

Support Tape User's Manual

HP Apollo 9000 Series 700



**HEWLETT
PACKARD**

**HP Part No. B2380-90000
Printed in USA March 1991**

**Edition 1
E0391**

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Printing History

New editions are complete revisions of the manual. Update packages, which are issued between editions, contain additional and replacement pages to be merged into the manual by the customer. The dates on the title page change only when a new edition or a new update is published. No information is incorporated into a reprinting unless it appears as a prior update; the edition does not change when an update is incorporated.

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Edition 1 March 1991



Preface

The *S700 Support Tape User's Manual* provides the information needed to use the S700 Support Tape in troubleshooting HP 9000 Series 700 Computer Systems.

The part number for the S700 Support Tape is B2380-13400.

It is assumed that the user has knowledge of the HP-UX operating system.

Note



The customer is only licensed to use the Recovery Utilities on the S700 Support Tape. All other use of any executable code on the S700 Support Tape is restricted to HP support personnel only. HP shall not be liable for any damages resulting from unauthorized use of the S700 Support Tape. The Support Tape remains the property of HP.

The following is a summary of chapters in this user's manual:

- | | |
|-------------------|--|
| Chapter 1 | introduces the support tape. |
| Chapter 2 | describes how to use the Support Kernel. |
| Chapter 3 | describes how to use the MULTIDIAG diagnostic |
| Appendix A | lists the contents of the Support Kernel memory-based file system. |

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The S700 Support Tape

This manual describes the S700 Support Tape and explains its use.

Note

The customer is only licensed to use the Recovery Utilities on the S700 Support Tape. All other use of any executable code on the S700 Support Tape is restricted to HP support personnel only. HP shall not be liable for any damages resulting from unauthorized use of the S700 Support Tape. The Support Tape remains the property of HP.

Purpose of the S700 Support Tape

The S700 Support Tape allows you to diagnose and fix problems when the operating system cannot be booted from the system disk. The support tape runs on minimal hardware, with or without the system disk. This hardware configuration includes:

- The minimum supported amount of memory for a given SPU (16 Mb for the MCF Release)
- Console
- DDS tape drive
- Input/output paths to the console and tape drive

The S700 Support Tape is also intended to:

- Provide a vehicle for distributing ISL-based support tools.

Design of the S700 Support Tape

The support tape contains a special version of the HP-UX operating system, called the Support Kernel.

Note



The Support Kernel contains a memory-based file system and functions independently of the system disk. This sets the Support Kernel apart from the standard HP-UX kernel.

Some consequences of the structure of the Support Kernel are:

- The memory-based file system is much smaller than the typical disk-based file system.
- Because the memory-based file system is smaller than normal, you can rapidly exhaust the available memory space. When the file system is full, you must remove some of the existing files before you can load any new files.
- The total memory used by HP-UX and the file system is about 6.0 Mb. You can use the remaining memory to run programs. Remember that the HP-UX kernel itself requires some of this space to run. Subject to space limitations and some other factors (discussed below), you should be able to run any program that runs on a standard HP-UX operating system.

Note



If you find any programs that do run on a standard HP-UX operating system, but do not run on the Support Kernel, please log an entry on the Software Tracking and Reporting System II (STARS II) against Part No. B2380-13400. See the *STARS II User's Guide* for details on how to use STARS II.

- The Support Kernel is not configured to swap (hence it is able to function independently of a system disk). A program that attempts to swap can cause the Support Kernel to crash. No program that inherently relies on the existence of a swap device or whose sticky bit is set should be run under the Support Kernel environment.

Tape Layout

The S700 support tape is organized as follows:

```
-----  
| LIF | Image 1 | Image 2 | Image 3 | Image 4 |  
-----
```

The following is a brief description of the contents of these sections of the tape:

LIF	This LIF volume contains the following programs/tools :
ISL	standard version of the Initial System Loader released with HP-UX.
FS	DEX environment contained in a tape-based file system.
HPUX	standard version of Mongoose to launch the RECOVERY kernel and DEX.
RECOVERY	Support Kernel
IOMAP	standard version of the IOMAP utility
SS_CONFIG	standard version of the SS_CONFIG utility
MULTIDIAG	standard version of the MULTIDIAG diagnostic
DEX	standard Diagnostic Executive contained in Support Tape LIF volume (for performance reasons)
Image 1	Golden Disk Image of the Developer's root disk
Image 2	Golden Disk Image of the Developer's /usr disk
Image 3	Golden Disk Image of the Runtime root disk
Image 4	Golden Disk Image of the Runtime /usr disk

Using the S700 Support Tape

To use the support tape you must:

- Know the HP-UX operating system, especially the HP-UX file system, device files, and data backup/recovery utilities.
- Know how to boot from the support tape.
- Know which tools and commands you need and how to use them (for example, `mount`, `fsck`, `fbackup`, `frecover`).
- Know how to use the Access Port, if remote support is required.

Booting Up

This section describes how to boot from the support tape.

Assume that the system has halted and cannot be booted from the system disk. To boot from the support tape:

1. Turn off the power to the workstation, wait a few seconds, then turn the power back on.
2. Press the <ESC> key. In a few seconds, the message appears:

```
Terminating selection process.
```

A short time later, this message appears:

```
Searching for potential boot devices.
```

```
To terminate search, press and hold the ESCAPE key.
```

A list of potential boot devices might look like this:

```
P0    scsi.6.0          QUANTUM PD210S
P1    scsi.5.0          QUANTUM PD210S
P2    scsi.4.0          HP SCSI DAT DRIVE
P3    scsi.3.0          TOSHIBA CD-ROM DRIVE:XM
P4    lan.123456-789abc  homebase
```

This process may take several minutes. When search ends, this list of actions appears:

```
b) Boot from specified device
s) Search for bootable devices
a) Enter boot administration mode
x) Exit and continue boot sequence
?) Help
```

Select from menu:

3. Insert support tape in the SCSI tape drive.
4. Scan the Device Selection list. Look for the SCSI tape drive and note its Pn number. For example, if the SCSI tape drive is listed as item P2, type:

```
Select from menu: b p2 ip1
```

This command will cause an S700 workstation to attempt to boot the Initial System Loader (also known as the Initial Program Loader or IPL). It may be about a minute before boot messages begin to appear on the screen. It takes about five minutes to boot ISL from the support tape.

The prompt for the Initial System Loader (ISL) appears:

```
ISL>
```

5. To launch the IOMAP utility, simply type (at the support tape ISL prompt):

```
ISL> IOMAP
```

Follow a similar procedure to launch the SS_CONFIG utility and the MULTIDIAG diagnostic. It takes twenty to thirty minutes to launch an ISL level utility or diagnostic from the S700 Support Tape.



6. The quickest way to launch DEX from the S700 Support Tape environment is to type:

```
ISL> hpux boot tape():DEX
```

It takes about thirty minutes to launch DEX from the support tape in this manner.

Another way to launch DEX from the support tape is to type:

```
ISL> hpux boot tape()/etc/diag/dex/dex
```

7. To boot the Support Kernel, type:

```
ISL> support
```

It currently takes about thirteen minutes to boot the Support Kernel from the S700 Support Tape. You will receive many boot/initialization messages on the screen. Eventually, you will receive this prompt:

```
Press <return> to continue
```

After you press the <return> key, the SUPPORT TAPE RESTORE DISK IMAGE MENU appears. See the “Using the Support Kernel” section of this manual for more details.

Caution



Do not reboot the system while any disk-based file systems are mounted. Unmount all of the disk-based file systems by typing the following (at the support tape shell prompt) :

```
# /etc/umount -a
```

Do not cycle power or press the Transfer of Control (TOC) button to reboot the system while the Support Kernel is running.

There are two proper ways to reboot the system. One of them is to type the following (at the support tape shell prompt) :

```
# /etc/reboot
```

The second way to reboot the system is to select the Shutdown System option from the SUPPORT TAPE RESTORE DISK IMAGE MENU.

Using the Support Kernel

After you boot the Support Kernel, the following menu appears:

```

SUPPORT TAPE RESTORE DISK IMAGE MENU

b. Backup System Disks
d. Restore Development Environment
r. Restore Run-time Environment
s. Shutdown System
h. Display Support Tape User's Manual
x. Exit to shell

```

Select one of the above:

A menu option is selected by typing an appropriate letter followed by <return> For instance, to exit to the shell, type:

```
Select one of the above: x <return>
```

To return to the Support Tape Menu, type this at the shell prompt:

```
# menu
```

The following commands are available at the S700 Support Tape shell prompt:

```

cat
clear
cp
cpio
dd
egrep
fbackup
frecover
fsck
init

```

```
ls
more
mount
mt
reboot
rm
sh
su
tar
umount
```

Refer to the `man` pages for these commands to obtain information about using them.

Note

Three mount points are provided in the Support Kernel memory-based file system for mounting disk-based file systems. Mount points are simply empty directories that can be used for mounting file systems. These mount points are : `/mnt1`, `/mnt2`, and `/mnt3`.

For example, to mount a file system pointed at by a device file `/dev/dsk/6s0` type the following command at the shell prompt:

```
# /etc/mount /dev/dsk/6s0 /mnt1
```

A file system may have to be fixed by `fsck`, before it can be mounted. Refer to the `man` pages for `mount` and `fsck` for more details.

2-2 Using the Support Kernel

In order to attempt to fix file system(s) on the system disk(s) by using the `fsck` utility, you must specify appropriate character disk device file(s). The following convention of mapping disk device file names to physical hardware paths is followed in the Support Kernel:

SCSI.0.0	/dev/rdisk/0s0
SCSI.1.0	/dev/rdisk/1s0
SCSI.2.0	/dev/rdisk/2s0
SCSI.3.0	/dev/rdisk/3s0
SCSI.4.0	/dev/rdisk/4s0
SCSI.5.0	/dev/rdisk/5s0
SCSI.6.0	/dev/rdisk/6s0

For example, to fix a file system on disk `SCSI.6.0` (the root disk for the MCF release), type the following command at the shell prompt:

```
# /etc/fsck -p /dev/rdisk/6s0
```

As the file system check progresses, many messages appear on the screen. Some of them may indicate that files have been corrupted and are being repaired.

Similarly, to fix a file system on disk `SCSI.5.0` (/usr disk for the MCF release), type the following command at the shell prompt:

```
# /etc/fsck -p /dev/rdisk/5s0
```

Troubleshooting Suggestions

The following section describes some typical troubleshooting scenarios with suggested fixes.

fsck succeeds in fixing the file system(s).

If `fsck` succeeds in fixing the file system(s), you have the following options:

1. Reboot system and try to boot from the system disk. There are two proper ways to reboot the system. One of them is to type the following (at the support tape shell prompt) :

```
# /etc/reboot
```

The second way is to select the `Shutdown System` option from the `SUPPORT TAPE RESTORE DISK IMAGE MENU`.

Note



Make sure no disk-based file systems are mounted when you are rebooting. This can be ensured by executing the following command:

```
# /etc/umount -a
```

2. Use support tape data backup/recovery utilities to restore the latest system backup. This may become necessary if `fsck` succeeds in repairing the file system(s), but the machine still cannot be booted from the system disk (for example, if a kernel has been corrupted). Support tape backup utilities can be used to back up the current contents of the system disk (or just the important files).

The following data backup/recovery utilities are provided in the support tape environment:

```
fbackup frecover tar cpio
```

Note that these utilities can be used only if the file systems have been successfully fixed by `fsck` and have been mounted. The `Backup System Disks` option of the `Support Tape Menu`, however, can be used to create a raw backup of the current contents of the disks, even if `fsck` fails.

Refer to the `man` pages for more details about using the HP-UX commands mentioned above.

2-4 Using the Support Kernel

3. Restore appropriate disk images using the Support Tape Menu.

Note



Restoring a disk image from the support tape causes ALL of the information currently contained on a system disk to be lost.

The procedure for restoring disk images is intended for dealing with D.O.A. ("Dead On Arrival") systems, and for recovering disks with corrupt file systems, which cannot be repaired by `fsck`. Restoring disk images may also become necessary when a system cannot be booted from the system disk, and a customer does not have a backup.

`fsck` is unable to fix the file system(s).

There are two possible reasons why `fsck` may not be able to repair the file systems:

1. File system corruption is too severe for `fsck` to succeed.
2. There is a hardware problem.

Error messages displayed by `fsck` should help to determine the cause of the problem.

In case of severe file system corruption, the suggested procedure is to restore Golden Disk images using the Support Tape Menu; boot from the system disk; and then restore the latest customer backup. Note that the Backup System Disks option of the Support Tape Menu can be used to back up current contents of disk(s), prior to restoring Golden Disk Images (even if `fsck` fails).

There are several tools on the S700 Support Tape which will help in troubleshooting hardware problems. These tools are:

IOMAP
DEX
MULTIDIAG

Using the Backup System Disks Main Menu Option

This support tape “SUPPORT TAPE RESTORE DISK IMAGE MENU” option allows you to create a raw backup of the current contents of the system disk(s). Disk images are backed up on a DDS tape in 10Kb block sizes, separated by End_Of_File (EOF) marks.

To back up the system disks, using this approach, do the following:

1. Obtain a scratch tape. This is a DAT tape which may be written on without destroying needed data. Make sure that the tape is not write-protected. To do this, check the rear of the cassette. You will see a sliding tab in one corner. This tab is used to open and close the “recognition hole” in the cassette. If the hole is open, the cassette is write-protected; if it is closed, data may be written on the tape. If necessary, slide the tab to close the recognition hole.
2. Type the following command at the Support Kernel shell prompt to get the SUPPORT TAPE RESTORE DISK IMAGE MENU:

```
# menu
```

The following menu appears:

```
SUPPORT TAPE RESTORE DISK IMAGE MENU

b. Backup System Disks
d. Restore Development Environment
r. Restore Run-time Environment
s. Shutdown System
h. Display Support Tape User's Manual
x. Exit to shell
```

Select one of the above:

3. To select the Backup System Disks option, simply type:

Select one of the above: b <return>

This prompt appears:

```
Legal tape drive paths :  
    SCSI.0.0, SCSI.1.0, SCSI.2.0, SCSI.3.0,  
    SCSI.4.0, SCSI.5.0, SCSI.6.0, SCSI.7.0
```

Enter Tape Drive Path :

4. Type in the hardware path of the SCSI tape drive from which the system is currently booted (the hardware path of the SCSI tape drive that contains the support tape). For example:

Enter Tape Drive Path : SCSI.4.0

These lines appear:

```
Remove Support Tape from tape drive.  
Insert writable scratch tape into tape drive.  
  
Press "c" then <return> to continue, or  
press "a" then <return> to abort backup process.
```

5. If you do not wish to continue, press A <return> You will receive a prompt that will allow you to return to the SUPPORT TAPE RESTORE DISK IMAGE MENU.
6. Remove the support tape from the tape drive, by pressing the eject button, and insert the scratch tape into the tape drive.
7. Press C <return>

If the tape is write-protected, you will see this message:

```
Unable to access tape at <address> for writing.  
Insert writable scratch tape into tape drive.  
  
Press "c" then <return> to continue, or  
press "a" then <return> to abort backup process.
```

If you receive this message, remove the scratch tape, render it writable, put it back in the tape drive, and press C <return>

These lines appear:

```
Press "r" then <return> to back up
Root ( / ) Disk, or
press "u" then <return> to back up
User ( /usr ) Disk, or
press "a" then <return> to abort
backup process.
```

8. Press R <return> This prompt appears:

```
Legal disk drive paths :
    SCSI.0.0, SCSI.1.0, SCSI.2.0, SCSI.3.0,
    SCSI.4.0, SCSI.5.0, SCSI.6.0, SCSI.7.0
```

```
Enter Path for Root ( / ) Disk :
```

The default MCF hardware path for the root (/) disk is
SCSI.6.0

9. Type in the hardware path of the disk which contains the root
(/) partition:

```
Enter Path for Root ( / ) Disk : SCSI.6.0
```

The backup of the root disk begins. It takes about half an hour.

When the backup of the root disk is finished, this prompt
appears:

```
Press "r" then <return> to back up
Root ( / ) Disk, or
press "u" then <return> to back up
User ( /usr ) Disk, or
press "a" then <return> to abort
backup process.
```

10. You may now type U <return> to back up the /usr disk.
When the backup is done, you will get the same prompt. Type A
<return> This prompt appears:

```
Remove scratch tape.
Insert Support Tape.
Press <return> to get back to main menu
```

2-8 Using the Support Kernel



Remove the scratch tape from the drive, and put it in a safe place. Put the support tape back in the drive, and press <return>. The SUPPORT TAPE RESTORE DISK IMAGE MENU reappears.

Note

The following procedure for restoring a backup, created by the process described above, assumes that a device file `/dev/rmt/4mn` corresponds to a DDS tape drive; and device files `/dev/rdisk/6s0` and `/dev/rdisk/5s0` correspond to the root and user disk drives, respectively.

Load the backup tape into the tape drive. Type the following commands at a shell prompt:

```
# dd if=/dev/rmt/4mn of=/dev/rdisk/6s0 bs=10k
# dd if=/dev/rmt/4mn of=/dev/rdisk/5s0 bs=10k
```

Using the Restore Development/Run-time Environment Main Menu Option

Note

Restoring a disk image from the support tape causes ALL of the information currently contained on a system disk to be lost. Consider backing up the system disk data before restoring disk image(s).

This can be accomplished by:

1. Using the Backup System Disks option of the SUPPORT TAPE RESTORE DISK IMAGE MENU.
2. Using `fbackup` from the support tape shell prompt (assuming `fsck` succeeds in fixing the file system).

Also note that `frecover` can be used from the support tape shell prompt to restore the latest backup (assuming `fsck` succeeds in fixing the file system).

To restore a development environment, press D <return> at the SUPPORT TAPE RESTORE DISK IMAGE MENU prompt.

To restore a runtime environment, press R <return> at the SUPPORT TAPE RESTORE DISK IMAGE MENU prompt.

The recovery procedure for both is identical:

1. This prompt appears:

```
Legal tape drive paths :  
    SCSI.0.0, SCSI.1.0, SCSI.2.0, SCSI.3.0,  
    SCSI.4.0, SCSI.5.0, SCSI.6.0, SCSI.7.0
```

```
Enter Tape Drive Path :
```

2. Type in the hardware path of the SCSI tape drive from which the system is currently booted (the hardware path of the SCSI tape drive that contains the support tape).

```
Enter Tape Drive Path : SCSI.4.0
```

These lines appear:

```
Press "r" then <return> to restore  
Root ( / ) Disk, or  
press "u" then <return> to restore  
User ( /usr ) Disk, or  
press "a" then <return> to abort  
restoration process.
```

3. Press R <return> This prompt appears:

```
Legal disk drive paths :  
    SCSI.0.0, SCSI.1.0, SCSI.2.0, SCSI.3.0,  
    SCSI.4.0, SCSI.5.0, SCSI.6.0, SCSI.7.0
```

```
Enter Path for Root ( / ) Disk :
```

The default MCF hardware path for the root (/) disk is
SCSI.6.0

4. Type in the hardware path of the disk which contains the root (/) partition:

```
Enter Path for Root ( / ) Disk : SCSI.6.0
```

The restoration of the root disk begins. It takes about half an hour.

2-10 Using the Support Kernel

When the restoration of the root disk is finished, this prompt appears:

```
Press "r" then <return> to restore
Root ( / ) Disk, or
press "u" then <return> to restore
User ( /usr ) Disk, or
press "a" then <return> to abort
restoration process.
```

5. Press U <return> to restore the user disk. The procedure is similar to that described above for the root disk.

When the restoration of the /usr disk is finished, this prompt appears:

```
Press "r" then <return> to restore
Root ( / ) Disk, or
press "u" then <return> to restore
User ( /usr ) Disk, or
press "a" then <return> to abort
restoration process.
```

6. Press A <return> This prompt appears:

```
Press <return> to get back to main menu
```

Remove the support tape from the drive, and put it in a safe place. The SUPPORT TAPE RESTORE DISK IMAGE MENU reappears after you press the <return> key.

7. To reboot the system, type S <return> at the SUPPORT TAPE RESTORE DISK IMAGE MENU prompt.

Using MULTIDIAG

This chapter provides basic information on running MULTIDIAG from the S700 Support Tape. For further information on S700 diagnostics, exercisers, and utilities, see the following two manuals:

- *HP Apollo 9000 Series 700 Precision Architecture RISC Diagnostic Manual (part number 09740-90041)*
- *Using DEX and SAX with HP-UX (part number A1926-90002)*

Introduction

MULTIDIAG provides a means to test and diagnose multiple components of the S700 Computer System, by integrating the testing of the processor, memory controller, and I/O interfaces into one ISL diagnostic.

Minimum Configuration

In order to run MULTIDIAG, the system must include the following:

- A disk or tape
- A system console

Running MULTIDIAG

Once ISL has been loaded, the ISL> prompt appears on the system console. At this time, the user can load MULTIDIAG by typing the following:

```
ISL>multidiag
```

The diagnostic is then loaded into memory and the following banner is displayed on the system console:

```
Series AXXXXA System Processor - Interface  
Diagnostic, Version A.00.01  
There are xxx sections in this diagnostic -  
1 thru xxx
```

The diagnostic prompt will then appear:

```
MULTIDIAG>
```

The system now waits for the user commands. At this point, the user can select which sections to run; whether to enable activity printouts; whether to enable error or isolation messages; and whether or not to enable looping. Hardcopy printout can also be selected at this point. If the user does not specify particular sections or steps to be run, the default values are the following:

- all test sections are run
- activity indicators are enabled
- error and isolation messages are enabled
- pause after isolation message is enabled
- looping is disabled
- hardcopy is disabled

To begin execution of the diagnostic, enter the following at the MULTIDIAG> prompt:

```
MULTIDIAG>resume
```

If activity printouts have been selected, the following will be displayed as the diagnostic progresses through each section (assuming all sections have been selected):

3-2 Using MULTIDIAG

```
STARTING CPU DATA PATH TESTS - SECTIONS 1/6
SECTION 001
SECTION 002
SECTION 003
SECTION 004
SECTION 005
SECTION 006
STARTING VIPER DATA PATH TESTS - SECTIONS 7/10
SECTION 007
SECTION 008
SECTION 009
SECTION 010
.
.
.
```

The following message is displayed, after the last has been executed:

```
DIAGNOSTIC COMPLETED
```

If looping has been enabled, then at the end of each pass through the diagnostic, a message similar to the following will be displayed:

```
END OF PASS 0000000001
```

If error messages have been enabled, and a fault is detected, then a message similar in form to the following is displayed:

```
ERROR NO. 003 DETECTED IN SECTION 012
```

Error numbers range from a few to over 100 per section, starting with 1. If isolation messages have been enabled, then immediately following the error message will appear a message of the form:

```
THE FAULT IS MOST LIKELY IN THE CPU CHIP
```

In some cases, additional components may be designated, if the symptom is such that the fault cannot be resolved to a single component. The exact function that failed can be determined by using the section and error numbers to index into the diagnostic listing.

Operational Commands

The following commands are provided via the user interface, to enable the user to run the diagnostic in the manner desired. These options pertain to the processor diagnostic. It is only necessary to type the first four letters of each command. Also, more than one command can be typed on the same line, by separating them with semicolons.

changeio	Change paths to boot devices, console, or printer
creg	Display all control registers at end of last test
debug	Invoke the Software Maintenance Monitor (MON)
eepr	Enable error message printing
eeps	Enable a pause after an error is detected
eipr	Enable isolation message printing
eips	Enable a pause after an isolation message is printed
enpr	Enable non-error message printing
enps	Enable a pause after a non-error message is printed
erro	Shorthand for <code>eepr;eipr;enpr</code>
errp	Shorthand for <code>epps;eips;enps</code>
exit	Return to ISL
freg	Display current contents of the floating point registers
hard	Force all messages to a hardcopy device
help	Print information on operating the diagnostic
info	Print information about diagnostic (e.g., what sections test what)
listio	List the I/O paths to boot devices, console, and printer
loop<n>	Set number of times to loop through diagnostic; if no n, loop forever
proc n	Set numbers of processors to run diagnostic

3-4 Using MULTIDIAG

pstatus	Display processor chip revision number, and various status registers
registers	Display all general registers at end of last test
reset	Re-initialize runtime options to default values
resume	Restart diagnostic after a pause
run	Start running diagnostic from beginning of currently enabled sections
sect n	Set numbers of test sections to be executed
sepr	Suppress error message printing
seps	Suppress a pause after an error is detected
sipr	Suppress isolation message printing
sips	Suppress a pause after an isolation message is printed
snpr	Suppress non-error message printing
snps	Suppress a pause after a non-error message is printed
sstate	Return diagnostic to initial entry point and re-initialize (start state)
state	Display the current values of the run time options
stop	Stop ISL from continuing the auto boot sequence



A

Tape-Resident Files

Below are the contents of the Support Kernel memory-based `root` file system :

```
./profile
./bin
./bin/cat
./bin/cp
./bin/cpio
./bin/dd
./bin/ls
./bin/mf
./bin/rm
./bin/sh
./bin/stty
./bin/su
./bin/tar
./dev
./etc
./etc/fbackup
./etc/fbackuprdr
./etc/fbackupwrtr
./etc/frecovery
./etc/fsck
./etc/init
./etc/mount
./etc/reboot
./etc/unmount
./etc/passwd
./etc/group
./etc/mnttab
./etc/utmp
./lib
./lib/crt0.o
```

```
./lib/dld.sl
./lib/libc.sl
./lib/libm.sl
./mnt1
./mnt2
./mnt3
./tmp
./usr
./usr/bin
./usr/bin/clear
./usr/bin/more
./usr/bin/tabs
./usr/bin/tset
./usr/lib
./usr/lib/terminfo
./usr/lib/terminfo/h
./usr/lib/terminfo/h/hp
./usr/tmp
./usr/tape_ui
./usr/tape_ui/backup_disks
./usr/tape_ui/menu
./usr/tape_ui/reboot_system
./usr/tape_ui/restore_disk
./usr/tape_ui/S700_man
./usr/tape_ui/show_man
./lost+found
```

A-2 Tape-Resident Files



HP Part Number
B2380-90000 E0391
Edition 1

Printed in U.S.A. March 1991