



PDP-11
Preservation Utility (PRESRV)
User's Guide

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

digital

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ABSTRACT

This manual describes the PDP-11 Volume Preservation Utility, PRESRV: its capabilities, and its usage. The manual is organized into five major sections.

Section 1 describes PRESRV's major functions, and summarizes the formats in which volumes can be copied.

Section 2 contains a description of bootstrap procedures and operating instructions.

Section 3 describes PRESRV's command line and option switches.

Section 4 provides information on how to calculate buffer sizes.

Section 5 lists error messages, their probable causes, and what to do about them.

Audience

This manual is for persons with some familiarity with PDP-11 systems. It is not a primer. Those using it should know about bootstrap procedures, how to mount devices, etc. This manual is not an operator's guide (although section 2.3 does contain magtape operating procedures). Anyone not familiar with bootstrapping should consult the documents associated with his or her systems.

Documentation Conventions

The following conventions have been used in the manual:

1. Lower-case text in examples indicates variable information supplied by the user. The actual text will depend on such factors as

device type, switch name, etc.
Upper-case text must be typed in at
the terminal exactly as shown in the
example.

2. Underlining in examples indicates
text that is typed in by the user.
Text that is displayed by PRESRV is
not underlined.

1.0 INTRODUCTION

The PDP-11 Volume Preservation Utility (PRESRV) is a stand-alone program used to create copies of volumes. PRESRV copies volumes to and from the following device types:

- Disks (except RK06)
- Magnetic tapes
- DECTapes
- Cassette tapes

PRESRV is most often used to preserve a system disk or master disk for backup purposes, usually on magnetic tape or another disk.

PRESRV creates copies in three formats:

- FILES-11 (RSX-11M, RSX-11D, IAS only)
- Logical tape
- Image

FILES-11 format is used to save only those blocks that have data allocated to them.

Logical tape format is used for magnetic tape output. It is also used to put a copy of PRESRV on the backup volume, in front of the data, so PRESRV can subsequently be bootstrapped from that volume.

Image mode format saves all blocks of the disk, regardless of allocation.

1.1 FILES-11 Format

FILES-11 format is a file structure that applies only to disks and DECTapes. This format is supported only by RSX-11D, RSX-11M, and IAS systems.

When PRESRV is copying in FILES-11 format, it can recognize which blocks of the input volume contain user data or FILES-11 control information, and which do not. Blocks that contain user data or FILES-11 control information are called "allocated" blocks. Only allocated blocks are copied during a FILES-11 format copy.

PRESRV assumes that an input disk or DECTape is in FILES-11 format, unless either /TP or /IM is specified on the input side of the command string; or unless image mode is implied by the command. (The /TP and /IM switches are described in Sections 3.2.2 and 3.2.3, respectively. Image mode is discussed in Section 1.3, below.)

When a disk or DECTape volume is being read in FILES-11 format, the output volume is normally created in logical tape format (see 1.2, below). This is the case, except when the input and output volumes are the same device type or when /FI is specified as part of the output side of the command string.

PRESRV can copy information in FILES-11 format to disk or DECTape only if the input volume is in FILES-11 format, or was created from a file on logical tape that was the result of a FILES-11 copy.

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To create a FILES-11 format output volume, use the /FI switch on the output side of the PRESRV command string. (/FI is described in Section 3.2.1.) When /FI is specified for the output volume, the allocated blocks of the input volume are copied to the identical logical blocks of the output volume. The remaining blocks of the output volume are unchanged. This is true even if the input is a file on logical tape that was the result of a FILES-11 copy.

NOTE

When the output volume is larger than the input volume, the FILES-11 control information copied on the output volume makes it appear that the output volume has the same number of blocks as the input volume. This means that copying a small disk to a large disk (e.g., RK to RP) in FILES-11 format results in a loss of capacity on the larger volume.

Conversely, when the input volume is larger than the output volume (e.g., RP to RK), the copy may fail if an attempt is made to copy to blocks that do not exist on the smaller volume.

A FILES-11 copy from disk or DECTape is limited to a single input volume per copy command. Similarly, a FILES-11 copy to an output disk or DECTape is also limited to a single output volume per copy command.

1.2 Logical Tape Format

Logical tape format is the format in which PRESRV writes information on magnetic tapes and cassettes, when the input and output volumes are different types of devices. Logical tape format can also be specified for disk and DECTape output by means of the /TP switch (see Section 3.2.2); or, when the input and output disks are different types, and the /FI switch is not specified on the output side of the command string.

When a logical tape copy is to be produced, the output side of the command string must include a filename, to identify the file created by the copy operation.

When the input volume is magnetic tape or cassette, PRESRV assumes logical tape format by default, unless the copy is to be made to a device of the same type as the input device. When the input volume is either disk or DECTape, logical tape format is recognized only when the /TP switch is specified on the input side of the command string.

The following examples illustrate the concepts discussed above.

Example 1.

```
PRE>MT0:URFILE=DP0:
```

In this example, DP0 is read in FILES-11 mode (/TP was not specified on input). The information is written on MT0 in logical tape format, as a file named URFILE. The output can occupy more than one magtape volume.

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Example 2.

```
PRE>DT0:FILA=DK0:
```

In this example, DK0 is read in FILES-11 format. The information is recorded on DT0 in logical tape format, as a file named FILA. FILA may occupy more than one DECTape.

NOTE

A logical tape (disk or magnetic tape) may occupy more than a single volume. On magnetic tape, a logical tape may contain more than one copy of other volumes, but a new copy of a volume can not begin on any magtape volume other than the first.

1.3 Image Format

Image format is used to copy all physical blocks of a single input volume (regardless of content) to an output volume.

Image format transfers result if the input and output devices are the same type, and no other copy format is in effect. That is, no format switches are specified, and no filename is specified on the output side of the command string. (Specifying a filename on the output side of the command string implies logical tape format.)

In some cases, it may be desirable to force a transfer in image format from disk or DECTape, to a device of a different type. To do this, specify the /IM switch on the input side of the command string. For example:

```
PRE>MT0:TOM1=DK0:/IM
```

As a result of this command, a logical tape file named TOM1 is created on MT0. TOM1 contains all the physical blocks of DK0.

NOTES

1. This type of command is limited to just one input volume.
2. It is illegal to specify the /IM switch for magnetic tape input.

2.0 OPERATING PROCEDURES

Because PRESRV is a stand-alone program, it is convenient to be able to bootstrap a preserved volume to get PRESRV into memory. When PRESRV copies in logical tape format, it places the following information on the first output volume: a label block, a bootstrap block, and an image of PRESRV as it currently exists in memory, which can be bootstrapped. This information is followed by the information being preserved. See Figure 1.

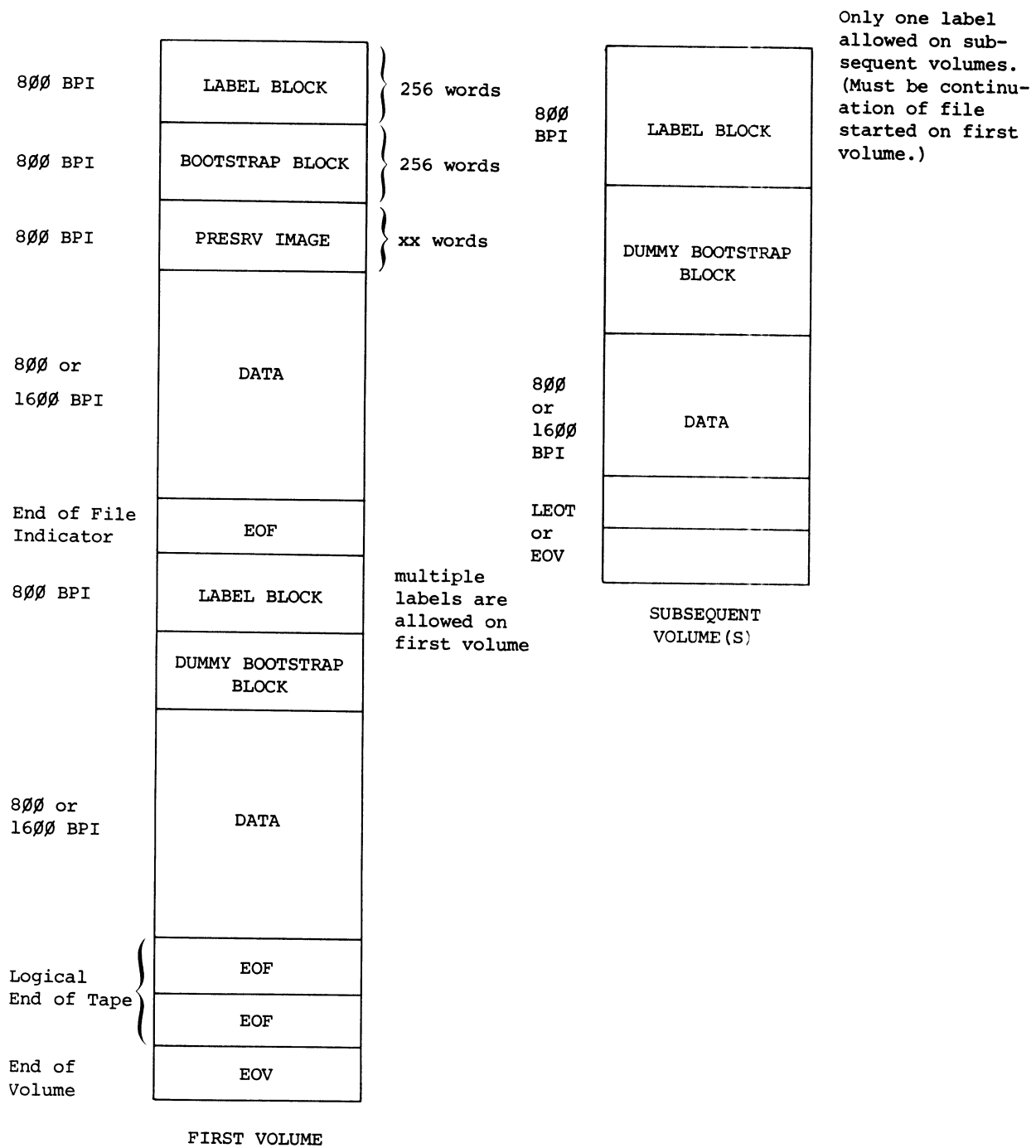


Figure 1 Logical Tape Format

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NOTE

The tape must be on line and at load point (BOT), or the bootstrap is not written correctly. Otherwise, the resulting tape cannot be booted, nor can it be read correctly.

Bootstrapping the first volume of a logical tape brings into memory a stand-alone system with a running version of PRESRV. (See the CAUTION in Section 2.1.) You can then type a command string to perform any desired PRESRV function.

To create a volume from which PRESRV can be bootstrapped, specify a copy operation from one type of device to another type of device. For example:

```
PRE>DT0:PRESRV=DK1:
```

The copy operation can be stopped before it is complete, because the necessary bootstrap information will be copied into the first few blocks of the resulting logical tape.

2.1 Bootstrap Procedure

To run PRESRV, mount the device to be copied and bootstrap the device on which PRESRV is recorded. Bootstrapping is accomplished by either setting the correct address in the console register, loading the address, and then depressing the START switch; or using the RSX-11M BOO command (on an RSX-11M system).

For details on bootstrap procedures, consult your system documentation.

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

```
RSX-11S V01 BL12
VOLUME PRESERVATION PROGRAM- V02.2
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-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
```

Change the blocking factor(s) and retry the operation.

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The number of blocks available for buffering should be kept in mind when the blocking switch (/BL) described in Section 3.2.4 is to be used. An error message is issued if the combined blocking factors for the input and output volumes exceed the number of blocks available.

CAUTION

PRESRV contains predefined CSR and vector addresses for devices. If these addresses differ from those established in your system, or if your system includes TU16 9-track magtapes, you must modify PRESRV. See Section 3.5 for a summary of PRESRV's CSR and vector addresses.

To tailor PRESRV to conform to a specific system, bootstrap the standard version of PRESRV into memory and then use the /CSR, /VEC, and /TM02 switches, described in Sections 3.5.1, 3.5.3, and 3.5.4 respectively, as required. Then create a logical tape copy, which will contain the modified version of PRESRV tailored to your system's configuration.

The following example shows how to modify in memory the vector address of an RP04 disk pack to 254. The vector address applies to both DB0 and DB1, and to any other DB-type device reassigned later to either DB0 or DB1 by means of the /UNIT switch (see Section 3.5.2).

CSR and TM02 values may be changed in similar fashion.

```
PRE>DB0:/VEC=254
```

The next example shows how to create a bootable image of the above modified version of PRESRV.

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

NOTE

This copy operation need not run to completion, because the first few blocks on DT0 are sufficient to bootstrap PRESRV into memory.

2.2 Tape Handling

PRESRV supports forms of multifile volumes and multivolume files on magnetic tape, cassettes, DECtape, and disk. Table 1 indicates the permissible combinations of files and volumes in logical tape format.

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Table 1
Legal Multifile/Volume Format in Logical Tape

Magtape/Cassette	DECTape/Disk
Multiple files on first volume only. Last file can extend to second and succeeding volumes.	One file only, which can extend to second and succeeding volumes.

Each file on a magnetic tape or cassette is terminated with an end-of-file (EOF) tape mark. A file copied in logical tape format is prefixed with a file label that identifies the file.

2.2.1 Logical Tape Input from Magnetic Tape or Cassette - PRESRV determines where to begin reading a tape as follows:

If a file label is specified, PRESRV rewinds the input tape and searches for the file label. If a file label is not specified, PRESRV assumes that the tape is correctly positioned to read the first file or next file (or file segment) of a volume set.

To read the first file of a volume set, without specifying its file label, position the first volume to Beginning-Of-Tape (BOT). After processing any file, PRESRV positions the tape to read either the next file of a set, or to an indicator marking the end of data (EOF), or the end of the volume set (EOV).

When PRESRV reaches the end of a volume by sensing the physical end of tape, it requests that the next input volume be mounted. When you mount the next volume, PRESRV assumes the volume is positioned at BOT. You are responsible for correctly positioning the tape to BOT, and for assigning the same unit number as the preceding volume.

2.2.2 Logical Tape Output to Magnetic Tape - To write the first copy of a set to magnetic tape or cassette, position the volume at BOT. If output is to be stored on two or more volumes of a set, the first volume mounted must be the first volume of the set.

After a copy operation is finished, PRESRV positions the tape to record a new file on the current volume by writing two EOF marks and then backspacing over the second EOF mark. An exception occurs when the copy ends on a volume that is not the first volume. In this case only, the backspace does not happen: any file added at that point is inaccessible to PRESRV. In the normal process of recording the new file, PRESRV overwrites the second EOF indicator that marks the current end of the volume set. If the current volume is not the first volume, the EOV indicator is not overwritten.

When PRESRV reaches the end of an output volume, it prints a message requesting that the next output volume be mounted. It assumes that the new volume is positioned at BOT. You must ensure that the volume is correctly positioned, and assigned the same unit number as the preceding volume.

Time may be saved by pre-mounting magnetic tapes (except cassettes), in the following way:

1. Pre-mount the next volume on a different unit, and assign it a different unit number than the current volume's unit number. Make sure it is positioned to the load point (BOT).
2. When PRESRV prints the request to mount the next volume, switch the unit numbers of the old and new volumes.
3. The old volume can now be rewound as PRESRV processes the new volume.

For output to magnetic tape, PRESRV assumes that the volume is correctly positioned at Beginning of Tape (BOT) initially and after a tape mark subsequently.

On input from magnetic tape, PRESRV functions differently depending on whether a file label is specified in the command line. If a file label is specified, the input volume is rewound and searched for the named file. If no file label is specified, the next file on the tape is read.

A file can extend across a volume boundary, but no new files can begin on the second or subsequent volume of a multivolume file.

NOTE

Be sure that tapes are rewound when PRESRV requests that a new volume be mounted. All tapes must be mounted, and assigned the same unit number.

2.3 Magtape Operating Procedures

The following steps are required to prepare for magtape operation.

1. Set the PWR ON/PWR OFF switch on the tape drive to PWR ON.
2. Set LOAD/BR REL to LOCK position (middle).
3. Mount the tape reel, and tighten center knob. For output tapes, make sure the write ring is inserted. For input tapes, the write ring may be removed to inhibit writing.
4. Set LOAD/BR REL to BR REL.
5. Thread the tape around capstan and read/write head, onto the pick-up reel.
6. Set LOAD/BR REL to LOAD.
7. Set ON-LINE/OFF-LINE to OFF-LINE.
8. Set FWD/REW/REV to FWD.
9. Press START. The tape will move to Beginning of Tape, which is indicated when the LD PT lamp comes on.
10. Set ON-LINE/OFF-LINE to ON-LINE.

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To rewind a tape, proceed as follows:

1. Set ON-LINE/OFF-LINE to OFF-LINE.
2. Set FWD/REW/REV to REW.
3. Press START. (If already at START, press STOP, then START.)
4. When the tape is completely rewound, to load point, the tape will stop.

To dismount a tape, proceed as follows:

1. Set LOAD/BR REL to BR REL.
2. Wind tape onto the reel.
3. Set LOAD/BR REL to LOCK (middle) and loosen center knob.
4. Remove tape reel.

2.4 Disk and DECTape Handling

PRESRV processes disks and DECTapes as described in the following sections.

2.4.1 Input from Disk and DECTape - When disk or DECTape input is in logical tape format, PRESRV processes as many volumes as necessary to copy the complete input file. However, when the input disk or DECTape is in FILES-11 or image format, PRESRV processes only a single input volume.

2.4.2 Output to Disk and DECTape - PRESRV can record only one file on a disk or DECTape output volume, regardless of format. This restriction exists because the first access to a disk or DECTape is to logical block 0. However, PRESRV can create a single logical tape copy that extends over more than one volume.

When the output volume is disk or DECTape, and FILES-11 or image format is specified or implied, PRESRV prints an error message if more than one volume is needed.

NOTE

Disks and DECTapes can be pre-mounted by following the general guidelines suggested in Section 2.2, above.

3.0 PRESRV COMMAND LINE

The PRESRV command line has the following format:

outdev:[label]/switch1.../switchn=indev:[label]/switch1.../switchn

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- outdev and indev = the physical devices on which the output and input volumes are mounted, e.g., DK0 or DT1. The device name consists of two ASCII characters followed by an optional 1-or 2-digit octal unit number. If the digit is omitted, 0 is assumed. The unit number is always 0 or 1, unless the /UNIT switch is used.
- label = a label for the file when a volume is written as a logical tape. It is used to identify files on logical tapes. See Section 2.2. The label can consist of up to nine alphanumeric characters. A label must be specified when the output is a logical tape. It is optional for input. The label parameter is applicable only for files on a logical tape.
- switch = an ASCII name identifying the switch option desired. Option switches are summarized in Table 2.

Table 2
Summary of PRESRV Switches

Category	Switch	Function
List	/HE	Causes a summary of PRESRV commands, switches, and defaults to be printed on the terminal.
	/LI	Causes a list of all files on a logical tape volume to be printed on the terminal.
Format	/FI	On input, indicates FILES-11 format for reading or writing a disk volume. On output, overrides the /TP default or implied /IM. (Never used with RSTS/E.)
	/IM	Indicates image mode, transfer all physical blocks of an input disk. Never used with tape.
	/TP	Indicates a logical tape format volume (which overrides the default image mode when device types are identical).
	/BL:nnn	Specifies a blocking factor for I/O operations. Octal is assumed; decimal is indicated by a trailing period (.).

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Table 2 (Cont.)
Summary of PRESRV Switches

Category	Switch	Function
Administrative	/ER	Indicates that the PRESRV operation is to be terminated if an I/O error occurs.
	/FO	Indicates that the output disk pack is to be formatted before use (by PRESRV).
	/RW	Causes a cassette or magnetic tape volume (either input or output) to be rewound at completion of PRESRV operation.
		<p>NOTE</p> <p>PRESRV rewinds only the last volume of a multi-volume set when it is completely finished. Intermediate volumes must be rewound by the user.</p>
Magnetic Tape	/VE	Causes the output volume to be verified after it is written.
	/20	Indicates a recording density of 200 bpi for 7-track tape. (Image transfers only.)
	/55	Indicates a recording density of 556 bpi for 7-track tape. (Image transfers only.)
	/80	Indicates a recording density of 800 bpi for 7-track tape. (Image transfers only.)
Stand-alone PRESRV	/PE	Indicates a recording density of 1600 bpi (phase encoded). Can be used only for TU16 tape drives.
	/CSR	Changes the control status register for a device type.
	/UNIT	Sets the physical unit number of either PRESRV unit 0 or 1 to a value from 2 through 7.
	/VEC	Changes the interrupt vector address for a device type.

Table 2 (Cont.)
Summary of PRESRV Switches

Category	Switch	Function
Stand-alone PRESRV (Cont.)	/TM02	Sets the unit number of the TM02 formatter on an RH controller for a specific TU16 magnetic tape unit. NOTE /CSR, /UNIT, /VEC, and /TM02 can all be specified in the same command.
	/TIM	Specifies the correct time of day to the system.
	/BO	Causes PRESRV to bootstrap the system from the specified device.

PRESRV options are specified by means of switches included in the command string or by stand-alone switches. Switches fall into five categories according to the functions they perform.

- List switches
- Format and blocking switches
- Administrative switches
- Magnetic tape switches
- Stand-alone PRESRV switches

3.1 List Switches (/HE and /LI)

The list switches are entered one at a time in response to the prompt (PRE>). Each switch is processed immediately by PRESRV. /HE obtains a printed summary of PRESRV commands, switches, and defaults. /LI obtains a list of all files of a logical tape volume set. When the designated device is a magtape or cassette, the /LI switch causes an automatic rewind, followed by a listing of the file label and a description of all the files in the set. If the two EOF tape marks are sensed before physical EOT, PRESRV performs a backspace. The tape is then positioned so a new file may be added.

The formats of the /HE and /LI switches follow.

PRE>/HE

PRE>dev:/LI

dev indicates the device and unit number on which the volume is mounted.

3.2 Format and Blocking Switches

Format switches specify the format of the input and output volumes. Three switches specify format.

/FI	specifies FILES-11 format.
/IM	specifies that a disk or DECtape volume is to be read in image format.
/TP	specifies logical tape format.

The /BL switch indicates the blocking factor.

If format switches are not included in the command line, PRESRV uses the following default values:

For the input portion of the command line, tape devices (magnetic and cassette tape) default to logical tape format, while FILES-11 devices (disk and DECtape) default to FILES-11 format.

For the output portion of the command line, logical tape format is used by default.

There are two exceptions:

1. If the input and output devices have the same device type and no format switches are included in the command line, the transfer is in image mode. The output volume will be an exact image of the input volume, regardless of the format of the input volume.
2. If the input volume is being read in logical tape format, and output is to disk or DECtape, the data portion of the input file is written into the logical blocks corresponding to the blocks the data occupied on the volume from which it was originally copied. In this case output is limited to a single volume.

Default blocking factors are provided with the description of the /BL switch in Section 3.2.4. Each block is 256 words (decimal).

3.2.1 FILES-11 Format Switch (/FI) - The FILES-11 format switch (/FI) indicates the following:

1. The input FILES-11 volume is to be read in FILES-11 format, overriding a default image-mode transfer. Only allocated blocks will be transferred.

The /FI switch is particularly useful if an image or logical tape transfer fails due to an unreadable block on a FILES-11 device that is being preserved. Because FILES-11 transfers result in copying allocated blocks only, use of the /FI switch results in a successful transfer if the unreadable block is not allocated.

NOTE

If the input volume is not in FILES-11 format, PRESRV generates an error message.

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- or, 2. The output FILES-11 volume is to be written in FILES-11 format, overriding a default logical tape format or implied Image Mode Transfer.

NOTE

This will fail if the input volume is not in FILES-11 format.

Examples:

PRE>DK0:/FI=DK1:/FI Use of the /FI switches overrides the default for this case, which is an image transfer. A FILES-11 copy of DK1 is produced on DK0.

PRE>DK0:STEVE/TP=DK1: In this case, DK0: will contain the file labelled STEVE, in logical tape format. STEVE will contain only blocks that were allocated on DK1.

PRE>DK0:/FI=DT: Use of the /FI switch indicates that the transfer is to result in DK0 containing a FILES-11 copy of the information on DECTape. The default for the output for this case is logical tape format. This is not recommended, because the resulting copy limits the capacity of DK0 to 578 blocks (the capacity of the DECTape).

NOTE

The /FI switch should not be used with RSTS/E.

3.2.2 Logical Tape Format Switch (/TP) - The logical tape format switch (/TP) indicates the following:

1. The input volume is to be read in logical tape format, or
2. The output volume is to be written in logical tape format.

When the PRESRV input is in logical tape format, the following message is printed on the terminal.

MOUNT INPUT VOLUME nn AND TYPE CR>

Mount the physical volume and then press the RETURN key to continue the PRESRV operation. If the volume is already mounted and correctly positioned, press RETURN only.

When the PRESRV output is in logical tape format, the following message is printed on the terminal.

MOUNT OUTPUT VOLUME nn AND TYPE CR>

The user response is the same as in the case of the MOUNT INPUT VOLUME message.

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Examples:

PRE>DK1:LAB/TP=DK0: The volume in DK0 is read in FILES-11 mode and is to be preserved in logical tape format on DK1. Use of the /TP switch overrides the default which is an image transfer. A label must be specified for the copy file.

PRE>DK0:=DK1:LAB/TP The file LAB in DK1 is in logical tape format, if it is the copy file created in the previous example.
or
DK1:/TP
or
DK1:LAB

3.2.3 Image Mode Switch (/IM) - The image mode switch overrides the FILES-11 default in copying disk-structured volumes. By using the /IM switch, an operator can copy any disk that is formatted compatibly with DIGITAL's hardware. In image mode, every block on the input volume is copied to the output file.

The image mode switch may also be used to override the FILES-11 default, as shown in the first of the following examples. This allows a logical tape to be used to restore a disk that was originally in any format compatible with DIGITAL hardware.

Examples:

PRE>MT0:AFIL=DP0:/IM (copy from disk to tape)
PRE>DP0:=MT0:AFIL (restore disk from tape)

3.2.4 Blocking Switch (/BL:nn) - The blocking switch (/BL:nn) indicates the following:

1. The blocking factor to be used when reading a disk or DECTape volume in image mode.
2. The blocking factor to be used when creating a logical tape or disk or DECTape output volume.

Specify the blocking switch to save time. Use the blocking switch to request that the specified number of 256-word blocks be read as a unit from a disk or DECTape; or be written as a unit to either a disk or DECTape, or in logical tape format.

Note, however, that the label of a logical tape specifies the blocking factor that was used when the file was created. The /BL switch cannot be used to override that value when the file is used as input.

The blocking switch has the following format.

/BL:nn (octal) nn indicates the number of 256-word segments combined to form a physical block. The value of nn is limited by the number of blocks available, which is printed (in decimal) on the terminal when PRESRV is initiated.
or
/BL:nn. (decimal)

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Each device has a default blocking factor that is used when no blocking switch is specified and if the buffer space is available to perform the default blocking. The defaults are shown in Table 3.

Table 3
Default Blocking Factors

Device	Format*	Default Block Size**	Max. Block Capacity (Decimal)
DK	BS	12.	4800 (RK05 Cartridge Disk)
DF	BS	8.	1024 per platter (FS11 Fixed Head Disk)
DP	BS	10.	40000 (RP02), 80000 (RP03) Disk Packs
DS	BS	8.	1024 (RS03), 2048 (FS04) Fixed Head Disks
DT	BS	2.	578 (TC11/TU56) DECtape
DB	BS	22.	167200 (KP04 Disk Pack)
MT	LT	1.	Variable TU10 or TS03 Magtape
MM	LT	1.	Variable TU16 Magtape
CT	LT	1.	Variable TA11/TU60 Cassette
DX	BS	6.	494 (RX11/RX01) Floppy Disk

* BS - Block Structured
LT - Logical Tape

** Decimal point indicates decimal value.

The defaults provided in Table 3 can be overridden by any of the following means.

1. For disks and DECtape, the /BL switch can be used with the input or output file specifier to establish a blocking factor.
2. For logical tape output, the /BL switch can be used to establish the blocking factor.
3. For magnetic tape image transfers, PRESRV calculates a blocking factor that uses all available buffering space.

NOTES

1. The /BL switch has no effect when the input device is a logical tape. The blocking factor is the same as that used when the tape was saved.
2. The blocking factor used for disk type devices should be a submultiple of the number of blocks on the volume (e.g., 4800 for RK) when copying in image mode.

Refer to Section 4.0 for the blocking calculations used to match available buffering space to blocking specifications for a file.

Example:

```
PRE>DK0:/BL:20.=MT0:/BL:20.    Twenty    256-word    blocks    are
                                transferred in each I/O operation.
                                Forty blocks must be available for
                                use in blocking.
```

3.3 Administrative Switches

Three administrative switches are provided.

```
/ER    aborts the operation if an I/O error occurs.
/RW    rewinds a tape after PRESRV completes.
/VE    verifies an output volume.
```

3.3.1 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 you type the ALTMODE key when PRESRV is ready to accept input, the current operation is aborted.

3.3.2 Rewind at Completion Switch (/RW) - The rewind at completion switch (/RW) applies to magnetic tape and cassette tape volumes. It indicates that the volume is to be rewound after PRESRV has completed the specified transfer.

The /RW switch applies to input and output file specifiers.

NOTE

Only the last volume of a multivolume input or output set is rewound.

3.3.3 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 are needed. The /VE switch may appear on either side of the command string. For example:

```
PRE>DK1:/VE=DKO:
PRE>DK1:=DKO:/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 with the following error message whenever a verification error occurs:

```
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.

3.4 Magnetic Tape Switches

Four switches are provided to specify magnetic tape options. The default recording density is 800 bpi. 7-channel tapes are always recorded in Core Dump Format.

```
/20 specifies 200 bpi for 7-track tape.
/55 specifies 556 bpi for 7-track tape.
/80 specifies 800 bpi for 7-track tape.
/PE specifies 1600 bpi (phase encoded) for TU16 tape.
```

NOTES

1. File labels, bootstraps, and system images are always written at 800 bpi. Therefore, logical tapes written with the /PE switch must be copied with /TP and /PE specified on both sides of the command. For example:

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

2. Logical tapes written on a 7-track drive are bootable only on a 7-track drive. Logical tapes written on a 9-track drive are bootable only on a 9-track drive.

3.4.1 200 bpi Switch (/20) - The 200 bpi switch (/20) indicates either that an input magnetic tape volume has been recorded at 200 bits per inch, or that an output magnetic tape volume is to be recorded at 200 bits per inch. The tape drive must be 7-track and an image copy must be performed. Thus:

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

produces and verifies an exact copy of MT1 on MT0 at 200 bpi.

3.4.2 556 bpi Switch (/55) - The 556 bpi switch (/55) indicates either that the input magnetic tape volume has been recorded at 556 bits per inch, or that the output magnetic tape volume is to be recorded at 556 bits per inch. The tape drive must be 7-track and an image copy must be performed.

3.4.3 800 bpi Switch (/80) - The 800 bpi switch (/80) indicates either that an input magnetic tape volume has been recorded at 800 bits per inch or that an output magnetic tape volume is to be recorded at 800 bits per inch. This switch can be specified for image transfers on 7-track magnetic tape only.

3.4.4 Phase Encoded Switch (/PE) - The phase encoded switch indicates either that an input magnetic tape volume is recorded at 1600 bits per inch (phase encoded) or that an output magnetic tape volume is to be recorded at 1600 bits per inch. The volume must be mounted on a TU16 drive.

3.5 Stand-Alone PRESRV Switches

Once a logical tape is booted into memory, PRESRV is running. Seven stand-alone switches are available with PRESRV. Four of the switches specify physical device address information.

/CSR	specifies a control status register.
/UNIT	sets the unit number for a device to 2 through 7.
/VEC	specifies an interrupt vector for a device.
/TM02	specifies the unit number of a TM02 formatter on the RH controller.

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These four switches can appear together, in any combination, in a single command line. This has no effect on their stand-alone status; i.e., the action specified by each switch is executed before another command is accepted.

A fifth switch, /TIM, sets the current time and date.

The remaining switches are /BO and /FO.

PRESRV is distributed with the control status register (CSR) and vector addresses shown in Table 4.

Table 4
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
MM	172440	320*
MT	172522	224
DX	171700	264

Two units (0 and 1) are generated for each device type.

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

If the generated CSR or vector address does not correspond to the actual hardware configuration in use, the /CSR and /VEC switches can be used to correct values generated by PRESRV (see below).

3.5.1 Control Status Register Switch (/CSR) - The control status register switch (/CSR) specifies the correct CSR for a device type. The switch is typed in response to the PRE> prompt and has the following format.

dev:/CSR=nnnnnn

dev = the device name and logical unit number of the device whose CSR is to be changed.

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

The new CSR applies to only the device specified in the command.

3.5.2 Physical Unit Number Switch (/UNIT) - The physical unit number switch (/UNIT) allows the user to copy to or from a device designated as a unit other than unit 0 or 1 of that device type. Type the /UNIT switch in response to the PRE> prompt, in the following format:

dev:/UNIT=n

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dev = the device name and unit number (0 or 1).
n = the unit number of the same device type that will be referenced each time "dev" (as specified above) appears in a command line.

For example:

```
>PRE>DB1:/UNIT=3
```

causes the RP04 assigned as unit 3 to be referenced each time DB1 appears in a command.

The /UNIT switch can also be used in conjunction with the /TM02 switch, to reference MM2 through MM7 on systems with mixed MASSBUS peripherals.

3.5.3 Vector Address Switch (/VEC) - The vector address switch (/VEC) changes the interrupt vector for a device type. The switch is typed in response to the PRE> prompt. It has the following format.

```
dev:/VEC=nnnnnn
```

dev = the device name and unit number for which the vector address is to be changed.

nnnnnn = the new octal vector address.

NOTE

When a tape created by online PRESRV is bootstrapped, if the vector address is incorrect, the first command issued after the prompt should be to set the appropriate vector address; for example:

```
MM0:/VEC=224
```

The new vector address applies to all devices of the specified type.

3.5.4 Set TM02 Unit Number Switch (/TM02) - The /TM02 switch changes the unit number of the TM02 formatter for a TUL6 attached to an RH11 controller. The TM02 formatter for the TUL6 is normally unit 0 on its RH11.

The format is:

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

dev: = The TM02 formatter whose position on the RH Controller is to be changed.

n = The unit number to which the TM02 formatter is to be changed.

Example:

```
MM0:/TM02=2
```

The new TM02 value applies to only the device specified in the command.

3.5.5 Time Switch (/TIM) - The time switch (/TIM) sets the time of day for the PRESRV system. It is typed in response to the PRE> prompt and has the following format.

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

mm = month

dd = day of the month

yy = year

hh = hours

mm = minutes

ss = if present, seconds

All values are in decimal (no decimal point is specified).

3.5.6 BOOT Switch (/BO) - The PRESRV program is a stand-alone program that runs independently of any other system. When PRESRV is completed, the user may bootstrap a monitor from 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 DK0: and loaded into memory. The /BO switch is a stand-alone switch and must be typed as a separate command. Only unit 0 of the specified device type may be bootstrapped in this way.

3.5.7 Format Disk Switch (/FO) - RK05, RP02, RP03, and RP04 disks delivered from the factory must be prepared to store data before they can be used. This preparation process is called "formatting", and consists of writing timing and sector identification information on the disk. PRESRV performs this operation in response to the /FO switch.

Formatting can be specified as a separate operation or in conjunction with a copy operation. If a copy operation has been specified, the format pass is made before the copy is made. The /FO switch can be specified only on the output side of the command string.

Examples:

```
PRE>DK0:/FO
```

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

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When formatting starts, the message

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

is displayed. When formatting has been completed, the message

```
** END FORMATTING **
```

is displayed.

Before RP02 or RP03 disks can be formatted, formatting must be enabled with the format enable switch on the RP11 controller. This switch is located in the third bay from the bottom on the controller. The front cover must be removed to expose the switch. PRESRV prompts the user to enable and disable formatting at the proper times with the following messages:

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

When the switch is set properly, press the RETURN key to tell PRESRV to continue.

Once a disk is formatted, it requires no reformatting unless the control information has been destroyed.

4.0 COMPUTING THE NUMBER OF BLOCKS REQUIRED FOR BUFFERING

When PRESRV is initiated, it prints at the terminal the maximum number of 256-word blocks available for buffering. (This number is a decimal number.) These blocks are required for data transfer and verification operations. The user must refer to the number (nn.) to determine whether a given media copy has sufficient buffering space.

The space required depends on blocking factors and use of the verification switch. Default block sizes for devices supported by PRESRV are provided in Table 3. The maximum number of buffer blocks depends on the memory size of the system.

The examples below illustrate the method for determining the blocks required for PRESRV copy operations. The method is to establish the total number of blocks required for input, output, and verification.

Example 1:

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

Thirteen blocks are required to create a logical tape file (labelled ABC) on magtape unit 0, from an RK disk in image mode, using default blocking factors.

<u>Operation</u>	<u>Blocks Required</u>
Input	12. (DK default block size)
Output	1. (MT default block size)
Verification	0. (no verification specified)
Total	13.

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Example 2:

```
PRE>MT0:DEF/BL:12.=DK0:/IM
```

Twenty-four blocks are required to create a logical tape file (labelled DEF) on magtape unit 0. The default blocking factor is used for the input device, while physical blocks of 3072 words each are written to MT0 (12 x 256). This results in fewer blocks on MT0, and requires less execution time because the number of tape write operations is reduced.

The blocking factor (12, decimal) will be recorded in file DEF's file label.

<u>Operation</u>	<u>Blocks Required</u>
Input	12. (DK default block size)
Output	12. (blocking factor specified for MT0)
Verification	0 (no verification specified)
Total	24.

Example 3:

```
PRE>DK0:=MT0:XYZ
```

Twelve blocks, plus the record size of file XYZ, are required to copy file XYZ from MT0: to unit DK0: and to have DK0: formatted as a logical tape.

<u>Operation</u>	<u>Blocks Required</u>
Input	Record size specified in file XYZ's label
Output	12. (DK default block size)
Verification	0
Total	12. plus record size of file XYZ.

Example 4:

```
PRE>DK0:/VE=MT0:IJK
```

Twenty-four blocks, plus the record size of file IJK, are required to copy file IJK from MT0: to DK0:, with verification specified.

<u>Operation</u>	<u>Blocks Required</u>
Input	Record size of file IJK
Output	12. (DK default block size)
Verification	12. (Re-read block from DK0:)
Total	24. plus record size of file IJK.

Example 5:

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

The above command results in an image copy. The image copy uses all available memory buffer space in creating blocks on the output volume. If any input record is too large, the transfer is aborted. If verification is specified, half of the available memory buffer space is used to form blocks for the output volume. The other half is required for verification.

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5.0 ERROR MESSAGE SUMMARY

As it executes, PRESRV checks to determine the success of the operation. If an error is detected, PRESRV prints one of the messages listed below:

<u>Error Message</u>	<u>Meaning</u>	<u>Recovery</u>
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 or is not ready.	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.
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.
FATAL ERROR ON OUTPUT DEVICE	An error occurred while reading or writing the output volume during a tape image copy.	Make sure the output device isn't write-protected. Retry the operation.

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<u>Error Message</u>	<u>Meaning</u>	<u>Recovery</u>
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 or is not ready.	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 while 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 specifying different block sizes.
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 logical unit (LUN) combination specified in the command string is not supported by the current PRESRV system or is not a valid device for PRESRV operations.	Determine the status of the device and type the proper command. You may be able to redirect the PRESRV operation to another unit by means of the /UNIT switch (Section 3.5.2).
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 file label.
OUTPUT DEVICE ERROR nnnnnnn	An error occurred while reading or writing data. The number printed is the octal logical block number where the error was detected.	Retry, continue or abort the operation.

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<u>Error Message</u>	<u>Meaning</u>	<u>Recovery</u>
OUTPUT VOLUME OVERFLOW	Input has more blocks than the output volume (FILES-11) can hold.	Try an alternate transfer format. Check the blocking factor.
*** nnn: -- SELECT ERROR	Device nnn: is off-line.	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 or is not ready.	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 while 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. If retry is specified, PRESRV performs the entire operation from the beginning.
VOLUME FAULTY - "R" TO RETRY, "C" TO CONTINUE	An I/O error was detected during a copy operation; or a verification error occurred.	Type R to retry the operation from the beginning. Type C to continue from the point at which the error occurred.

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NOTE: This form is for document comments only. Problems with software should be reported on a Software Problem Report (SPR) form.

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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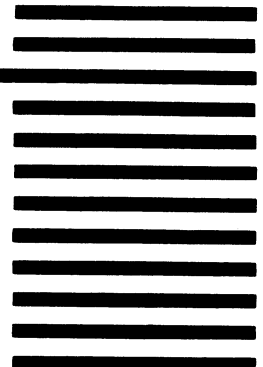
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