RSTS/E V06C
System Generation Manual

Order No. AA-2669D-TC

July 1978

This document describes procedures used to generate a RSTS/E Version V06C system.

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PREFACE

This manual describes the complete process for generating and installing a BASIC-PLUS run-time system, BASIC-PLUS system programs, and a monitor for Version V06C of RSTS/E, the PDP-11 Resource Sharing Time Sharing System/ Extended. The manual also presents information needed to change system characteristics, to optimally arrange system components, and to correct hardware and software problems. The material is of interest to those at an installation who are responsible for hardware and software policy and procedure. Certain information is also of interest to field service engineers, software support representatives, and system managers who are responsible for solving operational problems and for maintaining published changes to system software. Before attempting to generate a RSTS/E system, you should be familiar with the RSTS/E and BASIC-PLUS software, with the hardware on which RSTS/E will run, and with any published changes (patches) to system software.

Procedures for generating and installing diagnostic and optional software are described in other manuals provided with that software.

For more information on RSTS/E documentation for standard and optional software, consult the *RSTS/E Documentation Directory*. For information on hardware supplied with RSTS/E, consult the user documents that accompanied the system.

This manual uses the following symbology conventions:

- (LF) indicates pressing the LINE FEED key
- (RET) indicates pressing the RETURN key
- (ESC) indicates pressing the ESCAPE key (shown as ALT MODE on some terminals)

In addition, user input is underlined in all examples. Unless otherwise noted, user input is terminated by pressing the RETURN key.

For a quick reference to a subject in this guide, refer to the following list of topics.

If you need to know about:	See Section:
Adding auxiliary RTS support	6.3
Adding more memory to RSTS/E	3.8.4.3
Adding swap files	3.7
Automated patching	6.7
Bootstrapping a device	Appendix A
Building system library files	6.2
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CHAPTER 1
INTRODUCTION

Before generating a RSTS/E system, you should understand the fundamental elements of a RSTS/E system. You can then generate a system by performing the following steps, which are outlined in Figure 1-1.

1. Bootstrap the RSTS/E distribution medium (Step 1)
2. Use system initialization options to *tailor* a RSTS/E system (the SYSGEN system) supplied by DIGITAL to the needs of your installation. (Steps 2–11)
3. Use the SYSGEN system to generate a *target* RSTS/E system that supports the hardware and software your installation requires. (Steps 12–16)
4. Use system initialization options to tailor the target system to the needs of your installation. (Steps 18–25)
5. Build a library of RSTS/E system files (Steps 26–31)

NOTE

This documentation refers to the RSTS/E system generation (SYSGEN) system, the RSTS/E target system, and their system disks. DIGITAL supplies the SYSGEN system on a distribution disk, magtape, or DECtape. The SYSGEN system is a RSTS/E system that can run on any valid RSTS/E hardware configuration. While running the SYSGEN system, you generate a target system, which supports the hardware and software features that your installation requires. This manual calls the disk or tape supplied by DIGITAL the *distribution disk or tape.* This disk or tape is always mounted write-protected. The *SYSGEN system disk* is the disk to which you copy the SYSGEN files and on which you perform the system generation. The *target system disk* is the disk on which the target system is placed. At some installations, this disk and the SYSGEN disk are the same.

After you generate the first target system, you can generate additional monitors and BASIC-PLUS run-time systems. These can replace the original versions permanently or can be installed for temporary use. You can generate them during timesharing and tailor them immediately before using them as described in Chapter 7.

1.1 FUNDAMENTALS OF RSTS/E

Every RSTS/E system has a system disk that contains the following elements:

- A RSTS/E file structure
- The system initialization code
- A monitor Save Image Library (SIL)
- A run-time system
- An error message file
- A swapping file
- Auxiliary system files (optional)

The RSTS/E file structure on the system disk includes a bootstrap block and three directories. One directory is the Master File Directory (MFD) account[1,1]. It contains entries for itself, for the system file account[0,1], and for the system library account [1,2]. (Nonsystem disks do not require a system library account.) The MFD also includes the pack cluster size and disk pack identification (pack ID). In addition, the MFD notes whether the disk is public or private and whether the directories for the files on the disk retain the date on which the files were last accessed or the date on which the files were last modified. The second directory, which is catalogued in the MFD, is the User File Directory (UFD) for account [0,1]. This directory initially contains entries for the files SATT.SYS and BADB.SYS. The third directory is the UFD for account[1,2], which (after the system library build procedure) contains system library files.

The file SATT.SYS, which RSTS/E requires in account[0,1] on each disk, is a storage allocation table for that disk. SATT.SYS maps which disk clusters are allocated and which are free. BADB.SYS, also required on each disk, is the file to which the bad blocks found on that disk are allocated. (A bad block is a block from which the system cannot reliably read data.) The initialization code permanently allocates bad blocks to BADB.SYS to prevent their allocation to another file.

During system generation, you can use the system initialization code (INIT.SYS) to write a file structure on disks that will be used under RSTS/E. The system initialization code is a stand-alone program that contains routines to initialize disks, create system files, enable and disable peripheral devices, install a monitor, set system defaults, and perform other tasks that are necessary to create the RSTS/E operating environment.

A monitor Save Image Library (SIL) contains the actual operating system code – i.e., the RSTS/E monitor code and the File Processor (FIP) overlay code. It also includes global symbol values (which allow symbolic monitor patching), space for monitor default specification and patches, and an index of its contents. The system generation process runs programs that link the monitor and overlay code and build a SIL.

The RSTS/E system permits more than one monitor to be on a disk simultaneously; of course, only one is installed (i.e., in use as the monitor for timesharing) at any time. For example, an installation might have one monitor installed during the daytime for applications use and a different monitor installed at night for program development. Before any monitor can be installed, however, it must be in account [0,1]. The monitor SIL file can be written anywhere on the system disk and need not be contiguous.

RSTS/E provides run-time systems to control the interface between user jobs and the monitor. The system associates each job with a run-time system. The run-time system issues the proper monitor directives to perform whatever operations the job specifies. The system loads a run-time system upon receiving a request from a job for that run-time system. The request can be a special run-time system command or merely a command to run a program that is associated with a particular run-time system. A run-time system is code that jobs may share. Once a run-time system has been added to the system, any number of jobs can be associated with it. The monitor brings the run-time system into memory automatically whenever one of the jobs associated with the run-time system is running. The run-time system is the primary controller for the job. It interprets job input and directs the monitor accordingly.

RSTS/E requires as the system default a run-time system that is a keyboard monitor. The keyboard monitor prompts the user at the terminal and accepts RSTS/E command strings.

The default run-time system for RSTS/E systems is normally BASIC-PLUS. The BASIC-PLUS run-time system accepts input from logged-out terminals and logs in jobs (with the LOGIN program). It prompts users at terminals for input (the READY message) and accepts command strings (ASSIGN, RUN, and SAVE among others). In addition, the BASIC-PLUS run-time system includes a language processor. This facility enables a user to enter, debug, and execute programs in the BASIC-PLUS language.

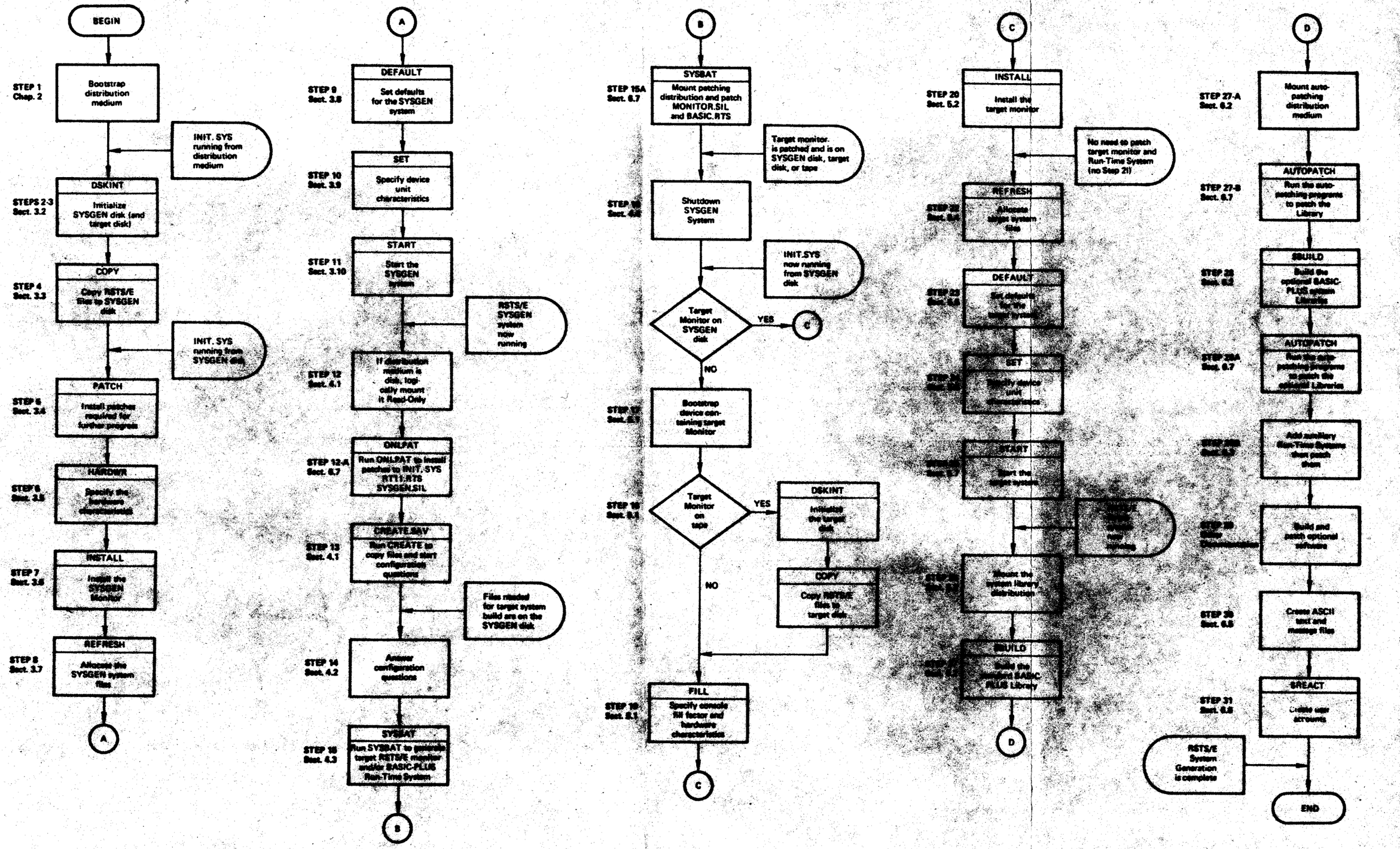


Figure 1-1 System Generation Flow Chart

The default run-time system for the SYSGEN system is RT11. This run-time system emulates many monitor functions of DIGITAL's RT11 operating system. DIGITAL provides and supports the RT11 run-time system and utility programs solely for the purposes of RSTS/E system generation.

Each system includes the error message file ERR.ERR so that RSTS/E can notify users with the appropriate text whenever an error occurs.

The RSTS/E system needs a swapping file -- i.e., contiguous disk space in which it can place jobs it has swapped out of memory. You can allocate the swapping space as one or more files and/or one or more non-file-structured swapping disks. One swapping file, SWAP.SYS, is always required on the system disk. You can allocate other files or disks for swapping depending upon your installation's requirements and resources. The system must include enough swapping space to hold all the jobs on the system at any given time (each job at its maximum size).

Four auxiliary RSTS/E system files (OVR.SYS, ERR.SYS, BUFF.SYS, and CRASH.SYS), may also exist. The system can access the overlay code directly from the SIL or from a separate file (named OVR.SYS) on a nonsystem disk. If your system includes an auxiliary fixed head disk, you may be able to improve system performance by creating OVR.SYS. The file ERR.SYS is a copy of ERR.ERR, which is the system error message file. As with OVR.SYS, you can create ERR.SYS on an auxiliary fixed head disk to increase access speed. All systems configured for DECtape require BUFF.SYS, which provides the buffer space necessary for DECtape operations. CRASH.SYS is necessary if you enable the crash dump facility. If a fatal monitor error occurs while the crash dump facility is enabled, the system dumps the contents of the read/write area of the monitor to the CRASH.SYS file. DIGITAL strongly recommends that you create the CRASH.SYS file and enable the crash dump facility.

The remaining sections of this chapter provide an overview of Chapters 2 through 7. In addition to the usual text, this manual includes five sections summarizing the system generation procedures described in each chapter. These sections, which are on colored paper, are intended for use by those experienced at generating RSTS/E. Note that Chapter 2, intended for all users, contains only procedural information and is therefore on colored paper.

1.2 BOOTSTRAPPING THE DISTRIBUTION MEDIUM

The first step in system generation is to use the hardware bootstrap loader to bootstrap the initialization code into memory from the distribution medium. Chapter 2 describes the procedures to follow to bootstrap the distribution medium. DIGITAL distributes RSTS/E on 7-track and 9-track magtape, and RK05, RL01, RK06, and RK07 disk cartridge. The distribution media contain the initialization code and other programs and data files needed to generate and tailor a RSTS/E system.

System generation procedures (except for the mounting and dismounting of distribution volumes) are essentially the same for all the distribution media.

1.3 TAILORING THE RSTS/E SYSGEN SYSTEM

After you bootstrap the distribution medium, you can use the initialization options (as described in Chapter 3) to tailor the SYSGEN system for your installation. The SYSGEN system is configured at DIGITAL to support a minimal number of each standard RSTS/E device -- four RK05 units, two units of each other disk type, two DECtape units, two units of each magtape type, two keyboards (the console keyboard and one pseudo keyboard), one line printer, etc. During the tailoring procedure, you must use options that perform the following functions:

1. Initialize RSTS/E disks (DSKINT option)
2. Copy SYSGEN system files from the distribution medium to the system disk (COPY option)
3. Correct the system code (PATCH option)
4. Specify the hardware configuration if necessary (HARDWR option)
5. Install the SYSGEN monitor (INSTALL option)
6. Allocate system files for the SYSGEN system (REFRESH option)
7. Set system defaults (DEFAULT option)
8. Specify characteristics of device units (e.g., line printer) if necessary (SET option)
9. Start timesharing with the SYSGEN system (START option)

If the console terminal for your system is not a standard type, you may need to set its fill factor (for use by the initialization code) before using any other option. Use the FILL option to do so.

In addition to the listed options, the initialization code includes three other options, which enable you to bootstrap devices, load stand-alone programs, and enable only the console terminal. These options are not generally required during the tailoring of the SYSGEN system.

1.4 GENERATING THE RSTS/E TARGET SYSTEM

After tailoring and starting the SYSGEN system, your next step is to generate a target system. The system generation process uses several programs that copy and edit files, ascertain the system configuration, and assemble and link components of the RSTS/E target monitor. The distribution medium contains a program that copies the necessary files to the system generation disk and chains to another program, which asks the system configuration questions.

Answering the configuration questions involves declaring permanent settings in the RSTS/E monitor code and BASIC-PLUS run-time system. These settings indicate the devices and optional software the system will support. Examples of configured elements include the device controllers in the RSTS/E monitor and the mathematical functions in the BASIC-PLUS run-time system. The only way to change the configuration is to regenerate the system. Configuring a system is different from tailoring a system. When you tailor a RSTS/E system, you specify variable factors for the RSTS/E monitor. You can change the tailored elements within their configured limits any time the initialization code is running.

After answering the configuration questions, the next step is to run another batch stream, which generates the target monitor and BASIC-PLUS run-time system.

1.5 TAILORING THE TARGET SYSTEM

Your next step is to tailor the target system as described in Chapter 5. Using the same initialization options that you used to tailor the SYSGEN system, do the following:

1. Initialize RSTS/E disks (DSKINT option)
2. Specify the hardware configuration if necessary (HARDWR option)
3. Install the target monitor (INSTALL option)
4. Correct the system code (PATCH option)
5. Allocate the system files (REFRESH option)
6. Set system defaults (DEFAULT option)
7. Specify characteristics for device units, if necessary (SET option)
8. Start timesharing with the target monitor (START option)

1.6 BUILDING THE SYSTEM LIBRARY FILES

DIGITAL supplies a library of system programs in the distribution kit. After tailoring the target system, you can begin to build the library. Chapter 6 explains building the system library, producing text and message files, and creating user accounts. The build procedure copies the system programs to the system disk and compiles them. You can then use the library programs (if necessary) to build optional software packages, such as the FORTRAN IV and COBOL languages. You can also use the system library programs to produce files containing information for users and files containing commands to be issued at system start up. As your final step, create user accounts. You can then make the RSTS/E system available for general use.

1.7 REGENERATING RSTS/E

You can generate additional RSTS/E monitors, BASIC-PLUS run-time systems, or both during RSTS/E timesharing using the RT11 run-time system. (You need not use the SYSGEN monitor.) Chapter 7 describes generating a RSTS/E monitor and/or BASIC-PLUS run-time system on line. After ensuring that all the system generation programs are on the system, you can run the SYSGEN.SAV program, which asks the configuration questions.

After you answer the configuration questions, you can (using SYSBAT.SAV) start the batch file that generates the monitor and/or BASIC-PLUS run-time system. After the batch run terminates, you can shut down the running system at a convenient time and use the initialization code to tailor and start the new system. If you generate only a run-time system, you can use the initialization code to make it the system default or use the UTILTY program to add it as an auxiliary run-time system.

1.8 PATCHING RSTS/E CODE

DIGITAL classifies RSTS/E patches as mandatory or optional. Mandatory patches must be installed in your system if the component needing the patch is in your system. Optional patches need not be installed in your system, as they extend or configure some optional feature of a software component. For further information on mandatory and optional patches, refer to the RSTS/E V06C Release Notes (AA-5246B-TC).

With the release of RSTS/E V06C, DIGITAL issues RSTS/E patches two ways:

1. All RSTS/E patches, mandatory and optional, are published in the RSTS/E V06C Release Notes and the RSTS/E V06C Software Dispatches.
2. ALL mandatory patches for RSTS/E V06C are distributed as command files on a RSTS/E-compatible magnetic tape or disk, as the RSTS/E Automated Patching Facility Kit. The objective of the kit is to allow you to automate the patching process for mandatory patches, thereby reducing the time required to install patches while improving the reliability of the patches.

   This manual contains procedures for using the Automated Patching Facility Kit during the system generation process.

1.9 INSTALLING AUXILIARY RUN-TIME SYSTEM SUPPORT

You must install auxiliary Run-Time System support on a RSTS/E system in order to use one or more optional language processors such as BASIC-PLUS-2, COBOL, and FORTRAN. The language and version determine the Run-Time System required, as given in the table below:

Language (Version)	Run-Time System
BASIC-PLUS-2	RSX (plus BASIC2 and/or BP2COM)
COBOL-11 (V03)	RSX, RMS11
FORTRAN IV	RT11
RPG-II (V8)	RSX, RMS11

In addition, the Record Management Services (RMS) subsystem requires the RSX Run-Time System.

Section 6.3 of this manual contains the procedures you must follow to add these Run-Time Systems to your RSTS/E system.

CHAPTER 2

BOOTSTRAPPING THE DISTRIBUTION MEDIUM

The distribution medium is the tape or disk on which DIGITAL supplies the RSTS/E system. To bootstrap the distribution medium, use the switches on the Central Processing Unit (CPU). The switches initiate a hardware loader that contains machine instructions for reading the first record of the distribution medium into memory. The record, called a bootstrap record, executes a program that loads additional program code from the distribution medium into memory and executes that code. This code prints a message on the console terminal. The message marks the successful completion of the bootstrap procedure. For example:

```
Enabling only console, disks, and tapes.

RSTS V06C (MT0)

Option:
```

For the bootstrap operation to succeed, the distribution medium must be on line and ready; the medium accessed must contain a proper bootstrap record; the console terminal must be on line. The following sections describe the bootstrap procedures for each of the distribution media. Detailed bootstrap procedures appear in Appendix A. Figure 2-1 is a flowchart of Step 1.

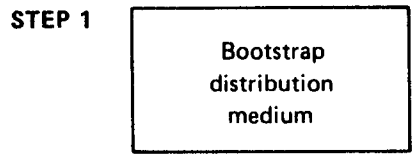


Figure 2-1 Bootstrap Procedure

STEP 1. Bootstrapping the Distribution Medium

Procedure:

a. For magtape distribution:

The operation of the magtape devices is described in the *RSTS/E System User's Guide*. To bootstrap the magtape, proceed as follows:

Mount the system generation tape on unit 0 with the write enable ring removed. This tape is labelled:

AP-2773F-BC for a 9 track TU10, TE10, TS03, TU16, TE16 or TU45 drive
AP-2772F-BC for a 7-track TU10 or TE10 drive

NOTE

The magtape bootstrap in the system initialization code will not use a TU16, TE16, or TU45 tape drive if a TU10, TE10, or TS03 drive is present. Therefore, if your system includes drives of both types (TU10/TE10/TS03 and TU16/TE16/TU45), bootstrap the distribution tape on the TU10, TE10, or TS03 drive.

Ensure that the tape is at its load point. (The LD PT indicator light comes on.) The computer does not bootstrap the device unless the tape is at its load point.

Set the ON-LINE/OFF-LINE switch on the tape unit to ON-LINE and ensure that the RDY indicator is lit.

Ensure that the console terminal is on-line.

Follow the instructions in Appendix A for the type of hardware bootstrap device that is on the system.

b. For disk cartridge distribution:

To bootstrap the disk cartridge, proceed as follows:

Insert in a free unit the cartridge labelled

AN-2771F-BC for an RK05 disk drive
AX-D527F-BC for an RL01 disk drive
AM-2774F-BC for an RK06 disk drive
AY-D526F-BC for an RK07 disk drive

Ensure that the RDY light is on.

Ensure that the WR PROT light is on.

Ensure that the console terminal is on-line.

Follow the instructions in Appendix A for the type of hardware bootstrap device that is on the system.

CHAPTER 3

TAILORING THE SYSGEN SYSTEM

After you bootstrap the distribution medium, your next step in system generation is to tailor the SYSGEN system for your installation. The initialization code includes 13 options that you can use to tailor the SYSGEN system. The following sections describe the initialization options.

3.1 OVERVIEW OF INITIALIZATION OPTIONS

When you bootstrap the RSTS/E distribution disk or tape, the RSTS/E system initialization code is loaded into memory. The RSTS/E system initialization code (INIT.SYS) is a collection of routines that create the RSTS/E file structure, system files, and start-up conditions for RSTS/E timesharing. The initialization code allows you to start the special SYSGEN monitor, which you can then use to generate a target RSTS/E system. When the target system generation process is complete, you can shut down the SYSGEN system and use the initialization code again to install the target system monitor and start timesharing.

The initialization code is one large stand-alone program with many functions. Initialization code routines (options) create a RSTS/E disk environment, install the monitor and run-time system, and set system defaults. Initialization routines also check the integrity of the system disk and load stand-alone programs. They allow you to patch system components, declare device characteristics, and disable hardware units and controllers.

Table 3-1 lists all the initialization options. This chapter describes all the initialization options. Usually, you need not use all the options in tailoring the SYSGEN system. A brief description of each option follows.

1. The disk initialization routines (DSKINT) initialize, format, and perform pattern checks on any RSTS/E disk. They write the minimum RSTS/E file structure and can create the library account [1,2].
2. The file copying routines (COPY) copy system files to an initialized RSTS/E system disk from the distribution medium.
3. Patching routines (PATCH) allow you to alter the RSTS/E system code or the INIT.SYS code to correct errors. Patches are published in the RSTS/E Release Notes and in monthly software publications.
4. Device controller routines (HARDWR) allow you to enable and disable device controllers, specify non-standard addresses and vectors for device controllers, and specify DM11-BB and DH11 associations.
5. Monitor installing routines (INSTALL) designate the Save Image Library file to be used as the monitor for a SYSGEN or target system.
6. The file manipulation routines (REFRESH) allow you to create and position system swapping files, update the bad block file, and arrange optional system files on the system disk or any auxiliary disk.
7. The default setting routines (DEFAULT) set system default start-up conditions. Among these conditions are job and swap maximums, the default run-time system, and the error message file.
8. Device characteristic routines (SET) enable and disable device units, set and reset modem control for keyboards, place and remove restrictions on the use of device units, and set line printer unit features.
9. Start-up routines (START) start the RSTS/E system for SYSGEN or normal timesharing. These routines load monitor tables, enable devices, and load the monitor and default run-time system into memory. START also allows you to override previously set system defaults for one timesharing session.
10. Bootstrap routines (BOOT) simulate the hardware bootstraps. They load an operating system into memory from disk or tape, or reload the initialization code into memory after you have corrected it on disk.
11. Loading routines (LOAD) load into memory and execute any stand-alone program.

12. A special diagnostic routine (UNISYS) allows you to start a RSTS/E system (by typing UNISYS and then typing START) with only the console terminal enabled. Problems sometimes occur in the terminal interfaces of new systems. These problems can prevent the start of timesharing when the start-up code fails to enable the terminal interfaces. UNISYS helps to isolate the problem to the terminal interface configuration by allowing you to start the system with only the console terminal enabled.
13. Fill factor routines (FILL) tell the terminal driver in the initialization code to insert the proper number of fill characters when printing messages on the console terminal.
14. A help option (HELP) prints a list of valid options.

Table 3-1
Initialization Options

Option Name	Abbreviation	Meaning
DSKINT	DS	Initialize and optionally format a disk. Check for bad blocks.
COPY	CO	Copy required RSTS/E files from distribution medium (or system tape) to system disk and bootstrap the system disk.
PATCH	PA	Alter RSTS/E system code to correct problems.
HARDWR	HA	Specify device controller characteristics.
INSTALL	IN	Install a RSTS/E monitor.
REFRESH	RE	Create or rebuild the system files in account [0,1] on any initialized RSTS/E disk; rebuild the storage allocation table for a disk; add bad blocks to BADB.SYS.
DEFAULT	DE	Establish or change a monitor's start-up defaults.
SET	SE	Set device characteristics on a unit-by-unit basis.
START	ST or LINE FEED key	Start timesharing operations.
BOOT	BO	Bootstrap a device.
LOAD	LO	Load a stand-alone program from account [0,1].
UNISYS	UN	Enable only the console terminal interface. Used as a diagnostic tool with the START option.
FILL	FI	Set the fill factor of the console terminal for the initialization code.
HELP	HE	Print a help message.

The user interface with the initialization code is a dialogue. Most questions in the dialogue have a long form and a short form. The initialization code automatically prints the short question. To receive the long form question, press the RETURN key in response to the short form question. Long form questions usually include information that may help you to answer the dialogue questions. For example, pressing the RETURN key in response to the DSKINT option's PACK CLUSTER SIZE? question yields a list of valid pack cluster sizes for the disk you are initializing.

The initialization code dialogue begins with the OPTION: prompt and returns to this prompt after the execution of each option. Typing HELP in response to OPTION: gives you a list of valid responses, as in the following example.

```
Option: HELP

The valid RSTS initialization options are:
        START   Start timesharing
        <LF>    Start timesharing (fast)
        DSKINT  Initialize disk to RSTS file structure
        HARDWR  Set controller characteristics
        BOOT    Bootstrap a device
        LOAD    Load a stand-alone program
        INSTALL Install a monitor SIL
        REFRESH Manipulate files in [0,1]
        DEFAULT Set monitor defaults
        SET     Set device characteristics
        COPY    Copy minimal system to disk
        PATCH   Patch a file
        HELP    Type this HELP message
        FILL    Set console fill for INIT
        UNISYS  Disable all but console terminal
Only the first two characters need be typed.


Option:
```

To request an option, type the first two or more characters of its name. The initialization code proceeds directly to execute the requested option. You can type the CTRL/C combination in response to any question during the execution of the option to abort execution and return to the OPTION: prompt.

Using the initialization options, perform the following steps to tailor the RSTS/E SYSGEN system:

1. DSKINT option – If you plan to put the SYSGEN and target systems on separate disks, first mount and initialize the target disk. Dismount it if you need the disk drive for the SYSGEN disk. After initializing the target disk (if necessary), initialize the SYSGEN disk and leave it mounted.
2. COPY option – Copy system files from the distribution medium to the SYSGEN system disk. The COPY option automatically bootstraps the SYSGEN system disk.
3. PATCH option – If necessary, correct errors in the initialization code.
4. HARDWR option – If necessary, disable device controllers, specify nonstandard UNIBUS addresses and floating vectors for device controllers, and specify the associations of DM11-BBs with DH11 multiplexers.
5. INSTALL option – Install the file SYSGEN.SIL as the RSTS/E monitor for system generation.
6. REFRESH option – Allocate swapping and other system files for the SYSGEN system.
7. DEFAULT option – Establish SYSGEN monitor defaults for job and swap maximums, the run-time system (RT11), the error message file, the installation name, the allocation of memory space, the crash dump facility, and the labelling format for magtapes.

8. SET option – If necessary, disable device units, enable modem control for keyboard lines, restrict the use of device units, and set type, width, and case for line printer units.
9. START option – Start timesharing on the SYSGEN system with RT11 as the default run-time system.

Note that if your console terminal is not an ASR33, KSR33, VT05, VT50, VT52, LA30, or LA36, you may need to use the FILL option (described in Section 3.14) immediately after using the COPY option. The FILL option sets the console terminal fill factor used by the initialization code for the current system device.

After starting the SYSGEN system, proceed to Chapter 4 to configure the target system.

NOTE

If you will be using the RSTS/E Automated Patching Facility Kit and the ONLPAT program to patch initialization code, you may not need to install some patches until after the SYSGEN system is started. Refer to Section 6.7 for instructions.

3.2 INITIALIZING DISKS

Before using any disk under RSTS/E, you must initialize it. Initialization consists of formatting the disk, performing pattern checks on the disk for bad blocks, and writing a RSTS/E file structure on the disk. Initialization is necessary for fixed head and moving head disks. The only exceptions are disks to be used non-file-structured only, such as swapping units and foreign (non-RSTS/E) volumes.

NOTE

Do not initialize a disk that contains any important information such as a monitor SIL or other files. Initialization destroys the data on the disk. Do not initialize the distribution disk.

Formatting (which should be done for RK05, RK05F, RP02, RP03, RP04, RP05, and RP06 disks) means writing the necessary timing and sense marks onto the disk and erasing any extraneous information. You must format all removable disks (except RL01, RK06, RK07, RM02, and RM03 disks, which are formatted at the factory) at least once before using them on a RSTS/E system.

You can choose from one to eight possible patterns (which DIGITAL supplies) to check for bad blocks on a disk. You can also specify up to eight patterns of your own. DIGITAL recommends that you use two or more patterns; the initialization code requires that you use at least one pattern. Using a larger number of patterns increases the probability that all bad blocks will be found and decreases the possibility that you will lose data later by writing into a bad block.

The RSTS/E file structure, which is described in Section 1.1, contains a bootstrap block and two directories. The Master File Directory (MFD) account [1,1] contains entries for itself and the system file account [0,1], the disk pack identification (pack id), pack cluster size, designates whether the files on the disk are catalogued according to the date they were last accessed or the date they were last changed, and indicates whether new files are to be added at the beginning or the end of a directory. It also designates the disk as public or private. The User File Directory (UFD) for account [0,1] contains entries for the files SATT.SYS and BADB.SYS.

During disk initialization you can request the creation of the system library account [1,2] on the disk. If you are initializing a system disk, the disk initialization routines create the account [1,2] automatically.

3.2.1 Initializing a Disk for Optimal Performance

The disk initialization process allows you to set up a disk for optimal performance. When you specify pack, MFD, and library cluster sizes, and position the file SATT.SYS, you can set up the disk to reduce access time and head movement.

The disk pack cluster size must be a power of 2. It cannot be less than the device cluster size for the disk (which may be 1, 2, 4, or 8) nor greater than 16. The pack cluster size is the minimum number of disk blocks that the system can allocate to a file on the disk pack. It is thus the minimum account and file cluster size as well. Specifying a large pack cluster size for a disk increases the speed of creation and extension of files on that disk by reducing the size of the storage allocation table (SATT.SYS). A large pack cluster size can, however, cause disk space to be wasted. For example, if the pack cluster size for a disk is 8, even a file that physically requires only 1 block is allocated 8 disk blocks (1 pack cluster).

The MFD cluster size, which cannot be less than the pack cluster size nor greater than 16, is the cluster size for account [1,1]. This value limits the number of user accounts possible on the system to approximately 108 times the MFD cluster size.[1] DIGITAL recommends that the MFD cluster size be 16, unless BASIC-PLUS and/or FORTRAN are used exclusively.

You must set the system library [1,2] cluster size to at least 4. A larger value may be necessary if you intend to store many files in account [1,2]. DIGITAL recommends that the library cluster size be 16. The maximum number of files allowed in this account (or any other) is approximately 72 times the UFD cluster size for the account. This estimate may not be true for accounts with large files or for systems that use RMS. Files with attributes (which are normally created only by RMS) consume additional directory space in the UFD. The maximum number of files with attributes that can be saved under an account is approximately 54 times the UFD cluster size for that account.

[1] The number of user accounts which may be stored in the MFD is impacted by the number and size of files put in account [1,1], as required by RMS.

You have two options regarding the positioning of the file SATT.SYS: you can specify its position yourself, or you can let DSKINT find a place for it. Positioning the file yourself is most advantageous on a moving-head system disk. In this system, you can group all system files near the middle of the disk to reduce average seek time for the disk heads. If DSKINT positions the file, it is placed in the first available space.

3.2.2 Performing the Initialization

To initialize a disk, use the DSKINT initialization option. If you plan to put the SYSGEN and target systems on separate disks, first mount and initialize the target disk. Dismount it if you need the disk drive for the SYSGEN disk. After initializing the target disk (if necessary), initialize the SYSGEN disk. Use different pack ids for the SYSGEN disk, the target disk, and the distribution disk (if present). Leave the SYSGEN disk mounted. Note that you must initialize each half of an RK05F disk separately. Therefore, to initialize an RK05F, you must use the DSKINT option twice. Table 3-2 summarizes the DSKINT dialogue. After you answer the questions in the dialogue, DSKINT begins the initialization process.

NOTE

During the DSKINT dialogue, you can type CTRL/Z in response to any prompt after DISK? to cause DSKINT to back up to the previous prompt.

The first user-specified process that DSKINT performs is formatting. DSKINT prints STARTING FORMAT PASS when it begins formatting, and END FORMAT PASS when it completes formatting the disk. The time required for formatting depends on the size and type of disk involved.

When RP02 and RP03 disks are being initialized, the DSKINT dialogue includes two requests immediately after the STARTING FORMAT PASS MESSAGE:

SET FORMAT ENABLE SWITCH, THEN TYPE <LF>:

You must set the RP11 controller FORMAT ENABLE/NORMAL switch to ENABLE, then type the LINE FEED key.

SET FORMAT SWITCH TO NORMAL, THEN TYPE <LF>:

You must set the RP11 controller FORMAT ENABLE/NORMAL switch to NORMAL, then type the LINE FEED key.

After it formats the disk, DSKINT runs the pattern checks and counts the bad clusters. If DSKINT finds 161 or more bad clusters, it prints the message EXCESSIVE BAD CLUSTERS and returns the OPTION: prompt. Use a different disk. If the pack contains fewer than 161 bad clusters, DSKINT builds the RSTS/E file structure. When the building of the file structure is complete, DSKINT returns to the OPTION: prompt. Several examples are in the following two sections.

3.2.3 Initializing a System Disk

In this example, a user initializes the disk to be used as the SYSGEN system disk. The printout from the dialogue follows. Each line is marked with a letter and is explained in the subsequent text.

```
Option: DSKINT

DD-MMM-YY? 12-JUN-78
10:09 AM? 08:00

Disk? DK                                          line  a
Unit? 0                                                 b
Pack ID? SYSGEN                                         c
Pack cluster size? 1                                    d
SATT.SYS base? 0                                        e
MFD password? SYSGEN                                    f
MFD cluster size? 2                                     g
PUB, PRI, or SYS? SYS                                   h
Library password? SYSLIB                                i
Library UFD cluster size? 4                             j
Date last modified? NO                                  k
New files first? Y                                      l
Use previous bad block info? N                          m
Format? Y                                               n
Patterns? 3                                             o
Proceed (Y or N)? Y                                     p
Starting format pass
End format pass

Pattern # 3
Pattern # 2
Pattern # 1

Option:
```

At line a, the user types the two-character device designator of the disk to be used in the SYSGEN disk. The query at line b, which DSKINT prints for DS, DK, DL, DM, DP, DR, and DB disks, requests, the unit number of the device on which the disk is mounted. For an RS11 (DF) disk, the PLATTERS? query replaces the UNIT? query. The user would respond to the PLATTERS? query by typing the number of RS11 disks (platters) connected to the RF11 controller.

In response to the PACK ID query at line c, the user types one to six alphanumeric characters, which become the pack identification label for the disk. RSTS/E uses this label as a system-wide logical name for the disk and internally as the password of system account [0,1].

At line d, the user specifies the pack cluster size for the system disk. Refer to Appendix C for a list of disk device sizes. The pack cluster size must be at least the device cluster size and no greater than 16. In general, large pack cluster sizes permit faster access to data stored on the disk at the expense of wasted disk space. Small pack cluster sizes permit more efficient allocation of disk storage space at the expense of frequent access to retrieval information (pointers to file data) stored in user file directories. You can improve the access speed on a disk with a small pack cluster size by clustering individual files and user file directories (UFDs) at a size greater than the pack cluster size. DIGITAL recommends the minimum cluster size for almost all installations.

At line e, the user specifies a base address for SATT.SYS, which is the storage allocation table for the disk.

The user types, at line f, one to six alphanumeric characters which become the password for the Master File Directory (MFD) account [1,1]. The MFD password should be kept secret, because irresponsible access to the MFD (or to any privileged account) can destroy system security.

At line g, the user specifies the cluster size for the MFD. With the restriction that the MFD cluster size cannot be less than the pack cluster size, the MFD cluster size can be 1, 2, 4, 8, or 16. The system manager can create approximately (108 *MFD cluster size) accounts. DIGITAL recommends that the MFD cluster size be 16, unless BASIC-PLUS and/or FORTRAN are used exclusively.

The user types SYS at line h to initialize a system disk. For a system disk, DSKINT automatically creates the library account [1,2] and prints the queries at lines i and j. At line i, the user types one to six alphanumeric characters, which become the password for account [1,2]. The user specifies 4 as the cluster size for account [1,2] at line j. The cluster size for the system library must be at least 4. You may need to specify a larger cluster size if you plan to save many of your installation's library files in account [1,2]. DIGITAL recommends that the library cluster size be 16.

The user types NO in response to the DATE LAST MODIFIED? query at line k. Therefore, the system will retain the date on which files on the disk were last accessed and not the date on which the files were last changed.

The user types Y in response to the NEW FILES FIRST? query at line l. Therefore, as files are created, their directory entries will be placed at the beginning of the directory for the account.

The user types N in response to the USE PREVIOUS BAD BLOCK INFO? query at line m. Therefore, DSKINT creates a zero-length bad block file on the disk. Had the user typed Y in response to the query, DSKINT would have used the information in the disk's current bad block file (if one was present) to create a new bad block file on the disk.

At line n, the user requests that DSKINT format the disk. At line o he requests the use of three patterns to check for bad blocks. Since he has made no errors in his responses, he types Y in answer to the query at line p.

Table 3-2
DSKINT Dialogue Questions

Question	Description of Response
DD-MMM-YY?	Type the current date in alphabetic or numeric format. Press the LINE FEED key to accept the date printed in the prompt.
HH:MM?	Type the current time in 24-hour or AM/PM format. For example, 14:53 or 2:53 PM. Press the LINE FEED key to accept the time printed in the prompt.
DISK?	Type two characters to indicate the type of disk being initialized. Acceptable entries are DC, DF, DS, DK, DL, DM, DP, DR, or DB.
UNIT?	For all disks except DC and DF. Type the physical unit number on which the disk, DECpack, or disk pack resides. Acceptable entries are 0 through 3 for DL disks and 0 through 7 for other disks. For an RK05F, use DSKINT twice, once for each half of the disk (i.e., once for each of two units).
PLATTERS(n)?	For DF and DC type disks only. The value n in the prompt is the number of platters that the initialization code found. Press the LINE FEED key to use n as the number of platters. Otherwise, type the number of platters connected to the RF11 or RC11 controller. Acceptable entries are 1 through 8 for DF disks and 1 through 4 for DC disks.
PACK ID?	Type one to six alphanumeric characters to be used when logically mounting the disk.
PACK CLUSTER SIZE?	Type the number of 256-word blocks that each cluster allocated on the disk will contain. Acceptable pack cluster sizes are 1, 2, 4, 8, or 16 for RS64, RS11, RS03, RS04, RK05, RK05F, RL01, RK06, and RK07 disks. For RP02 and RP03 disks, acceptable values are 2, 4, 8, or 16. For RM02, RM03, RP04, and RP05 disks, acceptable values are 4, 8, or 16. For RP06 disks, acceptable values are 8 or 16.
SATT.SYS BASE?	Type the logical block number (from 1 to the device size minus 1) in decimal at which to locate the file SATT.SYS on the disk. DSKINT rounds this number up to the next pack cluster boundary. Type the LINE FEED key or 0 to let DSKINT routines position the file at the first available space. Appendix C contains a table of device sizes.
MFD PASSWORD?	Type one to six alphanumeric characters, which become the password of account [1,1] on the disk.
MFD CLUSTER SIZE?	Type the decimal number of 256-word blocks that each cluster allocated to the MFD will contain. The MFD cluster size must be a power of 2 greater than or equal to the pack cluster size and less than or equal to 16. The maximum number of user accounts that can be created is approximately 108 times the MFD cluster size. This setting is permanent; you can change it only by re-initializing the disk. DIGITAL recommends that the MFD cluster size be 16.
PUB, PRI, OR SYS?	Type PUB to designate the disk as public. Type PRI to designate the disk as private. Type SYS to initialize a system disk.
CREATE LIBRARY ACCOUNT?	For PUB or PRI disks only. Type Y to create the account [1,2] on the disk. If you type N, DSKINT does not create the account and does not ask the next two questions.

Table 3-2 (Cont.)
DSKINT Dialogue Questions

Question	Description of Response
LIBRARY PASSWORD?	Type one to six alphanumeric characters, which become the password of account [1,2].
LIBRARY UFD CLUSTER SIZE?	Type the number of 256-word blocks allocated for each of the seven possible UFD clusters for the library account [1,2]. The number of files that can be stored under any account is approximately 72 times the UFD cluster size. The library UFD cluster size must be a power of 2. It cannot be less than the pack cluster size or greater than 16. DIGITAL recommends that the library UFD cluster size be 16.
DATE LAST MODIFIED?	Type Y to retain in the disk directory the date on which files on the disk were last modified. Type N or the LINE FEED key to retain the date on which files were last accessed.
NEW FILES FIRST?	Type Y to cause new files on this disk to be added at the beginning of the directory for the account in which they are created. Type N to cause new files on this disk to be appended to the end of the directory for the account in which they are created.
USE PREVIOUS BAD BLOCK INFO?	Type Y to have the new bad block file created using information from the current bad block file (if present). Type N to have DSKINT create a zero-length bad block file. If Y is typed, but there is no current bad block file, a zero-length bad block file is created.
FORMAT?	For DK, DM, DP, DR, and DB disks only. Type Y to write hardware timing and sense data on the disk. Type N to omit the formatting operation. If you type Y, DSKINT routines print messages indicating the start and end of the format pass. You must format all new disk packs and cartridges (except RL01, RK06, RK07, RM02, and RM03 disks) before using them on a RSTS/E system. You should never format a disk that contains any important data; formatting destroys the data on the disk.
PATTERNS?	To print the time required to execute each pattern for each type of disk, press the RETURN key. To specify the number of patterns in use in checking for bad blocks, type a number from one to eight. If you append an X to your response, DSKINT uses the specified number of DIGITAL's patterns and asks the next question.
YOUR PATTERN?	Asked only if the response to the last question ended with the letter X. (This capability is intended primarily for DIGITAL field service engineers.) Type an octal word between 1 and 177777, inclusive. The DSKINT option repeats the question until you have typed 8 patterns or pressed the LINE FEED key to indicate no more patterns.
PROCEED (Y OR N)?	Type Y to proceed with the disk initialization. Type N to abort the initialization and return to the OPTION: prompt. This question allows you to double-check your responses to the dialogue questions and abort the initialization if you have made any errors.

3.2.4 Initializing a Nonsystem Disk

The DSKINT option initializes, formats, and does pattern checking on nonsystem disks that will be used on the RSTS/E system. (System disk initialization is described in Section 3.2.3.) The example that follows applies only to nonsystem disks. Note that DSKINT must be run separately for each half of an RK05F.

The following example initializes an RK05 cartridge as a private disk:

```
Option: DS

14-JUN-78?
08:07 AM?

Disk? DK
Unit? 0
Pack ID? MYPACK
Pack cluster size? 1
SATT.SYS base?
MFD password? DATA
MFD cluster size? 2
PUB, PRI, or SYS? PRI
Create library account? NO
Date last modified? N
New files first? Y
Use previous bad block info? N
Format? Y
Patterns? 3
Proceed (Y or N)? Y
Starting format pass
End format pass

Pattern # 3
Pattern # 2
Pattern # 1

Option:
```

In the example, the pattern checks discovered no bad blocks. When bad blocks are found, however, DSKINT prints a summary of the block number, cluster, and hardware information (for use by DIGITAL field service personnel). The following example (for an RK06 disk) shows the summary:

```
Patterns? 2
Proceed (Y or N)? Y

Disk serial # 57402

   Cyl    Trk    Sec    Block   Cluster
    87      1      5     5769      1442

Pattern # 2

DM1 Error        RKCS1   RKWC    RKDA    RKCS2   RKDS    RKER    RKDCYL
                 100222  174502  000405  000201  100301  000200  000127
                 100222  177502  000405  000201  100301  000200  000127
 Block Cluster
  5769    1442
```

```
Pattern # 1

DM1 Error       RKCS1   RKWC    RKDA    RKCS2   RKDS    RKER    RKDCYL
                100222  174502  000405  000201  100301  000200  000127
                100222  177502  000405  000201  100301  000200  000127

 Block  Cluster
  5769     1442

Option:
```

3.2.5 Initializing a Non-File-Structured Disk

It is not necessary to use DSKINT on disks that you will use non-file structured for swapping. However, you can use the DSKINT option to perform pattern checking on these disks. Such disks do not require the RSTS/E file structure that DSKINT creates. The file structure is useless and is overwritten during timesharing operations.

During initial hardware installation or when a hardware malfunction is suspected, DSKINT can supplement the tests performed by standard diagnostic methods. DSKINT does not duplicate all the tests performed by diagnostic programs and should be used only in addition to standard hardware maintenance procedures.

The example that follows shows the use of DSKINT to run pattern checks on an RS04 fixed head disk.

```
Option: DSKINT

14-JUN-78
08:17 AM?

Disk? DS
Unit? 0
Pack ID? SWAP
Pack cluster size? 1
SATT.SYS base?
MFD password? SWPMFD
MFD cluster size? 1
PUB, PRI, or SYS? PUB
Create library account? NO
Date last modified? N
New files first? N
Use previous bad block info? N
Patterns? 4
Proceed (Y or N)? Y

Pattern # 4
Pattern # 3
Pattern # 2

DS0 Error  RSCS1   RSWC    RSBA    RSDA    RSCS2   RSDS    RSER
           144250  172066  056154  001463  040700  010600  000000

Pattern # 1

Option:
```

If DSKINT discovers bad blocks on a fixed head disk, you should not use the disk non-file-structured for swapping. Call DIGITAL field service to locate the hardware problem. You can avoid the bad blocks by using the disk for file-structured swapping space. Refer to Section 3.7.1.1 for a discussion of swapping files.

3.2.6 DSKINT Dialogue Error Messages

Table 3-3 summarizes the error messages that can appear during the DSKINT option dialogue.

Table 3-3
DSKINT Dialogue Error Messages

Message	Meaning
BLOCK NUMBER TOO BIG	The block number you typed is greater than or equal to the maximum logical block number for the disk.
DRIVE NOT READY	The initialization cannot proceed because the disk to be initialized is not on-line and ready. You can ready the drive and press the LINE FEED key to proceed or you can type CTRL/C to abort the initialization.
DSKINT NOT LEGAL ON SYSTEM DISK	You specified the disk from which the initialization code was bootstrapped. You cannot initialize this disk now because the initialization code would be destroyed.
ILLEGAL DISK NAME	The string you typed is not the name of a valid RSTS/E disk device.
ILLEGAL NUMBER, TRY AGAIN	The number you typed is not a valid octal number between 1 and 177777.
SORRY, BUT THAT DISK DOESN'T EXIST	The string you typed is a valid RSTS/E disk name, but that disk controller or the unit number does not exist on this system.

The preceding table describes only the errors that can occur during the DSKINT option dialogue. For information on the error messages that can appear during the initialization process, refer to Appendix B.

3.3 COPYING SYSTEM FILES TO DISK

The COPY option copies system files to the SYSGEN disk from account [0,1] on the distribution medium (during tailoring of the SYSGEN system) or to the target disk from account [0,1] on a system tape (during tailoring of the target system). The following are the files:

1. INIT.SYS, which is the system initialization code
2. SYSGEN.SIL (for the SYSGEN system) or the first file in [0,1] with the extension .SIL (for the target system), which is the RSTS/E monitor Save Image Library
3. RT11.RTS (for the SYSGEN system) or the first file in [0,1] with the extension .RTS (for the target system), which is the run-time system
4. ERR.ERR (for the SYSGEN system) or the first file in [0,1] with the extension .ERR (for the target system), which is the RSTS/E error message text
5. All files in [0,1] with the extension .SAV, which are stand-alone programs that can be loaded by the LOAD option

The COPY option automatically copies the files from the device that was last bootstrapped. If you are tailoring a SYSGEN system, the option copies the files from the distribution disk or tape. If you are tailoring a target system, the option copies the files from the system tape written by the batch stream.

As it attempts to transfer each file, COPY scans the output disk for a file with the same name. If it finds one, COPY issues the following prompt, substituting the filename and extension for filnam.ext.

FILE filnam.ext EXISTS:

Press the RETURN key for the following additional information:

```
The file named above already exists on the output disk.
Type 'D' to delete it and create a new file of the same name.
Type 'S' to skip this input file and continue.
Type CONTROL/C to abort the COPY operation:
```

After each filename scan, COPY creates the file on the output disk and copies the contents of the input file to it. However, COPY neither creates nor copies the file if it finds the file on the output disk and you specify 'S'. The COPY option does not generate an error if one or more of the input files is missing.

After COPY has transferred all the files, it scans the output disk to verify that account [0,1] contains a minimal set of system files (INIT.SYS, a .SIL file, a .RTS file, and a .ERR file). If one or more of the files is missing, COPY prints an error message and returns to the OPTION: prompt. If all the files are present, it bootstraps the output disk and returns to the OPTION: prompt. Therefore, the initialization code is running with a different system device after the COPY option completes.

The following is an example of the COPY option:

```
Option: COPY

14-JUN-78?
08:27 AM?

To which disk? DK
Unit? 0

Enabling only consoles, disks, and tapes.

RSTS V06C (DK0)

Option:
```

In the example, the user presses the LINE FEED key to accept the date and time printed. He then specifies the disk and unit number to which to copy the files. The COPY option copies the files, then bootstraps the output disk. When the disk has been bootstrapped, the initialization code prints the system identification message and the OPTION: prompt.

NOTE

To copy to the output disk all files that have .SIL, .RTS, and .ERR extensions, you can use the /A switch in response to the TO WHICH DISK? query. For example:

TO WHICH DISK? DK/A

Table 3-4 summarizes the error messages that can appear during the COPY option dialogue.

Table 3-4
COPY Option Dialogue Error Messages

Message	Meaning
CANNOT COPY TO THE SYSTEM DISK	You specified the current system disk, which is invalid as an output disk for the COPY option.
ILLEGAL DISK NAME	You typed an invalid disk name or specified a unit number for a DC or DF disk.
INVALID UNIT NUMBER	The disk unit number you specified does not exist on this PDP-11.
INVALID RESPONSE	Your response to the FILE filnam.ext EXISTS: prompt was not D, S, or CTRL/C.
SORRY, BUT THAT DISK DOESN'T EXIST	The disk type you specified does not exist on this PDP-11.

For information on errors that occur during the copying operation, refer to Appendix B.

3.4 CORRECTING THE SYSTEM CODE

The RSTS/E initialization code provides a method for altering RSTS/E system code as errors are found and corrections are published. DIGITAL publishes patches in the RSTS/E Release Notes (available with the release) if problems are uncovered in a new system release version after a current system release but before the new release version is available from DIGITAL's Software Distribution Center. Between releases, patches are published in the monthly software publications.

You can patch any file in account [0,1]. This account includes the initialization code (INIT.SYS) and any SIL. Patching makes permanent changes to the code on disk and has no effect on the code currently in memory. Therefore, after patching the initialization code, you must bootstrap the system disk to load the corrected initialization code into memory.

Patches take many different forms. Some are in-place patches to one or more words in one or more modules. Others require patch space in the affected areas. The RSTS/E monitor, initialization code, and run-time system always include patch space. You can patch the overlay code by using free space in overlay segments or monitor patch space. Sometimes, patches affect fixed addresses and are straightforward; usually, however, the exact octal address of a patch varies from system to system. Published patches describe in detail the procedures required to make the alterations correctly.

When you generate a new RSTS/E system, refer to the RSTS/E Release Notes for patches and patching information. Unless instructed otherwise by the RSTS/E Release Notes, you should install all required patches immediately after the SIL is placed on the SYSGEN or target system disk. This procedure is necessary because patches may affect the initialization code, which builds required file structures, creates system files, and sets up tables used during timesharing.

3.4.1 Using the PATCH Option

Use the PATCH option to perform patching operations. To invoke PATCH, type PATCH or PA. PATCH replies by asking for the name of the file to patch, a MODULE NAME (if the file is a SIL and has more than one module), a BASE ADDRESS, and an OFFSET ADDRESS.

In response to the FILE TO PATCH? query, type the name and extension of the file that requires patching. Press the LINE FEED key to patch the installed monitor SIL. Since the initialization code cannot always distinguish a SIL from other files, the published patch may append /N to the name of any file that is not a SIL.

The module name designates the SIL module to be patched. You can obtain a list of SIL modules by pressing RETURN in response to the MODULE NAME? question. The base address defines the actual locations to be patched. For example, if you are patching the PRINT USING section of BASIC-PLUS, you can enter the symbol PU as the base address. The offset address is the first location to be patched relative to the specified base. For example, a PRINT USING patch may begin at an offset of 100 octal bytes from the beginning of PRINT USING.

Responses to the BASE ADDRESS? and OFFSET ADDRESS? queries can be numbers or expressions. Valid octal numbers are 0 to 177777, and leading zeros are optional. Valid decimal numbers are 0. to 65535., and are distinguished from octal numbers by the presence of a trailing decimal point. When patching a SIL, you can substitute a global symbol name for an octal number anywhere. The load map for the module being patched is part of the SIL file. It contains that module's global symbol names and their values. A global symbol name must be one to six alphanumeric characters and must be defined in the symbol table for the current module. To refer to a global symbol in another module of the current SIL, type the symbol name followed by a commercial 'at' sign (@) and the name of the module in which the symbol is defined. For example, LOGIN@BASIC and DISK@ERR refer to the symbols LOGIN and DISK in the modules BASIC and ERR, respectively. An expression consists of one or more numbers or global symbols, separated by arithmetic operators (+, -, *, and /). Parentheses can be used to group portions of an expression.

After you specify the base and offset addresses, PATCH opens the specified locations, prints the old contents, and accepts input. Table 3-5 summarizes the possible input.

Table 3-5
Possible Input to the PATCH Option

Input	Meaning
number, symbol, or expression	Enter the number, symbol, or expression as the new contents of the current location.
LINE FEED	Advance to the next location without altering the contents of the current location.
^ (circumflex)	Return to the previous location without altering the contents of the current location.
CTRL/Z	Return to the previous question.
CTRL/C	Finish all patching and return to the OPTION: prompt.

PATCH makes the specified changes immediately after you press the RETURN key. Therefore, if you make an error, you must patch the location again to correct your mistake. To check that an entire patch is correct, use CTRL/Z to return to the OFFSET ADDRESS? query. Type the same offset, then press the LINE FEED key to examine all the patched locations. If the old contents listed for any location do not match the published patch, restore all locations to their original contents and try again to install the patch. If you have followed the published procedures correctly and the old contents do not match the published patch, consult your software support representative. The above procedure describes the PATCH option in detail. In general, however, published patches include the necessary instructions.

If you patch the initialization code, you must rebootstrap the system. Rebootstrapping loads the changed version of the initialization code into memory. To perform the bootstrap procedure, follow the instructions in the published patch and use the BOOT option, which is described in Section 3.11.

The examples in the following sections illustrate the use of PATCH.

3.4.2 Patching the Monitor – Example

The following example shows the procedure for patching the installed monitor SIL. The patch in the example is a sample only, NOT a real patch.

```
a  Option: PATCH
b  File to patch? (LF)
c  Module name? OVR
d  Base address? DLNOST
e  Offset address? 300
     Base    Offset   Old      New?
f  032000    000300   006200   ? 4737
g  032000    000302   032711   ? PATCH+10
h  032000    000304   040000   ? ^C
```

```
Option: PATCH
File to patch? (LF)
Module name? RSTS
Base address? PATCH
Offset address? 10
 Base    Offset  Old      New?
023136  000010  000000   ? 6200
023136  000012  000000   ? 32711
023136  000014  000000   ? 40000
023136  000016  000000   ? 207
023136  000020  000000   ? ^C

Option:
```

At line a, the user specifies the PATCH option and (at b) presses the LINE FEED key to patch the installed monitor SIL. He specifies the module OVR (line c) in response to the MODULE NAME? question and types the global symbol name DLN0ST to specify the base address (line d). The location to patch is offset 300 octal bytes from the base name DLN0ST, as indicated by the response at e. At lines f and g, the user types in the new values. Line g shows the use of addition in an expression. At h, the user types CTRL/C to exit from the PATCH option. The second use of the PATCH option (at i) continues the installation of this patch.

3.4.3 Patching the Initialization Code – Example

The following example shows the procedure for patching the initialization code. The patch in the example is a sample only, NOT a real patch.

```
a   Option: PATCH
b   File to patch? INIT.SYS
c   Base address? 26:117002
d   Offset address? 0
     Base    Offset  Old      New?
    117002  000000  016700   ? 4737
    117002  000002  177672   ? 104260
e   117002  000004  042705   ? ^Z
    Offset address? ^Z
    Base address? 104260
    Offset address? 0
     Base    Offset  Old      New?
    104260  000000  000000   ? 22127
    104260  000002  000000   ? 40
    104260  000004  000000   ? 17375
    104260  000006  000000   ? 105711
    104260  000010  000000   ? 261
    104260  000012  000000   ? 207
f   104260  000014  000000   ? ^Z
    Offset address? 0
     Base    Offset  Old      New?
    104260  000000  022127   ? (LF)
    104260  000002  000040   ? (LF)
g   104260  000004  017375   ? (LF)
    104260  000006  105711   ? (LF)
    104260  000010  000261   ? (LF)
h   104260  000012  000207   ? ^C

    Option:
```

At line a, the user specifies the PATCH option. He types the file name INIT.SYS at b and the base address at c. The example in Section 3.4.2 specified the base as a simple address. The base address in this example (26:117002) is the combination of an address (117002) and a relative block number (the 26th octal block) within the file INIT.SYS. After specifying the base, the user types the offset address (at d) and begins to enter the patch. Note (at lines e and f) the use of CTRL/Z to return to the previous question. After entering the patch, the user presses the LINE FEED key to examine successive locations (at g) and ensure that the patch is properly installed. At h, the user types CTRL/C to finish patching and return to the OPTION: prompt.

3.4.4 PATCH Option Error Messages

Table 3-6 summarizes the error messages that can occur during the PATCH option dialogue.

Table 3-6
PATCH Option Dialogue Error Messages

Message	Meaning
ADDRESS ABOVE MODULE BOUNDS	The address you specified is above the bounds of the module.
ADDRESS BELOW MODULE BOUNDS	The address you specified is below the bounds of the module.
BLOCK OFFSET BEYOND EOF	The block offset address you typed is greater than or equal to the number of blocks in the file.
FILE NOT FOUND	The initialization code did not find the file you specified in account [0,1] on the system disk.
ILLEGAL FILE NAME	The filename you typed is in an incorrect format. The name must be no more than six characters long; the extension must be no more than three characters long. The filename must be alphanumeric and can contain no embedded spaces. Typing the LINE FEED key in response is illegal if no monitor SIL is installed.
INVALID MODULE NAME	The module name you typed is in an incorrect format. The name must be one to six alphanumeric characters.
INVALID CHARACTER	The expression line contains an illegal character.
INVALID EXPRESSION	The expression contains an illegal symbol name or an invalid operator. Symbol names must be one to six alphanumeric characters. Valid operators are +, -, *, and /.
INVALID SIL FORMAT	The file you specified does not contain a valid SIL directory. If the file is not a SIL, append the /N switch to the filename.
MODULE NOT FOUND IN SIL	The module you specified is not in the SIL. Press the RETURN key in response to the MODULE NAME query for a directory of SIL modules.
SYMBOL NOT FOUND IN STB	A symbol you typed is not in the symbol table for the module.

3.5 SPECIFYING THE HARDWARE CONFIGURATION

With the HARDWR option, you can perform the functions summarized in Table 3-7. The option operates whether or not you have installed a monitor SIL because the settings it affects are written on the system disk, not in the monitor SIL. Thus, when you change system devices you must use the HARDWR option again. If you only change monitors, you need not use the option.

The HARDWR option includes a set of suboptions, which are summarized in Table 3-7.

Table 3-7
HARDWR Suboptions

Suboption	Function
LIST	List the system hardware configuration
DISABLE	Disable a device controller
ENABLE	Enable a device controller
CSR	Declare a nonstandard controller address
VECTOR	Declare a nonstandard vector assignment
RESET	Set all vectors and addresses to the standard and enable all devices
DM	Declare DM11-BB and DH11 associations
HERTZ	Specify AC line frequency of system
SWITCH	Specify CPU Switch Register characteristics

The LIST suboption lists the current configuration and all requested changes.

The ENABLE and DISABLE suboptions allow you to enable or disable a device controller, not just a single unit. By disabling the RK611 or RK711 (RM) controller, for example, you disable all RK06 and RK07 disk units. To disable or enable devices on a unit-by-unit basis, see Section 3.9.

The CSR suboption enables you to set nonstandard values for a device controller's CSR set. The CSR set is the unique set of addresses on the UNIBUS to which a device controller responds. When the initialization code is bootstrapped, it ascertains the number of each type of controller on the system by applying standard rules for finding CSR sets. (See Appendix F.) DIGITAL Field Service representatives follow these rules when they install systems; thus, you probably will not need to use the CSR suboption.

With the VECTOR suboption, you can specify a non-standard vector for any device controller. A controller vector assignment directs the processor to the proper routines when that controller requests an interrupt. When you bootstrap the system, the initialization code ascertains each device controller's vector assignment by forcing each device to interrupt. If a device does not respond, the initialization code disables it and prints a message at the console terminal. If more than one device has the same vector assignment, the initialization code disables all except the first one it finds. The VECTOR suboption should not be used except for non-DEC hardware and for card readers with non-standard vectors.

The RESET suboption returns all CSR sets and vector assignments to the standards, enables all devices, and associates each DM11-BB unit with the DH11 multiplexer that has the same unit number. If you have no HARDWR changes, you can use RESET to cause INIT. SYS to reboot the system device and execute a full configuration scan.

The DM suboption allows you to specify the DM11-BB modem control multiplexer that is associated with each DH11 terminal multiplexer.

The HERTZ suboption allows you to specify the AC line frequency of your system, and the SWITCH suboption allows you to specify the characteristics of your systems CPU Switch Register.

To use the HARDWR option, type HARDWR or HA. In response, the option requests a suboption name. Type the name of a suboption from Table 3-7. You need type only the first two characters. HARDWR then performs the dialogue (if any) for the suboption you selected. If you make any changes to the controller characteristics, HARDWR does not effect them immediately, but instead applies them when it bootstraps the system disk (when you exit from the HARDWR option). Thus, you can examine and verify the changes before the option applies them. If you have made any errors, you can correct them before HARDWR applies them.

After you have made (and verified) the changes you need, type EXIT or LINE FEED in response to the HARDWR SUBOPTION? query. HARDWR effects the changes, bootstraps the system disk, and prints one of the following messages:

Message	Meaning
OPTION:	You have made no HARDWR changes; and the initialization code has previously done a complete scan of the system's hardware configuration.
nn CHANGES PENDING REBOOTING . . .	Same as above, except you have made nn changes, which are now applied by the initialization code. A complete hardware scan is done as the system reboots.
ENABLING ALL DEVICES. nn CHANGES PENDING REBOOTING . . .	The initialization code had previously completed only a partial scan of the system's hardware configuration. You have made nn changes (or have used the RESET suboption). The changes are now applied by the initialization code, and a complete hardware scan is done as the system reboots.

If you have not yet used the HARDWR option and have not used the INSTALL option to install a monitor on the system disk, the complete hardware configuration is not available. That is, the initialization code (INIT. SYS) has not yet scanned the entire hardware configuration. (This prevents INIT. SYS from incorrectly treating devices at nonstandard addresses.)

You can declare any nonstandard device characteristics at this time by using the HARDWR suboptions you need. You can enter and verify changes, then exit from the HARDWR option. HARDWR will bootstrap the system disk; INIT. SYS will then scan the entire hardware configuration, applying the changes you have entered.

The INIT. SYS message

ENABLING ONLY CONSOLE, DISKS, AND TAPES.

when you bootstrap INIT.SYS indicates that the initialization code has done only a partial scan of your system's configuration. Note that the message occurs, for example, when the RSTS/E distribution medium is bootstrapped.

If you have no changes to device characteristics you can cause INIT. SYS to scan the entire hardware configuration by using the HARDWR suboption RESET, or by using the INSTALL option to install a monitor SIL. Either of these options will reboot the system disk (if necessary) to cause INIT. SYS to do a complete hardware scan.

To exit from the HARDWR option without applying any changes, type CTRL/C. CTRL/C returns to the OPTION: query.

Queries in the DISABLE, ENABLE, CSR, and VECTOR suboptions request the name of a controller. To get a list of valid controller names, type a question mark (?) in response to the query. The suboption responds with the following list:

```
Name  Max no  Description

TT      1     Console terminal
RC      1     RC11 fixed head disk
RF      1     RF11 fixed head disk
RS      1     RS03/RS04 fixed head disk
RK      1     RK05/RK05F disk
RL      1     RL01 disk
RM      1     RK06/RK07 disk
RP      1     RP02/RP03 disk
RB      1     RP04/RP05/RP06 disk
RR      1     RM02/RM03 disk
TM      1     TU10/TS03 magtape
TU      1     TU16/TU45 magtape
TC      1     TC11 DECtape
PR      8     Paper tape reader
PP      8     Paper tape punch
LP      8     Line printer
RX      4     RX11 floppy disk
CR      8     CR11/CM11 card reader
CD      8     CD11 card reader
KL     16     KL11/DL11A/DL11B single line interface
DL     31     DL11C/DL11D single line interface
DE     31     DL11E single line interface
DP     32     DP11 synchronous line interface
DC     32     DC11 single line modem interface
KG      8     KG11 CRC arithmetic unit
DM     16     DM11-BB modem control for DH11
DJ     16     DJ11 16 line multiplexer
DH     16     DH11 16 line multiplexer
DU     16     DU11 single line synchronous interface
D1     16     DUP11 single line synchronous interface
XM     16     DMC11 interprocessor link
DZ      8     DZ11 8 line multiplexer
```

The first column contains the controller names. The second column, Max no, is the maximum number of each type of controller that can be connected to a PDP-11. The final column describes the controller.

Your reply to a request for a controller name should be a 2-character controller name followed by the number of the controller you plan to change. Controllers, like device units, are numbered from 0 to 1 less than the maximum possible number of controllers. You can omit a controller number of 0 if only one such controller is possible. For example, RK and RK0 are equivalent because a PDP-11 can have only one RK05 controller. On the other hand, LP and LP0 are not equivalent. LP0 designates line printer controller number 0; LP is invalid because more than one line printer controller can be on the system.

To exit from a suboption without specifying a controller name, type CTRL/Z in response to the query.

Controller characteristics set by the HARDWR option remain with the disk device rather than with the RSTS/E monitor. Therefore, when you install a different monitor on the same system disk, you need not reset the device controller characteristics. If you create and bootstrap a new system disk, however, the initialization code sets all

controller characteristics to the standards and reverts to doing only a partial configuration scan. You will then need to use the HARDWR option to set nonstandard characteristics if necessary.

3.5.1 Listing the Hardware Configuration

The LIST suboption lists the current hardware configuration table, including all changes that HARDWR will apply when you exit from the option. The following is a sample listing:

```
          HARDWR suboption? LI

          1 change pending.

          Name   Address  Vector   Comments
line a    TT:     177560     060
          RS:     172040     204   Units: 0(RS04)
          RK:     177400     220   RK05F units: none
          RB:     176700     254   Units: 0
          TU:     172440     224
          TC:     177340     214
          LP0:    177514     200
line c   (LP0:    System             Disabled)
          DL0:    175610     310
          DL1:    175620     320
          DL2:    175630     330
          DL3:    175640     340
line b    KG0:                       Disabled
          DM0:    170500     474   DH0
          DH0:   *160100    *500
          DH1:   *160120    *510
          DU0:    160060     400

          KW11L   177546     100
          KW11P   172540     104
          SR      177570
          DR      177570

          Hertz = 60.

          Other: FPU, SL

          HARDWR suboption?
```

The top line lists the number of changes that HARDWR will enact (changes that are currently pending) when you exit from the option. If no changes are pending, the LIST suboption omits this line.

Next is the table itself. It contains one line for each device controller that actually exists on the system. (See line a.) The table also contains a line for controllers that are currently either disabled or nonexistent. This type of line is shown at b.

The table contains an additional line (in parentheses) at c for each controller that has changes pending. This line is present whether or not the controller has a listing line like that at a. Thus, if you declare nonstandard characteristics for a controller that does not yet exist on the system, HARDWR prints a parenthetical change line noting the changes.

Each line is divided into four columns. The first column contains the name and number of the device controller. The second column for a line like that at a includes the address of the controller's CSR set. The third column contains the controller's vector address. (If the device has two vectors, HARDWR prints the lower address.) An asterisk (*) precedes a CSR or vector address that is nonstandard.

In a parenthetical change line, the Address column contains either a nonstandard address or the notation SYSTEM. The notation SYSTEM means that the initialization code will find the CSR set according to the standard fixed and floating address rules when it bootstraps the system disk. (See Appendix F for a discussion of fixed and floating address rules.) The third column in a change line is blank or contains a nonstandard vector address that you specified.

The fourth column, for any line, supplies information about the controller. Table 3-8 summarizes the comments that may be in the listing for each controller.

Following the device table there are several lines of information. The information reported will vary with the system configuration and the changes (if any) you have made to the configuration.

The information reported is:

Line			Meaning
KW11-L	177546	100	If system has a KW11-L clock, its address and vector are reported
KW11-P	172540	104	If system has a KW11-P clock, its address and vector are reported.
SR	177570	[VOLATILE / DISABLED]	If the CPU has a Switch Register, its address is reported. If you have used the SWITCH suboption to specify Switch Register VOLATILE or DISABLED, that choice is reported.
SR		[VOLATILE / DISABLED]	The CPU does not have a Switch Register, but you have used SWITCH suboption to ENABLE or DISABLE it.
(SR		[DISABLED / ENABLED / VOLATILE])	There is a pending change from SWITCH suboption.
DR	177570		If the CPU has a Display Register, its address is reported.
HERTZ = [50 / 60]			The system's AC line frequency is always reported.
(HERTZ = [50 / 60])			There is a pending change to the system's AC line frequency.
FPU			The CPU has the Floating Point Processor option.
FIS			The CPU has the Floating Instruction Set option.
SL			The CPU has a stack limit register
MED			The CPU has the Maintenance Examine/Deposit instruction.

Line	Meaning
CACHE	The CPU has main memory cache.
CACHE w/ADDRESS	The CPU retains address information upon a cache memory fault.
SYSTEM ID = nnnnnn	The contents of the CPU identification register are reported, if the register exists.

Table 3-8
Possible Comments in the Configuration Listing

Device	Comment	Meaning
ALL	Disabled	Device is (or will be) disabled.
ALL	Not Found	Device has a nonstandard CSR set that did not respond when you last bootstrapped the system.
RC, RF	n platters	n is the number of disk platters present.
RS	units: m . . . t	m through t are unit numbers of drives that exist on the controller (8 are possible). In parentheses after each unit number is the disk type. Following the disk type is IL, if that unit interleaves sectors.
RP	RP03 units: m . . . t	m through t are unit numbers of RP03 disks. (Note that 8 units are possible.) Unit numbers of RP02 drives are not listed.
RL	units: m(RL01) . . p(RL01)	m through p are unit numbers of drives that exist on the controller (4 are possible). In parentheses after each unit number is the disk type.
RM	units: m(RK07) . . . t(RK07)	m through t are unit numbers of drives that exist on the controller (8 are possible). In parentheses after each unit number is the disk type.
RB, RR	units: m(RM02) . . . t(RM02)	m through t are unit numbers of drives that exist on the controller (8 are possible). In parentheses after each unit number is the disk type. Following the disk type is DP, if that unit is a dual-ported disk.
DM	DHn	DH11 controller number n is logically associated with this DM11-BB unit.
	No DH11	No DH11 controller is logically associated with this DM11-BB unit.
RK	RK05F units: n/m	n and m are the even and odd unit numbers of the RK05F drive.
	RK05F units: none	No RK05F units are on the system.

3.5.2 Disabling a Device Controller

The DISABLE suboption allows you to make a device controller unavailable for timesharing use. This suboption has two possible uses: (1) to disable a controller that needs repairs, and (2) to disable an erroneously detected controller. In certain circumstances, the initialization code interprets a nonstandard device as a normal PDP-11 device, and therefore enables the standard PDP-11 device. With the DISABLE suboption, you can disable the nonexistent PDP-11 device.

The following is a sample use of the DISABLE suboption:

```
HARDWR suboption? DIS

  Controller to disable? DM0

HARDWR suboption? LIST

2 changes pending.

Name   Address  Vector  Comments
TT:     177560    060
RF:     177460    204   2 platters
RK:     177400    220   RK05F units: none
RP:     176700    254   RP03 units: 0 1
TM:     172520    224
TC:     177340    214
PR0:    177550    070
PP0:    177554    074
LP0:    177514    200
DP0:                    Disabled
(DP0:   System)
DM0:    170500    300   DH0
(DM0:   System          Disabled)
DH0:    160020    310

KW11L   177546    100
KW11P   172540    104
SR      177570
DR      177570

Hertz = 60.

Other: FPU, SL

HARDWR suboption?
```

In the example, the user specifies DM0 as the device controller to disable. The initialization code executes the DISABLE suboption and returns to the HARDWR SUBOPTION? query. The user then uses the LIST suboption to verify that DM0 will be disabled when he exits from the HARDWR option.

3.5.3 Enabling a Controller

Use the ENABLE suboption to reenable a disabled controller. The following example illustrates the use of the ENABLE suboption:

```
HARDWR suboption? ENABLE

  Controller to enable? DP0

HARDWR suboption? LIST

1 change pending.

Name   Address  Vector  Comments
TT:     177560    060
RF:     177460    204   2 platters
RK:     177400    220   RK05F units: none
RP:     176700    254   RP03 units: 0 1
TM:     172520    224
TC:     177340    214
PR0:    177550    070
PP0:    177554    074
LP0:    177514    200
DP0:                    Disabled
(DP0:   System)
DM0:    170500    300   DH0
DH0:    160020    310

KW11L   177546    100
KW11P   172540    104
SR      177570
DR      177570

Hertz = 60.

Other: FPU, SL

HARDWR suboption?
```

The user in the example enables the DP0 controller. When the initialization code returns to the HARDWR SUBOPTION? query, the user lists the hardware configuration to verify the change.

3.5.4 Declaring a Nonstandard Controller Address

The CSR suboption allows you to specify a nonstandard address for a device controller's CSR set. Use the CSR suboption when a controller is installed at the wrong place or when you need to rearrange device controller assignments.

To invoke the CSR suboption, type CSR. The suboption responds by requesting a controller name and address. In response, type the controller name as described in Section 3.5. When the CSR suboption prints the query, type the address of the lowest register in the controller's CSR set. The address must be an even 6-digit octal number greater than 160000. To remove a nonstandard address and revert to the standard, type RE or REMOVE instead of a response.

To return to the HARDWR SUBOPTION? query without specifying a new address, type CTRL/Z.

The following example shows the use of the CSR suboption:

```
HARDWR suboption? CSR

  Controller with non-standard address? DH0
  New controller address? 160100

HARDWR suboption? LI

1 change pending.

Name   Address  Vector  Comments
TT:     177560    060
RS:     172040    204   Units: 0(RS04)
RK:     177400    220   RK05F units: none
RB:     176700    254   Units: 0
TU:     172440    224
TC:     177340    214
LP0:    177514    200
DL0:    175610    310
DL1:    175620    320
DL2:    175630    330
DL3:    175640    340
KG0:    170700
DM0:    170500    474   DH0
(DH0:  *160100)
DU0:    160060    400

KW11L   177546    100
KW11P   172540    104
SR      177570
DR      177570

Hertz = 60.

Other: FPU, SL

HARDWR suboption?
```

In this example, the user requests the CSR suboption. He types DH0 as the controller and specifies a new address of 160100. He then uses the LIST suboption to verify the change.

3.5.5 Declaring a Nonstandard Vector Address

The VECTOR suboption permits you to specify a nonstandard vector address for a device controller. Use VECTOR if the initialization code incorrectly determines a controller's vector address or if the hardware configuration includes more than one card reader.

If you have a nonstandard device controller, DIGITAL strongly recommends that you use *only* the CSR suboption. This tells INIT. SYS to find the device at its nonstandard UNIBUS address, but still lets INIT. SYS determine the device's vector. If the device is functioning properly, INIT. SYS will find the device's nonstandard vector. The only devices which INIT. SYS cannot determine vectors are card readers. If a card reader has a nonstandard vector, you must use the VECTOR suboption.

You must be careful when assigning nonstandard vectors to devices. INIT. SYS checks all device vectors (assigned through the VECTOR suboption or automatically determined) against a table of reserved locations. INIT also determines if a vector location is used by more than one device. If it finds any conflict, INIT. SYS prints the message:

Vector for Device XXn : (vvv) already in use – device disabled.

where vvv is the octal address of the erring vector.

The RSTS/E reserved locations, which may not be used as device vectors, are:

Address	RSTS/E Usage
0-2	Detection of jumps to 0 and traps to 0
4-36	System trap vectors
40-56	Reload start addresses, failure HALT
100-102	KW11-L line frequency clock vector
104-106	KW11-P crystal clock vector
110-112	Jump to 0 handling
114-116	Memory parity trap vector
144-146	Crash dump handling
234-236	Statistics handling
240-242	PIRQ trap vector
244-246	FPP or FIS exception trap vector
250-252	Memory Management Unit trap vector

VECTOR requests the device controller's name and its new vector address. Type the name as described in Section 3.5. The vector address is the 3-digit octal address of the lowest vector for the device controller. The address must be even. To remove a nonstandard vector address and return to the standard, type RE or REMOVE. Type CTRL/Z to return to the HARDWR SUBOPTION? question without specifying a new vector address.

The following is an example of the VECTOR suboption:

```
HARDWR suboption? VEC

  Controller with non-standard vector? DH0
  New vector address? 500

HARDWR suboption? LI

1 change pending.

Name   Address  Vector   Comments
TT:     177560    060
RS:     172040    204    Units: 0(RS04)
RK:     177400    220    RK05F units: none
RB:     176700    254    Units: 0
TU:     172440    224
TC:     177340    214
LP0:    177514    200
DL0:    175610    310
DL1:    175620    320
```

```
 DL2:    175630    330
 DL3:    175640    340
 KG0:    170700
 DM0:    170500    474    DH0
(DH0:   *160100   *500)
 DU0:    160060    400

 HARDWR suboption?
```

The user in this example has already set a nonstandard controller address for DH0. He now sets a nonstandard vector address for DH0. In response to the NEW VECTOR ADDRESS? query, he types 500. He then lists the configuration to verify the vector address.

3.5.6 Resetting the Configuration

The RESET suboption sets all device characteristics to the standards. It removes all nonstandard CSR sets and vector addresses and enables all devices. The following example shows the effects of the RESET suboption.

```
 HARDWR suboption? LIST

 3 changes pending.

 Name   Address Vector  Comments
 TT:     177560   060
 RF:     177460   204   2 platters
 RK:     177400   220   RK05F units: none
 RP:     176700   254   RP03 units: 0 1
 TM:     172520   224
(TM:     System  *226)
 TC:     177340   214
 PR0:    177550   070
(PR0:   *160002)
 PP0:    177554   074
 LP0:    177514   200
 DP0:                   Disabled
(DP0:    System)
 DM0:    170500   300   DH0
 DH0:    160020   310

 HARDWR suboption? RESET

 HARDWR suboption? LIST

 1 change pending.

 Name   Address Vector  Comments
 TT:     177560   060
 RF:     177460   204   2 platters
 RK:     177400   220   RK05F units: none
 RP:     176700   254   RP03 units: 0 1
 TM:     172520   224
 TC:     177340   214
 PR0:    177550   070
 PP0:    177554   074
```

```
LP0:    177514    200
DP0:                        Disabled
(DP0:   System)
DM0:    170500    300       DH0
DH0:    160020    310

HARDWR suboption?
```

For the purposes of this example, the LIST suboption is used before and after the RESET suboption to show the effects of resetting the configuration. The first listing shows that two devices (TM: and PR0:) will have nonstandard addresses and vectors set when the user exits from the HARDWR option. A third device, DP0:, is disabled and will be enabled with a standard address and vector. After the use of the RESET suboption, the listing shows that TM: and PR0: have returned to standard characteristics. Note that the listing for DP0: did not change because DP0: was already designated to be enabled with standard characteristics.

3.5.7 Declaring DM11-BB and DH11 Associations

The DM suboption allows you to specify the DM11-BB modem control multiplexer that is associated with each DH11 terminal interface multiplexer. The DH11 terminal interface multiplexer has 16 lines (which are numbered from 0 to 15), any number of which can be modem lines. A PDP-11 can have up to 16 DH11s. The DM11-BB modem control multiplexer also has 16 lines. Each line can answer one modem line on a DH11. A PDP-11 can have only as many DM11-BBs as DH11s.

DM11-BB modem control lines and DH11 modem lines must meet the following conditions under RSTS/E:

1. A DM11-BB can answer modem lines on only one DH11.
2. A DH11 can be associated with only one DM11-BB.
3. The line numbers of the DH11 modem line and its associated DM11-BB line must be the same. For example, a DM11-BB line number 4 can control only a DH11 modem line number 4.

The RSTS/E software cannot ascertain the DM11-BB unit that is associated with a DH11. Therefore, RSTS/E assumes that DM11-BB unit number 0 controls modem lines on DH11 unit number 0, and so forth. On most systems, the unit numbers are equal. RSTS/E does not, however, require that DH11 and DM11-BB unit numbers be equal. Thus, DM11-BB unit number 2 can control modem lines on DH11 unit number 4, as long as the preceding rules are followed.

The DM suboption allows you to specify the DM11-BB unit that is associated with each DH11 on the system. The suboption requests the DM11-BB unit number in the following prompt:

```
DH FOR DMn (xxx)?
```

In response, type the number of the DH11 unit with which DM11-BB unit number n is associated or press the LINE FEED key to accept the current setting, which appears in parentheses. If no DH11 is currently associated with the DM11-BB, a question mark (?) appears in parentheses. If DM11-BB unit n is not on the system, the notation NX (for nonexistent) appears in parentheses. HARDWR requests DH11 unit numbers for all 16 possible DM11-BB units whether or not the system includes 16 units. Therefore, you can logically associate a DH11 unit with a DM11-BB that is not yet on the system, but is expected in the future. You need not specify associations for nonexistent DM11-BBs; you can type CTRL/Z at any time to return to the HARDWR SUBOPTION? query. Note, however, that CTRL/Z causes the system to make no associations for the remaining DM11-BB units, and cancels the assumption that DHn is associated with DMn.

The following is an example of DM:

```
HARDWR suboption? DM
  DH for DM0 (0)? LF
  DH for DM1 (1, NX)? ^Z

HARDWR suboption?
```

In the example, the user associates DH0 with DM0. He makes no more associations because the system includes only 1 DH11 and 1 DM11-BB.

3.5.7.1 Specifying AC Line Frequency – The HERTZ suboption allows you to specify the correct AC line frequency of your system. Since the AC line frequency is the basis for all system timing, you will need to use the HERTZ suboption if the LIST suboption shows an incorrect line frequency.

To use the HERTZ suboption, type HERTZ in response to the HARDWR SUBOPTION? query. The prompt returned is:

NEW AC LINE HERTZ?

Type 50 if your AC line frequency is 50 Hz;
Type 60 if your AC line frequency is 60 Hz.

3.5.7.2 Specifying CPU Switch Register Characteristics – The SWITCH suboption allows you to specify the characteristics of your CPU's Switch Register. You define the characteristics of your CPU's Switch Register by typing SWITCH in response to the HARDWR SUBOPTION? query, then typing ENABLE, DISABLE, or VOLATILE in response to the following query:

SWITCH REGISTER?

The SWITCH suboption categories are defined in Table 3-8.A. The system uses the characteristics you specify to determine procedures for recovery after a power failure or other types of system crashes. For related information, refer to the RSTS/E System Manager's Guide.

Table 3-8.A
SWITCH Suboption Responses

Response	Meaning
ENABLE	Your CPU Switch Register has 2-position toggle switches.
DISABLE	Your CPU has no Switch Register, or you wish to prevent the Switch Register control of: a) Automatic Restart after a system crash. b) The optional Monitor Statistics Gathering Package.
VOLATILE	Your CPU Switch Register is volatile; that is it loses its contents upon a power failure. If RSTS/E encounters a power failure, it will ignore the Switch Register and will always reboot and perform on automatic restart. Note that a volatile Switch Register does control restarts after other types of system crashes.

3.5.8 HARDWR Option Error Messages

Table 3-9 summarizes the error messages that can occur during the dialogue of the HARDWR option.

Table 3-9
HARDWR Option Error Messages

Message	Suboption	Meaning
ADDRESS MUST BE AN EVEN OCTAL NUMBER GREATER THAN 160000.	CSR	You specified an invalid address. Type an address that meets the requirements.
CANNOT DISABLE CONSOLE TERMINAL	DISABLE	You tried to disable the console terminal.
CONTROLLER ALREADY DISABLED	DISABLE	You tried to disable a disabled controller.
CONTROLLER NOT DISABLED	ENABLE	You tried to enable an enabled controller.
CONTROLLER NUMBER MISSING	DISABLE, ENABLE, CSR, VECTOR	You did not specify a controller number for a device that has multiple controllers.
CONTROLLER NUMBER MUST BE LESS THAN nn	DISABLE, ENABLE, CSR, VECTOR	The controller number you typed is larger than the maximum of nn.
DH11 ALREADY ASSIGNED TO A DM11-BB	DM	The DH11 unit you specified is already assigned to a DM11-BB.
INVALID CONTROLLER NAME	DISABLE, ENABLE, CSR, VECTOR	The first two characters you typed did not name a valid device controller. Type ? to obtain a list of valid controller names and try again.
INVALID CONTROLLER NUMBER	DISABLE, ENABLE, CSR, VECTOR	The controller number you typed is not an integer. Type the number in the correct format.
INVALID RESPONSE	DM	The unit number you specified is not a decimal number from 0 to 15.
VECTOR MUST BE AN EVEN OCTAL NUMBER LESS THAN 1000.	VECTOR	You specified an invalid address. Type an address that meets the requirements.

3.6 INSTALLING A MONITOR

Use the INSTALL option to designate the monitor SIL that you will use for timesharing. You can use INSTALL to change to a different monitor any time the initialization code is running. Therefore, you can retain more than one monitor on one system disk. After installing a newly generated monitor, you must use the DEFAULT option to set defaults for that monitor. The monitor that you install in this step is the default monitor for all operations until you use the INSTALL option again to install another monitor SIL. When you are generating a SYSGEN system, the name of the monitor you should install is SYSGEN. When you are generating a target system, the monitor has the name you specified during the configuration questions. An example of the use of the INSTALL option follows:

If you are using the INSTALL option for the first time on the current system disk and the initialization code has not yet completely scanned the hardware configuration, the INSTALL option will reboot the system disk and make a complete scan of the hardware configuration. A sample dialogue of this situation is:

```
Option: INSTALL

  SIL? SYSGEN

  REBOOTING . . .

RSTS V06C (DK1)

Option:
```

If the initialization code has already done a complete scan of the hardware configuration, the INSTALL option does not bootstrap the system disk. A sample dialogue of this situation is:

```
Option: INSTALL

  SIL? RSTS

Option:
```

Thus, the INSTALL option prompts you for the name of the monitor SIL to install, performs consistency checks on the specified SIL, and bootstraps the system disk (when necessary). Execution of the INSTALL option takes 30-40 seconds. Table 3-10 contains the error messages that can appear when you respond to the prompt.

Table 3-10
INSTALL Option Dialogue Error Messages

Message	Meaning
FILE NOT FOUND	The installation code did not find the file that you specified on the system disk in account [0,1].
ILLEGAL FILE NAME	The file name you typed is not one to six alphanumeric characters.
INVALID SIL FORMAT	The file you specified does not have a valid SIL index block.

After you type a valid response, the option ascertains that the SIL you named contains all the necessary modules. If a module is missing or in an incorrect format, the INSTALL option prints an error message and returns to the OPTION: prompt. These error messages are explained in Appendix B.

If a monitor SIL file is already installed, the INSTALL option turns off certain bits (in the [0,1] directory entry for that file) so that you can delete the monitor file (and its default RTS and ERR files, if any). Next, for both a change of monitor and an entirely new system, the option turns on the proper bits to install the monitor SIL and records its name for use by the initialization code. Finally, the option records any defaults that are already set for the newly installed monitor. The installation is then complete.

3.7 CHANGING SYSTEM FILE ALLOCATION

You can 1) list file status, 2) change system file allocation, 3) create and delete files in account [0,1], and 4) examine and update the bad block file with the REFRESH option. REFRESH operates only on disks that have been initialized with the DSKINT option (see Section 3.2). The REFRESH option also includes a CLEAN facility, which rebuilds a disk's storage allocation table (SATT.SYS) and checks the consistency of directories.

If you are generating the first RSTS/E system on the current system disk, you must use REFRESH to create the required swapping file SWAP.SYS. REFRESH also creates additional swapping files, CRASH.SYS, OVR.SYS, ERR.SYS, and BUFF.SYS (which is required if the system will support DECtape). It allows you to position these files at specific places on a disk. File positioning and creation (except SWAP.SYS) are optional operations that can increase system speed and efficiency.

Once you have generated a system, use the REFRESH option when system files need changes. For example, REFRESH permits you to add bad blocks to the bad block file on any disk. If you discover bad blocks, use REFRESH to allocate them to the bad block file.

REFRESH can also allocate file space on auxiliary disks. For example, you can use REFRESH to allocate swapping space on an auxiliary disk (usually a fixed head disk). The REFRESH option can also allocate OVR.SYS and ERR.SYS files on auxiliary disks.

3.7.1 Planning System Files

Before you use the REFRESH option, you should plan which files to include in the system, how large to make them, and where to place them. REFRESH allows you to create the following files:

- Swapping files - SWAP.SYS, SWAP0.SYS, SWAP1.SYS, SWAP3.SYS (SWAP2.SYS does not exist.)
- OVR.SYS
- ERR.SYS
- BUFF.SYS
- CRASH.SYS

If the SYSGEN and target systems will be on the same (moving head) disk[1], you can allocate all system files that you will need later for the target system while you are tailoring the SYSGEN system. For example, you can allocate a SWAP.SYS file on the system disk at the size needed for the target system instead of the minimal size file that the SYSGEN system requires. If you plan to use a fixed head disk for swapping files, the overlay code, and error message file, you can also REFRESH it while you are tailoring the SYSGEN system. If you allocate the files for the target system when you tailor the SYSGEN system, you need not allocate them again after you install the target monitor. You should use the REFRESH option after installing the target monitor to list the file status table (Section 3.7.3) and ensure that the files are correctly allocated. Note that you need not allocate the target system files when you tailor the SYSGEN system; you can allocate them after you install the target monitor if you prefer.

If the SYSGEN and target systems will be on different disks (or if the target system will overwrite the SYSGEN system on a fixed head disk), you should not allocate target system files while tailoring the SYSGEN system. When you use REFRESH in tailoring the SYSGEN system, create only the minimal files necessary for system generation -- SWAP.SYS (at 208 blocks for a 48K word system and 224 blocks for all other systems) and BUFF.SYS (which is required if you need to use DECtape under the SYSGEN system). You can allocate target system files later when you tailor the target system (described in Chapter 5).

[1] DIGITAL recommends this method only for large, moving head disks of the DM, DP, DR, or DB type.

3.7.1.1 Planning the Swapping Files – The most important and time-consuming of the planning processes involves planning the swapping files. You must answer the following three questions to properly plan the swapping files:

1. How many swapping files does this system need?
2. Where should the swapping files be placed?
3. How large should each swapping file be?

The cardinal rule for planning swapping files is to anticipate future growth. If you suspect that the system will someday require a larger swap maximum or job maximum than it currently requires, you should allocate enough swapping space to serve your future needs. You should try to reserve this space now because swapping files require contiguous space on a disk. Although you can create contiguous swapping files during timesharing (with the contiguous mode bit in an OPEN statement), DIGITAL does not recommend this procedure. Once many files have been allocated on a disk, space on that disk becomes fragmented. This fragmentation may cause difficulty in allocating contiguous swapping files of sufficient length. Furthermore, if you allocate extra contiguous swapping space, but expected growth does not occur, you can simply release the space for other use.

RSTS/E can use swapping space in one to four swapping slots, numbered from 0 to 3. Swap slot 2 is permanently assigned to the file SWAP.SYS on the system disk. The other swapping slots (0, 1, and 3) can be associated with swapping files or non-file-structured disks. You can specify these associations on-line by using the UTILTY program or the INIT.BAC system program. When you associate swapping files with swapping slots, DIGITAL recommends that you use SWAP0.SYS for swap slot 0, SWAP1.SYS for swap slot 1, and SWAP3.SYS for swap slot 3. This manual follows that naming convention.

In allocating swapping space, you should consider the way in which the system is used and the number of event-driven jobs on the system. (Event-driven jobs are not run unless a particular event occurs. Events that cause these jobs to be run are the end of a SLEEP or hibernation state, and the reception of a message.)

The system scans the swap slots whenever it needs to swap a job out of memory. The system places event-driven jobs in the first swap slot with available space that it finds during a "bottom up" scan (from swap slot 3 to swap slot 0). Since these jobs do not require frequent swapping, they can be swapped onto a moving head disk without noticeably degrading performance. The system performs a "top down" scan (swap slot 0 to swap slot 3) when it swaps out a highly interactive job (one requiring frequent processor intervention). Whenever possible, highly interactive jobs should be swapped to the fastest area available. Figure 3-1 illustrates the swap slot scanning procedures.

You should also consider the system's disk configuration. If the system has only one disk, you need only create the one required swapping file, SWAP.SYS, on that disk. The file should be at least large enough to hold a number of jobs equal to the default job maximum.

For a system with more than one disk, planning swapping files is more complicated. You need to choose the disk or disks on which to place the swapping files and calculate the size of each file.

First, consider a system with both moving head and fixed head disks. Assume that the system disk is a moving head device. Unless you need the speed of access on the fixed head disk for other files (such as a frequently accessed database index), you should place all swapping files (except SWAP.SYS, which must be on the system disk) on a fixed head disk. If you can spare an entire fixed head disk, you can use it non-file-structured as a single swapping unit. To do so, you should first use the DSKINT option to check the disk for bad blocks. If the disk contains no bad blocks, you need not use REFRESH on it; you can simply use INIT.BAC at start-up time to install it as a swapping unit. (Refer to the RSTS/E System Manager's Guide for a discussion of INIT.BAC.) Once you install it, RSTS/E can use the disk only as a swapping unit. Remember that a swapping file can extend across platter boundaries on a DF or DC disk, but cannot extend across disk unit boundaries for other fixed head disks.

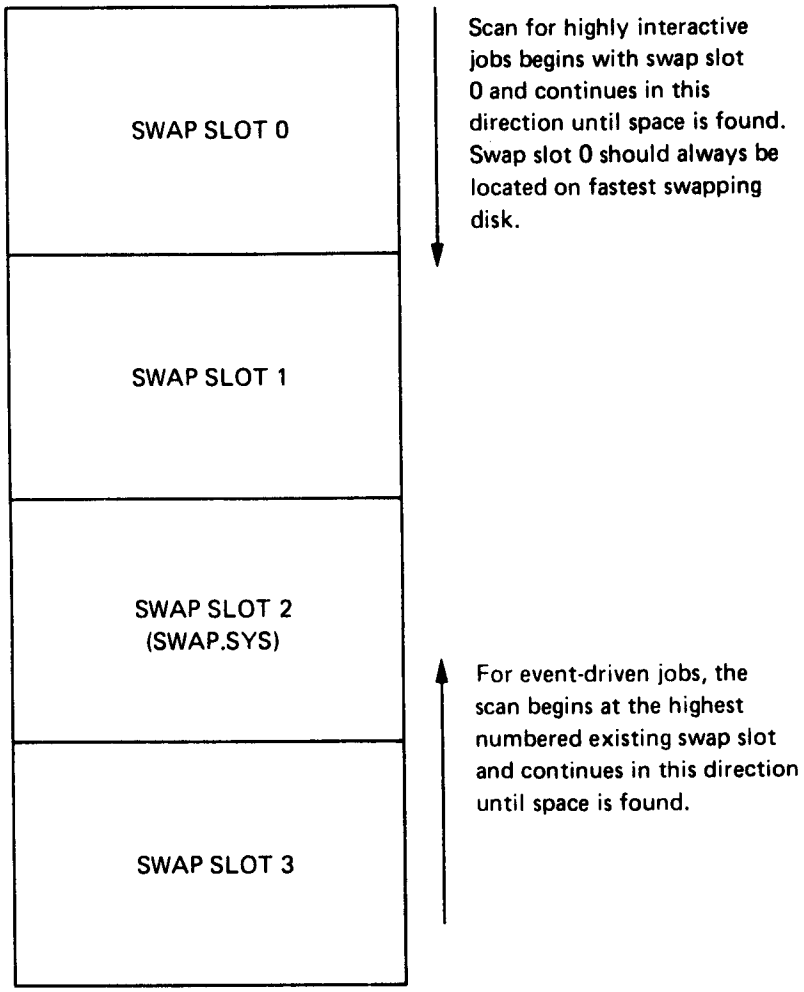


Figure 3-1 Swap Slot Scanning

DIGITAL recommends that, if at all possible, you place the files OVR.SYS and ERR.SYS on an initialized fixed head disk to increase system performance. You can then use the remaining space on the disk for swapping.

If the fixed head disk contains bad blocks, you can use it only as a file-structured unit. Use REFRESH to set up a swapping file on the disk. You can place other files on the disk if enough space remains. Note that the file SWAP.SYS must reside on the system disk and must be large enough for at least two jobs at size SWAP MAX. (The system requires this file as a place to swap a job when timesharing begins but before the other swapping files are installed.) Therefore, for a system that will swap all jobs onto a single fixed head disk, you must create two swapping areas: SWAP.SYS (which can be of minimal size) on the system disk, and SWAP0.SYS (which should be large enough to hold the default maximum number of jobs at size SWAP MAX) on the auxiliary fixed head disk.

If you cannot place all swapping files on a fixed head disk, you should consider the average number of jobs that will run on the system. If the system usually runs near the default job maximum, you should allocate as large a swapping space as possible on a fixed head disk. Name this file SWAP0.SYS if the fixed head disk is a nonsystem disk or SWAP.SYS if the fixed head disk is the system disk. The system will swap highly interactive jobs into this file. You should also allocate a swapping file on a moving head disk. This file should have a high number (SWAP3.SYS if on a nonsystem moving head disk or SWAP.SYS if on a moving head system disk) so that the system will swap event-driven jobs into it.

Some systems usually run below the default job maximum with approximately the number of jobs that fit into a swapping file on a fixed-head disk. For such a system, you should first estimate the number of jobs that are inactive at any one time. Inactive jobs usually include ERRCPY, QUEMAN, OPSER, spoolers, and similar programs. Then, estimate the amount of swapping space necessary to accommodate any jobs over those that will fit on the fixed head disk up to the default job maximum. For example, if approximately 18 jobs usually run on the system (and will fit on the fixed head disk), but the default job maximum is 25, calculate the amount of space necessary to accommodate the extra 7 jobs. (The seven jobs require 7 times the SWAP MAX multiplied by 4 blocks. Four blocks equal 1024, or 1K words.) For this system, you should allocate three swapping files. SWAP0.SYS, on a fixed head disk, should be large enough to hold the highly interactive jobs. SWAP3.SYS, also on a fixed head disk, should be able to hold the event-driven jobs. SWAP.SYS, on the moving head system disk, can accommodate any jobs that do not fit onto the fixed head disk.

If your system has more than one moving head disk and no fixed head disk space is available for swapping files, you need to consider one more possibility. If you are certain that two disks will always be mounted, you can create one swap file on each of two disks instead of creating one larger file on only one disk. Make the two files equal in size. This arrangement reduces access time for moving head disks because it uses the overlapped seek drivers efficiently. If, however, one of the disk drives becomes unavailable for use during timesharing, the system limits the maximum number of jobs that can log in. RSTS/E logs in only as many jobs as the existing swapping files can accommodate. You can run the system with a reduced job maximum, or you can try to allocate additional swapping space on another disk.

Now, consider the question of size. A swapping file must be (4 times SWAP MAX) blocks long to hold one job of size SWAP MAX. Thus, the total swapping space required on a system is (JOB MAX multiplied by 4 times SWAP MAX). Each swapping file holds an integral number of jobs, N, where

$$N = \frac{\text{Size of swapping file in blocks}}{\text{SWAP MAX} * 4} \quad \text{(truncated)}$$

Once you have decided how many jobs a particular swapping file needs to accommodate (N), simply calculate (N multiplied by SWAP MAX times 4) to determine the necessary size for each swapping file you plan to allocate. Appendix C contains a table of disk device sizes, which you may find useful in determining swapping file sizes.

3.7.1.2 **Planning Optional System Files** – To set up your system for optimal performance, you need to consider creation and placement of the additional contiguous system files BUFF.SYS, OVR.SYS, and ERR.SYS. If your system is configured for DECtape, you must create the file BUFF.SYS, which contains the DECtape buffers. This file must reside on the system disk and must contain at least three blocks for each DECtape unit on the system. If your system disk is a moving head device, you can group BUFF.SYS with other system files near the center of the occupied space on the disk for optimal performance. If your system disk is a fixed head disk, there is no need to specially place BUFF.SYS.

The files OVR.SYS and ERR.SYS perform no useful purpose on a fixed head system disk. Since the error messages and overlay code already reside on the fixed head system disk, placing them in separate files on the same fixed head disk does not improve performance and wastes disk space.

If your system disk is a moving head disk and the system hardware configuration includes a fixed head disk, you can improve system performance by creating separate files to hold the overlay code and error messages during timesharing. REFRESH allows you to create and position the files OVR.SYS and ERR.SYS for this code. You gain optimal system performance by placing these two files on a fixed head disk. Placing OVR.SYS and ERR.SYS on a fixed head disk should take precedence over allocating one extra swapping slot in a swapping file. You can enable the use of these files by using the UTILTY program or the INIT.BAC system program (see the RSTS/E System Manager's Guide for a description of these programs).

If space is not available on an auxiliary fixed head disk, group the files with other system files near the center of the occupied space on the system disk. This grouping can increase system performance by reducing average seek time for the disk heads.

3.7.1.3 Planning for the Crash Dump File – The final system file you need to plan is CRASH.SYS. First, decide whether to create it; second, determine its optimal size.

CRASH.SYS is optional, but if included, it must reside on the system disk. If you plan to enable the crash dump facility, you must create CRASH.SYS.

To ensure that you do not lose error information if the system crashes, DIGITAL recommends that you create CRASH.SYS and enable crash dumps. The following are the steps RSTS/E takes when a crash occurs.

1. The RSTS/E error handling code discovers an error from which it cannot recover.
2. RSTS/E dumps the contents of the read/write area of monitor memory into CRASH.SYS (if the file exists and the crash dump facility is enabled). Since the dump preserves the state of the system at the time of the crash, it contains essential diagnostic information.
3. RSTS/E then reloads the system from disk into memory and performs an auto-restart.

For example, assume that monitor error logging routines log a parity error within monitor memory. The system crashes because the monitor may be corrupt. Since the ERRCPY program cannot run to log the error, the error data (and probably the cause of the crash) are lost unless a crash dump is performed. Creating CRASH.SYS and enabling the crash dump facility would prevent this loss of error data.

Allocate enough space to CRASH.SYS so that it can hold the read/write area of the RSTS/E monitor. The read/write area of the monitor contains tables and data areas that change during timesharing. The size of the monitor read/write area depends on the system's hardware and software configuration, so it varies from system to system. It is usually 8K to 16K words (32 to 64 blocks).

To determine the size necessary for CRASH.SYS, examine the file status table printed by the LIST suboption. (See Section 3.7.3.) If your system disk is large, you can create CRASH.SYS at the maximum possible size (80 blocks). Allocating an 80 block CRASH.SYS file allows for future expansion and reserves additional contiguous disk space. Contiguous space may not be available after the disk has been heavily used. If your system disk is too small to allow you to allocate an 80 block CRASH.SYS file, try to allocate a file approximately eight to twelve blocks larger than the minimum required size. An extra eight to twelve blocks provides space for 2K to 3K monitor expansion. Of course, if you are certain that your system disk will not be used for an expanded monitor, you need not configure any extra space at all.

3.7.2 Using the REFRESH Option

To invoke REFRESH, type REFRESH or RE in response to the OPTION: prompt. The option responds by requesting date and time. After you specify the date and time, REFRESH asks you for the disk type and unit on which to allocate the files. Type a disk name or press the LINE FEED key to specify the system disk. If you do not press LINE FEED, the REFRESH option requests the unit number of the disk. After you specify the disk to use, REFRESH may ask whether to clean the disk. Table 3-11 summarizes these questions and the possible responses.

The cleaning operation, which repairs a corrupt file structure, performs the following steps:

1. It builds a new storage allocation table (SATT.SYS) that reflects all the files on the disk.
2. It scans all directories and deletes all files that have the extension .TMP or are marked for deletion.
3. It finds any doubly-allocated blocks and allows you to specify their correct allocation.
4. It finds and deletes all invalid directories.
5. It marks the disk as having a clean file structure.
6. It allows you to delete files that contain bad blocks.

Table 3-11
REFRESH Questions and Responses

Question	Response
DD-MMM-YY?	Type the date in alphabetic or numeric, or press the LINE FEED key to accept the date printed.
HH:MM?	Type the time in 24-hour or AM/PM format, as in 15:12 or 3:12 PM. Press the LINE FEED key to accept the time printed.
DISK?	Type the name of the disk on which to allocate files. Valid disk names are DC, DF, DS, DK, DL, DM, DP, DR, and DB. Press LINE FEED to use the system disk.
UNIT?	Type the physical unit number of the disk. This question is not asked if the response to the previous question was DC, DF, or LINE FEED.
CLEAN?	Type YES to clean the disk. Type NO or the LINE FEED key if you are certain that the directory structure of the disk is not corrupt. This question is asked only if the disk was logically dismounted after its last use. If the disk was not logically dismounted, the REFRESH option automatically cleans the disk.

REFRESH automatically cleans a disk that was improperly removed from the system (i.e., it was not logically dismounted). If your disk was properly dismounted, REFRESH asks the CLEAN? question. Specify a cleaning operation if you suspect that the disk has a corrupt file structure. Any ?BAD DIRECTORY FOR DEVICE errors occurring on a particular disk indicate a corrupt file structure on that disk. You should also specify a cleaning operation if a file containing a bad block was deleted during timesharing. The cleaning operation frees the portion of the file that did not contain any bad blocks. The amount of time required for the clean operation depends on the type of disk and the number of files it contains.

After all preliminary questions have been asked and answered, you can begin to use the REFRESH suboptions to allocate files. Table 3-12 lists the suboptions.

Table 3-12
REFRESH Suboptions

Suboption	Function
LIST	List the file status table
CHANGE	Change the system file allocation
FILE	Change the characteristics of a file in [0,1]
BADS	Examine or add to the bad block file

To use a suboption, type the first two or more characters of its name in response to the REFRESH SUBOPTION? query. REFRESH executes the suboption dialogue, makes any requested changes, and returns to the REFRESH SUBOPTION? query. You can then specify another suboption or type CTRL/Z to return to the DISK? query. When you are finished with the REFRESH option, type EXIT or the LINE FEED key to return to the OPTION: query.

3.7.3 Listing the File Status Table

The LIST suboption lists the file status table. This table includes all the files that may be in account [0,1] on the system disk. The files are divided into two categories: (1) the system files (under the heading System Files:) that you can manipulate with the REFRESH option and (2) other files (under the heading Others:). If you need a listing of only the files in the Others: category, type CTRL/O during the printing of the system files. The output automatically resumes printing at the Others: header. The following is a sample file status table:

```
REFRESH suboption? LIST

File                          File                Current   Minimum     Start
Name        Required?         Flags  Status       Size      Size        LBN

System files:

SWAP   .SYS    YES    NOD CTG     OK              224       128        2132
SWAP0  .SYS    NO                 OK
SWAP1  .SYS    NO                 OK
SWAP3  .SYS    NO                 OK
OVR    .SYS    NO                 OK                        43
ERR    .SYS    NO                 OK                         8
BUFF   .SYS    YES                CRE                        6
CRASH  .SYS    NO     NOD CTG     OK               35        35        2356

Others:

BADB   .SYS                   NOD                 0
SATT   .SYS            NOD CTG                     2                    9
INIT   .SYS                   NOD                210
RSTS   .SIL            NOD CTG                    214
RT11   .RTS                   CTG                 20                  452
BASIC  .RTS            NOD CTG                    68                   472
ERR    .ERR            NOD CTG                     8                   218


REFRESH suboption?
```

NOTE

The file status table lists only files in account [0,1]. Remember that the availability of space on the disk depends not only on the sizes of the files in account [0,1], but also in other accounts on the disk.

The file status table is divided into seven columns, which are labelled File Name, Required?, File Flags, Status, Current Size, Minimum Size, and Start LBN. Table 3-13 summarizes the file status table entries.

The File Name column lists all the files in account [0,1] by name.

The entry in the Required? column indicates whether the file is required for operation of the currently installed RSTS/E monitor. This column is blank for nonsystem files in [0,1] (i.e., files listed under the Others: heading). The file SWAP.SYS is always required on the system disk. The file BUFF.SYS is required on the system disk if the installed monitor supports DECtape. All other system files are optional on the system disk. All files are optional on a nonsystem disk.

Table 3-13
File Status Table Entries

Entry Heading	Possible Entries	Meaning
File Name	All files in account [0,1]	Files are divided into two categories under the headings System Files: and Others:.
Required	YES	The file is required for operation of the current monitor.
	NO	The file is not needed to operate the system.
	(blank)	The file is not a system file.
File Flags	NOD	The file cannot be deleted.
	CTG	The file is contiguous on the disk.
Status	OK	No REFRESH action is required.
	CRE	You must create the file.
	D/C	You must delete and re-create the file.
Current Size	n	n is the decimal number of 256-word blocks the file occupies on the disk.
	(blank)	The file does not exist.
Minimum Size	n	n is the decimal number of 256-word blocks the file minimally requires.
Start LBN	n	n is the logical block number (in decimal) at which each contiguous file starts. Disk logical blocks are numbered from 0 to (disk size - 1).
	(blank)	If the CTG flag is not present, the file is not contiguous. If the CTG flag is present, the file is currently contiguous but may be extended, becoming noncontiguous.

The File Flags column can contain the entries NOD and CTG. The entry NOD for a file means that users cannot delete that file during timesharing; the file can be deleted only during the use of the REFRESH option. The entry CTG means that the file is contiguous.

The Status column (which is always blank for files in the Others: category) contains the entry OK, CRE, or D/C. The entry OK means that you need not use REFRESH on the file. The entry CRE means that you must use REFRESH to create the file. The entry D/C means that you must delete the file and re-create it.

The Current Size column lists the current size of each existing file. If the file does not exist on the disk that is being REFRESHed, this column remains blank.

The Minimum Size column (which is blank for all files in the Others: category) lists the minimum size (in blocks) for each file if RSTS/E is to use that file. The minimum size for SWAP.SYS is four times the current value of SWAP MAX multiplied by two (to hold two jobs). If you have not yet set defaults for the installed monitor, the minimum size is 64 blocks – 2 jobs at 8K words each. ERR.SYS must always be at least eight blocks long. The minimum sizes of OVR.SYS and CRASH.SYS depend on the installed RSTS/E monitor. BUFF.SYS must contain at least three blocks for each DECtape unit that the installed monitor supports. The Minimum Size column is blank for OVR.SYS, CRASH.SYS, and BUFF.SYS if no monitor is currently installed. The column is blank for SWAP.SYS, CRASH.SYS, and BUFF.SYS if you are not REFRESHing the system disk because RSTS/E can use these files only on the system disk.

The column labelled Start LBN lists the logical block number (in decimal) at which each of the contiguous files starts. If a file does not exist or is not contiguous, its entry in the Start LBN column is blank.

3.7.4 Changing System File Allocation

The CHANGE suboption allows you to create, delete, and relocate contiguous files on disk. Since CHANGE creates and relocates files by manipulating the directory structure, you should not use it on files that contain data (such as ERR.ERR). CHANGE does not copy files; it merely allocates them in directories. The CHANGE suboption destroys the data in the files it manipulates.

CHANGE begins by asking questions about each of the files it can manipulate. When the dialogue is complete, CHANGE performs the specified file operations and returns to the REFRESH SUBOPTION? query. To exit from the suboption before answering all questions, type CTRL/C. Table 3-14 summarizes the CHANGE queries and possible responses.

Table 3-14
CHANGE Suboption Questions and Responses

Question	Possible Responses	Meaning
filnam.ext CHANGES?	NO, OLD, LINE FEED key	If the file exists, accept its current size and location and skip the remaining questions for this file.
	YES	If the file exists, skip to the DELETE? question. If the file does not exist, skip to the SIZE? question.
	CTRL/Z	Return to the REFRESH SUBOPTION? question.
OTHER FILES?	NO, N, LINE FEED key, CTRL/Z	Last question in the CHANGE suboption. Returns to the REFRESH suboption? question.
	filnam.ext	Allows you to create or delete other [0,1] files. This capability is intended primarily for DIGITAL software support personnel. Certain system files in [0,1] (such as INIT.SYS) must never be modified. If the named file exists, skip to the DELETE? question. If the file does not exist, skip to the SIZE question.
DELETE?	NO, OLD, LINE FEED key	Asked only if the file exists. Skip to the SIZE? question.
	YES	Delete the file and skip the remaining questions for this file.
	CTRL/Z	Return to the first question for this file.
SIZE?	OLD, LINE FEED key	If the file exists, retain the current size. If REFRESH is creating the file, create it at the minimum size.
	n	n, a positive nonzero integer, is the decimal number of blocks allocated to the file.
	CTRL/Z	Return to the filnam.ext CHANGES? question for this file (or to the OTHER FILES? question if the current file is not a system file).
BASE?	OLD, LINE FEED key	If the file exists, use the logical block number (in decimal) at which it now starts as its starting location. If creating the file, use a default of 0 (anywhere on the disk).
	n	n is a decimal number that specifies the starting logical block number for the file. If n is 0, place the file anywhere on the disk.
	CTRL/Z	Return to the first question for this file.

CHANGE can alter characteristics of the files SWAP.SYS, SWAP0.SYS, SWAP1.SYS, SWAP3.SYS, OVR.SYS, ERR.SYS, BUFF.SYS, and CRASH.SYS. It also allows you to create or delete other files (with the OTHER FILES? question) in account [0,1]. The suboption poses all of the questions in Table 3-14 for each file in the above list, substituting the name of the file for filnam.ext in the question. The following is an example of CHANGE:

```
REFRESH suboption? CH          line a
SWAP.SYS changes? Y            line b
  Size? 224                    line c
  Base? <LF>                   line d
SWAP0.SYS changes? <LF>        line e
SWAP1.SYS changes? <LF>        line f
SWAP3.SYS changes? <LF>        line g
OVR.SYS changes? <LF>          line h
ERR.SYS changes? <LF>          line i
BUFF.SYS changes? Y            line j
  Size? 12                     line k
  Base? <LF>                   line l
CRASH.SYS changes? Y           line m
  Size? 80                     line n
  Base? <LF>                   line o
Other files? <LF>              line p
REFRESH suboption?
```

In the example, the user allocates files for the SYSGEN system. First, he requests the CHANGE suboption (line a). He then creates a SWAP.SYS file (line b) of 224 blocks (line c), which holds 2 jobs at a maximum size of 28K words. He presses the LINE FEED key in response to BASE? (line d) and the REFRESH option places SWAP.SYS at the first available space on the disk. The user presses the LINE FEED key to make no changes to the files SWAP0.SYS, SWAP1.SYS, SWAP3.SYS, OVR.SYS, and ERR.SYS (lines e through i). He creates BUFF.SYS (line j) at 12 blocks (line k) for four DECtape drives and creates CRASH.SYS (line m) at the maximum size of 80 blocks. The user does not position either of the files (lines l and o). Finally, he presses the LINE FEED key in response to the OTHER FILES? question (line p) to omit changes to any other files in account [0,1]. REFRESH then returns to the REFRESH SUBOPTION? query.

3.7.5 Changing [0,1] File Characteristics

The FILE suboption allows you to create, delete, or mark as deletable or not deletable files in account [0,1]. It is intended mainly for two uses: 1) deleting obsolete run-time system files, and 2) marking other files as deletable or not deletable.

When you invoke the FILE suboption, REFRESH responds by asking you for the name of the file to modify. Reply with a filename and extension. If the file exists in account [0,1], REFRESH asks whether to delete it. Type YES or NO in response. If your response is NO, REFRESH retains the file. It then asks SIZE? and BASE? questions as in the CHANGE suboption. Refer to Table 3-14 for a summary of responses to these questions.

NOTE

The files INIT.SYS, the default error message file (e.g., ERR.ERR), the installed monitor SIL, and the default run-time system file must never be modified.

REFRESH allows you to change the status of the "do not kill" bit in the directory entry for the named file. When this bit is on, users cannot delete or rename the file under RSTS/E timesharing. The bit is automatically turned on when you set defaults (for the default error message and run-time system files), when you install the monitor SIL, and when you create other system files. When the bit is off, any privileged user can delete the file. To turn off the bit, type YES in response to the DELETABLE? query. To turn on the bit, type NO. To retain the current status of the bit, type OLD or the LINE FEED key.

The capability to set and reset this bit can be useful in many circumstances. For example, if your system has important accounting files that you want to protect from deletion, you can simply use the PIP program during timesharing to transfer the files to account [0,1] and set the "do not kill" bit. This bit protects the files so that they cannot be deleted during timesharing. Files for which the "do not kill" bit is set can, however, be extended. Only another use of the REFRESH option can delete them. The following example shows the use of the FILE suboption to set the "do not kill" bit for the file ROLLIN.SAV.

```
REFRESH suboption? FILE

  File name? ROLLIN.SAV

  File exists. Delete it? N

  Size? (LF)

  Base? (LF)

  Deletable? N

  File name? (LF)

REFRESH suboption?
```

Be careful to specify OLD or LINE FEED in response to the SIZE? and BASE? questions if you wish to retain the data in the files. The REFRESH option manipulates directory information only; it does not transfer actual file data. Therefore, if you do not reply to these questions with OLD or LINE FEED, REFRESH may reallocate the file and the data may be lost.

3.7.6 Expanding the Bad Block File

The BADS suboption enables you to list the bad blocks currently in the bad block file for the disk currently being REFRESHed and to add bad blocks to the file.

To use BADS, type BADS or BA. REFRESH responds with BADS?. Type LIST for a listing of the current contents of the file BADB.SYS. The list is in the following format:

```
Bads? LIST

Pack cluster size = 1

Bad clusters begin at logical block numbers:

3237     4177

Bads?
```

If the file contains no bad blocks, REFRESH responds as follows:

```
Bads? LIST

There are no bad blocks.

Bads?
```

After the listing (or message) is complete, REFRESH returns to the BADS? query. Type ADD to add bad blocks to the file. REFRESH responds with BLOCK NUMBER? Reply with the logical block number (in decimal) of the bad block. This number can be from 1 to the disk size minus 1. You can obtain the logical block number of a bad block from the ERRDIS print-out of the disk error. REFRESH questions you to ensure that you have typed the correct number. Reply with YES or NO. If your response is YES, REFRESH allocates the pack cluster in which the block resides to BADB.SYS. If you reply NO, REFRESH repeats the BLOCK NUMBER? prompt. Be careful to specify the correct block number. The allocation of a cluster to BADB.SYS is irrevocable.

After you have added all bad blocks to the file, type EXIT or LINE FEED to return to the REFRESH SUBOPTION? query. If you added any bad blocks to the bad block file, REFRESH now cleans the disk. The cleaning operation allows you to delete all files that contain bad blocks.

The following example illustrates the use of BADS:

```
REFRESH suboption? BADS

Bads? ADD

Block number? 2102

Really add logical block 2102 to BADB.SYS? Y

Block number? (LF)

Bads? LIST

Pack cluster size = 1
```

```
Bad clusters begin at logical block numbers:

3237      4177      2102

Bads? (LF)

Disk is being cleaned - wait ...

REFRESH suboption?
```

3.7.7 REFRESH Option Examples

Two examples of the use of the REFRESH option follow. The examples show some of the possible philosophies with which you can use the REFRESH option. In the first example, the system files are structured to allow future expansion. The second example is a small system where disk space is of primary importance. On this system, a reasonable structure of system files is created but no provision is made for future expansion.

3.7.7.1 RP04 System Disk with RS04 Disk – The first example shows a system file allocation typical for a large system. The hardware configuration includes an RP04 system disk and an auxiliary RS04 fixed head disk. Four DECtapes are also included in the system. The system is configured for a maximum of 40 jobs at a maximum size of 28K words each. The print-out of this example begins on the next page.

After the user answers the date and time question, the REFRESH option requests the name of the disk on which it should manipulate files. The user first allocates files on the auxiliary fixed head disk. (He has already used the DSKINT option to perform pattern checking and write a minimal RSTS/E file structure on this disk.) The user types his answer, DS, at line a, then types the unit number in response to the UNIT? question. Next, at line b, the user requests a cleaning operation to ensure that the file structure on the disk is not corrupt. He uses the LIST suboption at line c to obtain a listing of the current File Status Table for the disk.

The user now uses the BADS suboption to list the bad block file, which as you can see (line d), is empty. He has no bad blocks to add, so he types EXIT to return to the REFRESH SUBOPTION? question.

Beginning at line e, the user changes the system file allocation. First, he requests the CHANGE suboption, which allows him to create, delete, and position system files. He does not request changes to SWAP.SYS, because RSTS/E requires that file on the system disk. The first file he changes is SWAP0.SYS, at line f. He calculates the largest number of jobs (at the maximum size of 28K) that can fit on the RS04 disk, leaving room for the files ERR.SYS (8 blocks) and OVR.SYS (43 blocks) and the file structure. Of the total 2048 blocks, he can allocate approximately 1998 blocks as swapping space. (Some of this remaining space contains the RSTS/E file structure. Refer to Section 3.7.1.1 for further information.) Therefore, the user can allocate a swapping file that holds 17 jobs on the fixed head disk. At line g, he creates the file SWAP0.SYS at a size of 1904 blocks (1904 blocks = 17 jobs * swap maximum of 28K words * 4 blocks per 1K words). He does not specify a base position because positioning is not important on a fixed head disk. The user does not create the two remaining swapping files.

At line h, the user creates the file OVR.SYS to hold the overlay code. The size of OVR.SYS is 43 blocks, which is the minimum size listed in the File Status Table. He also creates (at line i) ERR.SYS at a size of 8 blocks. He presses the LINE FEED key in response to the remaining questions. The REFRESH option automatically returns to the REFRESH SUBOPTION? question. In response to this question, the user types CTRL/Z (line j) to return to the DISK? question.

```
Option: REFRESH

10-JUN-78? (LF)
04:50? (LF)

Disk? DS                                                        line a
Unit? 0

Clean? Y                                                        line b

Disk is being cleaned - wait ...


  REFRESH suboption? LIST                                       line c

  File                        File          Current  Minimum    Start
  Name       Required?  Flags Status          Size     Size      LBN

System files:

  SWAP   .SYS     NO              OK
  SWAP0  .SYS     NO              OK
  SWAP1  .SYS     NO              OK
  SWAP3  .SYS     NO              OK
  OVR    .SYS     NO              OK                    43
  ERR    .SYS     NO              OK                     8
  BUFF   .SYS     NO              OK
  CRASH  .SYS     NO              OK

Others:

  BADB   .SYS             NOD                 0
  SATT   .SYS         NOD CTG                 1                  2


  REFRESH suboption? BADS                                       line d

    Bads? LIST

    There are no bad blocks.

    Bads? EXIT

  REFRESH suboption? CHANGE                                     line e

  SWAP.SYS changes? (LF)

  SWAP0.SYS changes? Y                                          line f

    Size? 1904                                                  line g

    Base? (LF)
```

```
SWAP1.SYS changes? LF

SWAP3.SYS changes? LF

OVR.SYS changes? Y                                          line h

  Size? 43

  Base? LF

ERR.SYS changes? Y                                          line i

  Size? 8

  Base? LF

BUFF.SYS changes? LF

CRASH.SYS changes? LF

Other files? LF

REFRESH suboption? ^Z                                       line j
                                                            line k
Disk? LF

                                                            line l
Clean? N

REFRESH suboption? LIST                                     line m

File                        File          Current  Minimum    Start
Name       Required?  Flags Status         Size     Size       LBN

System files:

SWAP   .SYS   YES          CRE                      224
SWAP0  .SYS    NO          OK
SWAP1  .SYS    NO          OK
SWAP3  .SYS    NO          OK
OVR    .SYS    NO          OK                        43
ERR    .SYS    NO          OK                         8
BUFF   .SYS   YES          CRE                       12
CRASH  .SYS    NO          OK                        34

Others:

BADB   .SYS          NOD                0
SATT   .SYS      NOD CTG               11              12
INIT   .SYS      NOD CTG              209              28
SYSGEN.SIL           CTG              185             240
RT11   .RTS          CTG               20             428
ERR    .ERR      NOD CTG                8             448
RSTS   .SIL          NOD              205
BASIC  .RTS      NOD CTG               72            4520
```

```
  REFRESH suboption? CHANGE                                          line n

  SWAP.SYS changes? Y                                                line o

    Size? 2576

    Base? 80000

  SWAP0.SYS changes? (LF)

  SWAP1.SYS changes? (LF)

  SWAP3.SYS changes? (LF)

  OVR.SYS changes? (LF)

  ERR.SYS changes? (LF)

  BUFF.SYS changes? Y                                                line p

    Size? 12

    Base? 80000

  CRASH.SYS changes? Y                                               line q

    Size? 80

    Base? (LF)

  Other files? (LF)

  REFRESH suboption? LIST                                            line r

  File                    File          Current   Minimum     Start
  Name       Required?    Flags Status    Size      Size       LBN

System files:

  SWAP   .SYS    YES    NOD CTG    OK      2576       224     80000
  SWAP0  .SYS     NO               OK
  SWAP1  .SYS     NO               OK
  SWAP3  .SYS     NO               OK
  OVR    .SYS     NO               OK                43
  ERR    .SYS     NO               OK                 8
  BUFF   .SYS    YES    NOD CTG    OK        12       12     82576
  CRASH  .SYS     NO    NOD CTG    OK        80       34       692

Others:

  BADB   .SYS           NOD              0
  SATT   .SYS           NOD CTG         11                      12
  INIT   .SYS           NOD CTG        209                      28
  SYSGEN.SIL                CTG        185                     240
  RT11   .RTS               CTG         20                     428
  ERR    .ERR           NOD CTG          8                     448
  RSTS   .SIL               NOD        205
  BASIC  .RTS           NOD CTG         72                    4520

  REFRESH suboption? EXIT                                            line s

Option:
```

The user now allocates files for the system disk. He presses the LINE FEED key in response to the DISK? question (line k) to specify the system disk. He omits the cleaning operation (line l) because he recently initialized the disk and is sure that the file structure is not corrupt. Next, he specifies the LIST suboption (line m) to list the File Status Table for the system disk.

The user now selects the CHANGE suboption (line n) and begins to allocate system files on the system disk. First, at line o, he requests changes to the file SWAP.SYS. Since the fixed head disk cannot accommodate all the required swapping space, the user must allocate additional swapping space on the system disk. The user creates SWAP.SYS at 2576 blocks, which is large enough for 23 jobs at 28K words each. This file provides the remaining swapping space that the system requires so the user need not create other swapping files. Note that the user specifies a preferred starting location of 80000 to place SWAP.SYS near the center of the 167200-block RP04. He can group the frequently accessed system files near the middle of the disk to create a quiescent or "home" position there for the disk heads. By doing so, he reduces the seek distance to user file data on either side of the center. The effect of this grouping becomes more pronounced as user files and directories fill the disk.

The user does not create on the system disk the other swapping files or the overlay and error message files. He does, however, create the file BUFF.SYS (line p), which this system requires for its four DECtape drives. RSTS/E requires that BUFF.SYS contain at least three blocks for each DECtape unit. The user creates the file at the required size of 12 blocks. The final system file the user allocates is the crash dump file, CRASH.SYS (line q). Although the minimum size for CRASH.SYS is 34 blocks, he creates the file at the maximum of 80 blocks. The large CRASH.SYS file permits future expansion and reserves extra contiguous space that may be needed later. The user does not position CRASH.SYS because it is not frequently used.

At line r, the user specifies the LIST suboption to obtain a final listing of the File Status Table. The REFRESH option has placed all files as the user requested. Finally, at line s, the user exits from the REFRESH option. The initialization code returns to the OPTION: prompt. The user in the example can now proceed to establish default start up conditions (described in Section 3.8) for the new monitor.

3.7.7.2 RK05 System Disk – The second example shows the use of the REFRESH option on a smaller system which includes two RK05 disks (one of which is the system disk) and no fixed head disks. The hardware configuration also includes two DECtape units. The maximum number of jobs on this system is 20, and their maximum size is 16K words. The example begins on the next page.

In this example, the user answers the date and time questions. He then presses the LINE FEED key in response to the DISK? question (line a) to use the REFRESH option on the system disk. At line b, the user omits a cleaning operation on the system disk because he is sure that the file structure on the disk is not corrupt. REFRESH then asks the REFRESH SUBOPTION? question. The user specifies the LIST suboption (line c) to obtain a listing of the File Status Table.

The user now uses the BADS suboption to list the bad block file, which (line d) is empty. He has no bad blocks to add, so he types EXIT to return to the REFRESH SUBOPTION? question.

He next uses the CHANGE suboption (line e), which allows him to create, delete, and position files on the disk. He types Y in response to the SWAP.SYS CHANGES? question at line f to create and position the file SWAP.SYS. RSTS/E requires that SWAP.SYS exist on the system disk at a size large enough to hold at least two jobs at the maximum size of 16K words.

The user can allocate all swapping space in SWAP.SYS on the system disk or he can divide the swapping space between the two RK05 disks. Before he allocates swapping space on the second RK05 unit, he should be reasonably certain that the disk will always be mounted. (It can be either a public or private disk.) If the second disk becomes unavailable for use during timesharing, the system runs with a reduced job maximum until the system manager can allocate additional swapping space for that timesharing session. In this example, the user is reasonably certain that the second RK05 disk

```
Option: REFRESH

10-JUN-78? (LF)
05:59? (LF)

Disk? (LF)                                                          line a

Clean? N                                                            line b

  REFRESH suboption? LIST                                           line c

  File                          File                Current  Minimum    Start
  Name       Required?  Class  Status              Size     Size       LBN

System files:

  SWAP   .SYS    YES           CRE                          128
  SWAP0  .SYS    NO            OK
  SWAP1  .SYS    NO            OK
  SWAP3  .SYS    NO            OK
  OVR    .SYS    NO            OK                           43
  ERR    .SYS    NO            OK                           8
  BUFF   .SYS    YES           CRE                          6
  CRASH  .SYS    NO            OK                           22

Others:

  BADB   .SYS                  NOD                 0
  SATT   .SYS              NOD CTG                 1                5
  INIT   .SYS              NOD CTG               209               13
  SYSGEN.SIL               NOD CTG               185              223
  RT11   .RTS              NOD CTG                20              409
  ERR    .ERR              NOD CTG                 8              429
  ROLLIN.SAV               NOD CTG                18              697
  BASIC  .RTS              NOD CTG                72              745
  RSTS   .SIL              NOD CTG               205              817
 REFRESH suboption? BADS

   Bads? LIST                                                       line d

   There are no bad blocks.

   Bads? EXIT

 REFRESH suboption? CHANGE                                          line e

 SWAP.SYS changes? Y                                                line f

   Size? 640                                                        line g

   Base? 2200                                                       line h

 SWAP0.SYS changes? (LF)

 SWAP1.SYS changes? (LF)
```

```
SWAP3.SYS changes? LF

OVR.SYS changes? LF

ERR.SYS changes? LF

BUFF.SYS changes? Y                                              line i

  Size? 6

  Base? LF

CRASH.SYS changes? Y                                             line j

  Size? 22                                                       line k

  Base? LF

Other files? LF

REFRESH suboption? LIST                                          line l

File                    File          Current  Minimum   Start
Name      Required?  Flags Status      Size     Size      LBN

System files:

SWAP   .SYS   YES   NOD CTG   OK        640      128      2201
SWAP0  .SYS   NO              OK
SWAP1  .SYS   NO              OK
SWAP3  .SYS   NO              OK
OVR    .SYS   NO              OK                43
ERR    .SYS   NO              OK                 8
BUFF   .SYS   YES   NOD CTG   OK          6       6       445
CRASH  .SYS   NO    NOD CTG   OK         22      22       451

Others:

BADB   .SYS           NOD               0
SATT   .SYS         NOD CTG             1                   5
INIT   .SYS         NOD CTG           209                  13
SYSGEN.SIL          NOD CTG           185                 223
RT11   .RTS         NOD CTG            20                 409
ERR    .ERR         NOD CTG             8                 429
ROLLIN.SAV          NOD CTG            18                 697
BASIC  .RTS         NOD CTG            72                 745
RSTS   .SIL         NOD CTG           205                 817


  REFRESH suboption? ^Z                                          line m

Disk? DK                                                         line n
Unit? 1                                                          line o

Clean? Y                                                         line p

Disk is being cleaned - wait ...
```

```
  REFRESH suboption? CHANGE                                          line q

  SWAP.SYS changes? (LF)                                             line r

  SWAP0.SYS changes? Y

    Size? 640

    Base? 2200

  SWAP1.SYS changes? (LF)

  SWAP3.SYS changes? (LF)

  OVR.SYS changes? (LF)

  ERR.SYS changes? (LF)

  BUFF.SYS changes? (LF)

  CRASH.SYS changes? (LF)

  Other files? (LF)

  REFRESH suboption? LIST                                            line s

  File                          File          Current  Minimum  Start
  Name       Required?  Flags  Status          Size     Size     LBN

System files:

  SWAP   .SYS    NO             OK
  SWAP0  .SYS    NO   NOD CTG   OK             640              2200
  SWAP1  .SYS    NO             OK
  SWAP3  .SYS    NO             OK
  OVR    .SYS    NO             OK                      43
  ERR    .SYS    NO             OK                       8
  BUFF   .SYS    NO             OK
  CRASH  .SYS    NO             OK

Others:

  BADB   .SYS             NOD                    0
  SATT   .SYS         NOD CTG                    2                3

  REFRESH suboption? EXIT                                            line t

Option:
```

will remain mounted, so he allocates only half the necessary swapping space to SWAP.SYS on the system disk. (He will create another swapping file when he uses the REFRESH option on the second disk.) Therefore, at line g, the user specifies a size of 640 blocks (10 jobs at 16K words each) for SWAP.SYS. He places the file near the center of the 4800-block disk, at block 2200 (line h). Placing frequently used system files near the center of the disk decreases the average seek time for the disk heads and improves system performance as file data become scattered across the disk. The user does not create any other swapping files on the system disk.

The overlay code and error messages already reside on the system disk in the monitor SIL. System speed does not increase if the user creates separate files on either of the RK05 units. Therefore, the user does not create the OVR.SYS and ERR.SYS files.

The user must, however, create BUFF.SYS to permit operation of the two DECtape units on the system. He creates this file at line i. The user specifies a size of six blocks (three for each unit) for BUFF.SYS.

Next, at line j, the user makes changes to the CRASH.SYS file. He allocates the minimum size of 22 blocks for CRASH.SYS (line k). This size does not allow future expansion, but a larger file is impractical on the system because disk space is limited. The user does not place CRASH.SYS near the center of the disk because it is not frequently used. The REFRESH option now returns to the REFRESH SUBOPTION? question.

Having set up all files for the system disk, the user uses the LIST suboption once again to check the file allocation (line l). He then types CTRL/Z (line m) to return to the DISK? question.

In response to the DISK? (line n) and UNIT? (line o) questions, the user specifies the second RK05 unit. At line p, the user requests that the REFRESH option clean the disk to ensure that the file structure is not corrupt. He types CHANGE in response to the REFRESH SUBOPTION? question (line q) so that he can create the additional necessary swapping file. He chooses SWAP0.SYS as the additional file (line r) because the system swaps highly interactive jobs (which should have the fastest access time available) to the first swapping slot it finds. Access to the second RK05 may be slightly faster than access to the system disk. The system normally makes fewer accesses to the second RK05 than to the system disk because it starts all searches of user directories on the system disk. Placing the burden of a frequently used swapping file on the second RK05 can help to even the load between the two disks. The user creates SWAP0.SYS at a size of 640 blocks, which is sufficient for the remaining 10 jobs at 16K words each. He places the file near the center of the disk, at block 2200, to decrease the average seek time for the disk heads. The user types LINE FEED in response to the remaining CHANGE suboption questions.

The user next selects the LIST suboption (line s) to obtain a final listing of the files for the second RK05 disk. Finally, at line t, he types EXIT to leave the REFRESH option and return to the OPTION: prompt. The user in the example can now proceed to establish default start up conditions (described in Section 3.8) for the new monitor.

3.7.8 Error Messages

Table 3-15 summarizes the error messages that can appear during the REFRESH dialogue.

Table 3-15
REFRESH Dialogue Error Messages

Message	Meaning
CANNOT REFRESH THIS DISK	Rerun DSKINT, then try again.
ILLEGAL DISK NAME	The response you typed is not a valid disk name. Valid disk names are DC, DF, DS, DK, DL, DM, DP, DR, and DB. Type the LINE FEED key to use the system disk.
ILLEGAL SUBOPTION	The response you typed was not a valid suboption name.
SORRY, BUT THAT DISK DOESN'T EXIST	The disk device or unit number you specified does not exist on this PDP-11. If you disagree, use the HARDWR option to list the hardware configuration.
THAT FILE CANNOT BE CHANGED	You cannot modify the file.
TOO MANY BAD BLOCKS	There cannot be more than 161 clusters in the bad block file.
UNABLE TO CREATE REQUESTED FILE(S)	The disk does not contain sufficient contiguous space at the specified bases to create the specified files. Try again, specifying different bases or smaller files.

The preceding table explains only the error messages that can appear during the dialogue portions of REFRESH. For information on processing errors, refer to Appendix B.

3.8 SETTING SYSTEM DEFAULTS

The RSTS/E initialization code includes routines that allow you to establish system default start up conditions. These defaults include the following:

1. The maximum number of jobs the system allows during timesharing and the maximum storage space a job can occupy in memory and in the swapping files
2. The run-time system and error message files
3. The installation's name, which is used in LOGIN's identifying message
4. The allocation of certain portions of memory
5. The state of the crash dump facility
6. The labelling format for magtapes
7. The system clock you will use to generate a system time base
8. The formats for date and time
9. The power fail delay for your system

You must set the defaults after you create the system files and before you start timesharing. You can override some of the default conditions (job and swap maximums, all memory allocation, and crash dump) when you start timesharing. Any changes that you make at start-up time are temporary. They apply to the current timesharing session (and any auto-restart after a system crash). After this timesharing session, the permanent defaults are again in effect.

Note that defaults are set for a particular monitor rather than for a particular system device. Therefore, you must set defaults whenever you install a monitor for the first time.

Use the DEFAULT option and its suboptions to set defaults. To invoke the DEFAULT option, type DEFAULT or DE in response to the OPTION: prompt. If you have not yet installed a SIL, DEFAULT prints the following message and returns to the OPTION: prompt.

```
DEFAULTS CANNOT BE SET UNTIL A SIL IS INSTALLED
```

Use the INSTALL option (see Section 3.6) to install a SIL.

If you have installed a SIL, but have not yet used the DEFAULT option, DEFAULT disables the responses OLD and LINE FEED to all questions and prints:

```
NO DEFAULTS ARE CURRENTLY SET
```

DEFAULT then prompts you for the information needed to set the defaults described in the following sections.

3.8.1 Setting Job and Swap Maximums

The first defaults that you set are job and swap maximums. The job maximum is the largest number of jobs that can run during RSTS/E timesharing. The default job maximum (set with the DEFAULT option) can be any value from 1 to the configured job maximum (which is the limit you set when you answer the configuration questions). The configured job maximum for the SYSGEN system (which DIGITAL sets) is two.

The swap maximum is the maximum amount of storage space that a job can occupy in a swapping file. Since all jobs must be swappable, the swap maximum is also the largest size in memory to which each job can expand.

The maximum number of jobs and the maximum size to which a job can expand affect the sizes of the swapping files. A swapping file must be at least (SWAP MAX times 4) blocks long to hold one job of size SWAP MAX. Note that SWAP MAX is measured in memory storage units (K, where 1K=1024 words), whereas file length is measured in disk storage units (blocks, where 1 block=256 words). Four blocks equal 1K words. Thus, each swap file holds an integral number of jobs, N. You can compute N by using the following equation and truncating the result to an integral value.

$$N = \frac{\text{Size of swap file in blocks}}{\text{SWAP MAX} * 4}$$

The total number of jobs that the swap files can accommodate limits the number of jobs that can log in. The one required swap file, SWAP.SYS, must be large enough to accommodate at least two jobs of size (SWAP MAX times 4) blocks. You can add up to three more swap files by using UTILTY commands in the control file at system start-up time. When you enable logins after adding a swap file to the system, the maximum number of jobs that can log in increases by the number of jobs the new swap file can accommodate. The maximum number of jobs that can log in cannot be greater than the default job maximum. If the value (2 multiplied by SWAP MAX times 4) is greater than the current size of the file SWAP.SYS, DEFAULT prints the following message:

> Warning – this SWAP MAX requires that SWAP.SYS be at least n blocks. SWAP.SYS is currently m blocks.

In the message, n is the number of blocks required to hold 2 jobs at size SWAP MAX, and m is the current size of the file SWAP.SYS.

For the SYSGEN system, set the job maximum at 2 and the swap maximum at 24K words. For the target system, you should select values for job and swap maximums that are compatible with your software. For example, although the initialization code allows a value for SWAP MAX between 8K and 28K words, the BASIC-PLUS run-time system does not permit any of its jobs to exceed 16K. The RSTS/E COBOL compiler requires a 28K word swap maximum. FORTRAN IV requires a swap maximum of at least 8K words, but can use up to 28K words. If you plan to assemble MACRO programs under FORTRAN IV, a minimum of 12K words is necessary.

At start-up time and during the DEFAULT option, the initialization code prints the current values for job and swap maximums. It then requests any changes, as in the example that follows:

```
Option: DEFAULT

No defaults are currently set

You currently have: JOB MAX = 2, SWAP MAX = 16K.

JOB MAX or SWAP MAX changes? YES

  New JOB MAX?

  New SWAP MAX? 28

You currently have: JOB MAX = 2, SWAP MAX = 28K.

JOB MAX or SWAP MAX changes?
```

When you first use the DEFAULT option on a SIL, the option prints the configured job maximum and a swap maximum of 16K words. DEFAULT then asks the JOB MAX OR SWAP MAX CHANGES? question. Answer by typing NO or LINE FEED to retain the printed values for job and swap maximums and proceed to establish default files. Answer YES to change one or both of the values. If your answer is YES, the DEFAULT option prints the NEW JOB MAX? query. Respond with a decimal number between 1 and the configured job maximum, inclusive, to change the value or with NO, OLD, or the LINE FEED key to retain the current value. The next query is NEW SWAP MAX?. Your answer can be any integer between 8 and 28, or NO, OLD or the LINE FEED key as in the previous question. When you have answered both questions, DEFAULT prints the JOB MAX and SWAP MAX values and once again allows you to change them. Respond as in the first question. When the values are correctly set, DEFAULT proceeds to questions about default files.

3.8.2 Establishing Default Files

After setting up default job and swap maximums, you must designate the default run-time system and error message files for use during timesharing. The default run-time system for most installations is BASIC-PLUS. The default run-time system file must be a contiguous file on the system disk in account [0, 1] and have the extension .RTS. The default error message file also must be in account [0, 1]. It must be exactly 8 blocks long, and have the extension .ERR. Both the error message file and the default run-time system file must be contiguous.

DEFAULT prompts you first for the name of the default run-time system file. If you have already installed a run-time system as the default, its name appears in the prompt. For the SYSGEN system, you should type RT11. For the target system, type the name (one to six alphanumeric characters) of the run-time system you desire as the default. The BASIC-PLUS run-time system you can generate with the RSTS/E monitor has the name BASIC unless you specify a different name during the configuration questions. To retain the currently installed run-time system, press the LINE FEED key in response to the prompt.

Next, DEFAULT asks you to specify the default error message file. If you have already installed an error message file, the prompt includes its name. Press the LINE FEED key to retain the current default file or type the name (one to six alphanumeric characters) of the error message file you prefer to install as the default. The following is an example of establishing default files for the SYSGEN system.

```
Run Time System? RT11

Error message file? ERR
```

DEFAULT routines ensure that each file you specify is in the correct format. The routines store the name and size of the run-time system file, for use later when memory is allocated, then proceed to set the next default.

3.8.3 Specifying the Installation Name

After you select default run-time system and error message files, DEFAULT routines ask you to specify the installation name. This name is printed in the LOGIN identifying message and is error message number 0. The name must be a string of 1 to 14 printable characters including spaces. If your console keyboard has lower case input capability, you can type the installation name in upper and lower case. The following example illustrates the procedure.

```
Installation name? *Time Sharing*
```

3.8.4 Assigning and Allocating Memory

The initialization code allows you to allocate a specific area of memory to the default run-time system, to lock and unlock areas of memory from use, and to allocate a certain portion of memory to the extended buffer pool.

If you have never set memory allocation defaults for this SIL, DEFAULT routines automatically set the defaults and print a memory allocation table. If you have previously set defaults for this SIL, DEFAULT routines check the defaults against the actual memory configuration of the PDP-11. If the defaults mark any nonexistent memory as in use, DEFAULT prints a warning message. It then resets the defaults and prints the memory allocation table.

If you installed a new default run-time system earlier in the DEFAULT procedure, DEFAULT scans the allocation table for a place for it. DEFAULT positions the run-time system if it finds enough contiguous space; it resets the entire allocation table if sufficient contiguous space is not available. It then informs you of its actions.

Next, if you previously set defaults and the allocation table is still valid, DEFAULT prints the query ANY MEMORY ALLOCATION CHANGES? Table 3-16 lists the possible responses.

Table 3-16
Possible Responses to ANY MEMORY ALLOCATION CHANGES Query

Response(s)	Meaning
NO, OLD, O, or LINE FEED key	Causes currently established memory allocation assignments to remain unchanged and the next query, CRASH DUMP?, to be printed.
RETURN key	Causes an explanatory form of the query to be printed, after which you can type your response.
YES	Causes the TABLE SUBOPTION? to be printed. See Table 3-17 for a list of table suboptions.
CTRL/C	Causes execution to be aborted and the OPTION: prompt to be printed.

In all cases where DEFAULT sets the allocation table, the first query it prints is TABLE SUBOPTION?. Table 3-17 summarizes the memory allocation table suboptions. You can abbreviate the name of any suboption to the first two characters.

Table 3-17
Memory Allocation Table Suboptions

Suboption	Purpose
LIST	Lists the memory allocation table
PARITY	Lists the parity memory configuration
RESET	Lets the initialization code reset the memory allocation table
LOCK	Locks portions of memory
UNLOCK	Unlocks portions of memory
RTS	Moves the default run-time system
XBUF	Allocates memory for the extended buffer pool

When you have made all memory allocation changes, exit from the table suboptions by typing EXIT, EX or LINE FEED. The DEFAULT option then advances to the crash dump queries.

Questions in several of the suboptions ask you to specify a memory address or a range of memory addresses. You can specify an address in either of the following two formats:

1. Give the absolute address as a four to eight digit octal address. The octal number must be a multiple of 4000 (8) that is less than or equal to 16774000.
2. Give the K address as a decimal number followed by the letter K. The decimal number must be in the range from 0 to 1919.

Specify a range of addresses by typing either two addresses separated by a hyphen (e.g., 45K-47K) or by typing an address followed by a + and a number that represents the size of the range (for example 45K+3).

3.8.4.1 Listing the Memory Allocation Table – The LIST suboption prints the current allocation table on the console terminal. This table shows how each block of memory is being used. It provides information on the following:

- The sizes of the RSTS/E monitor and default run-time system
- The amount of memory available for user jobs
- Which portions of memory are locked
- Which portions of memory are assigned to the extended buffer pool
- The total amount of memory on the computer

The following is a listing for a large system:

```
Table suboption? LI

Memory allocation table:

   0K: 00000000 - 00163777 (  29K) : EXEC
  29K: 00164000 - 00263777 (  16K) : RTS (BAS4F)
  45K: 00264000 - 00567777 (  49K) : XBUF
  94K: 00570000 - 02777777 ( 290K) : USER
 384K: 03000000 - End              : NXM


Table suboption?
```

Each row of the memory allocation breakdown includes the following, in order:

1. The start of this range (in K words)
2. The starting and ending octal addresses for this range
3. The amount of memory this range occupies (in K words)
4. The purpose for which this memory is used

Table 3-18 explains the symbols in the memory allocation table.

Table 3-18
Memory Allocation Table Symbols

Symbol	Meaning
EXEC	Occupied by RSTS/E Monitor (Executive)
RTS	Occupied by the default run-time system, which is named in parentheses
USER	Available for user space
LOCKED	Unavailable for use (locked)
XBUF	Reserved for extended buffer pool
NXM	Does not exist (nonexistent) on this PDP-11

You can use the LIST suboption as often as you need during DEFAULT as well as at start-up time. Keep a copy of the final memory allocation breakdown with other system management information for future reference.

3.8.4.2 Listing the Parity Memory Configuration – With the PARITY suboption, you can identify and locate the various types of parity memory on the computer. This suboption is used primarily as a diagnostic tool. DIGITAL Field Service personnel can use it to verify the memory configuration when they install the PDP-11. The PARITY suboption looks at the hardware parity registers to ascertain the types of memory (parity memory, interleaved parity memory, or nonparity memory) on the computer.

On a PDP-11/70, this suboption produces the following response:

```
Table suboption? PARITY

Parity register usage:

All memory is 11/70 parity memory

Table suboption?
```

A typical print-out for a PDP-11 other than an 11/70 might be the following:

```
Table suboption? PARITY

Parity register usage:

  0K: 00000000 - 00137777 (  24K) : 00
 24K: 00140000 - 00177777 (   8K) : 06
 32K: 00200000 - 00277777 (  16K) : 10(NA)
 48K: 00300000 - 00377777 (  16K) : 14(NA)
 64K: 00400000 - End              : NXM


Table suboption?
```

Table 3-19 defines the parity type codes.

The values nn and mm are the last two octal digits of the address of the parity register that controls that section of memory. Up to 16 parity registers can exist. They are in the address range 772100 to 772136. When the system detects a parity error, the parity register responsible for that section of memory usually contains information on the location of the last error discovered. The code NA indicates that the parity register contains no error address information. All parity core memory returns error address information.

Table 3-19
Parity Type Codes

Symbol	Meaning
NO	Nonparity memory
NXM	Nonexistent memory
nn/mm	Interleaved parity memory with address information
nn	Parity memory with address information
nn (NA)	Parity memory with no address information
nn (ECC)	Memory with ECC hardware
nn/mm (ECC)	Interleaved memory with ECC hardware

In interleaved memory, alternate banks respond to sequential memory addresses. In the following example, parity register 00 responds to the first address (000000), while parity register 02 responds to the next address (000002) and so on.

ADDRESS	PARITY REGISTER
000000	00
000002	02
000004	00
000006	02
000010	00
000012	02

Interleaving is used because core memories are destructive read-out devices. After each read from a core memory, the system must restore the original data. However, once the processor receives the data it requested, it can go on to other things (presumably another memory access) during the restore cycle in the memory bank just accessed. The bank remains busy until the restore cycle completes. When memory is interleaved, the probability is low that the same bank of memory will be accessed on the next memory cycle. Hence, interleaving allows some overlap of memory operations and results in faster program execution.

3.8.4.3 Resetting the Memory Allocation – The RESET table suboption instructs the initialization code to set up the memory allocation table according to the following rules:

1. Place the default run-time system in low memory immediately after the monitor.
2. Do not reserve any memory for the extended buffer pool. Release any memory previously allocated to the extended buffer pool.
3. Do not lock any memory. Release to user space any memory that was previously locked.
4. Find any new memory on the system and allocate it to user space.

The following example shows the effects of the RESET suboption:

```
Table suboption? LIST

Memory allocation table:

   0K: 00000000 - 00103777 (  17K) : EXEC
  17K: 00104000 - 00203777 (  16K) : RTS (BASIC)
  33K: 00204000 - 00243777 (   8K) : XBUF
  41K: 00244000 - 00507777 (  41K) : USER
  82K: 00510000 - 00513777 (   1K) : LOCK
  83K: 00514000 - 00757777 (  41K) : USER
 124K: 00760000 - End              : NXM


Table suboption? RESET

Table suboption? LIST

Memory allocation table:
```

```
  0K: 00000000 - 00103777 (  17K) : EXEC
 17K: 00104000 - 00203777 (  16K) : RTS (BASIC)
 33K: 00204000 - 00757777 (  91K) : USER
124K: 00760000 - End              : NXM

Table suboption?
```

The first use of the LIST suboption shows memory locked and allocated to the extended buffer pool. After the use of the RESET suboption, the LIST suboption shows that the XBUF and LOCKed areas of memory have been released to user space.

You must use RESET whenever you add any new memory to the computer. Only RESET contains a mechanism that logically adds new memory. Generally, this is its only use.

3.8.4.4 Locking Portions of Memory – The LOCK suboption locks out certain portions of memory to prevent the use of that memory during timesharing. Use LOCK to avoid disruption of system operation when a section of memory is known to be defective. If sufficient undamaged memory remains, you can start the system for normal timesharing.

When you request the LOCK suboption, DEFAULT responds by asking for a LOCK ADDRESS. Your response should be an address or range of addresses to lock. The following example illustrates the procedure:

```
Table suboption? LOCK

  Lock address is? 80K

Table suboption? LIST

Memory allocation table:

  0K: 00000000 - 00103777 (  17K) : EXEC
 17K: 00104000 - 00203777 (  16K) : RTS (BASIC)
 33K: 00204000 - 00477777 (  47K) : USER
 80K: 00500000 - 00503777 (   1K) : LOCK
 81K: 00504000 - 00757777 (  43K) : USER
124K: 00760000 - End              : NXM

Table suboption?
```

Certain restrictions apply to locking out memory. You cannot lock memory in use by the monitor because the monitor cannot be relocated to another section of memory. Similarly, you cannot lock memory currently allocated to the default run-time system or to XBUF until the run-time system or extended buffer space is relocated to a usable area of memory. If you try to lock out a portion of memory already in use by the monitor, default run-time system, or as extended buffer space, LOCK prints the error message PART OF THAT AREA IS ALREADY IN USE. Finally, to remove a full bank of memory from use, lock all of the 4, 8, 16, or 32 contiguous 1K sections that make up the hardware bank. If the bad memory bank is interleaved, you must lock an amount of memory equal to twice its length.

Certain types of memory failures affect only one word. Other types affect larger sections or even the full hardware bank. Carefully analyze any memory failure to determine the 1K section of memory to lock. After locking memory, study the resultant memory configuration to ensure that sufficient contiguous user memory is available to run your installation's programs.

RSTS/E can continue running with certain types of memory failures. On systems with parity memory, the error handling routines in the monitor log parity errors. The recovery procedures depend on the use of the offending section of memory at the time of the error. Consider the following four cases of memory failure and recovery procedures.

In the first case, a parity error occurs when the monitor is running. Since continued system operation would be risky, the monitor logs the error, takes a crash dump (if the crash dump facility is enabled), and reloads the system. When the system restarts, use the ANALYS program to extract the error log information from the CRASH.SYS file. An ERRDIS report, automatically appended to the ANALYS report, provides sufficient information to identify the section that should be locked out. If the error occurred in the default run-time system or extended buffer memory, you can relocate these items and lock the section. If the error was in monitor memory, the hardware must be repaired. In either case, a hard failure may prevent the system from running at all and, hence, you can run neither ANALYS nor ERRDIS. The only recourse in such cases is to run memory diagnostics to locate the problem. If the failure was transient, you can shut down the system to lock out memory or you can continue timesharing. At some point, memory diagnostics should be run to reproduce the failure, if possible.

In the second case, a parity error occurs when a user job is running. The parity error handling routines determine whether a single user is affected (i.e., resides in the malfunctioning section) or more than one user is affected. If more than one user is affected, the system is reloaded as described previously. If a single user is affected, the system aborts that user with the error message ?MEMORY PARITY FAILURE. The monitor logs the error, automatically locks out the section from future use (if the error was reproducible), and the system continues running. You should permanently lock out the bad section of memory (until repaired) using the LOCK suboption the next time you start the system.

In the third case, multiple parity errors occur in rapid succession. RSTS/E halts at location 54 (56 is displayed in the lights) if a second parity error occurs while the system is processing the first parity error. Use memory diagnostics to locate the failing memory.

The fourth case concerns a memory cache parity error. If the hardware memory cache malfunctions and causes a parity error, the hardware refetches the needed word from main memory and causes a warning parity trap to occur. RSTS/E logs this type of error. If the error occurs twice within one minute, RSTS/E disables the part of the cache causing the malfunction. RSTS/E continues running but with degraded performance. The system does not print a message, but two successive errors within the same minute in the ERRDIS printout should alert you.

On systems without parity memory, the software cannot detect or locate a memory failure. Programs may get incorrect results, memory management errors may occur, or any number of random problems may happen. At worst, the system may crash with misleading clues as to the cause.

3.8.4.5 Unlocking Portions of Memory – The UNLOCK suboption frees a previously locked portion of memory for use by user jobs, the default run-time system, or the extended buffer pool. The following is an example of this suboption.

```
Table suboption? LIST

Memory allocation table:

   0K: 00000000 - 00103777 (  17K) : EXEC
  17K: 00104000 - 00203777 (  16K) : RTS (BASIC)
  33K: 00204000 - 00477777 (  47K) : USER
  80K: 00500000 - 00503777 (   1K) : LOCK
  81K: 00504000 - 00757777 (  43K) : USER
 124K: 00760000 - End              : NXM


Table suboption? UNLOCK

  Unlock address is? 80K

Table suboption? LIST

Memory allocation table:

   0K: 00000000 - 00103777 (  17K) : EXEC
  17K: 00104000 - 00203777 (  16K) : RTS (BASIC)
  33K: 00204000 - 00757777 (  91K) : USER
 124K: 00760000 - End              : NXM


Table suboption?
```

3.8.4.6 Positioning the Default Run-Time System – The RTS suboption places the default run-time system (usually BASIC-PLUS) anywhere in the first 124K of memory. It is generally advantageous to place the default run-time system (or extended buffer space) in solid-state memory, when it is available. Most of the processing done by RSTS/E systems involves executing BASIC-PLUS programs. Thus, to optimize performance, position the BASIC-PLUS run-time system in the fastest memory available on the system. If your system has a mixture of fast and slow core memory, you may gain a small advantage by locating BASIC-PLUS in fast core. Generally, the only reason to position BASIC-PLUS on systems without solid-state memory is to avoid defective memory. If you do not position the run-time system, DEFAULT places it immediately after the RSTS/E monitor in the lowest physical memory addresses.

When you specify the RTS suboption, DEFAULT responds with NEW RUN TIME SYSTEM ADDRESS IS? Reply with the address (in the format described in Section 3.8.4) at which you choose to start the run-time system. There must be sufficient free contiguous space for the default run-time system between the starting address you specify and 124K. The following example illustrates the use of RTS.

```
Memory allocation table:

   0K: 00000000 - 00137777 (  24K) : EXEC
  24K: 00140000 - 00237777 (  16K) : RTS (BASIC)
  40K: 00240000 - 00377777 (  24K) : USER
  64K: 00400000 - End              : NXM


Table suboption? PARITY

Parity register usage:
```

```
  0K: 00000000 - 00137777 (  24K) : 00
 24K: 00140000 - 00177777 (   8K) : 06
 32K: 00200000 - 00277777 (  16K) : 10(NA)
 48K: 00300000 - 00377777 (  16K) : 14(NA)
 64K: 00400000 - End              : NXM

Table suboption? RTS

  New Run Time System address is? 48K

Table suboption? LIST

Memory allocation table:

  0K: 00000000 - 00137777 (  24K) : EXEC
 24K: 00140000 - 00277777 (  24K) : USER
 48K: 00300000 - 00377777 (  16K) : RTS (BASIC)
 64K: 00400000 - End              : NXM

Table suboption?
```

Under certain conditions, you should not place BASIC-PLUS in solid-state memory. Consider the following configuration where the memory allocated to the Monitor is shown but, for the purpose of this illustration, the location of BASIC-PLUS is not shown.

Locations 0000000 through 0117777 (20K) are RSTS Executive
Locations 0120000 through 0177777 (12K) are available core
Locations 0200000 through 0277777 (16K) are available solid-state memory
Locations 0300000 through 0337777 (8K) are available core
Locations 0340000 upwards are nonexistent.

Assume that the size of BASIC-PLUS is 14K words. If BASIC-PLUS is located at address 0200000, the remaining user memory is divided into one 12K section below and one 10K section above. Because the system loads user job images into contiguous physical memory, no program larger than 12K can run with this memory configuration. In this system, BASIC-PLUS should be placed at the high end of available memory starting address 250000, leaving 22K words of contiguous memory for user jobs between the Monitor and BASIC-PLUS. This configuration allows 16K programs to be run at the expense of not using the high speed solid-state memory to full advantage. Only 6K words of memory are used for BASIC-PLUS while the other 10K words are part of the 22K words of user memory. Ensure that the location of BASIC-PLUS on your system leaves sufficient memory for user jobs.

3.8.4.7 Reserving Memory as Extended Buffer Space – You can reserve memory as extended buffer space with the XBUF suboption. Message send/receive, the DECnet/E package, the RSTS/2780 package, and the FIP buffering module use this reserved memory; if none is available, they use small buffers.

DIGITAL recommends that you allocate extended buffer space on all systems with sufficient memory. The amount of extended buffer space you should allocate depends on the type of processing done on the system. The FIP buffering module uses extended buffer space in 512-byte (256-word) sections, and can use at most 175K words of extended buffer space. If you allocate more than 8K words of extended buffer space, the FIP buffering module will not try to use small buffers for disk directory storage at all.

The message send/receive code uses extended buffer space to store messages. The amount of space it uses depends on the length and number of outstanding messages on the system. Each message requires a number of bytes equal to the length of the message plus 8 bytes, rounded up to the next multiple of 64 bytes. A message always consumes at least 64 bytes of extended buffer space; it can consume at most 576 bytes.

The DECnet/E package uses extended buffer space to hold inter-job messages. DECnet/E requires at least 4K words of extended buffer space for optimal performance. For the RSTS/2780 package, you should allocate an additional 1K words of XBUF space.

The DECnet/E package and message send/receive code use buffer space in large, contiguous sections. If you are unable to allocate sufficient extended buffer space for these facilities, you may need to configure more small buffers (Section 4.2.8.2).

When you request the XBUF suboption, DEFAULT responds by asking for the extended buffer address range. You can reply with an address or a range of addresses identifying the memory to reserve. (Refer to Section 3.8.4 for a description of the format for your response.) XBUF memory must be in the range 00100000 (16K) to 03777700 (511K). The allocation table must currently designate the memory you plan to reserve for extended buffer space as either USER or XBUF memory. If high-speed solid-state memory is available, you should place the XBUF space in it to further enhance system performance.

When you allocate memory to extended buffer space, DEFAULT releases any memory previously allocated for that purpose. You can reserve only one region of memory as extended buffer space. To release previously allocated XBUF memory to USER space, type RE (or REMOVE).

The following example illustrates the use of the XBUF suboption.

```
Table suboption? XBUF

  Extended buffer address range is? 115K-127K

Table suboption? LI

Memory allocation table:

   0K: 00000000 - 00147777 (  26K) : EXEC
  26K: 00150000 - 00247777 (  16K) : RTS (BASIC)
  42K: 00250000 - 00713777 (  73K) : USER
 115K: 00714000 - 00777777 (  13K) : XBUF
 128K: 01000000 - End               : NXM


Table suboption?
```

3.8.5 Enabling and Disabling the Crash Dump Facility

After you have set the memory allocation, DEFAULT routines print the current status of the crash dump facility. The message is one of the following:

```
You currently have crash dump enabled.

You currently have crash dump disabled.
```

The routines then check that the file CRASH.SYS 1) is present in account [0,1] on the system disk, 2) is large enough for the monitor and 3) is contiguous. If the file does not meet all three of these conditions, DEFAULT prints an appropriate warning text. If CRASH.SYS does not meet the required conditions, and you want to enable crash dump, use REFRESH to correct CRASH.SYS before starting the system.

After checking the file and printing a message (if necessary), DEFAULT prints the CRASH DUMP? question. Reply YES to enable crash dump, or NO to disable crash dump. If the CRASH.SYS file is invalid, but you enable crash dump anyway, DEFAULT prints no further warning.

3.8.6 Specifying the Labelling Defaults for Magtape

After completing the crash dump section, DEFAULT asks the user to set the default for magtape labelling. Individual jobs can reset and restore the magtape labelling default during timesharing. A job sets its default with the ASSIGN command, described in the RSTS/E System User's Guide. An individual program sets its default with the MODE option of the OPEN statement when it opens a file on the tape. (The RSTS/E Programming Manual describes the MODE option with magtape.) You can set and reset the system default only by using the DEFAULT option. Note that the default labelling format for the SYSGEN system must be DOS.

DEFAULT routines print the following query, with NONE, DOS, or ANSI in parentheses to indicate the current setting.

```
Magtape labelling default (none)?
```

Table 3-20 lists the valid responses to the query.

Table 3-20
Valid Responses to MAGTAPE LABELLING DEFAULT Query

Response(s)	Meaning
LINE FEED key or OLD	Retain the current default. (Not valid if current default is NONE.)
DOS	Set the default format to DOS/BATCH-11 labelling. The default for the SYSGEN monitor and for building of the system library (if the distribution medium is magtape) must be DOS.
ANSI	Set the default format to ANSI standard labelling.

After you specify the magtape labelling default, DEFAULT issues the PREFERRED CLOCK?: prompt.

3.8.7 Specifying the Preferred System Clock

Your hardware configuration can include one, or both, of the following system clocks. You must specify which clock will be used to provide system timing.

KW11-L Line Time Clock – The KW11-L divides system time into intervals based on the AC line frequency of the power source used to run your computer system. AC line frequency can be either 50 Hz (as is the standard in many countries) or 60 Hz (as is the standard in the United States).

KW11-P Programmable Real-Time Clock – The KW11-P can use the AC line frequency of the power source to provide a system time base, or it can be set to provide a crystal-controlled time base independent of the power source. Using the KW11-P crystal-controlled time base is beneficial in areas where the possible fluctuations in AC line frequency would adversely affect system timing. The interrupt time base for a KW11-P can be set from 50 to 1000 interrupts/second (in multiples of 50). DIGITAL recommends that you set the interrupt rate to 100 interrupts/second.

The DEFAULT routines let you control which clock will be used to provide a system time base, and, if you specify a KW11-P clock, the time base to be used for the system.

The DEFAULT routines print the following query (the current default condition appears in parentheses):

PREFERRED CLOCK (current default)?

To accept the current default, type LINE FEED.

If you have only a KW11-L clock, or you have both clocks but prefer to use the KW11-L, respond by typing L. The system will then use the KW11-L at the AC line frequency.

If you have only a KW11-P clock, or you have both clocks but prefer to use the KW11-P, respond by typing P. The DEFAULT routines then print the query:

INTERRUPT FREQUENCY?

Respond by typing LINE to have the KW11-P use the AC iine frequency for a time base.

Respond with a number from 50 to 1000 to have the system use the KW11-P's crystal oscillator (at that interrupt rate) for the time base. Your response must be a multiple of 50.

3.8.8 Specifying Date and Time Formats

The DEFAULT routines then print the following query (the current default condition in parentheses):

DATE FORMAT (current default)?

To accept the current default, type LINE FEED.

Respond with A (for ALPHABETIC) to change the date format to dd-mmm-yy format. (For example, 10-JUN-78.)

Respond with N (for NUMERIC) to change the date format to yy.mm.dd format. (For example, 78.06.10.)

Next, the DEFAULT routines print the following query (the current default condition in parentheses):

TIME FORMAT (current default)?

To accept the current default, type LINE FEED.

Respond with AM/PM to change the time format to nn:nn AM/PM format. (For example, 05:13 PM.)

Respond with 24-HOUR to change the time format to nn:nn format. (For example, 17:13.)

The result of the dialogue is that you have maintained or altered the current defaults for reporting date and time to users of your system.

3.8.9 Specifying the Power Fail Recovery Delay

RSTS/E systems attempt to recover from a momentary power failure by performing an automatic restart procedure. A momentary power failure occurs whenever the AC power drops below 95 volts for 110 volt power (or 190 volts for 220 volt power) or outside a limit of 47 to 63 Hz (DC power). RSTS/E allows you to specify the delay factor (in seconds) before the system attempts to restart after a momentary power failure. The delay can be from 1 to 300 seconds (5 minutes). Specifying a relatively long delay factor ensures that all disk devices are ready before the system attempts to auto-restart. (For information on the recovery times required by various RSTS/E devices, consult the appropriate hardware publications.) Refer to the RSTS/E System Manager's Guide for further information on the RSTS/E auto-restart procedures.

3.8.10 DEFAULT Option Dialogue Error Messages

Table 3-21 explains the error messages that can occur during the DEFAULT option dialogue.

Table 3-21
DEFAULT Dialogue Error Messages

Message	Meaning
EXTENDED BUFFER SPACE NOT IN RANGE 00100000 (16K) TO 03777700(511K)	The extended buffer space must fit entirely within the specified range.
FILE NOT CONTIGUOUS	The file you specified is not contiguous on disk. The default run-time system file and error message file must be contiguous.
FILE NOT FOUND	The initialization code did not find the file you specified on disk.
ILLEGAL FILE NAME	The filename you specified is not one to six alphanumeric characters.
ILLEGAL 1K SECTION ADDRESS SPECIFIED	The address you specified is not a multiple of 4000(8) or is greater than 1919K (16774000(8)). If you specified a range of addresses, the second of the two addresses must be greater than the first.
ILLEGAL SUBOPTION GIVEN	Your response to the TABLE SUBOPTION? query is not a valid suboption name.
INVALID FILE FORMAT	The error message file you specified is not exactly eight blocks long.
INVALID MODULE FORMAT	The run-time system SIL module is too long or too short or has a high limit other than 177776(8).
INVALID SIL FORMAT	The run-time system file does not contain a valid SIL index.
MUST FIT ENTIRELY BELOW 124K	The region you specified for the run-time system extends beyond the system's upper limit of 124K.
NAME MUST BE 1 TO 14 PRINTABLE CHARACTERS	The installation name you typed is more than 14 characters long or contains unprintable characters. You cannot respond by typing the LINE FEED key if no previously typed name is available.
PART OF THAT AREA IS ALREADY IN USE	The region you specified is unavailable for use. The region must currently be allocated to USER space or to the purpose for which you wish to allocate it. (You can allocate space marked for RTS to the run-time system.)
PART OF THAT AREA IS NOT LOCKED	Part of the region you specified is not now locked and, therefore, you cannot unlock it.
RTS IS NOT A KEYBOARD MONITOR	The run-time system you specified is not a keyboard monitor. RSTS/E requires as the default a run-time system that is a keyboard monitor (e.g., BASIC-PLUS).
TOO MANY MODULES	The run-time system SIL contains more than one module.

Table 3-21 describes only the dialogue error messages. For information on other error messages that appear when you use the DEFAULT option, refer to Appendix B.

3.9 SPECIFYING CHARACTERISTICS FOR DEVICE UNITS

You can specify the characteristics of device units in the installed SIL by using the SET option. SET contains a group of suboptions (summarized in Table 3-22). These suboptions allow you to enable and disable device units, set or remove modem control on keyboards, change line printer characteristics, and set or remove restrictions on the use of devices. The ability to enable and disable device units is particularly useful. If, for instance, one of two DECtape drives is not working properly, you can simply shut up the system, disable the malfunctioning unit, and start time-sharing. Repairs can be made while the system is in use.

Table 3-22
SET Suboptions

Suboption	Function
LIST	List the status of a device
MODEM	Enable modem control for keyboards
LOCAL	Disable modem control for keyboards
LP	Set line printer characteristics
DISABLE	Disable a device unit
ENABLE	Enable a device unit
PRIV	Set restrictions on device use
UNPRIV	Remove restrictions on device use

To use the SET option, type SET or SE in response to the OPTION: prompt. In response, SET requests a suboption name. Type a suboption name from Table 3-22. (You need type only the first 2 characters.) SET executes the suboption's dialogue, makes the requested changes in the installed SIL, and returns to the SET SUBOPTION? query. When you have made all the necessary settings, type EXIT (or LINE FEED) to return to the OPTION: prompt.

3.9.1 Listing Device Status

The LIST suboption lists the status of one or more devices in the installed monitor SIL. You can use LIST to verify changes made with other SET suboptions.

To invoke LIST, type LIST or LI in response to the SET SUBOPTION? query. LIST responds by asking for the device to list. To list characteristics of only one unit, type the device name and unit number (for example, DK2). To list all units of a particular device, type the device name (for example, DK). To list a group of device units, type the device name and two unit numbers separated by a hyphen (as in DK1-3). Type ALL or the LINE FEED key to list all devices supported by the installed SIL.

The following is a sample listing using this suboption.

```
SET suboption? LIST
Device? ALL

Name   Control Comments

DF0    RF:
DS0    RS:
DS1    RS:
DK0    RK:
DK1    RK:
```

```
DK2  RK:
DK3  RK:
DM0  RM:
DM1  RM:
DP0  RP:
DP1  RP:
DR0  RK:
DR1  RK:
DB0  RB:
DB1  RB:
KB0  TT:
KB1  PK0:
NL0
PK0
LP0  LP0:  NOOMITCR,CR,NOEOT,FILL,NOCONTROL,NOVTAB,BSEMULATE,  width 80
MT0  TM:
MT1  TM:
MM0  TU:
MM1  TU:
DT0  TC:
DT1  TC:
```

In a listing, the first column contains the device name and unit number. The second column denotes the hardware controller associated with the device. For example, DM1 is associated with RM:, the RK06/RK07 disk controller. For terminal multiplexers and RX11 floppy disks, the second column also tells you the line number on the controller associated with each unit. For instance, KB32 may be attached to line 4 on the second DH11 unit; thus the listing for KB32 would include the notation DH1:4. For pseudo keyboard units, this column includes the number of the pseudo keyboard associated with the keyboard unit. For example, if KB1 is associated with a pseudo keyboard number 0, the listing for KB1 includes the notation PK0:

The final column contains comments about the unit. The comment DISABLED means that the unit is not available for use during timesharing. For keyboards, the comment MODEM means that modem control is enabled for that unit. For line printers, the third column includes the printer type (LP, LV, LS, or LA180) and width. If the line printer is lower case, this column also includes the comment LOWER CASE. The comment PRIVILEGED appears for device units that are accessible only to privileged jobs or programs.

3.9.2 Enabling and Disabling Modem Control

The MODEM suboption allows you to enable and the LOCAL suboption allows you to disable modem control on keyboards controlled by a DH11 or DZ11 multiplexer.

To enable modem control, use the MODEM suboption. In response to MODEM's KB? query, type the keyboard number or range of keyboard numbers for which modem control should be enabled. To exit from the suboption, type the LINE FEED key or CTRL/Z. The following example illustrates the use of the MODEM suboption.

```
SET suboption? MODEM
KB? 27-30
KB? LF

SET suboption?
```

To disable modem control, use the LOCAL suboption. The format and exit procedures for LOCAL are the same as those for MODEM.

3.9.3 Changing Line Printer Unit Characteristics

Use the LP suboption to change the printer type, width, and case associated with any line printer unit on the system. The suboption requests the unit number (if the system includes more than one line printer) for which changes will be made, then prompts you for printer type, width, and case for that unit. Each prompt includes in parentheses the current setting for that characteristic.

The line printer type can be LP, LS, LV or LA180. If the line printer is not a standard DIGITAL line printer, you can set individual characteristics for it as described in Table 3-23.

Table 3-23
Line Printer Characteristics

Name	Function
OMITCR	Omit sending <CR> if next character is <LF>
NOOMITCR	Always send <CR> to the printer
CR	Insert <CR> before <LF>, <VT>, and <FF>
NOCR	Printer performs implied <CR> before <LF>, <VT>, <FF>
FILL	Insert fill after form feeds
NOFILL	Fill is not required after form feeds
CONTROL	Send non-printing characters to the printer
NOCONTROL	Discard non-printing characters or use uparrow mode
EOT	Send EOT (^D) to the printer
NOEOT	Treat EOT like other non-printing characters
VTAB	Send vertical tabs to the printer
NOVTAB	Treat vertical tabs like other non-printing characters
BSEMULATE	Emulate the action of 'backspace' on the printer
BSREAL	Printer has real backspace (carriage moves left)
BSCONTROL	Treat backspace like other non-printing characters

Unspecified characteristics take the following defaults:

NOOMITCR, CR, NOEOT, FILL, NOCONTROL, NOVTAB, BSEMULATE

The defined printer types are:

LP = OMITCR, NOCR, NOEOT, FILL, NOCONTROL, NOVTAB, BSEMULATE

LV = NOOMITCR, NOCR, EOT, NOFILL, NOCONTROL, NOVTAB, BSEMULATE

LS = NOOMITCR, CR, NOEOT, NOFILL, CONTROL, VTAB, BSEMULATE

LA180 = OMITCR, NOCR, NOEOT, FILL, NOCONTROL, NOVTAB, BSREAL

The width setting for the line printer is a decimal number between 1 and 254, inclusive. The default width is 80 columns, if none is specified with the LP suboption. Listings produced during the SYSGEN process are intended to be printed on 132 column printer. The case setting is upper or lower case. The default setting is upper case only. After you set all characteristics for a printer unit, the suboption returns to the LP? query. (If only one printer is on the system, the suboption does not return to LP? but exits to the SET SUBOPTION? query.) Type a unit number to set characteristics for another unit; type the LINE FEED key to exit from the suboption. The following is an example of the LP suboption:

```
SET suboption? LP
Type (NOOMITCR,CR,NOEOT,FILL,NOCONTROL,NOVTAB,BSEMULATE)? LP
Width (80)? 132
Lower case (no)? YES

SET suboption? EXIT
```

3.9.4 Enabling and Disabling Device Units

The ENABLE and DISABLE suboptions allow you to make device units available or unavailable for timesharing use. A timesharing user who attempts to access a unit disabled with the DISABLE suboption receives the ?DEVICE NOT AVAILABLE error message.

The DISABLE suboption of SET differs from that of the HARDWR option in that SET allows you to disable a single unit on a controller without affecting any other units of the same type. HARDWR permits disabling of device controllers only.

Use SET's DISABLE suboption when a particular unit has hardware problems. If you disable the troublesome unit, timesharing can take place while the unit is being repaired. When the unit is working properly, reboot the system and reenable the unit.

DISABLE and ENABLE also, in effect, allow you to configure a device unit that is not yet installed in the processor. You can include the unit at configuration time and disable it until it is installed. After its installation, you can enable it for timesharing use. Disabling nonexistent units with the SET option suppresses the warning messages generated when the start-up code automatically disables them.

To enable or disable a unit, type the appropriate suboption name (ENABLE or DISABLE, respectively). In response, the suboption poses the DEVICE? query. You can disable any device unit except the console keyboard (KB0:). To enable or disable only one unit or range of units of a device, type the device name followed by the unit number or numbers, as in KB10 or KB8-12. The suboption makes the specified change and returns to the DEVICE? question. To enable or disable several units of a single device, type only the device name in response to the query. The suboption next prompts with UNIT?. Reply with a number or range of numbers for the units to enable or disable. For the ENABLE suboption only, you can type ALL to enable all units of that device. The suboption makes the specified changes and repeats the query. Specify another unit or range of units or press the LINE FEED key to return to the DEVICE? query.

Once you are at the DEVICE? query, you can type another device name to enable or disable additional device units, or you can press the LINE FEED key to return to the SET SUBOPTION? question.

The following example demonstrates the DISABLE suboption. The dialogue for the ENABLE suboption is exactly the same.

```
SET suboption? DISABLE
Device? KB
Unit? 8-12
Unit? (LF)
Device? (LF)

SET suboption?
```

3.9.5 Restricting the Use of Devices

The PRIV and UNPRIV suboptions allow you to place and remove restrictions on the use of devices and device units on the RSTS/E system. RSTS/E timesharing normally allows any user job to use any device.

By using the PRIV suboption, you can permit only certain jobs to use specified devices. A permanently privileged user (one whose project number is 1) can use any restricted device and can reassign a restricted device to an unprivileged job. An unprivileged job gains ownership of a restricted device by running a privileged program that assigns the device or by having a privileged job reassign the device to it. The unprivileged job loses ownership of the device when it logs out or issues a DEASSIGN command. An unprivileged job can also gain access to a restricted device by running a privileged program that uses the device. If the program does not assign the device, the job has access to the device only while the privileged program executes. When execution of the program is complete, the device is once again inaccessible to the job.

You can restrict the use of any device except disks and the null device. Restrictions on keyboard access do not prevent jobs from logging in. Any job can log in to a restricted keyboard. The restrictions prevent an unprivileged job from opening or assigning a keyboard other than its console keyboard (KB:).

To place or remove restrictions on the use of one or more devices, use the PRIV or UNPRIV suboption. In response to the SET SUBOPTION? question, type the name of the suboption you need to use. The suboption then prints the DEVICE? question. Type the name of the device for which you need to set or remove restrictions. (When using the UNPRIV suboption, you can type ALL in response to the DEVICE? query to free access to all devices. UNPRIV then returns to the SET SUBOPTION? query.) After you specify a device name, the suboption prints the UNIT? question. Respond by typing a unit number, range of unit numbers, or ALL. The suboption enacts the requested changes and repeats the UNIT? question. Type another unit number or range of unit numbers, or press the LINE FEED key to return to the DEVICE? question. To set or remove restrictions for another device, type the name of the device. Press the LINE FEED key to return to the SET SUBOPTION? question.

The following example shows the use of PRIV to make the use of keyboards a privileged operation.

```
Option: SE

  SET suboption? PRIV
  Device? KB
  Unit? ALL
  Device? (LF)

  SET suboption? (LF)


Option:
```

3.9.6 SET Option Dialogue Error Messages

Table 3-24 summarizes the errors that can occur during the SET option dialogue.

Table 3-24
SET Dialogue Error Messages

Message	Suboption	Meaning
CAN'T DISABLE KB0:	DISABLE	You specified KB0:, which cannot be disabled.
INVALID KEYBOARD NUMBER	MODEM, LOCAL	The keyboard number you typed is greater than the maximum allowed.
INVALID RESPONSE	MODEM, LOCAL, LP	The number you typed is in an incorrect format.
	ENABLE, DISABLE, PRIV, UNPRIV	The device you specified is not configured in the installed monitor SIL. Use the LIST suboption to obtain a list of valid device names.
INVALID UNIT NUMBER	ENABLE, DISABLE. LP, PRIV, UNPRIV	The unit number you typed is not a decimal number, or is too large for the installed SIL. If you typed a range of unit numbers, they must be in ascending order.
KBnn: CANNOT HAVE MODEM CONTROL	MODEM	KBnn: is not on a DH11 or DZ11 interface. Therefore, it cannot have modem control.
NOT POSSIBLE ON DISK UNIT	PRIV, UNPRIV	You cannot use PRIV or UNPRIV on a disk device.

Table 3-24 describes only the errors that can occur during the SET option dialogue. For information on other errors that can occur with the SET option, refer to Appendix B.

3.10 STARTING TIMESHARING

Use the START option to start the RSTS/E system for normal timesharing. The START option allows you to change job and swap maximums, memory allocation, and crash dumps. However, any changes made with START override the DEFAULT settings for only one timesharing session. After that timesharing session, the DEFAULT settings again apply. You can make permanent changes in the defaults only by using the DEFAULT option.

To invoke the START option, type START, ST, or the LINE FEED key. START or ST causes the initialization code to print the start-up questions (which allow you to override DEFAULT parameters) and a list of the disabled devices. If you press the LINE FEED key, the initialization code omits the questions, preventing you from overriding any defaults. When you press the LINE FEED key to start the system, the initialization code prints a summary of the system defaults, requests the date and time, and then prints the number of disabled devices. The following sample dialogue shows the normal procedure for starting a RSTS/E SYSGEN system.

```
Option: ST

You currently have: JOB MAX = 2, SWAP MAX = 28K.

JOB MAX or SWAP MAX changes? (LF)

Any memory allocation changes? (LF)

You currently have crash dump enabled.

Crash dump? (LF)

19-JUN-78 (LF)
18:45? (LF)
DF0: disabled - no RF: controller
DM0: disabled - no RM: controller
DM1: disabled - no RM: controller
MT0: disabled - no TM: controller
MT1: disabled - no TM: controller

5 devices disabled

?Can't find file or account
.
```

In the example, the answer to each query is the LINE FEED key. By pressing the LINE FEED key, you accept the parameters you set with the DEFAULT option. Accepting the defaults is the normal start-up procedure. You can accept the current values for date and time, as well, by pressing the LINE FEED key.

After the system accepts your responses, a pause of several seconds occurs. During this time, the start-up routines enable all configured terminal interfaces, set up monitor tables, turn on memory management, load the monitor and default run-time system, and start the system clock. Finally, the system attempts to execute the INIT system program (described in the RSTS/E System Manager's Guide). When you bring up a new system for the first time, the INIT system program is not yet in the system library. As a result, the system generates the ?CAN'T FIND FILE OR ACCOUNT error message. If the default run-time system is BASIC-PLUS, the ?PROGRAM LOST–SORRY message also appears. The printing of a dot (.) for the SYSGEN system or the READY message for the target system (if its default run-time system is BASIC-PLUS) signals the end of the system initialization code routines.

3.10.1 Hardware Messages at Start-Up

The start-up code checks the system to verify that all configured devices exist and that they respond properly. The code disables any device that it cannot find or that you have disabled with the SET or HARDWR option. START accesses all configured terminal interfaces and disables any that do not respond. It activates the memory management unit to determine the size of available memory (as in DEFAULT), to load the monitor and default run-time system, and to prepare for normal timesharing. START, furthermore, loads the stack limit register, enables parity traps for all parity memory, and activates the system clock to begin timesharing. If the system does not start as shown in the examples, these components are suspect and should be exercised with the standard diagnostics.

3.10.2 Software Messages at Start-Up

In addition to hardware checks, START verifies that the required system files exist and are of the proper sizes.

If the file SWAP.SYS does not exist, is not contiguous, or is too small to accommodate two jobs of size SWAP MAX, START routines print one of the following messages:

```
SWAP.SYS not contiguous or too small

SWAP.SYS not present in [0,1]
```

If you enabled crash dumps (with either the DEFAULT option or the START option), START routines check that the file CRASH.SYS is present in account [0, 1] on the system disk, is large enough for the current monitor, and is contiguous on the disk. If the file does not meet all these conditions, START prints one of the following error messages:

```
CRASH.SYS does not exist

CRASH.SYS file of nnn blocks is not available

CRASH.SYS is not contiguous
```

In the second message, nnn indicates the number of blocks necessary for a monitor dump. The error message is followed by the text:

```
Crash dump automatically disabled
```

3.11 BOOTSTRAPPING DEVICES

The BOOT option, which simulates the hardware ROM bootstraps, allows you to bootstrap tape and disk devices. You can use BOOT to load another operating system into memory from disk or tape and to reload an altered copy of the initialization code after you have patched it on disk.

To run BOOT, type BOOT or BO in response to the OPTION: prompt. BOOT responds by asking for the device to bootstrap. In response, type either the device name or the RETURN key (for a list of bootable devices). If the device has unit numbers (all devices except DC and DF), you can append the unit number to the device name. (If you do not include the unit number in this response, BOOT requests it later, with the BOOT UNIT: prompt.) Any unit can be bootstrapped.

If you press the LINE FEED key, the system device is bootstrapped. The BOOT option automatically determines the system device and unit number, so the BOOT UNIT: prompt does not appear. This facility is useful for loading a patched version of the initialization code.

The following example illustrates the use of the option.

```
Option: BOOT
  Boot device: DK
  Boot unit: 0


RSTS/E V06C-02 System #144 (DK0)


Option:
```

After determining that the specified device exists, BOOT waits for the terminal to stop printing, then jumps to a device-dependent routine. It reads the device's bootstrap block into location 0, then transfers control to location 0.

The following table explains the error messages that can appear during the BOOT option dialogue.

Table 3-25
BOOT Dialogue Error Messages

Message	Meaning
NOT A VALID BOOT DEVICE	The device you named is not a valid bootable device or you specified a unit number for a DC or DF disk. Type the RETURN key for a list of devices that can be bootstrapped.
SORRY, BUT THAT DEVICE DOESN'T EXIST	The device name you typed is valid, but the device does not exist on this PDP-11.

For information on other error messages that appear during use of the BOOT option, refer to Appendix B.

3.12 LOADING STAND-ALONE PROGRAMS

Use the LOAD option to load and run any stand-alone program from account [0, 1] on the system disk. You can use LOAD only if the system device is disk. The program to be loaded must have the extension .SAV and must not require RSTS/E monitor support. The only stand-alone program that DIGITAL supplies is ROLLIN.

To run LOAD, type LOAD or LO in response to the OPTION: prompt. If you press the RETURN key in answer to the first question, LOAD lists the loadable programs. The following is a sample dialogue:

```
Option: LOAD
Load program: ROLLIN


ROLLIN V07


#
```

If the program you specify has an odd transfer address, or if the transfer address is greater than the size of the program, LOAD prints the following message:

```
Odd transfer address?
```

If you press RETURN in response to this question, LOAD prints the longer message:

```
The transfer address of the specified program is odd.
Please enter a new (even) transfer address or type
CONTROL/C to abort the load.  New transfer address?
```

The program to be loaded must have an even (word) octal transfer address because the PDP-11 traps to an error vector if you specify an odd (byte) address. Therefore, type an even address at which the system should start the program.

If you enter a legal transfer address, the system loads the designated program into memory and starts execution of it. When execution of the program is complete, you can restore RSTS/E by following the appropriate bootstrap procedures.

Error messages that can appear during the LOAD option dialogue are explained in Table 3-26.

Table 3-26
LOAD Dialogue Error Messages

Message	Meaning
DIRECTORY ERROR – FILE NOT FOUND	The directory lookup code in the LOAD option found the file you specified, but the file processor code did not. This error indicates a bug in the initialization code. You should submit an SPR.
ILLEGAL PROGRAM NAME	The program name you typed is in an incorrect format. The name must be one to six alphanumeric characters with no embedded spaces.
PROGRAM NOT FOUND	The program you specified could not be found. Type the RETURN key to get a list of programs that can be loaded.

For information on other errors that occur during the use of the LOAD option, refer to Appendix B.

3.13 ENABLING ONLY THE CONSOLE TERMINAL

The UNISYS option provides a way to start the RSTS/E system for timesharing without enabling any terminal interfaces except the console (KB0:) interface. Use UNISYS as a diagnostic tool in cases where the system will not start. If an otherwise nonworking system does work with UNISYS, the terminal configuration is probably faulty.

The UNISYS option simply sets a flag that is checked at start-up time. When the flag is set, the start-up routines bypass the code that enables terminal interfaces. The only way to clear the flag is to reboot the RSTS/E system disk, thus reloading the initialization code. (See the description of bootstrapping devices in Section 3.11.) Therefore, use UNISYS immediately before starting the system. The following shows the use of the UNISYS option.

```
Option: UNISYS

Option: START

You currently have: JOB MAX = 24, SWAP MAX = 16K.

JOB MAX or SWAP MAX changes? (LF)

Any memory allocation changes? (LF)

You currently have crash dump enabled.

Crash dump? (LF)

20-JUN-78 (LF)
19:58? (LF)
All except console terminal being disabled.
?Can't find file or account
?Program lost-Sorry

Ready
```

In the example, the user specifies the UNISYS and START options. The START option asks the usual questions, then prints a message indicating that only the console terminal is enabled.

3.14 SETTING CONSOLE TERMINAL FILL CHARACTERISTICS

The FILL option sets fill characteristics for the console terminal. The characteristics set by FILL are in effect only while the initialization code is running. If the initialization code is running from tape, the settings remain only until you reboot the initialization code. If the initialization code is running from disk, the characteristics remain set when you reboot the initialization code. When you start timesharing, however, the characteristics are no longer in effect.

To invoke the FILL option, type FILL or FI in response to the OPTION: prompt. Valid responses are 0-7 and LA30S. Table 3-27 lists the responses recommended for DIGITAL terminals.

Table 3-27
Recommended Console Terminal Fill Characteristics

Fill Characteristic		Terminal
0		ASR33, KSR33, VT05, LA30, VT50, VT52, LA36
1		ASR35, KSR35
3		VT05B
LA30S		LA30S

To set fill characteristics for use during timesharing, use the appropriate TTYSET commands in the START.CTL and CRASH.CTL control files. For more information on TTYSET and control files, see the RSTS/E System Manager's Guide.

3.15 SUMMARY OF PROCEDURES

This section summarizes the procedures you must follow to tailor the SYSGEN system. Figure 3-2 illustrates the flow of the procedures.

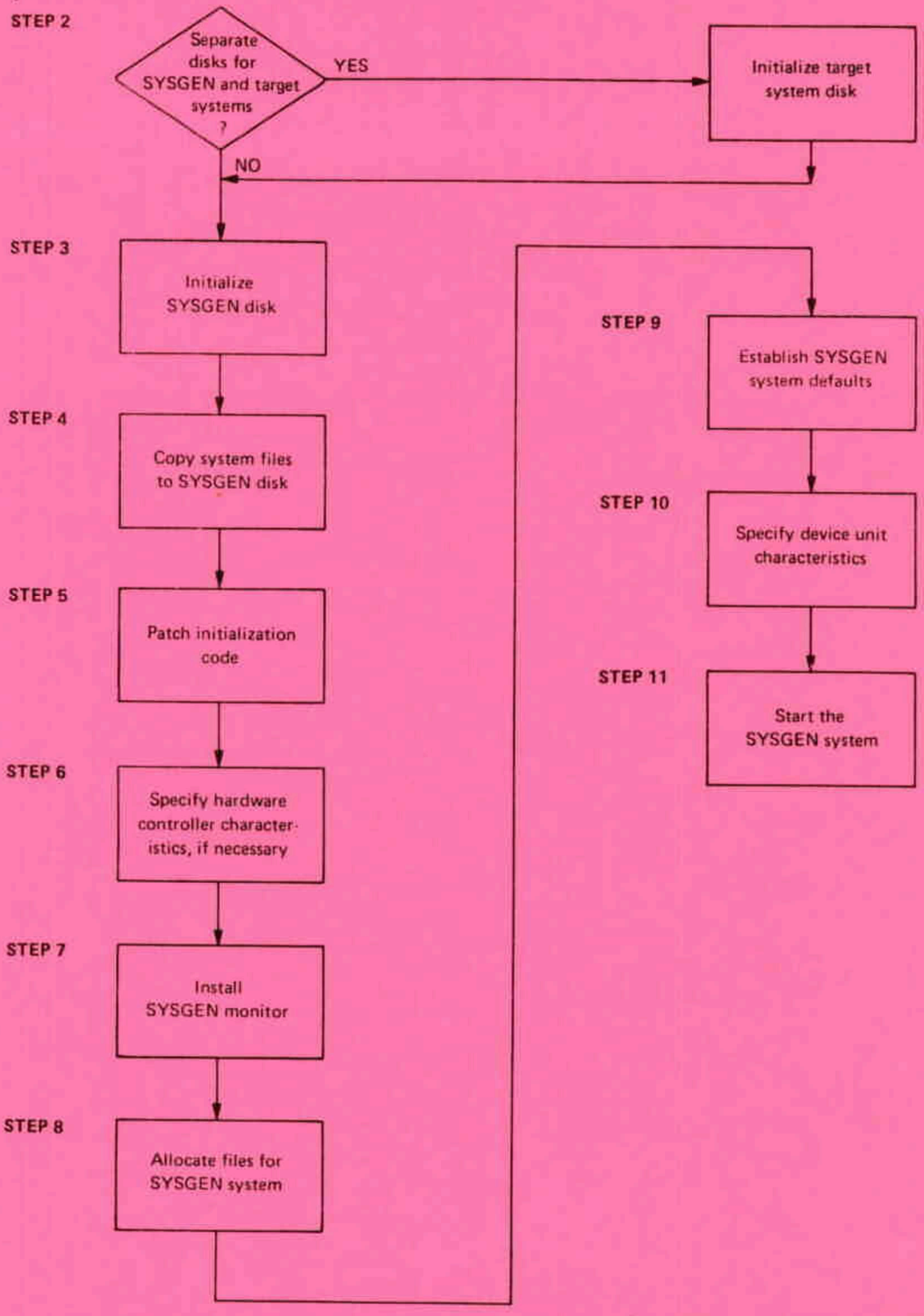


Figure 3-2 Summary of Tailoring Procedures for the SYSGEN System

STEP 2. Initializing a Disk for the Target System

Follow the procedure in this step if the following two conditions are true:

- You plan to use separate disks for the SYSGEN and target systems
- The target system disk does not contain data that you need to preserve

Procedure:

a. Physically mount the disk you plan to use as the target system disk.
b. Use the DSKINT option to initialize the disk as a system disk. Note that initialization destroys any data on the disk. Table 3-28 summarizes the DSKINT option dialogue. Refer to Section 3.2 for complete information on the DSKINT option.
c. Dismount the newly initialized disk if you need the disk drive for the SYSGEN system disk.

Table 3-28
Summary of DSKINT Option

Question	Possible Responses
DD-MMM-YY?	Current date. Press LINE FEED to accept the date printed.
HH:MM?	Current time. Press LINE FEED to accept the time printed.
DISK?	DC, DF, DS, DK, DL, DP, DR, or DB
UNIT?	0-7 (asked for multi-unit controllers only) 0-3 for DL disks
PLATTERS(n)?	1-8 for DF disks 1-4 for DC disks Press LINE FEED to use the number in parentheses. (asked for DC and DF disks only)
PACK ID?	One to six alphanumeric characters
PACK CLUSTER SIZE?	1, 2, 4, 8, or 16 for RS11, RS64, RS03, RS04, RK05, RK05F, RL01, RK06, and RK07 disks 2, 4, 8, or 16 for RP02 and RP03 disks 4, 8, or 16 for RM02, RM03, RP04, and RP05 disks 8 or 16 for RP06 disks
SATT.SYS BASE?	A number from 1 to (disk size - 1). Press the LINE FEED key to let DSKINT place SATT.SYS at the first available space.
MFD PASSWORD?	One to six alphanumeric characters
MFD CLUSTER SIZE?	A power of two not less than the pack cluster size and not greater than 16
PUB, PRI, OR SYS?	PUB for a public disk PRI for a private disk SYS for a system disk
CREATE LIBRARY ACCOUNT?	Y or N (N skips the next two questions.)

Table 3-28 (Cont.)
Summary of DSKINT Option

Question	Possible Responses
LIBRARY PASSWORD?	One to six alphanumeric characters
LIBRARY UFD CLUSTER SIZE?	A power of two not less than the pack cluster size and not greater than 16. The library UFD cluster size must be at least 4.
DATE LAST MODIFIED?	Y or N
NEW FILES FIRST?	Y or N
USE PREVIOUS BAD BLOCK INFO?	Y or N
FORMAT?	Y or N
PATTERNS?	1-8. Append X to specify up to eight of your own patterns in addition to the standard patterns.
YOUR PATTERN?	An octal word from 1 to 177777. Press LINE FEED to indicate no more patterns. (Asked only if you appended X to the previous response.)
PROCEED (Y OR N)?	Y or N

STEP 3. Initializing the SYSGEN System Disk

Procedure:

a. If the SYSGEN system disk will be a moving-head device, mount it.
b. Use the DSKINT option to initialize the disk as a system disk. Refer to Summary Table 3-28 or Section 3.2 for more information.

STEP 4. Copying System Files to the SYSGEN Disk

Procedure:

Use the COPY option to copy RSTS/E system files to the SYSGEN system disk. Summary Table 3-29 contains questions and appropriate responses for this use of COPY. For further information on the COPY option, refer to Section 3.3.

Table 3-29
Summary of COPY Option

Question	Possible Response
DD-MMM-YY?	Current date or LINE FEED to accept the date printed.
HH:MM?	Current time or LINE FEED to accept the time printed.
TO WHICH DISK?	DC, DF, DS, DK, DL, DM, DP, DR or DB
UNIT?	07- (asked for multi-unit controllers only) 0-3 for DL disks

STEP 5. Correcting the System Code

Procedure:

a. Gather the RSTS/E Release Notes, the Software Dispatch, and any other published patches your system requires.
b. Follow the instructions in the published patches for patching the system initialization code. Refer to Section 3.4 for further information on the PATCH option.
c. If the instructions in the published patch direct you to rebootstrap the system, use the BOOT option (described in Section 3.11) to do so.

STEP 6. Specifying Hardware Controller Characteristics

Follow the procedure in this step if one or both of the following conditions are true:

- You are installing new hardware and need to ascertain the configuration. (Usually, DIGITAL Field Service personnel do this.)
- At system installation, a DIGITAL Field Service representative had to make software changes to the hardware configuration, and these changes must also be applied to the system you are now generating.

Procedure:

Use the HARDWR option to check the hardware configuration. For new hardware, list the hardware configuration and correct it if necessary. If you are regenerating an existing system, make any changes necessary for this system. Summary Table 3-30 contains information on the HARDWR option and its suboptions. For complete information, refer to Section 3.5.

Table 3-30
Summary of HARDWR Option

Question	Possible Responses
HARDWR SUBOPTION?	LIST DISABLE ENABLE CSR VECTOR DM RESET EXIT (applies changes and returns to OPTION:) CTRL/C (applies no changes and returns to OPTION:) You can abbreviate the names to their first 2 characters.
LIST Suboption:	
The LIST suboption does not ask questions.	
DISABLE Suboption:	
CONTROLLER TO DISABLE?	Controller name. Type ? for a list of controller names.
ENABLE Suboption:	
CONTROLLER TO ENABLE?	Controller name. Type ? for a list of controller names.
CSR Suboption:	
CONTROLLER WITH NON-STANDARD ADDRESS?	Controller name. Type ? for a list of controller names.
NEW CONTROLLER ADDRESS?	Type an even octal address greater than 160000. Type RE to remove a nonstandard address. Type CTRL/Z to return to HARDWR SUBOPTION? without specifying a new address.
VECTOR Suboption:	
CONTROLLER WITH NON-STANDARD VECTOR?	Controller name. Type ? for a list of controller names.
NEW VECTOR ADDRESS?	Type an even octal address from 0 to 776. Type RE to remove a nonstandard vector. Type CTRL/Z to return to HARDWR SUBOPTION? without specifying a new vector.
DM Suboption:	
DH for DMn (xxx)?	Type the DH11 unit number. Press LINE FEED to accept the current setting of xxx. Type CTRL/Z to return to the HARDWR SUBOPTION? question.
RESET Suboption:	
The RESET suboption does not ask questions.	
HERTZ Suboption:	
NEW AC LINE HERTZ?	Type 50 or 60.
SWITCH Suboption:	
SWITCH REGISTER?	Type ENABLE, DISABLE, or VOLATILE.

STEP 7. Installing the SYSGEN System Monitor

Procedure:

a. Use the INSTALL option to install the monitor. Type SYSGEN in response to the question SIL? Refer to Section 3.6 for further information on the INSTALL option.
b. Follow the instructions in the RSTS/E Release Notes and published patches to patch the SYSGEN monitor SIL.

STEP 8. Allocating Files for the SYSGEN System

Procedure:

Use the REFRESH option to allocate the necessary files. Summary Table 3-31 contains questions and appropriate responses for this use of REFRESH. Refer to Section 3.7 for further information on REFRESH.

Table 3-31
Summary of REFRESH Option

Question	Possible Responses
DD-MMM-YY?	Current date. Press the LINE FEED key to accept the date printed.
HH:MM?	Current time. Press the LINE FEED key to accept the time printed.
DISK?	DC, DF, DS, DK, DL, DM, DP, DR, or DB. Press the LINE FEED key to REFRESH the system disk.
UNIT?	0-3 for DC and DL disks 0-7 for all other disks
CLEAN?	Y to clean the disk. N or LINE FEED to omit the cleaning operation.
REFRESH SUBOPTION?	LIST, CHANGE, FILE, or BADS. Type EXIT or press the LINE FEED key to return to the OPTION: prompt.
LIST Suboption:	
The LIST suboption does not ask questions.	
CHANGE Suboption:	
filnam.ext CHANGES?	Y or N. Type CTRL/Z to return to the REFRESH SUBOPTION? query. Asked for the following files, in order: SWAP.SYS, SWAP0.SYS, SWAP1.SYS, SWAP3.SYS, OVR.SYS, ERR.SYS, BUFF.SYS, and CRASH.SYS. If you answer Y to filnam.ext CHANGES? for any file, the CHANGE suboption asks the DELETE?, SIZE?, and BASE? questions for that file. After you have answered the filnam.ext CHANGES? question for each of the listed files, the suboption asks the OTHER FILES? question.

Table 3-31 (Cont.)
Summary of REFRESH Option

Question	Possible Responses
DELETE?	Y or N. (Asked only if the file exists.) Type CTRL/Z to return to filnam.ext CHANGES? for the current file.
SIZE?	A decimal number of blocks. For the SYSGEN system, the size of SWAP.SYS must be at least 208 blocks for a 48K word system and 224 blocks for all other systems. Type CTRL/Z to return to filnam.ext CHANGES? for the current file.
BASE?	The decimal number of the logical block at which you prefer to start the file. Type OLD or the LINE FEED key to retain the file at its current starting location. Type 0 to place the file at the first available space. Type CTRL/Z to return to the filnam.ext CHANGES? question for the current file.
OTHER FILES?	Type a filename and extension to change another file in account [0, 1]. The suboption then asks the DELETE?, SIZE, and BASE? questions. Type N or LINE FEED to omit changes to other files.
FILE Suboption:	
FILE NAME?	Filename and extension
FILE EXISTS. DELETE IT?	Y or N. Type CTRL/Z to return to the FILE NAME? question.
SIZE?	A decimal number of blocks. Type CTRL/Z to return to the FILE NAME? question.
BASE?	The decimal number of the logical block at which you prefer to start the file. Type OLD or the LINE FEED key to retain the file at its current starting location. Type 0 to place the file at the first available space. Type CTRL/Z to return to the FILE NAME? question.
DELETABLE?	Y or N. Press the LINE FEED key for no change. Type CTRL/Z to return to the FILE NAME? question.
BADS Suboption:	
BADS?	Type LIST for a list of bad blocks in the bad block file. Type ADD to add bad blocks to the bad block file. Type EXIT or the LINE FEED key to return to the REFRESH SUBOPTION? query.
BLOCK NUMBER?	(Asked only if you answered ADD to the BADS? query.) Type a logical block number (in decimal) between 1 and the disk size minus 1.
REALLY ADD LOGICAL BLOCK nn TO BADB.SYS?	Y or N

STEP 9. Setting Defaults for the SYSGEN System

Procedure:

Use the DEFAULT option to set defaults. Summary Table 3-32 contains the questions and appropriate responses for this use of the DEFAULT option. Refer to Section 3.8 for further information on the DEFAULT option.

Table 3-32
Summary of DEFAULT Option

Question	Possible Responses
JOB MAX OR SWAP MAX CHANGES?	Y
NEW JOB MAX?	2
NEW SWAP MAX?	26 for a 48K word system 28 for all other systems
RUN-TIME SYSTEM?	RT11
ERROR MESSAGE FILE?	ERR
INSTALLATION NAME?	1-14 printable characters including spaces
ANY MEMORY ALLOCATION CHANGES?	Y or N
TABLE SUBOPTION?	LIST, PARITY, RESET, LOCK, UNLOCK, RTS, XBUF Type EXIT or the LINE FEED key to proceed to the CRASH DUMP? question. An address typed in response to any of the following questions can be expressed either as an absolute octal address or as a decimal integer followed by the letter K. To name a range of addresses, type two addresses in the specified format, separated by a hyphen. Legal addresses are, for example, 00577777, 21K, 00130000-00137777, and 18K-23K.
LIST, PARITY, and RESET Table Suboptions: These suboptions do not ask any questions.	
LOCK Table Suboption: LOCK ADDRESS IS?	 Address or range of addresses
UNLOCK Table Suboption: UNLOCK ADDRESS IS?	 Address or range of addresses
RTS Table Suboption: NEW RUN TIME SYSTEM ADDRESS IS?	 Starting address
XBUF TABLE Suboption: EXTENDED BUFFER SPACE ADDRESS RANGE IS?	 Address or range of addresses
CRASH DUMP?	Y or N
MAGTAPE LABELLING DEFAULT?	DOS
PREFERRED CLOCK?	P or L
DATE FORMAT?	ALPHABETIC or NUMERIC
TIME FORMAT?	AM/PM or 24-HOUR
POWER FAIL DELAY?	1 to 300

STEP 10. Specifying Device Unit Characteristics for the SYSGEN System

Procedure:

Use the SET option to specify characteristics. Summary Table 3-33 contains the questions and possible responses for the SET option. Refer to Section 3.9 for further information on SET.

Table 3-33
Summary of SET Option

Question	Possible Responses
SET SUBOPTION?	LIST, MODEM, LOCAL, LP, DISABLE, ENABLE, PRIV, UNPRIV. Type EXIT or the LINE FEED key to return to the OPTION: prompt.
LIST Suboption:	
DEVICE?	Type a device name; device name and unit number; device name and two unit numbers for a range of devices (for example, KB1-6); or press the LINE FEED key to list all devices
MODEM and LOCAL Suboptions:	
KB?	Type a decimal number between 0 and the highest numbered keyboard or a range of decimal keyboard numbers.
LP Suboption:	
UNIT?	Decimal unit number. Not asked if only one is present.
TYPE (xx)?	LP, LV, LS, or LA180. Press LINE FEED to accept the setting in parentheses. Press RETURN to print the characteristics associated with LP, LV, LS, and LA180.
WIDTH (n)?	Type a decimal number between 1 and 254 or press the LINE FEED key to accept the setting in parentheses. Common widths are 80 and 132 characters.
LOWER CASE (x)?	Y or N. Press LINE FEED to accept the setting in parentheses.
ENABLE and DISABLE Suboptions:	
DEVICE?	Type a device name or a device name followed by unit number. For ENABLE suboption only, type ALL to enable all devices.
UNIT?	Type a unit number in decimal or two unit numbers separated by a hyphen. Type ALL to enable or disable all units of a device. This question is not asked if you specify a unit number in response to the previous question.
PRIV and UNPRIV Suboptions:	
DEVICE?	Type a device name or device name followed by unit number. For the UNPRIV suboption only, type ALL to free access to all devices.
UNIT?	Type a unit number in decimal or two unit numbers separated by a hyphen. Type ALL to restrict or free access to all units of the device.

STEP 11. Starting the SYSGEN System

Procedure:

Use the START option to start the SYSGEN system. To invoke the option, type START or ST. Refer to Section 3.10 for information on start-up messages and errors. The SYSGEN system is configured for many devices that may not exist on your computer. Therefore, the initialization code normally disables the non-existent devices when it starts the system.

CHAPTER 4

GENERATING THE TARGET SYSTEM

After tailoring the SYSGEN system, your next step in the system generation procedure is generating the target system. The generation of the target system involves 1) running the program CREATE.SAV, 2) answering the system configuration questions, 3) running the program SYSBAT.SAV, and 4) shutting down the SYSGEN system.

The program CREATE.SAV includes a batch stream that copies several files to the SYSGEN disk. These files are used in generating the RSTS/E monitor and BASIC-PLUS run-time system. After copying the files, CREATE.SAV chains to the SYSGEN program, which asks the configuration questions.

Your answers to the configuration questions establish the hardware devices and optional software elements that the target system will support.

After answering the configuration questions, run the SYSBAT.SAV program. SYSBAT.SAV runs a batch file containing commands that cause the assembling of the monitor terminal drivers and system tables and the linking of the target system monitor and BASIC-PLUS run-time system. When the execution of SYSBAT.SAV is complete, shut down the SYSGEN system and proceed to Chapter 5 to tailor the target system.

NOTE

All filename extensions in this chapter are .SAV, if not explicitly stated.

4.1 RUNNING THE PROGRAM CREATE.SAV

The program CREATE.SAV includes a batch stream that 1) enables logins and 2) copies the files needed for target system generation to the SYSGEN disk. CREATE.SAV then chains to the SYSGEN program, which asks the configuration questions.

If your distribution medium is disk cartridge, logically mount it before running CREATE.SAV. Ensure that the disk drive is write protected. Use a command of the following form:

```
.MOUNT dev:SYSGNF/RO
```

Replace dev in the example with the device name (DK, DL, or DM) and unit number of the distribution disk. The /RO switch mounts the disk for read access only to prevent accidental destruction of data on the disk.

Start the execution of CREATE.SAV by typing the following command:

```
.R dev:CREATE.SAV
```

Replace dev in the command with the device name and unit number of the distribution medium. The program first enables logins for the SYSGEN system. Second, it copies the LOGIN.SAV program from the distribution medium to the SYSGEN disk. Third, it logs in on a pseudo keyboard under account [1,2] and uses PIP to copy the following files to the SYSGEN disk from the distribution medium:

LOGOUT
PIP
UTILTY
MACRO
CREF
LINK
SILUS
HOOK
SYSGEN
SYSBAT
ONLPAT
ERR.STB

The programs LOGIN, LOGOUT, PIP, and UTILTY are special versions of system programs that run under the RT11 run-time system and are necessary for system generation. Note that they do not necessarily accept the same commands as the BASIC-PLUS LOGIN, LOGOUT, PIP, and UTILTY programs.

The files MACRO, CREF, LINK, SILUS, HOOK, and ERR.STB are used later in the actual generation of the RSTS/E monitor and BASIC-PLUS run-time system. MACRO assembles TBL, TTDINT, and TTDVR, which are the system table and terminal service modules. All other system modules are assembled at DIGITAL before they are shipped. CREF generates the cross reference table that appears at the end of each assembly listing. LINK links modules of both the RSTS/E monitor and the BASIC-PLUS run-time system. SILUS creates correctly formatted Save Image Library files. HOOK makes the disk or tape that is output from the system generation process capable of being bootstrapped. ERR.STB defines the error symbols for the monitor and run-time system links. ONLPAT allows installation and verification of patches to RSTS/E object code.

The SYSGEN program asks the configuration questions.

SYSBAT is the program which, later in the generation process, interprets a batch file containing commands that run the preceding programs in order to generate the monitor and/or BASIC-PLUS run-time system.

CREATE.SAV generates a log file, named CREATE.LOG, on the system disk under the logged in account (normally [1,2]). In addition, it prints all the pseudo keyboard input and output on the console terminal (KB0:), indented two spaces from the left margin.

After CREATE.SAV copies all the necessary files, it logically dismounts the distribution disk (if the distribution medium is disk) and chains to the SYSGEN program.

4.2 ANSWERING THE CONFIGURATION QUESTIONS

The SYSGEN program automatically answers the configuration questions by printing a response (RES) in one of the three forms shown in Table 4-1.

Table 4-1
Automatic Answer Formats

Answer	Reason
RES	The program has ascertained that RES is the correct response.
#RES#	The program assumes that RES is the correct response.
#??#	The program does not know and cannot guess the correct response.

To accept the automatic answer, press the LINE FEED key. To override the automatic answer, type a response followed by the RETURN key. To obtain an explanatory form of the question, press only the RETURN key. If you need to return to an earlier question, press the ESC key (shown as ALT MODE on some terminals). Table 4-2 summarizes the possible responses to a configuration question.

Table 4-2
Possible Responses to Configuration Questions

Response	Meaning
<string>	<string> is the desired answer.
RETURN key	Print the long, explanatory form of the question.
LINE FEED key	Accept the automatic answer for the question. Not valid if the automatic answer is #??#.
ESC key	Return to the preceding question or to the first question in this sequence.

By using the ESC key, you can return to the previous question or to an earlier question in the current sequence. For example, pressing ESC in response to the RK05'S question returns you to the previous question, RS03/RS04'S. Within a sequence of questions, ESC causes a return to the first question in the sequence. As an example, pressing ESC in response to the DATASET SUPPORT FOR DH11'S question backs up to the DH11'S question. You cannot back up beyond certain configuration questions, which delimit sections of the configuration dialogue. These questions are as follows:

KL11, LC11, DL11A, DL11B'S?
RC11/RS64'S?
TU16/TE16/TE45'S?
RX01'S?
MAXIMUM JOBS?
FPP?

If you press ESC in response to any of the listed questions, the SYSGEN program reprints the question.

The SYSGEN program uses the responses to the configuration questions to create a batch file, SYSGEN.CTL. If you are generating a monitor, the file CONFIG.MAC is also created. CONFIG.MAC defines assembly parameters for the target monitor. The SYSBAT program uses the SYSGEN.CTL file to perform the requested generation. The remainder of this section describes the configuration questions in detail.

4.2.1 Preliminary Considerations

The system can print the configuration questions in either a short form or a long form. The short form questions are merely a brief prompt. The long form questions include helpful information. If you specify the short form questions, you can request the long form for any question by pressing the RETURN key in response to the short form prompt.

You can generate RSTS/E for the computer on which you are working or for another computer. If you specify that you are generating RSTS/E for another computer, the SYSGEN program prints #??# for all hardware automatic answers because it cannot perform hardware checks to ascertain the answers.

You must specify the distribution medium on which you received the RSTS/E kit. The automatic answer to the DISTRIBUTION MEDIUM question is #??#. Answer by typing the device name of the distribution medium (MM, MT, DK, DL, or DM). Remember that the device names MM and MT are not equivalent on the SYSGEN system. If the system generation files are on the current system disk (e.g., if you are generating RSTS/E on-line), type SY to specify the system disk.

The generated system can be output to the SYSGEN disk, another disk, magtape, or DECtape. DIGITAL recommends that the SYSGEN disk be the output medium only if that disk is a DM, DP, DR, or DB type disk. If the output medium is an RK05, RL01, or smaller disk, the generated system should be output to a new disk or to a tape. Only the system initialization code, error message file, generated monitor SIL file, and generated run-time system file are written on an output disk to avoid cluttering the disk. An output DECtape receives the four system files above and the file CONFIG.MAC. An output magtape receives the four system files, all load maps, and the listing files. The automatic answer to the OUTPUT MEDIUM question is SY if the SYSGEN disk is large. Otherwise, the automatic answer is the same as the specified distribution medium.

NOTE

The SYSGEN system supports four RK05 drives and only two of each other disk type. If you plan to use a disk unit (not an RK05) other than 0 or 1 for the target system disk, you must use an intermediate medium (such as magtape) for output of the target system. You can later (as described in Chapter 5) copy the target system files to the final disk.

If you specify a disk as the output medium, the SYSGEN program prints the PACK ID question. Type the pack ID you specified when you initialized the output disk.

The system generation process places many files on the SYSGEN disk. If you need to conserve space on this disk, these files can be deleted after they are used. To delete the system generation files, answer YES to the DELETE FILES question. To retain the files, answer NO. On small disks (e.g., RF11), the system generation process will not complete unless you delete the files.

System generation creates load maps and (during RSTS/E monitor generation) assembly listing files. These files are unique for each system and contain valuable information for system documentation and maintenance. If a line printer is available during system generation, answer YES to the LP FOR SYSGEN question. The load maps will be printed automatically and you can request (in response to a later question) the printing of the assembly listings. If you answer NO to this question, none of the load maps or listings can be printed during system generation. If the answer to DELETE FILES is YES, but a line printer is not available, the load maps are not deleted from the SYSGEN disk.

The SYSGEN program allows you to generate an entire RSTS/E system, including monitor and BASIC-PLUS run-time system; only a monitor; or only the BASIC-PLUS run-time system. In addition, you can name both the RSTS/E monitor SIL and the BASIC-PLUS run-time system with any name you prefer. The name must be one to six alphanumeric characters. The default names for the RSTS/E monitor SIL and BASIC-PLUS run-time system are RSTS and BASIC, respectively. If you generate additional RSTS/E monitors or BASIC-PLUS run-time systems later, remember to assign different names to the new files.

4.2.2 Patching Monitor and BASIC-PLUS Code

The RSTS/E system contains a program, ONLPAT, which you can use to perform patches to system object code, or object code in programs you have created. The functions of ONLPAT are described in the RSTS/E System Manager's Guide.

The SYSGEN program allows you to include patching with ONLPAT. There is one set of queries for monitor patching and one set of queries for BASIC-PLUS Run-Time System patching. If you include either, the SYSBAT program will provide messages telling you when to mount the device on which your patch files reside.

4.2.2.1 Transferring RT11.RTS and PIP.SAV Files – If you want to transfer the RT11 Run-Time System, its utilities, and the PIP.SAV program to your target system, you may do so by typing YES in response to the SAVE RT11.RTS AND PIP.SAV? query.

If your target system and SYSGEN disk are the same, these files are automatically transferred. If you want to use optional software (see Section 6.3 and 6.4), and you are placing your target system on a disk other than your SYSGEN system, you must answer YES to this question.

4.2.3 Terminal Devices and Software

A RSTS/E system can handle a maximum of 128 terminals. An installation can have any combination of local and remote line interfaces as long as the total number of terminal lines and pseudo keyboards does not exceed 128.

RSTS/E assigns to each terminal a keyboard number ranging from 0 to 127. The system assigns keyboard number 0 to the console terminal and refers to the console terminal by the device designator KB0:. The type of line interface that connects a terminal (other than the console terminal) to the system establishes its keyboard number. The keyboard number associated with each line is important because you must use it as a basis for specifying the terminal speeds allowed on each of the variable speed lines on the system. (See the description of the TTYSET.SPD file in the RSTS/E System Manager's Guide.)

RSTS/E assigns keyboard numbers in the following order: the system console terminal; all KL11, LC11, DL11A, and DL11B lines; DC11 (remote dial); DL11C and DL11D lines; DL11E (remote dial); PK (pseudo keyboards); DJ11 lines; and DH11 and DZ11 lines in increasing order of unit number and increasing order of configured lines within each unit.

4.2.3.1 Terminal Interfaces – The answers to the configuration questions concerning the number of each type of terminal interface must accurately reflect the hardware configuration. For example, DL11C and DL11D interfaces are similar in construction and operation to the DL11A and DL11B interfaces. However, the interfaces have different ranges of UNIBUS addresses. Because of this similarity, new installations often have problems with improper configuration of the terminal interfaces. You should rely on the automatic answers to verify the terminal interface configuration.

SYSGEN requests the number of lines to enable for each DJ11, DH11, and DZ11 multiplexer unit on the system. Each DJ11 or DH11 multiplexer unit includes 16 lines. Each DZ11 multiplexer unit includes 8 lines. You need not enable every line on a DJ11, DH11, or DZ11. Therefore, RSTS/E can be configured for fewer than the maximum number of lines physically present on each multiplexer unit. Enable fewer than the maximum number of lines for a multiplexer unit when you need to conserve memory or when enabling all the lines would exceed the limit of 128 lines. For example, if four DH11 and four DJ11 units are present, you can enable at most 127 of the 128 possible lines (because of the console terminal, which is always on a single-line interface). If N lines (where N is less than 16) are enabled on a DH11 or DJ11, the lines numbered N through 15 on the unit are not enabled. Lines not enabled are not available for use and are treated as nonexistent. Thus, if you enable five lines on a DZ11, lines 0 through 4 are operational and lines 5 through 7 on that DZ11 cannot be used unless the system is regenerated.

If possible enable all multiplexer lines during system generation so that you can later use currently unused lines without regenerating the system. The configuration questions do not ask you to specify which enabled multiplexer lines are actually to be used or which lines are to have modem control enabled (if modems are configured). The SET initialization option allows you to temporarily enable or disable any keyboard line and to enable or disable modem control.

DH11 and DZ11 multiplexers can support automatic answer data sets. A DM11-BB connects a DH11 to an automatic answer data set. If your system includes one or more DH11 multiplexers and DM11-BB modem control multiplexers, you can include support for automatic answer data sets on the DH11s. DZ11-A and DZ11-B unit include partial modem control, but DZ11-C and DZ11-D units do not. If your system includes DZ11-A or DZ11-B units, you can include support for automatic answer data sets on the DZ11s.

4.2.3.2 Pseudo Keyboards – You can configure as many as 127 pseudo keyboards into the system. At least one pseudo keyboard is generated automatically into all systems. Each copy of the BATCH program requires one pseudo keyboard to run user jobs. If you plan to run several copies of BATCH simultaneously, specify at least one pseudo keyboard for each copy of BATCH. One additional pseudo keyboard is necessary for each application that will use the pseudo keyboard features described in the RSTS/E Programming Manual.

NOTE

RSTS/E permits a maximum total of 128 single line interfaces, enabled multiplexer lines, and pseudo keyboards. (The console keyboard is always enabled.) If you configure more than 128 lines and pseudo keyboards, the SYSGEN program prints a message after the pseudo keyboard question and repeats all the terminal interface questions.

4.2.3.3 2741 Terminals – RSTS/E supports 2741 compatible terminals connected to DL11D, DL11E, and DC11 single line interfaces and to DH11 and DZ11 multiplexers. 2741 terminals normally use the RS232 EIA standard connection; hence, they can be connected locally to the computer through null modems to any of the preceding interfaces. They can also be connected through data sets or acoustic couplers for operation over telephone lines. You can include 2741 support on any combination of single line interfaces (DL11D, DL11E, and DC11) and multiplexers (DH11 and DZ11).

NOTE

To function properly on a RSTS/E system, a 2741-type terminal must have the Transmit Interrupt feature, the Receive Interrupt feature, and the ATTN (or BREAK) key. These features allow the terminal to recognize a reverse break signal from the computer, lock its keyboard, and enter receive mode. Most companies usually provide these as standard features but a few offer them as optional at extra cost.

RSTS/E supports four code and keyboard arrangements for 2741 terminals: IBM Correspondence Code (CORR), Extended Binary Coded Decimal (EBCD), Standard Binary Coded Decimal (SBCD), and Call 360 BASIC Code (C360). The code and keyboard arrangements are described in the RSTS/E System User's Guide. You must define the code(s) your system should support so that the terminal service module can include them. You can specify any combination of the four supported codes.

If you configure more than one code, the terminal service includes a facility that enables a user at a 2741 terminal to change codes. The first code you name in response to the 2741 CODE(S)? question becomes the system default. For example, if your system will support both Correspondence and EBCD 2741 terminals, but you prefer EBCD as the default, type EBCD, CORR in response to the 2741 CODE(S)? question.

4.2.3.4 Multiple Terminal Service – The multiple terminal service option allows one BASIC-PLUS program to interact simultaneously with several terminals on one I/O channel. A BASIC-PLUS program can control several keyboards by establishing a master keyboard on a single channel and by assigning various other keyboards as slave terminals. To perform input or output, the program executes Record I/O statements on that single channel. It uses special software options to ascertain the keyboard being serviced. In addition, the system can automatically stall program execution in the absence of keyboard input. The system can then make the program eligible to run when keyboard input is pending from the master keyboard or from one of its slaves. Thus, a single program can interactively service low volume keyboard input and output associated with several stations. This facility eliminates the need to run separate copies of the same program at each terminal when several terminals must perform a similar function. Multiple terminal service is explained in detail in the RSTS/E Programming Manual.

4.2.3.5 Echo Control – The echo control option allows a full duplex terminal to simulate block mode operation. A program can define fixed-length fields for user input and accept input from only one field at a time. Echo control also enables a program to define special characters for character deletion sequences within a field. Echo control is useful for data entry and other applications in which the programmer needs to control the appearance of terminal output. A complete description of the echo control facility is presented in the RSTS/E Programming Manual.

4.2.4 Disk Devices

Disks in the RSTS/E system operate in either the public or private structure. The disk that contains the system accounts and executable code of RSTS/E is called the system disk and is the first disk of the public structure. All other disks in the system are referred to collectively as nonsystem disks.

A removable system disk is more practical on a RSTS/E system than a fixed system disk. A removable cartridge or pack can be taken from the computer area when the system is not operating and kept in a safe place to reduce the chances of inadvertent or malicious destruction. To provide the same level of security with a fixed platter disk, you must copy the contents to a secondary medium each time you shut down the system.

If the system requires a large amount of public storage space, a single, large-capacity disk pack drive is preferable to multiple RK05, RK05F, RL01, or RK06 DECpack disk drives. Each time a file is created within the public structure, the system searches the directories of each public disk to ensure that a file of the same name does not already exist. The use of multiple disks in the public structure increases the overhead required for such a search. You can use private disks rather than public disks as a method of reducing overhead on systems with multiple disk drives.

An RK05F moving head fixed disk is basically two RK05s with one set of read heads. It has twice the capacity of a single RK05, and provides increased capability at lower cost than multiple RK05s. Unit designations for each RK05F are an even-odd pair (e.g., 2 and 3, 4 and 5). You must initialize and format each half of the disk separately. An RK05F can be assigned unit designations of 0 and 1 and can be used as the system disk. However, DIGITAL recommends for security purposes that the system disk be a removable cartridge. Therefore, you can most effectively use an RK05F as a nonsystem disk.

You can obtain optimum performance if the system is configured with a removable, moving head disk and a fixed head disk. With such a configuration, the monitor can swap user jobs out of memory onto the faster fixed head disk. Disk accessing operations on the moving head system device can then be confined to manipulating user files and directories while the faster fixed head device takes on the burden of moving user jobs into and out of memory. In such a case, the fixed head disk need not contain valuable system data. At the start of time sharing operations, you can install swapping areas on the fixed head disk.

All moving head disk controllers except the RL01 allow several drives to perform seek operations simultaneously. Since the controller is not busy during seek operations, data transfers on one drive can overlap seeks in progress on other drives. If more than one drive is on the same controller, you can configure an overlapped seek driver to accelerate processing for the disks on that controller. The overlapped seek drivers, however, require more memory than the nonoverlapped seek drivers. The overlapped seek drivers provide advantages in throughput that normally outweigh the disadvantages of the additional memory required. Therefore, DIGITAL recommends the overlapped seek drivers for all systems with more than one disk drive on a single controller. The only exception to this recommendation is a system with a single RK05F disk and no RK05 disks. Because the RK05F disk has only one set of read heads for the even-odd unit pair, no overlapping can take place. You should configure the nonoverlapped seek driver for such a disk system.

4.2.5 Peripheral Devices

The use of peripheral devices on the RSTS/E system reduces the burden of storage requirements on the disks and provides convenient media for file archives. You can store infrequently used program and data files on magnetic tape (DECtape or magtape), paper tape, and diskette. You can access the files readily when necessary. The paper tape reader and card reader provide convenient methods of input. You can improve the production of hard copy output on the RSTS/E system by using multiple line printers with different characteristics.

If the RSTS/E system has a card reader, configure one of the four following card codes: ANSI standard, DEC029, DEC026, or IBM 1401. Refer to the Appendix of the RSTS/E Programming Manual for these card codes. The default card code is ANSI.

4.2.6 DECnet/E Network Support

DECnet/E is the DIGITAL network package for RSTS/E. DECnet/E allows user jobs to communicate with other DECnet systems in the network. The DECnet/E documentation describes in detail the concepts and capabilities of DECnet/E. The RSTS/E Programming Manual describes local communications. DECnet/E software is not included in the standard RSTS/E distribution kit but is licensed as a separate product. If your system includes DECnet/E, you must respond Y to the DECNET NETWORK SUPPORT query, then specify the medium on which you received the DECnet/E kit after the DECNET DISTRIBUTION MEDIUM? query.

For network operation, the system must include at least one DMC11 interprocessor link. RSTS/E supports up to 16 DMC11s.

Messages printed during SYSBAT processing tell you when to mount the medium containing the DECnet/E software.

4.2.7 RSTS/2780 Package

The 2780 package on RSTS/E allows users to communicate with other computers that have the 2780 Data Terminal package. The RSTS/2780 User's Guide describes the features of the 2780 package. The RSTS/2780 software is not included in the standard RSTS/E distribution kit, but is licensed as a separate product. Messages printed during system generation tell you when to mount the tape or disk containing the RSTS/2780 software. The 2780 package requires the KG11A communications arithmetic unit and a DP11, DU11, or DUP11 synchronous line interface unit.

4.2.8 System Capacity and Optional Features

4.2.8.1 Maximum Number of Jobs – With sufficient hardware, RSTS/E can handle up to 63 simultaneous jobs. You must specify a maximum number of jobs (the configured job maximum) at system generation time because this value determines the size of several monitor tables. You can set a lower maximum (the default job maximum) later when you set the system defaults. You cannot increase the configured job maximum without regenerating the RSTS/E monitor.

The maximum number of jobs that can be run efficiently depends on the memory space available and the number and types of disks on the system. Memory space requirements are described in Appendix D. To calculate the effect of disk devices, see Section 3.7.1.1, which describes swapping files.

4.2.8.2 Small Buffers – The RSTS/E system handles characters, data transfers, queued interjob messages, and file processing requests by using intermediate memory storage, called small buffers. Small buffers are 16-word storage units in the monitor part of memory. These buffers are a system resource. You must configure a sufficient number of them at system generation time. If you do not configure enough small buffers, jobs can become stalled because too few small buffers are available. Jobs must wait until enough buffers are freed by jobs currently claiming them.

The number of small buffers needed at any one time depends on the dynamic requirements of the jobs on the system. The automatic answer printed by the configuration question is computed as 9 for each configured job plus 80. This number is sufficient for most systems. Thus, for a typical 10-job system, you should configure 170 ((9 * 10) +80) small buffers.

For planning purposes, consider the following guidelines. Each active terminal requires four or five small buffers for normal input and output operations, and several more for echo control operations. Each job requires four small buffers for descriptive information about the job. Therefore, a system running 10 jobs and using 8 terminals needs 72 to 80 small buffers.

Next, consider the types of processing done on a typical system. Each file opened by a job requires one small buffer. If each of 10 jobs opens 2 disk files, RSTS/E needs 20 more small buffers. If all jobs open the maximum of 15 files simultaneously, 150 small buffers are necessary. On a typical system, the 2-file situation is more likely, so 20 more small buffers must be added for a running total of 92 to 100.

RSTS/E also uses small buffers for certain transient operations. The system uses one small buffer for each disk transfer queued by the monitor and one small buffer for each job that is installed as a message receiver. Many system programs, including QUEMAN, QUE, ERRCPY, BATCH, SPOOL, and OPSER, communicate through the send/receive system function calls. These system function calls claim one small buffer for each message queued for a receiving job. Normally, these operations use small buffers for short time periods (fractions of a second). A reasonable number of small buffers to allocate for such operations on the 10-job, 8-terminal system is approximately 35 small buffers, bringing the total to 127 to 135.

Unless the send/receive code can use extended buffer space (see Section 3.8.4.7), each pending message occupies small buffer space. The number of messages that the system can hold in the small buffer pool depends on the size of the messages and the speed with which the receiving job processes them. The following equation gives the number of small buffers (N) needed to process a message.

$$N = \frac{\text{length of message in bytes} + 8}{32} + 1$$

By substituting the correct value for the length of a message, performing the calculation, and rounding N up to the next integer, you can compute the number of small buffers needed to process any message. By using the equation, you can determine, for example, that a 512-byte message requires 18 small buffers. The size of the messages and the amount of message processing on the system affect the availability of small buffers. If the system processes many messages, you can improve system performance by allocating space to extended buffers.

Character-oriented output devices use small buffers to hold data awaiting output. These devices (line printer, terminal, and paper tape punch) have buffer quotas. A buffer quota is the number of small buffers a device should obtain for reasonable efficiency. The buffer quotas are 30 for a line printer, 10 for a terminal, and 6 for a paper tape punch. The sample system thus needs an extra 30 small buffers for one line printer. The running total is now 157 to 165 small buffers for an 8-terminal, 10-job system.

RSTS/E also uses small buffers for CCL commands and run-time systems. Each defined CCL command requires one small buffer. Auxiliary run-time systems (not the system default) that you add to the system with the UTILTY program also require one small buffer each. If the sample system has 10 CCL commands and 1 auxiliary run-time system, add another 11 small buffers to make the total 168 to 176.

The total requirement for an 8-terminal, 10-job system is approximately 170 small buffers, allowing for idle terminals and occasional system slowdown. Except for periods of heavy keyboard and message activity, enough free small buffers will be available to maintain good system throughput.

You can monitor system performance by observing the number of free small buffers available, as reported by the SYSTAT program. For good system performance, the number of free small buffers should never drop below 30.

4.2.8.3 System-Wide Logical Name Assignments – RSTS/E allows you to assign up to 50 logical names on a system-wide basis. Any user can type a system-wide logical name to access the device and account it represents. Each logical name assignment requires five words of monitor table space; therefore, you should not configure more logical assignments than your system will use. Refer to the RSTS/E Programming Manual or the System Manager's Guide for further information on system-wide logical names.

4.2.8.4 Monitor Statistics Gathering Package – The optional Monitor Statistics Gathering Package includes tables that record job, disk, and directory cache statistics. If you include the package, the code will be added to the monitor SIL.

4.2.8.5 File Processor Buffering – The optional file processor (FIP) buffering module accelerates file processing on the RSTS/E system. The module reduces the number of accesses to disk by maintaining more than one disk directory block in memory. FIP buffering is like cache memory operation in which faster access semi-conductor memory holds frequently used code or data to avoid accesses to the slower access main memory. The FIP buffering process improves the performance of system operations that involve accessing of disk directories because the related data are accessed in memory that is used as a cache. The following are representative operations that involve directory accesses:

- File OPEN and CLOSE operations
- Updating an in-memory window of a file
- Listing directories
- Wild card file operations
- Disk cleaning operations

Normally, FIP uses only one permanently allocated one-block buffer to store disk directory information. File processing is often delayed because at any given time the directory block that the file processor needs is not in its buffer.

The FIP buffering code claims free buffers from the normal small buffer pool and stores additional directory blocks in them. Frequently used information is thus kept in memory to avoid accesses to disk. If any of the buffers are required for their standard uses, the FIP buffering module releases them to the system. You need not increase the number of small buffers configured for other system operations when you include the FIP buffering module on the system.

You can enhance FIP buffering on the RSTS/E system by allocating additional memory for use by the FIP buffering module. The XBUF suboption of DEFAULT (Section 3.8.4.7) allows you to reserve a fixed amount of memory as extended buffer space. The FIP buffering module can use this space as a cache for disk directory blocks.

The module uses the available extended buffer space before it claims small buffers and does not use small buffers at all if you allocate more than 8K words of extended buffer space. By placing frequently accessed directory blocks in a special area of memory (the extended buffer pool), the FIP buffering module avoids disk accesses. This process prevents degradation of performance on a heavily loaded system, when fast access to directory blocks is needed and user jobs claim most of the small buffers.

With extended buffer space available, the FIP buffering module may increase the speed of an individual operation up to ten times or not at all (if the operation accesses none of the reserved memory). The module slightly degrades the performance of system operations that involve computing. Increased overhead in the monitor causes this degradation, which can be as low as a fraction of 1% or as high as 12%. Generally, the central processor degradation increases in direct proportion to the improvement in directory related operations.

RSTS/E allows you to control the FIP buffering facility with the ENABLE CACHE and DISABLE CACHE commands in the UTILTY program. (Refer to the RSTS/E System Manager's Guide for further information on the UTILTY program.) Therefore, you can disable the module if system use will be heavily compute-bound. You can later re-enable the module when speed of directory operations is needed. In general, however, the FIP buffering module greatly improves system performance and its use is strongly recommended.

4.2.8.6 Resident Code – You can configure certain portions of the overlay code to be resident in memory rather than to be stored on disk during time sharing. System performance improves if frequently used code is made resident. The size of each potentially resident segment of code is listed in Appendix D.

The most important code in terms of system performance is the disk-handling code. This code includes the following: 1) the system routines for disk file creation; 2) OPEN and CLOSE routines; 3) routines for processing the RUN command; 4) general routines for opening other devices, deassigning devices, fetching error messages, and looking up files by name; and 5) routines needed for logout. Because disk handling code is so frequently used, DIGITAL recommends that you configure it as resident if at all possible.

The send/receive code provides interjob communications for such programs as OPSER, QUEMAN, BATCH, and RJ2780. If your system applications require frequent interjob communication, resident send/receive code improves system performance.

The simple SYS call code is used whenever a program executes a SYS call to the file processor (SYS code 6). These SYS calls are often used in DIGITAL-supplied system library programs. If your system has more than 64K words of memory and frequently uses file processor SYS calls, you should make the SYS call dispatch code resident.

The file delete and rename code deletes and renames RSTS/E files. If your system is quite large or your applications require an inordinate number of file delete and rename operations, you may prefer to make the code resident.

The login, attach, and attribute code logs in and attaches jobs and performs file attribute read/write operations for systems that use the optional FCS/RMS-11 software. If your system is large or runs many programs that use FCS/RMS-11 files, you may prefer to make this code resident.

The directory listing code gathers information about disk directories, performs wildcard disk file lookups, and manipulates file identification blocks for certain files. This code is small, but it is less important than most of the other potentially resident code.

4.2.9 BASIC-PLUS Run-Time System Considerations

Several optional features are available for the BASIC-PLUS run-time system. These features include mathematical functions, the Print Using facility, matrix manipulation, and string arithmetic.

4.2.9.1 Floating Point Precision and Scaled Arithmetic – You can select either single-precision (2-word) or double-precision (4-word) floating point format as the type of numeric format to be used on the system. These floating point formats are described in Appendix E.1 of the BASIC-PLUS Language Manual.

Your answers to the FPP, FIS, MATH PRECISION, and FUNCTIONS questions establish which mathematical software package the SYSGEN program selects from the ten standard packages included in the RSTS/E distribution kit. Table 4-3 describes the 2-word math packages.

Table 4-3
Two-Word Math Packages

Math Package	Description
MA2, XL2, XT2	Without FIS or FPP; with extended functions
MA2	Without FIS or FPP; without extended functions
MA2I, XL2I, XT2I	11/40 compatible FIS; with extended functions
MA2I	11/40 compatible FIS; without extended functions
MA2F, XL2F, XT2F	11/45 compatible FPP; with extended functions
MA2F	11/45 compatible FPP; without extended functions

Table 4-4 describes the 4-word math packages.

Table 4-4
Four-Word Math Packages

Math Package	Description
MA4, XL4, XT4	Without FIS or FPP; with extended functions
MA4	Without FIS or FPP; without extended functions
MA4F, XL4F, XT4F	11/45 compatible FPP; with extended functions
MA4F	11/45 compatible FPP; without extended functions

The most critical difference among packages is the implementation of floating point operations. The PDP-11/45 compatible Floating Point Processor (FPP) provides both 2-word and 4-word floating instructions in hardware. The PDP-11/40 compatible Floating Instruction Set (FIS) does not provide 4-word floating point instructions in hardware. Therefore, on PDP-11/40 computers with or without FIS, RSTS/E must use the slower software packages (XL4, XT4 or MA4) to perform 4-word floating point operations.

On PDP-11 computers without FPP hardware, the size of a BASIC-PLUS run-time system that includes the 4-word floating point software may exceed the maximum of 16K words. To avoid exceeding the limit, you must omit some optional features when you configure BASIC-PLUS. Choose features from Table D-2 of Appendix D so that the total size of the BASIC-PLUS run-time system is at most 16383 words.

The scaled arithmetic feature is standard only on systems with 4-word floating point format. Scaled arithmetic is described in the BASIC-PLUS Language Manual and the SCALE command is described in the RSTS/E System User's Guide. Scaled arithmetic helps users to avoid problems such as loss of precision normally associated with floating point calculations. The feature is useful for calculating sums that cannot be manipulated easily as integer quantities.

4.2.9.2 Mathematical Functions – You can reduce the size of the BASIC-PLUS language code by omitting the mathematical functions SIN, COS, TAN, ATN, SQR, EXP, LOG, and LOG10. These functions are described in the BASIC-PLUS Language Manual. Some installations may need only one part of the math functions (e.g., the logarithmic functions) and may prefer to delete the other part (i.e., the trigonometric functions) in favor of another option. (The polynomial calculation portion of the math functions is present if either or both of the trigonometric or logarithmic functions are included.)

4.2.9.3 Print Using Option – The PRINT USING optional feature allows BASIC-PLUS programs to perform special formatting of output as described in the BASIC-PLUS Language Manual. You can reduce the size of BASIC-PLUS by omitting this option.

4.2.9.4 Matrix Manipulation – BASIC-PLUS can operate on an entire matrix using single statements called MAT statements as described in the BASIC-PLUS Language Manual. You must configure this optional feature if you want to include the matrix manipulation (MAT statement) capability.

4.2.9.5 String Arithmetic – BASIC-PLUS can, at your option, include the special string arithmetic functions SUM$, DIF$, PROD$, QUO$, PLACE$, and COMP%. These functions perform arithmetic operations on strings of numerics, minus signs and decimal points, with an accuracy of up to 56 digits. The string arithmetic functions, although slow to execute, are useful for applications such as monetary conversions, which can involve numbers that require a high degree of precision. Refer to the BASIC-PLUS Language Manual for complete information on the string arithmetic functions.

4.3 RUNNING THE SYSBAT PROGRAM

After you answer the final configuration question, the SYSGEN program completes the building of the configuration file (CONFIG.MAC) and the batch control file (SYSGEN.CTL). The program then prints a message instructing you to edit the files (if desired) and start the batch process. If editing is necessary, use the program EDIT.SAV, which is on the distribution tape or disk.

Type R SYSBAT in response to the dot (.) prompt character to start the batch process. The batch process executes commands in the batch control file to generate the RSTS/E monitor Save Image Library (SIL) and the BASIC-PLUS run-time system. Normally, logins have been enabled by CREATE.SAV. If CREATE.SAV has not been run since the system was last started, the batch process fails to log in and aborts. You should run the UTILTY program and issue the LOGINS command before restarting the batch process.

The batch process performs input and output to a pseudo keyboard, and prints all pseudo keyboard input and output at the console terminal, two spaces indented. As it executes, the batch process may request that you mount the distribution medium, ready a line printer (if you requested assembly listings), and mount the output medium for the target system. The following is an example of a batch process request.

```
MOUNT AP-2773F-BC ON A MAGTAPE DRIVE

WITH NO "WRITE RING" AND SET TO "ON LINE"

Mount MM:"SYSGNF"-write locked
Unit ? 0
```

In response to the UNIT? question, type the unit number on which you have mounted the tape.

The batch stream begins by attempting to delete the assembly listing files and other system generation files from previous system generations. If you have never generated a system on the current disk or if you have already deleted the listing files, the batch process cannot find the files. If so, the following appears in the console print-out:

```
.R PIP.SAV
*TBL.OBJ,TTDINT.OBJ,TTDVR.OBJ/DE
?Can't find file or account - file TBL    .OBJ - continuing
?Can't find file or account - file TTDINT.OBJ - continuing
?Can't find file or account - file TTDVR .OBJ - continuing
*TBL.LST,TTDINT.LST,TTDVR.LST/DE
?Can't find file or account - file TBL    .LST - continuing
?Can't find file or account - file TTDINT.LST - continuing
?Can't find file or account - file TTDVR .LST - continuing
*RSTS.SAV,TER.SAV,EMT.SAV,FIP.SAV,OVR.SAV/DE
?Can't find file or account - file RSTS   .SAV - continuing
?Can't find file or account - file TER    .SAV - continuing
?Can't find file or account - file EMT    .SAV - continuing
?Can't find file or account - file FIP    .SAV - continuing
?Can't find file or account - file OVR    .SAV - continuing
*RSTS.MAP,TER.MAP,EMT.MAP,FIP.MAP,OVR.MAP/DE
?Can't find file or account - file RSTS   .MAP - continuing
?Can't find file or account - file TER    .MAP - continuing
?Can't find file or account - file EMT    .MAP - continuing
?Can't find file or account - file FIP    .MAP - continuing
?Can't find file or account - file OVR    .MAP - continuing
*RSTS.STB,TER.STB,EMT.STB,FIP.STB,OVR.STB/DE
?Can't find file or account - file RSTS   .STB - continuing
```

```
?Can't find file or account - file TER    .STB - continuing
?Can't find file or account - file EMT    .STB - continuing
?Can't find file or account - file FIP    .STB - continuing
?Can't find file or account - file OVR    .STB - continuing
*NSP.SAV,RJ2780.SAV/DE
?Can't find file or account - file NSP    .SAV - continuing
?Can't find file or account - file RJ2780.SAV - continuing
*NSP.MAP,RJ2780.MAP/DE
?Can't find file or account - file NSP    .MAP - continuing
?Can't find file or account - file RJ2780.MAP - continuing
*NSP.STB,RJ2780.STB/DE
?Can't find file or account - file NSP    .STB - continuing
?Can't find file or account - file RJ2780.STB - continuing
*^C
```

These error messages do not mean that errors have occurred in the system generation procedure. They simply indicate that the files from a previous system generation cannot be found and, therefore, cannot be deleted. The following errors may appear for the same reason when SYSBAT starts linking the BASIC-PLUS run-time system.

```
.R PIP.SAV
*BASIC.SAV,BASIC.STB/D
?Can't find file or account - file BASIC .SAV - continuing
?Can't find file or account - file BASIC .STB - continuing
*^C
```

If any other error messages appear in the batch print-out, the system generation process may be in error. Refer to Appendix B.3 for a description of batch process error messages.

When the execution of the batch stream is complete, SYSBAT prints an informative message and returns to the dot (.) prompt character.

4.4 SHUTTING DOWN THE SYSGEN SYSTEM

When the batch process completes execution and returns to the dot (.) prompt character, shut down the SYSGEN system.

To shut down the SYSGEN system, run the UTILTY program and issue the NO LOGINS and SHUTUP commands. (If you mounted any disks that the batch process did not logically dismount, issue the DISMOUNT command before issuing the SHUTUP command). The following example illustrates the procedure.

```
.R UTILTY
*NO LOGINS
*SHUTUP
```

The UTILTY program disables logins and shuts down the SYSGEN system. The shutdown procedure automatically loads into memory and bootstraps the RSTS/E system initialization code from the SYSGEN disk. Remove the distribution medium and store it in a safe place. After the system initialization code prints its identifying message and the OPTION: prompt, you can proceed to Chapter 5 to tailor the target RSTS/E system.

NOTE

After the SYSGEN system has been shut down, you may wish to restart it to correct errors that occur in the SYSBAT listing. To return to the configuration dialogue follow these steps:

1. Reboot the system.
2. Run the START option again. The system will return the message.

   ?CAN'T FIND FILE OR ACCOUNT

3. Run the UTILTY program by typing:

   .R UTILTY
   *LOGINS
   *CTRL/C

4. The system will return the prompt(.). Type R SYSGEN in response to the prompt: the system will return to the configuration dialogue.

4.5 SUMMARY OF PROCEDURES

This section summarizes the procedures you must follow to 1) run the CREATE.SAV program, 2) answer the configuration questions, 3) run the SYSBAT.SAV program, and 4) shut down the SYSGEN system. Figure 4-1 illustrates the flow of the procedures.

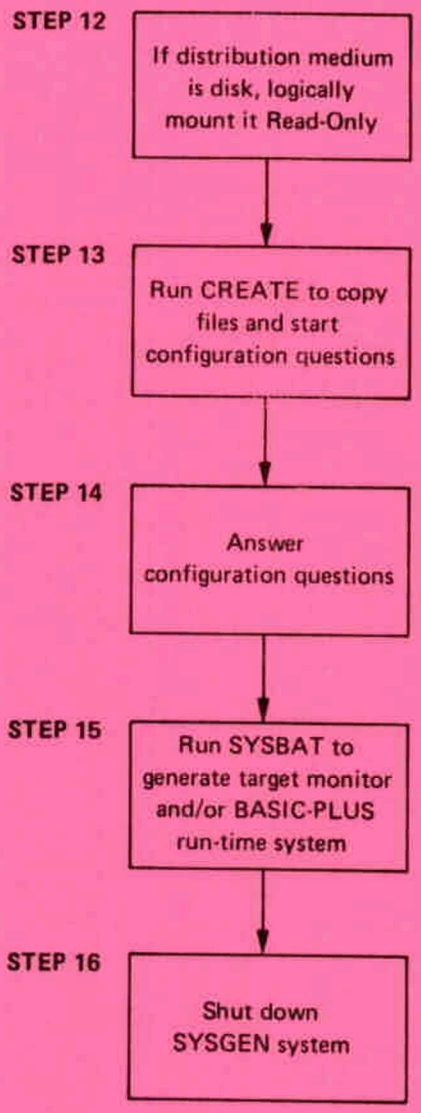


Figure 4-1 Summary of Batch and Configuration Procedures

STEP 12. Mounting the Distribution Disk

Procedure:

If your distribution medium is RK05, RL01, RK06, or RK07 disk cartridge, mount it on a free unit and ensure that it is write-locked. Type the following command to logically mount the disk:

```
.MOUNT dev:SYSGNF/RO
```

Replace dev: in the command with the device name and unit number on which the distribution disk cartridge is physically mounted.

STEP 13. Running the CREATE.SAV Program

Procedure:

Run the CREATE.SAV program, which includes a batch stream that transfers the SYSGEN program and several other programs to the system disk. Type the following command:

```
.R dev:CREATE.SAV
```

Substitute the name of the distribution medium (MM, MT, DK, DL, or DM) and the unit number on which it is mounted for dev.

STEP 14. Answering the Configuration Questions

Procedure:

The SYSGEN program automatically answers the configuration questions by printing a response in one of the three forms in Table 4-5.

Table 4-5
Automatic Answer Formats

Answer	Reason
RES	The program has ascertained that RES is the correct answer.
#RES#	The program assumes that RES is the correct answer.
#??#	The program does not know and cannot guess the correct answer.

Answer the configuration questions, referring to Sections 4.2 through 4.2.9.6 if necessary. Table 4-6 lists the possible responses to the configuration questions. Table 4-7 summarizes the short form questions.

Table 4-6
Possible Responses to Configuration Questions

Response	Meaning
<string>	<string> is the correct answer.
RETURN key	Print the long, explanatory form of the question.
LINE FEED key	Accept the automatic answer for the question. Not valid if the automatic answer is #??#.
ESC key	Return to the preceding question or to the first question in this sequence.

Table 4-7
Summary of Short Form Configuration Questions

Question	Possible Responses	Comments
FORM?	S, L	Answer S for short form or L for long form.
SAME SYSTEM?	Y, N	Answer Y if you are generating a system for the current machine.
DISTRIBUTION MEDIUM?	MT, MM, DK, DL, DM, SY	Specify the distribution medium type. If you are regenerating on-line, specify SY to use system generation files already on the system disk.
OUTPUT MEDIUM?	DF, DK, DL, DM, DP, DR, DB, MT, MM, DT, SY	The SYSGEN system supports four RK05 drives and only two of each other disk type. If you plan to use a disk unit (not an RK05) other than 0 or 1 for the target system disk, you must use an intermediate medium (such as magtape) for output of the target system. You can later (in steps 17 and 18) copy the target system files to the final disk.
PACK ID?	Pack ID specified when output disk was initialized	
DELETE FILES?	Y, N	Answer Y to delete SYSGEN system files from the SYSGEN disk after use.
LP FOR SYSGEN?	Y, N	If the answer to this question is N and the answer to DELETE FILES? is Y, the maps are not deleted.
GENERATE MONITOR?	Y, N	If N, the next question is BASIC-PLUS RTS NAME?
MONITOR NAME?	1 to 6 alphanumeric characters	The RSTS/E monitor SIL file has the extension .SIL. Do not type the name of a SIL that is already on the target disk.
ASSEMBLY LISTINGS?	Y, N	Asked only if the answer to LP FOR SYSGEN? is Y. The automatic answer is Y if the answer to DELETE FILES? is Y.
MONITOR PATCHING?	Y, N	If answer is NO, next three questions skipped.
PATCH FILE MEDIUM?	DF, DK, DL, DM, DB, DR, MM, MT, DT, SY	

Table 4-7 (Cont.)
Summary of Short Form Configuration Questions

Question	Possible Responses	Comments
PACK ID?	Pack ID of patch file disk	Asked only when PATCH FILE MEDIUM is disk.
PATCH FILE NAME?	File specification	Default is: $MONITR.CMD
SAVE RT11.RTS AND PIP.SAV?	Y, N	Asked only when target system is on disk different from SYSGEN system.
GENERATE BASIC-PLUS	Y, N	If you answer N, the next question is KL11, LE11, DL11A, DL11B'S?
BASIC-PLUS RTS NAME?	1 to 6 alphanumeric characters	BASIC-PLUS run-time system file has the extension .RTS. Do not type the name of a run-time system that is already on the target disk.
BASIC-PLUS PATCHING?	Y, N	If answer is NO, next three questions skipped.
PATCH FILE MEDIUM?	DF, DK, DL, DM, DB, DR, MM, MT, DT, SY	
PACK ID?	Pack ID of patch file disk	Asked only when PATCH FILE MEDIUM is disk.
PATCH FILE NAME?	File specification	Default is: $BASIC.CMD.
KL11, LC11, DL11A, DL11B'S?	1 to 16	Include the console terminal in your count.
DL11C, DL11D'S	0 to 31	
DC11'S?	0 to 32	
DL11E'S?	0 to 31	After this question, SYSGEN returns to the KL11, LC11, DL11A, DL11B'S? question if you have configured any combination of DL11C, DL11D, or DL11E interfaces that total more than 31.
DJ11'S?	0 to 16	If you answer 0, the next question is DH11'S?
DJ11 UNIT xx LINES ENABLED?	0 to 16	SYSGEN repeats this question for each DJ11 unit configured.
DH11'S?	0 to 16	If you answer 0, the next question is DZ11'S?
DH11 UNIT xx LINES ENABLED?	0 to 16	SYSGEN repeats this question for each DH11 unit configured.
DATASET SUPPORT FOR DH11'S?	Y, N	
DZ11'S?	0 to 16	If you answer 0, the next question is PSEUDO KEYBOARDS?
DZ11 UNIT xx LINES ENABLED?	0 to 8	SYSGEN repeats this question for each DZ11 unit configured.
DATASET SUPPORT FOR DZ11'S?	Y, N	

Table 4-7 (Cont.)
Summary of Short Form Configuration Questions

Question	Possible Responses	Comments
PSEUDO KEYBOARDS?	1 to 127	If you have configured more than 128 terminals (including the console terminal and pseudo keyboards), SYSGEN returns to the KL11, LC11, DL11A, DL11B'S? question.
2741 SUPPORT?	Y, N	Asked only if you configured one or more DL11D, DL11E, DC11, DH11, or DZ11 interfaces. If you answer N, SYSGEN goes to the MULTI-TERMINAL SERVICE? question.
SINGLE LINE 2741 SUPPORT?	Y, N	Asked only if you configured DL11D, DL11E, or DC11 interfaces.
2741 SUPPORT ON DH'S?	Y, N	Asked only if you configured one or more DH11'S.
2741 SUPPORT ON DZ'S?	Y, N	Asked only if you configured one or more DZ11'S.
2741 CODE(S)?	CORR, EBCD, SBCD, C360	Any combination of the four codes is legal.
MULTI-TERMINAL SERVICE?	Y, N	
ECHO CONTROL?	Y, N	
RC11/RS64'S?	Y, N	
RF/RS11'S?	Y, N	
RS03/RS04'S?	0 to 8	
RK05'S?	0 to 8	If the controller exists, the automatic answer is 8. If the answer is 0 or 1, SYSGEN skips the next question. Remember to count RK05F disks as two RK05 units.
OVERLAPPED SEEK?	Y, N	
RL01'S	0 to 4	
RK06/RK07'S	0 to 8	If the answer is 0 or 1, SYSGEN skips the next question.
OVERLAPPED SEEK?	Y, N	
RP02/RP03'S?	0 to 8	If the controller exists, the automatic answer is 8. If the answer is 0 or 1, SYSGEN skips the next question.
OVERLAPPED SEEK?	Y, N	
RM02/RM03'S	0 to 8	If the answer is 0 or 1, SYSGEN skips the next question.
OVERLAPPED SEEK?	Y, N	
RP04/RP05/RP06'S?	0 to 8	If you answer 0 or 1, SYSGEN skips the next question.

Table 4-7 (Cont.)
Summary of Short Form Configuration Questions

Question	Possible Responses	Comments
OVERLAPPED SEEK?	Y, N	
TU16/TE16/TU45'S?	0 to 8	If the controller exists, the automatic answer is 8.
TU10/TE10/TS03'S?	0 to 8	If the controller exists, the automatic answer is 8.
DECTAPES?	0 to 8	If the controller exists, the automatic answer is 8.
PRINTERS?	0 to 8	
RX01'S?	0 to 8	If the controller exists, the automatic answer is 8.
CR11/CM11 CARD READER?	Y, N	
CD11 CARD READER?	Y, N	
CARD DECODE?	029, 026, 1401, ANSI	SYSGEN skips this question if you answered N to the two previous prompts.
P. T. READER?	Y, N	
P. T. PUNCH	Y, N	
DMC11'S?	0 to 8	If you answer 0, SYSGEN skips the next two questions.
DECNET NETWORK SUPPORT?	Y, N	If you answer N, SYSGEN skips the next two questions.
DECNET/E DISTRIBUTION MEDIUM?	MT, MM, DK, DL, DM, DT, SY	
DECNET/E PATCHING?	Y, N	
2780 SUPPORT?	Y, N	If you answer N, SYSGEN skips the next two questions.
2780 INTERFACE?	DP, DU, DUP	
2780 DISTRIBUTION MEDIUM?	MT, MM, DK, DL, DM, DT, SY	
MAXIMUM JOBS?	1 to 63	
SMALL BUFFERS?	30 to 999	The automatic answer is 9 times the configured job maximum plus 80, but no more than 500.
SYSTEM WIDE LOGICALS?	5 to 50	
MONITOR STATISTICS?	Y, N	
FIP BUFFERING?	Y, N	
RESIDENT DISK HANDLING?	Y, N	
RESIDENT SEND/ RECEIVE?	Y, N	
RESIDENT SIMPLE SYS CALLS?	Y, N	

Table 4-7 (Cont.)
Summary of Short Form Configuration Questions

Question	Possible Responses	Comments
RESIDENT FILE DELETE/RENAME?	Y, N	
RESIDENT LOGIN/ ATTACH/ATTRIBUTE?	Y, N	
RESIDENT CATALOG/ LOOKUP?	Y, N	
FPP?	Y, N	The remaining questions are asked only when you are generating BASIC-PLUS. If you answer Y, SYSGEN skips the next question.
FIS?	Y, N	
MATH PRECISION?	2, 4	
LOG FUNCTIONS?	Y, N	
TRIG FUNCTIONS?	Y, N	
PRINT USING?	Y, N	
MATRICES?	Y, N	
STRING ARITHMETIC?	Y, N	

STEP 15. Running the SYSBAT Program

Procedure:

a. Type the following command to start the execution of the batch process:

```
.R SYSBAT
```

b. When the batch process asks you to mount a disk or tape, to enable a line printer, do so. Answer its UNIT? query by typing the unit number on which you mounted the disk or tape or the unit number of the line printer you enabled. If the SYSGEN system is running, only line printer unit 0 is legal.

STEP 16. Shutting Down the SYSGEN System

Procedure:

Run the UTILTY program and issue to NO LOGINS and SHUTUP commands, as follows:

```
.R UTILTY
*NO LOGINS
*SHUTUP
```

The shutdown procedure automatically loads and bootstraps the system initialization code from the current system device. Remove the distribution medium and store it in a safe place.

CHAPTER 5
TAILORING THE TARGET SYSTEM

After generating the target system, use the initialization code to tailor the target system to your installation. You need to 1) bootstrap the target disk, 2) install the target monitor, 3) correct the system code, 4) manipulate the system files, 5) establish default start up conditions for the target system, 6) specify device unit characteristics, and 7) start the target system.

5.1 BOOTSTRAPPING THE TARGET DISK

Before you can install the target monitor, the initialization code must be running and the system device must be the target disk. If the SYSBAT batch process wrote the target system on the SYSGEN system disk, the system shut down procedure has already loaded the initialization code from the target disk. Proceed to Section 5.2 to install the target monitor.

If the batch stream wrote the target system on another disk or on tape, bootstrap that disk or tape. Next, if the target system is on tape, copy the target system files to the target disk. The copying operation automatically bootstraps the target disk. After the target disk is bootstrapped, you can set hardware characteristics (if necessary).

5.1.1 Bootstrapping the Disk or Tape

Use the BOOT option (described in Section 3.11) to bootstrap the disk or tape output from the SYSBAT batch process. Type BOOT or BO in response to the OPTION: prompt. When the BOOT DEVICE: prompt appears, type the device name and unit number of the disk or tape to be bootstrapped. The initialization code bootstraps the device and returns to the OPTION: prompt. If the target system is on disk, proceed to Section 5.1.3 to set hardware characteristics. If the target system is on tape, follow the procedures in Section 5.1.2 to transfer the target system files from tape to disk.

5.1.2 Copying Files from Tape to Disk

If you have not already initialized the target disk, use the DSKINT option to do so. Type DSKINT or DS to invoke the DSKINT option, and then use the option to initialize the disk as a system disk. Refer to Section 3.2 for a complete description of the DSKINT option.

After initializing the target disk, use the COPY option (described in Section 3.3.) to copy the system initialization code, the RSTS/E monitor SIL, the run-time system file, and the default error message file from tape to the target system disk. The COPY option automatically bootstraps the target system disk.

You can now set hardware characteristics for the target system disk.

5.1.3 Specifying Hardware Characteristics

If you have not previously used the target disk as a system disk (or if the target disk is a fixed head disk), you may need to set console terminal fill characteristics and correct the hardware configuration.

If your console terminal has a fill characteristic other than 0, use the FILL option (Section 3.1.4). The FILL option allows you to set fill characteristics for a variety of terminal types.

The DIGITAL field service engineer who installed your system may have informed you of changes that are necessary for your system's hardware configuration. Use the HARDWR option (Section 3.5) to make any necessary changes.

5.2 INSTALLING THE TARGET MONITOR

Use the INSTALL option (described in Section 3.6) to install the target RSTS/E monitor. To invoke the INSTALL option, type INSTALL or IN in response to the initialization code's OPTION: prompt. When the option prints the SIL? query, type the name you specified for the RSTS/E monitor SIL during the configuration questions. The INSTALL option checks the monitor SIL for format, sets bits in the monitor SIL to install it, then returns to the OPTION: prompt. Execution of the INSTALL option takes about 30 seconds.

5.3 CORRECTING THE SYSTEM CODE

If you used Autopatch to correct the system code, then the patches are already in place. Otherwise, use the PATCH option at this point. Note that optional patches may be performed here also. Consult the RSTS/E Release Notes and other software publications for patches that your system requires. Follow the instructions in the published patch. If you need more information on the PATCH option, refer to Section 3.4.

5.4 ALLOCATING SYSTEM FILES

The REFRESH option (Section 3.7) creates, deletes, and positions files on any disk. If the target system is on the SYSGEN disk, you should use REFRESH to ensure that the system file allocation is correct. If the target system is not on the SYSGEN disk, you may need to use REFRESH to create all the system files.

5.5 SETTING DEFAULT START UP CONDITIONS

The DEFAULT option (Section 3.8) establishes system defaults for job and swap maximums, the run-time system, the error message file, the installation name, memory allocation, crash dumps, and magtape labels. Use the DEFAULT option to set these defaults for the newly generated monitor.

5.6 SPECIFYING CHARACTERISTICS FOR UNITS OF DEVICES

The SET option (described in Section 3.9) establishes device characteristics on a unit-by-unit basis. If your system includes one or more line printers, use SET to declare type, width, and case for each unit. You can also enable and disable units of a device, enable and disable modem control for keyboards, and restrict the use of devices by unprivileged jobs.

5.7 STARTING THE TARGET SYSTEM

After you specify characteristics for units of devices, use the START option (Section 3.10) to start the target system. You can invoke the START option by typing START (or ST) or by pressing the LINE FEED key. If you type START or ST, the START option prints questions that allow you to change certain default start up conditions. After you answer the questions, the START option prints a list of all the disabled devices on the system. If you press LINE FEED to start timesharing, the START option prompts you for only the current date and time and prints only a line telling the number of disabled devices on the system. If you omit the questions (i.e. press LINE FEED), you cannot change any of the default start up conditions.

5.8 SUMMARY OF PROCEDURES

This section summarizes the procedures you must follow to start timesharing with the target system after the batch stream writes the target monitor to disk or tape. Figure 5-1 illustrates the flow of the procedures.

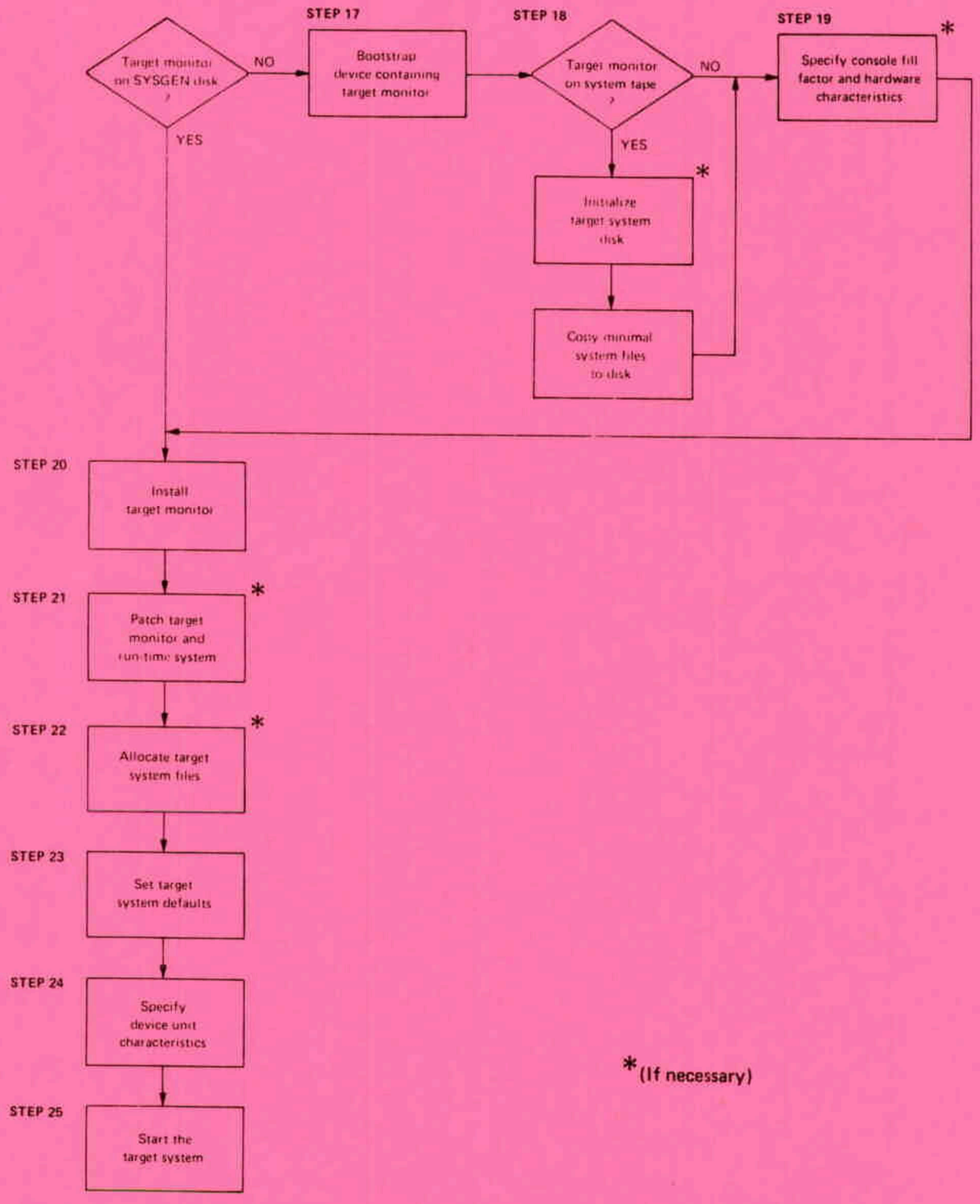


Figure 5-1 Summary of Start-up Procedures for the Target System

STEP 17. Bootstrapping the Device that Contains the Target System Monitor

Follow this procedure only if the batch stream wrote the target system monitor on a device other than the SYSGEN system disk.

Procedure:

Use the BOOT initialization option to bootstrap the initialization code from the device containing the target system monitor. Respond to the BOOT option prompt as follows:

BOOT DEVICE: xxn

Substitute the name of the device that contains the target monitor for xx and the unit number on which it is mounted for n.

STEP 18. Preparing the Target System Disk

Follow this procedure only if the batch stream wrote the target system monitor on a system tape or if the target system disk will be on unit 2-7 of a disk other than RK05.

Procedure:

a. If you have not already initialized the target system disk, use the DSKINT option now to do so. Summary Table 5-1 contains the DSKINT questions and possible responses. Refer to Section 3.2 for further information on DSKINT.

b. Use the COPY option to copy the target system files from the system tape to the target system disk. Summary Table 5-2 contains the COPY option questions and possible responses.

Table 5-1
Summary of DSKINT Option

Question	Possible Responses
DD-MMM-YY?	Current date. Press LINE FEED to accept the date printed.
HH:MM?	Current time. Press LINE FEED to accept the time printed.
DISK?	DC, DF, DS, DK, DL, DM, DP, DR, or DB
UNIT?	0-7 (asked for multi-unit controllers only) 0-3 for DL disks
PLATTERS(n)?	1-8 for DF disks 1-4 for DC disks Press LINE FEED to use the number in parentheses. (asked for DC and DF disks only)
PACK ID?	One to six alphanumeric characters
PACK CLUSTER SIZE?	1, 2, 4, 8, or 16 for RS11, RS64, RS03, RS04, RK05, RK05F, RL01, RK06, and RK07 disks 2, 4, 8, or 16 for RP02 and RP03 disks 4, 8, or 16 for RM02, RM03, RP04 and RP05 disks 8 or 16 for RP06 disks
SATT.SYS BASE?	A number from 1 to (disk size − 1). Press the LINE FEED key to let DSKINT place SATT.SYS at the first available space.
MFD PASSWORD?	One to six alphanumeric characters
MFD CLUSTER SIZE?	A power of two not less than the pack cluster size and not greater than 16
PUB, PRI, OR SYS?	PUB for a public disk PRI for a private disk SYS for a system disk
CREATE LIBRARY ACCOUNT?	Y or N (N skips the next two questions.)
LIBRARY PASSWORD?	One to six alphanumeric characters
LIBRARY UFD CLUSTER SIZE?	A power of two not less than the pack cluster size and not greater than 16. The library UFD cluster size must be at least 4.
DATE LAST MODIFIED?	Y or N
NEW FILES FIRST?	Y or N
FORMAT?	Y or N
PATTERNS?	1-8. Append X to specify up to eight of your own patterns in addition to the standard patterns.
YOUR PATTERN?	An octal word from 1 to 177777. Press LINE FEED to indicate no more patterns. (Asked only if you appended X to the previous response.)
PROCEED (Y OR N)?	Y or N

Table 5-2
Summary of COPY Option

Question	Possible Responses
DD-MMM-YY?	Current date or LINE FEED to accept the date printed.
HH:MM?	Current time or LINE FEED to accept the time printed.
TO WHICH DISK?	DC, DF, DS, DK, DL, DM, DP, DR, or DB
UNIT?	0-7 (asked for multi-unit controllers only) 0-3 for DL disks

STEP 19. Specifying Hardware Characteristics for the Target System Disk

Follow the procedures in this step only if the batch stream wrote the target system monitor on a device other than the SYSGEN system disk.

Procedure:

a. If necessary, use the FILL option to set the console terminal fill characteristics. Summary Table 5-3 contains the possible fill characteristics. Refer to Section 3.14 for further information on the FILL option.

b. If the DIGITAL field service engineer who installed your system informed you of any necessary hardware controller changes, use the HARDWR option to make those changes. Summary Table 5-4 contains the HARDWR option questions and possible responses. Refer to Section 3.5 for further information on the HARDWR option.

Table 5-3
Recommended Console Terminal Fill Characteristics

Fill Characteristic	Terminal
0	ASR33, KSR33, VT05, LA30, VT50, VT52, LA36
1	ASR35, KSR35
3	VT05B
LA30S	LA30S

Table 5-4
Summary of HARDWR Option

Question	Possible Responses
HARDWR SUBOPTION?	LIST DISABLE ENABLE CSR VECTOR DM RESET EXIT CTRL/C You can abbreviate the names to their first 2 characters. (applies changes and returns to OPTION:) (applies no changes and returns to OPTION:)
LIST Suboption:	
The LIST Suboption does not ask questions.	
DISABLE Suboption:	
CONTROLLER TO DISABLE?	Controller name. Type ? for a list of controller names.
ENABLE Suboption:	
CONTROLLER TO ENABLE?	Controller name. Type ? for a list of controller names.
CSR Suboption:	
CONTROLLER WITH NON-STANDARD ADDRESS?	Controller name. Type ? for a list of controller names.
NEW CONTROLLER ADDRESS?	Type an even octal address greater than 160000. Type RE to remove a nonstandard address. Type CTRL/Z to return to HARDWR SUBOPTION? without specifying a new address.
VECTOR Suboption:	
CONTROLLER WITH NON-STANDARD VECTOR?	Controller name. Type ? for a list of controller names.
NEW VECTOR ADDRESS?	Type an even octal address from 0 to 776. Type RE to remove a nonstandard vector. Type CTRL/Z to return to HARDWR SUBOPTION? without specifying a new vector.
DM Suboption:	
DH for DMn(xxx)?	Type the DH11 unit number. Press LINE FEED to accept the current setting of xxx. Type CTRL/Z to return to the HARDWR SUBOPTION? question.
RESET Suboption:	
RESET does not ask question.	
HERTZ Suboption:	
NEW AC LINE HERTZ?	Type 50 or 60.
SWITCH Suboption:	
SWITCH REGISTER?	Type ENABLE, DISABLE, or VOLATILE.

STEP 20. Installing the Target Monitor

Procedure:

Use the INSTALL option to install the target monitor. In response to the SIL? question, type the name you specified in response to the MONITOR NAME? configuration question. Refer to Section 3.6 for further information on the INSTALL option.

STEP 22. Allocating Target System Files

Procedure:

Use the REFRESH option to ensure that system files are correctly allocated. If the SYSGEN and target disks are the same, you may need only to list the file status table to be sure of the allocation. If the batch process wrote the target system on another device, you must allocate and position all files now. Summary Table 5-5 contains the REFRESH option questions and responses. Refer to Section 3.7 for further information on the REFRESH option.

Table 5-5
Summary of REFRESH Option

Question	Possible Responses
DD-MMM-YY?	Current date. Press the LINE FEED key to accept the date printed.
HH:MM?	Current time. Press the LINE FEED key to accept the time printed.
DISK?	DC, DF, DS, DK, DL, DM, DP, DR, or DB. Press the LINE FEED key to REFRESH the system disk.
UNIT?	0-3 for DC or DL disks 0-7 for all other disks
CLEAN?	Y to clean the disk. N or LINE FEED to omit the cleaning operation.
REFRESH SUBOPTION?	LIST, CHANGE, FILE, or BADS. Type EXIT or press the LINE FEED key to return to the OPTION: prompt.
LIST Suboption:	
The LIST suboption does not ask questions.	
CHANGE Suboption:	
filnam.ext CHANGES?	Y or N. Type CTRL/Z to return to the REFRESH SUBOPTION? query. Asked for the following files, in order: SWAP.SYS, SWAP0.SYS, SWAP1.SYS, SWAP3.SYS, OVR.SYS, ERR.SYS, BUFF.SYS, and CRASH.SYS. If you answer Y to filnam.ext CHANGES? for any file, the CHANGE suboption asks the DELETE?, SIZE?, and BASE? questions for that file. After you have answered the filnam.ext CHANGES? question for each of the listed files, the suboption asks the OTHER FILES? question.
DELETE?	Y or N. (Asked only if the file exists.) Type CTRL/Z to return to filnam.ext CHANGES? for the current file.

Table 5-5 (Cont.)
Summary of REFRESH Option

Question	Possible Responses
SIZE?	A decimal number of blocks. Type CTRL/Z to return to filnam.ext CHANGES? for the current file.
BASE?	The decimal number of the logical block at which you prefer to start the file. Type OLD or the LINE FEED key to retain the file at its current starting location. Type 0 to place the file at the first available space. Type CTRL/Z to return to the filnam.ext CHANGES? question for the current file.
OTHER FILES?	Type a filename and extension to change another file in account [0,1]. The suboption then asks the DELETE?, SIZE?, and BASE? questions. Type N or LINE FEED to omit changes to other files.
FILE Suboption:	
FILE NAME?	Filename and extension
FILE EXISTS. DELETE IT?	Y or N. Type CTRL/Z to return to the FILE NAME? question.
SIZE?	A decimal number of blocks. Type CTRL/Z to return to the FILE NAME? question.
BASE?	The decimal number of the logical block at which you prefer to start the file. Type OLD or the LINE FEED key to retain the file at its current starting location. Type 0 to place the file at the first available space. Type CTRL/Z to return to the FILE NAME? question.
DELETABLE?	Y or N. Press the LINE FEED key for no change. Type CTRL/Z to return to the FILE NAME? question.
BADS Suboption:	
BADS?	Type LIST for a list of bad blocks in the bad block file. Type ADD to add bad blocks to the bad block file. Type EXIT or the LINE FEED key to return to the REFRESH SUBOPTION? query.
BLOCK NUMBER?	(Asked only if you answered ADD to the BADS? query.) Type a logical block number (in decimal) between 1 and the disk size minus 1.
REALLY ADD LOGICAL BLOCK nn TO BADB.SYS?	Y or N

STEP 23. Setting Defaults for the Target System

Procedure:

Use the DEFAULT option to set defaults for the new monitor. Summary Table 5-6 contains DEFAULT option questions and responses. Refer to Section 3.8 for further information on the DEFAULT option.

Table 5-6
Summary of DEFAULT Option

Question	Possible Responses
JOB MAX OR SWAP MAX CHANGES?	Y or N.
NEW JOB MAX?	Decimal number from 1 to configured job maximum.
NEW SWAP MAX?	8 to 28.
RUN-TIME SYSTEM?	Name of the run-time system that you prefer as the system default.
ERROR MESSAGE FILE?	Name of the error message file that you prefer as the system default.
INSTALLATION NAME?	1-14 printable characters including spaces.
ANY MEMORY ALLOCATION CHANGES?	Y or N.
TABLE SUBOPTION?	LIST, PARITY, RESET, LOCK, UNLOCK, RTS, XBUF. Type EXIT or the LINE FEED key to proceed to the CRASH DUMP? question
LIST, PARITY, and RESET Table Suboptions: These suboptions do not ask any questions.	
LOCK Table Suboption: LOCK ADDRESS IS?	Address or range of addresses.[1]
UNLOCK Table Suboption: UNLOCK ADDRESS IS?	Address or range of addresses.[1]
RTS Table Suboption: NEW RUN TIME SYSTEM ADDRESS IS?	Starting address.[1]
XBUF Table Suboption: EXTENDED BUFFER SPACE ADDRESS RANGE IS?	Address or range of addresses.[1]
CRASH DUMP?	Y or N.
MAGTAPE LABELLING DEFAULT?	If the distribution medium is magtape, type DOS. If the distribution medium is DECtape or disk, type DOS or ANSI.
PREFERRED CLOCK?	P or L.
DATE FORMAT?	ALPHABETIC or NUMERIC.
TIME FORMAT?	AM/PM or 24-HOUR.
POWER FAIL DELAY?	1 to 300.

[1] An address typed in response to any of the following questions can be expressed either as an absolute octal address or as a decimal integer followed by the letter K. To name a range of addresses, type two addresses in the specified format, separated by a hyphen. Legal addresses are, for example, 00577777, 21K, 00130000-00137777, and 18K-23K

STEP 24. Specifying Characteristics for Units of Devices

Procedure:

Use the SET option to set modem control for keyboards, enable and disable device units, establish line printer characteristics, and set device assignment privileges. Summary Table 5-7 contains SET option questions and possible responses. Refer to Section 3.9 for further information on the SET option.

Table 5-7
Summary of SET Option

Question	Possible Responses
SET SUBOPTION?	LIST, MODEM, LOCAL, LP, DISABLE, ENABLE, PRIV, UNPRIV. Type EXIT or the LINE FEED key to return to the OPTION: prompt.
LIST Suboption:	
DEVICE?	Type a device name; device name and unit number; device name and two unit numbers for a range of devices (for example, KB1-6); or press the LINE FEED key to list all devices.
MODEM and LOCAL Suboptions:	
KB?	Type a decimal number between 0 and the highest numbered keyboard or a range of decimal keyboard numbers.
LP Suboption:	
UNIT?	Decimal unit number. Not asked if only one is present.
TYPE (xx)?	LP, LV, LS, or LA180. Press LINE FEED to accept the setting in parentheses Press RETURN to print the characteristics associated with LP, LV, LS, and LA180.
WIDTH (n)?	Type a decimal number between 1 and 254 or press the LINE FEED key to accept the setting in parentheses. Common widths are 80 and 132 columns.
LOWER CASE (x)?	Y or N. Press LINE FEED to accept the setting in parentheses.
ENABLE and DISABLE suboptions:	
DEVICE?	Type a device name or a device name followed by unit number. For ENABLE suboption only, type ALL to enable all devices.

Table 5-7 (Cont.)
Summary of SET Option

Question	Possible Responses
UNIT?	Type a unit number in decimal or two unit numbers separated by a hyphen. Type ALL to enable or disable all units of a device. This question is not asked if you specify a unit number in response to the previous question.
PRIV and UNPRIV Suboptions:	
DEVICE?	Type a device name or device name followed by unit number. For the UNPRIV suboption only, type ALL to free access to all devices.
UNIT?	Type a unit number in decimal or two unit numbers separated by a hyphen. Type ALL to restrict or free access to all units of the device.

STEP 25. Starting the Target System

Procedure:

Use the START option to start timesharing. The START option asks several of the DEFAULT option questions. When you answer these questions, you can override the defaults for the current timesharing session. These questions are summarized with the DEFAULT questions in Table 5-6. Refer to Section 3.10 for further information on the START option.

CHAPTER 6
BUILDING SYSTEM LIBRARY FILES AND OPTIONAL SOFTWARE

When you start the target system the monitor sets up job 1 under account [1,2], the system library account, then attempts to run the INIT.BAC system library program. Because you have not built the system library, there are no programs in the system library account [1,2]: the monitor therefore prints the message:

```
?CAN'T FIND FILE OR ACCOUNT
?PROGRAM LOST – SORRY
```

and returns control to the BASIC-PLUS command level. The console terminal (KB0:) can be used as if you had logged onto the system. Now, you can build the system library files and install the optional software required by your installation.

This chapter describes the procedures for building system library files and optional software, in the order you should follow to ensure complete generation of your system. In summary:

Section		Procedure
6.2	1.	Use the BUILD.BAC program to build the standard system library from the distribution medium.
6.2	2.	Use the Automated Patching Facility kit or the library patching procedures in the RSTS/E publications to install required patches (if any) to the standard library programs.
6.2	3.	Use the BUILD.BAC program to build the other system libraries required by your installation. Install any required patches for each library immediately after building that library.
6.3	4.	Install any auxiliary Run-Time Systems that are required by the optional software you will include in your system.
6.4	5.	Build the optional software required.
6.5	6.	Create text and message files for your timesharing system, using a PIP program or an editor. These files should be created: NOTICE.TXT, the system logon message file. HELP.TXT, the system help file. START.CTL, the system startup control file. CRASH.CTL, the system crash-restart file. ACCT.SYS, the standard account file.
6.6	7.	Use the REACT.BAC program to create user accounts in the Master File Directory of the system disk.

6.1 LIBRARY CONTROL FILES FOR THE BUILD PROGRAM

There are five system library control files on the RSTS/E distribution medium. Their purpose is summarized in Table 6-1. You must run the BUILD program using the BUILD.CTL file, since the standard system library is required for all RSTS/E systems. You build the other libraries only if you have planned to include their optional features in your system.

Table 6-1
Control Files for the BUILD Program

File	Function
BUILD.CTL	Builds the standard system library required for all systems.
SPLER.CTL	Builds the Spooling Programs system library files, executable only on a system with a SWAP MAX value of 16K words.
BIGPRG.CTL	Builds files for certain large programs, executable only on a system with a SWAP MAX value of 16K or greater.
BACKUP.CTL	Builds files for the BACKUP Package library, executable only on a system with a SWAP MAX value of 16K or greater.
UETP.CTL	Builds the User Environment Test Package library.

6.1.1 BUILD.CTL File

Commands in the BUILD.CTL file create a standard system library for all systems. Table 6-2 lists these programs and files. Section 6.5 supplies procedures for changing the sample ASCII text and message files. References provided in Table 6-2 are contained in this manual, the RSTS/E System User's Guide (SUG), the RSTS/E System Manager's Guide (SMG), or the RSTS/E Text Editor Manual.

Table 6-2
BUILD.CTL Programs and Files

Program or File Name	Protection	Description	Manual Reference
LOGIN.BAC	<232>	Logs users into system	SUG
LOGOUT.BAC	<232>	Logs users off system	SUG
BUILD.BAC	<124>	Builds system library files	Chapter 6, Section 7.4
PATCPY.BAC	<124>	Copies patch files	SMG
PBUILD.BAC	<124>	Builds system library patching files	SMG
CPATCH.BAC	<124>	Creates system library patching command files	SMG
AUTOED.BAC	<124>	Editor for system library patching	SMG
UTILTY package	<124>	System utility package	SMG
INIT.BAC	<124>	Initializes system at start of timesharing	SMG
SYSCAT.BAC	<124>	Creates a directory listing of accounts on a file structured device	SMG
PRIOR.BAC	<124>	Changes priority, run burst, and SWAP MAX value	SMG

Table 6-2 (Cont.)
BUILD.CTL Programs and Files

Program or File Name	Protection	Description	Manual Reference
TALK.BAC	<232>	Provides inter-terminal communications	SMG
ANALYS package	<124>	Analyzes system crash information and retrieves error data	SMG
SYSTAT.BAC	<232>	Reports system status	SMG SUG
UMOUNT.BAC	<232>	Mounts and dismounts private disks	SUG
QUOLST.BAC	<232>	Lists disk quota and usage data for current user	SUG
ERRINT.BAC	<124>	Validates or initializes ERRLOG.FIL for the ERRCPY program; chains to ERRCPY	SMG
ERRBLD.BAC	<124>	Builds error data file for use by ERRDIS package	SMG
ERRCPY.BAC	<124>	Copies hardware error data to a disk file	SMG
ERRDIS package	<124>	Formats error data	SMG
SHUTUP.BAC	<124>	Performs standard and OPSER system shut down	SMG
PIPSML.BAC	<104>	Transfers files from one peripheral device to another (small version)	SUG
SWITCH.BAC	<232>	Changes the private default Run-Time System	SUG
FILCOM.BAC	<104>	Compares ASCII files	SUG
MONEY.BAC	<104>	Performs system accounting functions	SUG SMG
GRIPE.BAC	<232>	Records user comments	SUG SMG
REACT.BAC	<124>	Creates user accounts	SMG
TTYSET.BAC	<232>	Sets terminal characteristics	SUG SMG

Table 6-2 (Cont.)
BUILD.CTL Programs and Files

Program or File Name	Protection	Description	Manual Reference
PLEASE.BAC	<232>	Prints requests at console terminal and interacts with OPSER package	SMG
INUSE.BAC	<104>	Prints terminal "INUSE" warning message	SUG
START.CTL	<60>	Sample system start up control file	SMG
CRASH.CTL	<60>	Sample system crash recovery control file	SMG
TTY.CMD	<60>	Sample indirect command file for setting terminal characteristics	SMG
SPOOL.CMD	<60>	Sample indirect command file for spooling and operator services package	SMG
RTS.CMD	<60>	Sample indirect command file for adding auxiliary run-time systems	SMG
CCL.CMD	<60>	Sample indirect command file for defining CCL commands	SMG
ANALYS.CMD	<60>	Sample indirect command file for crash analysis	SMG
ACCT.SYS	<60>	Sample system accounts file	SMG
PIPSML.TXT	<40>	PIP program help message text file (small version)	SUG
ERRDIS.HLP	<60>	Error display program help file	SMG
HELP.TXT	<40>	Sample system help message text file	SUG
NOTICE.TXT	<40>	Sample system notices text file	SUG
DIRECT.HLP	<40>	DIRECT program help message file	SUG
EDIT package	<104>	DOS compatible text editor	RSTS/E Text Editor Manual
ODT.BAC	<124>	Octal debugging tool	SMG
DSKINT.BAC	<124>	Initializes formatted disks	SMG
DIRECT.BAC	<232>	Lists device directories DIRECT handles disks, magtapes, and DECtapes (there is no 8K version)	SUG

Table 6-2 (Cont.)
BUILD.CTL Programs and Files

Program or File Name	Protection	Description	Manual Reference
COPY.BAC	<104>	Copies entire tapes and disk cartridges	SUG
REORDR.BAC	<124>	Restructures user file directories for optimal access	SMG
UTILTY.TXT	<60>	UTILTY program help message file	SMG
COPY.TXT	<40>	COPY program help message file	SUG

6.1.2 SPLER.CTL Files

Commands in the SPLER.CTL file create programs for the Spooling Package. Table 6-3 describes these programs. References provided in Table 6-3 are contained either in the RSTS/E System User's Guide (SUG) or the RSTS/E System Manager's Guide (SMG).

To build these files, you must have set the system SWAP MAX value large enough when you used the DEFAULT initialization option. If the current swap maximum is too small when BUILD creates a given program, the system generates the ?MAXIMUM MEMORY EXCEEDED error. After the BUILD program terminates, all of the SPLER.CTL files exist in the system library. Those programs that generated the ?MAXIMUM MEMORY EXCEEDED error cannot run on the system. You should delete them to prevent further errors. If the system does not require the queue management and batch facilities, delete the programs QUE, QUEMAN, QUMRUN, SPOOL, SPLIDL, SPLRUN, PLEASE, OPSER, OPSRUN, BATCH, BATIDL, BATDEC, BATRUN, BATDCD, and CHARS from the library.

Table 6-3
SPLER.CTL Programs and Files

Program or File Name	Protection	Description	Manual Reference
OPSER package	<124>	Operator services package	SMG
CHARS.BAC	<124>	Creates the character generation file	SMG
QUE.BAC	<232>	Creates requests for spooling programs	SUG
QUE Management Package	<124>	Queue management package	SMG
SPOOL.CMD	<60>	Sample command file for starting up spooling programs. (Replaces the SPOOL.CMD file in the standard system library.)	SMG
BATDCD.BAC	<124>	Creates BATCH program command decoding file BATCH.DCD	SMG
SPOOL package	<124>	Line printer spooling package	SMG
BATCH package	<124>	Batch control spooling package	SUG SMG

6.1.3 BIGPRG.CTL Files

Commands in the BIGPRG.CTL file create programs used with certain peripheral devices and optional software. References provided in Table 6-4 are contained in the RUNOFF User's Guide, the RSTS/E System User's Guide (SUG), or the RSTS/E System Manager's Guide (SMG).

Table 6-4
BIGPRG.CTL Programs and Files

Program or File Name	Protection	Description	Manual Reference
RUNOFF.BAC	<104>	Document formatting program	RUNOFF USER'S GUIDE
VT5DPY.BAC	<232>	Displays system status on VT05. Created from DISPLY.BAS and VT05.DPY	SMG
RUNOFF.RNO	<40>	Sample RUNOFF text file	See RUNOFF.DOC
PIPEXT.BAC	<104>	Extended Peripheral Interchange Program	SUG
VT50PY.BAC	<232>	Status display program for VT50 and VT52. Created from DISPLAY.BAS and VT50.DPY	SMG
FLINT.BAC	<104>	Copies files between diskettes and RSTS/E disks	SUG
PIPEXT.TXT	<40>	Extended PIP help message file	SUG
PMDUMP.BAC	<104>	Provides post-mortem dump of low memory and user job area.	SUG
BPCREF Package	<104>	Creates cross-reference listing for BASIC-PLUS programs	SUG
FLX.BAC	<104>	Converts RMS-compatible sequential files to and from ASCII stream or Formatted Binary formatted files	SUG
MAKRTS.BAC	<124>	Generates a Run-Time System file from a Task Image File. Use is restricted to DIGITAL maintenance.	
FLX.HLP	<40>	FLX program help message file	

6.1.4 BACKUP.CTL Files

Commands in the BACKUP.CTL file create programs for the BACKUP Package. Table 6-5 describes these programs. References provided in Table 6-5 are contained in either the RSTS/E System User's Guide (SUG) or the RSTS/E System Manager's Guide (SMG).

Table 6-5
BACKUP.CTL Programs and Files

Program or File Name	Protection	Description	Manual Reference
BACKUP.HLP	<40>	BACKUP package help message file	
BACKUP package	<232>	System Backup package	SMG SUG
BACDSK.BAC	<232>	Writes BACKUP file structure on disks	SMG

6.2 BUILDING SYSTEM LIBRARIES FROM DISTRIBUTION MEDIA

DIGITAL supplies the RSTS/E libraries on six distribution media: RK05, RL01, RK06, and RK07 disks, and 7- and 9-track magnetic tape. Table 6-6 identifies the contents of the library media.

Table 6-6
Contents of RSTS/E Library Distribution Media

Label	Medium	Control Files
AX-D528F-BC	RL01 (Pack ID= SYSL1F)	BUILD.CTL SPLER.CTL BIGPRG.CTL BACKUP.CTL UETP.CTL
AM-5445F-BC	RK06 (Pack ID= SYSL1F)	BUILD.CTL SPLER.CTL BIGPRG.CTL BACKUP.CTL UETP.CTL
AY-D526F-BC	RK07 (Pack ID= SYSGNF)	BUILD.CTL SPLER.CTL BIGPRG.CTL BACKUP.CTL UETP.CTL
AP-2725F-BC	7-track magtape	BUILD.CTL SPLER.CTL BIGPRG.CTL
AP-C726F-BC	7-track magtape	BACKUP.CTL UETP.CTL

Table 6-6 (Cont.)
Contents of RSTS/E Library Distribution Media

Label	Medium	Control Files
AP-2753F-BC	9-track magtape	BUILD.CTL SPLER.CTL BIGPRG.CTL
AP-C725F-BC	9-track magtape	BACKUP.CTL UETP.CTL
AN-2751F-BC	RK05 (Pack ID= SYSL1F)	BUILD.CTL SPLER.CTL BIGPRG.CTL
AN-5444F-BC	RK05 (Pack ID= SYSL2F)	BACKUP.CTL UETP.CTL

6.2.1 Building the Standard System Library from Magtape

To build the standard library, you will execute the BUILD.CTL file from the distribution medium.

Perform these steps:

1. Make sure there is no write-enable ring on the reel containing the standard library (see Table 6-6).
2. Mount the reel on a free unit.
3. Position the tape at its load point.
4. Set the ON-LINE/OFF-LINE switch to ON-LINE.
5. Run the BUILD program. For example:

```
RUN MT0:$BUILD
```

BUILD runs and prints the following dialogue. Respond as shown.

```
SYSTEM BUILD <NO>? YES
SOURCE INPUT DEVICE <MT0:/DENSITY:800/PARITY:ODD>? (LF)
LIBRARY OUTPUT DEVICE <SY:>? (LF)
TARGET SYSTEM DEVICE <SY0:>? (LF)
LIBRARY ACCOUNT <[1,2]>? (LF)
 ***COPYING FILE MT0:[1,2]BUILD.CTL TO SY:BUILD.TMP
```

The BUILD program now begins executing commands in the BUILD.CTL file.

NOTE

If any errors occur in reading the magtape, retry the procedure on another drive. If no other drive is available, either have Field Service align the heads on the drive or obtain a new magtape.

The tape rewinds several times at the beginning of the procedure but does not rewind after the statement OLD MT0:$LOGOUT. Multiple copies of some programs are on the tape to reduce the number of rewinds required.

The messages BUILD COMPLETE and READY signal the end of execution.

After the standard library has been built, install any required patches. Refer to Section 6.7 for patching instructions.

6.2.2 Building Other System Libraries from Magtape

To build the other system libraries, you will execute the BUILD.BAC program and these control files from the distribution medium: SPLER.CTL, BIGPRG,CTL, BACKUP.CTL, or UETP.CTL. Note that UETP must be built into a privileged account. When UETP executes, there can be no detached jobs concurrently executing under the same account.

The build procedure is similar to the procedure you used for building the standard library.

1. Remove the write enable ring from the reel containing the library you wish to build (see Table 6-6).
2. Mount the reel on a free unit.
3. Position the tape at its load point.
4. Set the ON-LINE/OFF-LINE switch to ON-LINE.
5. Run the BUILD program. For example:

   RUN MT0:$BUILD

BUILD runs and prints the following dialogue. Respond as shown. Note that you must supply the control file name of the library you are building (the example shows a build of BIGPRG.CTL), otherwise the responses for each library are identical.

```
SYSTEM BUILD <NO>? (LF)
SOURCE INPUT DEVICE <SY:>? MT0
LIBRARY OUTPUT DEVICE <SY:>? (LF)
LIBRARY ACCOUNT <[1,2]>? (LF)
CONTROL FILE IS? BIGPRG.CTL
 *** COPYING FILE MT0:BIGPRG.CTL TO SY:BUILD.TMP
```

The BUILD program now begins executing the commands in the control file you have specified. The messages BUILD COMPLETE and READY signal the end of execution.

After you have built any library, install any required patches. Refer to Section 6.7 for patching instructions.

6.2.3 Building the Standard System Library from Disk

To build the standard system library, you will execute the BUILD.CTL file from the distribution medium.

Perform these steps:

1. Mount the disk containing the standard system library on a free unit (see Table 6-6).
2. Set the unit's RUN/STOP (for RK06 or RK07) or LOAD/RUN switch (for RK05) to RUN; depress the LOAD switch to the in position for RL01's.
3. Set the unit's write-protect switch on.
4. When the unit's READY indicator comes on, logically mount the disk by typing:

   MOUNT dev: SYSL1F/RO (or MOUNT dev: SYSGNF/RO for RK07 distribution)

   where dev: is the device name and unit of the disk.

5. Type the following command:

   RUN dev: $BUILD

   where dev: is the same device name and unit you entered in step 4.

BUILD runs and prints the following dialogue. Respond as shown.

```
SYSTEM BUILD <NO>? YES
SOURCE INPUT DEVICE <dev:>? dev:
LIBRARY OUTPUT DEVICE <SY:>? (LF)
TARGET SYSTEM DEVICE <SY0:>? (LF)
LIBRARY ACCOUNT <[1,2]>? (LF)
```

The BUILD program now begins executing the BUILD.CTL file. The messages BUILD COMPLETE and READY signal the end of execution.

After the standard system library has been built, install any required patches. Refer to Section 6.7 for patching instructions.

6.2.4 Building the Other System Libraries from Disk

To build the other system libraries, you will execute the BUILD.BAC program and these control files from the distribution medium: SPLER.CTL, BIGPRG.CTL, BACKUP.CTL, or UETP.CTL.

The build procedure is similar to the procedure you used for building the standard system library.

1. Mount the disk containing the library you wish to build on a free unit (see Table 6-6).
2. Set the unit's RUN/STOP (for RK06 or RK07) or LOAD/RUN switch (for RK05) to RUN; depress the LOAD switch to the in position for RL01's.
3. Set the unit's write-protect switch on.
4. When the unit's READY indicator comes on, logically mount the disk by typing:

   MOUNT dev: packID/RO

   where dev: is the name and unit of the disk and packID is the identifier taken from Table 6-6.

5. Type the following command:

   RUN dev: $BUILD

   where dev: is the same device name and unit you entered in Step 4.

BUILD runs and prints the following dialogue. Respond as shown. Note that you must supply the control file name of the library you are building (the example shows a build of BIGPRG.CTL). Otherwise, the responses for each library are identical.

```
SYSTEM BUILD <NO>? (LF)
SOURCE INPUT DEVICE <dev:> dev:
LIBRARY OUTPUT DEVICE <SY:> (LF)
LIBRARY ACCOUNT <[1,2]>? (LF)
CONTROL FILE IS? BIGPRG.CTL
```

The BUILD program now begins executing the commands in the control file you have specified. The messages BUILD COMPLETE and READY signal the end of execution.

After you have built any library, install any required patches. Refer to Section 6.7 for instructions.

6.2.5 Terminating the BUILD Process

Successful completion of the BUILD process is indicated by the messages BUILD COMPLETE and READY.

However, there may be occasions when BUILD encounters a situation from which it cannot recover. On these occasions, BUILD will terminate with the following:

```
*** BUILD TERMINATED ***
<text of error message>

READY
```

For example, should you initiate a build of the BACKUP package, but have the wrong magtape mounted, BUILD will terminate after returning the messages:

```
*** BUILD TERMINATED ***
? CAN'T FIND FILE OR ACCOUNT -- MT0:BACKUP.CTL

READY
```

Your recovery would be to start the build process again, after you have mounted the correct magtape.

You can terminate the BUILD process by typing CTRL/C. When BUILD recognizes the CTRL/C, it terminates after printing:

```
*** BUILD TERMINATED ***
? CTRL/C DETECTED

READY
```

6.3 INSTALLING AUXILIARY RUN-TIME SYSTEMS

When you plan to include optional software such as BASIC-PLUS-2, COBOL, FORTRAN IV, or RPG-II in your system, you should first install the Run-Time System support required by the optional software. Run-Time System support includes the actual Run-Time Systems and their associated utilities.

For the optional language processors, you will have to install the following Run-Time System support:

BASIC-PLUS-2	RSX (plus BASIC2 and/or BP2COM)
COBOL-11 (V03)	RSX, RMS11
FORTRAN IV	RT11
RPG-II (V8)	RSX, RMS11

All optional software requires the RT11 Run-Time System and the PIP.SAV program, both provided on the RSTS/E distribution medium. Both are automatically part of your system if you specified that your target disk was the same disk as your SYSGEN disk during system generation.

If you placed your target system on a disk different from the SYSGEN disk during generation, you must have answered YES to the query SAVE RT11.RTS and PIP.SAV? when it occurred in the SYSGEN dialogue. Otherwise, you will not have RT11 and PIP.SAV in your system. RT11 is required if you wish to run SYSGEN on-line (see Chapter 7).

The following paragraphs describe the procedures you must follow to add the RMS11 and RSX Run-Time Systems to your system.

6.3.1 Adding RSX Run-Time System and Library

To add RSX support, perform the following steps:

1. Mount the RSX distribution
   AP-C883A-BC (9-track magtape).
   AP-C881A-BC (7-track magtape).
   AN-C885A-BC (RK05, PackID = RSXLBA),
   AX-D527F-BC (RL01, PackID = SYSGNF),
   AM-2774F-BC (RK06, PackID = SYSGNF), or
   AY-D526F-BC (RK07, PackID = SYSGNF)
   as described in Section 6.2.2 (for magtape) or Section 6.2.4 (for disk).
2. Run the BUILD program as described in Section 6.2.2 (for magtape) or Section 6.2.4 (for disk) but use the name $RSXBLD.CTL in response to the query CONTROL FILE IS?

6.3.2 Adding RMS Run-Time System and Library

To add RMS support, perform the following steps:

1. Mount the RMS distribution medium
   AP-C884A-BC (9-track magtape).
   AP-C882A-BC (7-track magtape).
   AN-C885A-BC (RK05, PackID = RSXLBA),
   AX-D527F-BC (RL01, PackID = SYSGNF),
   AM-2774F-BC (RK06, PackID = SYSGNF), or
   AY-D526F-BC (RK07, PackID = SYSGNF)
   as described in Section 6.2.2 (for magtape) or Section 6.2.4 (for disk).
2. Run the BUILD program as described in Section 6.2.2 (for magtape) or Section 6.2.4 (for disk), but use the name $RMSBLD.CTL in response to the query CONTROL FILE IS?

NOTE

For the RMS-11K software support package, follow the same procedure as stated above, but use the following media

AP-5226B-BC	(9-track magtape)
AN-5227B-BC	(RK05, Pack ID = RMSKIT)
AX-D945B-BC	(RL01, Pack ID = RMSKIT)
AM-5228B-BC	(RK06, Pack ID = ARMBAC)
AY-D946B-BC	(RK07, Pack ID = ARMBAC)

Use the control filename [1,1]RMS11.CTL in response to the query CONTROL FILE IS?

6.3.3 RT11 Support for FORTRAN IV

Although your system includes RT11.RTS and PIP.SAV, you need to transfer additional files from the RSTS/E distribution medium to be able to include the FORTRAN IV package in your system.

The procedure for transferring the files is:

1. Bring the system to the BASIC-PLUS command level, if it is not already there.
2. Mount the RSTS/E SYSGEN volume of the distribution medium:
   AP-2772F-BC (7-track magtape)
   AP-2773F-BC (9-track magtape)
   AN-2771F-BC (RK05, PackID = SYSGNF)
   AX-D527F-BC (RL01, PackID = SYSGNF)
   AM-2774F-BC (RK06, PackID = SYSGNF)
   AY-D526F-BC (RK07, PackID = SYSGNF)

3. Run the UTILTY library program by typing

```
RUN $UTILTY
```

after UTILTY prints its header and # prompt type the following:

```
#ADD RT11
#↑Z

READY

RUN $PIP.SAV
*$*.*<40>=xxm:$MACRO.SAV,$CREF.SAV,$LINK.SAV,$LIBR.SAV,$PATCH.SAV/N
*↑Z
```

6.4 BUILDING OPTIONAL SOFTWARE

If your system is to support any optional software, such as COBOL, FORTRAN IV, RPG-11 or BASIC-PLUS-2, build that software after adding the requisite Run-Time System support. To obtain the build procedures, consult the RSTS/E Release Notes or the Installation Guide for the software you plan to include. The documentation should include information on patching the software.

After building and patching the optional software, proceed to Section 6.5 to create the ASCII text and message files for your system.

6.5 CREATING THE ASCII TEXT AND MESSAGE FILES

Now you can run a PIP or editor system program and create the required ASCII text files. For information about PIP programs, refer to the RSTS/E System User's Guide. For information about editors, refer to the appropriate editor manual. The following five sections describe the procedures to follow when creating the ASCII text files and contain references to further descriptions of the use and contents of the files. Editing conventions for the use of the RUBOUT key and CTRL/U as described in the RSTS/E System User's Guide apply when you use a PIP system program.

6.5.1 System Message File NOTICE.TXT

The system prints the file NOTICE.TXT when a user successfully logs into the system as described in the RSTS/E System User's Guide. In this manner, you can relay to users information concerning operation of the installation or changes or additions to the system. Before creating your own NOTICE.TXT file, you can print the sample file in the library on the console terminal. The following example illustrates the procedure:

```
RUN $PIP
*NOTICE.TXT

WELCOME TO RESTS/E V06C TIME SHARING

*
```

You can create a tailored NOTICE.TXT file to replace the sample file by imitating the following sample procedure.

```
*SY0:NOTICE.TXT=KB:

HOURS OF OPERATION ARE:

    MON-SAT          8 AM TO 5 PM

    EVENINGS AND SUNDAYS BY REQUEST

^Z
*
```

The ↑Z at the end of the text file is necessary. It prints when you type the CTRL/Z* combination. It signals the end of the ASCII text, closes the file properly, and returns control to the PIP program as indicated by the # character. The system manager can update the file as needed.

6.5.2 System Help File HELP.TXT

When a user types HELP at a logged-out terminal, the system prints the file HELP.TXT. You can print the sample file stored in the system library by typing the following command string. (The example assumes that the PIP program is still running from the previous procedures.)

```
*HELP.TXT

TO GET ON-LINE AND USE RSTS/E, FOLLOW THE
INSTRUCTIONS FOUND IN THE
RSTS/E SYSTEM USER'S GUIDE.

*
```

If the text is satisfactory, but you need to add some local information, use the append feature of the PIP program, delete the old file, and rename the new file.

```
*SY0:NEW.TXT=HELP.TXT,KB:

ASK MS. SMITH FOR A PROJECT-PROGRAMMER
NUMBER AND PASSWORD.

^Z
*HELP.TXT/DE
*SY0:HELP.TXT<40>/RE=NEW.TXT
*
```

You can replace the sample HELP.TXT file by using a command string similar to the one shown in Section 6.5.1.

6.5.3 Control Files START.CTL and CRASH.CTL

The INIT.BAC system program requires two control files whenever it initializes the RSTS/E system for timesharing. The use and content of both of these files are explained in the RSTS/E System Manager's Guide. A sample file is provided on the distribution medium for each of these two control files. Being samples only, they *will not work* on your system and must be replaced. The procedures described here show how to print the sample files and how to replace the sample files with versions created to suit the needs of the local installation.

*See the description of control characters in the RSTS/E System User's Guide.

These two control files must contain the information required to properly initialize the system for timesharing operations. Before you attempt to modify or replace the contents of the example files, DIGITAL strongly recommends that you become thoroughly familiar with the information presented in the RSTS/E System Manager's Guide.

The first and second commands in the following example cause the system to print the sample CRASH.CTL and START.CTL files. The third and fourth commands cause the system to replace the sample files with the files typed at the terminal.

```
*START.CTL
          (THE SAMPLE FILE IS PRINTED.)
*CRASH.CTL
          (THE SAMPLE FILE IS PRINTED.)
*SY0:START.CTL=KB:/FA
          (TYPE NEW VERSION.)
^Z
*SY0:CRASH.CTL=KB:/FA
          (TYPE NEW VERSION.)
^Z
*
```

When you perform the preceding procedures, the system replaces the sample files in the system library with the versions typed. Be sure to replace the START.CTL and CRASH.CTL files on the system disk.

The sample START.CTL and CRASH.CTL files use the following indirect command files:

TTY.CMD (set terminal characteristics)
SPOOL.CMD (initialize spoolers)
RTS.CMD (install auxiliary run-time systems)
CCL.CMD (define CCL commands)
ANALYS.CMD (analyze crash dumps)

Edit these files as your installation requires, following the descriptions presented in the RSTS/E System Manager's Guide.

6.5.4 Terminal Speed Characteristics File TTYSET.SPD

There are some circumstances when you must create the optional terminal speed characteristics file TTYSET.SPD to set terminal speed characteristics at the start of each timesharing session. Its use and contents are explained in the RSTS/E System Manager's Guide. The following sample dialogue shows how to print the sample file in the library and how to replace the sample file with the new version.

```
*TTYSET.SPD
          (THE SAMPLE FILE IS PRINTED.)
*SY0:TTYSET.SPD=KB
          (TYPE NEW VERSION.)
^Z
*
```

When you perform the preceding procedures, the system replaces the sample file in the system library with the new version.

6.5.5 Standard Account File ACCT.SYS

You can use the REACT system program to create a large number of user accounts automatically. To use this convenience, create the file ACCT.SYS in the system library. The contents of the ACCT.SYS file are explained in the RSTS/E System Manager's Guide. A sample of ACCT.SYS is created by the BUILD program. You can print and replace this sample file by performing the following procedures. (DIGITAL suggests that you make entries in ACCT.SYS to create a privileged and a nonprivileged account for yourself and create auxiliary accounts associated with the !, #, &, and % characters.)

```
*ACCT.SYS
          (THE SAMPLE FILE IS PRINTED.)
*SY0:ACCT.SYS=KB:
          (TYPE NEW VERSION.)
^Z
*^Z

READY
```

The new version of ACCT.SYS replaces the sample ACCT.SYS in the system library. The PIP system program run terminates. Proceed to Section 6.6 to create the user accounts.

6.6 CREATING USER ACCOUNTS

Run the REACT system program and use the STANDARD function to create the user accounts in the MFD of the system disk. Refer to the RSTS/E System Manager's Guide for a description of the REACT system program. The following example illustrates the method used to create the user accounts from information in the ACCT.SYS file.

```
RUN REACT
REACT     V06C-02 RSTS V06C-02 *TIME SHARING*
SYSTEM ACCOUNT MANAGER
FUNCTION? STANDARD
ALL ACCOUNTS IN ACCOUNT FILE ARE NOW ENTERED
FUNCTION? ^Z

Ready
```

REACT prints an identification message and a request for a function. If you type STANDARD or S, the REACT program creates user accounts from information in the ACCT.SYS file. When the standard function is completed REACT prints an advisory message and reprints the FUNCTION request. Type CTRL/Z (↑Z) to terminate REACT.

At this point, you have built the system disk and have made the RSTS/E system fully operational. DIGITAL recommends that you shut down the system as described in the RSTS/E System Manager's Guide and restart it to test the new START.CTL file.

6.7 AUTOMATED PATCHING DURING SYSTEM GENERATION

The programs in the RSTS/E Automated Patching Facility Package can be used to

1. Install mandatory patches during system generation. The procedures are described in this Section.
2. Create patches and patching command files for customer-developed programs. The procedures are described in the RSTS/E System Manager's Guide.

NOTE

RSTS/E version V06C contains the first release of the Automated Patching Facility Package and the autopatch files used with the Package. Both are subject to design change: future versions of the Package programs and the patching files may not be compatible with the facilities described here.

The Autopatch kit is distributed on the following media

7-track magtape (Label is AP-D008B-BC)
9-track magtape (Label is AP-D009B-BC)
RK05 (Label is AN-D010B-BC, PackID is PATCHB)
RL01 (Label is AX-D529B-BC, PackID is PATCHB)
RK06 (Label is AM-D011B-BC, PackID is PATCHB)
RK07 (Label is AY-D523B-BC, PackID is PATCHB)

NOTE

The third from the last letter in each label, as well as the last letter in the disk PackID's, are the revision level letters of the Autopatch kit current as of this printing. Future revisions will bear revision levels using different letters. Check the exact label on the Autopatching kit you are using.

During system generation, the system manager prepares for, and uses, automated patching at these times:

1. After using the COPY option. There may be mandatory patches which must be installed for the SYSGEN system to function properly. Such patches must be installed immediately after the COPY, and must be installed using the manual procedures described in the Release Notes or RSTS/E Software Dispatch. Refer to Section 3.4 for a discussion of the PATCH option to the initialization code.
2. After the SYSGEN system is running. If there are mandatory patches required for INIT.SYS, RT11.RTS, or SYSGEN.SIL, they must be installed immediately after the SYSGEN system has been started. The system manager installs the patches by running the ONLPAT.SAV program. Refer to Section 6.7.1 for the procedures to use.
3. During the configuration dialogue. The dialogue contains questions concerning monitor and BASIC-PLUS Run-Time System automated patching. Answers given here set up SYSBAT processing of the Automated Patching Facility Kit. Refer to Section 6.7.2 for the procedures to use.
4. After the standard system library has been built. Immediately after a build of the standard system library, the system manager must install any patches to the programs in the library. Refer to Section 6.7.3 for instructions.
5. After each optional system library has been built. Should the installation require any of the optional system libraries, the system manager must install any patches to programs in the libraries. Refer to Section 6.7.4 for instructions.
6. After any auxiliary Run-Time Systems and/or optional software are built, the system manager must install patches for these software packages. Refer to the software Installation Guides for instructions.

6.7.1 Procedures for Patching RT11.RTS, INIT.SYS, and SYSGEN.SIL Code

Use these procedures to install mandatory patches to RT11.RTS, INIT.SYS, and SYSGEN.SIL Code.

1. After you have run the START option to the initialization code (to start the SYSGEN system) the message ?CAN'T FIND FILE ON ACCOUNT and the RT11 Run-Time System prompt (·) are printed. Then logically mount the RSTS/E distribution medium, if it is disk.

2. Physically mount the patching distribution medium on a free unit, then ready the unit.
3. Logically mount the patching medium if disk, by typing:

   .MOUNT dev:PackID/RO

   where dev: is the device and unit for the patching medium and PackID is the disk pack ID as noted in the previous section.

4. Run the ONLPAT program by typing:

   ·R dev: ONLPAT

   where dev: is the device and unit of the RSTS/E distribution medium.

5. The ONLPAT program prints the following query:

   COMMAND FILENAME?

   Respond with a command line in the following format:

   logfile = dev: command file

   where logfile can be:

LPn:	to print a record of the patching on the line printer unit specified and at the keyboard.
SY:filnam.ext	to record the patching process on a disk file in the public structure and at the keyboard.
NL:	to avoid recording the patching process except at the keyboard.
and dev:	must be the device on which the patching medium is mounted.

   and command file is:

RT11.CMD	to install patches to RT11.RTS
INIT.CMD	to install patches to INIT.SYS
SYSGEN.CMD	to install patches to SYSGEN.SIL

   For example:

   COMMAND FILE NAME? NL:=DEV:INIT.CMD

6. The ONLPAT program installs the mandatory patches to the file specified through the command file, then returns to the command FILE NAME? query. Enter another command line to repeat the process. When all three files have been patched, type CTRL/Z in response to the COMMAND FILE NAME? query to terminate ONLPAT.

7. Compare the log file produced by ONLPAT with the mandatory patches in the Release Notes and the Software Dispatches. If any mandatory patches have been published, but not installed, install them now, following the instructions in the article.

6.7.2 Procedures for Patching Monitor and BASIC-PLUS RTS Code

Use these procedures to provide automated patching of the RSTS monitor and BASIC-PLUS Run-Time System code.

6.7.2.1 Answering the Configuration Questions – There are two configuration dialogue questions which initiate automated patching: MONITOR PATCHING? and BASIC-PLUS PATCHING? Answer YES to both questions to initiate a series of questions that defines the placement and name of the Automated Patching Facility Kit.

For example, respond as follows if the kit is magtape:

```
MONITOR PATCHING?                    #??# YES
PATCH FILE MEDIUM?                   #MT# (LF)
PATCH FILE NAME?                     #$MONITR.CMD# (LF)
.
.
.
BASIC-PLUS PATCHING?                 #??# YES
PATCH FILE MEDIUM?                   #MT# (LF)
PATCH FILE NAME?                     #$BASIC.CMD# (LF)
```

Respond as follows if the kit is disk:

```
MONITOR PATCHING?                    #??# YES
PATCH FILE MEDIUM?                   #MT# DK
PACK ID?                             #??# PATCHB
PATCH FILE NAME?                     #$MONITR.CMD# (LF)
.
.
.
BASIC-PLUS PATCHING?                 #??# YES
PATCH FILE MEDIUM?                   #MT# DK
PACK ID?                             #??# PATCHB
PATCH FILE NAME?                     #$BASIC.CMD# (LF)
```

where the pack ID (shown here as PATCHB) is the pack identification from the patching kit disk.

When the SYSBAT program is processing, it prints a request to mount the patching file distribution medium. For example:

```
MOUNT THE MONITOR PATCH FILE MAGTAPE ON A MAGTAPE DRIVE WITH NO "WRITE RING"
AND SET TO "ON LINE"

MOUNT MT: "                " – WRITE LOCKED
UNIT? 1
```

After the system manager mounts the kit and types its unit number, the SYSBAT program installs necessary monitor patches (based on the configuration), and skips all others, logging each patch installed and skipped at the console keyboard.

6.7.2.2 Rerunning the SYSBAT Program – Should the system manager determine that some patches have been skipped that should have been installed (based on the system's configuration), the configuration dialogue could be in error. To recover, rerun the configuration dialogue, as described in the RSTS/E System Generation Manual. Include the patching kit again, and observe whether SYSBAT installs the patches.

6.7.2.3 Installing Published Patches – Compare the SYSBAT listing of patches installed with the mandatory patches in the Release Notes and the Software Dispatches. If any mandatory patches have been published, but not installed, install them now following the instructions in the article.

6.7.3 Procedures for Patching the Standard System Library

Use these procedures to provide automated patching of the source code for standard system library programs.

6.7.3.1 System Size and Patching Account Considerations – The system manager must make two decisions before patching source programs:

1. Whether or not to save patched source programs on-line.
2. Which account to use when copying the kit's patching files from the distribution medium.

The automated patching process allows the system manager to save patched source programs on-line, (thereby consuming disk storage and presenting possible security problems) or off-line, on the patching distribution medium (thereby requiring that the patches be reinstalled each time the patching medium is used). DIGITAL recommends that patched source programs not be saved on-line, since it does not take much time to install the patches from the distribution medium and since many systems cannot afford the disk storage patched sources would require.

The automated patching process also allows the system manager to choose which account to use when copying patching files from the kit. DIGITAL recommends that the system manager create an account in the public structure for storing files copied from the patching kit, and specifically not use the system library account [1,2] for patching, since there is a large number of files that must be stored.

6.7.3.2 Create an Account to Hold the Patching Files – Immediately after building the standard system library, run the REACT program to create an account in the public structure for storing the patching files. Use the ENTER function to create the account, as described in the RSTS/E System Manager's Guide. The following discussion will use [200,200] as the account created to hold patching files.

6.7.3.3 Copy Patching Command Files – Next, run the PATCPY program to copy the patching command files from the autopatching medium to the account created in Section 6.7.3.2.

1. Mount the autopatching magtape or disk on an available drive. Logically mount the device if it is disk.
2. Type RUN $PATCPY. After it prints its header line, PATCPY presents the following dialogue.

   ENTER DISTRIBUTION DEVICE/PPN <[1,2]>: nnx:

   Respond with the device and unit number of the autopatching files. Do not specify an account, as the files are distributed in the default account [1,2].

   ENTER OUTPUT DEVICE/PPN <default>: [200,200]

   Respond with the account created to hold the patching files. The example shown is account [200,200] in the public structure. The default is the account the system manager is logged into.

   PACKAGES TO PATCH? ALL

   Respond with the package(s) to be patched. The package names are defined in Table 6-7.

Table 6-7
Package Names for PATCPY

Package Name	Command Files Copied for
BUILD	The Standard System library as created by BUILD.CTL.
SPLER	The Spooling Package library as created by SPLER.CTL.
BIGPRG	The Large Programs library as created by BIGPRG.CTL.
BACKUP	The BACKUP Package library as created by BACKUP.CTL.
UETP	The UETP Package library as created by UETP.CTL.
ALL	All command files on the autopatching volume.

The example shows the response ALL. If system disk storage could be a problem, or the system will not include all the optional libraries, respond with another entry, then delete the contents of the patching file account before running PATCPY again. Entering ALL allows the system manager to run PATCPY just once during the automated patching process.

When ALL is entered, PATCPY copies the command files from the autopatching medium to the account. If any other response is entered, PATCPY prints.

```
OTHER WILD CARD STRINGS? (LF)
```

Respond by typing the LINEFEED key. Entering wild card strings is useful for customer patching kits, but is prohibited when patching the RSTS/E libraries. After (LF) is typed, PATCPY copies the files.

NOTE

The PATCPY operation copies several files in addition to those needed by any individual package. The PBUILD program (described in Section 6.7.3.4) uses the required files only, and ignores others.

As PATCPY transfers each file from the autopatching medium to the account, it prints

```
COPYING <filespec> TO <filespec>
```

Should this output become tiresome, type CTRL/O to suppress the output.

3. When the copy is completed, PATCPY prints:

```
nnn FILES COPIED
COPY OPERATION COMPLETE
```

and returns control to the BASIC-PLUS command level. Dismount the autopatching medium and store it. Remember to logically dismount the medium, if disk.

6.7.3.4 Install the Patches – Use the following procedures to install the patches into the system library.

1. Mount the RSTS/E distribution volume that contains the standard system library. Logically mount it, if disk.
2. Run the PBUILD program by typing RUN $PBUILD. After its header line is printed, PBUILD begins the following dialogue.

   READ FILES TO PATCH FROM <SY:[1,2]>: nnx:

   Respond with the device name and unit on which you have mounted the library distribution medium.

   COMPILE PATCHED PROGRAMS? YES
   LIBRARY DEVICE <SY:[1,2]>: (LF)
   SYSTEM DEVICE <SY0:[1,2]>: (LF)
   SAVE PATCHED SOURCES? NO

   Respond as shown, unless the library and/or system devices are different from the defaults indicated. If they are different, specify the correct device instead of typing the LINE FEED key.
3. PBUILD then prints a prompt (#). Enter a command line that defines the account and command file from which the patches will be executed, in the form:

   filespec = command file

   If the system manager specifies just an account and command file, the patches are installed, with the log of all edits printed at the keyboard the system manager is logged into. For example,

   # [200,200] BUILD.CMD

   patches the standard system library from account [200,200], printing the log at the system console and at the keyboard used (if different from the system console).

   To send the log to some other file use the command line form

   filespec = command file

   To prevent the log from being output to any device except the system console, use the command line form:

   NL: = command file

4. PBUILD now installs the patches. When the process is complete, PBUILD returns to the prompt:

   READ FILES TO PATCH FROM <nnx:>: ↑Z

   Since the standard system library is patched, type CTRL/Z to exit from the PBUILD program and return to the BASIC-PLUS command level. Remove the RSTS/E library medium, and logically dismount it, if disk.
5. Compare the log file produced by PBUILD with the mandatory patches in the Release Notes and the Software disptaches. If any mandatory patches have been published, but not installed, install them now, using the instructions in the Release Notes and Dispatches.

6.7.4 Procedures for Patching the Optional System Libraries

Procedures for automated patching of the optional system libraries are similar to those used to patch the standard system library. Follow the instructions in Section 6.7.3 to patch any of the optional libraries, but note these items before starting.

1. PATCPY has already been used to transfer files from the autopatching distribution medium to an account in the public structure. PATCPY need not be run again if the files needed for patching are in the account. For example, if ALL was used as a reply to the query PACKAGES TO PATCH?
2. PATCPY must be run again if the files have not yet been transferred. For example, BUILD was used in reply to the PACKAGES TO PATCH? query, and now the system manager is patching the just-built Large Programs Library. The system manager must delete the files from the account, then run PATCPY, specifying BIGPRG in response to the PACKAGES TO PATCH? query.
3. Be careful, when mounting and dismounting magtape distribution media. Different libraries are on different reels. Table 6-6 describes which libraries are on each of the tape reels.
4. When running PBUILD, use the following filenames in the command line entered in response to the (#) prompt:

Command File	Patches this Library
SPLER.CMD	The spooling package library built by SPLER.CTL
BIGPRG.CMD	The large programs library built by BIGPRG.CTL
BACKUP.CMD	The BACKUP package library built by BACKUP.CTL
UETP.CMD	The UETP package library built by UETP.CTL

6.8 SUMMARY OF PROCEDURES

This section summarizes the procedures you must follow to build the system library files. Figure 6-1 illustrates the flow of the procedures.

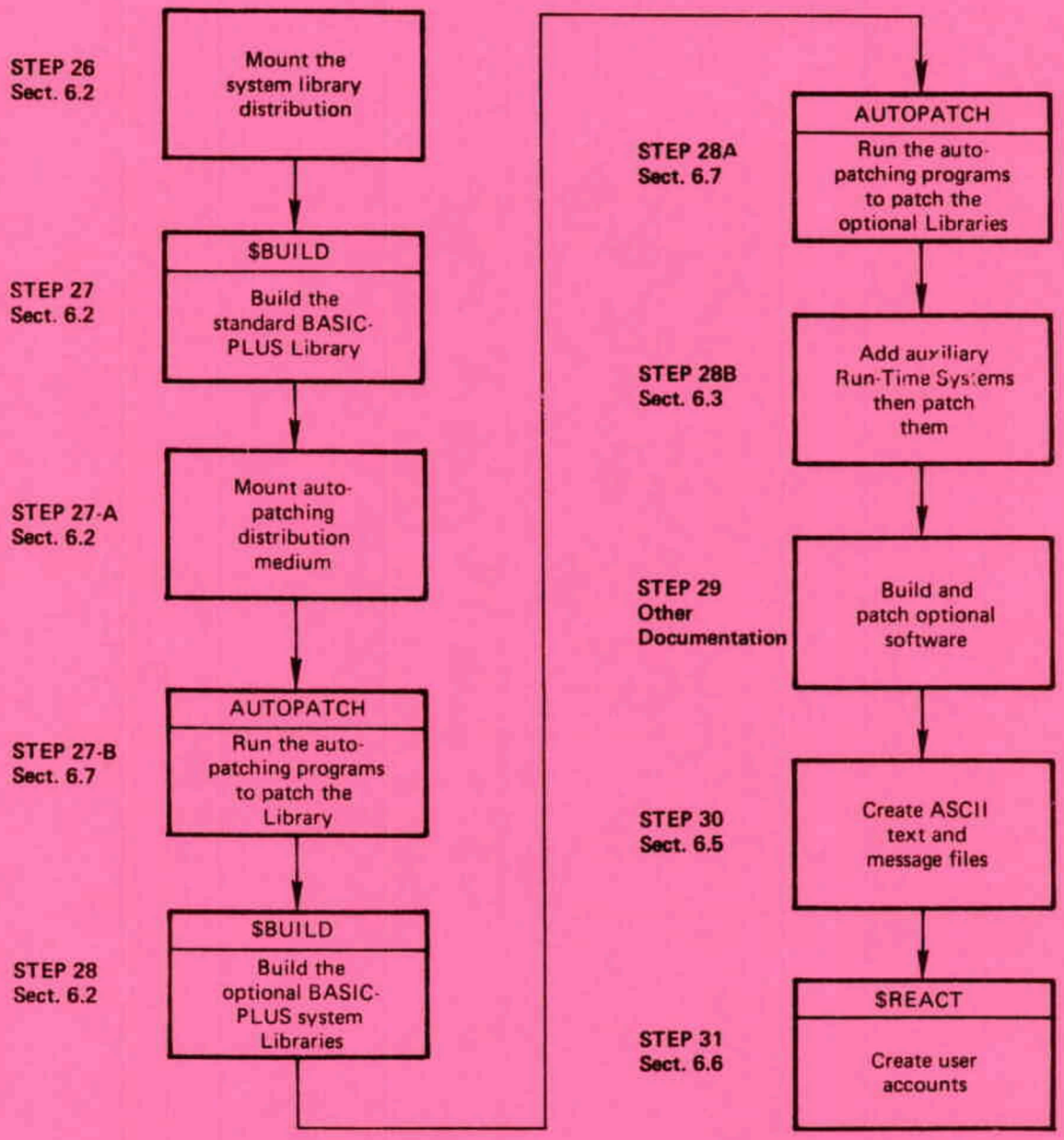


Figure 6-1 Summary of System Library Build Procedures

STEP 26. Mounting the System Library Distribution Medium

Procedure:

a. For magtape distribution:

Mount on unit 0 the tape labelled:

AP-2752F-BC (for a 7-track TU10 drive)

AP-2753F-BC (for a 9-track TU10/TS03 or TU16/TU45/TE16 drive)

Ensure that the write enable ring is removed.

Ensure that the LD PT and FILE PROT indicators are lit.

Set the ON-LINE/OFF-LINE switch to ON-LINE. Ensure that the READY light comes on.

b. For disk cartridge distribution:

Mount on a free unit the disk labelled:

AN-2751F-BC (for RK05 distribution)

AX-D528F-BC (for RL01 distribution)

AM-5445F-BC (for RK06 distribution)

AY-D526F-BC (for RK07 distribution)

Move the LOAD/RUN switch (on the RK05) or the STOP/RUN switch (on the RK06 and RK07) on the drive to the RUN position; depress the LOAD switch to the in position for RL01's.

Ensure that the READY indicator comes on.

Ensure that the WR PROT indicator is lit.

Type the following command, replacing dev with the device name and unit number of the disk:

MOUNT dev: SYSL1F/RO

MOUNT dev: SYSGNF/RO (for RK07 distribution only)

STEP 27. Building the Standard System Library Files
Refer to Section 6.2.1 (from magtape), or Section 6.2.3 (from disk).

STEP 28. Building the Large Programs
Refer to Section 6.2.2 (from magtape), or Section 6.2.4 (from disk).

STEP 29. Building Optional Software
Refer to Sections 6.3 and 6.4.

STEP 30. Creating the ASCII Text and Message Files
Refer to Section 6.5.

STEP 31. Creating User Accounts
Refer to Section 6.6.

CHAPTER 7

REGENERATING RSTS/E SOFTWARE DURING TIMESHARING

You can generate additional RSTS/E monitors and/or BASIC-PLUS run-time systems on-line during timesharing. These files can replace the existing versions or can be retained on the system disk for occasional use. To generate a monitor or run-time system, first ensure that the necessary system generation files are available and (when generating a run-time system) that sufficient contiguous space exists on the system disk. Next, answer the configuration questions and start the batch control file following essentially the same procedures as described in Chapter 4. When the batch run terminates, the monitor and/or run-time system generation is complete. You can then tailor (and install, if necessary) the monitor and/or make the run-time system available for use.

7.1 PREPARING FOR ON-LINE GENERATION

Before you can begin to generate a monitor or BASIC-PLUS run-time system on-line, the public disk structure must contain the system generation files and RT11 must be added as a run-time system. A pseudo keyboard must also be available. In addition, if you plan to generate BASIC-PLUS, ensure that the system disk contains enough contiguous space for the run-time system file.

7.1.1 Finding Contiguous Space for BASIC-PLUS

Run-time system files must occupy contiguous disk space. Therefore, you should ensure that sufficient contiguous space exists on the system disk before you generate an additional BASIC-PLUS run-time system. If you previously allocated extra contiguous space as a dummy or extra-large file, you can simply delete or reduce the size of that file. If you did not originally plan extra contiguous space, you can use a BASIC-PLUS OPEN statement with the contiguous MODE specification to open a file of the approximate size. If the system executes the statement without error, the space exists. If the statement fails, you must delete some files or transfer some files to other media in order to free contiguous disk space. You can then begin to generate the BASIC-PLUS run-time system.

7.1.2 Obtaining the System Generation Files

On-line generation of the monitor or BASIC-PLUS requires that the files SYSGEN.SAV, SYSBAT.SAV, MACRO.SAV, CREF.SAV, PIP.SAV, LINK.SAV, SILUS.SAV, HOOK.SAV, and ERR.STB be in the system library account [1,2]. The CREATE batch stream copies these files from the distribution medium to the SYSGEN system disk during the initial system generation.

If the target system was written on a system tape or on a disk other than the SYSGEN disk, all the files may not be available on the system disk. However, the RT11 run-time system must have been copied to the target system (see Section 6.3). Ascertain whether the files exist on the system disk. If not, follow the procedures in Chapter 2 to mount the distribution medium. Use the MOUNT command to logically mount the distribution disk. Then use UTILTY to add RT11 as a run-time system. The following is an example of this procedure:

```
RUN $UTILTY
UTILTY  V06C-03 RSTS V06B-02 *TIME SHARING*
*ADD RT11
*^Z

Ready
```

Replace DK1 in the example with the device name and unit number of your distribution medium.

Follow the procedures in Chapter 4 to run the CREATE batch stream. This batch stream copies the remaining required files to the system disk under the logged-in account and chains to SYSGEN.SAV, which asks the configuration questions.

If the target system was output to the SYSGEN system disk during the previous system generation, the files remained on the disk. In this case, you need not recopy them. You must, however, add the file RT11.RTS as a run-time system. Run the UTILTY program and use the ADD command to do so. You can then simply type the command RUN $SYSGEN, which runs the program SYSGEN.SAV, as in the following example.

```
RUN $SYSGEN

**19-JUN-78**


Beginning of RSTS/E system generation.

Questions come in long and short forms.
If you are familiar with them, answer
"S" for short; otherwise, answer "L" for
```

7.2 GENERATING THE MONITOR OR BASIC-PLUS RUN-TIME SYSTEM

Answer the configuration questions to include the features required by the monitor and/or run-time system. The SYSGEN program asks a subset of the configuration questions if you are generating only a monitor or a run-time system. When generating a monitor or run-time system for an existing system disk, be sure to assign the new file a different name from the installed file. If necessary, you can generate a monitor or run-time system for a new target medium.

When you have answered all the configuration questions, type RUN $SYSBAT to start the batch process. When the execution of the batch file is complete, the new monitor or run-time system resides in account [0,1] on the system disk.

7.3 TAILORING A NEW MONITOR

After the batch process ends, you can shut down the system and tailor the new monitor whenever it is convenient to do so. To tailor and install the monitor, follow the procedures in Sections 5.2 through 5.7. If the monitor runs on an existing system disk, you may not need to re-allocate system files. List the file status table (using the LIST suboption of the REFRESH initialization option) to ascertain any necessary changes.

7.4 PREPARING THE NEW RUN-TIME SYSTEM FOR USE

You can use the new BASIC-PLUS run-time system as an auxiliary run-time system or as the system default.

To use the new BASIC-PLUS as an auxiliary run-time system, run the UTILTY program. Issue the ADD command to add the run-time system for use under RSTS/E.

To install a new default run-time system, shut down the system. Use the REFRESH option (Section 3.7) to delete the current default run-time system (if you do not plan to use it again). Next, use the DEFAULT option (Section 3.8) and specify the new run-time system as the default. Finally, use the START option (Section 3.10) to start timesharing with the new default run-time system.

The new default run-time system needs a new system library. To create a new library, log into a privileged account and use the BUILD program. BUILD allows you to create the library on a public or private disk. Physically and logically mount the output disk, then physically mount the first volume of the system library distribution kit. Write-protect this volume. If the distribution medium is disk, use the MOUNT command (including the /RO switch) to logically mount the disk. Then type RUN $BUILD to run the BUILD program. The following is the BUILD program dialogue:

```
SYSTEM BUILD?
TARGET SYSTEM DEVICE <SY0:>?
SOURCE INPUT DEVICE?
LIBRARY OUTPUT DEVICE <SY:>?
LIBRARY ACCOUNT <[1,2]>?
```

Answer YES to the SYSTEM BUILD question. The BUILD program then prints the TARGET SYSTEM DEVICE question. The default response is the current system disk. To specify another disk, type its device name and unit number, followed by a colon. The disk must be logically mounted and write-enabled.

In response to the SOURC INPUT DEVICE question, specify the distribution disk or tape and its unit number. As the LIBRARY OUTPUT DEVICE, specify the device name and unit number to which to write the new library. Specify the desired library account in response to the final question.

The BUILD program runs and creates the files on the specified account. When finished, BUILD prints the BUILD COMPLETE and READY messages.

To build the large system programs, physically mount the next system library distribution volume. (If the distribution medium is RL01, RK06, or RK07 disk, use the same volume as for the standard library build.) Write-protect this volume. If the distribution medium is disk, logically mount it by using the MOUNT command (including the /RO switch). Then type RUN $BUILD.

Answer NO to the SYSTEM BUILD question, and answer the SOURCE INPUT DEVICE, LIBRARY OUTPUT DEVICE, and LIBRARY ACCOUNT questions as you did for the standard library build. In response to the CONTROL FILE IS question, specify $SPLER.CTL. The BUILD program runs and creates the large programs as requested. The BUILD COMPLETE and READY messages signal the end of the BUILD procedure.

APPENDIX A
HARDWARE BOOTSTRAP PROCEDURES

Bootstrapping a device involves using the central processor unit (CPU) console switches to access and initiate a hardware loader. The hardware loader contains machine instructions for reading a special record from the device. The record, called a bootstrap record, is transferred into memory and executes a specially designed software program. For the bootstrap operation to succeed, the device accessed must be on line and ready; the medium accessed must contain a proper bootstrap record; and the console terminal must be on line.

The console switches and their use are described in the PDP-11/70 Processor Handbook and in the PDP-11/04/05/10/35/40/45 Processor Handbook. The bootstrap procedure that you should use depends upon the type of hardware bootstrap device on the system. Table A-1 summarizes the addresses needed to bootstrap each device. The detailed procedures to bootstrap a device are presented according to the types of hardware bootstrap devices available.

Table A-1
Summary of Hardware Bootstrap Addresses

Device to Bootstrap	Bootstrap Type								
	BM873-YA	BM873-YB[1]	MR11-DB	BM792-YB	M9301-YA	M9301-YB	M9301-YC	M9301-YF	M9312
RF11 Disk	773000	773136	773100	777462					
RS03/RS04 Disk					DS	DS	100	DS	DS
RK11 disk cartridge Unit 0	773010	773030	773110	777406	DK	DK	30	DK	DK
RP02 or RP03 disk pack unit 0	773100	773350	773154	776716	DP	DP	40	DP	DP
RP04, RP05, or RP06 disk pack unit 0		773320				DB	70	DB	DB
RK11 disk (unit n)		773032			DKn	DKn	30+n	DKn	DKn
RL01									DLn
RK611 disk (unit n)								DMn	DMn
RK07 disk (unit n)									DMn
RP02 or RP03 disk pack (unit n)		773352			DPn	DPn	40+n	DPn	DPn
RP04, RP05, RM02, RM03, or RP06 disk (unit n)		773322				DBn	70+n	DBn	DBn
TU10 and TS03 magtape	773050	773110	773136	see footnote No. 2	MT	MT	10	MT	MTn
TU16/TE16/TU45 magtape		773150				MM	60	MM	MMn
TC11/TU56 DECtape	773030	773070	773120	777344	DT	DT	20	DT	DTn

[1] To bootstrap a nonzero disk unit, set the address in the Switch Register, press the LOAD ADRS switch, set the unit number in the Switch Register, and press the START switch.

[2] To bootstrap a TU10 or TS03 magtape, use the loading routine described in Section A.5.

A.1 BM873-YA PROCEDURE

If the BM873-YA Restart/Loader is on the system, perform the following steps.

Move the CPU Console ENABLE/HALT switch to its HALT position and back to its ENABLE position.

Set the CPU Switch Register to one of the following values.

773000 for RF11 disk
773010 for RK11 Disk Cartridge
773100 for RP02 or RP03 disk pack
773050 for TM11/TU10 magtape
773030 for TC11/TU56 DECtape

Press the CPU LOAD ADRS switch.

Press the CPU START switch

A.2 BM873-YB PROCEDURE

If the BM873-YB Restart/Loader is on the system, perform the following steps.

Move the CPU Console ENABLE/HALT switch to its HALT position and back to its ENABLE position.

Set the CPU Switch Register to one of the following values.

773030 for RK11 disk cartridge
773136 for RF11 disk
773320 for RP04 disk pack
773032 for RK11 disk unit specified in the Switch Register
773322 for RP04 or RM03 disk unit specified in the Switch Register
773352 for RP02 or RP03 disk unit specified in the Switch Register
773350 for RP02 or RP03 disk pack
773110 for TM11/TU10 magtape
773150 for TM02/TU16/TE16 magtape
773070 for TC11/TU56 DECtape

Press the CPU LOAD ADRS switch.

If necessary, set the CPU Switch Register to the unit number of the disk drive being bootstrapped.

Press the CPU START switch.

A.3 H324 PUSHBUTTON PANEL PROCEDURE

If the system includes the H324 Pushbutton Panel option for the BM873 Restart/Loader, perform the following steps.

Move the CPU Console ENABLE/HALT switch to its HALT position and back to its ENABLE position.

While holding down the UNLOCK switch, press the appropriate switch to bootstrap the desired device. The DIGITAL field service engineer who installed the computer should have informed you of the device that each switch bootstraps.

Press the CPU START switch.

A.4 MR11-DB PROCEDURE

If the MR11-DB Bulk Storage Loader is on the system, perform the following steps.

Move the CPU Console ENABLE/HALT switch to its HALT position and back to its ENABLE position.

Set the CPU Switch Register to one of the following values.

773100 for RF11 disk
773110 for RK11 disk cartridge
773154 for RP03 disk pack
773136 for TM11/TU10 magtape
773120 for TC11/TU56 DECtape

Press the CPU LOAD ADRS switch.

Press the CPU START switch.

A.5 BM792-YB PROCEDURE

If the BM792-YB Hardware Loader is on the system, perform the following steps.

Move the CPU Console ENABLE/HALT switch to its HALT position and back to its ENABLE position.

Set the CPU Switch Register to 773100.

Press the CPU LOAD ADRS switch.

Set the CPU Switch Register to one of the following values.

777462 for RF11 disk
777406 for RK11 disk cartridge
776716 for RP03 disk pack
777344 for TC11/TU56 DECtape

Press the CPU START switch.

To bootstrap a TM11/TU10 magtape when the system has neither the BM873 nor the MR11-DB loader, you must manually enter a load routine into memory using the CPU console Switch Register and the DEP switch.

To load the routine, perform the following steps.

Move the CPU Console ENABLE/HALT Switch to its HALT position and back to its ENABLE position.

Set the CPU Switch Register to 010000.

Press the CPU LOAD ADRS switch.

Load the following contents into memory using the Switch Register and DEP switch.

Address	Contents
010000	012700
010002	172524
010004	005310
010006	012740
010010	060011
010012	105710
010014	100376
010016	005710
010020	100767
010022	012710
010024	060003
010026	105710
010030	100376
010032	005710
010034	100777
010036	005007

Set the Console Switch Register to 010000.

Press the CPU LOAD ADRS switch.

Press the CPU START switch.

If the system reads the tape but halts at address 010034, the magtape generated a parity error. Try another drive. If the system appears to take no action and halts, verify the accuracy of the routine by using the CPU Console EXAM switch. Use the Switch Register and the DEP switch to correct any erroneous contents. Rewind the tape to its load point before executing the routine again. If no recovery is successful, you should have a DIGITAL field service representative check the device. If the hardware is working properly, you should use a new magtape reel.

A.6 M9301-YA AND M9301-YB PROCEDURE

If the M9301-YA or M9301-YB Bootstrap Terminator is on the system, perform the following steps.

While holding down the CTRL switch, press the BOOT switch on the front of the computer.

The bootstrap prints the contents (in octal) of registers R0, R4, the Stack Pointer, and the Program Counter at the console terminal. It then prints a prompting $ character.

In response to the $ character, type the 2-character device code and the unit number of the device to be bootstrapped. Terminate your response by pressing the RETURN key. The following are the device codes:

Table A-2
Device Codes for M9301-YA and M9301-YB Bootstraps

Device	Code
TU10/TS03	MT
*TU16/TU45/TE16 Magtape	MM
RK05 Disk Cartridge	DK
RP02/RP03 Disk Pack	DP
*RP04/RP05/RP06/RM02/RM03 Disk Pack	DB
*RS03/RS04 Fixed Head Disk	DS
TU56 DECtape	DT

*M9301-YB Bootstrap Terminator only.

A.7 M9301-YC PROCEDURE

If the M9301-YC bootstrap is on the system, perform the following steps.

Move the CPU ENABLE/HALT switch to its HALT position and back to its ENABLE position.

Set the start address of 17765000 in the console switches.

Press the CPU LOAD ADDR switch.

Set the device unit number in switches 0 through 2.

Set the device code for the device to be bootstrapped in switches 3 through 6. Table A-3 lists the device codes.

Table A-3
Device Codes for M9301-YC Bootstrap

Device	Code
TM11/TU10/TS03 Magtape	1
TC11/TU56 DECtape	2
RK11/RK05 Disk Cartridge	3
RP11/RP02/RP03 Disk Pack	4
RH70/TU16/TU45/TE16 Magtape	6
RH70/RP04/RP05/RP06/RM02/RM03 Disk Pack	7
RH70/RS03/RS04 Fixed Head Disk	10

Ensure that switches 7 through 21 are off (down).

Press the CPU START switch.

NOTE

Before the M9301-YC bootstrap actually bootstraps the system, it performs CPU tests, instruction and addressing tests, and memory and cache tests. If a hardware failure is detected, the diagnostic program halts. The lights contain the ROM address of the halt. If this occurs, call the DIGITAL field service engineer.

It may, however, be possible to continue with the bootstrap operation if the lights contain the address 1773764, which indicates a cache failure. To continue in this case, press CONT. This is the ONLY case in which it is possible to continue bootstrapping after the diagnostic detects an error.

A.8 M9301-YF PROCEDURE

If the M9301-YF Bootstrap Terminator is on the system, perform the following steps.

While holding down the CTRL switch, press the BOOT switch on the front of the computer.

The bootstrap prints the contents (in octal) of registers R0, R4, the Stack Pointer, and R5 at the console terminal. It then prints a prompting $ character.

In response to the $ character, type the 2-character device code and the unit number of the device to be bootstrapped. Terminate your response by pressing the RETURN key. Table A-4 lists the device codes.

Table A-4
Device Codes for M9301-YF Bootstrap

Device	Code
TU10/TS03 Magtape	MT
TU16/TU45/TE16 Magtape	MM
RK05 Disk Cartridge	DK
RK06 Disk Cartridge	DM
RP02/RP03 Disk Pack	DP
RP04/RP05/RP06/RM02/RM03 Disk Pack	DB
RS03/RS04 Fixed Head Disk	DS
TU56 DECtape	DT

A.9 M9312 PROCEDURE

The M9312 Bootstrap Module has five sockets that accommodate one CPU ROM and up to four peripheral boot ROMs. Each CPU and boot device has a unique ROM developed for it. The CPU ROM plugs into a specific socket location within the module. The peripheral ROMs, however, may be placed in any of the four peripheral socket locations as long as the sockets are filled in sequential order with no vacancies between loaded ROM sockets. Since a particular peripheral ROM has a different boot start address in each of the four sockets, it is important to know the locations of the ROMs in the bootstrap module. The ROM configuration is a diagram of where specific boot ROMs are located. This information must be known before the bootstrap procedure can begin. The following sections explain how to determine the ROM configuration if it is not known and how to bootstrap a device when the ROM configuration is known. Figure A-1 is a diagram of the ROM arrangement for the M9312 Bootstrap Module.

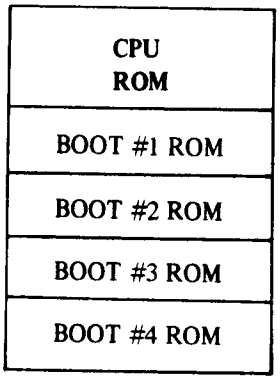


Figure A-1 M9312 ROM Arrangement

If the M9312 Bootstrap/Terminator is on the system, perform one of the following procedures:

- If you have the M9312 console emulator on the system, follow the procedures in Section A.9.1 (PDP-11/60's and PDP-11/70's do not have console emulators).
- If you have a CPU equipped with switch registers and *do not know* what devices the M9312 will boot, perform the procedures in Section A.9.2.
- If you have a CPU equipped with switch registers and *know* what device ROMs are on the M9312 Bootstrap Module, follow the procedures in Section A.9.3.

- If you do not have the M9312 Bootstrap/Terminator Module on your system and need to boot the RL01 or the RK07 disk device, perform the manual load routine described in Section A.10.

A.9.1 Using the M9312 Console Emulator

The M9312 console emulator can be initiated in two ways depending on the type of CPU (push button or switch register) on the system.

1. *Push button* boot using the M9312 console emulator.

   While holding down the CNTRL button, press the BOOT button on the CPU.

   The bootstrap prints the contents (in octal) of registers R0, R4, the stack pointer, and R5 at the console terminal. It then prints a prompting @ character.

   In response to the @ character, type the 2-character device code and the unit number of the device to be bootstrapped. Terminate your response by pressing the return key. If the unit number is not entered, it is assumed to be zero. Table A-7 contains the device codes.

   Successful completion of these push button bootstrap procedures produce header information on the console terminal, similar to the following example:

   ```
   Enabling only console, disks, and tapes

   RSTS V06C (MT0)

   Option:
   ```

   Begin the system generation process in Chapter 3 – TAILORING THE SYSGEN SYSTEM.

2. *Switch register* boot using the M9312 console emulator.

   - Move the CPU console Enable/Halt switch to its Halt position then back to its Enable position.
   - Set the CPU switch register to 765020.
   - Press the start switch. The bootstrap prints the contents (in octal) of registers R0, R4, the stack pointer, and R5 at the console terminal. It then prints a prompting @ character.

     In response to the @ character type the 2-character device code and the unit number of the device to be bootstrapped. Terminate your response by pressing the return key.[1] If the unit number is not entered, it is assumed to be zero. Table A-7 contains the device codes.

     Successful completion of the switch register bootstrap procedure produces header information on the console terminal, similar to the example given for the push button bootstrap. After the message appears, begin the system generation process in Chapter 3 – TAILORING THE SYSGEN SYSTEM.

A.9.2 Determining the M9312 Bootstrap ROM Configuration

If you *do not know the M9312 ROM configuration*, it can be determined by using Tables A-5 and A-7 and performing the instructions that follow Table A-5.

[1] The @ sign returns at this point if the correct boot ROM was not installed, or if a nonexistent device code is entered. If the contents of the registers R0, R4, R6, and R5 appear before the @ sign, this indicates that at least one boot ROM socket is empty and can accommodate another boot ROM.

Table A-5 ROM Locations

ROM Address	ROM Location
765774	Diagnostic ROM
773000	ROM 1
773200	ROM 2
773400	ROM 3
773600	ROM 4

Repeat the following steps for each of the ROM addresses shown in Table A-5. After you have completed this process, you will know the M9312 bootstrap ROM configuration of your system. With this information, you can boot any device having a boot ROM in the M9312 Bootstrap Module.

Table A-6 M9312 Bootstrap ROM Configuration

ROM Location	Bootable Device	Device Mnemonic
Diagnostic ROM		
ROM 1		
ROM 2		
ROM 3		
ROM 4		

- Select a six character ROM address from Table A-5.
- Set the CPU switches to the selected number.
- Press the LOAD ADRS switch to set the ROM address.
- Press the EXAM switch. The contents of the ROM address just loaded will appear in the CPU data register.
- Match the octal number represented in the CPU data register with the octal data number shown in Table A-7.
- Locate in Table A-7 the device mnemonic and the device name associated with the matching number. The ROM you have just investigated can boot the device(s) you located in Table A-7. Write the retrieved device information from Table A-7 with the appropriate ROM location in Table A-6. For example, if you selected a six character ROM address for ROM 1 from Table A-5, place the device mnemonic and name you located in Table A-7 with ROM 1 in Table A-6. Documenting the ROM configuration in Table A-6 will obviate performing the above procedure again.

Table A-7 Device Name and Mnemonic

Device to Be Booted	Mnemonic	Unit	Octal Data
RL01	DL	0-3	042114
RK06/RK07	DM	0-7	042115
RX01	DX	0-1	042130
RP02/RP03 RP04/RP05/RP06 RM02/RM03	DP DB DB[1]	0-7 0-7	042120
RK03/RK05 TU55/TU56	DK DT	0-7 0-7	042113
TU16/TE16	MM	0-7	046515
TU10/TE10/TS03	MT	0-7	046524
RS03/RS04	DS	0-7	042123
PC05 LO SPD RDR	PR TT	N/A N/A	050122
TU60	CT	0-1	041524
RX02	DY	0-1	042131
Console Emul. CPU ROM	A0	N/A	040460
Diagnostic ROM PDP-11/60/70	B0	N/A	041060
			177776[2] XXX777[3]

[1] Type in DB rather than DR if you are booting the RM02 or RM03 disk.
[2] This is a continuation ROM of a multiple ROM boot.
[3] Bad ROM or NO ROM present.

After you have determined the ROM configuration, perform the procedures in Section A.9.1 if you find you have a console emulator; otherwise, perform the procedures in Section A.9.3. The following section explains how to bootstrap with the M9312 module using a switch register controlled CPU.

A.9.3 Bootstrapping with the M9312

The following procedure describes how a device is bootstrapped when the M9312 Bootstrap ROM configuration is known. The data you need to bootstrap a device appears in Table A-8.

- Locate in Table A-8 the name of the device to be booted.
- Determine from the ROM configuration (Table A-6) the location (ROM 1/2/3/4) of the device boot ROM.
- Select the three character Switch Register Code (SWR) from Table A-8 for the particular ROM location.
- Move the CPU console Enable/Halt switch to its Halt position then back to its Enable position.
- Set the CPU switch register to 765744 (or 17765744 for PDP-11/70).
- Press the CPU LOAD ADRS switch.
- Set the Switch Register Code (SWR) selected from Table A-8 in CPU switches 0-8 as shown in Table A-9.
- Set the unit number of the boot device in CPU switches 9-11 (see Table A-9).
- Press the CPU start switch.

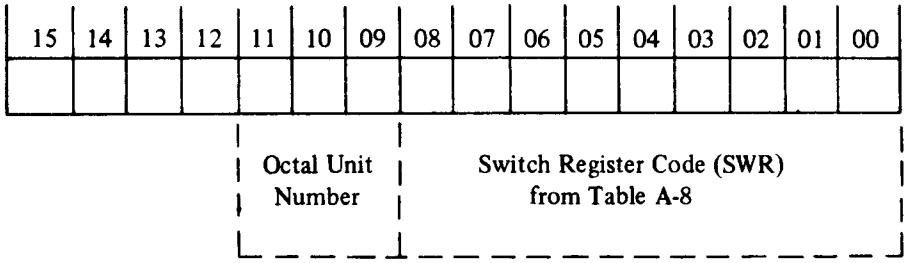
Successful completion of this process boots the device. A message, similar to the following example, appears on the console terminal. At this point, you may begin the system generation process in Chapter 3 – TAILORING THE SYSGEN SYSTEM.

```
Enabling only console, disks, and tapes.

RSTS V06C (MT0)

Option:
```

Table A-8 Switch Register Codes (SWR)

Device to Be Booted	Switch Register Code (SWR)			
	ROM 1	ROM 2	ROM 3	ROM 4
RL01	012	212	412	612
RK06/RK07	012	212	412	612
RX01	012	212	412	612
RP02/RP03	012	212	412	612
RP04/5/6 RM02/RM03	056	256	456	656
RK03/05/05J	012	212	412	612
TU55/56	042	242	442	642
TU16	012	212	412	612
TU10/TS03	012	212	412	612
RS03/04	012	212	412	612
High Speed Reader	012	212	412	612
Low Speed Reader	042	242	442	642
TU60	012	212	412	612
RX02	012	212	412	612

Table A-9 Console Switch Register Settings



A.10 LOAD PROGRAM BOOTSTRAP FOR THE RL01 AND RK07

To bootstrap an RL01 or RK07 device when the system does not have the M9312 Bootstrap Module, you must manually enter a bootstrap load routine using the CPU console. The following procedure describes the manual load process using the PDP-11/34. A similar procedure is followed using the CPU LOAD ADRS, DEP, and EXAM switches for the PDP-11/70 computer.

- While holding down the CNTRL button, press the HLT/SS button on the CPU.
- Set address 1000 in the console register by using the numbered console buttons.
- Press the LAD (load address) button.
- Press the CLR button to clear the register.
- Load the *contents*, that appear on the next page, into memory using the numbered buttons and the DEP button. Press the CLR button after you have placed the contents in the CPU register and pressed the DEP button.

Address	RL01 Bootstrap Routine Contents	RK07 Bootstrap Routine Contents
1000:	12700	12700
1002:	174400	177440
1004:	12760	12760
1006:	13	0[1]
1010:	4	10
1012:	12701	12701
1014:	4[2]	2003[3]
1016:	10110	10110
1020:	105710	105710
1022:	100376	100376
1024:	12760	12760
1026:	177601	177400
1030:	4	2
1032:	5721	62701
1034:	10110	16
1036:	105710	10110
1040:	100376	105710
1042:	12760	100376
1044:	177400	5710
1046:	6	100001
1050:	5060	0
1052:	4	5007
1054:	62701	
1056:	6	
1060:	10110	
1062:	105710	
1064:	100376	
1066:	5710	
1070:	100001	
1072:	0	
1074:	5007	

After the contents are loaded, perform the following steps.

- Place address 1000 in the console register *again* by using the numbered buttons.
- Press the CPU LAD (load address) button to load the address.
- While holding the CNTRL button down, press the START button on the CPU to boot the device.

You can verify the accuracy of the load routine by using the CPU EXAM button. Place address 1000 in the register and press the LAD button. Press the EXAM button to reveal the contents of address 1000. It should be 12700 for both the RL01 and RK07 routines. Continue to press the EXAM button to check the contents of the remaining addresses in the load routine. Use the LAD and the DEP buttons to correct any erroneous contents.

---

[1] Select drive number 0-7 for the RK07.
[2] Load 4 for unit 0, 404 for unit 1, 1004 for unit 2, and 1404 for unit 3.
[3] Load 3 for RK06.

APPENDIX B
SYSTEM GENERATION ERROR MESSAGES

B.1 INITIALIZATION CODE ERROR MESSAGES

The RSTS/E system initialization code routines make many checks to ensure the consistency of system structures. Initialization routines compare existing structures with their definitions and with references in other parts of the system. The checks must be successful; if not, the routines detect a consistency error, which indicates that the system is corrupted.

The initialization routines may also encounter errors while attempting to execute initialization options. The error text for many of these errors is preceded by the message FATAL RSTS/E SYSTEM INITIALIZATION ERROR. The initialization code prints a descriptive error message and returns to the OPTION: prompt. If such an error occurs, follow the error recovery procedures in Table B-1. If these procedures are unsuccessful, consult your DIGITAL Software Support Specialist.

For many of the errors, no recovery procedures exist. If such an error occurs, you should submit a Software Performance Report (SPR) as noted in the Recovery Procedures column for that error message.

Table B-1
Initialization Code Error Messages

Message	Recovery Procedure
ACCOUNT [1, 2] MISSING FROM OUTPUT DISK	Reinitialize the disk as a system disk.
BAD [0, 1] DIRECTORY	Rebootstrap the system disk and retry the operation. If the retry fails, use DSKINT to reinitialize the disk.
BADB.SYS NOT FOUND – RESULTS UNPREDICTABLE	Rebootstrap the system disk and retry the operation. If the retry fails, use DSKINT to reinitialize the disk.
BUFF.SYS NOT FOUND OR TOO SMALL – DECTAPE DISABLED	Warning message only. Shut down the system and use REFRESH to create the file at the required size.
CANNOT REFRESH THIS DISK	Reinitialize the disk.
CANNOT START WITH THIS SWAP MAX AND MEMORY TABLE	Use DEFAULT to change the swap max and/or memory allocation table.
CLUSTER 1 (REQUIRED FOR MFD) CONTAINS A BAD BLOCK	If the pack cluster size for the disk is greater than the device cluster size, use DSKINT to reinitialize the disk with a lower pack cluster size. If the error recurs, use a different disk.

Table B-1 (Cont.)
Initialization Code Error Messages

Message	Recovery Procedure
CLUSTER ALLOCATED TO [p,pn] filnam.ext IS NOT ON A PACK CLUSTER BOUNDARY	CLEAN asks whether to delete the file, then confirms your response.
[P,PN] CLUSTER MAP IN UFD DISAGREES WITH MFD	CLEAN asks whether to zero the account and confirms your response.
DECTAPE INPUT ERROR	Ensure that the DECtape drive is clean and properly aligned. If the error recurs, try another drive.
DEFAULT RTS HAS INVALID SIZE PARAMETERS	Regenerate.
DEFAULT RTS NOT FOUND OR INVALID	Ensure that a valid run-time system is on the system disk. Regenerate if necessary.
DEVICE xx: DOES NOT INTERRUPT – DEVICE DISABLED	Use HARDWR to set the correct vector address for xx: or call the DIGITAL field service engineer.
DEVICE ERROR WHEN TRYING TO BOOTSTRAP DEVICE	Ensure that the device is on-line and ready. If the error recurs, try a different device.
DIRECTORY ENTRY FOR [P,PN] filnam.ext CONTAINS PACK CLUSTER NUMBER WHICH IS TOO BIG	CLEAN asks whether to delete the file and confirms your response.
DIRECTORY ERROR DETECTED IN RDB	Reinitialize the disk.
DIRECTORY ERROR – FILE NOT FOUND	Reinitialize the disk.
[0,1] DIRECTORY NOT FOUND	Reinitialize the disk.
DISK BLOCK 0 (REQUIRED FOR BOOTSTRAPS) IS BAD	Reinitialize the disk. If the error recurs, use a different disk.
DISK ERROR DURING DSKINT BUILD PHASE	Reinitialize the disk. If the error recurs, use a different disk.
DISK STRUCTURE IS IRREVOCABLY CORRUPT	Reinitialize the disk.
DOUBLY ALLOCATED BLOCK FOUND AT DEVICE CLUSTER nn. THE BLOCK IS ALLOCATED TO [p,pn] filnam.ext AND [p,pn] filnam.ext	CLEAN lets you choose the file to delete, then confirms your response.

Table B-1 (Cont.)
Initialization Code Error Messages

Message	Recovery Procedure
DRIVE NOT READY:	Ensure that the disk drive is on-line and READY. Press the LINE FEED key to retry the operation. Type any other character to abort the operation.
DSKINT ERROR – ATTEMPT TO FORMAT UNFORMATTABLE DISK	Submit an SPR.
DSKINT OR SYSGEN ERROR – DSKINT ALLOCATION FAILURE	Submit an SPR.
EOF READING INIT.SYS	Submit an SPR.
ERR FILE INVALID	Copy the file ERR.ERR from the distribution medium to the system disk and use the DEFAULT option to install ERR.ERR as the system default.
ERR FILE NOT FOUND	Copy the file ERR.ERR from the distribution medium to the system disk and use the DEFAULT option to install ERR.ERR as the system default.
ERROR DETECTED WHILE READING ERROR RECORD SECTOR #n	Warning message only. Error occurred during reading of factory error records. Disregard the error message.
ERROR – KB INTERFACES OUT OF SEQUENCE	Regenerate. If the problem recurs, submit an SPR.
ERROR – NO SETUP FOR DISK xx:	Regenerate. If the problem recurs, submit an SPR.
ERROR – UNKNOWN DISK xx:	Regenerate. If the problem recurs, submit an SPR.
EXCESSIVE BAD CLUSTERS	If you need to use the current disk, use DSKINT to increase the pack cluster size. If the error recurs, use a different disk.
FATAL DISK ERROR DURING CONTROL RESET	Retry the DSKINT. If the error recurs, call the DIGITAL field service engineer to repair the disk drive.
FATAL ERROR – NO SMALL BUFFERS LEFT	Regenerate the system and configure more small buffers.
xxx FILE NOT FOUND WHEN REMOVING IT	Warning message only. xxx is SIL, RTS, or ERR. The initialization code did not find a file when trying to make it deletable.

Table B-1 (Cont.)
Initialization Code Error Messages

Message	Recovery Procedure
[P,PN] filnam.ext HAS A BAD BLOCK	CLEAN asks whether to delete the file and confirms your response.
[P,PN] filnam.ext HAS FIRST DCN OUT OF RANGE	CLEAN asks whether to zero the account and confirms your response.
[P,PN] filnam.ext HAS INVALID ACCOUNTING ENTRY LINK	CLEAN asks whether to delete the account and confirms your response.
filnam.ext HAS ILLEGAL FORMAT AND CANNOT BE COPIED	Submit an SPR if DIGITAL supplied the file on the distribution medium. Regenerate if the system generation process created the file.
FORMATTING FAILURE:	Press the LINE FEED key to retry. Type anything else to abort the DSKINT and return to the OPTION: prompt. Ensure that the disk drive is write enabled. This error may indicate a bad disk pack or a bad disk drive.
[P,PN] HAS A BAD BLOCK	CLEAN asks whether to delete the account and confirms your response.
[P,PN] HAS HOLES IN CLUSTER MAP	CLEAN asks whether to zero the account and confirms your response.
[P,PN] HAS INCONSISTENT CLUSTER MAPS	CLEAN asks whether to zero the account and confirms your response.
[P,PN] HAS INVALID CLUSTER SIZE	CLEAN asks whether to delete the account and confirms your response.
ILLEGAL INTERFACE INDEX nn	Regenerate. If the error recurs, submit an SPR.
INIT BUG – BAD DISK INDEX	Submit an SPR.
INIT BUG – CAN'T ALLOCATE FILE 2ND TIME	Submit an SPR.
INIT BUG – CAN'T CHECK PARITY	Submit an SPR.
INIT BUG – CAN'T FIND [0,1] AGAIN	Submit an SPR.
INIT BUG – CAN'T FIND FILE TO DELETE	Submit an SPR.

Table B-1 (Cont.)
Initialization Code Error Messages

Message	Recovery Procedure
INIT BUG – CLEAN FAILED TO FIND ALLOCATION ERROR	Submit an SPR.
INIT BUG – DIDN'T GET SAME CLUSTER 2ND TIME	Submit an SPR.
INIT BUG – DIDN'T GET SAME FILE CLUSTER 2ND TIME	Submit an SPR.
INIT BUG – DON'T KNOW HOW TO START	Submit an SPR.
INIT BUG – FAILED TO CREATE FILE	Submit an SPR.
INIT BUG – FAILED TO FIND FILE AGAIN	Submit an SPR.
INIT BUG – FAILED TO FIND FILE JUST CREATED	Submit an SPR.
INIT BUG – FILE EXISTS WHEN TRYING TO CREATE	Submit an SPR.
INIT BUG – xxx – file type FILE NOT FOUND 2ND TIME	Submit an SPR.
INIT BUG – xxx – FILE NOT FOUND WHEN REMOVING IT	Submit an SPR.
INIT BUG – FILE SIZE COMPUTED WRONG	Ensure that the system device you are using contains a valid system. If so, submit an SPR.
INIT BUG – FLOAT TABLE ERROR	Submit an SPR.
INIT BUG – INSTALL NOT SYNCHRONIZED AT xxxxxx	Submit an SPR.
INIT BUG – NO UFD FOUND IN CREATE	Submit an SPR.
INIT BUG – RNB TO WRONG DISK	Submit an SPR.
INIT BUG – SATT.SYS NON-EXISTENT AT TIME OF WOMP	Submit an SPR.
INIT BUG – SETNEW TABLE TOO SMALL	Submit an SPR.
INIT BUG – START LINKED TOO LOW	Submit an SPR.

Table B-1 (Cont.)
Initialization Code Error Messages

Message	Recovery Procedure
INIT LINK BUG – DEFBUF NOT ALIGNED.	Submit an SPR.
INIT LINK BUG – DSTBL TOO LOW	Submit an SPR.
INIT LINK BUG – FIBUF NOT ALIGNED	Submit an SPR.
INIT LINK BUG – INSBUF NOT ALIGNED	Submit an SPR.
INIT LINK BUG – SATBUF NOT ALIGNED	Submit an SPR.
INIT.SYS NOT FOUND – RESULTS ARE UNPREDICTABLE	Rebootstrap the system disk and retry the operation. If the retry fails, reinitialize the disk.
INPUT FILE MISSING FROM SYSTEM DEVICE	Retry the procedure that generated the error. If the error recurs, submit an SPR.
INSTALLED MONITOR DOES NOT SUPPORT THIS SYSTEM DISK	Regenerate a monitor that supports the system disk or use the COPY option to transfer the monitor to a disk it supports.
INSTALLED SIL INVALID	The installed SIL is invalid as a monitor SIL. Use the INSTALL option to install a valid SIL.
INVALID ACCOUNT NUMBER [P,PN]	CLEAN deletes the account after requesting your confirming response.
INVALID DATA IN ERROR RECORD SECTOR # n	Warning message only. The error occurred during reading of factory error records. Disregard the error message.
INVALID RETRIEVAL ENTRIES FOR FILE [p,pn] filnam.ext – FIXED BY CLEAN	Warning message. CLEAN truncates the file.
I/O TO UNOPENED FILE	Submit an SPR.
[P,PN] IS NOT A VALID ACCOUNT NUMBER	CLEAN asks whether to delete the account and confirms your response.

Table B-1 (Cont.)
Initialization Code Error Messages

Message	Recovery Procedure
MFD NAME ENTRY CONTAINS A BAD LINK. CLEAN WILL DELETE ALL [1,1] FILES AND ALL ACCOUNTS BEYOND [p,pn] filnam.ext	CLEAN confirms your response.
MONITOR SIL CHANGED – REINSTALL IT	Use the INSTALL option to install the monitor SIL.
MONITOR SIL NOT FOUND	Use the INSTALL option again to install the SIL. If the error recurs, submit an SPR.
MT / MM ERROR OR INVALID FORMAT ON TAPE	Ensure that the magtape drive heads are clean and correctly aligned. If the error recurs, try using a different drive.
NO LIBRARY ACCOUNT ON THIS DISK	Reinitialize the disk and create a library account.
NO ROOM FOR DIRECTORY ON OUTPUT DISK	Delete files or reinitialize the disk to create sufficient contiguous space on the disk for the file. Or use a different disk.
NO ROOM FOR FILE ON OUTPUT DISK	Delete files, reinitialize the disk to create sufficient contiguous space on the disk for the new file, use a different disk.
NO ROOM FOR 2 JOBS IN SWAP.SYS	Use REFRESH to increase the size of SWAP.SYS so that it can accommodate two jobs of size SWAP MAX.
NOT ENOUGH ROOM IN LOW MEMORY FOR MONITOR	Generate a smaller monitor.
NOT ENOUGH ROOM IN MEMORY FOR RUN TIME SYSTEM	Generate a smaller monitor or run-time system.
ONE OR MORE SYSTEM FILES MISSING	Reinitialize the disk.
OPTION ATTEMPTED DURING BOOT-STRAP PHASE	Rebootstrap the system and retry the operation. If the retry fails, submit an SPR.
OPTION NOT AVAILABLE	The option you requested is not available until you bootstrap the system disk.
OUTPUT DISK IS DIRTY – CANNOT PROCEED	Use REFRESH to clean the disk or use DSKINT to reinitialize the disk.
OUTPUT DISK IS NOT A SYSTEM DISK	Reinitialize the disk as a system disk.

Table B-1 (Cont.)
Initialization Code Error Messages

Message	Recovery Procedure
OVERLAY HANDLER IN ERROR	Submit an SPR.
OVR NOT IN SIL	Regenerate.
PACK CLUSTER SIZE IS NOT 1, 2, 4, 8, OR 16	Reinitialize the disk.
PARITY CSR FOUND, BUT NOT RELATING TO MEMORY	Call the DIGITAL field service engineer.
PARITY CSR CONTROLS MORE THAN 31K	Call the DIGITAL field service engineer.
PERMANENTLY MAPPED REGION OF MONITOR IS TOO LARGE	Regenerate to create a smaller monitor. Configure fewer small buffers or less resident code.
PRIORITY OF xx: INTERRUPT (PRn) IS TOO HIGH – DEVICE DISABLED	Call the DIGITAL field service engineer to install the device correctly.
QUESTION ATTEMPTED DURING AUTO-RESTART	If the system disk needs cleaning, start the system by typing START or LINE FEED, thereby cleaning the disk. If any other problem occurs, submit an SPR.
REQUESTED DISK DRIVE NOT FOUND	Request a disk that is on the system.
REQUIRED MODULE xxxxxx HAS INVALID LENGTH	Regenerate. If the error recurs, submit an SPR.
REQUIRED MODULE xxxxxx HAS INVALID TRANSFER ADDRESS	Regenerate. If the error recurs, submit an SPR.
REQUIRED MODULE xxxxxx HAS WRONG LOAD ADDRESS	Regenerate. If the error recurs, submit an SPR.
REQUIRED MODULE xxxxxx IS IMPROPERLY LINKED	Regenerate. If the error recurs, submit an SPR.
REQUIRED MODULE xxxxxx IS MISSING A REQUIRED SYMBOL	Regenerate. If the error recurs, submit an SPR.
REQUIRED MODULE xxxxxx NOT FOUND IN SIL	Regenerate. If the error recurs, submit an SPR.
REQUIRED MODULE xxxxxx OUT OF SEQUENCE IN SIL	Regenerate. If the error recurs, submit an SPR.
REQUIRED MODULE xxxxxx TOO LARGE	Regenerate. If the error recurs, submit an SPR.

Table B-1 (Cont.)
Initialization Code Error Messages

Message	Recovery Procedure
REQUIRED MODULE xxxxxx TOO SMALL	Regenerate. If the error recurs, submit an SPR.
REQUIRED SYMBOL xxxxxx MISSING FROM MONITOR	Regenerate. If the error recurs, submit an SPR.
RSTS/E REQUIRES AT LEAST 32K WORDS OF MEMORY	Your configuration is too small for the system.
RSTS/E REQUIRES EIS!	Correct the hardware configuration to include EIS.
RSTS/E REQUIRES A CLOCK!	Correct the hardware configuration to include a KW11P or KW11L clock.
RSTS/E REQUIRES MEMORY MANAGE-MENT HARDWARE!	Correct the hardware configuration to include a memory management unit.
SATT.SYS IS OVER 16. BLOCKS LONG	If the file structure on the disk is sound, submit an SPR. Otherwise, reinitialize the disk.
SATT.SYS NON-EXISTENT AT TIME OF READ	If the file structure on the disk is sound, submit an SPR. Otherwise, reinitialize the disk.
SATT.SYS NOT FOUND – RESULTS UNPREDICTABLE	Rebootstrap the system and retry the operation. If the error recurs, reinitialize the disk.
filnam.SIL NOT FOUND – PLEASE INSTALL A SIL	The SIL that you previously installed is not on the disk. Use the INSTALL option to install a monitor SIL.
SWAP.SYS NOT CONTIGUOUS OR TOO SMALL	Use the REFRESH option to create a contiguous SWAP.SYS of the correct size.
SWAP.SYS NOT PRESENT IN [0,1]	Use the REFRESH option to create SWAP.SYS in [0,1]
SYMBOL xxxxxx NOT FOUND IN MONITOR SYMBOL TABLE	Regenerate. If the problem recurs, submit an SPR.
SYSTEM DISK DISABLED IN MONITOR	Use the SET option to enable the system disk device.
TOO MANY BLOCKS IN DEVICE CONFIGURATION TABLE	Regenerate.
TOO MANY xx: CONTROLLERS GENERATED	Ensure that any edits to CONFIG.MAC are correct. If there are no editing errors, regenerate the system.
TOO MANY RH OR UNIBUS DEVICES	Submit an SPR.

Table B-1 (Cont.)
Initialization Code Error Messages

Message	Recovery Procedure
TOO MANY SUBLINES FOR nn:	Ensure that any edits to CONFIG.MAC ARE correct. If there are no editing errors, regenerate the system.
TOO MANY UNIBUS DEVICES ON THIS 11/70	First, disable unnecessary devices with HARDWR or SET. If the error condition persists, use DEFAULT to lock all memory addresses above 124K. (The computer runs in 18-bit addressing mode instead of 22-bit addressing mode.) If the error condition is present after you lock memory, or if the computer has 124K words of memory or fewer, submit an SPR.
TOO MUCH MODIFICATION TO MONITOR REQUIRED	Regenerate to produce a monitor that is more closely configured to your system hardware.
UFD HAS SIZE TOO LARGE FOR FILE [P,PN] filnam.ext – FIXED BY CLEAN	Warning message only. CLEAN corrects the condition.
UFD HAS SIZE TOO SMALL FOR FILE [P,PN] filnam.ext – FIXED BY CLEAN	Warning message only. CLEAN corrects the condition.
[0,1] UFD NOT FOUND	Reinitialize the disk.
UNABLE TO CREATE REQUESTED FILE(S)	Delete some files and retry the procedure, or request smaller files. Also, try using the FILE suboption of REFRESH to create files one at a time.
UNEXPECTED TRAP THROUGH THE VECTOR AT nnn. TRAP OCCURRED FROM PC = nnnnnn.	Submit an SPR.
UNKNOWN DEVICE BOOTED	Submit an SPR.
UNKNOWN RH CONTROLLER PRESENT	Call the DIGITAL field service engineer to correct the hardware configuration.
UNRECOVERABLE DISK ERROR ON xxn:	Ensure that the disk is mounted and write-enabled (if necessary). If the disk is properly mounted, this error indicates a fatal disk error. Reformat and reinitialize the disk, or use a different disk.
USER-DEFINED ADDRESS FOR DEVICE xxn: NOT FOUND – DEVICE DISABLED	Use HARDWR to set the correct CSR address for xx:, or call the DIGITAL field service engineer.
USING KW11L CLOCK	Warning message only. The installed SIL is configured for a KW11P clock, but the KW11P clock is not present. RSTS/E uses the KW11L clock instead.

Table B-1 (Cont.)
Initialization Code Error Messages

Message	Recovery Procedure
USING KW11P CLOCK AT LINE FREQUENCY	Warning message only. The installed SIL is configured for a KW11L clock; but the KW11L clock is not present. RSTS/E uses the KW11P clock instead.
VECTOR FOR DEVICE xx: (nnnn) ALREADY IN USE - DEVICE DISABLED	Use HARDWR to set the correct vector address for xx:, or call the DIGITAL field service engineer.
WARNING – BAD BLOCK DOUBLY ALLOCATED TO BADB.SYS	Warning message only.
WARNING – DCN IN BADB.SYS TOO BIG	Warning message only. The file structure on the disk being cleaned appears invalid.
WARNING ** DBn: IS DUAL PORTED, PROCEED WITH CAUTION	Warning message only.
WARNING – DCN IN BADB.SYS NOT ON PACK CLUSTER BOUNDARY	Warning message only.
WARNING – xxx FILE NOT FOUND – PLEASE SET DEFAULTS	The SIL you are installing specifies a default run-time system or error message file that is not present. Use the DEFAULT option to specify a valid file.
WARNING – FILE filnam.ext NOT FOUND WHEN REMOVING OLD SIL	Warning message only.
WARNING – LINK IN BADB.SYS IS BAD. BAD BLOCKS MAY BE LOST.	Warning message only.
WARNING – MAIN MEMORY (cache) DISABLED AT STARTUP. RSTS/E WILL NOT USE (cache). SYSTEM MAY RUN SLOWLY.	Warning message only. (cache) is CACHE, CACHE GROUP 0, or CACHE GROUP 1.
WARNING – MAIN MEMORY (cache) IS FAILING REPEATEDLY. RSTS/E WILL NOT USE (cache). SYSTEM MAY RUN SLOWLY.	Warning message only. (cache) is CACHE, CACHE GROUP 0, or CACHE GROUP 1.
WARNING – ODT IN THE SIL IS IN AN ILLEGAL FORMAT	Warning message only.
WARNING – SUBLINES for xx: ARE OUT OF SEQUENCE	Warning message only, but the system may crash. Regenerate.

B.2 RT11 RUN-TIME SYSTEM ERROR MESSAGES

The RT11 run-time system can generate the errors described in Tables B-2 and B-3.

Table B-2
Recoverable RT11 Run-Time System Errors

Message	Meaning
?ADDR?	You specified an illegal address with an E, D, or B command.
?BAD LOAD?	RT11 encountered an error when reading the program into memory.
?BAD PPN?	You typed an illegal PPN in response to a LIB or PPN command.
?BAD START ADDRESS?	The program start address was odd or out of bounds.
?FIL NOT FND?	The specified file cannot be found.
?FILE?	You specified no filename or an illegal filename with the R, RUN, or GET command.
?ILL CMD?	You typed an illegal command. The command includes an unrecognized command, a syntax error in a command string, a command line longer than 510 characters, or an attempt to change to an illegal size (2<size<swap max for this job).
?ILL DEV?	The command string includes an illegal device name.
?NO RESTART?	You typed the RESTART command, but the program is not restartable.
?OVR CORE?	The program is too large to fit into memory.

Table B-3
RT11 Run-Time System Fatal Execution Errors

Message	Meaning
?M-BPT TRAP	The program issued a BPT instruction, but the job has an illegal vector location.
?M-FP TRAP	A floating point trap occurred.
?M-HALT	The program halted.
?M-ILL EMT	The program issued an invalid monitor call.
?M-IOT TRAP	The program issued an IOT instruction, but the job has an illegal vector location.
?M-OVLY ERR	The RT11 run-time system encountered an error while reading a program overlay. This message may indicate a hardware error.

Table B-3 (Cont.)
RT11 Run-Time System Fatal Execution Errors

Message	Meaning
?PROGRAM LOST – SORRY	An unrecoverable error occurred. The run-time system resets user core image.
?M-TOO MANY OPEN CHANNELS	The job attempted to open more than 15 channels or attempted to open two DECtape files at once.
?M-TRAP TO 4	The program trapped to the vector at location 4.
?M-TRAP TO 10	The program trapped to the vector at location 10.
?M-TRAP TRAP	The job issued the TRAP instruction, but the job has an illegal vector location.

B.3 BATCH ERROR MESSAGES

During the execution of the batch streams associated with CREATE.SAV and SYSBAT.SAV, two types of errors may occur. The RT11 run-time system returns most errors. The batch program translates these errors to their BASIC-PLUS equivalents and prints the BASIC-PLUS error message text. You can find a discussion of BASIC-PLUS error messages in the Appendix of the *BASIC-PLUS Language Manual.* The batch program itself may generate several other errors. Table B-4 summarizes these errors.

Table B-4
BATCH Error Messages

Message 1	Meaning
CREATE NOT RUN FROM DISTRIBUTION MEDIUM	The CREATE program can be run only from the distribution medium.
DEVICE NOT MOUNTED	The batch stream attempted to dismount a device that was not mounted.
ERROR CHAINING TO $SYSGEN.SAV	The CREATE program could not find the $SYSGEN.SAV file.
ERROR DURING PSEUDO KEYBOARD INPUT	An error occurred during input to the pseudo keyboard.
ERROR DURING PSEUDO KEYBOARD OUTPUT	An error occurred during output to the pseudo keyboard.
ERROR OPENING OR READING $LOGIN.SAV	The CREATE program could not find the $LOGIN.SAV file on the distribution medium, or an error occurred while reading the file.
ERROR OPENING OR READING SYSGEN.CTL FILE	The SYSBAT program could not find the SYSGEN.CTL file, or an error occurred while reading the file.

Table B-4 (Cont.)
BATCH Error Messages

Message 1	Meaning
INVALID CARD	A line contained a command in an incorrect format.
INVALID SWITCH	A switch used in the command field or in the specification field is undefined or in an incorrect format.
JOB FAILED TO LOG IN	The job cannot log in because the LOGIN program or the requested account was missing.
LOGINS HAVE NOT BEEN ENABLED	Logins must be enabled before the batch stream can be processed.
MOUNT ERROR	The volume to be mounted was not correct (pack IDs do not match) or the device was already in use.
TOO MANY MOUNTED DEVICES	The job requested the mounting of more than twelve devices.

APPENDIX C
DISK DEVICE SIZES

The following table lists the device cluster size and device size (in 256-word blocks) for each of the disk devices supported by RSTS/E.

Table C-1 Disk Device Sizes

Disk Device	Device Cluster Size	Device Size
RS64	1	256 * (number of platters)
RS11	1	1024 * (number of platters)
RS03	1	1024
RS04	1	2048
RK05	1	4800
RK05F	1	4800 for each unit; 2 units for each drive
RL01	1	10220
RK06	1	27104
RK07	1	53768
RP02	2	40000
RP03	2	80000
RM02	4	131648
RM03	4	131648
RP04	4	167200
RP05	4	167200
RP06	8	334400

APPENDIX D
SYSTEM MODULE SIZES

Table D-1 supplies the approximate memory sizes of software modules on RSTS/E. Table D-2 supplies approximate memory sizes for BASIC-PLUS modules. By summing the values given, you can estimate the total size of the system.

Table D-1 System Module Sizes

Module	Decimal Words	Comments
Monitor Options		
FIP Buffering	508	
Small Buffers	16 per buffer	
System Wide Logical Names	5 per name	Up to 50 logical names allowed
Resident FIP Functions		
Disk Handling	1750	
Send/Receive	466	
Simple SYS Calls	241	
File Delete/Rename	218	
Login/Attach	390	
Directory Lister	213	
Disk Support		
RC Disk	41	RC11/RS64
RF Disk	51	RF11/RS11
RS Disk	52	RS03/RS04
RK Disk (nonoverlapped)	92	RK05/RK05F
RK Disk (overlapped)	232	
RL Disk (nonoverlapped)	283	RL01
RM Disk (nonoverlapped)	277	RK06/RK07
RM Disk (overlapped)	371	
RP Disk (nonoverlapped)	119	RP02/RP03
RP Disk (overlapped)	230	RM02/RM03
RR Disk (nonoverlapped)	288	
RR Disk (overlapped)	398	
RB Disk (nonoverlapped)	288	RP04/RP05/RP06
RB Disk (overlapped)	398	
Queue Optimize	45	For RK, RM, RP, or RB disks
ECC Module	99	For RM or RB disks
Device Support		
TU16/TU45/TE16 Magtape	735	Add 19 per unit for DDB
TE10/TU10/TS03 Magtape	791	Add 19 per unit for DDB
DECtape	439	Add 16 per unit for DDB

Table D-1 (Cont.) System Module Sizes

Module	Decimal Words	Comments
Floppy Disk	360	Add 12 per unit for DDB.
Pseudo Keyboards	134	Add 5 per unit for DDB.
Paper Tape Reader	104	Add 8 per unit for DDB.
Paper Tape Punch	107	Add 8 per unit for DDB.
Line Printer	583	Add 14 per unit for DDB.
CR11/CM11 Card Reader	263	Add 89 per unit for DDB.
CD11 Card Reader	274	Add 89 per unit for DDB.
Card Decode Table	128	
DMC11 Synchronous Line Interface	1013	Add 19 per unit for DDB.
Big Buffer	48	For TE16/TU16/TU45 or TE10/TU10/TS03 magtape, but no DECtape.
	256	For DECtape with or without magtape.
Terminal Option Support		
Terminals		Add 21 per unit for DDB.
Echo Control	240	Add 4 per unit for DDB.
Multi-Terminal Service	184	
2741 Support	200	Add 2 per unit for DDB.
Single Line	+100	
DH11	+100	
DZ11	+100	
Code Table	+128 per code	Up to four codes allowed.

Table D-2 BASIC-PLUS Module Sizes

Module	Decimal Words
Compiler and RTS	11282
Math Packages	
MA2, XL2, XT2, BAS2	2474
MA2, BAS2X	2028
MA2I, XL2I, XT2I, BAS2I	2147
MA2I, BAS2IX	1701
MA2F, XL2F, XT2F, BAS2F	1992
MA2F, BAS2FX	1648
MA4, XL4, XT4	3473
MA4	2825
MA4F, XL4F, XT4	2523
MA4F	2047
Optional Features	
Print Using (PU, PX)	745
Matrices (MX)	752
String Arithmetic (SF)	874
Math Functions	
Trig Functions	296
Log Functions	345
Common Polynomial Calculation	47

APPENDIX E
ADDRESS AND VECTOR ASSIGNMENTS

The RSTS/E system initialization code performs a hardware configuration check each time the system disk (or distribution medium) is bootstrapped. In the absence of any information to the contrary, the initialization code assumes that all devices attached to the UNIBUS have been assigned addresses according to the manufacturing standards. The initialization code determines interrupt vectors automatically by forcing each supported device to interrupt. Although the HARDWR initialization option allows you to declare nonstandard address and vector assignments, DIGITAL recommends that the standard configuration rules be followed whenever possible.

Several devices have so called "Floating Addresses." This means that the presence or absence of any floating address device will affect the assignment of addresses to other floating address devices. Similarly, many devices have "Floating Vectors." According to the standards, interrupt vectors must be assigned in a specific sequence and the presence of one type of device will affect the correct assignment of interrupt vectors for other devices. Finally, there are many options that have fixed addresses and vectors. This appendix presents the algorithms for assignment of floating addresses and vectors. It also lists the fixed assignments for devices supported by RSTS/E.

E.1 FLOATING ADDRESSES

Currently the floating address devices include the DJ11 and DH11 multiplexers; the DQ11, DU11, and DUP11 synchronous line interfaces; the LK11; the DMC11 interprocessor link; and the DZ11 multiplexer. The following ground rules apply to these devices and future floating address devices:

1. Only new devices will be assigned floating addresses. Devices now in production will keep their old addresses.
2. Future devices may float both their addresses and interrupt vectors.
3. The floating address space starts at 760010(8) and proceeds upward to 764000(8).
4. A gap in the address space (no SLAVE SYNC) implies that a device does not exist.
5. The first address of a new type device will always be on a 2↑N word boundary, where N is the integer value of (LOG_2 M+.9999999), and M is the number of device registers.

Number of Registers In Device	Possible Boundaries
1	Any Word
2	XXXXX0, XXXXX4
3,4	XXXXX0
5,6,7,8	XXXX00, XXXX20, XXXX40, XXXX60
9 thru 16	XXXX00, XXXX40

6. A "gap" of at least one word will be left after each type of device, starting on the same boundary the device would start on. Note that the gap must be at least one word in length but may be longer than one word. Gap length is determined by the boundary on which the next device must begin.
7. Multiple devices of the same type must be addressed contiguously.

Address 760010 is reserved for the first DJ11. Since the DJ11 has four registers, additional DJ11's are assigned addresses modulo 10 (base 8) immediately following the first DJ11 (i.e., 760010, 760020, etc.). The modulo 10 (base 8) address following the last DJ11 is left empty and is known as the DJ11 gap. If there are no DJ11's, the gap is at 760010. If there is one DJ11, the gap will be at 760020. All gaps must be at least one word in length.

After all DJ11 addresses and the DJ11 gap are defined, the address for the first DH11 can be assigned. DH11's have eight registers which implies a modulo 20 (base 8) boundary. The address of the first DH11 is the first modulo 20 address following the DJ11 gap. If there are no DJ11's (DJ11 gap at 760010), the first DH11 is assigned address 760020. Similarly, if there is one DJ11, the DJ11 gap will begin at 760020 and the next available mod 20 boundary is 760040. All additional DH11's are assigned addresses modulo 20 immediately after the first DH11. The DH11 gap begins on the 20 boundary following the last DH11.

After all DH11 addresses and the DH11 gap are defined, DQ11, DU11, DUP11, LK11, DMC11, and DZ11 addresses and the required gaps can be assigned in sequence. Addresses for any future floating address devices will be assigned in a similar manner.

FLOATING ADDRESS WORKSHEET

The algorithm for assignment of floating addresses can be confusing for a large configuration with multiple units of several types of floating address devices. The floating address worksheet that follows is a graphic aid that should eliminate some confusion and relieve configuration problems. The worksheet allows you to assign device addresses quickly without referring to the formal rules. Instructions for use of the worksheet are presented below and two configuration examples follow. A blank worksheet is also provided for general use.

The worksheet is divided into four sections covering the address range 760010 through 762000. Although the floating address area continues up to address 764000, the worksheet should cover most configurations. If necessary, you can create a second worksheet by adding 2000 to all addresses listed.

The following are the instructions for the use of the worksheet:

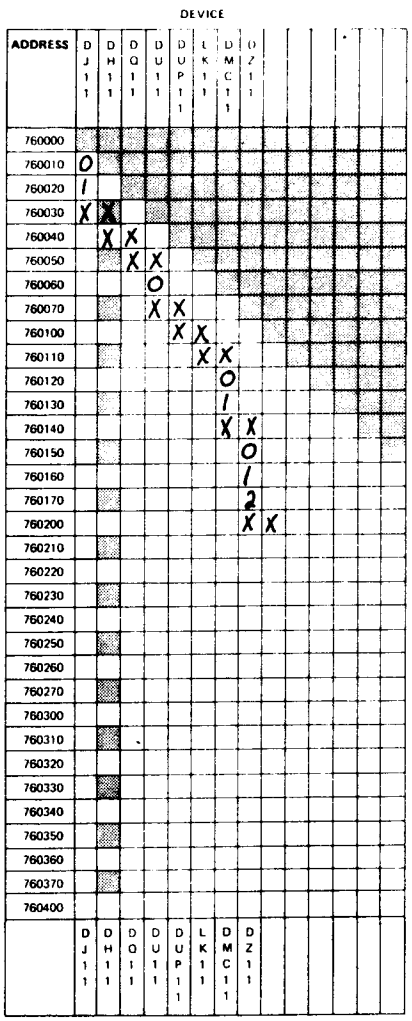
1. Record the quantity of each type of floating address device in the space provided on the worksheet.
2. Beginning at the upper left of the worksheet at address 760010 and proceeding down the DJ11 column, record the unit numbers for all DJ11's in the configuration. Begin with unit 0 and end with unit n-1. (There are n DJ11's in the configuration.)
3. Immediately below the last DJ11 unit, mark an X for the required DJ11 address gap. Also mark an X in the box immediately to the right (DH11 column).

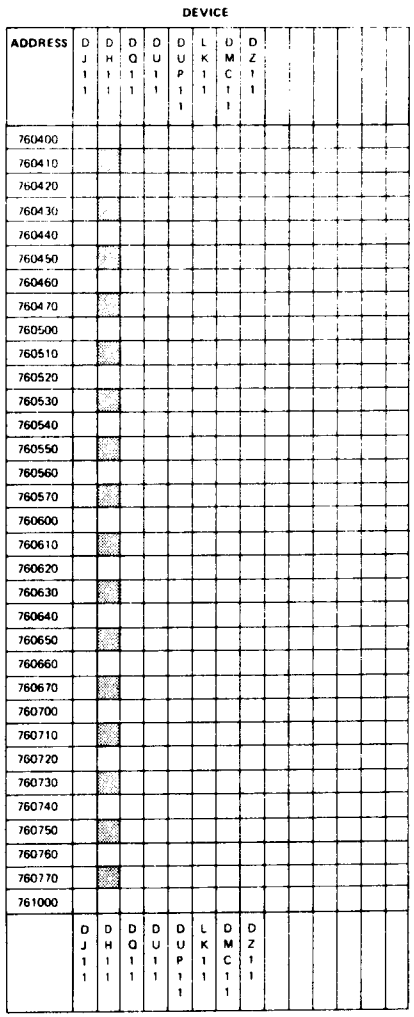
   In general, when numbering device units down the appropriate column, use only the unshaded boxes. The shaded boxes represent illegal addresses for the particular device type. Since the gap address must also be a legal device address, use only an unshaded box for the gap X when numbering down a column.

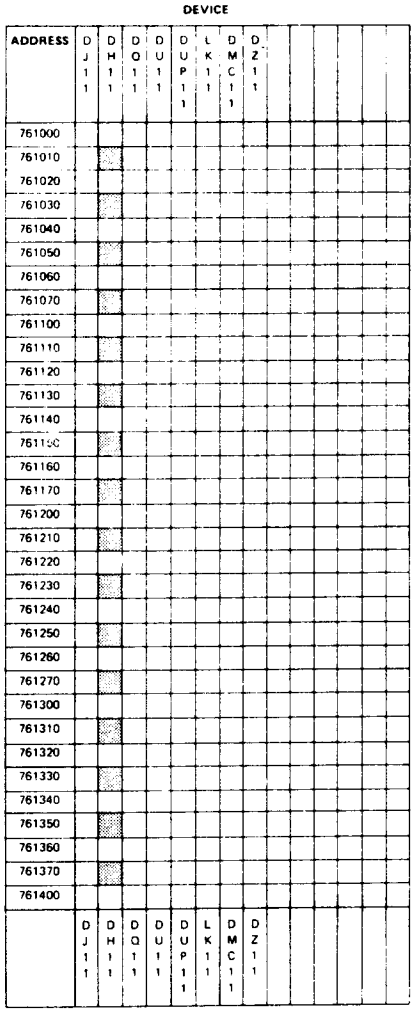
   In marking an X in the column to the right of a device address gap, use shaded boxes since the X in the next column merely provides a starting point for numbering units of the next device type. If there are no units of a particular device type, enter only the gap X's on the worksheet.

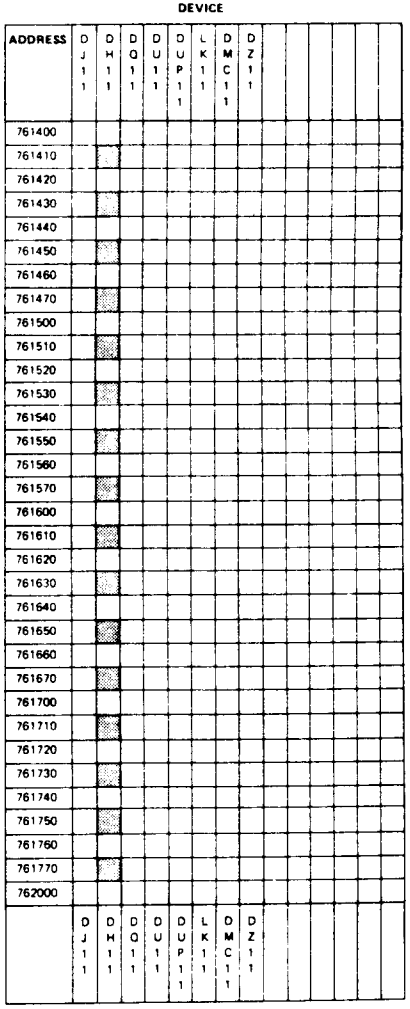
   If you use all available space in one section of the worksheet, simply copy the entries on the last line of the full section to the top line of the next section. Then continue numbering in the new section.
4. Continuing just below the X in the DH11 column, number all DH11 units. Once again, start with unit 0 and continue to unit n-1. Skip the shaded boxes in numbering down the column. In the first unshaded box below the last DH11 unit, mark an X for the DH11 gap. Also mark an X in the box to the right, whether it is shaded or unshaded.
5. Continue with the remaining floating address devices. In each case, number units from 0 to n-1 down the column beginning in the first unshaded box below the X. Mark an X in the next unshaded box below the last unit and in the box immediately to the right of the last unit (whether that box is shaded or unshaded).
6. After you have recorded all floating address devices, you can read the UNIBUS address for each device unit directly from the worksheet.

FLOATING ADDRESS WORKSHEET (EXAMPLE 1)









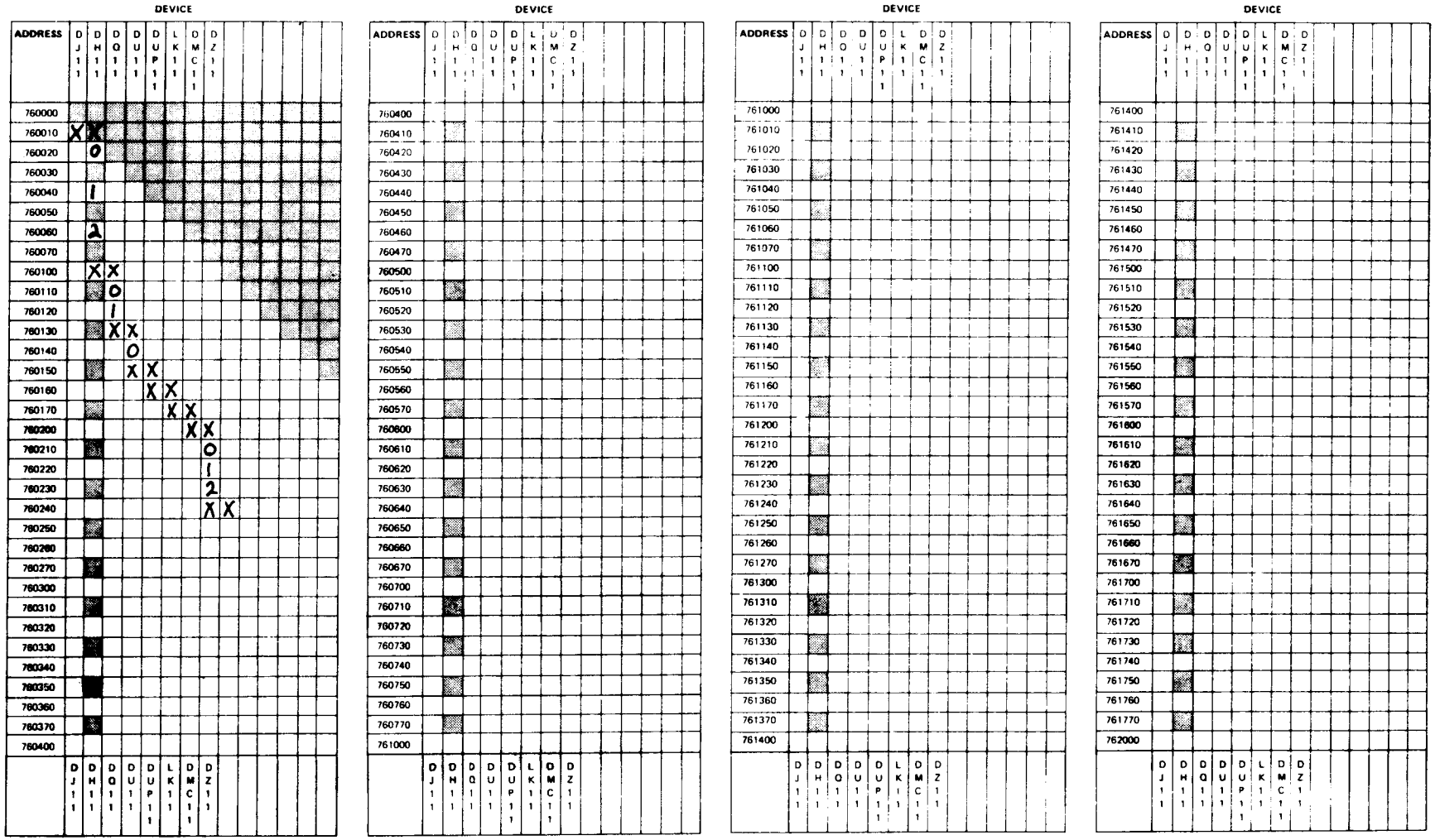
	QTY (n)		QTY (n)
DJ11	2	DMC11	2
DH11	0	DZ11	3
DQ11	0		
DU11	1		
DUP11	0		
LK11	0		

DEV	UNIT	ADDRESS
DJ	0	760010
DJ	1	760020
DU	0	760060
DMC	0	760120
DMC	1	760130
DZ	0	760150

DEV	UNIT	ADDRESS
DZ	1	760160
DZ	2	760170

DEV	UNIT	ADDRESS

FLOATING ADDRESS WORKSHEET (EXAMPLE 2)



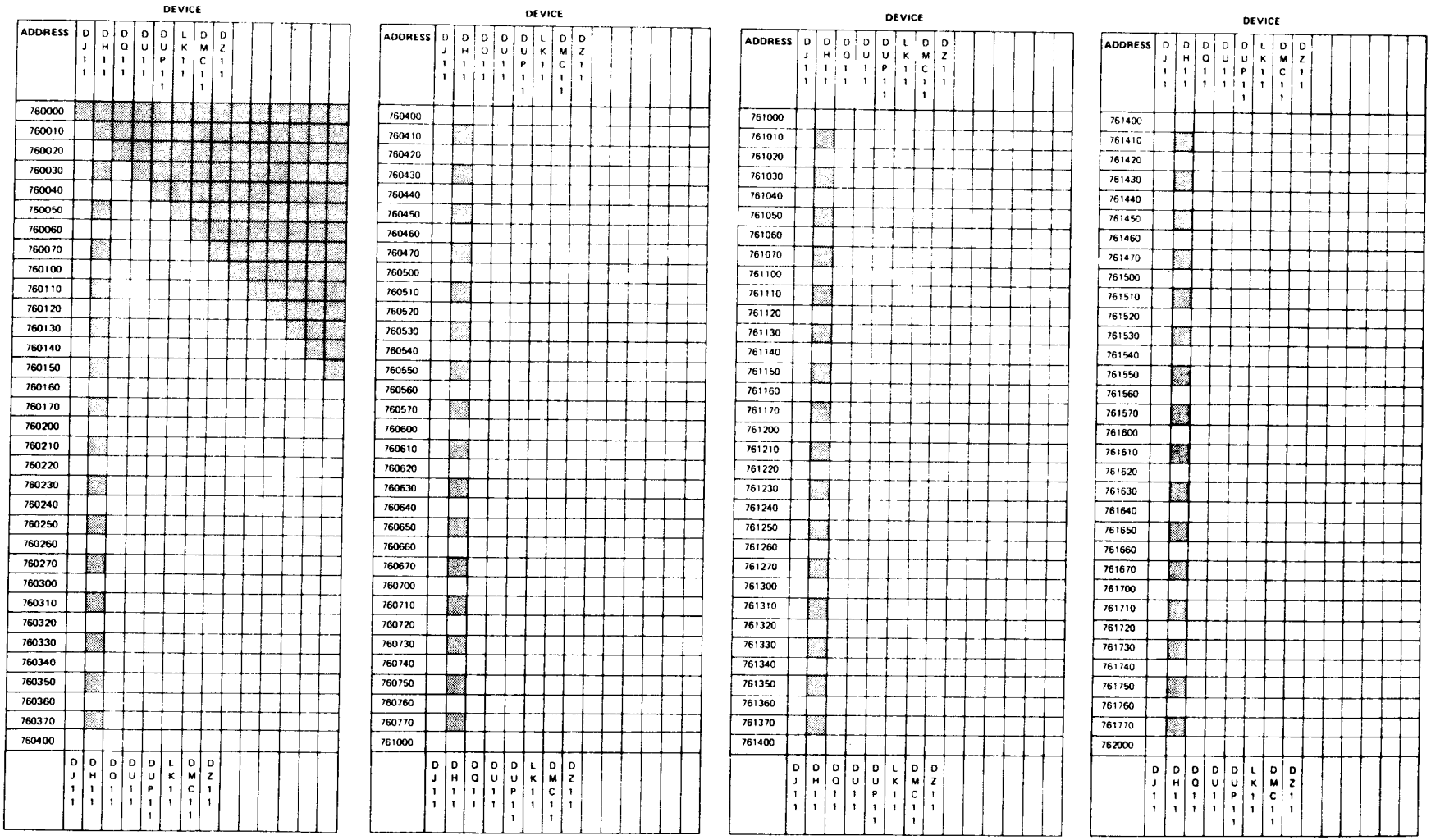
	QTY (n)		QTY (n)
DJ11	0	DMC11	0
DH11	3	DZ11	3
DQ11	2		
DU11	1		
DUP11	0		
LK11	0		

DEV	UNIT	ADDRESS
DH	Ø	760020
DH	1	760040
DH	2	760060
DQ	Ø	760110
DQ	1	760120
DU	Ø	760140

DEV	UNIT	ADDRESS
DZ	Ø	760210
DZ	1	760220
DZ	2	760230

DEV	UNIT	ADDRESS

FLOATING ADDRESS WORKSHEET



	QTY (n)		QTY (n)	DEV	UNIT	ADDRESS	DEV	UNIT	ADDRESS	DEV	UNIT	ADDRESS
DJ11	_____	DMC11	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
DH11	_____	DZ11	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
DQ11	_____		_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
DU11	_____		_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
DUP11	_____		_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
LK11	_____		_____	_____	_____	_____	_____	_____	_____	_____	_____	_____

E.2 FLOATING VECTORS

Many devices have floating vectors. The vector assignment sequence is normally the same sequence as that in which the devices enter production. A vector for a new hardware option is not inserted before the vector for a device that is already in production. Gaps in the vector assignments are not required. The floating vectors begin at address 300 and proceed continuously upwards. The vector assignment sequence for current devices is defined below.

Device	First Address	Next Addr.	Vector Size	Max # Units	BR Level	RSTS/E Notes
DC11	174000	+10	10	32	BR5	
KL11,DL11A,B	176500	+10	10	16	BR4	NON-CONSOLE
DP11	174770	-10	10	32	BR5	2780 ONLY***
DM11A	175000	+10	10	16	BR5	NOT SUPPORTED
DN11	175200	+10	4	16	BR4	NOT SUPPORTED
DM11BB	170500	+10	4	16	BR4	
DR11A,C	167770	-10	10*	32	BR5	NOT SUPPORTED
PA611 READER	172600	+ 4	4*	16	BR4	NOT SUPPORTED
PA611 PUNCH	172700	+ 4	4*	16	BR4	NOT SUPPORTED
DT11 (DT03-FP)	174200	+ 2	10*	8	BR7	NOT SUPPORTED
DX11	176200	+40	10*	4	BR4	NOT SUPPORTED
DL11C,D,E	175610	+10	10*	31	BR4	
DJ11	FLOAT	+10	10*	16	BR5	
DH11	FLOAT	+20	10*	16	BR5	
GT40	172000		20*		BR4	NOT SUPPORTED
LPS11	170400	+40	30*	14	BR5,6	NOT SUPPORTED
DQ11	FLOAT	+10	10*	16	BR5	NOT SUPPORTED
KW11W	172400	NA	10*	1		NOT SUPPORTED
DU11	FLOAT	+10	10*	16	BR5	2780 ONLY***
DUP11	FLOAT	+10	10*	16	BR5	2780 ONLY***
DV11	175000	+40	20*	4	BR5,6	NOT SUPPORTED
LK11	FLOAT	+10	10*	1	BR4	NOT SUPPORTED
DMC11	FLOAT	+10	10*	16	BR5	DECNET/E ONLY**
DZ11	FLOAT	+10	10*	8	BR5	

* The first vector for the first device of this type must always be on a 10(8) boundary.

** DECNET/E limits the maximum number of units to eight.

*** Also supported at BR6 under RSTS/2780.

E.3 FIXED ADDRESS AND VECTORS

The following table lists the devices supported under RSTS/E that have fixed addresses and vectors.

Device	Address	Vector	BR Level	RSTS/E Notes
RC11/RC64	177440	210	BR5	UP TO 4 PLATTERS
RF11/RS11	277460	204	BR5	UP TO 8 PLATTERS
RK11/RK05/RK05F	177400	220	BR5	UP TO 8 DRIVES*
RL11/RL01	174400	160	BR5	UP TO 4 DRIVES
RK611/RK06/RK07	177440	210	BR5	UP TO 8 DRIVES
PR11C/RP02/RP03	176710	254	BR5	UP TO 8 DRIVES
RH11/RS03/RS04	172040	204	BR5	UP TO 8 DRIVES
RH11/RP04/RP05/RP06	176700	254	BR5	UP TO 8 DRIVES
RH11/RM02/RM03	176300	150	BR5	UP TO 8 DRIVES
RX11/RX01	177170	264	BR5	UP TO 8 DRIVES
TC11	177340	214	BR6	UP TO 8 DRIVES
TM11/TU10	172520	224	BR5	UP TO 8 DRIVES
RH11/TM02/TU16/TE16	172440	224	BR5	UP TO 8 DRIVES
LP11, LS11 (LP0)	177514	200	BR4	UP TO 8 PRINTERS
(LP1)	164004	170	BR4	DEPENDING ON
(LP2)	164014	174	BR4	SPEED.
(LP3)	164024	270	BR4	
(LP4)	164034	274	BR4	
(LP5)	164044	774	BR4	
(LP6)	164054	770	BR4	
(LP7)	164064	764	BR4	
CR11, CM11	177160	230	BR5	
CD11	177160	230	BR4	
KW11L	177546	100	BR6	
KW11P	172540	104	BR6	
KG11	170700	NONE	NONE	2780 ONLY
KL11, DL11A, DL11B	177560	60	BR4	CONSOLE INTERFACE

*Each RK05F must be counted as two drives.

E.4 RH70 BAE AND CS3 ADDRESSES

The following table lists the four possible RH70 High Speed I/O Controller addresses, their Bus Address Extension (BAE) and Control addresses, their Bus Address Extension (BAE) and Control Status 3 (CS3) addresses, and their usages.

Usage	Address	BAE	CS3
RS03/RS04 only	172040	172070	172072
TM02/TV16/TE16 only	172440	172474	172476
mixed/nonstandard	176300	176350	176352
RP04/RP05/RP06 only	176700	176750	176752

APPENDIX F
SYSTEM GENERATION EXAMPLES

This section contains one sample system generation from bootstrapping the distribution medium through building the standard BASIC-PLUS System Library. The sample shows magtape distribution and an RP03 system disk.

```
Enabling only console, disks, and tapes.


RSTS V06C (MTO)


Option: DSKINT

12-Jun-78?
06:48 AM? 07:41

Disk? DP
Unit? 0
Pack ID? SYSGEN
Pack cluster size? 2
SATT.SYS base? 0
MFD password? SYSMFD
MFD cluster size? 16
PUB, PRI, or SYS? SYS
Library password? SYSLIB
Library UFD cluster size? 16
Date last modified? Y
New files first? N
Use previous bad block info? N
Format? Y
Patterns? 1
Proceed (Y or N)? Y
Starting format pass
Set FORMAT ENABLE switch, then type <LF>:
Set format switch to NORMAL, then type <LF>:
End format pass

Pattern # 1

Option: COPY

12-Jun-78?
07:58 AM?

To which disk? DP
Unit? 0
```

```
Enabling only console, disks, and tapes.

RSTS V06C (DPO)


Option: PATCH
File to patch? INIT.SYS
Base address? 142:104002
Offset address? 4312
 Base    Offset  Old      New?
104002  004312  115244   ? 140
104002  004314  103771   ? ^C

Option: HARDWR

   HARDWR suboption? LIST

   Name   Address Vector  Comments
   TT:     177560   060
   RS:     172040   204   Units: 0(RS04 IL) 1(RS04 IL)
   RK:     177400   220   RK05F units: none
   RP:     176700   254   RP03 units: 0 1
   TM:     172520   224
   TC:     177340   214

   KW11L   177546   100
   KW11P   172540   104
   SR      177570
   DR      177570

   Hertz = 60.

   Other: FPU, SL

   HARDWR suboption? RESET

   HARDWR suboption? EXIT

   Enabling all devices, 0 changes being made.

   Rebooting . . .


RSTS V06C (DPO)

Option: INSTALL

   SIL? SYSGEN
```

```
Option: REFRESH

12-Jun-78
08:11 AM?

Disk? DP
Unit? 0

Clean?

  REFRESH suboption? LIST

  File                                File                Current   Minimum     Start
  Name          Required?             Flags  Status       Size      Size        LBN

System files:

  SWAP   .SYS    YES                        CRE                      64
  SWAP0  .SYS     NO                        OK
  SWAP1  .SYS     NO                        OK
  SWAP3  .SYS     NO                        OK
  OVR    .SYS     NO                        OK                       46
  ERR    .SYS     NO                        OK                        8
  BUFF   .SYS    YES                        CRE                       6
  CRASH  .SYS     NO                        OK                       22

Others:

  BADB   .SYS                        NOD                0
  SATT   .SYS                NOD     CTG               10                    18
  INIT   .SYS                NOD     CTG              229
  ERR    .ERR                        CTG                8                   264
  ROLLIN.SAV                         CTG               18
  SYSGEN.SIL                 NOD     CTG              175
  RT11   .RTS                        CTG               20                   466

  REFRESH suboption? CHANGE

  SWAP.SYS changes? YES

    Size? 256

    Base? 0

  SWAP0.SYS changes?

  SWAP1.SYS changes?

  SWAP3.SYS changes?

  OVR.SYS changes?
```

```
ERR.SYS changes?

BUFF.SYS changes? YES

  Size? 16

  Base? 0

CRASH.SYS changes? YES

  Size? 64

  Base? 0

Other files?

REFRESH suboption? LIST

File                                File                Current   Minimum   Start
Name          Required?             Flags  Status       Size      Size      LBN

System files:

SWAP   .SYS    YES    NOD CTG      OK          256        64      486
SWAP0  .SYS    NO                  OK
SWAP1  .SYS    NO                  OK
SWAP3  .SYS    NO                  OK
OVR    .SYS    NO                  OK                     46
ERR    .SYS    NO                  OK                      8
BUFF   .SYS    YES    NOD CTG      OK           16         6      742
CRASH  .SYS    NO     NOD CTG      OK           64        22      758

Others:

BADB   .SYS            NOD          0
SATT   .SYS            NOD CTG     10                            18
INIT   .SYS            NOD CTG     229
ERR    .ERR                CTG      8                           264
ROLLIN.SAV                 CTG     18
SYSGEN.SIL             NOD CTG     175
RT11   .RTS                CTG     20                           466

  REFRESH suboption? EXIT

Option: DEFAULT

No defaults are currently set

You currently have: JOB MAX = 2, SWAP MAX = 16K.

JOB MAX or SWAP MAX changes? YES
```

```
  New JOB MAX?

  New SWAP MAX? 28

You currently have: JOB MAX = 2, SWAP MAX = 28K.

JOB MAX or SWAP MAX changes?

Run Time System? RT11

Error message file? ERR

Installation name? *My Timeshare*

  Memory allocation table:

    0K: 00000000 - 00113777 (  19K) : EXEC
   19K: 00114000 - 00133777 (   4K) : RTS (RT11)
   23K: 00134000 - 00757777 ( 101K) : USER
  124K: 00760000 - End               : NXM


  Table suboption? EXIT

You currently have crash dump disabled.

Crash dump? YES

Mastape labelling default (none)? DOS

Preferred clock (F 100)?

Date format (ALPHABETIC)?

Time format (AM/PM)? 24-HOUR

Power fail delay (1)? 300


Option: SET

  SET suboption? LIST
  Device? ALL

  Name  Control Comments

  DF0   RF:
  DS0   RS:
  DS1   RS:
  DK0   RK:
  DK1   RK:
  DK2   RK:
  DK3   RK:
  DM0   RM:
```

```
  DM1  RM:
  DP0  RP:
  DP1  RP:
  DR0  RR:
  DR1  RR:
  DB0  RB:
  DB1  RB:
  KB0  TT:
  KB1  PK0:
  NL0
  PK0
  LP0  LP0: NOOMITCR,CR,NOEOT,FILL,NOCONTROL,NOVTAB,BSEMULATE, width 80
  MT0  TM:
  MT1  TM:
  MM0  TU:
  MM1  TU:
  DT0  TC:
  DT1  TC:

  SET suboption? LP
  Type (NOOMITCR,CR,NOEOT,FILL,NOCONTROL,NOVTAB,BSEMULATE)? LP
  Width (80)? 132
  Lower case (no)? YES

  SET suboption? EXIT

Option: START

You currently have: JOB MAX = 2, SWAP MAX = 28K.

JOB MAX or SWAP MAX changes?

Any memory allocation changes?

You currently have crash dump enabled.

Crash dump?

12-Jun-78?
08:25 ?
DF0: disabled - no RF: controller
DM0: disabled - no RM: controller
DM1: disabled - no RM: controller
DR0: disabled - no RR: controller
DR1: disabled - no RR: controller
DB0: disabled - no RB: controller
DB1: disabled - no RB: controller
MM0: disabled - no TU: controller
MM1: disabled - no TU: controller

9 devices disabled

?Can't find file or account
.R MT0:CREATE.SAV
```

```
^C
HELLO 1/2
Password:
1 other user is logged in under this account

.
.ASSIGN MT0: .DOS

.ASSIGN MT0: IN

.R IN:PIP.SAV
*SY:$*.*<232>=IN:$LOGIN.SAV,$LOGOUT.SAV,$PIP.SAV
*SY:$*.*<104>=IN:$UTILTY.SAV
*SY:$*.*<104>=IN:$MACRO.SAV,$CREF.SAV,$LINK.SAV
*SY:$*.*<104>=IN:$SILUS.SAV,$HOOK.SAV,$SYSGEN.SAV/NOREW
*SY:$*.*<124>=IN:$SYSBAT.SAV
*SY:$*.*<104>=IN:$ONLPAT.SAV
*DK:$*.*<40>=IN:$ERR.STB,$PIPSAV.TXT/NOREW
*^C

.DEASSIGN IN

.DEASSIGN MT0:

.R LOGOUT
Confirm: Y
Saved all disk files; 362 blocks in use
Job 2 User 1,2 logged off KB1 at 12-Jun-78 08:28
1 other user still logged in under this account
System RSTS V06C-03 *My Timeshare*
Run time was 2 seconds
Elapsed time was 1 minute
Good morning


12-Jun-78


Beginning of RSTS/E  system  generation.


Questions come in long and short  forms.
If  you  are  familiar with them, answer
"S" for short; otherwise, answer "L" for
long form.

Form ?                              #S #

Same system ?                       #Y #

Distribution medium ?               #MT#

Output medium ?                     #SY#
```

```
Delete files ?                          #NO#

LP for SYSGEN ?                         *Y *      NO

Generate monitor ?                      #Y #      YES

Monitor name ?                          #RSTS#

Monitor patching ?                      #??#      YES

Patch file medium ?                     #MT#

Patch file name ?                       #$MONITR.CMD#

Generate BASIC-PLUS ?                   #Y #

BASIC-PLUS RTS name ?                   #BASIC#

BASIC-PLUS patching ?                   #??#      NO

Now you must specify the hardware con-
figuration on which this RSTS/E system
will run.

KL11,LC11,DL11A,DL11B's ?               *02*

DL11C, DL11D's ?                        *01*

DC11's ?                                *00*

DL11E's ?                               *00*

DJ11's ?                                *00*

DH11's ?                                *01*

DH11 unit 00 lines enabled ?            #16#

Dataset support for DH11's ?            *Y *

DZ11's ?                                *01*

DZ11 unit 00 lines enabled ?            #08#

Dataset support for DZ11's ?            #NO#

Pseudo keyboards ?                      #04#

2741 support ?                          #NO#

Multi-terminal service ?                #Y #

Echo control ?                          #Y #
```

```
RC11/RS64's ?                    *NO*
RF/RS11's ?                      *NO*
RS03/RS04's ?                    *02*
RK05's ?                         #08#      2
Overlapped seek ?                *Y *
RK06's ?                         *00*
RP02/RP03's ?                    #08#      2
Overlapped seek ?                *Y *
RM02/RM03's ?                    *00*
RP04/RP05/RP06's ?               *00*
TU16/TE16/TU45's ?               *00*
TU10/TE10/TS03's ?               #08#      2
DECtapes ?                       #08#      4
Printers ?                       *01*
RX01's ?                         *00*
CR11/CM11 card reader ?          *NO*
CD11 card reader ?               *NO*
P.T. reader ?                    *NO*
P.T. punch ?                     *NO*
DMC11's ?                        *01*
DECNET network support ?         #Y #      NO
2780 support ?                   #NO#
Maximum jobs ?                   #10#
Small buffers ?                  #170#
System wide logicals ?           #10#
Monitor statistics ?             #NO#
FIP buffering ?                  #Y #
```

```
Resident disk handling ?                #Y #

Resident send/receive ?                 #NO#

Resident simple SYS calls ?             #NO#

Resident file delete/rename ?           #NO#

Res. login/attach/attribute ?           #NO#

Resident catalog/lookup ?               #NO#


The following questions deal with the
BASIC-PLUS run-time system

FPP ?                                   *Y *

Math precision ?                        #02#

Log functions ?                         #Y #

Trig functions ?                        #Y #

Print using ?                           #Y #

Matrices ?                              #NO#

String arithmetic ?                     #NO#


The system generation dialog is finish-
ed. If you have any special requirements
which require editing the generated file
CONFIG.MAC(system configuration file) or
SYSGEN.CTL(batch control file) you may
do it now. When ready type "R SYSBAT".

.R SYSBAT


SYSGEN batch processing has started.
If any problems develop during the batch
process it may be aborted by typing
"Control/C". To restart type "R SYSBAT".


^C
HELLO 1/2
Password:
1 other user is logged in under this account

.
.SIZE 24
```

```
MOUNT AP-2773F-BC OR AP-2772F-BC ON A MAGTAPE DRIVE

WITH NO "WRITE RING" AND SET TO "ON LINE"

Mount MT:"SYSGNF"-write locked
Unit ? 0
   .ASSIGN  MT0: .DOS

   .ASSIGN  MT0: TAPE

   .R PIP.SAV
   **.*<40>=TAPE:$COMMON.MAC
   **.*=TAPE:$*.MAC/HALT/NOREW
   **.*=TAPE:$*.OBJ/HALT/NOREW
   **.*=TAPE:$*.SAV/HALT/NOREW
   *ODT.SAV<60>/RE
   *DEFALT.SAV<60>/RE
   **.*=TAPE:$*.STB/HALT/NOREW
   *^C


Dismount MT0:
   .DEASSIGN  TAPE

   .DEASSIGN  MT0:


   .ASSIGN  SY:  IN

   .R PIP.SAV
   *TBL.OBJ,TTDINT.OBJ,TTDVR.OBJ/DE
   ?Can't find file or account - file TBL    .OBJ - continuing
   ?Can't find file or account - file TTDINT.OBJ - continuing
   ?Can't find file or account - file TTDVR .OBJ - continuing
   *TBL.LST,TTDINT.LST,TTDVR.LST/DE
   ?Can't find file or account - file TBL    .LST - continuing
   ?Can't find file or account - file TTDINT.LST - continuing
   ?Can't find file or account - file TTDVR .LST - continuing
   *RSTS.SAV,TER.SAV,EMT.SAV,FIP.SAV,OVR.SAV/DE
   ?Can't find file or account - file RSTS   .SAV - continuing
   ?Can't find file or account - file TER    .SAV - continuing
   ?Can't find file or account - file EMT    .SAV - continuing
   ?Can't find file or account - file FIP    .SAV - continuing
   ?Can't find file or account - file OVR    .SAV - continuing
   *RSTS.MAP,TER.MAP,EMT.MAP,FIP.MAP,OVR.MAP/DE
   ?Can't find file or account - file RSTS   .MAP - continuing
   ?Can't find file or account - file TER    .MAP - continuing
   ?Can't find file or account - file EMT    .MAP - continuing
   ?Can't find file or account - file FIP    .MAP - continuing
   ?Can't find file or account - file OVR    .MAP - continuing
   *RSTS.STB,TER.STB,EMT.STB,FIP.STB,OVR.STB/DE
   ?Can't find file or account - file RSTS   .STB - continuing
   ?Can't find file or account - file TER    .STB - continuing
```

```
?Can't find file or account - file EMT    .STB - continuing
?Can't find file or account - file FIP    .STB - continuing
?Can't find file or account - file OVR    .STB - continuing
*NSP.SAV,RJ2780.SAV/DE
?Can't find file or account - file NSP    .SAV - continuing
?Can't find file or account - file RJ2780.SAV - continuing
*NSP.MAP,RJ2780.MAP/DE
?Can't find file or account - file NSP    .MAP - continuing
?Can't find file or account - file RJ2780.MAP - continuing
*NSP.STB,RJ2780.STB/DE
?Can't find file or account - file NSP    .STB - continuing
?Can't find file or account - file RJ2780.STB - continuing
*^C

.R MACRO.SAV
*TTDVR,TTDVR/C=IN:COMMON,KERNEL,DK:CONFIG,IN:CHECK,KBDEF,TTDVR
ERRORS DETECTED:  0
*^C

.R MACRO.SAV
*TTDINT,TTDINT/C=IN:COMMON,KERNEL,DK:CONFIG,IN:CHECK,KBDEF,TTDINT
ERRORS DETECTED:  0
*^C

.R MACRO.SAV
*TBL,TBL/C=IN:COMMON,KERNEL,DK:CONFIG,IN:CHECK,TBL
ERRORS DETECTED:  0
*^C

.R LINK.SAV
*RSTS/Z,RSTS/A/W,RSTS=TBL,$ERR.STB/X/B:0/U:#1000/I/C
*TTDINT/C
*IN:RSTS
Round section? MORBUF
Library search? BUF
Library search? DKSEEK
Library search? DPSEEK
Library search?
*^C

.R LINK.SAV
*TER/Z,TER/A/W,TER=IN:TER,DK:RSTS.STB/X/B:#117000/U:#1000/C
*TTDVR
Round section? TERPAT
*^C

.R LINK.SAV
*EMT/Z,EMT/A/W,EMT=IN:EMT,DK:RSTS.STB/X/B:#117000/U:#1000/C
*IN:RSTS
Round section? EMTPAT
*^C
```

```
   .R LINK.SAV
   *FIP/Z,FIP/A/W,FIP=IN:FIP,DK:RSTS.STB/X/B:#117000/U:#1000/I/C
   *IN:RSTS
   Round section? FIPPAT
   Library search? OPN
   Library search?
   *^C

   .R LINK.SAV
   *OVR/Z,OVR/A/W,OVR=IN:OVR,DK:FIP.STB/X/B:#1000/C
   *IN:RSTS
   *^C

   .R SILUS.SAV
   *SY0:[0,1]RSTS.SIL=RSTS,TER/M,EMT/M,FIP/M/C
   *OVR/M/C
   *IN:ODT,DEFALT
   *^C

   .R PIP.SAV
   *BASIC.SAV,BASIC.STB/DE
   ?Can't find file or account - file BASIC .SAV - continuing
   ?Can't find file or account - file BASIC .STB - continuing

MOUNT AP-2773F-BC OR AP-2772F-BC ON A MAGTAPE DRIVE

WITH NO "WRITE RING" AND SET TO "ON LINE"

Mount MT:"SYSGNF"-write locked
Unit ? 0
   *^C

   .ASSIGN  MT0: .DOS

   .ASSIGN  MT0: TAPE

   .R PIP.SAV
   **.*=TAPE:$RTS.OBJ
   **.*=TAPE:$*.OBJ/NOREW
   *^C


Dismount MT0:
   .DEASSIGN  TAPE

   .DEASSIGN  MT0:

   .R LINK.SAV
   *BASIC/Z,BASIC/A/W,BASIC=IN:RTS,DK:$ERR.STB/X/H:#177776/U:#4000/C
   *IN:MA2F/C
   *IN:XL2F/C
   *IN:XT2F/C
   *IN:IO/C
   *IN:PU/C
```

```
   *IN:SN/C
   *IN:VE
   Round section? FA
   *^C

   .R SILUS.SAV
   *BASIC.RTS=BASIC
   *^C

   .DEASSIGN  IN


MOUNT THE MONITOR PATCH FILE MAGTAPE ON A MAGTAPE DRIVE

WITH NO "WRITE RING" AND SET TO "ON LINE"

Mount MT:"       "-write locked
Unit ? 0
   .ASSIGN  MT0: .DOS

   .ASSIGN  MT0: PATCH

   .R ONLPAT.SAV
      •
      •
Dismount MT0:
   .DEASSIGN  PATCH

   .DEASSIGN  MT0:

   .R PIP.SAV
   *SY0:[0,1]*.*/MODE:16.=BASIC.RTS
   *BASIC.RTS/DE
   *^C

   .R LOGOUT
   Confirm: Y
   Saved all disk files; 3824 blocks in use
   Job 2 User 1,2 logged off KB1 at 12-Jun-78 09:04
   1 other user still logged in under this account
   System RSTS V06C-03 *My Timeshare*
   Run time was 12 minutes, 15.9 seconds
   Elapsed time was 25 minutes
   Good morning


Batch Job completed.

.R UTILTY
*NO LOGINS
*SHUTUP
```

Here, the ONLPAT.SAV program installs the patches contained in the $MONITR.CMD file.

```
RSTS V06C-02 *My Timeshare* (DP0)

Option: INSTALL

  SIL? RSTS

Option: REFRESH

12-Jun-78?
09:08 ?

Disk? DP
Unit? 0

Clean?

  REFRESH suboption? LIST

  File                          File          Current   Minimum     Start
  Name        Required?  Flags  Status        Size      Size        LBN

System files:

  SWAP  .SYS    YES    NOD CTG    OK          256         64        486
  SWAP0 .SYS     NO               OK
  SWAP1 .SYS     NO               OK
  SWAP3 .SYS     NO               OK
  OVR   .SYS     NO               OK                      46
  ERR   .SYS     NO               OK                       8
  BUFF  .SYS    YES    NOD CTG    OK           16         12        742
  CRASH .SYS     NO    NOD CTG    OK           64         31        758

Others:

  BADB  .SYS           NOD                     0
  SATT  .SYS           NOD CTG                10                    18
  INIT  .SYS           NOD CTG               229
  ERR   .ERR               CTG                 8                   264
  ROLLIN.SAV               CTG                18
  SYSGEN.SIL               CTG               175
  RT11  .RTS               CTG                20                   466
  RSTS  .SIL               NOD               239
  BASIC .RTS               CTG                64                  4970


  REFRESH suboption? EXIT

Option: DEFAULT

No defaults are currently set
```

```
You currently have: JOB MAX = 10, SWAP MAX = 16K.

JOB MAX or SWAP MAX changes? YES

  New JOB MAX?

  New SWAP MAX? 28

You currently have: JOB MAX = 10, SWAP MAX = 28K.

JOB MAX or SWAP MAX changes?

Run Time System? BASIC

Error message file? ERR

Installation name? *My Timeshare*

  Memory allocation table:

     0K: 00000000 - 00143777 (  25K) : EXEC
    25K: 00144000 - 00233777 (  14K) : RTS (BASIC)
    39K: 00234000 - 00757777 (  85K) : USER
   124K: 00760000 - End              : NXM


  Table suboption? EXIT

You currently have crash dump disabled.

Crash dump? YES

Mastape labelling default (none)? DOS

Preferred clock (F 100)?

Date format (ALPHABETIC)?

Time format (AM/PM)? 24-HOUR

Power fail delay (1)? 300


Option: SET

  SET suboption? ?

  Valid SET suboptions are:
        LIST     List the status of a device
        MODEM    Enable modem control for keyboards
        LOCAL    Disable modem control for keyboards
        LP       Set line printer characteristics
        DISABLE  Disable a device unit
```

```
        ENABLE   Enable a device unit
        PRIV     Make device ownership privileged
        UNPRIV   Make device ownership non-privileged
        EXIT     (or <LF>) exit from SET option

   Only the first two characters need be typed

   SET suboption? LP
   Type (NOOMITCR,CR,NOEOT,FILL,NOCONTROL,NOVTAB,BSEMULATE)? LP
   Width (80)? 132
   Lower case (no)? YES

   SET suboption? EXIT


Option: START

You currently have: JOB MAX = 10, SWAP MAX = 28K.

JOB MAX or SWAP MAX changes?

Any memory allocation changes?

You currently have crash dump enabled.

Crash dump?

12-Jun-78
09:15 ?
?Can't find file or account
?Program lost-Sorry

Ready


RUN MT1:$BUILD
BUILD    V06C-03 RSTS V06C-03 *My Timeshare*
System Build <No>? YES
Source Input Device <MT1:/DENSITY:800/PARITY:ODD>?
Library Output Device <SY:>?
Target System Device <SY0:>?
Library Account <[1,2]>?
 *** Copying file MT1:[1,2]BUILD.CTL to SY:BUILD.TMP
ASSIGN SY0:SYSDSK
ASSIGN [1,2]
ASSIGN MT1:INPUT
OLD INPUT:$LOGIN
COMPILE SYSDSK:@LOGIN
CHAIN 'INPUT:$BUILD' 31000

Ready


Ready
```

```
Ready

Ready

Ready

Ready

BUILD Detaching...


^C
HELLO

RSTS V06C-03 *My Timeshare*  Job 2  KB0  12-Jun-78  09:21
#1/2
Password:
Job 1 is detached under this account
Job number to attach to?
1 other user is logged in under this account


Ready

ASSIGN SY0:SYSDSK

Ready

ASSIGN SY:SYSTEM

Ready

ASSIGN [1,2]

Ready

ASSIGN MT1:INPUT

Ready

!********** BUILD.CTL - STANDARD LIBRARY PROGRAMS

OLD INPUT:$PATCPY

Ready

COMPILE SYSTEM:@PATCPY
```

```
Ready

OLD INPUT:$PBUILD

Ready

COMPILE SYSTEM:@PBUILD

Ready

OLD INPUT:$CPATCH

Ready

COMPILE SYSTEM:@CPATCH

Ready

OLD INPUT:$AUTOED

Ready

COMPILE SYSTEM:@AUTOED

Ready

OLD INPUT:$LOGOUT

Ready

COMPILE SYSDSK:@LOGOUT

Ready

OLD INPUT:$UTILTY

Ready

COMPILE SYSTEM:@UTILTY

Ready

OLD INPUT:$UTILT1

Ready

COMPILE SYSTEM:@UTILT1

Ready

OLD INPUT:$INIT

Ready
```

```
COMPILE SYSDSK:@INIT

Ready

OLD INPUT:$SHUTUP

Ready

COMPILE SYSTEM:@SHUTUP

Ready

OLD INPUT:$ERRBLD

Ready

COMPILE SYSTEM:@ERRBLD

Ready

RUN SYSTEM:@ERRBLD
ERRBLD  V06C-03 RSTS V06C-03 *My Timeshare*

Ready

OLD INPUT:$ERRINT

Ready

COMPILE SYSTEM:@ERRINT

Ready

OLD INPUT:$ERRCPY

Ready

COMPILE SYSTEM:@ERRCPY

Ready

OLD INPUT:$PIPSML

Ready

COMPILE SYSTEM:@PIPSML<40>

Ready

OLD INPUT:$DIRECT

Ready

COMPILE SYSTEM:@DIRECT
```

```
Ready

OLD INPUT:$TTYSET

Ready

COMPILE SYSTEM:@TTYSET

Ready

OLD INPUT:$SYSTAT

Ready

COMPILE SYSTEM:@SYSTAT

Ready

OLD INPUT:$EDIT

Ready

COMPILE SYSTEM:@EDIT<40>

Ready

OLD INPUT:$EDITCH

Ready

COMPILE SYSTEM:@EDITCH<40>

Ready

OLD INPUT:$BUILD

Ready

COMPILE SYSTEM:@BUILD

Ready

OLD INPUT:$ERRDIS

Ready

COMPILE SYSTEM:@ERRDIS

Ready

OLD INPUT:$ERRDET

Ready
```

```
COMPILE SYSTEM:@ERRDET

Ready

OLD INPUT:$ANALYS

Ready

COMPILE SYSTEM:@ANALYS

Ready

OLD INPUT:$ANALY1

Ready

COMPILE SYSTEM:@ANALY1

Ready

OLD INPUT:$SYSCAT

Ready

COMPILE SYSTEM:@SYSCAT

Ready

OLD INPUT:$PRIOR

Ready

COMPILE SYSTEM:@PRIOR

Ready

OLD INPUT:$ODT

Ready

COMPILE SYSTEM:@ODT

Ready

OLD INPUT:$REACT

Ready

COMPILE SYSTEM:@REACT

Ready

OLD INPUT:$REORDR
```

```
Ready

COMPILE SYSTEM:@REORDR

Ready

OLD INPUT:$DSKINT

Ready

COMPILE SYSTEM:@DSKINT

Ready

OLD INPUT:$UMOUNT

Ready

COMPILE SYSTEM:@UMOUNT

Ready

OLD INPUT:$COPY

Ready

COMPILE SYSTEM:@COPY<40>

Ready

OLD INPUT:$FILCOM

Ready

COMPILE SYSTEM:@FILCOM<40>

Ready

OLD INPUT:$QUOLST

Ready

COMPILE SYSTEM:@QUOLST

Ready

OLD INPUT:$MONEY

Ready

COMPILE SYSTEM:@MONEY<40>

Ready
```

```
OLD INPUT:$GRIPE

Ready

COMPILE SYSTEM:@GRIPE

Ready

OLD INPUT:$TALK

Ready

COMPILE SYSTEM:@TALK

Ready

OLD INPUT:$PLEASE

Ready

COMPILE SYSTEM:@PLEASE

Ready

OLD INPUT:$INUSE

Ready

COMPILE SYSTEM:@INUSE<40>

Ready

OLD INPUT:$SWITCH

Ready

COMPILE SYSTEM:@SWITCH

Ready

RUN SYSTEM:@PIPSML
PIPSML  V06C-03  - RSTS V06C-03 *My Timeshare*
#SYSTEM:@NOTICE.TXT<40>=INPUT:$NOTICE.TXT/FA
#SYSTEM:@HELP  .TXT<40>=INPUT:$HELP  .TXT/FA
#SYSDSK:@START .CTL    =INPUT:$START .CTL/FA
#SYSTEM:@TTY   .CMD    =INPUT:$TTY   .CMD/FA
#SYSTEM:@SPOOL .CMD    =INPUT:$SPOOL .CMD/FA
#SYSTEM:@RTS   .CMD    =INPUT:$RTS   .CMD/FA
#SYSTEM:@CCL   .CMD    =INPUT:$CCL   .CMD/FA
#SYSDSK:@CRASH .CTL    =INPUT:$CRASH .CTL/FA
#SYSTEM:@ANALYS.CMD    =INPUT:$ANALYS.CMD
#SYSTEM:@UTILTY.TXT    =INPUT:$UTILTY.TXT/FA
#SYSTEM:@PIPSML.TXT<40>=INPUT:$PIPSML.TXT/FA
#SYSTEM:@DIRECT.HLP<40>=INPUT:$DIRECT.HLP/FA
```

```
#SYSTEM:@ERRDIS.HLP     =INPUT:$ERRDIS.HLP/FA
#SYSTEM:@ACCT   .SYS    =INPUT:$ACCT   .SYS/FA
#SYSTEM:@COPY   .TXT<40>=INPUT:$COPY   .TXT/FA
#=SYSDSK:@LOGIN .BAC<232>/RE
#=SYSDSK:@LOGOUT.BAC<232>/RE
#=SYSTEM:@DIRECT.BAC<232>/RE
#=SYSTEM:@TTYSET.BAC<232>/RE
#=SYSTEM:@SYSTAT.BAC<232>/RE
#=SYSTEM:@UMOUNT.BAC<232>/RE
#=SYSTEM:@QUOLST.BAC<232>/RE
#=SYSTEM:@GRIPE .BAC<232>/RE
#=SYSTEM:@TALK  .BAC<232>/RE
#=SYSTEM:@PLEASE.BAC<232>/RE
#=SYSTEM:@SWITCH.BAC<232>/RE
#^Z


Ready

RUN SYSTEM:@UTILTY
UTILTY  V06C-03 RSTS V06C-03 *My Timeshare*
#LOGINS
#EXIT

Ready

^C

Ready

HELLO

RSTS V06C-03 *My Timeshare*  Job 2  [1,2]  KB0  12-Jun-78  09:37
Job 1 is detached under this account
Job number to attach to? 1
Attaching to Job 1

BUILD Complete

Ready



RUN $PIPSML
PIPSML  V06C-03  - RSTS V06C-03 *My Timeshare*
#KB:/FA=START.CTL
@TTY.CMD
@SPOOL.CMD
@RTS.CMD
@CCL.CMD
FORCE KB0: RUN $ERRINT
FORCE KB0: 100
FORCE KB0: NO
LOGINS
```

```
SEND RSTS/E IS NOW ON THE AIR...
END
#SY0:START.CTL=KB:/FA
@TTY.CMD
@RTS.CMD
@CCL.CMD
FORCE KB0: RUN $ERRINT
FORCE KB0: 100
FORCE KB0: NO
LOGINS
SEND RSTS/E IS NOW ON THE AIR (VIA START.CTL)...
END
^Z
#KB:/FA=CRASH.CTL
@ANALYS.CMD
@TTY.CMD
@SPOOL.CMD
@RTS.CMD
@CCL.CMD
FORCE KB0: QUE ANALYS.DMP/DE
FORCE KB0: RUN $ERRINT
FORCE KB0: 100
FORCE KB0: YES
LOGINS
SEND RSTS/E IS NOW ON THE AIR...
END
#SY0:CRASH.CTL=KB:/FA
@ANALYS.CMD
@TTY.CMD
@RTS.CMD
@CCL.CMD
FORCE KB0: QUE ANALYS.DMP/DE
FORCE KB0: RUN $ERRINT
FORCE KB0: 100
FORCE KB0: YES
LOGINS
SEND RSTS/E IS NOW ON THE AIR (VIA CRASH.CTL)...
END
^Z
#KB:/FA=ACCT.SYS
1,1,MFD,0,0,MASTER FILE DIRECTORY
1,2,LIB,0,4,SYSTEM LIBRARY
1,10,PASS,0,0,PRIVILEGED ACCOUNT
100,100,DEMO,100,0,NORMAL ACCOUNT
#^Z

Ready

RUN $REACT
REACT   V06C-03 RSTS V06C-03 *My Timeshare*
System Account Manager
Function? STANDARD
Account [1,1] being bypassed
```

```
Account [1,2] on System Disk being bypassed
All Accounts in Account File are now Entered
Function? ^Z

Ready

RUN $SHUTUP
SHUTUP    V06C-07    RSTS V06C-03 *My Timeshare*

********  Set-up Dialogue Phase  ********

Type 'ESC'('ALT') to any query to backup one (1) step

'OPSER' not running

Minutes until system shutdown (0-99) <5>?  0

********  Warning Message Phase  ********
Further LOGINs are now disabled

********  Initial Job Killing Phase  ********

********  Unload/Remove RTS Phase  ********

********  SWAP File Removal Phase  ********

********  Disk DISMOUNT Phase  ********

********  Final Shutdown Phase  ********

Please wait for system to re-boot itself


RSTS V06C-03 *My Timeshare* (DF0)


Option: START

You currently have: JOB MAX = 10, SWAP MAX = 28K.

JOB MAX or SWAP MAX changes?

Any memory allocation changes?

You currently have crash dump enabled.

Crash dump?

12-Jun-78?
09:49 ?
INIT     V06C-03 RSTS V06C-03 *My Timeshare*
```

```
Command File Name?
DETACHING...


^C
HELLO 1/2
Password:
Job 1 is detached under this account
Job number to attach to?
1 other user is logged in under this account


Ready

RUN $TTYSET
TTYSET  V06C-03 RSTS V06C-03 *My Timeshare*
Terminal characteristics program
? EXIT

Ready

BYE/F



ATTACHING TO JOB 1
DETACHING...


^C
HELLO 1/2
Password:
Job 1 is detached under this account
Job number to attach to?
1 other user is logged in under this account


Ready

RUN $UTILTY
UTILTY  V06C-03 RSTS V06C-03 *My Timeshare*
#ADD RSX
?Can't find file or account - in ADD
#ADD RT11
#ADD RMS11
?Can't find file or account - in ADD
#EXIT

Ready

BYE/F
```

```
ATTACHING TO JOB 1
DETACHING...


^C
HELLO 1/2
Password:
Job 1 is detached under this account
Job number to attach to?
1 other user is logged in under this account


Ready

RUN (1,2)UTILTY
UTILTY  V06C-02 RSTS V06C-02 *My Timeshare*
#CCL ATT-ACH=(1,2)LOGIN.BAC;PRIV 30000
#CCL BCK-=(1,2)RMSBCK.TSK;0
#CCL BPC-REF=(1,2)BPCREF.BAC;30000
#CCL BYE-=(1,2)LOGOUT.BAC;PRIV 0
#CCL CNV-=(1,2)RMSCNV.TSK;0
#CCL CRE-ATE=(1,2)EDIT.BAC;30000
#CCL DEF-=(1,2)RMSDEF.TSK;0
#CCL DFN-=(1,2)RMSDFN.TSK;0
#CCL DIS-MOUNT=(1,2)UMOUNT.BAC;PRIV 30000
#CCL DI-RECTORY=(1,2)DIRECT.BAC;PRIV 30000
#CCL DSP-=(1,2)RMSDSP.TSK;0
#CCL EDT-=(1,2)EDT.TSK;0
#CCL ED-IT=(1,2)EDIT.BAC;30000
#CCL HELLO-=(1,2)LOGIN.BAC;PRIV 0
#CCL HELP-=(1,2)PIP.BAC;30000
#CCL LBR-=(1,2)LBR.TSK;0
#CCL LIB-R=(1,2)LIBR.SAV;8208
#CCL LIN-K=(1,2)LINK.SAV;8208
#CCL LOG-IN=(1,2)LOGIN.BAC;PRIV 0
#CCL MACR-O=(1,2)MACRO.SAV;8216
#CCL MAC-=(1,2)MAC.TSK;0
#CCL MOU-NT=(1,2)UMOUNT.BAC;PRIV 30000
#CCL PAT-=(1,2)PAT.TSK;0
#CCL PIP-=(1,2)PIP.SAV;8208
#CCL PL-EASE=(1,2)PLEASE.BAC;PRIV 30000
#CCL QU-EUE=(1,2)QUE.BAC;PRIV 30000
#CCL RST-=(1,2)RMSRST.TSK;PRIV 0
#CCL SE-T=(1,2)TTYSET.BAC;PRIV 30000
#CCL SRT-=(1,2)SRT.TSK;0
#CCL SY-STAT=(1,2)SYSTAT.BAC;PRIV 30000
#CCL TKB-=(1,2)TKB.TSK;0
#CCL UT-ILTY=(1,2)UTILTY.BAC;30000
#EXIT

Ready

BYE/F
```

```
ATTACHING TO JOB 1
RUN $ERRINT
100
NO

Ready

ERRINT  V06C-03 RSTS V06C-03 *My Timeshare*
ERRLOG File is 2% Full
Change Size to < 100 >?
Utilize Crash File Output (Yes/No) <No>? Detaching


HELLO 1,10
Password:

WELCOME TO RSTS/E V06C TIME SHARING


Ready

RUN $SHUTUP
SHUTUP   V06C-03   RSTS V06C-03 *My Timeshare*

********  Set-up Dialogue Phase  ********

Type 'ESC'('ALT') to any query to backup one (1) step

'OPSER' not running

Minutes until system shutdown (0-99) <5>?  0

********  Warning Message Phase  ********
Further LOGINs are now disabled

********  Initial Job Killing Phase  ********

********  'ERRCPY' Shutdown Phase  ********

********  Unload/Remove RTS Phase  ********

********  SWAP File Removal Phase  ********

********  Disk DISMOUNT Phase  ********

********  Final Shutdown Phase  ********

Please wait for system to re-boot itself


RSTS V06C-03 *My Timeshare* (DP0)


Option:
```

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RSTS/E V06C
System Generation Manual
DEC Order No. AA-2669C-TC

READER'S COMMENTS

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Did you find errors in this manual? If so, specify by page.

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

Is there sufficient documentation on associated system programs required for use of the software described in this manual? If not, what material is missing and where should it be placed?

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

- ☐ Assembly language programmer
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- ☐ Non-programmer interested in computer concepts and capabilities

Name _____ Date _____

Organization _____

Street _____

City _____ State _____ Zip Code or Country _____

Please cut along this line.

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