   FORTRA.SAV
>   SYSLIB.OBJ
>   DEMOF1.FOR

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

>   BASIC.SAV

3.5.2.8 Source Files - You do not need any source files, except demonstration sources. You need the demonstration sources to perform the exercises in Section 3.11 of this manual or in the <u>Introduction to RT-11</u>. Once you perform these exercises, the demonstration source files are no longer useful and you can delete them.

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

1. VTMAC.MAC and VTHDLR.OBJ unless you write applications that use a VT11/VS60

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 DELETING UNNEEDED COMPONENTS FROM THE DISK

Once you have selected the components you need, you can delete any unneeded components from the disk.

> 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.

Type: DELETE/SYSTEM *.* (RET)

Response: Files deleted:
           aaaaaa.ttt?

Type: Y (RET) to delete that specific file

            N (RET) to include that specific file

Response: bbbbbb.ttt? (and so on)

The system queries you about all the files on the volume. You choose the files it deletes.

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

3.7 CUSTOMIZING THE SYSTEM

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

NOTE

You can perform the system generation process on your disk to implement additional customizations. However, DIGITAL does not support performing system generation on DECtape II. See Section 3.12.

Table 3-1
RT-11 Customizations

Customization	Section in System Generation Manual	Description
Changing CSR addresses in FORMAT utility program	2.4.17	If any devices that FORMAT supports are installed at nonstandard addresses, you must patch FORMAT to change the addresses.
Changing default output device from line priniter 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.
Changing location of VT11/VS60 floating vectors	2.4.7	If you add a DL11 device or RL01 disk (or certain others) to a configuration that includes a VT11 or VS60, you must patch the monitor to move the VT11 or VS60 vector addresses.

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

Customization	Section in System Generation Manual	Description
Changing RJS03 support to RJS04	2.4.4	RT-11 RJS03/4 support is initialized for RJS03 when distributed. To use RJS04, you must patch the DS monitor files and the DS handler to change the monitors' device size tables and the handler's device size entry.
Changing RP02 support to RP03	2.4.5	RT-11 RP11 support is initialized for RP02 when distributed. To use RP03, you must patch the DP monitors and handler.
Customizing the editor	2.4.8	<u>Size of text window</u>: In certain applications using VT11/VS60 terminals, the text window overflows onto the scrolled editing commands, making a portion of the screen difficult to read. You can alleviate this problem by patching EDIT to reduce the size of the text window. <u>Terminals with nonstandard ESCAPE code</u>: If you have a terminal with nonstandard ESCAPE code (that is, the terminal generates 175 octal or 176 octal rather than 33 octal), you must patch EDIT so that it operates correctly.
Establishing fill characters	2.4.1	The LA30S DECwriter requires filler characters to follow each carriage return, and the 600, 1200, and 2400 baud VT05 terminals require filler characters to follow each line feed. If your configuration includes any of these terminals, you must install a patch.
Extending directory size	2.4.14	To change the size of a directory without reinitializing the disk or cartridge, you can use the supplied program.
Installing other devices	2.4.2	<u>Card reader</u>: If you need card reader support, you can edit the startup command file to install that support whenever you reboot.

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

Customization	Section in System Generation Manual	Description
Installing other devices (cont.)	2.4.2	High-speed paper tape: If you need high-speed paper tape support, you edit the startup command file to install that support whenever you reboot. Hardware magtape: If you need hardware magtape support, you can rename the hardware handler to MT.SYS or MM.SYS and reboot the system. Setting magtape parity and density: If you need to set magtape parity or density (other than the standard 800 bpi, odd parity), you can use the monitor SET command.
Modifying BATCH to save disk space	2.4.19	If you need to save disk 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.
Specifying number of RF11 platters	2.4.3	RT-11 RF11 fixed-head disk support is initialized for one platter when distributed. To use more than one platter, patch the RF monitor files and RF handler to change the monitors' device size tables and the handler's device size entry.
Using CAPS-11 to load files	2.4.18	If you need to use CAPS-11 to load RT-11 files, you must patch the cassette handler, CT.SYS, to alter header records.

3.8 COMPRESSING THE DISK

DIGITAL recommends that you compress the disk (after you create your
system) to make its free space contiguous. This squeeze operation
moves all the files to the beginning of the disk, producing a single
unused area after the group of files. (The squeeze operation does not
move files with .BAD file type.) Thus, squeezing free space allows you
to use space on the disk that would otherwise be too fragmented to be
usable.

Type: SQUEEZE xxn: (RET)

Response: xxn:/Squeeze are you sure?

Type: Y(RET)

The system automatically reboots when you compress a system volume.

3.9   INSTALLING THE DECTAPE II DEVICE HANDLER

Now, install the DECtape II device handler. You should have included
the DECtape II handler, DD.SYS in your system.

Use the SHOW command to check your system's device assignments. If
you do not have a free device slot, use the REMOVE command to remove
an unneeded device.

Type: SHOW

Response: TT (Resident)
          DM (Resident)
          DM0 =SY, DK   [sample]
          LP
          PC
           •

Remove an unneeded device. For example, remove paper tape.

Type: REMOVE PC(RET)

Response: •

Type: INSTALL DD(RET)

Response: •

You must install the DECtape II handler every time you bootstrap the
disk unless you:

    1. Create a startup indirect command file that installs it

    2. Perform the system generation process to permanently install
        DECtape II support

DIGITAL supports performing the system generation process on the disk
but not on DECtape II. See Section 3.12 and the RT-11 System
Generation Manual (Chapter 3) for a description of the system
generation process.

3.10 PRESERVING THE WORKING SYSTEM

DIGITAL recommends that you preserve your working system on the backup medium of your choice.

3.10.1 Preserving the Working System on DECtape II

If your backup medium is DECtape II cartridge, begin by initializing a number of blank cartridges. Insert the first blank cartridge (write enabled) in Unit 0. Use the INITIALIZE command with the BADBLOCKS and SEGMENTS:1 options.

Type: INITIALIZE/BADBLOCKS/SEGMENTS:1 DD0:(RET)

Response: DD0:/Init are you sure?

Type: Y(RET)

Response: .

There is a significant delay as the system scans the cartridge for bad blocks and creates a new directory. The monitor dot prints when this process is complete.

To copy all the files in your working system, you will have to plan how many files will fit on each cartridge. You can examine your disk directory to establish how long each file is and each cartridge directory to ensure that there is sufficient free space for a particular file on a cartridge.

Copy files on as many cartridges as necessary, in the order in which you have arranged them on disk (even though order is not significant to cartridge operation). In this way, if you ever need to restore the system, you can maintain the planned arrangement.

Type: COPY/SYSTEM filnam.typ DD0:filnam.typ(RET)

where filnam.typ is the specification of the file you want to copy

Response: .

Repeat this command for each file you intend to copy to a cartridge, insert the next cartridge, repeat the command for each file you want to copy to that cartridge, and so on.

Then, use the COPY/BOOT command to copy the bootstrap on the cartridge that needs to be bootable.

Type: COPY/BOOT DD0:DDMNyy.SYS DD0:(RET)

where yy is SJ or FB

Response: .

Then, store the backup cartridges in a safe place.

3.10.2 Preserving the Working System on Magtape

If you want to preserve your working system on magtape, begin by mounting a blank magtape (write enabled) on the backup drive.

Type: INITIALIZE/FILE:MBOOT.BOT xxn: (RET)

where xx is MT or MM and n is the unit number

Response: xxn:/Init are you sure?

Type: Y (RET)

Response: ♦

You must also copy the secondary boot and the MDUP program onto the tape to allow you to rebuild the system, if necessary, from the backup tape.

Type: COPY MSBOOT.BOT xxn:MSBOOT.BOT (RET)

where xx is MT or MM and n is the unit number

Response: ♦

Type: COPY MDUP.xx xxn:MDUP.xx (RET)

where xx is MT or MM and n is the unit number

Response: ♦

Now, copy all the remaining files to the magtape. Copy the following files (if they are included in the system) in the order indicated in the list.

        SWAP.SYS
        monitor
        TT.SYS
        LP.SYS
        MT.SYS or MM.SYS
        PIP.SAV
        DUP.SAV
        DIR.SAV

To copy the files in the correct order, use a separate command line for each file you copy. Include the /POSITION:-1 option in the commands to prevent the tape from rewinding after each file is copied.

Type: COPY/SYSTEM filnam.typ xxn:*.*/POSITION:-1 (RET)

where filnam.typ represents the file name and file type of the file to be copied; xx is MM or MT and n is the unit number

Response: File copied:

        DK:aaaaaa.ttt to xxn:aaaaaa.ttt

        ♦

Copy all the files in the working system in this way. Then store the backup in a safe place.

3.10.3 Preserving the Working System on Disk

If you want to back up your working system on disk, begin by mounting
a blank disk (write enabled) on the backup drive. Then, initialize
the disk and replace or cover bad blocks. See Section 3.2.

Type: INITIALIZE/REPLACE xxn: (RET)

or

           INITIALIZE/BADBLOCKS xxn: (RET)

where xx is the permanent device name for your disk

Response: xxn:/Init are you sure?

Type: Y (RET)

Response: .

Now copy all the files in the working system to the backup disk.

Type: COPY/SYSTEM *.* xxn:*.* (RET)

RT-11 logs the files on the terminal as it copies them (as in Section
3.2). Do not forget to include a monitor file that is appropriate for
the backup device.

Now, install the bootstrap.

Type: COPY/BOOT xxn:xxMNyy.SYS xxn: (RET)

where xxn is the backup device and unit number and xxMNyy.SYS is the
monitor file name.

Then store the backup in a safe place.

3.11 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
    xxMNSJ.SYS
    xxMNFB.SYS (if you do the foreground/background monitor exercise)
    TT.SYS (for SJ monitor)
    LP.SYS
    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.

3.11.1 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 (RET)

where dd-mmm-yy is the day month and year

Response: .

              If your system configuration includes a VT11 or
              VS60 display processor and scope and has more than
              8K words of memory, shift system output to the
              display scope.

              Type: GT ON(RET)

              Verify that the scope is on by turning the
              BRIGHTNESS knob to an adequate level.

              You still enter commands at the keyboard, but the
              echo is on the screen.

              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: (RET)

Response:

```
        dd-mmm-yy
      DDMNSJ.SYS
      DD    .SYS
      LP    .SYS
      PP    .SYS
      PR    .SYS
      TT    .SYS
      PATCH .SAV
```

```
EDIT  .SAV
MACRO .SAV
SYSMAC.SML
LINK  .SAV
ODT   .OBJ
PIP   .SAV
         .
         .
         .
xxx Files, bbb Blocks
fff Free blocks
         .
```

> If you have shifted system output to a scope and the directory scrolls by too quickly to read, type CTRL/S to stop the display and CTRL/Q to restart it.

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

Type: EDIT SY:DEMOBG.MAC(RET)

Response: *

Type: F;(TAB).ASCII(ESC)(ESC)

Response: *

Type: OAD(ESC)(ESC)

Response: *

Type: EX(ESC)(ESC)

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:(RET)

Response: .

> If your configuration does not include a line printer, you can use the console terminal.
>
> Type: ASSIGN TT: LST:(RET)
>
> Response: .

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 3-1)

```
DEMORG   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 000000                          START:: .RCVDC  #AREA,#BUFFER,#400,#MSGIN ;POST REQUEST FOR MESSAGE
      9 000034                                  .PRINT  #MSG                      ;PRINT DEMONSTRATION MESSAGE
     10 000042       000777                     BR      .                         ;AND LOOP
     11
     12                                 ;       COMPLETION ROUTINE ENTERED WHEN FG SENDS MESSAGE
     13
     14 000044                          MSGIN:  .PRINT  #BELL                     ;RING BELL IN RESPONSE TO MESSAGE
     15 000052                                  .RCVDC  #AREA,#BUFFER,#400,#MSGIN ;POST ANOTHER MESSAGE REQUEST
     16 000106       000207                     RETURN                            ;AND RETURN FROM COMPLETION ROUTINE
     17
     18                                 ;       ASCII MESSAGES
     19                                          .NLIST  BEX
     20 000110  007   200                BELL:   .BYTE   7,200                    ;MESSAGE THAT RINGS BELL
     21
     22 000112  172   124   055          MSG:    .ASCII  /RT-11 DEMONSTRATION PROGRAM/<15><12>
     23 000147  111   106   040                  .ASCII  /IF INCORRECTLY EDITED,THIS IS THE LAST LINE./<15><12>
     24 000225  127   105   114                  .ASCII  /WELL DONE./
     25 000237  000                              .BYTE   0
     26
     27 000240                          AREA:   .BLKW   6                        ;EMT ARGUMENT AREA
     28 000254                          BUFFER:                                   ;RCVDC MESSAGE AREA
     29         000000'                          .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   000000RG

. ABS.  000000       000
        000254       001
ERRORS DETECTED:  0

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

Figure 3-1   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/NOOBJECT SY:DEMOBG (RET)

Response: ERRORS DETECTED: 0
               ●

Type: COPY DEMOBG.LST LST: (RET)

Response: (see Figure 3-1)

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

Type: LINK DEMOBG (RET)

Response: ●

Type: RUN DEMOBG (RET)

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

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

Response: ^C
          ^C
          .

                    If your configuration includes a graphics display,
                    turn it off at this point.

                    Type: GT OFF (RET)

                    Response: . (on console terminal)

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 (RET)

Response: .

Then, repeat the editing procedure.

3.11.2 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 and a clock. 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 xxMNFB.SYS (RET)

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

3-18

If your configuration includes a VT11 or VS60 display processor and scope, shift system output to the display scope.

Type: GT ON (RET)

Verify that the scope is on by turning the BRIGHTNESS knob to an adequate level.

You still enter commands at the keyboard, but the echo is on the screen.

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/FOREGROUND 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 DEMOBG every two seconds. Now execute DEMOBG in the background and receive the messages.

Type: RUN DEMOBG (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
         .

Type: DIRECTORY(RET)

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(RET)

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

Response: ^C
         ^C
         .

(The bell stops.)

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

Type: (CTRL/F)

Response: F>

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

Response: ^C
         ^C
         B>

Type: UNLOAD FG(RET)

Response: .

          If your configuration includes a VT11 or VS60 graphics display, turn it off.

          Type: GT OFF(RET)

          Response: .

3.12 PERFORMING THE SYSTEM GENERATION PROCESS

If you want to permanently install DECtape II support or implement any
system generation options (see Table 3-2), you can generate your own
monitor and handlers. The RT-11 System Generation Manual (Chapter 3)
describes how to perform this system generation process.

However, before you turn to the system generation manual, you should
note the additional questions that have been added to the SYSGEN
dialogue to accommodate DECtape II support.

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:

     DD DECtape II Data Cartridge

Other questions that have been added are:

Do you want DECtape II support [Y/N] (N)?

Type: Y (RET)

What is the CSR address for the DECtape II controller [0] (176500)?

Type: The address of the control register for the DECtape II
           controller, followed by (RET). The range
           for valid responses is 160000 through 177570.

What is the vector address for the DECtape II controller [0] (300)?

Type: The vector address of the DECtape II, followed by (RET).
           The range for valid responses is from 100
           through 777.

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.
Double density only RX02 support	Permits you to use only double density RX02 diskettes on the system. Enhances performance on RX02 systems.
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.
Extended memory monitor	Permits you to make use of additional memory above 28K. The XM monitor requires 32K words of memory, a memory management unit, and the extended instruction set.

Table 3-2 (Cont.)
System Generation Options

Option	Description
Extra device slots	Permits you to add devices to the system after it is built.
Escape sequence support	Permits your application to make special use of escape sequences (either DEC standard or ANSI standard).
Idle loop light pattern	Causes FB or XM monitor's scheduler idle loop to display a moving light pattern on certain processors.
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.
Second RX02 controller support	Adds support for second RX02 controller, allowing a total of four units in the configuration.
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 4

INSTALLING A CATEGORY 3 SYSTEM

If you have a previously installed RT-11 system and need only install DECtape II support, your configuration belongs to Category 3. To install DECtape II support, you must perform the steps summarized in the following list. Sections 4.1 through 4.7 describe the procedures involved in each step.

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.

1. Bootstrap the cartridge

2. Copy cartridges to system disk

3. Rebootstrap system disk

4. Install mandatory patches

5. Install the DECtape II device handler

6. Preserve the distribution cartridges

7. If appropriate, perform the system generation process

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

NOTE

To improve DECtape II performance, you can use the procedure in Section 2.5.5 for avoiding excessive tape rewinds.

4.1 BOOTSTRAPPING THE CARTRIDGE

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

Begin by ensuring that the processor is powered up but not running. Insert distribution cartridge number 1 (write protected) in DECtape II

Unit 0 (which has the physical device name DD0:). The next step you perform depends on whether your configuration includes a hardware bootstrap. If you have a hardware bootstrap, use it to bootstrap the first distribution cartridge and proceed to Section 4.2. (Refer to the <u>Introduction to RT-11</u> if you need help with bootstrapping procedures.) If you do not have a hardware bootstrap, perform the following steps:

Use the previously installed RT-11 system to create the following MACRO program. Note that when you type the program, you need not type comments (preceded by ;).

Bootstrap the previously installed RT-11 system and set the date.

Type: DATE dd-mmm-yy (RET)

where dd-mmm-yy is the day month and year

Response: .

Type: EDIT/CREATE DDBOOT.MAC (RET)

Response: *

Insert the program as follows:

```
I         .MCALL   .PRINT,.EXIT,.MTPS,.SCCA
          .IIF NDF DD$CSR,                DD$CSR = 176500
          .IIF NDF UNIT,                  UNIT = 0
;
;DEFINE DEVICE REGISTERS
;
          TI$CSR   =        DD$CSR        ;INPUT CONTROL AND STATUS
          TI$BFR   =        TI$CSR+2      ;INPUT BUFFER
          TO$CSR   =        TI$CSR+4      ;OUTPUT CONTROL
          TO$BFR   =        TI$CSR+6      ;OUTPUT BUFFER
;
;DEFINE DEVICE FUNCTIONS AND CONSTANTS
;
          R$$RED   = 2                    ;READ FUNCTION
          R$CONT   = 20                   ;CONTINUE
          R$INIT   = 4                    ;INIT PROTOCOL
          R$DATA   = 1                    ;DATA PACKET
          R$MSG    = 2                    ;MESSAGE PACKET
          R$MSIZ   = 10.                  ;MESSAGE PACKET SIZE
;INITIALIZE THE TU58 CONTROLLER
START:    MOV      #1,@#TO$CSR            ;SET BREAK FOR SIGNAL
          MOV      (PC)+,R3               ;DO CHARACTER TIMING
          .WORD    177777                 ;WITH TWO BYTES OF 1'S
          CALL     BCHROS                 ;OUTPUT BOTH
1$:       TSTB     @#TO$CSR               ;WAIT TILL READY
          BPL      1$                     ;BEFORE CLEARING BREAK
          MOV      #0,@#TO$CSR            ;CLEAR THE BREAK
          MOV      (PC)+,R3               ;GET TWO INITS
          .BYTE    R$INIT,R$INIT          ;TWO INITS FOR TX
          CALL     BCHROS                 ;OUTPUT BOTH INITS
          TST      @#TI$BFR               ;DUMP OLD CHAR
          CALL     BICHR                  ;GET A CHAR FOR INPUT
          CMPB     R3,#R$CONT             ;IS IT A CONTINUE?
          BNE      BFATAL                 ;NO - FATAL ERROR
;OUTPUT THE MESSAGE PACKET FOR READ
          MOV      #B$CKS,R4              ;GET CHECKSUM ADDRESS
          MOV      #B$PKT,R5              ;COMMAND PACKET ADDRESS
```

```
2$:     MOV     (R5)+,R3                ;GET NEXT TWO BYTES TO OUTPUT
        ADD     R3,(R4)                 ;ADD INTO THE CHECKSUM
        ADC     (R4)                    ;END AROUND
        CALL    BCHROS                  ;OUTPUT THE TWO BYTES
        CMP     R5,R4                   ;ALL THE PACKET OUT ?
        BLOS    2$                      ;NO, KEEP OUTPUTTING
;
;NOW INPUT THE DATA FROM TU58
;
        MOV     #BLK0,R2                ;GET ADDRESS TO TEMP STORE BLOCK 0
3$:     CALL    BICHP2                  ;READ TWO CHARACTERS
        MOVB    R3,R4                   ;BYTE COUNT TO R4
                                        ;NOTE THE C BIT IS ALREADY CLEARED
        RORB    R4                      ;MAKE IT A WORD COUNT
        MOV     R1,R0                   ;INIT THE CHECKSUM
        CMPB    R1,#R$DATA              ;DATA PACKET ?
        BNE     5$                      ;NOPE, END PACKET ?
4$:     CALL    (R5)                    ;INPUT 2 BYTES
        MOV     R1,(R2)+                ;STORE IN THE BUFFER
        ADD     R1,R0                   ;BUILD THE CHECKSUM
        ADC     R0                      ;END AROUND CARRY
        DECB    R4                      ;DONE ?
        BGT     4$                      ;IF GT - NO
        CALL    CHKCKS                  ;INPUT AND CHECK CHECKSUM
        BR      3$                      ;CONTINUE
;
;NOW INPUT THE END PACKET AND CHECK FOR SUCCESS
;
5$:     CALL    (R5)                    ;TWO CHARS IN
        TSTB    R3                      ;CHECK SUCCESS CODE
        BGE     7$                      ;GOOD - GO CHECK CHECKSUM
        BR      BFATAL                  ;BAD CODE - FATAL
6$:     CALL    (R5)                    ;TWO MORE CHARS
7$:     ADD     R1,R0                   ;COMPUTE CHECKSUM
        ADC     R0                      ;END AROUND
        DEC     R4                      ;DONE ?
        BGT     6$                      ;NOPE
        CALL    CHKCKS                  ;INPUT AND CHECK CHECKSUM
;
;NOW MOVE BLOCK ZERO CODE TO LOCATIONS 0 -776 AND JUMP TO
;LOCATION TWO TO INITIATE THE BOOT
;
        .SCCA   #AREA,#SCCA             ;INHIBIT CTRL C ABORT
        .MTPS   #340                    ;LOCK OUT INTERRUPTS
        RESET                           ;RESET DEVICES
        CLR     R0                      ;MOVE THE BLOCK 0 CODE TO
        MOV     #BLK0,R1                ;LOCATIONS 0 - 776
10$:    MOV     (R1)+,(R0)+             ;MOVE A WORD
        CMP     R1,R2                   ;ALL DONE ?
        BLO     10$                     ;NO, MORE TO DO
        MOV     #UNIT,R0                ;PASS UNIT BOOTED IN R0
        CLR     @#0                     ;INDICATE SOFTWARE BOOT
        JMP     @#2                     ;JUMP TO START THE BOOT
;
;INPUT BYTE ROUTINE
;
BICHP2: MOV     PC,R5                   ;STORE THE ENTRY POINT TO THE
        CLR     R1                      ;FOLLOWING ROUTINE
        JSR     PC,@PC                  ;ENTRY FOR TWO BYTES WITHOUT STORE
```

```
BICHR:
1$:     TSTB    @#TI$CSR                ;WAIT ON READY
        BPL     1$                      ;TIL SET
        MOVB    @#TI$BFR,R3             ;GET BYTE
        BISB    R3,R1                   ;MAKE PARTIAL WORD
        SWAB    R1                      ;AND SET TO MAKE NEXT PART
        RETURN
;
;OUTPUT BYTE ROUTINE
;
BCHROS: CALL    @PC                     ;OUTPUT LOW BYTE
BCHRO:
1$:     TSTB    @#TO$CSR                ;WAIT TIL DONE
        BPL     1$
        MOV     R3,@#TO$BFR             ;AND OUTPUT LOW BYTE
        SWAB    R3                      ;AND SWAP THE WORD
        RETURN
;
;INPUT AND CHECK CKECKSUM
;
CHKCKS: CALL    (R5)                    ;INPUT CHECKSUM
        CMP     R1,R0                   ;CHECKSUM OK ?
        BNE     BFATAL                  ;NO - FATAL ERROR
        RETURN                          ;OK - RETURN
;
;FATAL ERROR EXIT
;
BFATAL: .PRINT  #BOOTER                 ;PRINT FATAL MESSAGE
        .EXIT
BOOTER: .ASCIZ  \?DDBOOT-F-I/O ERROR\
        .EVEN
B$PKT:  .BYTE   R$MSG,R$MSIZ,R$$RED,0
BTUNIT: .WORD   UNIT                    ;UNIT BOOTED FROM
        .BYTE   0,0
        .WORD   1000                    ;BYTE COUNT
        .WORD   0                       ;RECORD NUMBER
B$CKS:  .WORD   0                       ;CHECKSUM
AREA:   .BLKW   2
SCCA:   .BLKW   1
BLKO:   .BLKW   256.
        .END    START
```
(ESC)(ESC)

Response: *

Type: EX(ESC)(ESC)

Response: .

Once you are sure that you have created this program exactly as it
appears here, you must assemble, link, and run it.

DDBOOT.MAC reads in block 0 of Unit 0, using the standard CSR 176500.
If your system has a nonstandard CSR or you want to boot Unit 1,
assemble DDBOOT with the following system conditional file, DDCND.MAC.
Use EDIT to create this file.

Type: EDIT/CREATE DDCND.MAC (RET)

Response: *

Insert the file as follows, making entries for the appropriate CSR and/or unit:

```
I;
; THIS IS THE CONDITIONAL FILE TO BE ASSEMBLED WITH DDBOOT.MAC IN ORDER TO
; CHANGE EITHER ONE OF THE TWO CONDITIONALS
;
DD$CSR = XXXXXX                      ;DEFINE A NON-STANDARD CSR FOR DECTAPE II
UNIT = 1                             ;SPECIFIES UNIT 1 AS UNIT TO BE BOOTED
```
(ESC)(ESC)

Response: *

Type: EX(ESC)(ESC)

Response: .

Use the following command to assemble DDBOOT without the system conditional file:

Type: MACRO DDBOOT.MAC(RET)

Response: ERRORS DETECTED: 0
            .

To assemble DDBOOT with the system conditional file for a nonstandard CSR, use the following command:

Type: MACRO/OBJ:DDBOOT DDCND+DDBOOT(RET)

Response: ERRORS DETECTED: 0
            .

Now link the program.

Type: LINK DDBOOT(RET)

Response: .

Run DDBOOT.

Type: RUN DDBOOT.SAV(RET)

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

Running this program bootstraps the cartridge.

If the cartridge is not now bootstrapped or if the following message appears, you have probably made a typographical error in creating the program.

          DDBOOT-F-I/O ERROR

Correct the error and assemble, link, and run the program again.

4.2 COPYING THE CARTRIDGES TO THE DISK

Once you have bootstrapped DECtape II distribution cartridge number 1, you should copy certain files from both distribution cartridges to the former system disk.

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
```

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
```

> NOTE
>
> If your previously installed system includes a custom generated monitor, you must perform the system generation process to generate your own DECtape II handler source file (DD.MAC), which you must assemble and link to produce the DECtape II handler (DD.SYS).

Type: COPY/SYSTEM/QUERY *.* xxn:*.* (RET)

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

Type: Y(RET)   to include a specific file
           N(RET)   to exclude a specific file

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

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

Then insert distribution cartridge number 2 in Unit 1.

Type: COPY/SYSTEM/QUERY DD1:*.* xxn:*.* (RET)

Response: Files copied:
           DD1:aaaaaa.ttt to xxn:aaaaaa.ttt?

Type: Y(RET)   to include a specific file
           N(RET)   to exclude a specific file

Response: DD1:bbbbbb.ttt to xxn:bbbbbb.ttt?   (and so on)

4.3 REBOOTSTRAPPING THE DISK

Now, use the hardware bootstrap to reboot the disk.

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

Set the date.

Type: DATE dd-mmm-yy (RET)

Response: •

4.4 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 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.

4.5 INSTALLING THE DECTAPE II DEVICE HANDLER

Among the files you copy from the cartridges is the DECtape II device
handler, DD.SYS. You must now install this handler on your disk
system.

Use the SHOW command to check your system's device assignments.   If
you do not have a free device slot, use the REMOVE command to remove
an unneeded device.

Type: SHOW

Response: TT (Resident)
          DM (Resident)
          DM0 =SY, DK   [sample]
          LP
          PC
            •

Remove an unneeded device. For example, remove paper tape.

Type: REMOVE PC (RET)

Response: •

Type: INSTALL DD(RET)

Response: .

You must install the DECtape II handler every time you bootstrap the
disk unless you:

1.   Create a startup indirect command file that installs it

2.   Perform the system generation process to permanently install
     DECtape II support

DIGITAL supports performing the system generation process on the disk
but not on DECtape II. See Section 4.7 and the <u>RT-11 System
Generation Manual</u> (Chapter 3) for a description of the system
generation process.

4.6   PRESERVING THE DISTRIBUTION CARTRIDGES

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

4.7   PERFORMING THE SYSTEM GENERATION PROCESS

If you want to permanently install DECtape II support or implement any
system generation options (see Table 4-1), you can generate your own
monitor and handlers.

                          NOTE

          The distribution kit includes a set of
          uncommented system source files (with
          the file type .MAC) and SYSGEN input
          files (with the file type .CND), which
          you should have copied to your working
          system.   When you perform system
          generation, be sure to use copies of the
          files that were on the distribution kit.
          These files supersede any previous
          versions of them that you may have.

The <u>RT-11 System Generation Manual</u> describes how to perform this
system generation process.   However, before you turn to the system
generation manual, you should note the additional questions that have
been added to the SYSGEN dialogue to accommodate DECtape II support.

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:

     DD DECtape II Data Cartridge

Other questions that have been added are:

Do you want DECtape II support [Y/N] (N)?

Type: Y (RET)

What is the CSR address for the DECtape II controller [0] (176500)?

Type: The address of the control register for the DECtape II
          controller, followed by (RET). The range
          for valid responses is 160000 through 177570.

What is the vector address for the DECtape II controller [0] (300)?

Type: The vector address of the DECtape II, followed by (RET).
          The range for valid responses is from 100
          through 777.

Table 4-1
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.
Double density only RX02 support	Permits you to use only double density RX02 diskettes on the system. Enhances performance on RX02 systems.
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.
Extended memory monitor	Permits you to make use of additional memory above 28K. The XM monitor requires 32K words of memory, a memory management unit, and the extended instruction set.
Extra device slots	Permits you to add devices to the system after it is built.
Escape sequence support	Permits your application to make special use of escape sequences (either DEC standard or ANSI standard).
Idle loop light pattern	Causes FB or XM monitor's scheduler idle loop to display a moving light pattern on certain processors.
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.

Table 4-1   (Cont.)
System Generation Options

Option	Description
Second RX02 controller support	Adds support for second RX02 controller, allowing a total of four units in the configuration.
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.

READER'S COMMENTS

NOTE: This form is for document comments only. DIGITAL will
         use comments submitted on this form at the company's
         discretion. If you require a written reply and are
         eligible to receive one under Software Performance
         Report (SPR) service, submit your comments on an SPR
         form.

Did you find this manual understandable, usable, and well-organized?
Please make suggestions for improvement.

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Did you find errors in this manual? If so, specify the error and the
page number.

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Please indicate the type of reader that you most nearly represent.

☐ Assembly language programmer
☐ Higher-level language programmer
☐ Occasional programmer (experienced)
☐ User with little programming experience
☐ Student programmer
☐ Other (please specify)_____

Name_____ Date_____

Organization_____

Street_____

City_____ State_____ Zip Code_____
                                                 or
                                                 Country

--- **Fold Here** ---

--- **Do Not Tear - Fold Here and Staple** --