pdp11

PDP-11

Preservation Utility (PRESRV) User's Guide

Order No. DEC-11-UPRMA-A-D

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User's Guide

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ABSTRACT

This guide describes the option switches, operating procedures and error messages used by the PDP-11 Preservation program.

PRESRV is a stand-alone utility which, when loaded into memory, overwrites any monitor present and begins execution.

This manual is directed to the system manager or system programmer who wishes to use PRESRV to copy information from one storage device to another. PRESRV can be used to copy information from and to disk, magnetic tape, cassette and DECtape devices.

For quick reference to subjects in this guide, use the following list.

If you need to know about	See Section
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Transferring in Logical Tape mode	3.2.3
Transferring information on a TU16 drive	3.2.2
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1.0 INTRODUCTION

The PDP-11 Preservation Program (PRESRV) is a stand-alone program which, when loaded from disk or magnetic tape, overwrites any resident monitor present and begins execution. Thus PRESRV runs independently of any operating system. PRESRV copies data from disk to disk, disk to magnetic tape, magnetic tape to magnetic tape, and (to restore data to its original device) from magnetic tape to disk.

PRESRV supports two classes of devices:

1. Tape devices (magnetic tape and cassette), and
2. Block-structured devices (DECtape and disk).

Devices supported by PRESRV are listed in Table 1.

Table 1
Devices Supported by PRESRV

Device Mnemonic	Device Type	Device Class
CT	TA11/TU60 Cassette	Tape
DB	RH11/RP04 and RH70/RP04 Disk Pack	Block-structured
DK	RK11/RK05 Cartridge Disk	Block-structured
DF	RF11/RS11 Fixed Head Disk	Block-structured
DP	RP11/RP02/RP03 Disk Pack	Block-structured
DS	RH11/RS03/RS04 and RH70/RS03/RS04 Fixed Head Disk	Block-structured
DT	TC11/TU56 DECtape	Block-structured
DX	RX11/RX01 Floppy Disk	Block-structured
MM	RH11/TM02/TU16 and RH70/TM02/TU16 9-track Magnetic Tape	Tape
MT	TM11/TU10 7- or 9-track Magnetic Tape and TM11/TS03 9-track Magnetic Tape	Tape

PRESRV commands are of the form:

outspec/switch=inspec/switch

where

outspec is the output device to which the data is copied.

/switch is the optional format switch modifying either the input or output device or both.

inspec is the input device from which the data was copied.

PRESRV operates in one of three modes: image mode, logical tape mode and FILES-11 mode.

1.1 Image Mode

When copy operations are performed in image mode, output format is identical to input format. In image mode, PRESRV assumes no knowledge of the input device structure and copies all physical blocks, whether in use or not, onto the output device. For example, PRESRV reads all blocks on DK0: and copies them to DK1:. PRESRV can copy volumes containing multiple files and files stored on multiple volumes. If the input and output devices are identical, the copy operation is automatically performed in image mode unless the user specifies a format switch.

In image mode explicitly, PRESRV separates each file with an End-Of-File (EOF) tape mark. When copying information from magnetic tape to another tape device, PRESRV assumes the input and output volumes are correctly positioned at the load point or positioned after an EOF tape mark. After writing each file, PRESRV writes two EOF tape marks and then positions the volume between the two EOF tape marks for any additional processing.

If a filelabel is specified when copying information from magnetic tape, PRESRV rewinds the input volumes and searches for the specified file. A filelabel is a name given to a file written to a logical tape. If no filelabel is specified, PRESRV assumes the tape is properly positioned (at the load point for the first file or between two EOF tape marks for subsequent files) and takes the next file on the tape as input.

NOTE

1. Filelabels, bootstraps, and system images are always written at 800 bits per inch (bpi). Logical tapes written with the /PE switch (which writes TU16 magnetic tape volumes at 1600 bpi), therefore, cannot be copied in image mode.

2. Logical tapes written on a TU10, TU16, or TS03 are bootable interchangeably on any of the three magtape devices; however, 1600 bpi TU16 tapes are not readable on a TU10 or TS03.

PRESRV can copy multi-volume files; however, no new file can begin on the second or subsequent volume of a multi-volume file.

1.2 Logical Tape Mode

In logical tape mode, PRESRV copies information from a disk or magnetic tape onto a magnetic tape. In this mode PRESRV copies a core image of itself preceding all data records. This image permits PRESRV to be bootstrapped from any device containing information to be loaded. A logical tape consists of a label block, a bootstrap block, a PRESRV image (first volume only) followed by preserved data. See Figure 1 for an example of logical tape format. Subsequent volumes contain a label block and a dummy bootstrap block followed by data of a file started on the first volume.

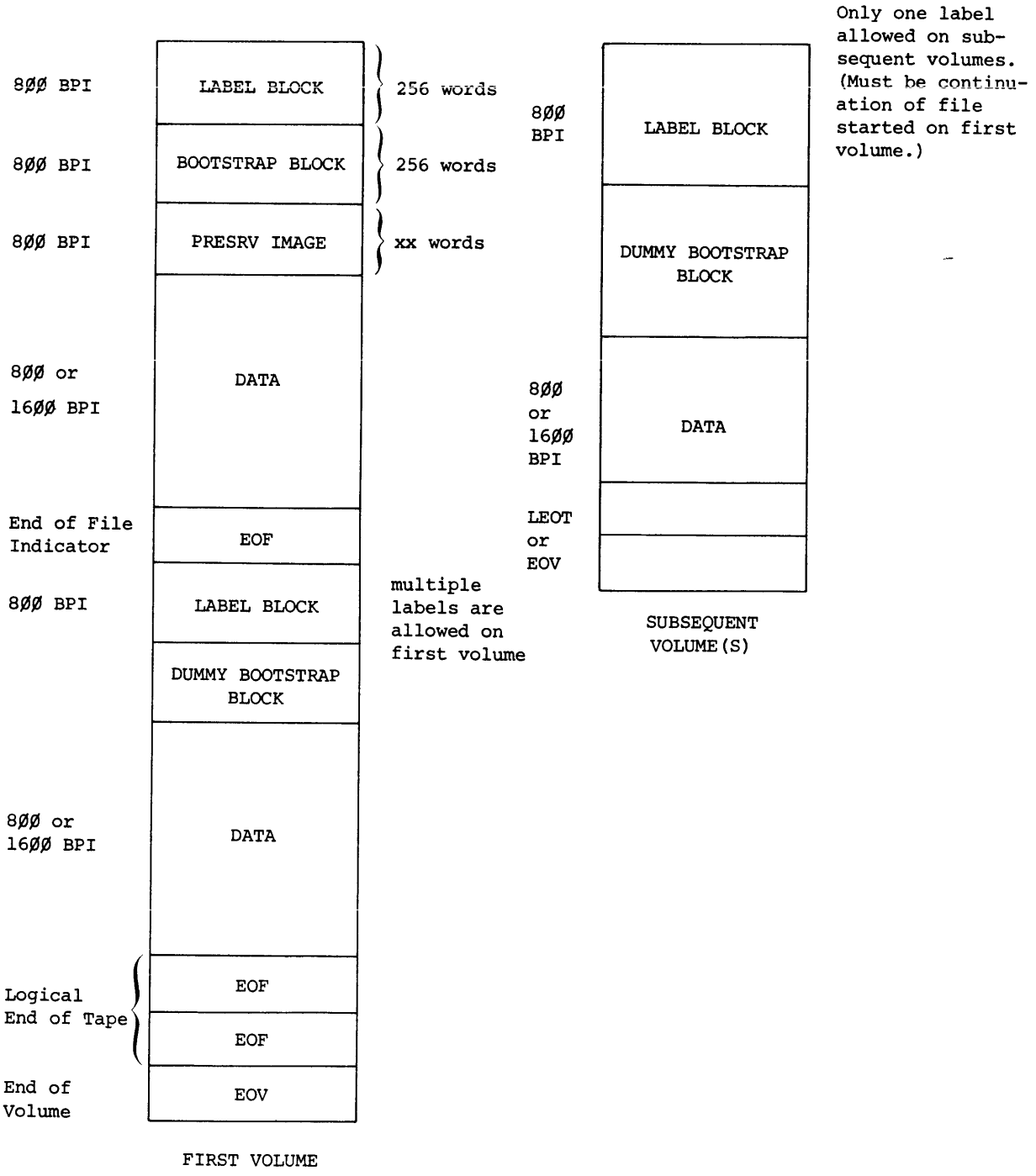

Figure 1 Logical Tape Format

Bootstrapping the first volume of a logical tape starts PRESRV, so that the contents of the logical tape may be copied to another device if desired. When a physical or logical tape is produced by PRESRV, the user may specify a filelabel of 1 to 12 characters for the image to be produced. See Figure 2 for an example of a logical tape label block.

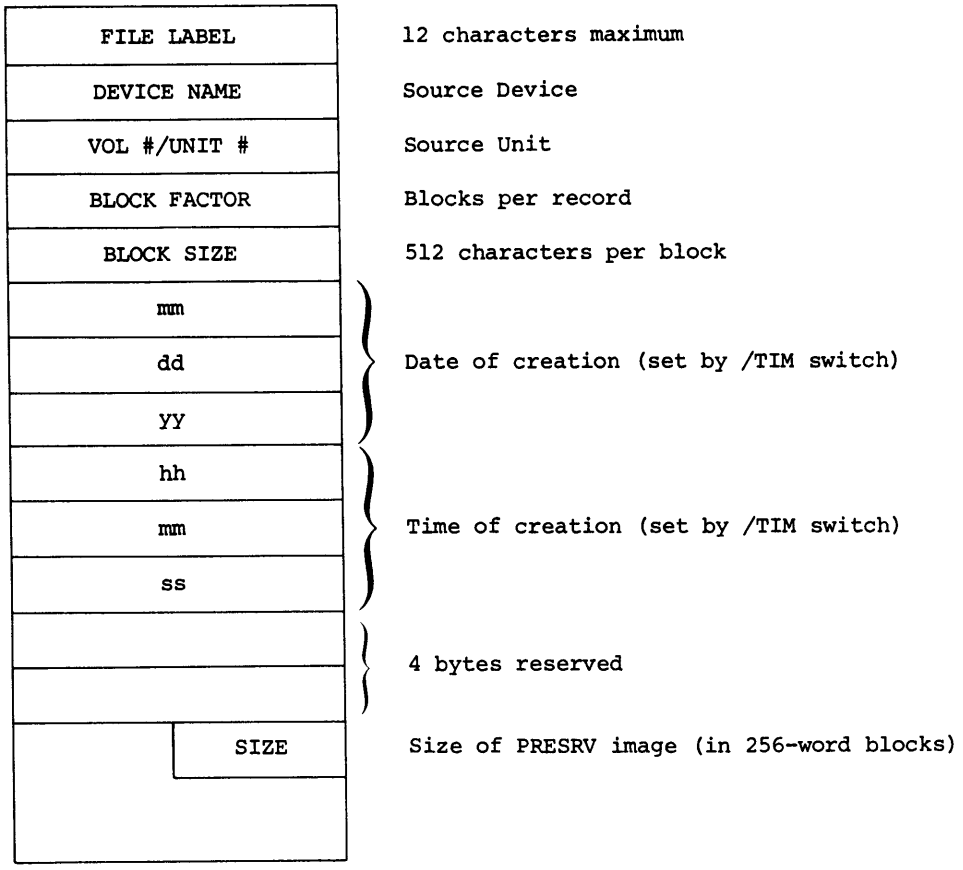

Figure 2 Logical Tape Label Block

Tape devices (magnetic tape and cassette) are defaulted to logical tape mode with the following exceptions: when input and output devices are identical, PRESRV copies in image mode unless the user specifies a format switch. Also, the output is written in logical tape mode when the output device type differs from the input device type. For example, if an RK05 disk cartridge is copied to an RP04 disk pack, the pack is written in logical tape mode.

1.3 FILES-11 Mode

FILES-11 is the disk structure used by RSX-11M, RSX-11D and IAS. In FILES-11 mode, PRESRV copies only blocks in use. Thus FILES-11 mode assumes knowledge of the disk file structure, whereas, image mode and logical tape mode do not. FILES-11 information blocks are allocated to files and include the files themselves. Blocks not allocated to files are not copied. If PRESRV is operating in FILES-11 mode and the input device is not in FILES-11 format, PRESRV prints the message:

STORAGE BITMAP FILES READ ERROR

Retype the command to specify image mode.

Block-structured devices (DECtape and disk) are always assumed to be in FILES-11 format except when:

1. Input is a disk or DECtape and output is also a block-structured device different from the input and without a modifying format switch. In this case, the output is defaulted to logical tape format. For example, the command string

   PRE>DT0:STEVE=DK0:

   creates a file (STEVE) on DT0: in logical tape mode rather than in FILES-11 mode. (The filelabel on the output device is required.) This choice was made because the typical copy operation between non-identical media is done to create backup copies of the system. The resulting output, being in logical tape format, contains a bootable image of PRESRV on the first volume.

2. Both input and output devices are the same type and neither is modified by a format switch. In this case, the copy operation is automatically performed in image mode.

2.0 PRESRV SERVICES

After the user bootstraps PRESRV and types a command, PRESRV can perform the following services:

1. Make image copies of volumes,
2. Make copies of volumes in logical tape mode,
3. Format RK05, RP02, RP03 and RP04 disks,
4. List labels from volumes in logical tape mode, and
5. Make copies of volumes in FILES-11 mode.

3.0 USING PRESRV

3.1 Bootstrapping PRESRV

To run PRESRV, mount the device to be copied and bootstrap the device on which PRESRV is recorded.

When PRESRV is bootstrapped, it displays an identification message of the form:

```
RSX-11S V01 BL12
VOLUME PRESERVATION PROGRAM- V02.1
FOR HELP TYPE /HE
nn.  BLOCKS AVAILABLE FOR BUFFERING

PRE>
```

PRESRV is built as a task running under the RSX-11S Executive and thus displays the version of the stand-alone executive in use, the version number of PRESRV, and the number of 256(10)-word blocks (nn.) available for buffering. The user must use the number of blocks available for buffering (displayed in the identification message) to determine if a given PRESRV media copy has sufficient buffering space.

If the total space required for input, output and verification (optional) buffers is greater than nn. blocks, PRESRV responds with the following message:

```
INSUFFICIENT BUFFER SPACE
```

Abort or retry the operation.

By typing the /HE command the user is provided with a list of command switches and defaults used by PRESRV. /HE is a stand-alone switch and must therefore be typed as a separate command.

CAUTION

When using RP04 disk pack or TU16 9-track magnetic tape, it is advisable to bootstrap PRESRV from its original medium, to configure it if necesssary (using the /CSR switch and other switches as described in Section 4.4) and to write a DECtape, magtape, cassette or floppy disk by preserving some volume with a command. For example:

```
PRE>DT0:ZORG=DK0:/IM
```

A filelabel must be specified if the output is in logical tape mode. Subsequent booting of the logical tape will bring up a user-tailored version of PRESRV. The data on the logical tape is of no consequence.

If PRESRV halts at location 522 while in the course of trying to perform a function, the system has crashed. The probable cause of the crash is the use of improper values for the Control Status Register (/CSR) or vector address (/VEC) for one of the specified devices in the command string. Rebootstrap PRESRV, set the correct CSR and vector addresses for the devices in question and retype the command. See Section 4.4 for a list of devices and their corresponding CSR and vector addresses.

After the identification message is displayed PRESRV is ready to accept a command and responds with PRE> on the console terminal. PRESRV accepts command strings containing up to 80 characters. PRESRV commands are of the form:

```
outspec/switch../switch=inspec/switch../switch
```

Outspec and inspec represent the output and input device respectively. Each input or output device has the following format:

```
dev:filelabel
```

where

dev:	is the physical device on which the volume containing the desired file is mounted, for example, DK0: The name of the device consists of two ASCII characters followed by an optional unit number and a colon. If no unit number is specified, PRESRV assumes a default by assigning a unit number of 0 to the device.
filelabel	is the label given to the logical tape file to be copied or created. PRESRV accepts filelabels of 1 to 12 characters. A filelabel must be specified if the output is in logical tape mode.

If the specified device is not ready or up to speed, PRESRV prints:

```
DEVICE NOT READY
```

Wait until the device is ready to run, and retry the operation.

If the device or unit combination specified in the command string is not supported by the current PRESRV program or is not a valid device for PRESRV operations, PRESRV prints the following message:

```
NO SUCH FILE
```

Retype the command using the proper filelabel. Output and input specifiers can be modified by one of three types of switches:

/switch	a two character ASCII name identifying the switch option, or
/switch:nn or /switch=nn	a two-or three-character ASCII name identifying the switch option followed by a colon or equal sign and an alphanumeric value.

These switches are listed for reference in Table 2.

If two conflicting switches are specified in the command string (for example, /TP/FI), PRESRV prints the following error message:

CONFLICTING SWITCHES

Retype the command string with the correct switch(es) specified.

Table 2
PRESRV Option Switch Descriptions

Option Switch	Syntax	Description
ABORT ON I/O ERROR	/ER	Causes termination of the current PRESRV operation upon an unrecoverable I/O error. /ER applies to either input or output file specifiers but not to both.
BLOCKING SWITCH	/BL:nn	Blocking can be imposed on copy operations either on logical tapes or block-structured devices. nn followed by a decimal point is the number of 256(10)-word blocks in each record. Without the decimal point, nn is interpreted as an octal number. The /BL switch can apply to either input or output file specifiers. However, when the input volume is a logical tape, the input blocking factor is overridden by the blocking factor of the label.
LOGICAL TAPE MODE	/TP	Overrides an inappropriate PRESRV default. On output /TP can apply to any device and the result of the copy operation is a logical tape. On input the volume to which /TP is attached must be in logical tape mode.
REWIND AT COMPLETION	/RW	Rewinds any physical tape that has completed the specified copy operation.

Table 2 (Cont.)
PRESRV Option Switch Descriptions

Option Switch	Syntax	Description
TIME AND DATE	/TIM=mm/dd/yy hh:mm	Sets the time and date of the copy operation. mm is the month (1-12) dd is the day (1-31) yy is the year (0-99) hh is the hour (0-23) mm is the minute (0-59) The /TIM switch is a stand-alone switch and must therefore be typed in a separate command.
BOOTSTRAP	dev:/BO	Causes PRESRV to bootstrap the system on the specified device, read the first block (bootstrap block) and pass control to it.
CONTROL STATUS REGISTER	dev:/CSR=nnnnnn	Sets the address of the Control Status Register to nnnnnn, which is the octal address of the CSR used by the specified device.
DEVICE SPECIFIC SWITCHES	MTn:/20	Sets the density of TU10 7-track drive n to 200 bpi.
	MTn:/55	Sets the density of TU10 7-track drive n to 556 bpi.
	MTn:/80	Sets the density of TU10 7-track drive n to 800 bpi. The /20,/55 and /80 switches apply only to a 7-channel TU10 drive being copied in image mode. These switches may be applied to either the input or output file specifiers.
Phase-Encoded Tape	/PE	Indicates magnetic tape volumes, to be written or read on a TU16 drive, are to be treated in phase-encoded mode (1600 bpi). The /PE switch may appear on either the input or output side of the command string.

Table 2 (Cont.)
PRESRV Option Switch Descriptions

Option Switch	Syntax	Description
Format Disk	/FO	Enables PRESRV to write the necessary timing and sector identification information on RK05, RP02, RP03 and RP04 disks to prepare them for storing data. The /FO switch may only be specified on the output side of the command string and may be used as a stand-alone switch or in conjunction with a copy operation.
Vector	/VEC=nnn	Sets the interrupt vector for a device. nnn is the new octal vector address.
TM02 Formatter	MMn:/TM02=x	Sets x as the RH unit number of the TM02 formatter for the TU16 tape drive n.
Unit	/UNIT=n	Sets to n the physical unit number for a device. The /UNIT switch is used to refer to units 2 through 7 in place of either unit 0 or 1 of a specified device.
FILES-11 MODE	/FI	Overrides an image mode copy operation of devices not written in FILES-11 mode. The /FI switch may apply to either input or output file specifiers.
HELP COMMAND	/HE	Prints a summary of PRESRV services. This is a stand-alone switch and, therefore, must be typed as a separate command.
IMAGE MODE	/IM	Overrides the FILES-11 default in copying disk-structured volumes.
LISTING	/LI	Lists a directory (a list of all filelabels) of a logical tape. The /LI switch is a stand-alone switch and must, therefore be typed in a separate command.

Table 2 (Cont.)
PRESRV Option Switch Descriptions

Option Switch	Syntax	Description
VERIFY SWITCH	/VE	Causes a second pass over the input and output media so that every block written on the output device is read back and compared with the corresponding block on the input device. If the comparison fails, a verification failure is declared. The /VE switch may appear on either side of the command string.

3.2 Primary Command Switches

3.2.1 Image Mode (/IM) Switch - When copying disk-structured volumes to logical tape the Image Mode (/IM) switch overrides the FILES-11 default. By using the /IM switch an operator can copy any format disk to tape. For example, the following command string copies information on DK0: to MT0:

```
PRE>MT0:STAR=DK0:/IM
```

A filelabel must be specified when the output is in logical tape mode. PRESRV writes 512-character records on magnetic tape unit 0. The /IM switch is used to override the FILES-11 default attached to the RK05 cartridge disk. If the input and the output devices are identical, the copy is made in image mode, and the /IM switch is not required. If the /IM switch is specified when copying information from a magnetic tape to another magnetic tape, PRESRV responds with the following error message:

```
TRANSFER SPECIFICATION MODE ERROR
```

Retype the command without specifying a switch.

When a tape drive is the output device, PRESRV prints the following message:

```
MOUNT OUTPUT VOLUME 1.  AND TYPE CR>
```

Mount the first volume and type the RETURN key.

If the output volume specified needs a write-ring, PRESRV prints the following message:

```
OUTPUT VOLUME WRITE-LOCKED.  TYPE CR WHEN READY >
```

Insert the write-ring and type the RETURN key.

3.2.2 Phase-Encoded Tape (/PE) Switch - Magnetic tape volumes to be written or read on a TU16 drive are treated in phase-encoded mode (1600 bpi) by supplying the phase-encoded tape (/PE) switch. The /PE switch must be specified with the filelabel of a TU16 device. For example,

```
PRE>MM0:filelabel/PE=DB0:/IM
```

PRESRV writes the bootstrap block, label block and PRESRV image at 800 bpi but writes the data from the RP04 disk at 1600 bpi. A block size of 1 is used. The /IM switch is used to override the FILES-11 default attached to RP04 unit 0.

3.2.3 Logical Tape Mode (/TP) Switch - The logical tape mode (/TP) switch is used to override an inappropriate PRESRV default. On output /TP can apply to any device and the result of the copy operation is a logical tape.

On input the volume to which /TP is attached must be in logical tape mode. For example, the following command string restores an RK03 or RK05 cartridge preserved on DECtape.

```
PRE>DK0:=DT0:ART/TP
```

The /TP switch is optional in the above example because the filelabel attached to the input device indicates logical tape.

3.2.4 Verification (/VE) Switch - The verification (/VE) switch causes PRESRV to verify the copy operation. For example, PRESRV compares the output device to the input device to make sure there are no differences.

When the verification operation begins, PRESRV responds with the following message:

```
**BEGIN VERIFICATION**
```

This will cause a second pass over the input and output media so that every block written is read back and compared with the corresponding block on the input device. When verification is requested, twice the number of output buffers is needed. The /VE switch may appear on either side of the command string. For example:

```
PRE>DK1:/VE=DK0:
PRE>DK1:=DK0:/VE
```

If the verification is successful, PRESRV prints

```
PRE>
```

and will accept another command.

If the comparison fails, PRESRV prints the following error message:

```
VERIFICATION ERROR nnnnnnn
```

The number printed is the octal logical block number on the output device where the error was detected. Retry, continue or abort the operation.

If the volume to be verified is faulty, PRESRV responds whenever a verification error occurs, with the following error message:

```
VOLUME FAULTY - "R" TO RETRY, "C" TO CONTINUE>
```

Type R to retry or C to continue the operation.

NOTE

If the user types the ALTMODE key when PRESRV is ready to accept input, the current operation is aborted.

3.2.5 Rewind at Completion (/RW) Switch - The Rewind at Completion (/RW) switch enables PRESRV to rewind any physical tape after the copy operation has been completed. The /RW switch applies to either input or output file specifiers. For example:

```
PRE>MT1:JOAN/RW=DP0:/IM
```

rewinds the tape after information on RP03 unit 0 has been copied to magnetic tape unit 1.

3.2.6 FILES-11 Mode (/FI) Switch - The FILES-11 mode (/FI) switch applies only to FILES-11 devices (Disk and DECtape). The /FI switch overrides a default that would result in a PRESRV operation not intended by the user. For example, when units are identical and no formatting switches are specified, the copy operation is in image mode. A FILES-11 copy operation is made by using the /FI switch. The /FI switch may apply to either input or output file specifiers.

NOTE

If an image copy operation (DK0:=DK1:) fails and the input volume is FILES-11, use a /FI transfer to copy only blocks in use. The blocks that are unreadable may be free blocks that do not contain data. /FI copy operations take more time and should be used only if I/O errors occur in an image mode copy. The following is an example of an /FI copy operation.

```
PRE>DK0:/FI=DK1:/FI
```

3.2.7 Abort on I/O Error (/ER) Switch - If the Abort on I/O Error (/ER) switch is attached to a file specifier, an unrecoverable I/O error causes the termination of the current PRESRV operation. After issuing an error message, PRESRV prints

```
PRE>
```

and is ready to accept another command.

The /ER switch applies to either input or output file specifiers. For example:

```
PRE>DK1:/ER=DK0:
```

If a write error occurs and the /ER switch has not been specified, PRESRV responds with the following message:

```
VOLUME FAULTY - "R" TO RETRY, "C" TO CONTINUE>
```

Type C to continue or R to retry the operation.

NOTE

If the user types the ALTMODE key when PRESRV is ready to accept input, the current operation is aborted.

3.3 Command String Examples

3.3.1 Disk to Magnetic Tape (TU10) - The following is an example of copying information from a disk to a 7-channel magnetic tape:

```
PRE>MT0:filelabel/BL:20./VE=DK0:/IM
```

A filelabel must be specified when the output is in logical tape mode. The /IM switch overrides the FILES-11 default attached to RK05 unit 0 and copies information onto magnetic tape unit 0 in logical tape mode at 800 bpi.

The /VE switch causes a second pass over the input and output media after the data on the input device is copied onto the output device. Every block written is read back from magnetic tape unit 0 and compared with the corresponding block on the input device.

Because the /BL:nn switch is specified, PRESRV writes 20 blocks per record on the output tape. This is the most efficient processing method. Normally, only one block per record is used. Since a 512-character record occupies one-half an inch on the tape and the interrecord gap is three-fourths of an inch, a blocking factor of one is wasteful. Verification also uses 20 blocks. Thus all available memory is used for the copy operation: two 20-block buffers for the magnetic tape copy operation and verification and a 12-block buffer for RK05 disk. (See Section 4.2 for more information on computing required blocks for buffering.)

PRESRV requests the user to mount the file output volume by printing the following message:

```
MOUNT OUTPUT VOLUME 1 AND TYPE CR>
```

After the RETURN key is typed, PRESRV creates the file specified by the filelabel.

Upon copying the data, PRESRV rewinds the tape and performs the verification as signalled by the **BEGIN VERIFICATION** message. PRESRV continues to request the user to mount subsequent volumes until all data on the RK05 has been copied. The end of the copy operation is signalled by the PRESRV prompting message (PRE>).

If the input device is RP04, the INSUFFICIENT BUFFER SPACE error is generated because the RP04 default is 22 blocks for buffering. Simply override the default by using the /BL switch on input as follows:

```
PRE>MT0:ZEUS/BL:20./VE=DB0:/BL:11./IM
```

A blocking factor of 11 is a submultiple of the number of blocks on the volume (167200) and overrides the default of 22. As a result, sufficient buffer space is available: two 20-block buffers for the magnetic tape copy operation and verification and an 11-block buffer for the RP04 disk.

3.3.2 Magnetic Tape (TU10) To Disk - To restore a disk from a logical tape the following format is used:

```
PRE>DP0:/VE=MT0:TERRY
```

PRESRV requests the user to mount the first input volume by printing the following message:

```
MOUNT INPUT VOLUME 1 AND TYPE CR>
```

After the RETURN key is typed, PRESRV searches for the file specified by filelabel. If the file specified in the command string was not found on a logical tape, PRESRV prints the following error message:

```
NO SUCH FILE
```

Retype the command using a proper filelabel.

If no filelabel is specified, PRESRV assumes the tape is properly positioned (at the load point for the first file or between two EOF tape marks for subsequent files) and takes the next file on the tape as input. The blocking factor for magnetic tape is taken from the filelabel. The blocking factor on output is the default (10) for an RP02 or RP03 disk. If the data is continued on a subsequent volume, PRESRV prints the following message:

```
MOUNT INPUT VOLUME 2 AND TYPE CR>
```

PRESRV checks the filelabel and volume number on magnetic tape unit 0 before continuing. If the volume number is incorrect, the following message is printed:

```
INPUT VOLUME 2 OUT OF SEQUENCE
```

Mount the proper volume and proceed. PRESRV continues in this fashion until the end of volume is reached. After all reels have been copied, PRESRV makes a second pass over the data for verification. The user must mount all reels beginning with the first volume and continuing in sequence until the last volume is verified. PRESRV uses 10 extra blocks of buffer space for the verification. The end of verification is signalled by the PRESRV prompting message (PRE>).

3.3.3 Disk to Magnetic Tape (TU16) - To copy information from a disk to a TU16 magnetic tape the following command string is used:

```
PRE>MM0:RICHARD/PE/VE/BL:20.=DB0:/IM/BL:11
```

A filelabel must be specified when the output is in logical tape mode. The /IM switch is used to override the FILES-11 default in copying block-structured volumes to tape. The /PE switch enables PRESRV to write data on the TU16 drive at 1600 bpi. PRESRV always writes filelabels and bootstrap blocks, however, at 800 bpi. The /BL:20 switch causes PRESRV to use the most efficient blocking factor as described in Section 3.3.1. The /BL:11 switch overrides the 22-block default for RP04 and allows sufficient buffer space (51 blocks) for the copy operation and verification to occur. The /VE switch causes a second pass over the input and output media so that every block written is read back from magnetic tape unit 0 and compared with the corresponding block on the input device. Action messages are printed as described in Section 3.3.1.

3.3.4 Magnetic Tape (TU16) To Disk - To restore a disk from a TU16 magnetic tape written at 1600 bpi the following format is used.

```
PRE>DB0:/BL:11./VE=MM0:RICHARD/PE
```

The /PE switch enables the TU16 drive to read the data at 1600 bpi (the filelabel is read at 800 bpi). PRESRV reads data from magnetic tape unit 0 with the blocking factor it finds in the label record. (This blocking factor is 20 if the tape was written following the procedures described in the disk to magnetic tape (TU16) copy operation shown above. The /BL:11. switch overrides the default blocking factor of 22 used for RP04 disks and allows sufficient buffer space for verification of a magnetic tape written with a blocking factor of 20. (Two 11-block buffers are allocated for copying and verifying the RP04 records and one 20-block buffer for the magnetic tape records.) Refer to Section 4.2 for a discussion on computing required blocks for buffering.

The /VE switch causes a second pass over the input and output media after all reels have been copied. (The action messages are described in Section 3.3.2.) Every block written is read back from RP04 unit 0 and compared with the corresponding block on the input device.

3.3.5 Magnetic Tape (TU10) to Magnetic Tape (TU10) - To copy information from a magnetic tape to another magnetic tape the following format is used.

```
PRE>MT1:=MT0:
```

When copying two identical devices, image mode is automatically assumed and no switch is needed. If an /IM switch is specified in a tape to tape copy operation, PRESRV prints the following error message:

```
TRANSFER SPECIFICATION MODE ERROR
```

Retype the command string without specifying a switch.

The image copy mode uses the default memory buffer space to create blocks on magnetic tape unit 1. (See Section 4.3 for default blocking factors.) If any input record is too large, the copy operation is aborted. PRESRV assumes the tape is correctly positioned at the load point or positioned after an EOF tape mark when no filelabel is specified on the input side of the command.

3.3.6 Magnetic Tape (TU16) to Magnetic Tape (TU16) - To copy information from a magnetic tape (TU16) to another magnetic tape (TU16) the following format is used:

```
PRE>MM1:/PE/TP=MM0:/TP/PE
```

The phase-encoded tape (/PE) switch is used when reading or writing information on a TU16 drive written at 1600 bpi. The /TP switch overrides the image mode default when copying two identical devices.

3.3.7 Disk to Disk - To copy information from a disk to another disk the following format is used:

```
PRE>DP1:=DP0:
```

When copying information from a device onto a similar device, image mode is automaticlly assumed and a switch is not required. If more memory is available, the block (/BL:nn) switch can be used to speed the copy operation.

3.3.8 DECtape to DECtape - To copy information from a DECtape to another DECtape the following format is used:

```
PRE>DT1:=DT0:
```

Image mode is automatically assumed when copying information on two identical devices. The /IM switch is not required.

3.3.9 Disk to DECtape - When copying information from a disk to DECtape, the following format is used:

```
PRE>DT0:IGOR/VE=DK0:/IM
```

A filelabel must be specified on the output side of the command for disk to DECtape copy operations or when the output is in logical tape mode. The /IM switch is used to override the FILES-11 default attached to RK05 unit 0 and copies the information onto DECtape unit 0 in logical tape mode. Ten DECtapes are required for copying information from one RK05 disk cartridge. The /VE switch causes a second pass over the input and output media after information is copied to the output reel so that every block written is read back from DECtape unit 0 and compared with the corresponding block on the input device.

PRESRV requests the user to mount the first output volume by printing the following message:

```
MOUNT OUTPUT VOLUME 1 AND TYPE CR>
```

After the RETURN key is typed, PRESRV creates the file named IGOR on DECtape unit 0.

Upon copying the data, PRESRV rewinds the tape and performs the verification as signalled by the **BEGIN VERIFICATION** message. PRESRV continues to request the user to mount subsequent volumes until all data on the RK05 device has been copied. The end of the copy operation is signalled by the PRESRV prompting message (PRE>).

3.3.10 DECtape To Disk - To restore information to a disk from DECtape the following format is used:

```
PRE>DK0:/VE=DT0:IGOR/TP
```

PRESRV requests the user to mount the first input volume by printing the following message:

```
MOUNT INPUT VOLUME 1 AND TYPE CR>
```

After the RETURN key is typed, PRESRV searches for the file specified by the filelabel on the input side of the command. If the file specified in the command string was not found on a logical tape, PRESRV prints the following error message:

```
NO SUCH FILE
```

Retype the command using a proper filelabel.

A filelabel is used in the above copy operation because a filelabel was specified in the initial copy operation. The /TP switch is optional in the above example because the filelabel attached to DT0: indicates logical tape.

4.0 AUXILIARY OPERATIONS

4.1 Formatting the Disk - (/FO) Switch

PRESRV writes the necessary timing and sector identification on RK03, RK05, RP02, RP03 or RP04 disks to prepare them for storing data. This operation is called formatting the volume and is specified by the /FO switch. Formatting may be specified as a separate operation or in conjunction with a copy operation. If a copy operation has been specified, the disk is formatted before information is copied to it.

If the device specified for formatting is not one of these devices, PRESRV prints the following message:

```
DEVICE NOT FORMATTABLE
```

Specify the correct device mnemonic.

The /FO switch may only be specified on the output side of the command string. For example:

```
PRE>DP0:/FO
```

or

```
PRE>DP0:/FO/VE=MT0:DISK
```

When formatting begins PRESRV prints the following message on the user's terminal.

```
**BEGIN FORMATTING**
```

If an RP02, RP03 disk is being formatted, however, the format switch on the RP11-C controller must be enabled. Perform the following steps:

1. Remove the third panel below the bank of indicator lights on the RP11-C controller.
2. Set the FORMAT ENABLE/NORMAL switch to the FORMAT ENABLE position. (It is the switch farthest to the left.)
3. When formatting is completed, set the FORMAT ENABLE/NORMAL switch to the NORMAL position.

PRESRV prompts the user to enable and disable formatting at the proper times by printing the following messages:

```
ENABLE FORMATTING WITH SWITCH ON CONTROLLER.  TYPE CR WHEN READY>
```

or

```
DISABLE FORMATTING WITH SWITCH ON CONTROLLER.  TYPE CR WHEN READY>
```

When the switch is properly set, the user should press the RETURN key to continue. When formatting has been completed, PRESRV prints the following message:

```
**END FORMATTING**
PRE>
```

The PRE> message indicates that another command can be typed.

NOTE

If the user types the ALTMODE key when PRESRV is ready to accept input, the current operation is aborted.

4.2 Computing Required Blocks for Buffering

In the display of the number of blocks available for buffering nn. is the number of 256(10)-word blocks available for data copying and verifying operations. The user must use nn. to determine if a given PRESRV media copy has sufficient buffering space. The space required depends on blocking factors and use of the verification (/VE) switch. See Section 4.3 for information on default blocking factors for devices supported by PRESRV.

To determine the blocks needed for PRESRV copy operations, blocks required for input, output and verification must be established.

Example 1:

```
PRE>MT0:MARY=DK0:/IM
```

creates a logical tape labeled MARY on magnetic tape unit 0.

Blocking requirements are:

Input	12.	(DK default block size)
Output	1.	(MT default block size)
Verification	0.	(no verification specified)
Total	13.	

Example 2:

```
PRE>DK0:=MT0:HELEN
```

copies file HELEN from magnetic tape unit 0 to disk cartridge unit 0.

Input	n.	(Record size specified in file HELEN's label)
Output	12.	(DK default block size)
Verification	0.	(no verification specified)
Total	x.	(Output block size plus record size of file HELEN)

EXAMPLE 3:

```
PRE>MT0:LORRY/BL:20./VE=DK0:/IM
```

creates a logical tape labeled LORRY on magnetic tape unit 0. The /VE switch causes each block written to MT0: to be read and compared to the corresponding block on DK0:

Input	12.	(DK default block size)
Output	20.	(MT block size specified by the /BL:20. switch)
Verification	20.	(Reread 20 blocks from MT0:)
Total	52.	

Example 4:

```
PRE>DK0:/VE=MT0:SHARON/TP
```

copies file SHARON from magnetic tape unit 0 to disk cartridge unit 0. Each record written to DK0: is read and compared to the corresponding block on the input device. The /TP switch is optional in the above example because the filelabel attached to MT0: indicates logical tape.

Input	n.	(Record size of file SHARON printed in output of /LI switch)
Output	12.	(DK default block size)
Verification	12.	(Reread block from DK0:)
Total	x.	(Output block size, verification and record size of file SHARON)

Example 5:

```
PRE>MM0:=MM1:
```

copies the data on TU16 unit 1 to unit 0 at 800 bpi. The image copy mode uses all available memory buffer space to create blocks on massbus magnetic tape unit 0. If any input record is too large, the operation is aborted.

Example 6:

```
PRE>MM0:/VE=MM1:
```

is the same as example 4 except that verification is requested. One-third of available memory buffer space is used to form blocks to be written to MM0:. If any input record is too large, the operation is aborted.

4.3 Default Blocking Factors - (/BL:nn) Switch

Blocking can be imposed on copy operations either on logical tape or block-structured devices by specifying the blocking (/BL) switch. A block is a group of 256-word units that represents the amount of data that is copied by a single read or write issued by PRESRV. If the number of blocks specified with the /BL switch is too large for the available buffer space or is 0, PRESRV prints the following message:

ILLEGAL BLOCK COUNT

Retry the operation using a valid block count.

When PRESRV is loaded, the number of blocks available for buffering is printed. PRESRV runs unmapped on the PDP-11 and, therefore, uses a maximum of 28K words, 15K words of which are occupied by the executive and PRESRV itself. Thus, the current version of PRESRV has available 13K words, or 52 blocks, for buffering.

Each device has a default blocking factor that is used by PRESRV when no blocking switch is specified, and when buffer space is available to perform the default blocking. See Table 3 for default blocking factors.

Table 3
Default Blocking Factors

DEVICE	FORMAT CLASS*	DEFAULT BLOCK SIZE**	MAXIMUM BLOCK CAPACITY
CT	LT	1.	variable
DB	BS	22.	167200 (RP04)
DF	BS	8.	1024 per platter
DK	BS	12.	4800 (RK05)
DP	BS	10.	40000(RP02), 80000(RP03)
DS	BS	8.	1024 (RS03), 2048 (RS04)
DT	BS	2.	572 (TC11/TU56)
DX	BS	6.	494 (RX11/RX01)
MM	LT	1.	variable
MT	LT	1.	variable

*LT denotes Logical Tape.
BS denotes Block-Structured.

**The decimal point indicates decimal values. Without the decimal point, the values are interpreted as octal numbers.

Default blocking factors are overridden as follows:

1. For block-structured devices the /BL switch can be used on either input or output file specifiers to establish a blocking factor.

2. For logical tape output, a /BL switch can establish the blocking factor.

3. For logical tape input,the blocking factor is always taken from the filelabel; the /BL switch is ignored.

4. If a tape is being copied in image mode, PRESRV uses a blocking factor that exhausts all available buffering space.

The /BL switch is of the form:

```
/BL:nn
```

where

nn is the number of 256(10)-word blocks in each record. These blocks may be specified in octal or decimal (with trailing decimal point).

The /BL switch can apply to either input or output file specifiers. For example:

```
PRE>DK1:/BL:48.=DK0:
```

By specifying a blocking factor of 48. the cartridge disk default block size of 12 is overridden.

When specifying block sizes, a trailing decimal point must be used following a base 10 number. If a trailing decimal point is not used and an illegal octal digit (8 or 9) is present, PRESRV prints the following error message:

```
SYNTAX ERROR
```

Retype the command with a decimal point after the base 10 block size.

NOTE

1. For image copies, the blocking factor specified with a disk or DECtape must be a submultiple of the number of blocks on the volume (for example, 4800 for DK).

2. If buffer space permits, use a large blocking factor for DECtape to speed the copy operation.

4.4 Hardware Specific Switches

Hardware specific switches are acted upon immediately by PRESRV and no other commands are accepted until PRESRV completes the current command.

4.4.1 Control Status Register (/CSR) Switch - To set the control status register for a device, use the /CSR switch. The following format is used for setting the CSR:

dev:/CSR=nnnnnn

where

dev: is the device whose CSR is to be changed.

nnnnnn is the octal address of the CSR used by the device.

For example:

PRE>DB0:/CSR=176300

See Table 4 for a list of devices and their corresponding CSR and vector addresses.

Table 4
Devices and Corresponding CSR and Vector Addresses

DEVICE	CSR	VECTOR*
CT	177500	260
DB	176700	300 *
DF	177460	204
DK	177404	220
DP	176714	254
DS	172040	310 *
DT	177342	214
DX	171700	264
MM	172440	320 *
MT	172522	224

*The asterisk (*) indicates that this is not a normal vector.

4.4.2 Vector Address (/VEC) Switch - To set the vector address for a device the following format is used:

dev:/VEC=nnn

where

dev: is the device-unit whose vector address is to be changed.

nnn is the new octal vector address.

For example:

```
PRE>MM0:/VEC=224
```

See Table 4 for a list of devices and their corresponding vector addresses.

Two units (physical unit number 0 and 1) were generated for each device type. Both units of each device type are defined as being on the same controller. Thus, if the CSR or vector address is changed for one unit, it is automatically changed for the other unit.

All the CSR assignments generated into PRESRV are the normal CSR assignments for those devices; however, some of the devices have vector addresses that overlap the vectors of other devices. By using the /VEC=nnn switch, the normal vectors for those devices can be established.

DEVICE	NORMAL VECTOR
DB	254
DS	204
MM	224

If the generated CSR or vector address does not correspond to the actual hardware configuration in use, the /CSR and /VEC commands can be used to correct PRESRV generated values.

CAUTION

When using an RP04 disk pack or TU16 9-track magnetic tape, it is advisable to bootstrap PRESRV from its original medium, to configure it if necessary (using the /CSR switch and other switches as described in Section 4.4) and to write a DECtape, magnetic tape, cassette or floppy disk by preserving some volume with a command. For example:

```
PRE>DT0:ZEUS=DK0:/IM
```

A filelabel must be specified on the output side of the command string when dissimilar devices are specified. Subsequent booting of the logical tape brings up a user-tailored version of PRESRV. The data on the logical tape is of no consequence.

4.4.3 TM02 (/TM02) Switch - The /TM02 switch sets the unit number of the TM02 tape formatter on the RH controller. The format is:

```
dev:/TM02=n
```

where

dev: is a device whose TM02 formatter position on the RH controller is to be changed.

n is the unit number desired.

For example:

```
PRE>MM0:/TM02=2
```

By using the /UNIT and the /TM02 switches it is possible to set the mapping of device mnemonic to the actual physical devices.

4.4.4 Unit (/UNIT) Switch - The /UNIT switch sets the desired physical unit number for a device mnemonic, allowing PRESRV to support device configurations with more than one drive of the same device type. For example:

```
PRE>DK0:/UNIT=2
```

sets DK0: to physical unit 2 and every reference to the name DK0: actually refers to physical unit 2 on the RH11 controller. This is the only method of using units other than 0 and 1. Another use for the /UNIT switch is for mixed Massbus peripherals. It is possible to attach RP04, RS03/04 drives and TM02 tape formatters to the same RH11/RH70 controller; however, operating system software may not support such a configuration. The /UNIT switch selects the unit number of RP04, RS03 and RS04 disk drives on the RH controller or the drive number of the TU16 tape drives on the TM02.

The /CSR, /VEC, /UNIT and /TM02 switches may all be specified on the same command line.

4.5 Auxiliary Stand-Alone Switches

4.5.1 Listing (/LI) Switch - The listing (/LI) switch lists from the device specified all tape filelabels, the device from which the data originated, the volume number, block number, record size, and the date and time of the copy operation. The /LI switch is of the following format:

```
dev:/LI
```

The specified device must be formatted as a logical tape. Whether or not the device was created with the /PE switch specified, the tape labels are always written in 800 bpi mode on 9-track drives. Thus the /PE switch is not needed to list the files on a tape created at 1600 bpi. The /LI switch is a stand-alone switch and must, therefore, be typed as a separate command. For example, after typing

```
PRE>MT1:/LI
```

PRESRV prints a message similar to the following:

```
LAB:A   FRM:DK0  VOL 1.  BLK:1.  RECSIZ:512.  29-APR-74 00:01:34
```

where

LAB:A	is the name given to a file written to a logical tape.
FRM:DK0	is the source device.
VOL 1.	is the volume number of the input device.
BLK:1.	is the number of blocks used in the copy operation.
RECSIZ: 512.	is the block size. 512 is the number of characters per block.
29-APR-74	is the date of the copy operation. The default is the creation date of the input device.
00:01:34	is the time of the copy operation. The default is the time the input device was created.

4.5.2 Time (/TIM) Switch - The time (/TIM) switch sets the time and date of the copy operation and is of the following format:

```
/TIM=mm/dd/yy hh:mm(:ss)
```

where

```
mm/  is the month (1-12)
dd/  is the day (1-31)
yy   is the year (0-99)

hh:  is the hour (0-23)
mm:  is the minute (0-59)
ss   is the second (0-59) (optional)
```

For example:

```
/TIM=8/29/75 15:15
```

sets the date of the copy operation to August 29, 1975 and the time to 3:15.

All values are decimal without a trailing decimal point. The /TIM switch is a stand-alone switch and must, therefore, be specified as a separate command.

The value set by the /TIM switch is used as the base from which the date and time of day is calculated. The calculated values are written in the label block of logical tapes. If the /TIM switch is not specified, PRESRV uses the creation date and time of the input device as the base.

4.6 Device Specific Switches

Device Specific Switches (/20, /55 and /80) define the density of the tape and apply only to 7-channel TU10 magnetic tapes operating in image copy mode. When 7-channel tape is being used, the copy operation must be accomplished in image mode. If no tape density is defined, the default is 800 bpi. For example:

```
PRE>MT0:/VE=MT1:
```

automatically sets the density of the tape to 800 bpi.

```
PRE>MT0:/VE=MT1:/55
```

sets the density of the tape to 556 bpi.

```
PRE>MT0:/VE=MT1:/20
```

sets the density of the tape to 200 bpi.

NOTE

Logical tapes written on 7-channel drives are always in core-dump mode (two 4-bit frames per byte).

5.0 RESTORING THE MONITOR - (/BO) SWITCH

The PRESRV program is a stand-alone program and thus, runs independently of any other system. When PRESRV is completed, the user may bootstrap a monitor from unit 0 of a specified device by using the bootstrap (/BO) switch. For example:

```
PRE>DK0:/BO
system monitor identification
```

The above command string causes a monitor to be read from unit 0 of any device and loaded into core. The /BO switch is a stand-alone switch and must, therefore, be typed as a separate command.

6.0 SAMPLE RUN

The terminal dialogue from a sample run of PRESRV is shown below. A RSTS/E system disk (RK) was mounted on drive 0 and bootstrapped to obtain the first two lines of dialogue. A TU10 9-channel magtape containing PRESRV was then mounted, write protected, on drive 0 and bootstrapped. The first command to PRESRV set the date and time. The RSTS/E disk was then write protected, and a command was issued to PRESRV to perform an image mode copy of DK0: to file TSTFIL on MT1:. Verification was requested, and the blocking factor was arbitrarily set at the octal number 24 which is equivalent to a decimal number of 20.

Input	12.	(DK default block size)
Output	20.	(MT block size specified by the /BL:24 (octal) switch)
Verification	20.	(Reread block from MT0:)
Total	52.	

A zeroed magtape was then mounted, write enabled, on drive 1, and the RETURN key was typed to begin the copy.

Upon completion of the copy, a directory of MT1: was requested to verify that the file TSTFIL had been created.

The RSTS/E disk was then removed from drive 0, and a scratch disk was mounted, write enabled, on drive 0. The next command to PRESRV requested that the contents of MT1: (TSTFIL) be copied to the scratch disk on drive 0. Formatting and verification were requested. When PRESRV completed the copy, a command to bootstrap disk 0 was given, and the final two lines of dialogue were obtained. Figure 3 below shows the terminal dialogue.

```
RSTS V06X-00 SYSTEM #2027  }
                           }<---------- Boot DKØ:
OPTION:                    }


RSX-11S V01 BL12                            }
VOLUME PRESERVATION PROGRAM - V02.1         }<---- Boot MTØ:
FOR HELP TYPE /HE                           }
52. BLOCKS AVAILABLE FOR BUFFERING          }

PRE>/TIM=09/30/75 21:00:00 <----------- Set date and time

PRE>MT1:TSTFIL/BL:24/VE=DK0:/IM <------ Copy DKØ: to MT1:TSTFIL
MOUNT OUTPUT VOLUME 1. AND TYPE CR>
** BEGIN VERIFICATION **

PRE>MT1:/LI <-------------------------- Obtain directory of MT1:

LAB:TSTFIL      FRM:DK0   VOL 1. BLK:20. RECSIZ:10240. 30-SEP-75 21:00:00


PRE>DK0:/FO/VE=MT1:TSTFIL <------------ Copy MT1:TSTFIL to new DKØ:
** BEGIN FORMATTING **
** END FORMATTING **
MOUNT INPUT VOLUME 1. AND TYPE CR>
** BEGIN VERIFICATION **
MOUNT INPUT VOLUME 1. AND TYPE CR>

PRE>DK0:/BO <-------------------------- Boot DKØ:

RSTS V06X-00 SYSTEM #2027

OPTION:
```

Figure 3 Sample Run

7.0 ERROR MESSAGE SUMMARY

During the execution of PRESRV, many checks are made by PRESRV to determine the success of the operation. If the check is unsuccessful, PRESRV prints one of the messages listed below:

ERROR MESSAGE	MEANING	RECOVERY
BITMAP FILE HDR READ ERROR	An attempt has been made to perform a copy in FILES-11 mode, but the input volume is not in FILES-11 format.	Retype the command using either the /IM or /TP switch.
CONFLICTING SWITCHES	Two conflicting switches were specified in the command string. For example, /TP/FI.	Specify the correct switch(es).
DEVICE NOT FORMATTABLE	The specified device is not accepted by PRESRV. Devices accepted by PRESRV for formatting are RK03/05, RP02/03, RP04.	Specify the correct device mnemonic. (See Table 1 for device names).
DEVICE OFFLINE	The specified device is not in the configuration hardware or the Control Status Register (/CSR) switch is improperly set.	Set the /CSR and vector (/VEC) addresses for the device to the proper addresses. Retype the command.
DICTIONARY READ ERROR	An error occurred in reading a dictionary (storage bitmap equivalent) from logical tape.	Retry or abort the operation.
DRIVE NOT READY	The specified drive is not ready or up to speed.	Wait until the drive is ready.
ERROR IN READING COMMAND	An error occurred in input to the terminal or CTRL Z (^Z) was illegally typed.	Retype command.
EXPECTED EOF NOT FOUND	An End-Of-File (EOF) mark was read from the input volume but not from the output volume during the verification of a tape image copy.	Retry the operation.
FATAL ERROR ON INPUT DEVICE	An error occurred while reading the input volume during a tape image copy.	Retry the operation.

ERROR MESSAGE	MEANING	RECOVERY
FATAL ERROR ON OUTPUT DEVICE	An error occurred while reading or writing the output volume during a tape image copy.	Retry the operation.
HOME BLOCK READ ERROR	An attempt has been made to perform a copy in FILES-11 mode, but the input volume is not in FILES-11 format.	Wait until the device is ready or retype the command using the /IM or /TP switch to specify the proper transfer mode.
ILLEGAL BLOCK COUNT	The number of blocks specified with the switch is 0 or is too large for the available buffer space.	Retry with valid block count. (See Table 3 for default block sizes).
INPUT DEVICE ERROR nnnnnnn	An error occurred when attempting to read data. The octal logical block number listed is the location where the error occurred.	None
INPUT VOLUME nn. OUT OF SEQUENCE	The number of the input volume does not match the number of the required volume.	Mount the proper volume and proceed.
INSUFFICIENT BUFFER SPACE	A record on an input tape is too large for the available buffer space. More blocks than are available in the buffer are needed to complete the copy operation.	Abort or retry the operation.
LABEL OR BOOTSTRAP WRITE ERROR	An error occurred while writing the initial part of a logical tape.	Retry or abort the operation.
LUN ASSIGNMENT ERROR	Device or unit combination specified in the command string is not supported by the current PRESRV system or is not a valid device for PRESRV operations. PRESRV recognizes only units 0 and 1 unless the /UNIT switch is used to reassign the reference of either 0 or 1.	Determine the status of the device and type the proper command.
NO SUCH FILE	File named in the command string was not found on a logical tape, or a magnetic tape was at End-Of-Volume (EOF) for input.	Retype the command using a proper filelabel.

ERROR MESSAGE	MEANING	RECOVERY
OUTPUT DEVICE ERROR nnnnnnn	An error occurred in reading or writing data. The number printed is the octal logical block number where the error was detected.	Retry, continue or abort the operation.
OUTPUT VOLUME OVERFLOW	Input has more blocks than the output volume (FILES-11) can hold.	Try an alternate transfer (for example, Image Mode).
** nnn: -- SELECT ERROR	Device is off-line. nnn: is the specified device.	Put device on line.
STORAGE BITMAP FILE READ ERROR	An attempt has been made to perform a copy in FILES-11 mode, but the input volume is not in FILES-11 format.	Wait until the device is ready or retype the command specifying the proper transfer mode (/IM or /TP).
SYNTAX ERROR	The command string was not a valid command.	Retype the command string correctly.
TAPE LABEL READ ERROR	An error occurred when reading a logical tape label record.	Retry or abort the operation.
TAPE WAS WRITTEN FOR dd	This is a warning message not an error message. The FILES-11 volume being restored from a logical tape is not of the same type as the one from which the tape was originally made. The new volume is given the bitmap of the old volume. The characters dd identify the intended FILES-11 device.	None
TRANSFER SPECIFICATION MODE ERROR	An inconsistency appears in the command string. For example, a magnetic tape has a /FI switch associated with it.	Retype an acceptable command.
VERIFICATION ERROR nnnnnnn	The data read back from the output volume does not match what was written. The number printed is the octal logical block number on the output device where the error was detected.	Retry, continue or abort the operation.

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The most important references to subjects are underlined.

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Did you find errors in this manual? If so, specify by page.

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

Is there sufficient documentation on associated system programs required for use of the software described in this manual? If not, what material is missing and where should it be placed?

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