**RSTS/E
Release Notes**

Order No. AA-5246G-TC

digital
software

RSTS/E
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These Release Notes describe new features of the RSTS/E system and explain the differences between this version and previous versions of RSTS/E. System managers and system maintainers should read this document prior to system installation.

OPERATING SYSTEM AND VERSION: RSTS/E   V9.0

SOFTWARE VERSION: RSTS/E   V9.0

digital equipment corporation, maynard, massachusetts

digital ™	DIBOL	ReGIS
	FMS-11	RSTS
DEC	LA	RSX
DECmail	MASSBUS	RT
DECmate	PDP	UNIBUS
DECnet	P/OS	VAX
DECtape	Professional	VMS
DECUS	Q-BUS	VT
DECwriter	Rainbow	Work Processor

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Preface

Preface

The *RSTS/E V9.0 Release Notes* describe new features in RSTS/E for this release as well as differences between this and the previous release, RSTS/E V8.0-7.

Anyone who is about to install a RSTS/E V9.0 system should be thoroughly familiar with the information presented in these *Release Notes*. In addition, users and programmers familiar with earlier versions of RSTS/E should read these notes to learn about changes and new features.

Note

Because of the changes to the V9.0 installation process, users of previous versions of RSTS/E should read the *System Installation and Update Guide* prior to attempting an installation of RSTS/E V9.0.

1 New Features of RSTS/E V9.0

1.1 New Device Support

This section explains some of the new devices which are supported in RSTS/E V9.0. Several of the devices were supported during the release of RSTS/E V8.0, but are listed here because they are relatively new.

1.1.1 The Virtual Disk (DV0:)

The virtual disk is memory allocated from the host processor's main memory to be used as a disk device for access by user programs. It provides fast access to temporary data using disk I/O directives. By allowing access to the virtual disk through disk I/O directives, the use of memory as a temporary data storage device becomes transparent to current RSTS/E utilities and programs. The virtual disk can contain the same structures as any other RSTS/E disk (file-structured or non-file-structured).

The virtual disk driver is automatically included in every RSTS/E monitor. Refer to the *System Installation and Update Guide* (formerly known as the *System Generation Manual*) for details on how to allocate memory for the virtual disk. Note that you are not required to allocate any memory to the virtual disk. The virtual disk is disabled at system start up if no memory is allocated for the device.

1.1.2 VT200 Series Terminals

The VT200 Series terminals were supported in V8.0. There are now three terminals in this family.

VT220

This is a black and white terminal with no graphics capability. It
can emulate either a VT52 or VT100. When used as a VT220 (non-
emulation mode) it has many additional capabilities including the
ability to send and receive 8-bit characters (international
characters).

VT240

This terminal is similar to the VT220 but has graphics capabilities
(ReGIS, Sixel) as well. These graphics can be used from a program, or
an application like DECgraph. In addition it offers Tektronix
4010/4014 graphics emulation.

VT241

The VT241 is a color version of the VT240 graphics terminal.

1.1.3 LN03 printer

The LN03 is a small, high speed, desktop laser printer. It prints 8
pages per minute using cut sheet paper. It uses an RS232 EIA
interface and can be connected to any terminal line. Additional fonts
can be loaded into the LN03's RAM. Additional RAM or ROM cartridges
can be added for additional dynamic font memory, or hard coded fonts.
There are however many standard character sets including 8-bit
characters, VT100 Line draw, and Technical/Math symbols.

1.1.4 LA200 Series printers

These devices are high speed dot matrix type printers. They include
both a draft mode (higher speed), and a letter quality mode. In
addition, they can print the new 8 bit international characters, and
operate in IBM-PC compatibility mode. In draft mode, the LA210 print
rate is 240 CPS; in letter quality mode the print rate is 40 CPS.

1.1.5 LQP03 Letter Quality Printer

The LQP03 is a new high quality daisy wheel printer. It prints at 25
CPS using 10-pitch (CPI) and 34 CPS using 12-pitch (CPI). It has
interchangeable daisy wheels for printing various type styles
including the 8-bit character set. It can use fanfold paper, or cut

sheet paper using a sheet feeder option. It is also smaller and
quieter than most current daisy wheel printers.

1.1.6 DF100 Series Modems

These modems offer the full range of communication products. The
DF124/224 modems offer 2400 baud 2-wire full-duplex communication with
manual or auto dial origination and auto answer. The DF126 offers
2400 baud half-duplex or 4-wire full-duplex communication either in
asynchronous or synchronous mode (Bell 201 B/C compatible). The DF127
is a 4800 baud synchronous private/leased line modem and the DF129
offers 9600 baud synchronous private/leased line operations.

1.1.7 J-11 Processors

The J-11 is a new processor chip being included in new PDP-11 systems.
The J-11 chip offers the full 11/70 compatible instruction set and
capabilities including I&D space. There are several new CPUs based on
this new chip. The KDJ11-A (LSI 11/73) is a dual Q-bus CPU board.
The KDJ11-B (PDP 11/73) is a quad Q-bus CPU board which includes a
console terminal interface, boot roms, and diagnostics. The KDJ11-B
CPU is used in the new 11/73 (Q-bus) system, and the 11/84 (UNIBUS)
system. These new systems currently offer 11/44 class performance for
a much lower price in a physically smaller package. This family of
new PDP11's will, over time, match the performance of the 11/70.

1.1.8 DU Class Disks

The RC25 is now available as an additional disk for your system. It
offers 26Mb fixed and 26Mb removable capacity. You can have 1 or 2
drives per controller (4 units), and 1 or 2 MSCP controllers in your
system.

The RUX50 is another MSCP type disk. It allows the connection of RX50
flexible diskettes to UNIBUS systems. These are the 400Kb (800 block)
5 1/4 inch floppy drives that exist on the Micro/PDP-11. Your system
can have a maximum of 2 MSCP controllers, including the UDA50
(RA60/80/81), RC25, RUX50 (RX50). The RD52 (31.9Mb) can now be added
to the MICRO systems.

1.1.9 DHV/DHU/DZQ Terminal Multiplexors

The DHV is an 8-line DMA terminal interface for the Q-BUS. The DHU is
a 16-line DMA terminal interface for the Unibus. These interfaces
offer high efficiency and performance at a low cost. XON and XOFF are
handled in the interface. In addition, the DHU uses an input
interrupt delay capability to reduce CPU overhead. Support for these
interfaces was added in RSTS/E V8.0 Update Kit C.

The DZQ is a lower cost version of the DZV 4-line terminal multiplexor
offering the same capabilities in half the backplane space.

1.2 Disk Structure

1.2.1 Disk Structure Enhancements

RSTS/E V9.0 implements a new revision level of the disk structure,
level 1.2. DSKINT will initialize disks to this level. Use the
DSKCVT program to convert existing disks -- either V7.2 style (level
0.0) or V8.0 style (level 1.1) to level 1.2. Refer to the *System
Installation and Update Guide* Appendix F and to Section 2.11.7 of this
document for further details.

Level 1.2 disks are identical in structure to level 1.1 disks; the
only difference is the addition of a number of new account attribute
blocks. The following attribute blocks were added:

    o Disk quotas: This block contains the new disk-related
       quotas, such as the logged-in disk quota, current disk usage,
       as well as the detached-job quota.

    o Privilege mask: This block contains the authorized
       privileges for the account (see Multiple Privileges, Section
       1.5.1 of this document, for details).

    o Account name: This optional block contains a 1 to 13
       character name for the account.

    o Nondisk quotas: This block contains the account's job quota,
       message quota, and RIB quota.

Although level 1.2 disks can be read by RSTS/E V8.0, they cannot be
written to because the current disk usage information would not be
kept up to date. RSTS/E V7.2 and earlier versions cannot read or
write level 1.2 (or level 1.1) disks.

RSTS/E V9.0 requires level 1.2 disks as the system disk or as public
disks in a multidisk public structure. RSTS/E V9.0 does permit level

1.1 and level 0.0 disks to be mounted as private disks on the system.
Level 1.1 disks can be used as any read/write disk without
restriction. However, level 0.0 disks can only be read because they
are always mounted read-only. If you attempt to use a level 0.0 or
level 1.1 disk as your system disk, it will be mounted read-only
thereby making the system virtually useless. The system will have to
be rebooted in order to recover from this situation.

Future versions of RSTS/E *will continue* to be able to read *all* levels
of disks. They will not necessarily be able to *write* level 1.1 disks.

1.2.2   [0,*] Accounts are now Allowed

RSTS/E version 9.0 now permits the use of programmer numbers 1 to 254
for project number 0. Programmer numbers in the range 1 to 199 are
reserved for DIGITAL use and may be deleted or zeroed during any
installation or update of RSTS/E, or any layered product. Programmer
numbers in the range 200 to 254 are reserved for customer packages.
These accounts can only be used to store files and cannot be logged in
to or spawned in to. This restriction is enforced by the RSTS/E
monitor.

1.3   System Generation (SYSGEN.SAV)

Several new features have been added to SYSGEN.SAV to make the program
easier to use. One major improvement is the ability to specify an
existing monitor to establish the default answers to configuration
questions. This allows you to create a new monitor based on the
configuration of an existing monitor without having to answer all of
the SYSGEN questions. SYSGEN has also been changed to create a
monitor mainly for the system it is running on. Therefore, SYSGEN
will prompt the user about any devices that are not in the template
monitor but are on the system.

As always, support for new hardware devices has also been added.
Refer to the *System Installation and Update Guide* as well as Section
2.2 of this document for more details.

Please note that the SYSGEN.SAV program is run as part of the
installation command procedure. It is not intended to be run
directly. Unlike V8.0 you should not use the RUN SYSGEN.SAV command.

1.4 Initialization Code (INIT.SYS)

1.4.1 New INIT.SYS Dialogue

INIT.SYS has been enhanced to eliminate some of the lengthy dialogue
required to start timesharing on a new system disk. When a RSTS/E
system disk is bootstrapped, a new question appears after the INIT.SYS
banner asking you if you want to start timesharing. If you answer
YES, INIT installs a monitor (if one was not previously installed),
selects reasonable defaults for that monitor (if no defaults have been
previously set), and builds the required system files (SWAP.SYS,
CRASH.SYS and BUFF.SYS) on the system disk without any user dialogue.

The following is an example of the new dialogue that takes place when
you bootstrap a RSTS/E system disk:

        RSTS V9.0 (DU0:) INIT V9.0

        Please enter Date <DD-MMM-YY> ?
        Please enter Time <hh:mm AM/PM> ?

        Start Timesharing <Yes> ?

1.4.2 New DATE Option

Prior to V9.0, many of the INIT.SYS options (START, SAVRES, DSKINT,
COPY, and REFRESH) would prompt for date and time before executing.
In RSTS/E V9.0, these options simply display the current date and time
as they were entered during the boot dialogue. The DATE option in
INIT allows you to reset the current date and time if they were not
entered correctly during the boot dialogue.

1.4.3 DEFAULT Memory Table Suboption VIRTUAL

The memory table suboption of the DEFAULT option has a new parameter
to allocate user memory to the virtual disk. The command syntax is
the same as the XBUF command syntax. Refer to the *System Installation
and Update Guide* for a complete description of how to allocate memory
to the virtual disk.

1.4.4 One-line Status Report (^T)

Within certain processing stages of the initialization code
(INIT.SYS), you can enter the ^T (CTRL/T) character at the console to

display a brief description of the current state of INIT's process.
You can enter the ^T character during any part of INIT's processing,
however only certain stages within INIT will print a description.
INIT's one-line status report is different from the one-line status
report displayed during timesharing. The one-line status report
within INIT is useful during long disk operations such as disk
initialization (DSKINT) or system disk rebuilds. The format of INIT's
one-line status report is as follows:

INIT.SYS(ddu) - Ov:n XXX(ddn:[ff/xxxxx]) hh:mm PRn

Where:

    INIT.SYS   - Indicates that the status is INIT's one-line status
                  report.

    ddu   - Describes the booted device of INIT.SYS (e.g. DL0).

    Ov:n   - Describes the overlay number currently running in
                  INIT. For example, Ov:6 means that overlay 6 is in
                  memory; overlay 6 is the DSKINT overlay (or Option).

    XXX   - Describes the process that is currently running in
                  INIT. The following four processes can appear:

                  "Booting" indicates that INIT is being bootstrapped.

                  "TTY"   indicates that INIT is doing terminal I/O.

                  "ROO"   indicates that INIT is in some process in
                             permanently mapped memory.

                  "DSK"   indicates that INIT is doing disk or tape
                             I/O. During the "DSK" process, additional
                             information is printed in parentheses.

    ddn: - Only printed when INIT is in the "DSK" process.
                  This identifies the device that INIT is performing
                  I/O to, for example; DU0: or MT0:

    ff/xxxxx - Only printed when INIT is performing I/O to disk.
                  ff indicates the I/O function, for example "W"
                  indicates a write, "R" indicates a read and "RC"
                  indicates a read-check (compare). xxxxx indicates
                  the logical block number currently being written
                  or read.

    hh:mm   - Represents the time in hours and minutes.

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    PRn   - n indicates the KERNEL processor priority (i.e PR7
                     means processor priority 7)

    Example:

          INIT.SYS(DL0:) - Ov:6 DSK(DU0:[RC/364545]) 01:10 AM PR7

This example shows that INIT.SYS is running from DL0: and performing
a DSKINT to device "DU0:". DSKINT is currently performing a
read-check on logical block 364545. The time is 1:10 in the morning
and the processor priority is currently 7.

1.5   Monitor

1.5.1 Multiple Privileges

In RSTS/E V9.0, there are multiple classes of privilege. The
privileged monitor functions are each tied to a specific privilege
class; if a job has a specific privilege, it can execute privileged
functions controlled by that privilege, but not others. The system
manager sets up the privilege classes for each account. Unlike V8.0,
it is possible to give an account some privileges, but not necessary
to give an account all privileges. There is no longer any connection
between the account number (PPN) and the privileges for the account.
For example, it is possible to have an account [1,3] with few or no
privileges, or an account [100,100] with many privileges.

Some existing application programs on your system may assume that
group [1,*] is the group of privileged accounts. DIGITAL recommends
that you continue to keep your highly privileged accounts in group
[1,*] until applications have been changed to accommodate the new
multiple privileges feature. Refer to section 2.16 of this document
for information on layered products which fall into this category.

For general background on the multiple privileges feature, refer to
the *System Manager's Guide*.

The *RSTS/E Programming Manual* and the *System Directives Manual* have
been updated to reflect the multiple privileges feature. These
manuals describe each monitor directive and the privilege required for
that function (or each of its subfunctions).

In addition, the DCL Help Files and the *Quick Reference Guide* now
specify which privilege or privileges are required in order to use
each system command.

The DSKCVT program sets up privileges for all accounts when converting
a disk (unless you convert your accounts to NOUSER accounts). The

privileges are set up to be equivalent to the privilege rules of V8.0.
See section 2.11.7 for further details on DSKCVT.

1.5.1.1 New Privilege TMPPRV

A new privilege, TMPPRV, has been added to V9.0. This privilege is
not described in the V9.0 documentation because of its late inclusion
in the product. However, it is described in the on-line help topic
PRIVILEGES.

The TMPPRV privilege controls the setting of the privilege bit (128)
in the protection code of an executable program. Originally, this
function was under the control of another privilege, SYSIO. Because
SYSIO privilege controls other functions as well (like write access to
files in the [0,*] accounts), potential security risks could arise by
giving someone SYSIO privilege to perform one function, while at the
same time allowing them to create and execute privileged programs.

For this reason, a new privilege, TMPPRV, has been provided to control
only the function of marking programs privileged. This privilege,
like SYSMOD, is **NOT** assigned to privileged programs when they are
executed. Thus, programs with temporary privilege cannot mark other
programs privileged; a user must have TMPPRV privilege to perform this
function.

The DSKCVT program will assign this privilege to all [1,*] accounts
when converting disks to level 1.2, for compatibility with V8.0.

Note that the *RSTS/E System Manager's Guide* incorrectly describes the
SYSIO privilege as controlling the setting of the privilege bit in a
file. The documentation should be corrected to indicate that SYSIO
privilege controls the setting of the privilege bit in a data file
(file with the execute bit (64) not set), while TMPPRV controls the
setting of the privilege bit in an executable file (file with the
execute bit (64) set).

1.5.1.2 New SYS Calls for Support of Multiple Privileges

The following SYS calls (.UUO subfunctions) were added to support the
multiple privileges feature:

    o   UU.PRV (+28): Set/Clear/Read current privilege flags

    o   UU.3PP (+31): Enable/Disable third party privilege checking

     o UU.CHK (+32): Check privilege flag, or check file access

Refer to the *System Directives Manual* and the *RSTS/E Programming Manual* for details on these new functions.

1.5.1.3 New Message-Send Subfunction for Multiple Privileges

The .MESAG directive (send-receive SYS call) has a new subfunction code (-11) to send local data and include the sender's current privilege mask as part of the data. Refer to the *System Directives Manual* and the *RSTS/E Programming Manual* for details.

1.5.2 Writing Programs in V9.0

When writing programs to run on RSTS/E V9.0, you must consider several new issues that arise due to the inclusion of multiple privileges in RSTS/E.

1.5.2.1 Programs Protected <124>

Prior to V9.0, an executable program residing in a [1,*] account with a protection code of <124> (60+64) could only be run by a "privileged" user. Such programs could safely assume that anyone able to run the program had all the privileges required to perform all of the program's steps (an exception to this was POKE (write to memory), which required the program to be run from the [1,1] account).

In V9.0, there is no concept of a "privileged" user. If you have WREAD (world read) privilege, you can execute any <124> program on the system, even though you may not have other privileges required for the program to work properly.

It may be acceptable to simply leave <124> programs as is. Such programs will succeed or fail depending on the privileges of the user who executes them. However, some <124> programs may require the user to have several different privileges in order to succeed. If a user has some but not all of the privileges required, the program may "partly" succeed, meaning it is able to complete some of its tasks, but may fail at others. This could be undesirable, especially where failing part way through a multi-step operation could leave a file or other data in an inconsistent state.

The solution to this problem is for such programs to do an "up-front" privilege check, to ensure that the user has all the required

privileges before proceeding. A new monitor directive, UU.CHK, can be
used to determine if a user has a particular privilege. See the
System Directives Manual and the *RSTS/E Programming Manual* for further
details on this directive.

Once such a check is added to <124> programs, the program's protection
code can be safely lowered to <104> (40+64), allowing any user on the
system to run the program. The up-front privilege check will
terminate the program if its user does not have the required
privileges to continue.

For example, suppose a program requires HWCFG, SWCFG and TUNE
privileges to work properly. It could perform a check at the start of
the program to ensure that any user running the program has all three
privileges before continuing. If the user has HWCFG and SWCFG
privileges, but lacks TUNE privilege, then the program should issue an
error message and terminate.

If program "privacy" is still desired, the program's protection code
can be left <124>, allowing only the file's owner or users with WREAD
(or GREAD (group read) if the program resides in the same group as the
user) to access the program or display it in a DIRECTORY listing.

In some cases, you may not want to require users to have all the
privileges that a program needs to work properly. In such cases, a
program can be given temporary privilege (by setting the "privilege"
bit (128) in its protection code). Such programs can then check for a
single privilege that the user must have to continue. Using the above
example, if the <104> program were made privileged (protection code
<232>), it could check at the beginning for only TUNE privilege. The
program would proceed for those users with TUNE privilege, even though
the program itself required HWCFG and SWCFG privilege. Be sure to
drop temporary privilege before doing the privilege check, so that the
user's privileges are checked, not the program's (see the section
below).

SHUTUP is an example of such a program. It requires a variety of
privileges to remove jobs, remove run-time systems, dismount disks,
and issue the "shutup" SYS call. Instead of requiring a user to have
all of these privileges, SHUTUP is installed as a privileged program
(protection code <232>) and only requires the user to have SHUTUP
privilege to perform all of its steps. SHUTUP displays the error
"?SHUTUP privilege required" if a user runs it and lacks SHUTUP
privilege.

1.5.2.2 Privileged Programs

In version 9.0, programs with their privileged bit (128) set are given

a temporary set of privileges. All privileges except SYSMOD and
TMPPRV are enabled whenever a privileged program is executed.

Whenever such a program drops temporary privilege, the program's
privileges are saved and the user's own privileges are re-enabled.
When temporary privileges are regained, the two sets of privileges are
exchanged again. If temporary privileges are permanently dropped,
then the user's privileges are re-enabled and the program's temporary
privileges are lost.

Care should be taken when creating privileged programs. In general,
such programs should execute most of their functions with temporary
privileges dropped, raising them just before executing a privileged
operation and then dropping them immediately following the operation.

Special attention should be paid to BASIC-PLUS-2 error handling under
such conditions. If a privileged operation causes an error, control
may be passed to an error handler with temporary privileges still
enabled. Be sure that there are no paths in the program where
temporary privileges may be accidently left enabled.

The TMPPRV privilege controls the setting of the privilege bit (128)
in the protection code of executable programs. Be careful when
assigning the TMPPRV privilege to accounts, since users with TMPPRV
privilege can write and execute programs that perform system functions
controlled by privileges they might not possess.

1.5.2.3 Access and Privilege Checks

When designing programs, you should when possible avoid "duplicating"
the monitor's access and privilege checks in your program. When
performing an operation that depends on the user's privileges and/or a
file's protection code, a program should simply perform the operation
(with temporary privileges disabled if a privileged program), and let
the monitor enforce its access and privilege rules. Duplicating such
checks in the program itself is inefficient and may lead to
incompatibility in the future.

For example, suppose you want to design a privileged program that
creates a file in a user-specified location (device and account).
Rather than having the program determine if the user is authorized to
create the file in the location specified, simply drop temporary
privileges and create the file. If the user lacks the privileges
needed, the monitor will block the file's creation and return an
error. The program can then report the error and re-prompt the user
for a new file location. Note that this program would continue to
function properly, even if RSTS/E access and privilege rules changed
in the future.

Several new "access check" directives have been added to V9.0 to allow
programs to more easily declare access rights and privileges. DIGITAL
recommends that you make use of these directives where possible.

1.5.3 Additional Quotas

In addition to the new disk-related quotas in V9.0 (see Section
1.6.1), there are also some new nondisk quotas. These are set for
each account using the account management commands. Some of these
quotas replace (and generalize) feature patches in V8.0 (patches
3.1.4, 3.1.5, and 3.1.6). The new quotas are:

   o Job quota: Specifies the maximum number of jobs that may be
      logged in to this account.

   o Detached job quota: Specifies the maximum number of jobs in
      this account that may be detached. Unlike V8.0, this quota
      is specified as an actual limit, not as a ratio of attached
      jobs to detached jobs; thus, feature patch 3.5.14 is no
      longer needed. This feature also replaces feature patch
      3.1.6.

   o RIB quota: Specifies the maximum number of receiver ID
      blocks (RIBs) that a job in this account can declare. RIB
      quotas replace feature patch 3.1.4.

   o Message quota: Specifies a maximum for the sum of the
      message-max values of the RIBs declared by a job in this
      account. Message quotas replace feature patch 3.1.5.

1.5.4 New Magtape Special Function: EOV

The RSTS/E V9.0 monitor supports ANSI multivolume files with the
magtape EOV (end-of-volume) special function call. You can use this
call to write ANSI end-of-volume labels at the end of a tape instead
of end-of-file labels.

The end-of-volume mark signifies that the file is too large to fit on
the current tape, and must be continued on another tape. This is the
only way for RSTS/E to split a file into more than one segment on a
tape. The EOV special function call must be issued while the file is
open so the monitor will write out the EOV label when the file is
closed.

Since the same file name is used on all tapes that contain a section
of the file, they must be identified by a section number. This number
is specified with the /POSITION:n switch of the file specification.
If the position number is zero or the switch is not specified, then an
OPEN FOR OUTPUT statement will use a section number of one. If a
section number other than zero or one is used, then the section must
be the first file on the tape. If no section number is specified and
the open is for input, then the open will match any section number
found on the tape. If the section number specified for input does not
match the section number found on the tape, then the error "?Pack-ID's
don't match" (ERR = 20) is returned.

The EOV spec call would normally be issued when the program which is
writing to tape crosses the end-of-tape mark. When this occurs then
the program must take the following steps:

1. Issue the EOV spec call as described below.

2. Close the file with a normal close. This will write out the
    EOV labels.

3. Dismount the tape, and mount a newly initialized tape on the
    drive.

4. Open the file on the tape with the next higher section
    number.

When a multivolume file is read, and the end-of-volume mark is
reached, then the error "?End of volume" (ERR = 68) is returned
instead of the error "?End of file on device" (ERR = 11). When the
end of volume is reached, then the program must take the following
steps:

1. Close the file.

2. Dismount the tape.

3. Mount the tape volume which contains the next section of the
    file.

4. Open the next segment of the file.

Refer to the *RSTS/E Programming Manual* and *System Directives Manual*
for details.

1.5.5   Asynchronous Read/Write Capabilities

1.5.5.1   .READA and .WRITA Directives

The RSTS/E monitor now has the capability to perform asynchronous
read/write operations on disk devices and MS type tape drives: the
.READA directive (EMT 102) performs asynchronous read; the .WRITA (EMT
104) performs asynchronous write. The new V9.0 BACKUP utility uses
these new directives.

The general functions of the asynchronous READA/WRITA directives are
the same as the synchronous READ/WRITE, both transfer data between a
device and a user program. While synchronous operations stall the
user program until the I/O completes, asynchronous operations allow
the program to continue running while the I/O completes in the
background. On completion of the I/O request, the monitor notifies
the user program by executing a user-specified completion routine. On
devices which do not support asynchronous I/O, asynchronous operations
will stall the user's job and execute the user defined completion
routine when the I/O request has completed.

Refer to the *System Directives Manual* for more details on these new
directives as well as additional information on asynchronous I/O
processing.

1.5.5.2   Completion Routines

A completion routine is a section of code within the user program that
executes immediately when an I/O request is complete. Completion
routines generally check for device-dependent errors that may have
occurred during I/O execution, such as "?Device hung or write-locked,"
"?Data error on device," or "?No room for output on device."

The monitor interrupts the main code of the user program when an
asynchronous I/O is completed. However, if another asynchronous
request completes when a completion routine is already running, the
monitor will not execute the second completion routine until the first
one finishes. For this reason, it is wise to make careful use of the
interrupt capabilities and keep the completion routines as brief as
possible. This ensures that the monitor will not inhibit the
execution of the completion routines.

It is possible to disable (and later reenable) completion routine
execution by means of the .AST directive. This directive is useful
when a particular operation in your program must not be interrupted by
completions.

Refer to the *System Directives Manual* for more details.

1.5.5.3 .ASTX Directive

Sections 1.5.5.1 and 1.5.5.2 mention that the monitor interrupts the
user program's main code when an asynchronous I/O completes and then
immediately begins execution of the specified completion routine. The
monitor saves the user's current job context (including the current PC
and PS) so that when the completion code finishes, the user's job can
continue where it left off at the time of the interrupt. The new
.ASTX directive signals the end of a completion routine to the
monitor. All completion routines must end with .ASTX so that the
monitor can perform the necessary cleanup and return the user to the
main code.

Refer to the *System Directives Manual* for more details on these new
directives.

1.5.5.4 Magtape Special Function: "Error Condition Acknowledged"

Unlike disk requests, all tape requests must be completed in the order
that they are issued. If some asynchronous request finishes in error,
additional asynchronous requests that were issued by the program but
not yet started by the monitor will not be executed. In RSTS/E, when
an asynchronous request fails for some reason, any further requests to
the same tape unit returns the error "?Device Hung or Write-locked."
This procedure prevents requests from being completed out of order.

To clear the tape unit so that it can accept more requests, the user
program must issue the magtape special function "Error Condition
Acknowledged." This notifies the monitor that the user is aware of the
error on the unit, and is prepared to take whatever steps are
necessary to continue processing its job. Once the magtape error
condition is cleared, requests are again accepted and processed.

The ECA special function call can be issued using the BASIC-PLUS
MAGTAPE% or SPEC% function calls or from a MACRO program or subroutine
using the .SPEC directive. There are no parameters associated with
this call, and the call cannot fail. If no error condition exists
within the tape unit being accessed, then no action is taken.

Refer to the *RSTS/E Programming Manual* and *System Directives Manual*
for details.

1.5.6 User I&D Space

Instruction and Data (I&D) space, found in the 11/44, 45, 55, 70, 73,
84 processors, is a hardware feature that provides programs with

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increased address space. The I&D space hardware provides two virtual
address spaces for a task. One 16-bit address space is available for
instructions (I) and another separate 16-bit address space is
available for data (D). Therefore, there can be two different
physical locations in memory for each address. For example, there
could be an instruction at location 1000 (in I-space), and a data word
at a different location 1000 (in D-space). Thus, you must write the
program using special rules described in the *MACRO Language Manual*,
Task Builder Reference Manual, and the *System Directives Manual*.

For example:

```
        .PSECT CODE,I

            .=1000

    START:  MOV      FOO,R0
            HALT

    .PSECT  VALUES,D

            .=1000

    FOO:    .WORD    -1

            .END     START
```

Both FOO and START are at location 1000; however, one is in
instruction (I) space and the other is in data (D) space.

Because of the special programming requirements, the only languages
which currently allow the use of I&D space are RSX MACRO, FORTRAN-77,
and BASIC-PLUS-2 V2.3.

1.5.7 Dynamic Regions

V9.0 adds a new subfunction of UU.RTS (FIP SYS call -18) to allow
programs to dynamically allocate memory for private or shared use. A
modifier flag tells the sys call to create a region as large as
possible if the requested amount of memory is not available.

For example, if a program requests 100K of memory, and only 50K is
available, a 50K region will be created if this flag is set. If the
flag is not set, the error "?No room for user on device" will be
returned.

For further information on dynamic regions, refer to the *RSTS/E
Programming Manual*.

1.5.8 Command Line Directive

A new directive (.CMDLN) has been added to allow programs to communicate up to 1024 bytes of data when chaining. This new directive will pass the data in core common provided the data will fit, otherwise it will use XBUF.

If a program places something in core common directly (without the use of .CMDLN), and there is nothing in XBUF as a result of .CMDLN, this directive returns whatever is in core common. This procedure is not recommended, since the receiving program may not get the data intended (if a previous use of .CMDLN placed anything in XBUF that was never read).

This new directive is used by DCL to pass long command lines to some server programs.

Refer to the *System Directives Manual* for further details.

Note

The read function deletes the command line after it has been read. Therefore, it can only be read once.

1.6 File Processor

1.6.1 Logged-In Disk Quotas

The logged-in disk quota feature provides the ability to limit the use of disk space while a user is logged in. Before V9.0, disk allocation was only checked when the user was logging out of the system. Therefore, while the user was logged in, no disk allocation restrictions were enforced, allowing unlimited access to available disk space.

Note that this feature is *only* available on level 1.2 disks. Quota checking is enforced on all level 1.2 disks which are mounted read/write, unless the unit is mounted with the /NOQUOTA qualifier. Also note that logged-in quota checking is not enforced for users with EXQTA (exceed quota) privilege and for privileged programs, since privilege programs have EXQTA privilege.

RSTS/E V9.0 extends disk quotas from a 16-bit unsigned integer value to a 24-bit unsigned integer value. Therefore, quotas for level 1.2 disks can be in the range 0 to 2^24-1, with zero meaning *no disk*

allocation allowed, and 2^24-1 meaning unlimited disk access. Disk
quotas for level 0.0 and level 1.1 disks are still in the range 0 to
65535 with zero meaning unlimited access.

RSTS/E V9.0 maintains two types of quotas: a logged-in quota and a
logged-out quota. All file creations and file extend operations are
checked against the logged-in quota if at least one user is logged in
to the account where the file is created or extended. If no one is
logged in to the account, then the logged-out quota is checked. The
logged-out quota is also enforced when the user logs out of the
system. The file processor will not issue any warning message
indicating that the quota is about to be reached.

A new RSTS/E error code, QUOTA (69, "?Quota exceeded"), is returned
whenever the monitor is unable to extend a file because the logged-in
or logged-out quota is exceeded.

For more detailed information concerning this feature, refer to the
Systems Manager's Guide.

1.6.2 Long and Hashed Passwords

In V9.0, the password for each account may be set up in one of two
ways, at the option of the system manager. One option is to retain
all of the rules and restrictions of V8.0 (uppercase letters and
digits only, 6 characters maximum). The other option extends the
password length to 14 characters, allows all printable characters,
including space but not including the question mark (?) character, and
stores the password in a "hashed" form, which cannot be converted back
to the original password. The choice is made using the /[NO]LOOKUP
qualifier of the account management commands (refer to the *System
Manager's Guide.*)

If your system includes DECnet, please refer to the *DECnet/E V2.1
Release Notes* for information on how hashed passwords affect DECnet/E.

For maximum security and flexibility in passwords, DIGITAL recommends
the /NOLOOKUP choice (long, hashed passwords). If your installation
has accounts whose passwords must be looked up by some application
program, use the /LOOKUP choice for those accounts. In most cases,
you can avoid the need to look up passwords by using the "Create a
Logged-in Job" (UU.CRE) function, added in RSTS/E V8.0. All RSTS/E
utility programs have been updated to use the spawn logged-in feature
and do not need to look up password·.

The DSKCVT program optionally hashes all the passwords on a disk. It
does not provide the ability to selectively hash some passwords.

As an additional security enhancement, passwords now must be at least
six characters long (this restriction applies to all passwords,
/LOOKUP or not; this is a specific incompatibility with V8.0 for
/LOOKUP passwords). DSKCVT will still preserve passwords shorter than
six characters. However, all new passwords entered must be at least
six characters long.

The Login, Attach, and Set Password SYS calls (UU.LIN, UU.ATT, and
UU.CHU) have been extended to allow for the longer password. The old
forms, however, are still valid. Refer to the *RSTS/E Programming
Manual* and the *System Directives Manual* for details.

1.6.3 System Password

RSTS/E V8.0 had a feature patch to LOGIN for an auxiliary password.
In RSTS/E V9.0, this feature patch has been replaced by the "system
password" feature. Using DCL commands, you can set a system password,
which the RSTS/E monitor enforces. You can specify that system
passwords will apply to dial-up jobs or to network jobs only; to both
network and dial-up jobs; or to all jobs on the system. You may elect
not to use a system password at all. If you include network jobs
among the jobs that require the system password, then the system
password will also be checked on network file access and similar
operations. Refer to the *DECnet/E V2.1 Release Notes* for details.

For a discussion of the directives used, refer to the description of
the Login SYS call (UU.LIN) in Section 2.5.8 of this document as well
as the *RSTS/E Programming Manual* and the *System Directives Manual* for
further details.

1.6.4 Account Flags

To provide additional control over the use of accounts, RSTS/E V9.0
implements a number of account flags. These flags are maintained and
displayed using the account management commands (refer to the *System
Manager's Guide*). The following flags are implemented:

> o Dialup: This flag allows or disallows dial-up access to the
>   account.

> o Network: This flag allows or disallows network access to the
>   account.

o Interactive: This flag controls interactive access (access
  by using a terminal) to the account. Accounts marked as
  "Nointeractive" can only be used by jobs created using the
  Create-a-Job (UU.JOB) directive (which includes Batch jobs).

o Captive: Accounts marked "captive" do not have access to
  keyboard monitors. They are kept under control of the
  LOGIN.COM command file. The monitor will remove ("kill") any
  job running in a captive account that returns to a keyboard
  monitor.

o Password-prompt: If an account is marked
  "nopassword-prompt," a user logging in to that account will
  not be asked for a password. In effect, the account becomes
  a "guest" account, since anyone knowing the account's PPN can
  log in to it. Note that a System Password, if enabled, is
  still required for users logging into guest accounts.

1.6.5 Account Expiration Date

In V9.0, each account has an expiration date after which the account
can no longer be used. By default, it is set to "no expire. " Using
account management commands, you can set up an expiration date. If a
user attempts to log in to an expired account, the user receives the
message "?Access not permitted" to indicate that the password
specified was correct but that the account is not accessible. Refer
to the *System Manager's Guide* for further details.

1.6.6 Automatic Cluster Size Optimization

RSTS/E V9.0 supports automatic cluster size optimization. Cluster
size optimization is a method to reduce the amount of file processor
overhead for reading disk files at the cost of disk space.

If a file is created without an explicit cluster size, and a
pre-extension amount is specified, the monitor will use the file size
divided by seven, rounded up to a power of two, as the cluster size.

This behavior is different from previous releases, which always used
the pack cluster size as the default. If you want to explicitly
request use of the pack cluster size (to save on disk space), specify
the cluster size value of -1. This means the same as in previous
releases, that is, use a cluster size of 1 if possible and if not,
then use the pack cluster size.

Since PIP defaults to a source file's cluster size, you must
explicitly request the use of this feature when using PIP. To do so,
you simply request a cluster size of 0.

For example:

    PIP DR0:*.*/CL:0=DR1:*.*

Refer to the *RSTS/E Programming Manual* and *System Directives Manual*
for further details.

                                    Note

        Most layered products, such as BASIC-PLUS-2 and
        SORT-11, use this feature when creating their
        temporary work files. As a result these products will
        generate inconsistent or unusual error messages if
        there is insufficient disk space.

1.6.7 New SYS Call for Fast Directory Lookup and File Opens

A new SYS call, UU.ONX (FIP SYS call +33) has been added. This
function allows programs to open a series of disk files, each matching
a particular wildcard file specification. This call is faster than
lookup-by-index calls, since it uses an I/O channel to keep track of
the last file returned by the previous call to UU.ONX.

The new BACKUP program and the DCL function F$SEARCH use this feature
for faster wildcard lookup of disk files. The PIP.SAV program does
not use this new feature.

For further information on this call, refer to the *RSTS/E Programming
Manual* and the *System Directives Manual*.

1.6.8 UU.CFG Directive

A new directive UU.CFG (FIP SYS call +34) has been added to provide
support for changing some system parameters during timesharing. These
parameters were previously changeable only through suboptions of
INIT.SYS or by means of feature patches. This directive is used by
the DCL SET SYSTEM and SET PRINTER commands, as well as the DCL
SET TERMINAL/[NO]DIALUP command. Refer to the *System Directives
Manual* and the *RSTS/E Programming Manual* for more details.

Please note that the "set default tape density" option of subfunction
2 in UU.CFG is expected to change in the future and will be removed
after that change. You should avoid using that option in any programs
you write.

1.6.9 Resident Overlay Code

The decision to make certain monitor code resident or overlaid no
longer must be made at system installation time. A new subfunction of
UU.CFG is available to load, unload, and list resident overlays. See
section 1.8.25 of these notes for more information on the LOAD/OVERLAY
and UNLOAD/OVERLAY commands.

1.7 Terminal Service

1.7.1 New Terminal Service Features

V9.0 includes several new features that provide better control and use
of terminals on your system. V9.0 adds support for the following new
terminal features, which are controlled by the SET TERMINAL command:

   o Permanent characteristics: Each terminal on the system now
      has a set of permanent characteristics which are installed
      whenever a terminal becomes free (due to a user either
      logging off, detaching from, or deallocating the terminal).
      This feature is similar to the /RING characteristic which
      applied to modem-controlled terminal lines. Permanent
      characteristics now apply to both local and dial-up lines.

   o Terminal types: Each terminal's characteristics now include
      an 8-bit value that identifies a particular terminal type.
      All DIGITAL-supported terminal types have unique codes. A
      range of values is also reserved for user-defined terminal
      types.

   o Capability flags: Each terminal's DDB also includes
      "capability" flags that indicate whether a terminal supports
      features such as ReGIS graphics, 132-column mode or the
      Advanced Video Option.

   o CTRL/C disabling: You can now disable the CTRL/C interrupt
      function on an individual terminal. When disabled, the
      CTRL/C key behaves like any other control character.

   o CTRL/X: CTRL/X is similar to CTRL/U in that it cancels
      type-ahead. However, CTRL/U cancels only the current line,

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> while CTRL/X will cancel *all* type-ahead no matter how many
> lines have been typed.

> o Selectable control characters: You can now individually
>   enable or disable the ^R (repaint), ^T (mini-status), ^X
>   (cancel type-ahead) and ^C (interrupt) control characters.
>   When any of these keys are disabled, they behave as any other
>   character typed.

> o Autobaud Detection: Autobaud detection allows automatic
>   detection and setting of speed of any multiplexed terminal
>   line, both local and dial-up. Once the characteristic is set
>   with the SET TERMINAL/AUTOBAUD/PERM command, a user simply
>   presses the <CR> (carriage return) key until the system
>   determines the terminal's speed and responds with the "User:"
>   log-in prompt. Also, Autobaud will reset itself to the
>   default state if nothing is typed within 3 seconds. For
>   instance, if you type a character other than carriage return,
>   simply stop typing for 3 seconds and Autobaud will reset to
>   its initial state. Then you can begin typing carriage
>   returns again to have Autobaud detect your line speed and
>   invoke LOGIN. Note that if "Autobaud" is set for a keyboard,
>   changing speeds is not allowed.

For further information on programming the various terminal
characteristics, refer to the *RSTS/E Programming Manual* and the *System
Directives Manual*.

1.7.2 Eight-bit Control Characters now Supported

To allow support of VT200 series terminals in the "VT200 mode,
eight-bit controls" setting, RSTS/E terminal service will now convert
eight-bit control characters to their seven-bit equivalent. This
process is transparent to the application programs. The conversion
rule is: If the terminal is set /EIGHT_BIT, and not in binary mode,
then any incoming character in the range 129 to 159 is converted to
Escape followed by the character minus 64. This works in both normal
mode and Escape Sequence mode. The result is that the applications
can see no difference between the seven-bit controls and eight-bit
controls settings.

1.7.3 Default Terminal Settings

The default setting for all multiplexed terminal lines is /AUTOBAUD.
This means that if you have multiplexed terminal lines that you do not

want set to Autobaud, you should set these lines using the
SET TERMINAL/NOAUTOBAUD/PERM command in your start up command
procedure.

The default speed setting for multiplexed terminal lines has been
changed to default to 9600 baud. This affects DZ11, DZV11, DH11,
DHV11 and DHU11 terminal lines. Also, the default line width has been
changed to 80, and lowercase is enabled on all lines.

1.7.4 Keyboard Device Designator Names

In V9.0 you can specify keyboard devices by means of their controller
designator.

For example:

```
    KBA0:  is the console
    KBA1:  is the next DL11A,B type interface
    KBB0:  is the first DL11C,D type interface
    KBC0:  is the first DL11E type interface
    KBC1:  is the second DL11E type interface
    KBD0:  is the first pseudo keyboard
    KBE0:  is the first subline on the first DJ11
    KBF0:  is the first subline on the first DH11
    KBF16: is the first subline on the second DH11
           (if the first one has all 16 sublines enabled)
    KBG0:  is the first subline on the first DZ11
    KBG8:  is the first subline on the second DZ11
           (if the first one has all 8 sublines enabled)
    KBH0:  is the first line on the first DHU11 or DHV11
```

This feature allows you to specify terminals without having to worry
about the designations changing when adding hardware or pseudo
keyboards. For example, suppose you have 4 pseudo keyboards, a
DL11-E, and a DZ11, and want to add an additional 4 pseudo keyboards.
Prior to V9.0, your keyboard numbers for the DZ11 would go up by 4.
However, by using controller names you could refer to them as KBG0-7
(or TTG0-7). These references would stay the same, no matter what new
hardware or pseudo keyboards are added. The corresponding keyboard
numbers still move, of course, but the controller-style names stay
fixed.

This feature is most useful when specified in the system start-up file
to set terminal characteristics and when used with the DCL SET and
SHOW TERMINAL, and SET and SHOW DEVICE commands.

1.8   DCL

DCL has been enhanced for version 9.0, to provide many new commands
and features. The following summary describes the major DCL changes.

1.8.1   Command File Processing

DCL now includes an integrated command file processor that supports
expressions, symbol substitution, functions, and branching. If a job
running under control of an indirect command file is detached using
the UU.DET directive, a new job is created at that terminal, logged in
to the same account, and execution of the command file continues with
the new job. See the new *Guide to Writing Command Procedures* for
complete details.

1.8.2   Command Substitution

DCL now allows you to define new DCL commands or redefine existing DCL
commands. For example, you can redefine the DIRECTORY command to be
DIRECTORY/DATE, or define the command KB as SHOW TERMINAL/FULL. An
abbreviation point can be defined within a command keyword by
including a hyphen (-) character to mark its minimum abbreviation.
See the new *Guide to Writing Command Procedures* for complete details.

1.8.3   LOGIN Command Files

Whenever you log in to the system, LOGIN executes the system-wide
log-in command file _SY:[0,1]LOGIN.COM. This command procedure
performs some of the actions that were previously handled by the LOGIN
program itself, such as displaying the NOTICE.TXT file at your
terminal. System managers can edit this command file to perform other
actions for all users logging in to the system.

The supplied system-wide log-in command file completes by executing
the LOGIN.COM file found in the user's account (if one exists). This
allows users to define their own procedures that will be executed
whenever they log in to the system. Typically, a user's log-in
command file defines new DCL commands, assigns logicals, displays
messages, or executes other command procedures or programs. Since
most command procedures execute silently (no output to the user's
terminal), users may perceive a longer time required to log in to a
V9.0 system.

In addition, group LOGIN.COM files are also supported. If a LOGIN.COM
file exists in the user's group library account ([p,0]), then that
command file is invoked before the user's own LOGIN.COM file. Note
that this step is not taken if the user is logging into the group
library account, to prevent the user's LOGIN.COM file from being
executed twice.

Refer to the *System User's Guide* for more information on user-defined
log-in command files.

1.8.4 Terminal Logging

The OPEN/LOG_FILE command allows you to create a disk file containing
a record of your terminal session. All characters echoed or output to
the terminal, including escape sequences, are recorded, with the
exception of ^T, broadcast messages, and CTRL/edit characters (DEL,
^U, ^X, ^R, etc.). Time-stamps can also be included on each line in
the log file. You can use the SET LOG_FILE command to temporarily
disable or reenable logging to a log file. The CLOSE/LOG_FILE command
closes a log file that is currently open. DCL changes its "$" prompt
to "$." whenever a log file is open. Refer to the *System User's Guide*
for further details.

1.8.5 Use of new $-logicals

DCL now accesses various system programs and files using the new
$-logicals, described in Section 2.4.3 of this document.
Consequently, certain programs that were required to reside in the
[1,2] account are now located elsewhere. For example, HELP.TSK is now
located in the HELP package location, referenced by the logical
"HELP$:". Refer to the *System Installation and Update Guide* for
further details on $-logicals.

1.8.6 DCL in V9.0

You can now install DCL as the system's primary run-time system
because RSX emulation is standard in all V9.0 monitors. When used as
the primary RTS, DCL requires 28K words of permanently reserved
memory. Alternatively, you can define RSX as the primary RTS
(requiring only 1K words); DCL then serves as the default keyboard
monitor. DCL is required on all V9.0 systems and always serves as the
default keyboard monitor.

The DCL run-time system executes .COM files the same way that RSX
executes .TSK files and RT11 executes .SAV files. Unlike most other
executable files, .COM files can be edited using a standard text
editor. The execute bit in a .COM file's protection code must be set
if the file is to be executed with the RUN command. The bit need not
be set if the file is invoked using the DCL "@" command. Like all
other executable files, .COM files can be chained to or spawned using
the monitor's CREATE JOB sys call. Note that, .COM files cannot be
executed by detached jobs (the job will hibernate).

DCL is always installed as the default keyboard monitor because of the
interaction of DCL and the monitor in executing DCL command files.
Users that want to run under a different keyboard monitor can easily
include a SET JOB/KEYBOARD_MONITOR=kbm command in their log-in command
file.

DCL requires 28K words for its read-only (high segment) memory, which
is shared by all users, and 4K words of read/write (low segment)
memory for each user currently running under DCL.

In order to maintain global and local symbols, DCL creates a small
temporary work file in each user's account on the system disk. Each
time DCL exits (to run a program, for example), it writes the
in-memory symbol table to its work file. Upon reentry to DCL, the
work file table is read back in to memory. A new structure within the
monitor is provided so that the work file need not be closed each time
DCL exits. DCL has been optimized to read and write its work file
only when necessary. For example, DCL's global symbol table is not
written to disk if it has not changed since it was last read in to
memory.

DCL performance when executing command files is nominal, considering
that it must interpret and execute commands as pure text.
Applications that require high performance should continue to use
languages such as MACRO or BASIC-PLUS. Command files are best suited
to situations where the user needs to perform high-level command
procedures with some embedded execution control (for example, GOTO's,
error trapping, and so on).

The most noticeable performance impact is during log in time when the
system, group (if one exists), and user (if one exists) LOGIN.COM
files are executed. The amount of time between entering the account
password and DCL prompt will vary depending on the number of commands
in each command file. RSTS/E plans to improve performance of DCL
command processing in the future.

1.8.7 New Commands to Assign System Logicals

DCL now supports the ASSIGN/SYSTEM command which will enable you to
assign system-wide logicals, including the new $-logicals described in
section 2.4.3 of this document. Refer to the *System Manager's Guide*
for further details.

1.8.8 Enhanced SET and SHOW TERMINAL Commands

The SET TERMINAL and SHOW TERMINAL commands have been upgraded for
V9.0 so that the TTYSET.BAS program is no longer required. These
commands support all of the new terminal characteristics defined for
V9.0. One new feature is the addition of the /INQUIRE qualifier which
is used with the SET TERMINAL command. This qualifier interrogates
the user's terminal by sending an ANSI ESCAPE identifying sequence,
which determines the terminal type, and sets the appropriate terminal
characteristics. This is useful for setting a terminal's
characteristics without having to know the terminal's type or
individual characteristics.

Another very useful new feature of the SET TERMINAL command is the
/[NO]INTERACTIVE qualifier. This new qualifier is useful for
designating terminal lines that are not being used for logging into
the system, i.e., terminal lines used for printing or terminal lines
connected to other processors. This remedies the problem of noise on
a terminal printer's line initiating an unwanted LOGIN sequence.

Refer to the *System User's Guide* and the *System Manager's Guide* for
further details.

Note that the TTYSET.BAS program cannot set any of the new terminal
characteristics and therefore is *not* included in V9.0.

Note

> There is a known restriction that if you specify a
> large number of qualifiers with the SET TERMINAL
> command, a "??Maximum memory exceeded" error could
> occur. If you receive this error message, use several
> SET TERMINAL commands with fewer qualifiers. This
> problem is being investigated and will be fixed in a
> future release.

1.8.9 New DCL Account Management Commands

V9.0 provides a new account management facility with new commands for creating, deleting, as well as setting and displaying accounts and directories. Refer to the *System Manager's Guide* for further details.

Note that MONEY.BAS and REACT.BAS cannot perform any of the new functions and are no longer supported. MONEY.BAS is included in V9.0 and can be found in the UNSUPP package. The REACT.BAS program is *not* included in V9.0.

Note

There is a known restriction that if you specify a large number of qualifiers with the CREATE/ACCOUNT and SET ACCOUNT commands, a "??Maximum memory exceeded" error could occur. If you receive this error message, use several commands with fewer qualifiers. This problem is being investigated and will be fixed in a future release.

1.8.10 New DCL Commands to Replace UTILTY.BAS

V9.0 provides new commands to perform all of the functions of UTILTY.BAS, which is no longer supported. Some commands have been enhanced. For example, the BROADCAST command allows you to broadcast a message to a user by PPN, causing the message to be broadcast to any terminal logged in under the PPN specified. Refer to the *System Manager's Guide* for further details.

The V9.0 HELP facility includes a table that lists each UTILTY command and the corresponding DCL command. You may find this table helpful in learning the new DCL commands.

To obtain on-line help about the UTILTY program, type the command:

    $ HELP PROGRAM UTILTY

The UTILTY program is still included in V9.0 for those layered products that issue UTILTY commands during installation.

1.8.11 New DCL Command for Changing Passwords

DCL now supports the SET PASSWORD command to allow users with the SETPAS privilege to change their password. Also, the

SET PASSWORD/SYSTEM command is provided to change the optional system
password. It functions in the same manner as the SET PASSWORD command
but requires WACNT privilege. Refer to the *System User's Guide* and
the *System Manager's Guide* for further details.

1.8.12 New SET and SHOW SYSTEM Commands

Many of the functions in the DEFAULT option of INIT.SYS can now be
executed during timesharing. For example, the SET SYSTEM/NAME command
sets the installation name for the system, while the
SET SYSTEM/TIME_FORMAT command sets the system time format (AM/PM or
24-hour).

The SET SYSTEM/[NO]PASSWORD_PROMPT[=(class[,...])] command is used to
specify which class of user is required to enter the system password
when logging in to the system. If no class is specified, then all
users must enter the system password. If NETWORK is specified, then
users accessing the system by means of DECnet/E will be prompted. If
DIALUP is specified, then users accessing the system over dial-up
lines will be prompted. If /NOPASSWORD_PROMPT is specified, then no
one will be prompted for the system password. WACNT privilege is
required to enable or disable the system password prompting feature.

The SHOW SYSTEM command displays the various system defaults,
including current settings for the system password prompt. Refer to
the *System Manager's Guide* for further details.

1.8.13 New SET and SHOW DEVICE Commands

All of the functions in the SET option of INIT.SYS can now be executed
during timesharing. For example, the SET DEVICE/ENABLE command
reenables a device that had been disabled with the SET DEVICE/DISABLE
command. The SHOW DEVICE command displays information similar to that
formerly shown with the SET LIST option of INIT.SYS. Refer to the
System Manager's Guide for further details.

1.8.14 New SET and SHOW PRINTER Commands

The SET LP option of INIT.SYS can now be performed during timesharing
by using the DCL SET and SHOW PRINTER commands. All attributes for
LP-controller devices can be modified and displayed using the new
commands. These commands support all new LP characteristics defined
for V9.0. Refer to the *System Manager's Guide* for further details.

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1.8.15 New Commands for Print/Batch Services

Additional commands are provided to manage the new Print/Batch
Services (PBS) package on RSTS/E, described in Section 1.9 of this
document. Refer to the *System Manager's Guide* for complete details on
using the PBS package.

V8.0 provided two versions of DCL: one that supported the new print
spooler; and one that supported the OPSER-based spooling package. In
V9.0, only one version of DCL is supplied: that version supports only
the new PBS commands. Sites continuing to use the OPSER-based package
must run the QUE program or define CCLs to issue print and batch
requests for that package.

1.8.16 New BACKUP and RESTORE Commands

V9.0 provides BACKUP and RESTORE commands for saving and restoring
files using the new BACKUP utility included in V9.0. On streaming
tape drives (TU80, TK25 and TSV05) these new commands will normally
operate in streaming mode (depending on system load). Refer to
Section 1.10.2 of this document and to the *System Manager's Guide* for
further details on the new BACKUP package.

1.8.17 New commands to replace SYSTAT.BAS

New SHOW commands have been added to replace many of the common SYSTAT
commands. SYSTAT is still supported and is used to process the new
commands. DCL simply translates these commands into the appropriate
SYSTAT command and chains to SYSTAT at its CCL entry point. All of
the commands accept the /OUTPUT=filespec qualifier so you can direct
output to a file.

The new commands are:

DCL Command	Corresponding Systat Option
SHOW USERS	/A, /S, /U
SHOW JOBS	/A, /S, /U
SHOW DISKS	/D
SHOW LIBRARY (LIBRARIES)	/L
SHOW RUN_TIME_SYSTEMS	/R
SHOW RECEIVERS	/M
SHOW MEMORY	/C
SHOW BUFFERS	/F
SHOW DEVICES/ALLOCATED	/B
SHOW FILES/OPEN	/O, /W

Refer to the *System User's Guide* for further details.

1.8.18 New qualifiers for the INITIALIZE Command

V9.0 includes a new qualifier with the INITIALIZE command for disks.
The /NOERASE qualifier eliminates erasing a disk during
initialization. Note that the /NOERASE option may compromise system
security and should be used with caution. Refer to the *System
Manager's Guide* for further details.

1.8.19 Changes to the MOUNT Command

The term "locked" has been changed to "restricted."

V9.0 includes several new qualifiers to the DCL MOUNT command for
disks. The following list describes them:

o   /NOSHARE=n qualifier: This qualifier allows the user to
    mount a disk nonshareable for another job (n) on the system.

o   /[NO]RESTRICT qualifier: When a disk is mounted /RESTRICT it
    can only be accessed by users with DEVICE privilege. By
    default, a disk is mounted /NORESTRICT.

o   /[NO]QUOTA qualifier: This qualifier allows the user to
    select whether or not quota checking will be enforced on this
    pack. The default is /QUOTA. This qualifier applies to
    level 1.2 disks only.

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o   /OVERRIDE=IDENTIFICATION qualifier: This qualifier allows
     the user with MOUNT privilege to mount a disk pack without
     specifying the pack id.

Refer to the *System Manager's Guide* for further details.

1.8.20   DCL Relative Date/Time Syntax

DCL now supports both absolute and relative dates/times.   For example,
the PRINT command accepts /AFTER=+2DAYS to request printing a file two
days from today.   Refer to the *System User's Guide* for further
details.

1.8.21   Improved DCL Help Facility

The help file HELP.HLP has been reorganized into a series of nested
files, providing faster access to help text.   The RSTS/E V9.0 help
files document all new DCL commands and qualifiers.

In addition to all DCL commands and qualifiers, the help facility
includes information about general RSTS topics.   These include such
topics as "expressions", "labels", "dates", and "functions".   For
example, the DATES help topic explains the rules for specifying both
relative and absolute dates on a DCL command line.

On video terminals, the HELP command will display only a page of help
text at a time and will prompt you to "Press return for more".   If you
desire, you can redirect the output of the HELP command directly to a
file using the /OUTPUT=filespec qualifier.

The HELP command now has the /PROMPT qualifier.   /PROMPT is the
default.   This will prompt you for "Topic?" and "Subtopic?".   You
can get back to the previous level at any prompt by pressing RETURN.
Type CTRL/Z to exit from the help process.   /NOPROMPT will display the
help text without prompting for topic or subtopic.

Most of the help topics will include additional help on EXAMPLES,
which will show a few examples of the use of the command and explain
the result.   In the case of the DATES topic, for example, EXAMPLES
will illustrate specifying a relative date, an absolute date, or a
combination of the two.

In V8.0, the help information you received depended on whether you
invoked help from DCL (using the DCL command HELP), or from another
keyboard monitor (using the HELP CCL or running the HELP program

directly). In V9.0, this inconsistency has been eliminated. All references to the HELP facility will produce the same set of topics and sub-topics.

All on-line help information in V9.0 is available to any user, regardless of privilege. You can change the protection code of certain help files to restrict access. However, with multiple privileges controlling various system commands and functions, controlling access to on-line information through file protection codes may not be appropriate.

1.8.22 New SET PROMPT Command

A new command has been added which will enable you to change your DCL command prompt. Refer to the *System User's Guide* for further details.

1.8.23 New LOGIN command

A new command, LOGIN, is now available. It allows you to:

o   Log in a new job at a specified terminal.

o   Log your current job into another account.

o   Reset your current job to its initial logged-in state.

If you are logging into another account and you have the appropriate GACNT or WACNT privilege, then you will not be prompted for a password. Refer to the *System Manager's Guide* for further details.

1.8.24 /POSITION Qualifier for COPY and CREATE Commands

A new /POSITION qualifier is available for the COPY and CREATE commands to allow you to indicate the starting position of a target file on disk. Refer to the *System User's Guide* for further details.

1.8.25 New LOAD/OVERLAY and UNLOAD/OVERLAY Commands

A new feature in the RSTS/E monitor allows you to load and unload monitor overlays during timesharing. Previously, you had to indicate, during system generation, which monitor overlays you wanted to make resident. If you later decided to change the set of resident

overlays, you had to build a new monitor. Now you can use the
LOAD/OVERLAY and UNLOAD/OVERLAY commands to load and unload monitor
overlays in memory. This new feature, when used in conjunction with
the STATUS program and DCL SHOW CACHE command, can be used to monitor
the effects on your system of making certain overlays resident or
nonresident. Refer to the *System Manager's Guide* for further details.

1.8.26 DCL Prompt Restriction Fixed

When DCL prompts you for a parameter, you can now enter a qualifier
with the parameter. For example, if DCL prompts you on the PRINT
command you can now do the following:

```
        $ PRINT <RET>
        Files: /JOB_COUNT=2 <RET>
        Files: MYFILE.DAT + LIMMER.ICK <RET>
```

DCL will continue to prompt "Files: " until you supply a file
specification. Certain DCL commands, like DELETE/SYMBOL and CLOSE,
accept the /ALL qualifier to delete ALL symbols or close ALL channels.
You can now specify /ALL at the command prompt. For example:

```
        $ DELETE/SYMBOL/GLOBAL <RET>
        Symbol: /ALL <RET>
        $
```

In this case, DCL deletes ALL global symbols.

1.8.27 Error Message "?Non-printable character" has been Removed

This error message was formerly displayed when DCL encountered a
control character in the command line that was not in the valid DCL
character set. The error has been removed due to the overhead DCL had
to pay to check each character before parsing the command line. In
V9.0, if indeed there is a non-printable character in your command
line DCL will fail with "?Invalid command" or a number of other error
messages.

1.9 Print/Batch Services (PBS)

The RSTS/E V9.0 Print/Batch Services (PBS) package is a new utility
for processing print and batch requests. The PBS program replaces the
V8.0 Micro/RSTS Spooling package. The main additions to the package

since V8.0 are summarized below.

Unless otherwise stated, refer to the *System Manager's Guide* for a
more complete description of these features.

1.9.1 Batch Processing

PBS now includes support for multiple batch servers that can process
one or more user batch jobs concurrently. Like the OPSER-based batch
processor, each PBS batch server uses a pseudo keyboard to execute a
user's command files. Unlike the OPSER-based processor, PBS does not
actually read or process the user's command files; commands are
executed by the new DCL command processor. Batch servers simply
monitor processing until the job completes.

You can use the DCL function F$ACCESS within a command procedure to
determine if it is being executed as a batch job.

Batch servers invoke the system-wide LOGIN.COM file at the start of
each batch job. Users can include special batch initialization
commands in their LOGIN.COM files.

Each batch server (_BA0: to _BA31:) has a defined run burst and
priority. These values control the execution of jobs started by the
server. This feature allows you to define both "high" and "low"
priority batch servers to minimize system impact. RSTS/E will not
permit a batch job to change its own priority to one higher than its
controlling batch server.

You can use the /PARAMETERS qualifier with the SUBMIT command to
specify up to eight parameters to be passed to your batch job when it
begins.

Refer to the new *Guide to Writing Command Procedures* for complete
details on writing command procedures.

1.9.2 Multiple Queues

In V8.0, only the single queue PRINT was defined. In V9.0, you can
create multiple print and batch queues to provide logical groupings
for requests and to establish defaults. The following features are
provided with multiple queues:

    o User-Defined Queue Names: Queue names up to nine characters
       long are permitted from the character set {A-Z,0-9,$,_}.

o Many-to-Many Queue-Server Assignments: You can establish
   single-server queues, where entries on the queue are routed
   to a single server, or multiserver queues, where entries on
   the queue are routed to any one of a set of servers. Also,
   you can assign several queues to the same server.

o Processing Limits: Each queue has defined default and
   maximum limits to control job processing. If a user issuing
   a PRINT or SUBMIT command does not specify a limit, then the
   queue's default limit is used. If the user does specify a
   limit, then it cannot exceed the queue's maximum for that
   limit, unless the user has the EXQTA (exceed quota)
   privilege. The following limits are defined:

        Priority: Controls the order in which jobs will
                     be processed.
        Page Limit: Controls the maximum pages allowed for
                     each print job.
        CPU Limit: Controls the maximum CPU time allowed
                     for each batch job.
        Time Limit: Controls the maximum elapsed time allowed
                     for each batch job.

o Default Queues: You can specify which queue you want to
   serve as the default print or default batch queue. If you
   issue a PRINT or SUBMIT command and do not specify a queue,
   then the request is placed on the default print or batch
   queue. Use the SET QUEUE command to change the default
   queues.

o Privileged queues: You can assign one or more privileges to
   a queue, restricting it to only those users who have all of
   the privileges assigned.

o Default Form Names: You can specify a default form name for
   each print queue. If you issue a PRINT command and do not
   specify a form name, then the default form name for the
   requested queue is used.

o Queue Control: You can use the STOP/QUEUE command to prevent
   any waiting entries on a queue from being started. You can
   also use the CLOSE/QUEUE command to prevent any additional
   entries from being placed on a queue. Use the START/QUEUE
   and OPEN/QUEUE commands to start a stopped queue, or to open
   a closed queue.

1.9.3 Preserved Context

In V8.0, you were required to reinitialize the Micro-spooler printers
each time the package was restarted. In V9.0, all package context is
preserved across restarts. All defined queues, servers and entries,
as well as the current status of all package components are maintained
in the PBS system file. These are then reloaded into memory each time
the package is started. You only need to issue the single command
START/QUEUE/MANAGER to restart the PBS package. This command is
included in the system start up command file START.COM.

1.9.4 Initial PBS.SYS Queue File

The PBS.SYS queue file that is shipped with the Print/Batch Services
package has default data structures defined within it to allow
processing to be able to begin upon initial startup of the package.
The default queues (SYS$PRINT and SYS$BATCH) are defined and assigned
to the servers _LP0: and _BA0:. In addition to the default queues,
there are four other system queues defined. For UU.SPL (the spooling
SYS call), the queues LP0 and BA0 are defined and are also assigned to
the servers _LP0: and _BA0:. For network requests, the queues
NET$PRINT and NET$BATCH are defined and assigned to the same servers.
Refer to the *DECnet/E V2.1 Release Notes* for further details on these
queues.

Note

> If your system is not configured for the device _LP0:,
> then the server definition of _LP0: and its
> associated assignments will be deleted when PBS is
> first started.

1.9.5 SET and SHOW Commands

V9.0 provides the SET ENTRY, SET QUEUE, and SET SERVER commands to
allow modification of components in PBS. The corresponding display
commands, SHOW ENTRY, SHOW QUEUE, and SHOW SERVER display the
characteristics and current status of entries, queues, and servers.

1.9.5.1 SET ENTRY

With the SET ENTRY command, you can modify an entry's:

     o   After time (/AFTER)

     o   Priority (/PRIORITY)

     o   Hold status (either /HOLD or /RELEASE)

     o   Cpu time limit (/CPU_LIMIT; batch only)

     o   Time limit (/TIME_LIMIT; batch only)

     o   Forms name (/FORMS; print only)

     o   Job count (/JOB_COPIES; print only)

     o   Page limit (/PAGE_LIMIT; print only)

Input file specifications, batch parameters, or any log file
qualifiers cannot be modified.

1.9.5.2 SET QUEUE

With the SET QUEUE command, you can modify a queue's:

     o   Default status (/DEFAULT or /NODEFAULT)

     o   Privileges (/PRIVILEGE)

     o   Priority (/PRIORITY)

     o   Cpu time limit (/CPU_LIMIT; batch only)

     o   Time limit (/TIME_LIMIT; batch only)

     o   Default forms name (/FORMS; print only)

     o   Page limit (/PAGE_LIMIT; print only)

1.9.5.3 SET SERVER

With the SET SERVER command, you can modify a server's:

     o   Controls status (/CONTROLS, /CONTROLS=UPARROW, or
         /NOCONTROLS; print only)

o   Forms name (/FORMS; print only)

o   Shareable status (/SHAREABLE or /NOSHAREABLE; print only)

o   Priority value (/PRIORITY; batch only)

o   Runburst value (/RUNBURST; batch only)

1.9.5.4   SHOW SERVER Command

The SHOW SERVER command will now display on-line and off-line status
(off-line meaning that the printer appears to be "not ready" because
it is not processing output).

1.9.6   Command Syntax Changes

Because of the addition of many new DCL commands for managing the PBS
package, several existing commands have been changed to provide a more
consistent command structure and easier-to-use commands. The command
changes are summarized as follows:

o   The DELETE/JOB command has been removed. The keyword JOB in
    V9.0 refers to RSTS/E jobs, rather than to entries in a
    queue. The DELETE/ENTRY command allows you to delete entries
    by entry number or by name. Entry names can no longer
    consist entirely of numeric characters.

o   The SHOW QUEUE command in V8.0 displayed entries in a queue.
    The keyword QUEUE in V9.0 refers to queues themselves, rather
    than their entries. Consequently, the SHOW QUEUE command
    displays information about queues, while the SHOW ENTRY
    command displays information about entries.

o   The keyword PRINTER was used with several commands
    (INITIALIZE/PRINTER, DELETE/PRINTER) in V8.0. In V9.0, the
    keyword PRINTER is no longer included with PBS commands.
    Instead, the keyword SERVER refers to both print and batch
    servers. Thus, the INITIALIZE/SERVER command is used to
    define a print server, which controls either an LP or KB
    device, or a batch server. The SET PRINTER and SHOW PRINTER
    commands are now used to maintain the characteristics of LP
    devices, while SET TERMINAL and SHOW TERMINAL are used to
    maintain the characteristics of KB devices. The SHOW SERVER
    command displays the attributes and status of PBS servers.

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o   The DCL commands PRINT and SUBMIT now always create requests
     for the PBS package, not for the OPSER-based spoolers. Use
     the QUE CCL or run the QUE program to issue commands to the
     OPSER-based package.

1.9.7 Print Server Enhancements

The following new features have been added to the PBS print server for
V9.0.

1.9.7.1 Device Characteristics

Print servers will use the characteristics for the device it controls
(LP or KB). These include lowercase, eight bit, controls, etc.

1.9.7.2 New Job and File Header Page Formats

Page fields now provide additional information not included in V8.0,
such as account names, installation names, copy numbers, etc.

1.9.7.3 Eight Bit Support and Control Character/Sequence/String
             Processing

The V9.0 Print/Batch services package now has support for processing
eight bit characters, control characters, control sequences, and
control strings.

1.9.7.3.1 Eight Bit Character Support

Print/Batch Services will now allow printable eight bit characters to
pass to the print device. Printable eight bit characters have the
character values between 160 and 255.

1.9.7.3.2 Control Character/Sequence/String Support

The Print/Batch Services package allows a system manager to indicate
how control characters and escape sequences should be handled. A

system manager can choose to allow control characters to be sent to
the print device, not to allow controls characters to be sent to the
print device or to have control characters translated to printable
characters.

The controls feature is enabled by the /CONTROLS qualifier on either
the INITIALIZE/SERVER or SET SERVER command. /CONTROLS indicates that
the control codes will be passed to the print device,
/CONTROLS=UP_ARROW indicates that the control codes will be translated
to printable codes. /NOCONTROLS means that no control codes in either
printable or non-printable form will be sent to the print device.

Zero to O (oh) conversion will not be done while processing any
control sequence, escape sequence, or control string. Also, page
limitations will not be in effect during the processing of a control
string/sequence on a /CONTROL server.

Refer to the *System Manager's Guide* for further details.

1.9.8 Dialup print devices

Support for detecting carrier loss on the modem of a dialup print
device has been implemented. When the carrier is lost, the server
marks itself as stopped and as having lost the carrier. The server
will automatically come back on-line when the connection is
re-established, but an operator must issue a START/SERVER command to
resume printing. Since some buffered data may be lost during a
carrier loss, it is recommended that you restart the server at the
previous page (START SERVER/BACKSPACE).

1.9.9 User Request Packet Processing

A new subfunction of send/receive allows you to send a complete print
or batch request to PBS. This feature functionally replaces the
UU.SPL directive, which is still provided and can also be used to
issue requests to PBS.

The new packet uses position-independent data fields, and supports all
options available with the PRINT and SUBMIT commands. Multiple
file-specs can be included in a single packet.

A major improvement of User Request Packets over UU.SPL is the ability
to receive a "confirmation" message from PBS. An application can
declare itself a receiver and receive a message from PBS indicating
whether the request was accepted. The returned message includes error
and field codes to help determine the cause of a request rejection.

Refer to the *RSTS/E Programming Manual* for complete details on sending
User Request Packets to PBS.

1.9.10 Package Location

All PBS programs and files are maintained in a single account
referenced by the system logical PBS$:. The V9.0 installation
procedure copies PBS components into the default PBS$: account
_SY:[0,6].

Once installation is completed, you can relocate the PBS package by
copying all the files in PBS$: to a new account, and changing the
PBS$ system logical to reference the new location. Finally, delete
the original PBS components and, optionally, delete the original
account.

Future updates to PBS will use the PBS$ system logical when replacing
or adding components in the package.

1.9.11 PBS Configuration

PBS minimizes the use of RSTS/E job slots in two ways:

  o By using its own "subjob" scheduler, PBS can support several
     print or batch servers in the same RSTS/E job.

  o Whenever an additional RSTS/E job is required, PBS creates
     the required job, then removes it when all of its subjobs
     become idle again.

The PBS package uses two types of jobs. The *primary* job is created by
the START/QUEUE/MANAGER command and contains the queue manager module,
print server modules, and batch server modules. Additional *secondary*
jobs, consisting only of print and batch servers, are created by the
primary job as needed.

Refer to the *System Manager's Guide* for further details on how PBS
uses RSTS/E jobs.

1.10 Commonly Used System Programs (CUSPs)

1.10.1 CSPLIB Resident Library

A new feature in the RSTS/E V9.0 monitor allows you to install
"floating" resident libraries. Unlike "fixed" libraries, these
libraries require no fixed address in memory, and are swapped into
memory exactly as run-time systems. Only tasks that run under the
monitor RSX emulation (.TSKs) can attach to floating libraries. Also,
tasks can only be mapped to one floating library at a time.

To install a resident library as a floating library, use the command:

        INSTALL/LIBRARY/NOADDRESS library

With the debut of this feature, RSTS/E V9.0 includes an 8K resident
library called CSPLIB which contains many of the routines used by
RSTS/E cusps. This library is installed as a floating library during
system startup (as part of the SYSINI.COM command procedure), and is
required for proper operation of most cusps. Because this library
requires no fixed area in memory, no user memory need be reserved.

The benefits of this new library are significant:

   o Cusps built against the library are smaller in size on disk.
      Since most cusps use the CSPLIB library, the amount of disk
      space required to store these programs has been significantly
      reduced.

   o Since resident libraries represent "shared" code in memory,
      any cusps built against the CSPLIB library that are run
      concurrently by several users will save memory. For example,
      consider three users running SYSTAT.TSK, HELP.TSK and
      DISPLY.TSK at the same time. Without the CSPLIB library,
      these cusps would require a total of 56K words of memory.
      With the library, these tasks require only 36K words (plus
      the 8K CSPLIB library), or 44K words, a savings of 12K words.

   o For systems constrained by memory size, overall job swapping
      should be reduced, because of the memory savings described
      above.

   o Many sites that could not install and use the RMS resident
      libraries because of insufficient memory may now be able to
      do so. Previously, all of the RMS library components
      required fixed memory locations totaling 29K words. With
      V9.0, only the root library RMSRES must be fixed; all of the
      other RMS libraries (RMSLBA, RMSLBB, etc.) can be installed
      as floating libraries. Thus, you now only lose 4K words of
      user memory instead of 29K when you install the RMS
      libraries.

The version of PBSMGR.TSK (used to execute DCL commands for
Print/Batch Services) that uses the RMS resident library takes
advantage of clustering to share the same address space between the
CSPLIB and RMS resident libraries, reducing its overall size by 8K.

UTLMGR.TSK (used to execute DCL commands that replaces UTILTY) is not
built against CSPLIB, since this program is responsible for executing
the INSTALL/LIBRARY command.

Also, SHUTUP.TSK is not built against CSPLIB, since it must be able to
remove all resident libraries before shutting down the system.

If you have BASIC-PLUS-2 V2.3, you can task build your own
applications to use the CSPLIB library. To do so, simply add the
following line to your Task Builder command file:

    LIBR=CSPLIB:RO

If your application uses the RMS resident libraries, then you can
cluster the CSPLIB library with the RMS libraries. Add the following
line to your Task Builder command file:

    CLSTR=CSPLIB,RMSRES:RO

The CSPLIB library is provided solely for the support of DIGITAL
programs included with RSTS/E V9.0 and later. No support is provided
for CSPLIB for other purposes. If you discover a problem with CSPLIB,
please submit a priority 5 SPR and mark it "FYI."

See section 2.4.5 for more details on "floating" libraries in RSTS/E.

1.10.2 New BACKUP Program

A new VMS-compatible, high-performance BACKUP utility has been added
to V9.0. This new BACKUP package performs all of the functions of the
V8.0 BACKUP package plus more (e.g. Large files can be backed up.)
BACKUP can save files and/or accounting data selectively or for an
entire volume. SAVRES should still be used for IMAGE operations, or
to create bootable save sets. The BACKUP package uses the new
asynchronous I/O capabilities of RSTS/E to provide high performance.
On lightly loaded systems, BACKUP will support high-speed streaming
mode I/O to streaming tape drives like the TU80 and TSV05.

                              Note

        BACKUP creates container sets. If you backup a set of
        files into a container set, and then include that
        container set in future backups, the size of these

backup sets will grow very rapidly. When used
carefully however, this feature can be very beneficial
in creating history type backups.

If you type a delimiter while running the BACKUP
program, BACKUP will constantly stay in a runnable
state. This will cause degradation of system
performance.

Refer to the *System Manager's Guide* for more details.

1.10.3   TERMGR Program

The terminal manager ($TERMGR.TSK) program is used to process the DCL
SET TERMINAL and SHOW TERMINAL commands. It performs all of the
functions provided in the past by the TTYSET program, no longer
included with RSTS/E. Refer to Section 1.8.8 of this document, to the
System User's Guide and to the *System Manager's Guide* for further
details.

1.10.4   UTLMGR Program

The utility manager ($UTLMGR.TSK) program is a replacement for the
V8.0 UTILTY.BAS program. It processes new DCL commands which perform
all of the functions previously handled by the UTILTY.BAS program.
Refer to Section 1.8.10 of this document and to the *System Manager's
Guide* for further details.

1.10.5   ACTMGR Program

The account manager ($ACTMGR.TSK) program processes all of the new DCL
commands used to control accounts and directories on the system. The
ACTMGR program is a replacement for the programs MONEY.BAS and
REACT.BAS, which are no longer supported. Refer to Section 1.8.9 of
this document and to the *System Manager's Guide* for further details.

1.11   Documentation

Refer to the *RSTS/E Documentation Directory* for complete information
about V9.0 documentation.

1.11.1 DECnet/E V2.1 Support

RSTS/E V9.0 will support only version 2.1 of DECnet/E. Version 2.0 or
earlier versions of DECnet/E will not run under RSTS/E V9.0.
Likewise, version 2.1 of DECnet/E requires version 9.0 of RSTS/E.

For further information regarding V2.1 of DECnet/E, please refer to
the *DECnet/E V2.1 Release Notes*.

2 Differences Between RSTS/E V9.0 and RSTS/E V8.0

2.1 Retired Hardware

Several devices were retired during V8.0 of RSTS/E:

    RF11
    RS03/4
    TU58
    VT05
    VT50
    LT33
    IBM 2741
    DP11
    RK05 as a system device

While some of these devices may still function, the code for most of
these devices has been removed from V9.0. In particular, the RF11,
RS03/04, and TU58 drivers are not part of V9.0.

RSTS/E is no longer distributed on these devices:

    RK05
    RK06
    RL01
    600 foot 800 BPI magnetic tapes (for TS03 tape drives,
                                     replaced by 2400 foot
                                     800 BPI magtapes)

2.2 System Generation (SYSGEN)

The following is a complete summary of changes made to SYSGEN.SAV for
V9.0. Refer to the *System Installation and Update Guide*, Phase 4, for
details on using the SYSGEN.SAV program.

o   The <ESC> character is no longer used to back up to the
    previous question. The circumflex character, "^", is now
    used for this purpose.

o   You can now press <CR> or <LF> in response to any question to
    select the default answer. (In V8.0, only the <LF> key
    selected the default.)

o   The "short form" of questions is now always used. You can
    type "?" followed by <CR> to any question to display the
    "long" form of a question.

o   The "Same system?" question is no longer asked. The current
    system configuration will always be used to establish
    defaults.

o   The "Output medium?" question has been removed from the
    SYSGEN dialogue. All files are now built on the target
    system disk.

o   The "Distribution medium?" question is no longer asked. The
    installation procedure copies all necessary monitor files
    onto the system disk before running the SYSGEN.SAV program.
    For DECnet/E and RJ2780, their respective distribution medium
    questions have been removed and will be asked when it is time
    to mount the medium.

o   The "Delete files?" question is no longer asked. Any
    temporary or intermediate files created by SYSGEN are now
    always deleted.

o   The "LP for SYSGEN?" question is no longer asked. SYSGEN
    does not use a line printer when creating a monitor.

o   No map files (.MAPs) are created during the SYSGEN procedure.
    This reduces the time required to build a monitor.

o   The "Generate monitor?" question is no longer asked. SYSGEN
    is now only used to generate a monitor (a separate program is
    used to build the BASIC-PLUS run-time system).

o   A new question, "Use template monitor?" has been added. This
    allows you to specify an existing monitor. SYSGEN will read
    the monitor you specify and set up defaults based on the
    values found in that monitor.

o   SYSGEN now protects against accidental erasure of an existing
    monitor. If you specify a monitor name that already exists
    in [0,1] and that monitor is not the currently installed
    monitor, you see the question, "Supersede existing monitor?"

thus, you can decide whether or not to replace an existing monitor. If you specify a monitor which is the same as the currently installed monitor, SYSGEN returns an error message and reprompts.

o   The questions concerning patching the monitor, RSX, DECnet, and RJ2780 have been removed; patches are now always applied. Any patch files for the monitor, RSX, DECnet, and RJ2780 are always located in the SYSGEN$: directory.

o   The questions to build the BASIC-PLUS run-time system have been removed from SYSGEN.SAV and moved to a separate program, BPLGEN.SAV.

o   The question "RSX as default RTS?" is no longer asked.

o   A new question "Accept defaults?" has been added. If you answer "YES", then SYSGEN will use the default answers to all questions (based on an existing monitor or the current system's configuration) and not ask any configuration questions. Note that SYSGEN will still ask any questions for which it could not establish a default answer. If you are using a template monitor and you type a "?" to this question, the default values found in the template monitor will be listed.

o   At the beginning of the Terminal, Disk, Peripheral, and Software sections, a new question has been added to allow you to accept the defaults for all questions in that particular section. As above, SYSGEN will still ask any questions for which it could not establish a default answer.

o   "DZQ11" has been added to the long and short form of the DZ11 question.

o   The "RF/RS11's?" question has been removed; that hardware is no longer supported.

o   The "RS03/RS04's?" question has been removed; that hardware is no longer supported.

o   The "RM02/RM03/RM05/RM80" question has been reworded to "Number of disks on DR controller?".

o   The "RP04/RP05/RP06" question has been reworded to "Number of disks on DB controller?".

o   "RQDX1" has been added to the long form of the MSCP controllers question.

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o   "TK25" has been added to the long and short form of the TS11
    question.

o   The "System wide logicals?" question has been removed; these
    logicals are now allocated dynamically and are stored in
    XBUF. The maximum number of system-wide logicals is
    determined by the size of XBUF.

o   The "Directory caching?" question has been removed; directory
    information is now always cached.

o   If DECnet/E support is to be included in the monitor being
    built, Data caching is automatically included.

o   The "Resident libraries?" question has been removed; support
    for resident libraries is now always included in V9.0
    monitors.

o   The "RSX directives?" question has been removed; RSX
    emulation is now standard in all V9.0 monitors.

o   The "Resident file open/close?" question has been removed;
    this code is now always resident in its own monitor phase.

o   The "Resident send/receive?" question has been removed; the
    send and receive subfunctions of the send/receive SYS call
    (.MESAG) are always resident; the declare receiver and remove
    receiver calls are always nonresident.

o   The questions "Resident simple SYS calls?", "Resident file
    delete/rename?", "Resident attribute?", and "Resident
    directory lookup?" that pertain to making frequently used
    monitor code resident have been removed. The code can be
    made resident online with the LOAD/OVERLAY question. See
    sections 1.6.9 and 1.8.25 for more details.

o   SYSGEN no longer creates the file SYSGEN.CTL. Instead, it
    creates the command file SYSGEN.COM, which is executed under
    the new DCL command file processor. As before, a
    "stop-point" is provided in the installation procedure to
    allow any necessary editing of this file before it is
    executed.

o   The problem of having to recreate the monitor if too many
    small buffers was specified has been fixed in V9.0. When the
    monitor is being created, the installation procedure compares
    the number of small buffers requested to the maximum number
    the monitor can have. If the number requested is too large,
    the procedure will lower the number of small buffers to the
    maximum and will automatically restart the procedure.

o The SYSBAT.SAV program is no longer used for system
   installation and has been removed from V9.0.

2.3 Initialization Code (INIT.SYS)

2.3.1 DEFAULT Option

2.3.1.1 On-line DEFAULT Parameters

Most of the system parameters that were settable from the DEFAULT
option prior to V9.0 are now settable online. Specifically, JOBMAX,
cache cluster size, date/time format, and power fail delay can be
changed online using the DCL SET SYSTEM command. Refer to Section
1.8.12 of this document and to the *System Manager's Guide* for more
details.

2.3.1.2 Memory Table Allocation, XBUF and VIRTUAL

When starting a RSTS/E monitor for the first time, DEFAULT will now
automatically select the size and placement of XBUF. The allocation
and placement of memory entities depend upon the memory size of the
configuration. In the past, INIT would always relocate memory
entities to the lowest possible memory address. In V9.0, INIT will
try to allocate XBUF and the virtual disk at the highest possible
memory address first, before shuffling those entities to the lowest
possible memory address. DEFAULT will also eliminate the virtual disk
if there is not enough user memory to start timesharing. XBUF will be
reset to INIT's selected default based on the total memory size.

XBUF can now be allocated above 512KW. Refer to the *System
Installation and Update Guide* for a description of the legal memory
address ranges for XBUF allocation.

2.3.1.3 INIT.SYS Selected DEFAULT Parameters

In all other cases, the DEFAULT option will attempt to arrive at some
reasonable value for all other parameters. Some parameters in the
DEFAULT option of INIT will only be asked if DEFAULT cannot find the
appropriate system files in the [0,1] system account. For example,
INIT will select ERR.ERR as the error message file name if it is
present in [0,1]. If ERR.ERR is not found in the [0,1] system
account, then DEFAULT will prompt you for an error message file name.

Refer to the *System Installation and Update Guide* for a complete
description of all changes that have been made to the DEFAULT option
of INIT.

2.3.1.4 SWAP.SYS, CRASH.SYS and BUFF.SYS System Files

INIT is now able to create the files SWAP.SYS, CRASH.SYS and BUFF.SYS
at their minimum sizes. The minimum size for SWAP.SYS is (SWAP MAX *
4), which allows one job to use the system unless additional swap
files are added. The minimum size for CRASH.SYS is system dependent.
Whenever the start option is executed and the file does not exist, is
too small, or corrupt, INIT creates (or recreates) the file. The
minimum size for BUFF.SYS is (# of units * 3 blocks).

If SWAP.SYS cannot be created, then timesharing cannot be started.
However, if CRASH.SYS cannot be created, timesharing is still started,
but crash dump is disabled. This is the only time that crash dump is
disabled in V9.0. If CRASH.SYS is valid, then crash dump is always
enabled. If BUFF.SYS cannot be created, timesharing is still started,
but DECtapes are disabled.

Note that if you want SWAP.SYS to hold more than one job, you must use
the REFRESH suboption of INIT to allocate the file. However, because
of the inconvenience of doing this, the preferred approach is to
create additional swap files using the DCL command INSTALL/SWAPFILE,
and then install these swap files at system start-up. (Normally there
is no need to change the size of SWAP.SYS.) Refer to the *System
Installation and Update Guide* for more information.

2.3.2 START Option

The START option will now allow you to select the monitor you want to
start, (for example, "START RSTSV9"). If that monitor is not
currently installed, INIT will install the new monitor before starting
timesharing. Specifying "START" without a monitor name will start the
currently installed monitor (the monitor used last). If there was no
previously installed monitor, INIT will prompt for the monitor name
you want to start. Specifying "START ?" at the option prompt will
display the currently installed monitor and allow you to display a
list of all RSTS/E monitors on the system disk.

Because of this addition to the START option, the INSTALL option of
INIT.SYS is no longer necessary. It is still available but considered
a declining feature.

2.3.3 COPY Option

The COPY option will now automatically copy every eligible file from a
distribution kit to account [0,1] on the target media. As each file
is copied, a message will be printed on the console terminal,
identifying the file name and the device to which it was copied.
Format checking has also been improved; if, during the copy, an input
file is found to have an invalid format, an error will be printed on
the console and the file will be skipped.

Note

> The COPY option is *only* supported for copying DIGITAL
> supplied RSTS/E distributed media to a target system
> disk.

2.3.4 SET Option removed

The SET option of INIT.SYS has been removed and replaced with the DCL
SET DEVICE, SET PRINTER and SET TERMINAL/DIALUP commands. Refer to
Sections 1.8.13, 1.8.14 and 1.8.8 of this document and to the *System
Manager's Guide* for further details.

2.3.5 Booting from Secondary Controllers

The ability to boot from secondary controllers is now supported on
RP/RM disks and MSCP-class disks (such as the RA80/81, RD51/52 and
RC25). Note that secondary controller boot support has been present
for some time on RP/RM disks, but it has been enhanced to utilize
information passed by the hardware bootstrap.

The following restrictions apply to the secondary controller boot
support:

   o A disk on a secondary controller cannot be bootstrapped using
      a toggle-in boot, unless the toggle-in boot is modified to
      place the unit number to be booted into R0 and the controller
      base CSR address into R1.

   o A restriction exists on MSCP systems using SAVRES on the
      secondary controller. If a save set is booted on a drive on
      the primary controller, the secondary controller will not be
      accessible. This restriction occurs because the minimal INIT
      which is placed on a save set does not perform a complete

hardware scan. However, a save set booted on a drive on the
secondary controller will be able to use the primary
controller.

o   A V9.0 system residing on an RP/RM disk that is connected to
    a secondary controller cannot be software booted by a RSTS/E
    V8.0 or earlier system.

2.4   Monitor

2.4.1   Security Related Changes

There have been many changes in RSTS/E V9.0 to improve overall system
security and integrity. Although DIGITAL has attempted to make all of
these changes compatible with previous releases, there were some cases
where the behavior of previous releases was inherently insecure, and
there was no way to make the behavior secure without introducing
incompatibility.

The following sections will detail the changes which have been made
for security which are not strictly compatible with previous releases,
as well as any work-arounds, if they exist.

2.4.1.1   The "Pass Privilege" Flag

In previous releases of RSTS/E, the .RUN and .CHAIN directives
accepted a parameter at FIRQB+FQNENT which was a parameter to pass to
the run-time system associated with the executable file described by
the FIRQB. The most significant bit of this word, bit 15, was cleared
if the user was not privileged, but beyond that, the monitor took no
action on the word. The interpretation of this word was left to the
run-time system. BASIC-PLUS, for example, uses the low order 15 bits
as a line number to begin execution at, and uses the high bit to
determine whether privileges should be maintained upon entry to a
temporarily privileged program.

Since all security should be implemented by the monitor, it was
determined that it was more appropriate to move the handling of the
"drop privilege" flag into the monitor.

The effect of this change is that any run-time system which
implemented the dropping of privileges when bit 15 is not set on entry
to a privileged program will be uneffected, since the monitor has
already done the work and dropping privileges more than once has no

effect. A run-time system which did not implement handling for bit 15
will not be passed privileges if the bit is not set upon entry, which
is different from previous releases.

To pass privileges under RSTS/E V9.0 and pass a non-zero parameter in
FIRQB+FQNENT, bit 15 must be set and temporary privileges must be
active at the time of the .RUN or .CHAIN. For the BASIC-PLUS
programmer, temporary privileges must be raised at the time of issuing
the CHAIN statement, if a non-zero line number is to be passed.

2.4.1.2 Change to .PEEK Directive

Under previous releases, a privileged user could use the .PEEK
directive to read data from the I/O page (addresses 160000-177776).
Reading from certain device addresses in the I/O page can cause data
corruption or system crashes. As a result, SYSMOD privilege is
required for this operation.

A program with temporary privileges does not get SYSMOD privilege.
Therefore, it is not possible for a temporarily privileged program to
.PEEK at the I/O page.

There is no work-around for this, but .PEEKing at the I/O page is not
a generally useful function.

2.4.1.3 Channel Closing by the Monitor

Under previous releases of RSTS/E, the act of exiting a program (via
the .RUN, .CHAIN, .RTS, or .EXIT directives) would keep all open files
open. It was the responsibility of the run-time system being entered
to close the files.

This presented a security risk, since files containing confidential
data could be left open by a privileged program and it might be
possible to get an improperly coded run-time system to divulge the
contents of the file.

To solve this problem, the behavior of various exit directives has
been changed to close all of the open channels. This could introduce
an incompatibility for run-time systems that expect to be able to
transfer control from one to another with files left open.

To allow run-time systems to keep files open under controlled
situations, thereby maintaining security without sacrificing a
feature, the following implementation was chosen:

o   The .CHAIN directive, which does not switch from one run-time
    system to another, will keep channels open.

o   The .EXIT directive, used at program exit, will always close
    channels. Since this directive is used to switch to the
    default keyboard monitor, it is not expected that there are
    any cases where user programs expected channels to be left
    open.

o   The .RUN directive, used to run a program under another
    run-time system, will always close channels. It is possible
    that there are some cases where this is undesirable. A
    work-around for this behavior is described below.

o   The .RTS directive, when asked to not maintain "job context",
    will close all channels. The .RTS directive, when asked to
    maintain "job context", will keep all channels open. This
    allows a program to choose to keep channels open, but will
    generally cause the channels to be closed.

If a program is using the .RUN directive to enter another program, and
expects channels to be left open, it will need to be modified. If the
program to run will run under the same run-time system, the .RUN can
generally be replaced with a .CHAIN (see the System Directives Manual
for specific differences). If the program is to run under another
run-time system, the program should be modified to do a .RTS with
context preserved to the desired run-time system. The desired
run-time system should then issue a .CHAIN directive.

2.4.1.4   Privileged Program Cleanup

Upon any exit from a privileged program (except for a context saved
.RTS or a .CHAIN), the monitor will automatically zero the memory used
by the program and reset the program size to the minimum for the
run-time system being used. In addition, if the exit was due to a
.RTS, then the .RTS will always return to the P.NEW entry point in the
run-time system, even if a switch of run-time systems did not actually
occur.

This .RTS behavior is not strictly compatible, since under previous
releases, if a switch was not actually occurring, control would return
in-line. DIGITAL does not expect that there are any cases of a
program relying on this behavior. There is no way to defeat this
function.

Note that the behavior of clearing memory is not compatible either.
If a privileged program does want to switch to another run-time
system, however, and wants the program contents passed intact, the
context-saving form of .RTS should be used (or for a .RUN, a .RTS
followed by a .CHAIN, as described in the previous section, should be
used).

2.4.2 Default Keyboard Monitors

Either RSX or DCL must be the primary run-time system selected during
INIT.SYS. DCL is always the system default keyboard monitor and is
installed automatically when the system is started.

2.4.3 Logical Names

In version 8.0, logical names could not be greater than six characters
in length, and the number of system-wide logicals allowed was limited
to the number specified during system installation. In V9.0,
system-wide logical and disk logical names can be up to nine
characters in length and may contain dollar signs ($), but not as the
first character. Logical names ending with ($) are reserved for use
by DIGITAL.

The SYSGEN question that prompted for the number of system-wide
logicals to be defined has been removed. System-wide logicals are now
dynamically allocated and are in the XBUF buffer pool rather than in a
fixed-length monitor table. This means that the availability of
buffer space in the XBUF buffer pool determines the number of
system-wide logical names that can be defined. Disk logical names,
however, are still kept in a fixed-monitor table and can be accessed
by using the pointer returned by the monitor directive UU.TB2 (FIP SYS
call -12). System-wide logical data is obtained by using the new
subfunction code of the UU.SLN directive (FIP SYS call +21). Refer to
the *System Directives Manual* and the *RSTS/E Programming Manual* for
more details on these calls and to the *System Manager's Guide* for
details on logical names.

2.4.4 Small Buffers

Systems with I&D space now have 240 additional FIP pool buffers.
These buffers are available through the BUFFER suboption of the
DEFAULT option of INIT.SYS.

Some systems with large numbers of different types of devices will
also be able to obtain more small buffers. This change will typically
be noticed on systems with KMC support and magtape support.

Most systems will be able to generate approximately 16 more general
small buffers.

The number of general small buffers available on I&D systems through
the BUFFER suboption has been increased slightly.

2.4.5 Floating Resident Libraries

It is now possible to add floating resident libraries which do not
require a fixed address in memory. The following conditions must be
met to use these libraries:

   o   The job must be running under monitor RSX emulation

   o   The job may map to only one floating resident library at a
       time

   o   The start address for mapping the library may not be any
       higher than 32K -- (size of library rounded up to the next
       highest 4K boundary)

2.4.6 Attaching to Libraries

It is now possible for a program to attach to an unlimited number of
resident libraries (limited by available system resources).

RMS-11 has been changed so that it will take advantage of this feature
when using it's satellite libraries. This will result in increased
performance for programs that use the RMS-11 resident libraries.

2.4.7 Cache Cluster Size

DIGITAL recommends that you do not specify a cache cluster size larger
than the pack cluster size. If the cache cluster size is larger than
the pack cluster size, and the file being cached is positioned
directly in front of a bad block, RSTS/E will fill the entire cache
cluster size so that it will read in the next contiguous pack cluster,
which contains a bad block, and log an error. Refer to the *System
Installation and Update Guide* for further details on cache cluster
size.

2.4.8 Access to Marked-For-Delete Files

The wildcard directory look-up functions UU.DIR and UU.LIN (FIP SYS
calls +15 and +17) have been enhanced to allow the lookup of
marked-for-deletion files. For further information, refer to the
RSTS/E Programming Manual.

2.4.9 Changes with Priorities and Pseudo Keyboards

RSTS/E now prohibits the priority of a job running on a pseudo
keyboard from exceeding the priority of it's controlling job.

2.4.10 Changes to Disk Statistics

The disk statistics code has been changed to keep statistics in the
extended buffer pool (XBUF). The pointer to disk statistics used in
prior releases, will always contain a zero, so that programs that
expected to read disk statistics will fail gracefully.

The monitor directive UU.TB3 (FIP SYS call -29) has been enhanced to
return the offset, in 32-word units, from the beginning of memory that
the statistics table resides in. This value can be used in the .PLAS
subfunction to map physical memory to gain access to statistics. The
format of the statistics table is unchanged.

2.4.11 Time Format Changes

For compatibility with VMS and with international standards, the AM/PM
format time display (TIME$ function in BASIC-PLUS; UU.CNV subfunction

in .UUO) has changed in two cases:

o   Midnight was 12:00 PM, it is now returned as 12:00 **AM**

o   Noon was 12:00 M, it is now returned as 12:00 PM

2.4.12   RSTS/E Error Messages

Two new error codes and associated messages have been defined:

```
68      EOV     ?End of volume
69      QUOTA   ?Quota exceeded
```

The error message text for the following errors have been changed:

```
22      PAKLCK  ?Device is restricted
24      PRIVAT  ?Account does not exist
```

In addition, the message texts for many of the error messages have been revised so that the message prefix reflects the severity of the error: "%" for warning; "?" for error; and "??" for severe error.

2.4.13   New Option in Remove Receiver Call

The Remove Receiver directive now allows a "conditional remove" modifier. To specify a conditional remove, simply set the sign bit of the job number (times two) you want to remove the receiver for. If you are conditionally removing receivers for your own job, then this field must contain the value 128. When set, this modifier will reject the remove request if there are pending messages for the receiver. Refer to the *RSTS/E Programming Manual* and the *System Directives Manual* for details on removing receivers.

2.4.14   Send by Local Object Number

The Send Local Data directive now allows data to be sent by local object number rather than by name or by job number. Refer to the *RSTS/E Programming Manual* for details.

2.4.15 Detaching While Running Under a DCL Command Procedure

If a program running under a DCL command procedure issues the UU.DET
sys call to detach itself, and the job's console is open only on
channel zero (or the close all channels flag bit is set), the monitor
will attempt to create a new job to finish execution of the command
file at the terminal.

If the new job cannot be created for any reason, an error is returned
to the job attempting to detach, and the job remains attached.

The following errors can be returned:

```
NOBUFS  - No XBUF was available to pass context
          to the new job.
NOROOM  - There are no more job slots available,
          or no small buffers to create the new job.
QUOTA   - Some job quota is being exceeded (total
          job or detached).
```

Note that this change only affects programs that detach while running
under a DCL command file; programs that detach while running
interactively do not return errors (except possibly the QUOTA error if
the account's detached job quota is exceeded).

2.4.16 Feature Patches

Many feature patches supplied with V8.0 have been removed. In many
cases they are no longer needed because of new V9.0 features, such as
multiple privileges. In other cases, the feature patches are removed
because of marginal usefulness.

The following list shows all the V8.0 feature patches and their status
in V9.0.

```
1.1.1     Change SAVRES density default: REMOVED

1.1.2     Make /NOERR the default: REMOVED

1.1.3     Make /NOSTATS the default: REMOVED
          STATS is the default

1.1.4     Change default line frequency to 50 Hz: REMOVED

3.1.1     First fit memory allocation: REMOVED
          First fit memory allocation is always used
3.1.2     Cache replacement time: REMOVED
          Now set by DCL command
```

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3.1.3   Disable the use of data space: retained

3.1.4   Change quota of receiver ID blocks: REMOVED
              Replaced by per-account quota

3.1.5   Change pending message limit: REMOVED
              Replaced by per-account quota

3.1.6   Nonprivileged spawn of detached jobs: REMOVED
              Replaced by per-account quota

3.3.1   Restrict terminal modes: REMOVED
              All modes are now unrestricted

3.3.2   Immediate modem hangup: REMOVED
              Replaced by the /HANGUP command qualifier
              of the SET SYSTEM command

3.3.3   Special login terminal: retained

3.3.4   Change terminal buffer quota: REMOVED
              Replaced by the /BUFFER_QUOTA command qualifier
              of the SET TERMINAL command

3.3.5   Input escape sequence handling: retained

3.3.6   Restricting pseudo keyboard modes: REMOVED
              Mode 1 requires EXQTA privilege

3.3.7   Increase dial-up timeout: REMOVED
              Timeout is now 127, the maximum possible value

3.5.1   Change auxiliary library accounts: REMOVED

3.5.2   Change default protection code: REMOVED
              Can be done using LOGIN.COM files

3.5.3   Restricting disk modes: REMOVED
              Mode 256 requires TUNE privilege, mode 16384
              (for UFDs) requires WRTNFS privilege

3.5.4   Make SYS calls privileged: REMOVED

3.5.5   Restrict nonprivileged access to NFS disks: REMOVED
              RDNFS privilege is now required

3.5.6   Nonprivileged writes to NFS disks: REMOVED
              WRTNFS privilege is now required

3.5.7   Allow cross-account creations: REMOVED
              Controlled by GWRITE and WWRITE privileges

3.5.8   Allow cross-account renames: REMOVED
           Controlled by GWRITE and WWRITE privileges

3.5.9   Extending directory lookup: REMOVED
           Controlled by GREAD and WREAD privileges

3.5.10   Restricting nonprivileged use of UU.TRM: REMOVED

3.5.11   Allow users with temp privileges to set
           privilege protection codes: REMOVED
           TMPPRV privilege is required to mark
           programs as privileged; SYSIO privilege
           is required to mark data files as
           erase-on-delete.

3.5.12   EMT logging: retained

3.5.13   Disable UU.SPL routing to new spooler: REMOVED
           Additional option bits defined to change routing
           of print and batch requests

3.5.14   Logout with detached jobs: REMOVED
           No longer needed with per-account quotas

3.5.17   Remove receiver ID restriction: REMOVED
           SYSIO privilege now required

3.7.1   Special line printer drums: REMOVED
           Replaced by SET PRINTER command

3.7.2   Default printer form length: REMOVED
           Replaced by SET PRINTER command

3.7.3   Magtape density/parity default: REMOVED
           Replaced by SET SYSTEM command

3.7.4   CSS paper-tape reader: retained

4.1.1-9   BASIC-PLUS patches: all retained

4.10.2-6   BASIC-PLUS patches: all retained

10.3.1   DIRECT - nonprivileged cross-account
           access: REMOVED
           Controlled by GREAD and WREAD privileges

10.12.2   Programs may chain to LOGIN: REMOVED
           Now standard by means of system-wide
           LOGIN.COM file

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10.12.3   LOGIN can print message for specific
              accounts: REMOVED
              Can be done using LOGIN.COM files

10.12.4   LOGIN can chain to a specified program: REMOVED
              Can be done using LOGIN.COM files

10.12.5   Log access attempts on dial-up lines: REMOVED
              Dial-up logins are always logged

10.12.6   Change LOGIN to set different SWAP MAX: REMOVED
              Always set to the maximum
              Can be done using LOGIN.COM files

10.12.7   Enable logged-out commands: REMOVED

10.12.8   Enable auxiliary password: REMOVED
              Replaced by system password feature

10.13.1   Make LOGOUT not hang up data set: REMOVED

10.21.1   Change SHUTUP sleep parameters: REMOVED

13.5.1   BACDIR - disable warning message: REMOVED
              Can only be used to restore now

14.4.1   QUE - disable operator queueing to another
              account: REMOVED
              Requires WACNT privilege

14.6.1   QUMRUN - disable "job with different form
              name waiting" message: REMOVED

14.6.2   QUMRUN - restricting the assignment of BA:
              REMOVED

14.6.3   QUMRUN - disable operator queueing to another
              account: REMOVED

14.10.1   SPLRUN - eliminate extra form feeds: REMOVED

14.15.1   BATRUN - $EOJ does not reset error: REMOVED

17.7.2   Allow ATPK to detach: REMOVED

17.7.3   Limit use of $LOGIN command: REMOVED

20.2.1   Run DCL at increased priority: REMOVED

20.2.2   Changing DCL BASIC command default from /BP2
            to /BPLUS: REMOVED
            Can be done using command substitution set up by
            LOGIN.COM file

20.2.3-4   Changing BASIC-PLUS and BASIC-PLUS-2 name: REMOVED
            DCL now looks for BP2IC2.TSK for BASIC-PLUS-2 and
            BASIC for BASIC-PLUS

20.2.5-8   Change command defaults: REMOVED
            Can be done using command substitution set up by
            LOGIN.COM file

21.3.1   RSX.RTS - make task images nonswappable: REMOVED

21.3.2   Disable post-mortem dumps for CTRL/C: REMOVED

21.3.3   Change KBM prompt: REMOVED

21.3.4   Change program name of KBM: REMOVED

21.3.5   Invoking a menu program: REMOVED
            Can be done using command files

22.1.3   Changing default program load size for macro
            CUSPs: REMOVED
            CUSPs that this patch could have been applied
            to will all use the maximum amount of memory
            available, for example, 28KW or SWAP MAX, whichever
            is smaller.

22.13.1   PIP - make /NEWFILE the default: REMOVED
            /NEWFILE is the default

22.13.2   PIP - transferring files by date of last
            access: REMOVED

22.13.3   PIP - requiring volume I.D. specifications
            with ANSI magnetic tape: REMOVED

22.13.4   PIP - make /LOG the default: REMOVED

22.13.5   PIP - make /ERASE imply /DELETE: REMOVED

22.13.6   PIP - change maximum tape blocksize: REMOVED
            Maximum blocksize is now 8192

22.19.1-2   SAVRES defaults: REMOVED

22.19.3   SAVRES - make /NOSTATS the default: REMOVED
          STATS is the default

31.21.1-2 Defaults for remote queueing: REMOVED
          Replaced by network-specific queues (NET$PRINT and
          NET$BATCH) in the new print/batch package.
          Refer to the *DECnet/E V2.1 Release Notes*
          for details on remote queues.

Any feature patches retained in V9.0 have been renumbered. See the
RSTS/E V9.0 Maintenance Notebook for further details.

2.5 File Processor

2.5.1 More Open Files per Disk Unit

RSTS/E V9.0 has increased the maximum number of files that can be
opened on a disk unit from 511 to 1023 files.

2.5.2 Get Monitor Tables - Part I

Directive UU.TB1 (FIP SYS call -3) has been modified to conform to
monitor table changes. Refer to the *RSTS/E Programming Manual* and the
System Directives Manual for details.

2.5.3 Get Monitor Tables - Part III

Directive UU.TB3 (FIP SYS call -29) has been modified to return
additional monitor table information. Refer to the *RSTS/E Programming
Manual* and the *System Directives Manual* for details.

2.5.4 Read or Read and Reset Accounting Data Directive

The UU.RAD directive (FIP SYS call +14) has been modified to return
the new extended disk quota information along with the current disk
usage; the number of users logged in to the account, and the number of
open files in the account.

Prior to V9.0, if a user made a request of UU.RAD (FIP SYS call +14)
and was not privileged to do so, the data for the caller's account was
returned. A new option bit has been added for RSTS/E V9.0 which will
cause the call to return an error instead of doing the look-up on the

callers own account. Refer to the *RSTS/E Programming Manual* for more details.

2.5.5 Create User Account Directive

The UU.PAS directive (FIP SYS call 0) has been enhanced to allow for the initial setting of the new extended disk quotas when the account is created. Refer to the *RSTS/E Programming Manual* and the *System Directives Manual* for more details.

2.5.6 Change Password/Quota Directive

The UU.CHU directive (FIP SYS call +8) was modified to allow the user to change the new extended disk quotas for the account specified. An option has also been added to allow the user to set long passwords. Refer to the *RSTS/E Programming Manual* and the *System Directives Manual* for more details.

2.5.7 Login and Attach Directive

The UU.LIN and UU.ATT directives (FIP SYS calls +4 and +6) have been extended to allow for longer passwords. The old forms, however, are still valid. Both calls include a (privileged) option flag to bypass the password check. Refer to the *RSTS/E Programming Manual* and the *System Directives Manual* for details.

2.5.8 New Subfunction on the Login Directive

There are two new subfunctions of the Login directive UU.LIN (FIP SYS call +4); both perform password checking without actually changing a job's logged-in state.

   o Check account password: This call is used to check whether the password for an account is correct.

   o Check system password: This call is used by the LOGIN program to check the system password.

For details, refer to the *RSTS/E Programming Manual* and the *System Directives Manual*.

2.5.9 Disk Pack Status Directive

The UU.MNT directive (FIP SYS call +3) has been changed to permit the
mounting of level 1.2 disks with /NOQUOTA. When this bit in the mode
word is set, the file processor will not issue the error "?Quota
exceeded" when the user is about to exceed the logged-in disk quota.
Refer to the *RSTS/E Programming Manual* for more details.

2.5.10 Logout Directive

The UU.BYE directive (FIP SYS call +5) has been modified to return a
24 bit unsigned integer value for the disk quota and current usage if
the logout failed because of exceeded logged-out disk quota. If a
disk is logically mounted but spun down or is experiencing hardware
problems, quota checking on the unit is skipped. However, quota
checking on the remaining logically mounted disks will be performed.
Refer to the *RSTS/E Programming Manual* and the *System Directives
Manual* for more details.

2.5.11 File Utilities Directive

The UU.FIL directive (FIP SYS call -26) has been enhanced to allow the
changing of a file's no-delete/rename flag (the "P" bit). The files
[0,1]BADB.SYS and [0,1]SATT.SYS on any disk and [0,1]INIT.SYS on the
system disk are the only files for which the monitor will not permit
this flag to be cleared. Prior to V9.0, this flag could only be
changed by the REFRESH option of INIT.SYS. UU.FIL has also been
changed to allow a user to specify a set of changes to make, limited
only by the privileges the user has. Refer to the *RSTS/E Programming
Manual* and the *System Directives Manual* for more details.

2.5.12 Read or Write Attributes Directive

The UU.ATR directive (FIP SYS call -25) has been enhanced to read the
attributes of a RSTS/E disk pack. It also can be used to read, write,
or delete account attributes. Refer to the *RSTS/E Programming Manual*
and the *System Directives Manual* for more details.

2.5.13 New Data Returned When Allocating a Device

When issuing any of the allocate (assign) directives (UU.ASS as a
.UUO, UU.ASS as a .ULOG, ASSFQ as a CALFIP, and FIP SYS call +10 from

BASIC), the job number of the previous owner of the device (if any) is
now returned. For further information on these calls, refer to the
RSTS/E Programming Manual or the *System Directives Manual.*

2.5.14 The UU.SPL Directive

This section describes changes to the UU.SPL directive in V9.0, and
how it affects Print/Batch Services (PBS) and the OPSER-based
packages.

In V8.0, changes were made to UU.SPL to take advantage of the new
micro spooler. If the "spooled device" field was passed as null
(which defaults to LP0:) or any LP device (LP: or LP0:-LP7:), then
the monitor would check to see if the new spooling package was
running. If so, the request was routed to the new package, with the
request being placed on the (only) queue named PRINT. If the new
spooler was not running, or the spooled device field contained a
device other than LP, then the request was routed to the OPSER-based
package. A feature patch was provided to always route all requests to
the OPSER-based package, regardless of the presence of the new
spooler. This was done so users could still run both packages
concurrently, but continue to have UU.SPL work only with the
OPSER-based package, as it had done previously.

In V9.0, with the inclusion of multiple print queues in PBS,
additional changes were made to the UU.SPL directive so that print
requests could be routed to specific queues in the new package. Also,
new flag bits are provided so that an application can force the
request to a given package.

Refer to the *RSTS/E Programming Manual* for further details.

2.5.15 UU.CLN Function Removed

The UU.CLN subfunction of the .UUO directive (FIP SYS call +2) has
been removed.

2.5.16 Changes to the UU.DET Function

The UU.DET directive (FIP SYS call +7) of .UUO (Detach a job) has been
changed in two ways:

> o Quota enforcement: The UU.DET call will fail with error code
>   69 (?Quota exceeded) if the detached job quota for the

account has been reached, unless the EXQTA privilege is in
effect.

o   Interaction with DCL command files: If a job running under
    control of an indirect command file is detached using the
    UU.DET directive, a new job is created at that terminal,
    logged in to the same account, and execution of the command
    file continues with the new job. The detached job retains
    its job number, while the command file resumes under a
    different job number.

2.5.17 Changes in File Protection Rules

For purposes of file access rules, RSTS/E separates users into three
categories: owner, group, and world. Prior to V9.0, these categories
were mutually exclusive; in V9.0, these categories are inclusive.
Since the protection code specifies the access rights separately for
owner, group, and world, this means that it was possible to allow *more*
access to, say, "world" than to "group." In V9.0, "world" includes
"group" and "owner", and "group" includes "owner." Thus, any access
granted to the larger category is also granted to the smaller
category.

All standard protection codes are unaffected by this change, since
none of them grant more access to the larger categories than to the
smaller ones.

2.5.18 Change Date/Time Directive

The Change Date/Time directive UU.DAT (FIP SYS call -14) no longer
allows dates to be set prior to 01-Mar-85.

2.5.19 Change File Backup Statistics Directive

The Change File Backup Statistics directive UU.BCK (FIP SYS call -11)
no longer requires privilege to modify the creation date and time
fields for a file. Modifying the last access/last change date still
requires privilege (the DATES privilege) to ensure that users cannot
interfere with system backups and cannot hide the fact that a file was
changed.

2.5.20 Create a Job Directive

The create a logged-in job feature of the Create-a-Job directive
UU.JOB (FIP SYS call +24) has a new option flag to suppress passing of
user logicals to the new job. Refer to the *RSTS/E Programming Manual*
for details.

If the spawn logged-in job function is used to spawn a job attached to
a pseudo keyboard, the monitor will no longer allow the spawned job to
be given a priority greater than the priority of the job controlling
the pseudo keyboard.

If the spawn logged-out job function is used to create a logged-out
job, the new job is now given the caller's privileges rather than all
privileges.

2.5.21 New Option in Return Job Status Information Directive

The Return Job Status directive UU.SYS (FIP SYS call +26) now returns
a third set of information (job status, part three). It includes the
job's current privilege mask and additional information. Refer to the
RSTS/E Programming Manual and the *System Directives Manual* for
details.

The job-status function no longer requires privilege if the calling
job is controlling a pseudo keyboard and the job whose status is being
read is running at that pseudo keyboard.

2.5.22 System Logical Names Directive

A list subfunction has been added to the UU.SLN directive (FIP SYS
call +21). This subfunction is used to perform lookups by index of
system-wide logical data. Refer to the *System Directives Manual* and
the *RSTS/E Programming Manual* for more details.

2.5.23 File Name String Scan Directive (FSS)

The File Name String Scan directive .FSS (FIP SYS calls -10 and -23)
has been changed in the following ways:

> o   In the case of an untranslatable logical device name, the
>   directive will return the third word of the RAD50 logical
>   name (the seventh, eighth and ninth characters) in the FIRQB
>   at FQFLAG or bytes 19 and 20 if the FIP SYS call is used.

o   If a logical containing a "$" is being parsed, then user
    logicals will not be considered (only system logicals are
    used).

o   FSS accepts the new keyboard controller designator names and
    translates them to their physical device names. Refer to
    Section 1.7.4 of this document for further details on
    controller designator names.

o   FSS rejects file specifications with the sign bit set in any
    character. In V8.0, FSS simply stripped the sign bit.

Refer to the *RSTS/E Programming Manual* and the *System Directives
Manual* for details.

2.5.24   The .LOGS Directive

The .LOGS directive has been modified to allow three-word (nine
character) logical names. The third word should be passed in the XRB
at XRLOC (that is, immediately following the first two).

The returned information is unchanged; however, the meaning of the
flag returned in XRLOC was previously documented incorrectly. Refer
to the *System Directives Manual* for details.

2.5.25   Changes to Read/Write Attributes

The Read/Write attributes SYS call, UU.ATR, now includes subfunctions
to read and write account attributes as well as read pack attributes.
Refer to the *RSTS/E Programming Manual* and the *RSTS/E Directives
Manual* for further details.

2.5.26   Changes to UU.RTS

The Load RTS, Load Library, and Set Default KBM subfunctions have been
removed. DCl is always installed as the system default keyboard
monitor.

2.6 Drivers

2.6.1 Disk Drivers - Asynchronous Support

The disk drivers have been enhanced to provide asynchronous read/write operations on disk devices. Refer to Section 1.5.5 of this document for further information on asynchronous I/O capabilities.

2.6.2 Disk Autosizing

The Disk device drivers can now automatically determine which type of drive is attached to a controller. Therefore, the UNITS suboption of the INIT.SYS hardware option is no longer required and has been removed. This also allows you to change the unit numbers between different drives on the same controller if the units are not in use (dismounted and not open).

2.6.3 Disk Drivers

The initialization code in the DU, DB, DR, DM, DL, DK and DV drivers has been enhanced to allow you to determine the state of a disk device when you attempt to mount it or open it in non-file-structured mode. The enhancements are:

o   If you try to open a disk device that is not generated into the system, the "?Not a valid device" error will be returned.

o   If you try to open a disk device whose controller is generated into the system, but does not exist on the current configuration, the "?Device not available" error will be returned.

o   If you try to open a disk device when the controller exists, but the unit in question does not, the "?Device not available" error will be returned, and FQSIZ for that disk device will be returned as zero. No hard errors will be logged.

o   If you try to open a disk device which exists on the system, but which is not spun up, the "?Device hung or write locked" error will be returned, but a hard error will not be logged. FQSIZ will contain the proper device size, except in the case of MSCP-class disks, where it will contain zero.

o   If you open a disk which is present on the system and spun up, no error will be returned, and FQSIZ will contain the

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device size in device clusters. This is the only valid way
to determine the size of MSCP-class disks.

In any case, if unexpected hard errors are encountered during the
sizing process, a "?Device hung or write locked" error will be
returned, and hard errors will be logged for the device.

2.6.4 TS11 Driver changes

The device driver for TS11 type magnetic tape drives has been
restructured to provide full support of the new asynchronous
functions, .READA and .WRITA. Proper use of these functions, as well
as the new ECA (error condition acknowledged, see Section 1.5.5.4 of
this document) special function call, allows suitably coded programs
to achieve good streaming on the new TSxx streaming tape drives
(including TSV05, TK25, and TU80).

Refer to Section 1.5.5, of this document for information on the use of
the new asynchronous calls.

2.6.5 Line Printer Driver Changes

Several enhancements have been made to the LP driver for V9.0. Refer
to the *RSTS/E Programming Manual* for further details on using line
printer devices in applications.

The following summary highlights the LP changes and features in V9.0:

   o New open MODE bits defined:

      - Convert <ESC> character to $

      - Disable wrapping of long lines

   o New write modifier (RECORD) bits defined:

      - Disable output (for transparent page counting)

      - Binary output (disables character formatting)

   o Software page length maximum of 127 increased to 255

   o New 32-bit page counter, read by means of a .SPEC directive

o New .SPEC directive to return current vertical/horizontal
   position

o New default page length characteristic for each LP unit

o New tab characteristic for each LP unit

o Elimination of feature patches 3.7.1 and 3.7.2 (features
   supported by the new SET PRINTER command)

2.7 DCL

Because of the extensive enhancements and modifications made to DCL
for V9.0, DCL differences from V8.0 are covered in Section 1.8 of this
document.

2.8 Terminal Service

2.8.1 Changes to CTRL/T

CTRL/T has been enhanced for this release. The following changes have
been made:

o The I-space and D-space sizes of a program are displayed
   separately, in the form of "I-size+D-size", if a program is
   using separate I&D space.

o If a job is using the file processor to execute a SYS() call,
   the three-character UUO name is displayed. Previously,
   CTRL/T displayed the job as FP(DSP).

o If a job is presently running, it will be reported as RN*.

o If a job is presently being processed by the file processor,
   it will be reported as FP*.

o If a job is being processed by the file processor, but the
   file processor is waiting for a disk request to complete, it
   will be reported as FP-.

o The determination of whether a job is reading or writing on a
   channel has been improved. If a job is waiting on a special
   function (the .SPEC directive), CTRL/T displays an "S" after
   the channel number. If the wait cannot be determined, CTRL/T
   displays a "?". If the request is determined to be I/O, but

the monitor cannot determine whether it is read or write, no
special character will be displayed.

2.9 RSX Package

The RSX emulator has been changed significantly for RSTS/E V9.0. The
RSX run-time system is no longer mandatory because the monitor is able
to perform all functions (other than serving as a keyboard monitor).
The RSX run-time system is now only 1K words in size.

2.9.1 Monitor Task Loader

The monitor is now responsible for loading RSX tasks directly. If an
executable file is associated with the RSX run-time system, the
monitor will automatically load it, regardless of whether the RSX
run-time system is present.

2.9.2 Directive Emulation for CRRG$ Directive

The RSX emulator now emulates the CRRG$ directive (Create Dynamic
Region). Refer to the *System Directives Manual* for more information
on this directive.

2.9.3 RSX Utilities

With RSTS/E support of user mode data space on processors that support
it, there are now versions of MAC, TKB, STK, and REORDR which use I&D
space. These versions run considerably faster than the standard
versions, although they require the SWAP MAXIMUM to be at least 41K.
Setting SWAP MAXIMUM to 64K requires 256 blocks of disk space per job,
so a system that is limited on disk space may not want to use this
feature.

2.10   RT11 Package

2.10.1   PIP.SAV

o   The V8.0 feature patch 22.13.1 has been implemented. This
    makes /NEWFILE the default.

o   The V8.0 feature patch 22.13.6 has been implemented. This
    makes the maximum magtape blocksize 8192.

o   PIP's help file is now located in the HELP$ location.

2.11   Commonly Used System Programs (CUSPs)

2.11.1   BASIC-PLUS Sources

Prior to V9.0, many of the BASIC-PLUS utilities included with RSTS/E
were distributed in source form (.BAS) and were used to generate
executable programs during installation. Because this was very time
consuming, RSTS/E V8.0 included optional pre-built versions of the
BASIC-PLUS utilities, allowing you to either generate the executable
programs (.BACs or .TSKs) during installation, or simply install the
pre-built versions (.TSKs) directly.

In V9.0, only executable versions of most utilities are provided,
reducing the time it takes to install RSTS/E. Because some sites
modify certain BASIC-PLUS utilities to provide features not included
in the standard version, V9.0 does include a small set of BASIC-PLUS
sources. The following sources are provided:

                    ATPK .BAS
                    DIRECT.BAS
                    DISPLY.BAS
                    HELP .BAS
                    LOGIN .BAS
                    LOGOUT.BAS
                    SYSTAT.BAS

These source files are all located in the backup file SOURCE.BCK on
the V9.0 library kit. You can transfer these files to your system by
including the package name SOURCES in your list of packages to
install. The SOURCES package will not be installed if you specify
"ALL."

If you require sources which are not included in the RSTS/E V9.0 kit,
they can be obtained in either microfiche or machine readable form.

Substantial pricing and availability changes make these options
attractive for those sites that need detailed access to complete and
up-to-date sources. Options and order numbers are listed in the
RSTS/E V9.0 SPD. For additional information on pricing and
availability consult your DIGITAL sales representative or call our
toll free number to order directly.

2.11.2 SYSTAT

The following changes were made to SYSTAT for V9.0:

o   The size field of the Disk Statistics table now shows the
    maximum number of blocks available based on the pack cluster
    size rather than the total size (in blocks) of the unit.

o   The run-time system display now displays the RSX emulation
    (...RSX) "pseudo" run-time system.

o   The resident library display has been changed to display both
    named and unnamed dynamic regions. Refer to Section 1.5.7 of
    this document and to the *System Directives Manual* for
    information on dynamic regions.

o   The symbols [SELF] and [OPR] formerly found in the job status
    display have been removed; the job's PPN is always displayed.

o   The minus sign character (-) in a SYSTAT switch to display a
    job's actual PPN has been removed and is no longer allowed.

o   The /P (display privileged jobs) and /N (display
    non-privileged jobs) switches have been removed and are no
    longer allowed.

o   The priority and run-burst parameters of a job are only
    displayed if you have TUNE privilege.

o   The /W and /O switches to display open files require WREAD
    privilege.

o   The /C switch to display memory configuration requires no
    privileges.

o   The memory list display has been changed to annotate the
    virtual disk when it is mounted. Also, the problem of XBUF
    being annotated more than once on systems with greater than
    127KW of XBUF has been corrected.

2.11.3 REORDR

The REORDR program has been converted to BASIC-PLUS-2. Two versions
of REORDR are available; one for systems with I&D space, and one for
systems without. The I&D space version requires a swap maximum of
40K, and performs considerably faster. Both versions are
significantly faster than the one supplied with V8.0. This was
accomplished by using larger buffers. Use of the I&D space version is
optional; the regular version will work on all systems.

Note

> You cannot re-order your own account on the system
> disk, since DCL always has its work file open there.
> In order to re-order your own account, you must log
> out and log in to a different account.

2.11.4 SHUTUP

The following changes have been made to SHUTUP for this release:

   o   SHUTUP privilege is required to run the program.

   o   SHUTUP has been modified to shut down the Print/Batch
       Services (PBS) package.

   o   SHUTUP now accepts circumflex (^) instead of <ESC> to backup
       to a previous question in the dialogue.

   o   The "OPSER not running" message has been removed.

   o   Warning and error messages now include the standard "%" and
       "?" prefixes.

   o   References to "Micro-spooler" have been changed to
       "Print/Batch Services."

   o   References to the "console terminal" have been changed to the
       "system console (KB0)."

2.11.5 LOGIN

The LOGIN program has been changed to support the new account
attributes, password features, and DCL command processing provided in

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V9.0. The following changes have been made:

o System Password. LOGIN will prompt for the system password
   before prompting for User if system password checking is
   enabled for the type of connection (local, dial-up, network)
   being used.

o DCL Command Files. After logging in, LOGIN will execute the
   system-wide command file SY:[0,1]LOGIN.COM. A template
   system LOGIN.COM file is created as part of system
   installation.

o Security Enhancements. To slow down password guessing,
   invalid login attempts after the second attempt are delayed
   5, 10 or 15 seconds. To provide less information to an
   intruder, LOGIN will not display the system name when logged
   out. Logged-out commands and CTRL/T are no longer available
   while logged-out.

o Detached Jobs. If jobs are detached under the user's
   account, a "mini-SYSTAT" is displayed, giving the job number,
   program name, job state, CPU time, and run time, for each
   detached job under the account, rather than just a list of
   job numbers.

o Expired Accounts. If the user specifies a valid PPN and
   password, but the account is expired, LOGIN displays "?Access
   not permitted," rather than "?Invalid entry".

o Quotas. LOGIN will enforce the job and detached job quotas.
   If there are any detached jobs running in the account you
   want to log in to, then LOGIN will force you to attach to one
   of these jobs.

o New LOGIN command to "initialize" your job. If you issue the
   LOGIN command while logged in, and you do not specify a PPN
   (or you specify your current job's PPN), LOGIN will reset
   your job to its original logged-in condition. LOGIN then
   executes the system-wide login command file (which in turn
   executes your group and private login command files).

o Switching accounts. If you issue the LOGIN command while
   logged in, and specify a a different PPN, LOGIN will skip the
   password prompt if your current job has sufficient privilege
   (GACNT or WACNT).

o Invoking LOGIN. From the logged out state, you can now type
   <CR> to invoke the LOGIN program.

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o Dropped support for ";password" feature. LOGIN will no
longer accept a password as part of the command string (i.e.
HELLO 2,250;password). An error is displayed in this case.

2.11.6 LOGOUT

LOGOUT has been changed for V9.0 as follows:

o The "Confirm:" prompt and all of its options have been
removed. Users needing to delete files before logging out
will need to use the DCL DELETE command and then re-invoke
LOGOUT.

o The LOGOUT or BYE commands cause LOGOUT to perform a "full"
logout, which displays the full log-out message.

o The LOGOUT/BRIEF or BYE/F commands cause LOGOUT to perform a
"fast" logout, which does not display any logout text but
advances the cursor six lines. The qualifiers /F and /Y are
the only valid qualifiers when executed as a CCL command.

o If LOGOUT fails for any reason, it exits and returns to the
user's private keyboard monitor.

o As before, LOGOUT enforces the user's logged-out quota on all
disks mounted read/write. If a disk error occurs while
checking quotas, LOGOUT skips the check and proceeds with the
next disk.

o LOGOUT has been modified to handle 24-bit values for the
current disk usage and disk quota.

2.11.7 DSKCVT

The DSKCVT (Disk Convert) utility has been updated to convert V8.0 and
older disks (level 1.1 and 0.0) to the new level 1.2 format.
Specifically, DSKCVT performs the following functions:

o Converts level 0.0 disks to 1.2

o Converts level 1.1 disks to 1.2

o Converts accounts with "LOOKUP" passwords to "NOLOOKUP"
(optional)

As in V8.0, DSKCVT converts disks directly; no second disk is necessary to perform the conversion. DIGITAL recommends that you first back up the data on any disks to be converted, so that any hardware or software errors that might occur during conversion will not result in loss of data.

In converting level 1.1 disks to level 1.2, DSKCVT adds several new attribute blocks to each account. Since some of the new attributes are only relevant on "user" accounts (accounts on the system disk used to log into or run jobs on the system), DSKCVT will ask:

        Convert accounts to NOUSER <no>?

If you answer yes to this question (the default is no), DSKCVT will change all accounts to "non-user" accounts. Non-user accounts have no passwords or privileges associated with them, and can only be used to store files.

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

> If you intend to move the accounts (via BACKUP and RESTORE) to the system disk from a disk you are converting with DSKCVT, then *do not* convert the accounts to NOUSER accounts. Otherwise, you will not be able to log into the accounts or create jobs in them.

DSKCVT converts accounts to level 1.2 by adding the following new attribute blocks to each account:

 o Disk quota/usage block

 o Privileges block

 o Nondisk quota block

In creating the privilege attribute block, DSKCVT uses the following rules:

 o For account [1,1], it assigns all privileges, except EXQTA

 o For all other [1,*] accounts, it assigns all privileges except SYSMOD and EXQTA

 o For accounts not in the [1,*] group, it assigns no privileges

This scheme assigns privileges that are compatible with previous versions of RSTS/E. Once the conversion is complete, you can modify privileges as necessary using the SET ACCOUNT/PRIVILEGE command.

For example, if you want all users to be able to change their
password, use:

        SET ACCOUNT/PRIVILEGE=SETPAS [*,*]

The quota values are set as follows:

  o Logged-Out Disk Quota: Quotas of 0 (unlimited in V8.0 and
     earlier) are changed to -1 (unlimited in V9.0) other values
     are retained.

  o Logged-In Disk Quota: Set to unlimited.

  o Job Quota: Set to unlimited.

  o Detached Job Quota: Set to unlimited for accounts [1,*],
     zero for others.

  o RIB Quota: Set to unlimited for accounts [1,*], 3 for
     others.

  o Message Quota: Set to unlimited for accounts [1,*], 12 for
     others.

The values assigned are chosen to be compatible with version 8.0.
Again, you can use the SET ACCOUNT command to change them if needed.

The account flags are set as follows:

  o NOEXPIRE *

  o NOCAPTIVE

  o INTERACTIVE

  o DIALUP

  o NETWORK

  o PASSWORD_PROMPT

  o LOOKUP or NOLOOKUP (according to what you specified)

* If the account's password was "??????" then the account is marked
EXPIRED.

                                Note

    Accounts with any ?'s in their password will be
    properly converted but cannot be logged into, since

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"?" is an invalid password character in V9.0. This is
compatible with the meaning of "?" passwords in
previous versions.

When converting a disk, you can decide whether to convert all account
passwords to their hashed form (NOLOOKUP) or leave them in their
readable form (LOOKUP). If your site still uses applications that
must look up passwords, then do not hash passwords on the converted
disk. (When you no longer need LOOKUP passwords, you can use DSKCVT
to convert all account passwords to NOLOOKUP on an existing level 1.2
disk.)

If you convert all accounts to NOUSER accounts, then DSKCVT will not
create a password, privilege or non-disk quota block for all accounts
on the disk.

You need ALL privileges to run DSKCVT. DSKCVT displays an error and
aborts if you do not have all privileges currently enabled.

There are two ways to obtain all privileges in order to use DSKCVT:

   o   Log into an account that has all privileges. Such an account
       has all the power and capabilities of the [1,1] account in
       version 8.0, including the ability to poke memory (SYSMOD
       privilege).

   o   During system startup, answer NO to the "Proceed with system
       startup" prompt. You will return to the DCL prompt, and will
       be running in a job that has all privileges. You can then
       run the DSKCVT program to convert disks as necessary. Once
       you have finished using DSKCVT, you can resume system startup
       by typing the command:

            $ @[0,1]START

The second method shows that you do not require any account on your
system that has all privileges. Whenever you need to perform an
operation that requires a privilege not assigned to any account, you
can do so by interrupting the initial system startup procedure.

Refer to the *System Installation and Update Guide* Appendix F for
complete details on how to use the DSKCVT program.

2.11.8   V8.0 BACKUP Package (RESTORE)

The V8.0 BACKUP package, consisting of BACKUP.BAS and several other
.BAS modules, has been functionally replaced by the new V9.0 BACKUP

facility. Because users may need to restore archived backup sets
created with the V8.0 BACKUP package, V9.0 still includes and supports
the RESTORE option of the V8.0 package. Future releases of RSTS/E
will continue to support this capability.

The following changes have been made:

>   o   The V8.0 BACKUP package is included in V9.0 as RESTOR.TSK
>   (RESTOR.BAS). The BACKUP option has been removed; the other
>   options (RESTORE, LOADINDEX, and LIST) are still available.
>
>   o   Those .BAS modules which supported the BACKUP option have
>   been removed. The other modules retain their V8.0 filenames
>   (BACxxx).
>
>   o   RESTORE and all of its associated modules are installed in
>   the directory _SY:[0,7] and is accessed using the system-wide
>   logical RESTOR$:. The package can be relocated to another
>   directory or disk by copying the package components to their
>   new location and reassigning the RESTOR$: logical. Refer to
>   the *System Installation and Update Guide* for information on
>   relocating package components.
>
>   o   To use the RESTOR package, you must have all of the following
>   privileges:
>
>   -- WREAD   (world read)
>   -- WWRITE (world write)
>   -- WACNT   (world accounting)
>
>   o   RESTOR will display an error message if you attempt to run it
>   and do not have all of the privileges listed above.
>
>   o   If you have no back-up sets created with the V8.0 BACKUP
>   package, then you do not have to install the RESTOR package.
>   Answer NO to the question, "Do you want to install the RESTOR
>   package?" during installation.
>
>   o   Complete documentation for the RESTOR package is located in
>   the *Utilities Reference Manual*.

2.11.9   DISPLY (VTxxPY)

The V8.0 programs VT50PY has been renamed to DISPLY. VT5DPY is no
longer included in V9.0.

DISPLY's initial settings have been changed to support standard video
terminals like the VT100 and VT200 series terminals. Also, internal
changes have been made to reflect changes in the monitor's logical
name tables and memory control lists.

The following list outlines the major changes that have been made:

    o By default, DISPLY will use 24 lines in its display. You can
       change the number of lines with the /n switch, where n is any
       value from 12 to 24.

    o By default, DISPLY will use <tab> characters in its display.
       Use the /NOTAB switch if your terminal does not process <tab>
       characters correctly.

    o By default, DISPLY will use direct cursor addressing to
       position the cursor on the screen. Use the /NODCA switch if
       your terminal does not support the VT52 or ANSI escape
       sequences for cursor positioning.

    o The [OPR] flag in the job display has been removed.

    o The EBP flag in the memory display has been renamed XBF.

    o A new flag DYN has been added to the resident library display
       to indicate dynamic memory regions.

2.11.10 MONEY

The MONEY program has been functionally replaced by the new account
management facility in V9.0 and is no longer required. However, for
those sites that want to continue using MONEY, this program is still
being distributed (as an unsupported program) in the UNSUPP kit.

Note that MONEY does not display any of the new account attributes
provided in V9.0; use the SHOW ACCOUNT or SHOW DIRECTORY commands to
display complete accounting information.

If you have WACNT privilege, you can use MONEY to display any account
on the system. If you do not have WACNT privilege, then you can only
display your own account. Support for GACNT privilege is not
provided.

If you choose the "Print passwords?" option, MONEY cannot display the
password of any account with NOLOOKUP (hashed) passwords; the password
field will be blank for such accounts.

If you choose to install MONEY, be sure to install it with a
protection code of <232>.

No additional functions or support have been added to MONEY for V9.0.
Users are encouraged to use the new DCL commands that replace MONEY.
MONEY will be removed in any future release of RSTS/E.

2.11.11   REACT

The REACT program has been functionally replaced by the new account
management facility in V9.0 and is not included on the V9.0 kit.

2.11.12   DIRECT

The DIRECT program has been updated to make use of multiple
privileges. The file access rules followed by DIRECT are the same as
those used by the monitor:

   o   If you have WREAD privilege, you can display all files in any
       directory, regardless of individual file protection codes.

   o   If you have GREAD privilege, you can display all files within
       your group, regardless of individual file protection codes.
       For directories outside your group, each file's protection
       code determines whether or not it will be displayed.

   o   If you have neither WREAD or GREAD privilege, you can display
       all files within your directory, regardless of individual
       file protection codes. For other directories, each file's
       protection code determines whether or not it will be
       displayed.

2.11.13   UTILTY

The UTILTY program has been functionally replaced by new DCL commands
and is no longer required. However, it is still supplied and
supported for any layered products that use it for their installation.

No new functions have been added and certain UTILTY functions may not
work properly in V9.0. You are encouraged to use the new DCL commands
that replace UTILTY. Refer to the *System Manager's Guide* for details
on the DCL commands.

Note

There are no DCL commands to replace the UTILTY LOAD
and LOAD LIBRARY commands. These functions do not
serve any practical purpose, therefore, they have been
removed. Their corresponding SYS calls and monitor
directives have also been removed.

2.11.14   ATPK

The ATPK program has been updated for multiple privileges. The
following changes have been made:

o   ATPK is a privileged program and should be installed with the
    protection code <232>.

o   No special privileges are required to use ATPK. However,
    DEVICE privilege is needed if your system's pseudo-keyboards
    are marked as restricted. All terminals configured for
    RSTS/E are initialized as restricted.

o   GACNT or WACNT privilege is required to log in a job under a
    different account.

o   Write access is required to any log file specified.

o   Job and detached-job quotas control the ability to spawn jobs
    or to detach the ATPK job.

o   Users with TUNE privilege can include the new qualifier
    /PRIORITY:n, where n is the priority of the ATPK controlled
    job, in the range -120 to +120.

o   Users with TUNE privilege can include the new qualifier
    /RUNBURST:n, where n is the runburst of the ATPK controlled
    job, in the range 1 to 127.

o   Sites wanting to restrict ATPK use to certain users can edit
    ATPK.BAS to require users to have a certain privilege (e.g.,
    USER1) to run ATPK. Comments in the code explain how to do
    this.

Note

ATPK is unsupported except when used with BUILD to
execute control files supplied by DIGITAL and by the

PRELIN.TSK program to execute the DCL LINK command.
If you encounter any problems using ATPK, please
submit a priority 5 SPR marked "FYI."

ATPK is a declining utility. DIGITAL encourages you to convert any
existing ATPK command files to DCL command files.

2.11.15   BUILD

The BUILD program has been updated for multiple privileges and to
improve the user dialogue. The BUILD program is now located in the
directory associated with the logical name UPDATE$: rather than in
the system library account [1,2]. Note that BUILD is a declining
utility; existing BUILD control files should be converted to DCL
command files.

The following changes have been made to BUILD:

o   You must have "most" privileges to run BUILD. You do not
    need SYSMOD, EXQTA or the USERx (USER1-USER8) privileges, but
    must have all others. BUILD displays an error message for
    each privilege it requires that you do not have.

o   The prompt, "System Build," has been removed. The system
    build option has been replaced by the new installation
    command procedure.

o   The prompt, "Source input device," has been changed to,
    "Input device."

o   The prompt, "Library output device," has been removed. _SY:
    is always used as the library output device.

o   The prompt, "Library account." has been removed. [1,2] is
    always used as the library account.

o   The prompt, "Target output device," has been changed to,
    "Output device."

o   If your keyboard monitor is DCL, BUILD will create its ATPK
    job using RT11. This eliminates problems with ASSIGNs in the
    ATPK command files run under DCL. You no longer have to
    switch from DCL to a different keyboard monitor before
    running BUILD.

o   The default patch location has been changed from [200,200] to
    PATCH$:.

o   The prompt, "Save patched sources," has been removed.

o   The prompt, "Write patched sources to," has been removed.

o   BUILD no longer checks whether the RT11 runtime system is
     installed, since it is installed during system startup.

2.11.16   PBUILD

The PBUILD program has been retired and is not included in RSTS/E
V9.0. Those layered products that used PBUILD to install patches and
updates will now use the PATCH option of BUILD instead. One
consequence of this change is that you will have to mount the
distribution kit of these layered products to update them.
Previously, you could update those layered products using PBUILD
without having to mount their distribution kits.

See Section 2.16 for further information on updating Layered Products
in V9.0.

2.11.17   OPSER Package

Several changes have been made to the OPSER package programs for V9.0.
Listed below is a summary of the changes made.

   1.   General Changes:

        o   All of the OPSER work files and the queue file are now
             created and maintained in the OPSER package location
             (OPSER$:) instead of the system library (_SY0:[1,2]).

        o   All of the OPSER programs are now privileged and are
             installed with protection code <232>.

        o   You must have SWCFG privilege to run any of the following
             programs:

             -   OPSER

             -   QUEMAN

             -   SPOOL

- BATCH

2. QUE Modifications:

   o You must have WACNT privilege, GACNT privilege, or be an
     OPSER operator to specify a PPN other than your own when
     queuing, killing, or modifying jobs.

   o You must have read access to the file to be able to
     submit an entry for both BATCH and SPOOL, and you must
     have write access to the file to be able to specify /DE
     to delete the file.

   o You must be an OPSER operator or have SWCFG privilege in
     order to flush a queue via the F command.

3. OPSER/OPSRUN Modifications:

   o OPSRUN accepts commands sent to it from another job
     (running PLEASE) if:

     - The sending job has SWCFG privilege, or

     - The sender is a valid OPSER operator, i.e., the
       sender's PPN and keyboard number matches an entry in
       the valid-operator table.

4. QUEMAN/QUMRUN Modifications:

   o You must have TUNE privilege to specify /PRIORITY or
     /RUNBURST switches when starting up QUEMAN.

   o Problems encountered when the queue became full have been
     resolved.

   o Job owner must have write access to file for QUMRUN to
     process the delete file (/DE) switch.

   o File access checks (to ensure read access) are now
     performed by the server (SPLRUN/BATDEC) rather than by
     QUMRUN. This removes the timing window in case
     privileges are changed while the package is processing an
     entry.

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5. SPOOL/SPLIDL/SPLRUN Modifications:

    o You must have TUNE privilege to specify /PRIORITY or
       /RUNBURST switches when starting up SPOOL.

    o SPLRUN will now pass 8-bit characters rather than strip
       the 8th bit.

    o SPLRUN will now check read access to files immediately
       prior to printing. This eliminates a timing window that
       existed when QUMRUN performed the privilege checking.

6. BATCH/BATIDL/BATDEC/BATRUN Modifications:

    o You must have TUNE privilege to specify /PRIORITY or
       /RUNBURST switches when starting up BATCH.

    o BATDEC will now check read access immediately prior to
       reading the control file. This eliminates a timing
       window that existed when QUMRUN performed the privilege
       checking.

    o Submitter's account must have WACNT or GACNT privilege to
       specify an alternate account on the $JOB line.

    o Submitter's account must have TUNE privilege to specify a
       higher priority on the $JOB line. Note that lower
       priorities (lower than -8) are permitted by all users
       without TUNE privilege.

    o Prior to RSTS/E V9.0, batch jobs would run under the
       primary RTS unless /DCL was specified, in which case DCL
       was used. With RSTS/E V9.0, DCL can be the default RTS,
       and thus, BATRUN would use DCL regardless of a /DCL
       specification. Due to this, RT11 is now used unless /DCL
       was specified. Thus, batch jobs will always start under
       either RT11 or DCL, depending if /DCL was specified on
       the $JOB line.

2.11.18 FIT

The FIT program has been updated for multiple privileges. The program
must still have a protection code of <232>. Users are required to
have TMPPRV privilege in order to set the privilege bit of the
protection code when writing an executable task to a RSTS/E disk.

2.11.19 Error Package

The following is a list of changes that have been made to the Error
Package for V9.0:

- o The detailed error report for MSCP-class devices has been
  significantly enhanced for V9.0. The error packet type is
  now displayed, and only information meaningful for that
  packet type is listed. Field annotations have also been
  enhanced to reflect new device and controller types.

- o A new MSCP-class annotation file, called MSCPER.FIL, has been
  added. This file contains error information and text for
  MSCP-class devices.

- o SWCTL privilege is now required to run any portion of the
  Error Package.

2.11.20 QUOLST

The QUOLST program has been converted to BASIC-PLUS-2. It has been
updated to display the 24-bit unsigned integer values for the new
logged-in and logged-out quotas. The display has also been changed to
be more readable.

2.11.21 INIT

The INIT program, used to start timesharing in V8.0, is no longer
supplied in V9.0. System start up is now handled by the new DCL
command processor. See section 2.14 for further details.

2.11.22 TTYSET

The TTYSET program, used to set and display terminal characteristics
in V8.0, is no longer supplied in V9.0. The DCL commands SET TERMINAL
and SHOW TERMINAL now perform these functions.

2.11.23 RUNOFF

The RUNOFF program will no longer be supported after October, 1986 and
will be moved to the unsupported software kit (UNSUPP).

2.12   System Installation Procedures

Major' changes have been made to the system installation and update
process. Changes in INIT.SYS have been made to simplify the
installation and require less user interaction. DCL command files now
drive the installation and update process. This process has been
simplified to require less user interaction.

The installation procedure uses two media, the INSTALLATION medium,
and the LIBRARY medium. The INSTALLATION medium is booted and used to
start the installation, create and update your monitor, and update the
CUSPs. The LIBRARY medium, which contains the major portions of
RSTS/E, is then used to install any remaining CUSPs (those which have
not been updated). The files contained on these media are backup sets
created with the new BACKUP program. If your installation has
received its media in tape form, then the LIBRARY medium is an ANSI
tape, and the INSTALLATION medium is part DOS and part ANSI. For this
reason you cannot do a directory listing of the files contained on the
INSTALLATION tape.

Note

Before updating your system read the V9.0 *System
Installation and Update Guide*. In particular see Part
IV, "Updating a RSTS/E V9 System to a Newer Release."
Also see Part III, "Performing an Online System
Installation" for the procedures to perform a partial
installation.

In addition to the privileges listed in the *System
Installation and Update Guide*, you are also required
to have SYSIO and TMPPRV privileges to perform the
installation.

If you want to rebuild EDT, you will need the BLDEDT
package. To obtain this package you must specify the
package name BLDEDT in your list of packages to
install. It is not included if you specify "ALL."

2.13   Creating and Using a System Disk Recovery Medium

The new BACKUP package and the command file RECOVR.COM can be used to
create the necessary components needed to recreate your system disk in
the event that it becomes corrupted and unusable. The BACKUP package
allows you to backup your system disk once it has been created and
ready for normal timesharing use. The command file RECOVR.COM, which
is located in account [0,1], creates a bootable disk or tape

containing the minimum files needed to start your system. You can use
this command file to create this bootable disk or tape or
alternatively you can use the latest RSTS/E V9.0 INSTALLATION kit to
start your system. The procedures outlined below describe what steps
need to be followed to create the recovery medium and to restore the
system disk:

Creating the recovery medium:

1. After the system is installed, accounts have been created,
    and the system is generally useful; use the DCL BACKUP
    command to create a full backup of all accounts and files on
    the system.

2. Once the backup has completed, if you choose to do so, use
    the command file RECOVR.COM to create the bootable disk or
    tape from which the RESTORE command can be used to recreate
    the system disk.

3. Perform full system backups on a regular basis.

Recreating the system disk:

1. Boot the latest RSTS/E V9.0 INSTALLATION kit. Alternatively,
    boot the recovery disk/tape you created with the RECOVR.COM
    procedure.

2. Begin installation procedures. Note that this will
    reinitialize the system disk.

3. After answering "Yes" to the start timesharing question one
    of two things will occur:

    o If the latest RSTS/E V9.0 INSTALLATION kit was booted,
       you will be asked if you want to proceed. Respond by
       typing "No".

    o If the recovery disk/tape was booted, a message stating
       that the system is ready for you to begin using the
       RESTORE command is displayed.

4. At the DCL "$" prompt, physically mount your latest full
    backup set. Enter the RESTORE command specifying the
    /ACCOUNTING qualifier.

5. Next, mount the latest incremental backup (if you perform
    incremental backups) and issue the RESTORE command specifying
    /ACCOUNTING and /REPLACE.

6. When the restore completes, run the SHUTUP program and
    restart the system using your normal monitor (restored from
    the backup set).

7. The system disk is now back to the point of the last backup.

2.14   System Start-up Procedures

System startup is now done by means of DCL command files. Since the
RSX task loader and emulator are standard in all monitors, the RSX
run-time system is no longer required. For these reasons, DCL is the
only run-time system which is required to be in _SY0:[0,1]. It will
always be automatically installed as the system default keyboard
monitor, even if it is not the primary run-time system. DCL can also
be defined as the primary run-time system if sufficient memory is
available. Installations with moderate amounts of memory should use
RSX as the primary run-time system.

2.14.1   System Start-Up Command Files

Whenever a V9.0 system is started normally or restarted after a system
crash, the monitor executes the command file _SY0:[0,1]SYSINI.COM.
This command file performs any required start-up actions and is
reserved for use by DIGITAL; do not edit or modify it in any way.
SYSINI completes by executing the command file _SY0:[0,1]START.COM.
This command file contains all of the start-up commands necessary to
begin timesharing, and can be edited as necessary by the system
manager. The distributed version of START.COM is commented to
illustrate how various system start-up commands can be included.

The parameter P1 is passed to START.COM with the string value "START"
for normal system start-up, or "CRASH" if the system is restarting
after a system crash. The command file can conditionally execute
commands for each situation. Consequently, no CRASH.COM file or
nested command files are required, because all actions can be
performed within the single START.COM file. System managers who want
to logically group start-up commands in separate command files may
still do so.

The start-up utility INIT.BAS and its associated control files are no
longer supported, thus are not included with RSTS/E V9.0. Refer to
the *System Installation and Update Guide* or *System Manager's Guide* for
further details on system start-up.

2.15 Layered Product Update Notes

For instructions on how to patch or update your layered product,
please refer to the file *UPDATE.DOC* which is located in the directory
pointed to by the logical UPDATE$:.

2.16 RSTS/E Layered Products

Before beginning the installation of layered products set the system
tape label default to DOS (SET SYSTEM/LABEL=DOS), unless otherwise
noted by the layered product.

When using a layered product on RSTS/E V9.0, please be certain to set
the quotas, privileges, and account attributes to those indicated by
the layered product.

Refer to the *System Installation and Update Guide* and to the document
UPDATE.DOC, which is located in the account associated with the
logical name UPDATE$:, for further details on installing layered
products.

Note

> PBUILD is not included with RSTS/E V9.0. To patch
> those layered products that formerly used PBUILD, you
> will now need to mount the distribution kit for that
> layered product, run UPDATE$:BUILD and answer PATCH to
> the question BUILD/PATCH. For further information
> please refer to the document *UPDATE$:UPDATE.DOC*.

2.16.1 MACRO-11 5.3

The following changes have been made to MACRO-11:

o A symbolic expression involving one symbol from a relocatable
   PSECT and another symbol from an absolute PSECT was not being
   marked as complex. This resulted in incorrect linker output
   if the base of the absolute PSECT was at anything other then
   zero. This has been corrected.

o A symbolic expression involving two symbols, each from
   different absolute PSECTs was not being marked as complex.
   This resulted in incorrect linker output if the base of
   either PSECT was at anything other than zero. This has been
   corrected.

o   When a direct assignment was made to a symbol, specifying a
    value of the current location counter symbol '.' in an
    absolute PSECT, MACRO incorrectly bound the symbol to the
    .ABS. PSECT when it should have been bound to the absolute
    PSECT from which the direct assignment statement was
    executed. This has been corrected.

o   MACRO-11 hung in an infinite loop if it read a record with an
    invalid record size. This has been corrected.

o   Labels with invalid characters within them caused MACRO-11 to
    hang in an infinite loop if a macro with the same name as the
    valid part of the label name existed. This has been
    corrected.

o   Page 6-17 of the MACRO-11 LANGUAGE REFERENCE MANUAL
    incorrectly states that the .IDENT string appears in
    'Librarian directory listings'. This string will appear only
    in RSX librarian directory listings - not RT-11 librarian
    directory listings.

o   The .MCALL documentation in the MACRO-11 LANGUAGE REFERENCE
    MANUAL does not mention the fact that any macro's defined via
    the .MCALL statement are defined during pass-1 of the
    assembler only. These macros are not re-defined during
    pass-2 of the assembler, as in-line macros are. Thus, a
    macro which re-defines itself during execution, may not work
    in both the in-line and .MCALL case.

2.16.2   SORT/MERGE V3.0

If you encounter any unexplained failures of SORT/MERGE, the first
area you should check is the setting of the quotas, privileges, and
attributes for the users:

o   SWAP MAX must not exceed 32K at the time SORT/MERGE is
    installed.

    When installing SORT/MERGE, make sure that the SWAP MAX does
    not exceed 32K. By default the installation will specify the
    SORT and MERGE task to be the size of SWAP MAX. If SWAP MAX
    is greater than 32K the installation will be aborted by the
    command file.

o   Redirection of work files.

    Work files can be placed on another device, however, they

must have the SAME [ppn] as the account from which the SORT
command was issued. PDP-11 SORT/MERGE documentation
incorrectly states that the work files can be assigned to a
different account. DIGITAL recommends that you indicating
only the device and omit the [ppn] qualifier.

o Disk Quota requirements.

   SORT/MERGE will need sufficient disk quota to open several
   work files as well as the output file. The space needed
   varies depending on the size of the input file. In general,
   there has to be enough quota to write an output file of the
   same size as the input file and to open several work files
   that could have the same size as the input file.

   To be guaranteed to work the minimum disk quota required is:

   (number of work files + 1) * (total size of input files)

   If SORT/MERGE encounters insufficient disk quota one or both
   of the following error messages will occur aborting the job:

   SORT-F-CRSFOO: Error creating work file N: RMS codes -368/
   69

   SORT-F-CRSFOO: Error creating output file: RMS codes -368/
   69

No privileges or special account attributes are required.

2.16.3 EDT V3.0

If you encounter any unexplained failures of EDT, the first area you
should check is the setting of the quotas, privileges, and attributes
for the users:

o Disk Quota requirements.

   When EDT is invoked, a work file is created which is the same
   size as the input file. EDT also opens a journal file
   (unless suppressed) and adds to it continuously during the
   editing session. The MINIMUM amount of quota required would
   be (N + 1) blocks , where N is the size of the input file and
   1 is the default size of the journal file.

   If the disk quota is exceeded during an edit session, EDT
   will abort with the following error message.

        I/O error on work file

        ?Quota exceeded

        The terminals characteristics are changed requiring the
        terminal to be reset.

No privileges or special account attributes are required.

2.16.4   FORTRAN-77 DEBUG

If you encounter any unexplained failures of DEBUG, the first area you
should check is the setting of the quotas, privileges, and attributes
for the users. The quotas, privileges, and attributes required are:

    Job Quotas

        Detached : 1 or more
        Total   : 2 or more

Both debugger tasks, F77DEB.TSK and F77DBG.TSK must have a protection
code of <232> for proper operation of the debugger. The user does not
require any privileges or special account attributes.

2.16.5   COBOL V4.4

If you encounter any unexplained failures of PDP-11 COBOL, the first
area you should check is the setting of the quotas, privileges, and
attributes for the users. The quotas, privileges, and attributes
required are:

    Disk Quota

        Logged-in   : 100 or more

No privileges or special account attributes are required.

2.16.6   DATATRIEVE-11 V3.1

If you encounter any unexplained failures of DTR or DDMF, the first
area you should check is the setting of the quotas, privileges, and
attributes for the users.

Note, passwords when using REMDTR will be limited to 8 characters.
This will be fixed in a future update of DATATRIEVE-11.

Also, after building DDMF, RUN DECNET$:NCP and execute the following
commands :

    DEFINE OBJECT 30 VERIFICATION ON

    SET OBJECT 30 VERIFICATION ON

    EXIT

Failure to execute the above commands will result in the DDMF only
accepting 6 character passwords.

    Disk Quota

        Logged-in : 200 or more

    Job Quota

        Detached : 1 or more on the system you are accessing using REMDTR

No privileges or special account attributes are required to use DTR or
REMDTR. If you use REMDTR, your account on the remote system (where
DDMF runs) must have the NETWORK attribute enabled.

2.16.7   BASIC-PLUS-2

If you encounter any unexplained failures of BP2, the first area you
should check is the setting of the quotas, privileges, and attributes
for the users. The quotas, privileges, and attributes required are:

    Disk Quota

        Logged-in : 1000 blocks or more

No privileges or special account attributes are required.

2.16.7.1   BASIC-PLUS-2 Installation

When installing BASIC-PLUS-2 on RSTS/E Version 9.0, please be certain
to set the following quotas, privileges, and attributes for the
account from which BP2 is installed. These quotas, privileges, and
attributes are the minimum set for the installation of BP2.

If you encounter any unexplained failures of BP2, during the
installation, the first area you should check is the setting of the
quotas, privileges, and attributes for the installation account. The
quotas, privileges, and attributes required are:

    Disk Quota

        Logged-in : 6000 blocks

    Job Quota

        Total   : 2 or more

You also must have the following privileges and attributes set:

    PRIVILEGES   ATTRIBUTES

        WWRITE   Interactive
        WREAD   Nocaptive
        HWCTL
        DEVICE
        INSTAL
        SYSIO
        MOUNT

2.16.8   COBOL-81 V2.3

If you encounter any unexplained failures of COBOL-81, the first area
you should check is the setting of the quotas for the users. The
quotas, privileges, and attributes required are:

    Disk Quota

        Logged-in : 100 or more

No privileges or special account attributes are required.

2.16.9   DECdx

If you have the layered product, DECdx V1.0, you will need to add the
following CCL command before installing DECdx:

    DEFINE/COMMAND/SYSTEM QUE OPSER$:QUE.TSK/LINE=30000/PRIVILEGE

Note that the old spooler (OPSER) must be installed and started before
this CCL will work. If you have not installed and started the old

spooler, then either install the old spooler or edit the DECdx control
file and remove the line "QUE SY:[1,2]DDXRLS.RST". If you want a
listing of the DECdx release notes just print the file DDXRLS.RST.

Note

> Even though the installation of DECdx will abort if
> the old spooling package is not installed or if the
> DECdx control file is not edited as described above,
> the DECdx installation is still completed. The only
> remaining item not completed is the defining of the
> DECdx CCL command. This can be done manually by
> adding the following DCL command to your START.COM
> file:
>
> DEFINE/COMMAND/SYSTEM DDX [1,2]DDX.TSK/LINE=0

2.16.10 DECmail-11 V2.0 for RSTS/E V9.0

2.16.10.1 DECmail-11 V2.0 System Management

DECmail-11 V2.0 requires the system manager's account to reflect the
characteristics of a privileged RSTS/E V8.0 account. In order for the
system manager to perform DECmail-11 commands which access the global
MAIL:MAIL.SYS file (ie. commands with /SYSTEM qualifiers, system wide
node name operations, and SET TERMINAL KBnn:/[NO]BROADCAST commands),
the system manager's account must be a [1,*] account with EXQTA,
WREAD, and WWRITE privileges.

2.16.10.2 Pre-installation Requirements

Before attempting the installation of DECmail-11 V2.0 on RSTS/E V9.0,
the following requirements must be met, as well as those listed in the
DECmail-11 Installation and System Manager's Guide for RSTS:

o   Logins must be enabled. Type: SET SYSTEM/LOGINS

o   Your current account must have all RSTS/E V9.0 privileges,
    with the exception of USER1-8, SYSMOD and EXQTA.

o   The MAIL: account must be created, if it does not already
    exist, with the command:

    CREATE/ACCOUNT/NOUSER

o   Account [1,2] must have detached and job quotas of 1 or more.

o   Mail user accounts must have reasonable disk quota limits and
    job quotas of 1 or more.

2.16.10.3   DECmail-11 V2.0 Installation Procedure

In order to install DECmail-11 V2.0 on RSTS/E V9.0, you must copy the
patches for DECmail-11 by typing "@[0,1]COPYUP MAIL". After the
patches have been copied start the build procedure by typing "RUN
UPDATE$:BUILD" and answer the build questions as they appear in the
DECmail-11 Installation and System Manager's Guide for RSTS.

The installation of DECmail-11 V2.0 on RSTS/E V9.0 will produce minor
utility errors which do not affect the installation of DECmail-11.
The failing operations are:

o   The RUN SY:[1,2]TTYSET command fails with errors because the
    TTYSET program is not included in RSTS/E V9.0. This command
    merely tries to set the terminal width to 132 columns and
    does not affect the final operation of DECmail-11.

o   The RUN SY:[1,2]NCP command fails with a "?Can't find file or
    account" error and two "?Illegal...." errors. This does not
    affect the installation of DECmail-11 since the correct NCP
    commands are performed just prior to that section. Note that
    the NCP commands are executed ONLY if you answered YES to the
    multi-node DECnet support question.

2.16.10.4   Support and Restrictions Concerning PBS

DECmail-11 now uses the new RSTS/E V9.0 PBS service for printing
messages, for sending messages via BATCH, and for the Auto-Answer
feature. For this update of DECmail-11, the following restrictions
exist when using PBS:

o   The BA0: PBS queue is used for Auto-Answer and mail sent via
    BATCH. For customers who expect mail users to be sending
    large amounts of batched mail requiring long sending periods,
    the BA0 queue CPU and elapsed time limits should be set
    accordingly.

o   DECmail-11's default print queue is LP0:. User's may specify
    other print queues in mail, provided the queue name is in the

format LPn: where "n" is a number from 0 to 7.

o The SHOW QUEUE/BATCH command on page 36 of the *DECMAIL-11
   Installation and System Manager's Guide for RSTS* has been
   changed to SHOW ENTRY/ALL/BATCH.

o Since DECMAIL-11 use PBS to send "batched" mail, it is
   suggested that the following command line be included as the
   first line in the users' LOGIN.COM file to prevent any
   conflicts with DCL commands:

   IF F$ACCESS .EQS. "BATCH" THEN EXIT

2.16.10.5   Non-trappable "?Quota Exceeded" Error

User's may experience a currently non-trappable "?Quota Exceeded"
error in DECmail-11 when mail attempts to deposit new mail messages in
the addressee's mail folder. The work around is to increase the disk
quota limits of the addressees.

2.16.11   DIBOL V5.1A

2.16.11.1   DIBOL Installation Procedures

Installation of DIBOL V5.1A on RSTS/E V9.0 uses the BUILD utility and,
except for changes in BUILD itself, follows the procedures described
in the *RSTS/E DIBOL Release Notes and Installation Guide*. Refer to
the *RSTS/E V9.0 Release Notes* and the *RSTS/E System Installation and
Update Guide* for documentation on using BUILD.

It is mandatory that DIBOL on RSTS/E V9.0 be installed using the
BUILD/PATCH option of BUILD. Therefore, you must move the patch files
from the RSTS/E installation kit to the system patch account before
using BUILD. These patch files can be moved as part of the original
RSTS/E installation (See Part I, Phase 4, Task 1 of the *RSTS/E System
Installation and Update Guide)* or by using the command "@[0,1]COPYUP
DIBOL" (See Part IV, Phase 6, Task 1 of the *RSTS/E System Installation
and Update Guide).*

Note

The DIBOL installation procedure warns that the RSTS/E
feature patch 3.1.5 must be installed. This patch has
been removed in V9.0 and is no longer required.

2.16.11.2 Current DIBOL Restrictions

The following is a list of known restrictions:

- o Use of the FORM qualifier in the LPQUE statement requires
     that the RSTS/E OPSER-based spooling package be running.

- o Use of the LPNUM qualifier in the LPQUE statement requires
     that there be RSTS/E PBS print queues named LP0, LP1, LP2,
     etc.

- o The DECFORM compilers, FOCOMP and FOCOMR, require that the
     OPSER-based batch package be running.

- o Accounts from which DIBOL programs will be run should be
     created with a MESSAGEQUOTA of at least 12 (the default).

2.16.12 RPGII V8.8

The installation of RPGII V8.8 on RSTS/E V9.0 differs from the
installation procedures described in the *PDP-11 RPGII Release Notes*
and the RPGII *Installation Guide* section 4.0.

To install RPGII on RSTS/E V9.0, copy the files named CSPCOM.TSK and
CSPCOM.OLB to the corresponding standard library accounts SY0:[1,2]
and LB:.

    $COPY UPDATE$:CSPCOM.TSK SY:[1,2]CSPCOM.TSK

    $COPY UPDATE$:CSPCOM.OLB LB:CSPCOM.OLB

Proceed with the installation procedures as documented in section 4.0
of the *RPGII Installation Guide*.

2.16.13 TECO

TECO has been updated to Version 40, and corresponds closely to the
version of TECO being supplied with VMS V4.0. Updated documentation
(machine readable) is included on the kit.

2.17 Old Problems Corrected

Various system problems found after the release of RSTS/E V8.0 were
fixed in RSTS/E V9.0. All applicable mandatory RSTS/E Software
Dispatch articles published through June 1985 have been incorporated
into RSTS/E V9.0.

2.18 Distribution Media

RSTS/E will no longer be distributed on RL01, RK05 and RK06 disks.
This change became effective after Update Kit F. The RK06 and RL01
will continue to be supported as both system and data devices. \The
RK05 disk on the other hand is only supported as a data device not as
a system disk. In addition, the 800 BPI tape distribution will be
distributed on 2400 foot reels rather than 600 foot reels.

RSTS/E V9.0 is distributed on the following media:

        9-Track Magnetic Tape - 800 BPI (TU10/TE10/TU16/TE16/TU45/TU77)
        9-Track Magnetic Tape - 1600 BPI (TS11/TU80/TE16/TU77)
        RK07 Disk Cartridge
        RL02 Disk Cartridge

Please refer to Section 3.1 of these Release Notes for more
information on the distribution kits.

2.19 Optional Software

Refer to the RSTS/E V9.0 Optional Software Cross Reference Table of
the SPD for a complete list of optional layered products that are
supported on RSTS/E V9.0.

2.20 Support for RSTS/E V8.0

RSTS/E V8.0 will be supported for 6 months after the release of RSTS/E
V9.0.

3 RSTS/E V9.0 Distribution Kits

3.1 Distribution Kit Order Numbers

This chapter provides you with the most current order numbers for the
RSTS/E distribution kits. For the most current order numbers of other
optional software kit(s) see the bill of materials. The *System
Installation and Update Guide* tells you to check these order numbers
prior to beginning the actual installation.

DIGITAL sends you distribution kits on one of the following:

    o 9-track magnetic tape (800 bpi)

    o 9-track magnetic tape (1600 bpi)

    o RL02 disk cartridge

    o RK07 disk cartridge

3.1.1 RSTS/E V9.0 Distribution Kit

The RSTS/E V9.0 distribution kit consists of the tapes or disks that
contain the programs and files you need to perform an installation.
This section lists the order numbers for the RSTS/E V9.0 distribution
kits. You should compare the numbers on the tapes or disks that make
up your kit to the numbers shown here, when you are instructed to do
so by the *System Installation and Update Guide*.

DEC Order Number	Pack ID	Label Title
9-Track Magnetic Tape (800 bpi)		
AP-2753k-BC	SYS090	RSTS/E V9 LIBRARY 8MT9
AP-C883F-BC	UPD093	RSTS/E V9.0 INSTALLATION 8MT9 1/2
AP-P013H-BC	BACKUP	RSTS/E V9.0 INSTALLATION 8MT9 2/2
9-Track Magnetic Tape (1600 bpi)		
BB-H751M-BC	SYS090	RSTS/E V9 LIBRARY 16MT9
BB-P016H-BC	UPD093	RSTS/E V9.0 INSTALLATION 16MT9
RK07 Disk Cartridge		
AY-D526M-BC	SYS090	RSTS/E V9 LIBRARY RK7
AY-P019H-BC	UPD093	RSTS/E V9.0 INSTALLATION RK7
RL02 Disk Cartridge		
BC-J026G-BC	SYS090	RSTS/E V9 LIBRARY RL2
BC-P015H-BC	UPD093	RSTS/E V9.0 INSTALLATION RL2 1/2
BC-V352B-BC	BACKUP	RSTS/E V9.0 INSTALLATION RL2 2/2

3.1.2 RSTS/E V9.0 Installation Kits

You will receive this kit approximately every three months between
releases, and the kits are labeled 9.1, 9.2, 9.3 and so forth.
Because each kit is cumulative, use the most current one. For
example, version 9.3 contains all of the patches and replacement
modules that were on 9.1 and 9.2 in addition to some new patches and
replacement modules.

3.2 Unsupported Components

Note

The following modules are not released products
supported by DIGITAL for use on RSTS/E, and their
inclusion on the distribution kit does not imply
recommendation or endorsement by DIGITAL regarding

their use. There is no commitment by DIGITAL to
continue to include any of these modules in future
distributions of RSTS/E. Each of these modules is to
be considered "user supported".

The RSTS/E Development Group would like to be informed
of any problems with or suggestions concerning these
components, as supplied with RSTS/E V9.0. A
reasonable effort will be made to respond to such
feedback, although problem fixes cannot be guaranteed.
If you choose to provide reports on unsupported
components via the SPR mechanism, please check
Priority 5, "Documentation/Suggestion."

3.2.1 RNO

RNO is available from the DECUS library and is widely used on RSTS/E.
It is included on the distribution kit for your convenience.

RNO is a variant of the RUNOFF program (which is part of the RSTS/E
library of system programs). RNO is written in MACRO-11 and generally
executes much faster than RUNOFF, which is written in BASIC-PLUS.
However, RNO is not completely compatible with RUNOFF, and may
sometimes produce different results. This version of RNO was
originally developed on RSX-11M and was distributed with the V3
release of that system.

For those users wanting to make their own modifications to RNO,
sources are included with this distribution. The RSTS/E Development
Group would appreciate hearing from any user making modifications in
the hope that such feedback will help to improve the program for
future releases.

3.2.2 TECO

TECO is a character-oriented text editor that is implemented on all
major DIGITAL operating systems. TECO has many powerful features as a
text editor and is especially popular among programmers. Many users,
however, find TECO's set of commands rather cryptic, while others
prefer line-oriented editors. For these users, an editor like the DEC
standard editor, EDT, is more appropriate.

A copy of the *PDP-11 TECO User's Guide* is included in the
documentation set and a document file is included on the distribution
kit explaining the use of the TECO Video Terminal Editor (VTEDIT).
For installation instructions, see Part I, Phase 4 of the *System
Installation and Update Guide*.

3.2.3 SRCCOM.SAV and DUMP.SAV

RSTS/E users who are also users of RT11 may find SRCCOM.SAV (a text
comparison program) and DUMP.SAV (a files dump/display program) useful
on RSTS/E, although such use is not supported by DIGITAL.

The SRCCOM.SAV and DUMP.SAV files on the RSTS/E distribution kits are
identical to the SRCCOM.SAV and DUMP.SAV files supplied with RT11
V4.0. Installation of each program consists of copying it from the
distribution kit.

3.2.4 RSTSFLX

RSTSFLX is a program which will run on any VAX/VMS system. RSTSFLX
reads files from a RSTS disk and copies those files to a VMS disk.
This allows for easy interchange from RSTS to VMS. More information
is available on the distribution kit in RSTSFL.DOC and RSTSFL.HLP.

3.2.5 STATUS

The STATUS program has been changed to read statistics from the
statistics table in XBUF. The source file, STATUS.B2S, will no longer
compile under BASIC-PLUS.

3.2.6 QSTATS

The QSTATS program has been changed to read statistics from the
statistics table in XBUF. The source file, QSTATS.B2S, will no longer
compile under BASIC-PLUS.

3.2.7 UNSUPP Package Components

The following is a list of components and executable tasks which are provided in the UNSUPP (unsupported software) package:

Component	Description
MONEY .BAS	Program to display accounting data
MONEY .TSK	Task file for MONEY.BAS
DSKDMP.BAS	Program for producing formatted dumps of files
DSKDMP.TSK	Task file for DSKDMP.BAS
DSKDMP.HLP	Help file for DSKDMP.BAS
STATUS.B2S	Monitor statistics program
QSTATS.B2S	Monitor statistics program
LQSTAT.BAS	Monitor statistics program
STATUS.TSK	Task file for STATUS.B2S
QSTATS.TSK	Task file for QSTATS.B2S
LQSTAT.TSK	Task file for LQSTAT.BAS
DSKPEK.OBJ	Subroutine for monitor statistics programs
QSTATS.DOC	Documentation file for QSTATS.B2S program
MEMORY.BAS	Program to display current items in memory
MEMORY.TSK	Task file for easy installation of MEMORY program
FLOAT .BAS	Program to determine floating device addresses
FLOAT .TSK	Task file for easy installation of FLOAT program
DIALER.BAS	Auto dialer for some VADIC type hardware
DIALER.DOC	Documentation for using DIALER.BAS and CONNEC.BAS
DIALER.TSK	Task file for DIALER.BAS
CONNEC.BAS	Program for use with DIALER
CONNEC.TSK	Task file for CONNEC.BAS
EMTCPY.BAS	Sample program for use with the EMT logger
EMTCPY.TSK	Task file for EMTCPY.BAS
RSTSFL.OBJ	VMS program for reading RSTS/E disks
RSTSFL.OLB	Library used to build RSTSFL on VMS
RSTSFL.DOC	Documentation for VMS RSTSFLX program
RSTSFL.HLP	Help file for VMS RSTSFLX program
B2CREF.TSK	Basic-Plus (+2 also) cross reference generator
B2CREF.HLP	Help file for B2CREF.TSK
B2CREF.DOC	Documentation for B2CREF.TSK
BPDA .BAS	Basic-Plus DUMP analysis program
BPDA .TSK	Task file for BPDA.BAS

Component	Description
RNO .TSK	RSX RNO program
RNO .RNO	RNO documentation in RNO format
RNOBLD.CMD	TKB command file to build RNO
RNOBLD.ODL	TKB ODL file to build RNO
RNPRE .MAC	RNO source file
COMND .MAC	" " "
CMTAB .MAC	" " "
ERMSG .MAC	" " "
FMTCM .MAC	" " "
HYPHEN.MAC	" " "
INDEX .MAC	" " "
PINDX .MAC	" " "
RNCMD .MAC	" " "
RNFIO .MAC	" " "
RNORSX.MAC	" " "
RUNOFF.MAC	" " "
START .MAC	" " "
DUMP .SAV	RT11 program for producing formatted dumps of files
SRCCOM.SAV	RT11 program for doing file comparisons

These files are transferred to your system by specifying the package name UNSUPP in your list of packages to install. The UNSUPP package is included if you specify "ALL."

4   RMS-11 V2.0 For RSTS/E V9.0

4.1   RMS-11 Access Methods Features

4.1.1   Segmented Resident Library

A performance improvement has been made in the way your task attaches
to the RMS resident library. Due to an improvement in the RSTS/E
monitor it is no longer necessary for RMS to reattach to the desired
satellite. All satellites will be attached at the beginning of RMS
operations only.

4.1.2   Support for I&D Space

You can task-build with the /ID switch. This means that your task is
able to be divided into separate sections of Instructions and Data.
In most cases this will allow greater virtual task size since two sets
of APRs are available to an I&D task.

4.1.3   User Friendly STV Errors

On certain RMS errors the STV is used to provide the operating system
error. In the past this value was presented as a negated RSTS/E
system error. This has been corrected so that RSTS/E errors are in
the same form as those documented in the *RSTS/E Programming Manual*.

4.1.4   Remote File and Record Access via DECNET

If suitable DECNET facilities exist on your system and on the target
system, RMS-11 V2.0 will allow file and record access to files

residing on other network nodes, provided that such nodes include an
RMS-based File Access Listener (FAL).

For most purposes, remote access is indistinguishable from local
access, though performance may not be equivalent. The following
general limitations apply:

   o RMS-11 generally does not support remote functions which are
      not supported locally.

   o Certain RMS functions (wildcard support, $PARSE, $SEARCH,
      $RENAME, and transmission of device, directory, and file
      identifiers) are not supported by the Data Access Protocol
      (DAP) used, and hence cannot be executed remotely.

   o Certain FALs do not support the full set of RMS functions
      expressible via DAP, and hence further limit remote access.

   o Higher-level languages may not allow expression of the file
      specification necessary to establish contact with a remote
      node.

To operate upon a remote file, your program must include a node
specification for the remote file and you must include the RMS remote
access code when you build your task.

4.1.4.1 Remote Node Specification

You must include a remote node specification at the start of the File
Name String or the Default Name String you provide to an $OPEN,
$CREATE, or $ERASE operation. In addition, your File Name String and
Default Name String must conform to the DIGITAL Command Language (DCL)
file specification syntax rules. The file specification resulting
from the merge of these two strings must conform to the file
specification conventions on the destination system as well.

In general, a file specification consisting of the elements:

     nodespec::devicespec:[directoryspec]filename.filetype

in the order (and with the delimiters) presented is appropriate where
the elements to the right of the nodespec conform to the conventions
of the target system. Elements not present will be defaulted
according to the conventions of the target system.

The nodespec:: element is of the form:

     node"user password account"::

where node is the (required) destination node name and "user password
account" is an (optional) access control string containing login
information acceptable to the remote system.

If "user password account" is provided, the device and directory
defaults and access privileges of that remote account are acquired; if
not, the device and directory defaults and access privileges of the
default DECNET account on the remote system are acquired.

4.1.4.2 Support for DECNET Extended Access Control Strings

In the past the size limits of the three fields of the network access
control string were 16, 8 and 16 characters respectively. This has
been increased to 39 characters maximum for each field, thus providing
the capability of passing longer passwords (now available on RSTS/E
V9.0 and VMS V4.0) and longer system passwords (passed in the account
field).

4.1.4.3 Linking Programs with RMSDAP Support

To link your program with remote RMSDAP modules you can use either the
disk-overlaid version, or reference the DAPRES resident library.

To link with the disk-overlaid version, insert the reference
"@LB:DAP11X" in your ODL. As with other RMS ODLs, you reference the
RMS root modules as RMSROT, and specify other RMS modules as the
co-tree, RMSALL.

To link with the DAPRES resident library, insert the reference
"@LB:DAPRLX", and specify RMSRES and DAPRES in your TKB command file.
RMSRES and DAPRES can be specified as single resident libraries
(LIBR=RMSRES:RO, LIBR=DAPRES:RO), or as clustered resident libraries
(CLSTR=RMSRES,DAPRES:RO).

Note that DAPRES is a clusterable, task-independent library (see
RMS-11 User's Guide Chapter 8 for further information). It is not a
segmented library.

4.1.4.4 RMSDAP Environments

RMS-based FALs are currently available on VAX/VMS, RSTS/E, RSX-11M,
and RSX-11M-PLUS systems. The version of Data Access Protocol which
is used must be at least 5.6 or greater; this means that you must have

at least Version 2.1 of DECNET/E, Version 3.1 of DECNET for 11M,
version 1.1 of DECNET for 11MPLUS, or Version 2.0 of DECNET for VMS.

For more information on remote access using RMS-11, see Appendix B of
the *RMS-11 Users Guide*.

4.2   RMS-11 Utilities Features

4.2.1   New Feature for RMSCNV

DIGITAL has provided the /ER switch for the RMSCNV utility. There is
no reference to this switch in the documentation. The purpose of this
switch is to allow RMSCNV to continue processing a file after
encountering an exception record.

The format of the switch is:

    /ER:filename

If no /ER switch is used RMSCNV will terminate after encountering the
first exception record. It will also issue an error message
indicating the type of exception record.

If the /ER:file-spec switch is used, RMSCNV will continue processing
the file. The exception records encountered will be placed in that
file. In either case the exceptions are described via a prefix code
in the same way as RMSIFL. Refer to the *RMS-11 Utilities Manual* (Page
3-6) for further details.

4.3   Problems Fixed with this Version

4.3.1   RMS-11 Access Methods

   o   Records loaded into an indexed file by descending key were
       not all found by random access or sequential access. This
       has been corrected.

   o   The first word of a block in a file was sometimes corrupted
       with a -1 when update was done on a sequential file. This
       will occur when a find or an update follows a get on the last
       record in a block, if that record ends at the end-of-file or
       within one byte of end-of-file. The -1 will be in the first
       word of the block. This has been corrected.

o Open by File ID now works correctly.

o. On failure to create due to non-existent directory, RMS
   returned "file not found" in the STV. This has been
   corrected.

o Deferred Write now works as documented. RMS was failing to
   set this bit in its internal data structures.

4.3.2   Remote Access Methods (RMSDAP)

RMSDAP now allows RSTS/E to perform remote access on indexed files.

4.3.3   RMS-11 Utilities

4.3.3.1   RMSCNV

o A problem with the /EO switch in RMSCNV has now been fixed.
   This switch enables the conversion of the ASCII CTRL/Z EOF
   terminator to a null, and pads the rest of the file with
   nulls.

o CNV is now able to convert an input file to stream format.

o RMSCNV had problems calculating the amount of available
   memory for output buffering. This occurred in two cases with
   different error messages reported as follows:

   1. When trying to append records from a large index file
       into a sequential file, RMSCNV would abort with a MEMORY
       PROTECTION VIOLATION.

   2. When a large cluster size was involved RMSCNV would abort
       with DYNAMIC MEMORY EXHAUSTED.

4.3.3.2   RMSDSP

o DSP did not correctly display the complete attributes of a
   file that was held OPEN by another user. This has been

corrected so that if DSP can access the file it returns the
correct attributes.

o   A full display of files contained in a magtape container
    showed incorrect values for the PPN. The Project and
    Programmer fields were reversed. This has been corrected.

4.3.3.3   RMSIFL

o   Records loaded into an indexed file by RMSIFL were not all
    found by random access or sequential access. This has been
    corrected.

o   The use of /DE allows the five IFL sort files to be
    redirected to alternate devices (other than the users
    device). This switch failed in several ways. It either
    reported failure to Create IFLA.TMP or Extraneous Data in
    File Specification (ER$XTR). This has been corrected.

o   The use of IFL with an indirect command file (IFL @file.cmd)
    would report "?Output file must be empty" on any commands
    following the first command. This would abort a batch
    submission. This problem has been corrected.

o   IFL was crashing with an odd address trap when IFLing a file
    using the /ER:name switch. This has been corrected.

o   IFL was displaying garbage as the Exception Record Type in
    the exception record file if the exception record was
    detected on the alternate key. This has been corrected.

o   The statistics displayed on the screen at the end of IFLing a
    file reported an incorrect Output Record Count and Exception
    Record Count. Any exception detected in the alternate key
    caused these counts to be displayed as "????". This has been
    corrected.

o   IFL was displaying an INCORRECT Primary Key value on the
    screen when exception records were detected on Primary Key.
    Exceptions on Alternate Keys worked fine. This only failed
    when no /ER switch was specified. This has been corrected.

o   The Exception Record codes in the *RSTS/E RMS-11 Utilities
    Manual* (Page 3-6) should be modified as follows:

        002:   Record contains a duplicate key where not allowed

This change indicates a duplicate in either the primary or alternate key fields when no-duplicates was specified.

o IFL did not correctly handle PACKED DECIMAL alternate keys. It rejected these as exception records during the alternate key loading phase. This has been corrected.

o IFL did not return correct exit status after encountering a corrupted index. This caused batch jobs to run incorrectly. This has been corrected.

4.3.3.4 RMSRST

o The /SE switch is used to selectively restore files from a container. RMSRST did not always find the files specified due to an incorrect order-based algorithm. This has been corrected.

o When an explicit file spec was given with the /SE switch, RST found the file but continued "searching" through the tape. This has been corrected.

o The use of wildcard directory in the output specification did not restore the file(s) to the original owner account as documented. This has been corrected.

o A non-privileged user was able to restore backed-up files to a privileged account. This no longer possible.

o The /OA switch is used to restore files from a magtape container based on the original owner account. When the switch included a decimal number in the PPN, this was being misinterpreted as an octal value. Consequently, when the container contained two files with the same name but different PPNs, it was possible for RMSRST to restore the wrong file. This has been corrected.

4.4 Known Problems with this Version

4.4.1 RMS-11 Access Methods

o RMS-11 allows the creation of an indexed file whose maximum
   record size exceeds its bucket size. However, the file is
   not useable. Users should avoid this situation.

o There are problems with $UPDATE operations to an indexed
   variable file containing alternate keys when record sizes are
   increased during updates. In cases where the new record no
   longer fits in the old bucket, it is written to a new bucket
   with an incorrect RRV pointer. Later attempts to get that
   record via alternate key will return ER$RRV. If alternate
   key access is desired it is necessary to reload the file via
   IFL. The problem can be reduced by increased bucket size,
   however DIGITAL recommends avoiding the use of changing
   record sizes until this problem is fixed.

o Locate Mode does not work when accessing a sequential fixed
   file and the target record ends on the block boundary. This
   impairs performance. You can work around this by not using a
   fixed record size that allows records to fit perfectly in a
   block.

o RMS-11 tasks will go into Sleep state if performing record
   access to temporary indexed fixed files opened access modify,
   allow modify. To avoid this problem remove the "allow
   modify".

4.4.2 RMS-11 Utilities

4.4.2.1 RMSDES

o Using default areas - when the record size is greater than
   1024 bytes DES selects area bucket sizes that are not large
   enough. The file is successfully created but is unuseable.
   You should override this with the correct area bucket sizes
   using the DES SET commands.

o Using default areas - when there are a larger amount of
   duplicates than can fit in a bucket (see *RMS-11 Users Guide*
   chapter 6 for calculation) RMSDES sets up larger than

necessary area allocations. These can be overridden by DES
SET commands or the number of duplicates can be reduced and
DES will allocate more conservatively.

o SET FILE CLUSTERSIZE works incorrectly. It does not permit
   the values 256 and -1 through -256. Until this is corrected
   you may enter 255 to obtain 256 or zero to obtain the default
   cluster size of the device. Note that in RSTS/E V9.0 the
   monitor will now select an optimal cluster size if the
   cluster size is zero. Therefore, preallocating your files
   whenever possible takes advantage of this new V9.0 feature.
   See section 1.6.6 for further information on automatic
   cluster size optimization.

o When a Packed Decimal Key Field is selected, DES never
   prompts for the length of this field. A subsequent CREATE
   returns an error "Invalid Key Field Specified for File".
   Therefore, if a packed decimal key is selected you must
   explicitly set the segment length.

4.4.2.2 RMSIFL

o There exists a problem in RMSIFL that restricts the multiple
   IFLing of files with the /DE switch and specifying 5 devices
   within the same IFL session. The temporary work around is to
   invoke IFL for each file.

o RMSIFL does not use a stable sort. Hence if called upon to
   sort the primary key it will not preserve the first in first
   out ordering of duplicates. Users should use RMSCNV to
   convert a non-indexed file to indexed. Thereafter use RMSIFL
   with /NOSO.

4.4.2.3 Others

o RMSCNV and RMSIFL do not use area extension quantities when
   loading a file. Instead they use preset values.

4.5 Documentation

The RMS-11 V2.0 documentation has not been revised since the release
of RSTS/E V8.0. The following errors exist:

o *RMS-11 User Guide* Appendix B Remote File and Record Access
   via DECnet

   This section points out that the RSTS/E FAL does not support
   remote record access to indexed files. This is no longer
   true. ISAM access is supported by DECnet/E V2.1.

o *RMS-11 User Guide* chapter 8 page 8-7 shows incorrect syntax
   for the cluster option in your Task Builder command file. It
   should read:

       CLSTR = RMSRES,DAPRES:RO

o *RMS-11 Macro Programmer's Guide* section 2.3, page 2-4, shows
   the argument of P$BUF as "buf count". This should read "I/O
   poolsize" as discussed in section 2.3.4.

o *RMS-11 Macro Programmer's Guide* section 5.17, page 5-63, the
   last paragraph incorrectly describes the use of the FID field
   in the NAM block. It should read "if this value is
   non-zero".

4.5.1 Additions to documentation

o *RMS-11 User Guide* Chapter 2 section 2.2.3.3 Discussion of
   Deadlock - It should also be noted that an application should
   not use multi-channel access to write to the same indexed
   file. When RMS-11 needs to update an RRV which is currently
   locked, it must wait for that lock to be released. Control
   will not be returned to the user program until this occurs.
   Since the lock is held on another channel within the same
   program, this is deadlock. However, RMS-11 can update an RRV
   in a bucket that is locked on another stream within the same
   program. See your programming language documentation for
   implementation of multi-streaming.

o *RMS-11 User Guide* Chapter 6 section 6.3 Discussion of
   Contiguity areas - This is the default for multi-area
   contiguous files. A small benefit might be obtained by
   setting areas contiguous on a non-contiguous file. However,
   there is no vehicle for RMS-11 to determine if those areas

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remain contiguous. Consequently RMSDSP and RMSDES will
display them as non-contiguous. As long as the areas are
preallocated they will behave as contiguous areas. However,
once the file is extended they will not.

o   *RMS-11 User Guide* Chapter 6 section 6.2.4 Discussion of
    Writing a record - Users should note that if the record
    includes a partial alternate key but the record is not large
    enough to include space for the full alternate key field then
    RMS-11 will insert the record in the file, however it will
    not insert a pointer to the record in the alternate key
    tree structure. Therefore, any attempt to access the record
    by the alternate key will return "record not found".

o   *RMS-11 Macro Programmer's Guide* Appendix A p.A-13 - ER$RSZ
    may also be caused by an attempt to insert a record that is
    too small to contain the whole primary key field.

4.6 RMS-11 Files and Placement

File Name	Destination	Comments
RMSMAC.MLB	LB:	Can be deleted if you are not using MACRO RMS programs.
RMSLIB.OLB	LB:	Object library for RMS local access.
RMSDAP.OLB	LB:	Object library for RMS remote access. Can be deleted if you don't need remote access.
RMSDES.HLP	LB:	RMSDES indexed help file
RMSFUN.OBJ	SY:/deleted	Concatenated object module containing objects to be put in LB:SYSLIB
RMS11.ODL	LB:	Prototype ODL file
RORMS1.MAC	LB:	For use with the prototype ODL
RMS11S.ODL	LB:	ODL file for sequential
RMS12S.ODL	LB:	ODL file for sequential
RMS11X.ODL	LB:	Standard indexed file ODL
RMS12X.ODL	LB:	Indexed file ODL
RMSRLX.ODL	LB:	ODL for use with RMSRES
DAP11X.ODL	LB:	ODL for use with overlaid DAP
DAPRLX.ODL	LB:	ODL for use with DAPRES

```
------------------------------------------------------------------------
: File Name   : Destination   :   Comments :
------------------------------------------------------------------------
```

File Name	Destination	Comments
RMSRES.LIB	RMS$	Library image for RMSRES "root"
RMSRES.TSK	LB:	TSK image for linking against RMSRES
RMSRES.STB	LB:	STB file for linking against RMSRES
RMSLBA.LIB thru RMSLBF.LIB	RMS$	Library image for RMSLBA thru MSLBF segment (six satellites)
DAPRES.LIB	RMS$	Library image for RMSDAP library
DAPRES.TSK	LB:	TSK file for linking against DAPRES
DAPRES.STB	LB:	STB file for linking against DAPRES
GSA.MAC	Not transferred	Demonstration program included as an illustration of how to extend an RMS task in the event of pool exhaustion.
PARSE.MAC, SEARCH.MAC, RENAME.MAC, ERASE.MAC, PARSE.TSK, SEARCH.TSK, RENAME.TSK, ERASE.TSK	Not transferred	Demonstration programs for the new directory and wildcarding facilities

The RMS-11 Utilities are built in a number of variants. The suffix
("yz") encodes the way in which the utility has been built and whether
it can be used over the network. The letters in positions y and z are
interpreted as follows:

y - Describes how the RMS-11 code has been built into the task

        O = Disk Overlaid
        R = Resident Library

z - Describes how the RMS-11 DAP (Network) code has been built
    into the task

        O = Disk Overlaid
        R = Resident Library
        N = None

```
-------------------------------------------------------------------
: File Name  :  Destination   :    Comments :
------:------------------------------------------------------------

BCKNyz.TSK         RMS$:                 BCK utility
RSTNyz.TSK         RMS$:                 RST utility
DEFNyz.TSK         RMS$:                 DEF utility
DSPNyz.TSK         RMS$:                 DSP utility
CNVNyz.TSK         RMS$:                 CNV utility
DESNyz.TSK         RMS$:                 DES utility
IFLNyz.TSK         RMS$:                 IFL utility
```

4.7 RMS V2.0 Installation on RSTS/E V9.0

RMS-11 installs via the normal system installation procedure. The
user is prompted for the RMS-11 configuration and the RMS-11 tasks and
libraries are automatically copied and installed accordingly.

If you have reason to remove any of the RMS libraries, note that
although the library segments do not have to be physically resident,
ALL library segments must be installed before any use of the resident
library (including use of RMS utilities which are built against the
resident library). Failure to install the root segment RMSRES will
cause an error "?Resident library not found" when the task or utility
is invoked; however, failure to install any of the remaining resident
library segments will not cause an error at invocation, but may cause
a BPT trap when the missing segment is subsequently needed by RMS.

Note

> There are several circumstances involving
> "inconsistent or incomplete resident libraries" which
> can cause a BPT trap to be generated, with R0
> containing the error code ER$LIB. This can happen if
> some segments of the library are not installed or if
> the version numbers of one or more segments do not
> match the root segment, the RMSDAP code, or the task
> itself.

You may also want to include new RMS Utility CCL definitions in the
system start-up control file.

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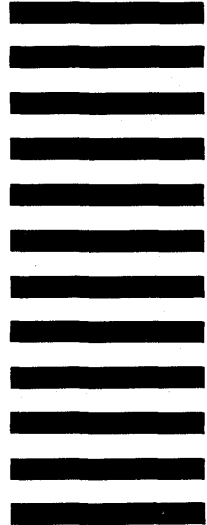   Country

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