STORAGETEK ®

ASM

APPLICATION SOFTWARE MANAGER ® (ASM) SOFTWARE

INSTALLATION AND CONFIGURATION GUIDE
For UNIX

PRODUCT TYPE
SOFTWARE

StorageTek ASM and StorageTek QFS Installation and Configuration Guide

Version 4.1

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Contents

List Of Figures

List of Tables

List of Tables

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Preface

This manual, the StorageTek QFS and StorageTek ASM File System Administration Guide, describes the file system software included in the StorageTek QFS and StorageTek ASM 4.1 releases. The software products and the file systems they include are as follows:

StorageTek ASM file system. The StorageTek ASM environment includes a general-purpose file system along with the storage and archive manager, SAM. The StorageTek ASM environment's file system enables data to be archived to automated libraries at device-rated speeds. Data can also be archived to files in another file system through a process known as disk archiving. The file system in the StorageTek ASM environment is a complete file system. The user is presented with a standard file system interface and can read and write files as though they were all on primary disk storage.

StorageTek QFS file system. The StorageTek QFS file system can be used as a standalone file system, or it can be used in conjunction with the storage and archive manager, SAM. When used in conjunction with an ASM, it is known as StorageTek ASM QFS. StorageTek QFS shares most of the StorageTek ASM file system's features. The StorageTek QFS file system, however, is designed for high performance and contains more features than are supported within the StorageTek ASM environment.

You can purchase licenses for both StorageTek QFS and StorageTek ASM software with the intent to run the StorageTek QFS file system with the storage and archive manager found in the StorageTek ASM software. Such a system is referred to as StorageTek ASM QFS.

This manual does not call out the StorageTek ASM QFS configuration unless it is necessary for clarity. In this manual, you can assume that references to StorageTek ASM also apply to StorageTek ASM QFS configurations when talking about storage and archive management. Likewise, you can assume that references to StorageTek QFS also apply to StorageTek ASM QFS configurations when talking about file system design and capabilities.

■Organization

This manual has six chapters, an appendix, and an index:

Chapter 1   "System Requirements and Preinstallation Tasks" describes system requirements and prerequisites to installation.

Chapter 2   "Release Package Contents and Directories Created" describes escribes the release package contents and the directories created at installation time.

Chapter 3   ."StorageTek QFS Initial Installation Procedure" describes the StorageTek QFS initial installation procedure

Chapter 4   ."StorageTek QFS Upgrade Procedure" the StorageTek QFS upgrade procedure.

Chapter 5   "StorageTek ASM Initial Installation Procedure" the StorageTek ASM initial installation procedure.

Chapter 6   "StorageTek ASM Upgrade Procedure" the StorageTek ASM upgrade procedure.

Appendix A   "ASM QFS Manager Software Notes" provides information on administering ASM QFS Manager.

Index   The Index helps you locate information.

■Related Publications

You can find additional information in the following publications:

Publication	Part Number
StorageTek ASM and StorageTek QFS File System Administration Guide	312593801
StorageTek ASM and StorageTek QFS v4.1 Release Notes	312594001
StorageTek ASM Storage and Archieve Manager	312596501

■Additional Information

StorageTek offers several methods for you to obtain additional information.

StorageTek's External Web Site

StorageTek's external Web site provides marketing, product, event, corporate, and service information. The external Web site is accessible to anyone with a Web browser and an Internet connection.

The URL for the StorageTek external Web site is http://www.storagetek.com

Customer Resource Center

StorageTek's CRC is a Web site that enables members to resolve technical issues by searching code fixes and technical documentation. CRC membership entitles you to other proactive services, such as HIPER subscriptions, technical tips, answers to frequently asked questions, addenda to product documentation books, and online product support contact information. Customers who have a current warranty or a current maintenance service agreement may apply for membership by clicking on the Request Password button on the CRC home page. StorageTek employees may enter the CRC through PowerPort.

The URL for the CRC is http://www.support.storagetek.com.

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Hardcopy Publications

You may order paper copies of publications listed on the CRC. Send e-mail to DistrL@louisville.stortek.com.

System Requirements and Preinstallation Tasks

<div style="text-align: right">1</div>

This chapter outlines the system requirements for installing the StorageTek QFS and StorageTek ASM software. This chapter starts with an overview. The remaining sections describe the requirements you must meet or the actions you must take before you begin to install and configure your software. These requirements are as follows:

■ Overview

The StorageTek QFS and StorageTek ASM file systems are similar, but this manual notes differences when necessary. The software products and the file systems they include are as follows:

- StorageTek QFS file system. The StorageTek QFS file system can be used as a standalone file system, or it can be used in conjunction with the storage and archive manager, ASM. When used in conjunction with ASM, it is known as StorageTek ASM QFS. StorageTek QFS shares most of the StorageTek ASM file system's features. The StorageTek QFS file system, however, is designed for high performance and contains more features than are supported within the StorageTek ASM environment.

- StorageTek ASM file system. The StorageTek ASM environment includes a general-purpose file system along with the storage and archive

manager, ASM. The StorageTek ASM environment's file system allows data to be archived to automated libraries at device-rated speeds. In addition, data can also be archived to files in another file system through a process known as disk archiving. The file system in the StorageTek ASM environment is a complete file system. The user is presented with a standard file system interface and can read and write files as though they were all on primary disk storage.

Note: You can purchase licenses for both StorageTek QFS and StorageTek ASM software with the intent to run the StorageTek QFS file system with the storage and archive manager found in the StorageTek ASM software. Such a system is referred to as StorageTek ASM QFS.

This manual does not call out the StorageTek ASM QFS configuration unless it is necessary for clarity. In this manual, you can assume that references to StorageTek ASM also apply to StorageTek ASM QFS configurations when talking about storage and archive management. Likewise, you can you can assume that references to StorageTek QFS also apply to StorageTek ASM QFS configurations when talking about file system design and capabilities.

■ Server Requirements

The StorageTek QFS and StorageTek ASM software must be installed on a Sun server based on UltraSPARC® technology.

If you plan to install the ASM QFS Manager graphical user interface tool, there are additional requirements for the server that you want to use as the web server host. For more information on these requirements, see "Verifying Requirements for the ASM QFS Manager (Optional)" on page 20.

■ Solaris Operating System Requirements

StorageTek QFS and StorageTek ASM software packages run on many Sun workstations and servers. Before installation, you should verify the applicability of the hardware, the level of the Solaris Operating System (OS), and the patch release installed. To install the StorageTek QFS or StorageTek ASM software, you also must ensure that you have root-level access to your system.

To Verify the Environment

1. **Verify that your system has a CD-ROM drive or that it can access the release package at the StorageTek Customer Resource Center (CRC).**

   http://www.support.storagetek.com.

2. **Log in to your system as root.**

You must have superuser access to install the software.

3. **Verify your system's Solaris OS level.**

The software relies on properly configured Solaris software at one of the following levels:

- Solaris 8 OS (7/01) (update 5)

- Solaris 9 OS (4/03) (update 3)

Installing Solaris OS Patches

Sun Microsystems provides Solaris OS patches to customers with a maintenance contract by means of CD-ROM, anonymous FTP, and the Sun Microsystems SunSolveSM web site (http://sunsolve.sun.com).

To install a patch after you install the StorageTek QFS or StorageTek ASM release packages, load the CD-ROM or transfer the patch software to your system. Follow the instructions outlined in the Patch Installation Instructions and Special Install Instructions in the README file included in the patch or jumbo patch cluster.

Note: If you install Solaris patches after you have installed the StorageTek QFS or StorageTek ASM 4.1 software, verify that your /etc/name_to_sysnum file is intact. The procedure for verifying your /etc/name_to_sysnum file is described in "Installing Sun Solaris Patches" on page 34.

■ Planning Your File System and Verifying Disk Cache

The StorageTek QFS and StorageTek ASM software packages require a certain amount of disk cache in order for them to create and manage data files and directories.

- The StorageTek QFS software requires at least two disk devices or partitions, one for file data and one for metadata. Multiple disk devices or partitions increase I/O performance.

- The StorageTek ASM software requires at least one disk device or partition.

The disk devices or partitions do not require any special formatting, nor do they need to have a UNIX file system created on them. You might see better performance if you configure multiple devices across multiple interfaces (HBAs) and disk controllers.

CAUTION: Make sure that the disks and partitions that you plan to use are not currently in use and do not contain any existing data

because any existing data is lost when you create the
StorageTek QFS or StorageTek ASM file system.

The disks must be connected to the server using a Fibre Channel or SCSI
controller. You can specify individual disk partitions for a disk, or you can use
the entire disk as a disk cache. The software supports disk arrays, including
those under the control of volume management software, such as Solstice
DiskSuiteTM, Solaris Volume Manager (SVM), and other volume management
software products.

To Plan Your File System

- **Familiarize yourself with StorageTek QFS and StorageTek ASM file
  system layout possibilities.**
  Describing all the aspects of StorageTek QFS and StorageTek ASM file
  systems is beyond the scope of this manual. For information on volume
  management, file system layout, and other aspects of file system design,
  see the StorageTek QFS and StorageTek ASM File System Administration
  Guide.

To Estimate Disk Cache Requirements

1. **Estimate the disk cache requirements for StorageTek QFS software
   (ma file systems).**

   - Disk cache = largest file (in bytes) + amount of space needed for
     working files

   - Metadata cache = ((number of files + number of directories) * 512) +
     (16384 * number of directories)

2. **Estimate the disk cache requirements for StorageTek ASM software.**

   - Disk cache = largest file (in bytes) + ((number of files + number of
     directories) * 512) + (4096 * number of directories) + amount of space
     needed for working files

3. **Estimate the disk cache requirements for StorageTek ASM QFS
   software (ma file systems plus the storage and archive manager).**

You can create a StorageTek ASM QFS file system when you install both the
SUNWsamfsr and SUNWsamfsu packages and you are licensed for both
StorageTek QFS and StorageTek ASM software. You install the StorageTek
ASM software package, and the license key enables the faster StorageTek
QFS file system. Use the following guidelines if you are creating StorageTek
ASM QFS file systems:

- Disk cache = largest file (in bytes) + amount of space needed for
  working files

- Metadata cache = ((number of files + number of directories) * 512) + (16384 * number of directories)

4. Enter the format(1M) command to verify that you have sufficient disk cache space.

Use the format(1M) command if you are installing a StorageTek QFS or StorageTek ASM file system on a single server or if you are installing a StorageTek QFS file system as a local file system on a Sun Cluster node.

Remember to use Ctrl-d to exit the format(1M) command.

Example 1 - Using the format(1M) Command On Fibre Channel-Attached Disks

Figure 1 shows six disks attached to a server. There are two internal disks connected by means of controller 0 on targets 10 and 11 (c0t10d0 and c0t11d0). The other disks are external.

For the sake of clarity, the format(1M) command output in Figure 1 has been edited.

Figure 1. CODE EXAMPLE - format(1M) Command for a Fibre Channel-Attached Disks

```
# format < /dev/null
Searching for disks...done


AVAILABLE DISK SELECTIONS:
       0. c0t10d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /sbus@3,0/SUNW,fas@3,8800000/sd@a,0
       1. c0t11d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /sbus@3,0/SUNW,fas@3,8800000/sd@b,0
       2. c9t60020F2000003A4C3ED20F150000DB7Ad0 <SUN-T300-0118 cyl 34530 alt 2 h
d 48 sec 128>
          /scsi_vhci/ssd@g60020f2000003a4c3ed20f150000db7a
       3. c9t60020F2000003A4C3ED215D60001CF52d0 <SUN-T300-0118 cyl 34530 alt 2 h
d 48 sec 128>
          /scsi_vhci/ssd@g60020f2000003a4c3ed215d60001cf52
       4. c9t60020F2000003A4C3ED21628000EE5A6d0 <SUN-T300-0118 cyl 34530 alt 2 h
d 48 sec 128>
          /scsi_vhci/ssd@g60020f2000003a4c3ed21628000ee5a6
       5. c9t60020F2000003A4C3ED216500009D48Ad0 <SUN-T300-0118 cyl 34530 alt 2 h
d 48 sec 128>
          /scsi_vhci/ssd@g60020f2000003a4c3ed216500009d48a
Specify disk (enter its number):
#
# format /dev/rdsk/c9t60020F2000003A4C3ED216500009D48Ad0s2

Part      Tag    Flag     Cylinders        Size            Blocks
  0 unassigned    wm       0 -  4778      14.00GB     (4779/0/0)   29362176
  1 unassigned    wm    4779 -  9557      14.00GB     (4779/0/0)   29362176
  2     backup    wu       0 - 34529     101.16GB    (34530/0/0) 212152320
  3 unassigned    wm    9558 - 14336      14.00GB     (4779/0/0)   29362176
  4 unassigned    wm   14337 - 19115      14.00GB     (4779/0/0)   29362176
  5 unassigned    wm   19116 - 23894      14.00GB     (4779/0/0)   29362176
  6 unassigned    wm   23895 - 28673      14.00GB     (4779/0/0)   29362176
  7 unassigned    wm   28674 - 33452      14.00GB     (4779/0/0)   29362176

partition> partition>
#
```

Example 2 - Using the format(1M) Command on SCSI-Attached Disks

Figure 2 shows four disks attached to a server. There are two internal disks connected by means of controller 0 on targets 0 (c0t0d0) and 1 (c0t1d0). There are two external disks connected by means of controller 3 on targets 0 (c3t0d0) and 2 (c3t2d0).

Figure 2. CODE EXAMPLE - format(1M) Command for SCSI-Attached Disks

```
# format
Searching for disks...done


AVAILABLE DISK SELECTIONS:
       0. c0t0d0 <SUN9.0G cyl 4924 alt 2 hd 27 sec 133>
          /sbus@1f,0/SUNW,fas@e,8800000/sd@0,0
       1. c0t1d0 <SUN2.1G cyl 2733 alt 2 hd 19 sec 80>
          /sbus@1f,0/SUNW,fas@e,8800000/sd@1,0
       2. c3t0d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /sbus@1f,0/QLGC,isp@0,10000/sd@0,0
       3. c3t2d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /sbus@1f,0/QLGC,isp@0,10000/sd@2,0
Specify disk (enter its number): 1
selecting c0t1d0
[disk formatted]
Warning: Current Disk has mounted partitions.


FORMAT MENU:
       disk       - select a disk
       type       - select (define) a disk type
       partition  - select (define) a partition table
       current    - describe the current disk
       format     - format and analyze the disk
       repair     - repair a defective sector
       label      - write label to the disk
       analyze    - surface analysis
       defect     - defect list management
       backup     - search for backup labels
       verify     - read and display labels
       save       - save new disk/partition definitions
       inquiry    - show vendor, product and revision
       volname    - set 8-character volume name
       !<cmd>     - execute <cmd>, then return
       quit
format> par

PARTITION MENU:
       0      - change '0' partition
       1      - change '1' partition
       2      - change '2' partition
       3      - change '3' partition
       4      - change '4' partition
       5      - change '5' partition
       6      - change '6' partition
       7      - change '7' partition
       select - select a predefined table
       modify - modify a predefined partition table
       name   - name the current table
       print  - display the current table
       label  - write partition map and label to the disk
       !<cmd> - execute <cmd>, then return
       quit
```

```
partition> pri
Current partition table (original):
Total disk cylinders available: 2733 + 2 (reserved cylinders)

Part      Tag    Flag    Cylinders       Size          Blocks
  0        var    wm     0 - 2732       1.98GB    (2733/0/0) 4154160
  1 unassigned    wm     0              0         (0/0/0)          0
  2     backup    wm     0 - 2732       1.98GB    (2733/0/0) 4154160
  3 unassigned    wm     0              0         (0/0/0)          0
  4 unassigned    wm     0              0         (0/0/0)          0
  5 unassigned    wm     0              0         (0/0/0)          0
  6 unassigned    wm     0              0         (0/0/0)          0
  7 unassigned    wm     0              0         (0/0/0)          0

partition> q
```

■ Verifying Disk Space

The software requires a disk cache consisting of RAID devices, JBOD devices, or both. It also requires a certain amount of disk space in the / (root), /opt, and /var directories. The actual amount needed varies depending on the packages you install. Table 1 shows the minimum amount of disk space required in these various directories.

Table 1. Minimum Disk Space Requirements

Directory	StorageTek QFS Minimums	StorageTek ASM Minimums	ASM QFS Manager Minimum
/ (root) directory	2,000 kilobytes	2,000 kilobytes	0 kilobytes
/opt directory	8,000 kilobytes	21,000 kilobytes	5,000 kilobytes
/var directory	1,000 kilobytes	6,000 kilobytes	2,000 kilobytes
/usr directory	2,000 kilobytes	2,000 kilobytes	7,000 kilobytes

Note that the archiver data directory, archiver queue files, and the log files are written to the /var directory, so the sizes shown in Table 1 should be considered a minimum amount for the /var directory.

To Verify Disk Space

The following procedure shows how to verify whether or not there is enough disk space on your system to accommodate the SUNWsamfsu and SUNWsamfsr packages.

1. Issue the df**(1M) command.**

Figure 3 shows this command and its output.

Figure 3. CODE EXAMPLE - Using the df(1M) Command to Verify Disk Space

```
# df -k /
Filesystem          kbytes   used    avail capacity   Mounted on
/dev/dsk/c0t1dos0 76767    19826   49271    29%       /
# df -k /opt
Filesystem          kbytes   used    avail capacity   Mounted on
/dev/dsk/c0t1dos4 192423   59006   114177    35%      /opt
```

2. Verify that there are at least 2,000 kilobytes available in the avail column for the / directory.

3. Verify that there are at least 21,000 kilobytes in the avail column for the /opt directory.

4. Verify that there are at least 6000 kilobytes available in the /var directory.

   A quantity of 30,000 kilobytes or more is recommended to allow for the growth of log files and other system files.

5. If there is not enough room for the software under each directory, repartition the disk to make more space available to each file system.

   To repartition a disk, see your Sun Solaris system administration documentation.

◼ Verifying Removable Media Devices (Optional)

This section applies to the StorageTek ASM software only.

You can write archive copies either to removable media cartridges or to disk space in another file system, as follows:

- If you archive to disk space in another file system, you are using disk archiving. Verify the following:

  - That the host system to which the disks are attached has at least one StorageTek ASM file system created upon it.

  - That there is space available on the disk to which you want to write the archive copies.

- If you archive to removable media devices, your environment must include the following:

  - At least one removable media device for archiving files. This device can be a single tape or optical drive or it can be multiple devices such as the drives within an automated library.

  - Tape or magneto-optical cartridges to which archive files can be written. For most SCSI-attached and Fibre Channel-attached libraries, the StorageTek ASM software supports only one media type. If you

have a tape library that can be partitioned logically into two or more libraries, you can have one media type in one logical library and a different media type in another. The StorageTek ASM software records the cartridges used for each library in a library catalog. You cannot mix the tape media types in a library catalog, so plan to use only one media type per library or logical library.

The StorageTek ASM environment supports a wide variety of removable media devices. You can obtain a list of currently supported drives and libraries from your StorageTek sales or support staff. To make sure that your devices are attached and enumerated in an easily retrieved list, perform one or both of the following procedures:

- If your removable media devices are not attached to your server, perform the procedure in "To Attach Removable Media Devices" on page 10 .

- Enumerate your devices using the instructions in "To Create a List of Devices" on page 13. You will use this list again in "StorageTek ASM Initial Installation Procedure" in Appendix 5.

To Attach Removable Media Devices

This section describes how to attach removable media devices to a server. These are general guidelines for attaching removable media hardware to a server. For explicit instructions on connecting these peripherals to a server, refer to the hardware installation guide supplied by the vendor with the automated library and drives.

1. **Ensure that you are on a console connection to the server.**

2. **Power off the server before connecting devices.**

   Typically, you power off central components first and then the peripheral equipment. So, use the init(1M) command to power off the server, as follows:

   # init 5

   This command brings down the system to the PROM level. At this point it is safe to power off the server and peripherals. For specific instructions regarding your equipment, see the documentation from the hardware vendor for proper power-on and power-off sequences.

3. **Ensure that the removable media devices and the disk(s) to be used for the StorageTek ASM file system are connected and properly addressed.**

4. **Ensure that the SCSI target IDs are unique for each SCSI initiator (host adapter). (Optional)**

Perform this step if you have libraries attached to the host system through a SCSI interface.

Avoid setting SCSI target IDs for peripherals to ID 7 because this ID is typically reserved for the initiator. For example, if you are using a SCSI host adapter with a previously attached disk drive set to use a target ID of 3, any additional peripheral connected to this bus must not have an ID of 3. Typically, the internal disk drive ID is 3 for SPARC® systems and 0 for UltraSPARC systems.

5. **Power on the peripherals according to the manufacturer's recommended sequence.**

   Typically, you power on the outermost peripherals first, working toward more central components in sequence.

6. **Disable autobooting.**

   At the >ok prompt, enter the following command to disable autobooting:

   >ok setenv auto-boot? false

7. **Type reset at the next prompt.**

   For example:

   >ok reset

   Reenabling autobooting is described later in this procedure.

8. **Conduct an inventory of target IDs and LUNs for each device connected to the host system through a SCSI interface. (Optional)**

   Perform this step if you have libraries attached to the host system through a SCSI interface.

   Figure 4 shows the PROM >ok prompt and the output from the probe-scsi-all command.

Figure 4. CODE EXAMPLE - Output From the probe-scsi-all Command

```
{0} ok probe-scsi-all
/pci@6,400/scsi@2,1
Target 0
  Unit 0    Removable Device type 8     STK 9730        1700
Target 1
  Unit 0    Removable Tape   type 7     QUANTUM DLT7000 2565
Target 2
  Unit 0    Removable Tape   type 7     QUANTUM DLT7000 2565

/pci@1f,4000/scsi@3
Target 0
  Unit 0   Disk     SEAGATE ST318404LSUN18G 4207
Target 6
  Unit 0   Removable Read Only device   TOSHIBA
XM6201TASUN32XCD1103
```

9. **Save the output from the previous step. (Optional)**

   If you performed the previous step, save the output. You use the
   information in this output for the next procedure, "To Create a List of
   Devices" on page 13

10. **Conduct an inventory of target IDs and LUNs for each device
    connected to the host system through a Fibre Channel interface.
    (Optional)**

    Figure 5 shows the commands to use to locate the host adapter directory,
    to select an item, and to display the Fibre Channel host bus adapter (HBA)
    devices.

**Figure 5. CODE EXAMPLE - Commands and Output Showing How to
Conduct an Inventory of Target IDs and LUNs**

```
{0} ok show-devs
/SUNW,ffb@1e,0
/SUNW,UltraSPARC-II@2,0
/SUNW,UltraSPARC-II@0,0
/counter-timer@1f,1c00
/pci@1f,2000
/pci@1f,4000
/virtual-memory
/memory@0,a0000000
/aliases
/options
/openprom
/chosen
/packages
/pci@1f,2000/SUNW,qlc@1
/pci@1f,2000/SUNW,qlc@1/fp@0,0
/pci@1f,2000/SUNW,qlc@1/fp@0,0/disk
/pci@1f,4000/SUNW,ifp@2
/pci@1f,4000/scsi@3,1
/pci@1f,4000/scsi@3
/pci@1f,4000/network@1,1
/pci@1f,4000/ebus@1
/pci@1f,4000/SUNW,ifp@2/ses
{0} ok select /pci@1f,2000/SUNW,qlc@1
{0} ok show-children
LiD HA LUN   --- Port WWN ---   ----- Disk description -----
 2  7e   0   500104f00041182b   STK     L700             0236
7c  7e   0   500104f00043abfc   STK     9840             1.28
7d  7e   0   500104f00045eeaf   STK     9840             1.28
6f  7e   0   500104f000416304   IBM     ULT3580-TD1      16E0
6e  7e   0   500104f000416303   IBM     ULT3580-TD1      16E0
```

    If the server does not acknowledge all the known devices (disk drives,
    tape or optical drives, the automated library, and so on), you should check
    the cabling. Cabling is often the problem when devices and controllers are
    not communicating. Do not proceed until all devices appear when probed.

11. **Save the output from the previous step. (Optional)**

If you performed the previous step, save the output. You use the information in this output for the next procedure,

12. Reenable autobooting.

At the >ok prompt, enter the following command to enable autobooting:

>*ok setenv auto-boot? true*

13. Boot the system.

For example:

>*ok boot*

14. Review system files.

Review the following files:

- /var/adm/messages to ensure that all devices were recognized.

- /dev/rmt for expected tape devices.

- /dev/dsk and /dev/rdsk for expected disks.

Due to special driver requirements, no device information appears in /var/adm/messages for magneto-optical devices or libraries until after you install the StorageTek ASM software packages.

15. Disable autocleaning and autoloading.

If your automated library supports autocleaning or autoloading, disable those features when using that library with the StorageTek ASM software. Consult the documentation from your library's manufacturer for information on disabling autocleaning and autoloading.

Note: The only times you can use autoloading are during the initial loading of cartridges and when the StorageTek ASM software is not running. Remember to disable autoload when the StorageTek ASM system is running.

16. Go to .

To Create a List of Devices

The device(s) that you intend to use must be attached and recognized by the server upon which you intend to install the StorageTek ASM software. To configure the StorageTek ASM software, you need to know the following about your devices:

- The device type, manufacturer, and model number.

- The mechanism by which the device is attached to the server. You can attach devices in one of the following ways:

- Drives can use either a SCSI attachment or a Fibre Channel attachment. Each drive accepts either tape cartridges or magneto-optical (MO) cartridges.

  For SCSI-attached drives, you need to know each drive's SCSI target ID and LUN.

  For Fibre Channel-attached drives, you need to know each drive's LUN and world-wide node name.

- Automated libraries can use either a SCSI attachment, a Fibre Channel attachment, or a network attachment.

  Libraries that use SCSI or Fibre Channel attachments are called direct-attached libraries. For SCSI-attached libraries, you need to know each library's SCSI target ID and LUN. For Fibre Channel-attached libraries, you need to know each library's LUN and world-wide node name.

  Libraries that use a network attachment are called network-attached libraries. You cannot configure network-attached libraries in the existing system configuration files. You need to create a parameters file for each network-attached library, and this is explained later in the installation process.

1. Make an inventory list of your devices.

Fill in Table 2 to include the name, manufacturer, model, and connection types for each device that you want to include in your StorageTek ASM environment.

Table 2. Inventory List of Devices to be Configured

Device Name, Manufacturer, and Model	Target ID	LUN	World-Wide Node Name
SCSI-Attached Tape Drives			
			Not applicable
			Not applicable
			Not applicable
			Not applicable
Fibre Channel-Attached Tape Drives			
	Not applicable		
	Not applicable		

Table 2. Inventory List of Devices to be Configured

Device Name, Manufacturer, and Model	Target ID	LUN	World-Wide Node Name
	Not applicable		
	Not applicable		
	Not applicable		
SCSI-Attached MO Drives			
			Not Applicable
			Not Applicable
			Not Applicable
			Not Applicable
			Not Applicable
Fibre Channel-Attached MO Drives			
	Not applicable		
	Not applicable		
	Not applicable		
	Not applicable		
	Not applicable		
SCSI-Attached Automated Libraries			
			Not applicable
			Not applicable
			Not applicable
			Not applicable
			Not applicable
Fibre Channel-Attached Automated Libraries			
	Not applicable		
	Not applicable		
	Not applicable		
	Not applicable		

Table 2. Inventory List of Devices to be Configured

Device Name, Manufacturer, and Model	Target ID	LUN	World-Wide Node Name
Not applicable			

2. **Retain Table 2 for use again later in the configuration procedure.**

■ Obtaining a Software License Key

Make sure that you have a software license key for the StorageTek QFS or StorageTek ASM release that you are installing.

If you do not have a StorageTek license key for the release level that you are installing, contact your authorized service provider (ASP) or StorageTek. When you contact StorageTek for a license, you will be asked to provide information regarding your environment.

For StorageTek QFS software, you will need to provide information such as the following:

• Your StorageTek sales order number.

• The host IDs of the system(s) upon which you will be installing the StorageTek QFS software.

• The server type of each host system to be used in the StorageTek QFS environment.

For a StorageTek ASM license, you will need to provide information such as the following:

• Your StorageTek sales order number.

• The host IDs of the system(s) upon which you will be installing the StorageTek ASM software.

• The types of libraries to be used in the StorageTek ASM environment.

• The media types of the drives to be used in the StorageTek ASM libraries.

• The amount of archive data, in terabytes, that you want to maintain.

• The total number of slots to be available to the StorageTek ASM software.

The license keys for the StorageTek QFS and StorageTek ASM packages allow the system to run indefinitely unless one of the following conditions is present:

• You were issued a temporary license. When a temporary license expires, the system is no longer able to load and unload cartridges, or to archive, stage, or release files.

- You are using StorageTek ASM software and you have exceeded the number of slots allowed for the license. In this case, you cannot import or label cartridges. Access continues unaffected for files already on a disk.

- You have changed the hardware with which the software must interoperate. These types of changes include changes to drives, automated libraries, and servers. Licenses are assigned to a specific hostid and are not transferable.

If your license expires, you can mount the file systems, but you cannot archive or stage files in a StorageTek ASM environment.

After your initial installation, if you upgrade your software or if you change your environment's configuration, you might need to change your software license. Changes to the environment that might necessitate upgrading your license include adding a library or changing a host system. If you have questions regarding your existing license, you can enter the samcmd(1M) l command (lowercase l for license). If you need to upgrade your license, contact your StorageTek sales representative.

Note: The upgrade procedures are the same regardless of whether you are upgrading from a QFS 3.5.0 release or a StorageTek QFS 4.0 release:

- If you are upgrading from a QFS 3.5.0 release, you need to upgrade your license.

- If you are upgrading from a StorageTek QFS or StorageTek ASM 4.0 release, you might need to upgrade your license depending on other changes in your environment.

■ Obtaining the Release Files

Make sure that you have a copy of the release software. You can obtain the StorageTek QFS and StorageTek ASM software from the StorageTek Customer Resource Center (CRC) or on a CD-ROM. Contact your authorized service provider (ASP) or your StorageTek sales representative if you have questions on obtaining the software.

After the release, upgrade patches are available from the following URL:

http://www.support.storagetek.com.

CAUTION: If you have not read the StorageTek QFS and StorageTek ASM 4.1 Release Notes, please do so before continuing. You can access the StorageTek QFS and StorageTek ASM 4.1 Release Notes for this release at any time from one of the documentation web sites described in this manual's preface. After your software is installed, the content of the Rlease Notes file is located in http://www.support.storagetek.com.

To Obtain the Software From the StorageTek Download Center

1. **Enter the following URL in your browser:**

    http://www.support.storagetek.com.

2. **Click on the StorageTek QFS or StorageTek ASM software package you want to receive.**

3. **Follow the instructions at the web site for downloading the software.**

To Install From a CD-ROM

1. **Log in as root on your StorageTek QFS or StorageTek ASM server.**

    The StorageTek QFS and StorageTek ASM software uses the Sun Solaris operating system (OS) packaging utilities for adding and removing software. You must be logged in as superuser (root) to make changes to software packages. The pkgadd(1M) utility prompts you to confirm various actions necessary to install the packages.

2. **Insert the CD into the CD-ROM drive.**

    The system should automatically detect the CD's presence. If it does not, issue the commands shown in Figure 6 on page 18 to stop and start the Sun Solaris Volume Manager and to change to the directory that contains the StorageTek QFS and StorageTek ASM software packages.

Figure 6. CODE EXAMPLE - Commands to Use to Access the StorageTek QFS and StorageTek ASM Packages

```
# /etc/init.d/volmgt stop
# /etc/init.d/volmgt start
# volcheck
# cd /cdrom/cdrom0
```

On the CD, the packages reside in the /cdrom/cdrom0 directory organized by Sun Solaris version.

To Remove the StorageTek QFS or StorageTek ASM 4.1 Software

If you need to remove the 4.1 software packages in the future, perform the following steps.

1. **Remove the ASM QFS Manager software from the management station and from the StorageTek QFS and StorageTek ASM server. (Optional)**

   If you have installed the ASM QFS Manager software, perform the procedure described in "Removing the ASM QFS Manager Software" on page 263.

2. **Use the pkginfo(1) command to determine which StorageTek QFS and StorageTek ASM software packages are installed on your system.**

   To find the StorageTek QFS 4.1 packages, enter the following command:

   # pkginfo | grep qfs

   To find the StorageTek ASM 4.1 packages, enter the following command:

   # pkginfo | grep sam

3. **Use the pkgrm(1M) command to remove the existing software.**

   If you are using any optional packages, make sure you remove them before removing the main SUNWqfsr/SUNWqfsu or SUNWsamfsr/SUNWsamfsu packages. In addition, make sure that you remove the SUNWqfsu and SUNWsamfsu packages before removing the SUNWqfsr and SUNWsamfsr packages.

   Example 1. To remove all possible StorageTek QFS packages, enter the following command:

   # pkgrm SUNWsamqfsuiu SUNWsamqfsuir SUNWqfsu SUNWqfsr

   SUNWqfsr must be the last package removed.

   Example 2. To remove all possible StorageTek ASM packages, enter the following command:

   # pkgrm SUNWsamqfsuiu SUNWsamqfsuir SUNWsamfsu SUNWsamfsr

   SUNWsamfsr must be the last package removed.

■ Verifying Compatibilities

The StorageTek QFS and StorageTek ASM software interoperates with many different hardware and software products from third-party vendors. Depending on your environment, you might need to upgrade other software or firmware before installing or upgrading the StorageTek QFS or StorageTek ASM packages. Consult the StorageTek QFS and StorageTek ASM 4.1 Release Notes for information pertaining to library model numbers, firmware levels, and other compatibility information.

■ Verifying Requirements for the ASM QFS Manager (Optional)

The ASM QFS Manager allows you to configure, control, monitor, and reconfigure a StorageTek QFS or StorageTek ASM environment through a web server. You can install the ASM QFS Manager in one of the following configurations:

- As a standalone management station to manage one or more StorageTek QFS or StorageTek ASM hosts.

- As additional software on the StorageTek QFS or StorageTek ASM host.

After the ASM QFS Manager software is installed, you can invoke the ASM QFS Manager from any machine on the network that is allowed access to its web server.

If you plan to use ASM QFS Manager, the host upon which you are configuring the ASM QFS Manager software must meet various hardware and software requirements. The server to act as the host for ASM QFS Manager must meet the requirements described in the following sections:

- "Hardware Requirements" on page 20
- "Browser Requirements" on page 20
- "Operating System Requirements" on page 21
- "Web Software Requirements" on page 21

Hardware Requirements

You must install the ASM QFS Manager on a SPARC server. Additional minimum hardware requirements are as follows:

- SPARC 400 MHz (or more) CPU
- 1 gigabyte of memory
- One 20-gigabyte disk
- 10 megabytes of free space in the / (root) directory
- 200 megabytes of free space in the /tmp directory
- One 10/100/1000 BaseT Ethernet port

Browser Requirements

Ensure that your installation meets the following browser requirements:

- One of the following browsers, at the minimum levels indicated, must be installed on the web server:

    - Netscape 7.x / Mozilla 1.2.1ml on the Solaris OS

    - Netscape 7.x on Microsoft Windows 98, SE, ME, 2000, XP

    - Internet Explorer 5.5 on Microsoft Windows 98, SE, ME, 2000, and XP.

- You must enable JavaScriptTM technology in your browser. In Mozilla, for example, click through the following menus to get to a panel showing whether JavaScript technology is enabled: Edit, Preferences, Advanced, and Scripts & Plugins.

Operating System Requirements

Make sure that one of the following minimum Solaris levels is installed on the web server:

- Solaris 8 OS (7/01) (update 5)

- Solaris 9 OS (4/03) (update 3)

Web Software Requirements

The ASM QFS Manager installation packages includes revisions of the following software at the minimum levels indicated:

- Java 2 Standard Edition version 1.4.1_03

- TomCat version 4.0.5

During the installation procedure, you will be asked to answer questions. Based on your answers, the installation software can install the correct revisions for you if the compatible revisions of these software packages are not present.

■ Verifying the Network Management Station (Optional)

You can configure the StorageTek QFS and StorageTek ASM software to notify you when potential problems occur in its environment. The Simple Management Network Protocol (SNMP) software manages information exchange between network devices such as servers, automated libraries, and drives. When the StorageTek QFS and StorageTek ASM software detects potential problems in its environment, it sends information to a management station, which allows you to monitor the system remotely.

The management stations you can use include the following:

- The Storage Automated Diagnostic Environment (StorADE)

- The Sun™ Management Center (Sun MC)

- The Sun Remote Server (SRS)

- The Sun Remote Services NetConnect

If you want to enable SNMP traps, make sure that the management station software is installed and operating correctly before installing the StorageTek QFS and StorageTek ASM software. Refer to the documentation that came with your management station software for information on installation and use.

The types of problems, or events, that the StorageTek QFS and StorageTek ASM software can detect are defined in the StorageTek QFS and StorageTek ASM Management Information Base (MIB). The events include errors in configuration, tapealert(1M) events, and other atypical system activity. For complete information on the MIB,
see /opt/SUNWsamfs/mibs/SUN-SAM-MIB.mib after the packages are installed.

The StorageTek QFS and StorageTek ASM software supports the TRAP SNMP (V2c) protocol. The software does not support GET-REQUEST, GETNEXT-REQUEST, and SET_REQUEST.

Release Package Contents and Directories Created

<div style="text-align:right">**2**</div>

This chapter describes the content of the release packages and shows the directories and files that the software creates when it is installed. Specifically, it contains the following topics:

■ Release Package Contents

The StorageTek QFS and the StorageTek ASM software packages are in Sun Solaris pkgadd(1M) format. These packages reflect the Sun Solaris version for the platform upon which you will be installing the StorageTek QFS or the StorageTek ASM software.

For information on the directories and files provided with the release package, see the StorageTek QFS and StorageTek ASM 4.1 Release Notes, which is posted to the documentation web sites described in this manual's preface.

Table 3 shows the release packages

Table 3. Release Packages

Installed Package	Description
SUNWqfsr, SUNWqfsu	StorageTek QFS standalone file system software packages.
SUNWsamfsr, SUNWsamfsu	StorageTek ASM software packages. Includes the standard file system and the storage and archive management (ASM) software.
SUNWsamqfsuir, SUNWsamqfsuiu	ASM QFS Manager packages.

Note: The 4.1 release does not include any localized software packages.

The releases are identified using characters arranged in the following format:

major.minor.patch

Table 4 explains the release numbering scheme

Table 4. Release Numbering

Release Level Component	Meaning
major	The release level of a major release.
minor	The release level of a minor feature release.
patch	The patch number. A number between 1 and 99 indicates a patch release. A letter from A through Z indicates prerelease software. The base release of a first feature release of a major release might not contain a patch level.

Examples:

• 4.0 is a major release with no minor release revisions and no bug fixes.

• 4.1 is a minor release.

• 4.1.1 is a patch release that contains software fixes for a major or minor release. This number appears in the patch's README file.

■ Directories and Files Created

This section describes the directories and files associated with the StorageTek QFS and StorageTek ASM products. You can obtain additional information about the files in this section from the man pages after the software is installed.

Directories Created at Installation

Table 5 lists the directories created when the StorageTek QFS and StorageTek ASM software packages are installed.

Table 5. Directories Created

Directory	Content	Used By
/dev/samst	Device driver special files.	StorageTek ASM
/etc/fs/samfs	Commands specific to StorageTek QFS and StorageTek ASM software.	StorageTek QFS StorageTek ASM
/etc/opt/SUNWsamfs	Configuration and license files.	StorageTek QFS StorageTek ASM
/etc/opt/SUNWsamfs/scripts	Site-customizable scripts.	StorageTek QFS StorageTek ASM
/opt/SUNWsamfs/bin	User command binaries.	StorageTek QFS StorageTek ASM
/opt/SUNWsamfs/client	Files for RPC API client.	StorageTek QFS StorageTek ASM
/opt/SUNWsamfs/examples	Various example configuration files.	StorageTek QFS StorageTek ASM
/opt/SUNWsamfs/include	API include files.	StorageTek QFS StorageTek ASM
/opt/SUNWsamfs/lib	Relocatable libraries.	StorageTek QFS StorageTek ASM
/opt/SUNWsamfs/man	man(1) pages.	StorageTek QFS StorageTek ASM
/opt/SUNWsamfs/sbin	System administrator commands and daemon binaries.	StorageTek QFS StorageTek ASM

Table 5. Directories Created (Continued)

Directory	Content	Used By
`/opt/SUNWsamfs/doc`	Documentation repository for any informational files included in the release. The README file, which summarizes the installed release's features, is included in this directory.	StorageTek QFS StorageTek ASM
/opt/SUNWsamqfsui/bin	StorageTek ASM QFS Manager administrator commands.	StorageTek ASM QFS Manager
/opt/SUNWsamqfsui/doc	StorageTek ASM QFS Manager online documentation repository.	StorageTek ASM QFS Manager
/opt/SUNWsamfs/mibs	Standard MIB files and product MIB (`SUN-ASM-MIB.mib`).	StorageTek QFS StorageTek ASM
`/var/opt/SUNWsamfs`	Device catalogs; catalog trace file; log files; archiver data directory and queue files.	StorageTek ASM

Files Created at Installation

Table 6 and Table 7 list the files created when the StorageTek QFS or StorageTek ASM software is installed.

Table 6. Files Created - Miscellaneous

File	Description	Used By
`/etc/opt/SUNWsamfs/inquiry.conf`	Vendor and product identification strings for recognized SCSI devices.	StorageTek ASM

Table 6. Files Created - Miscellaneous (Continued)

File	Description	Used By
/etc/sysevent/config/SUNW,SUNWsamfs,sysevent.conf		
	Solaris system event handler configuration file.	StorageTek QFS StorageTek ASM
/kernel/drv/samst	Driver for SCSI media changers, optical drives, and non-motion I/O for tape drives.	StorageTek ASM
/kernel/drv/samst.conf	Configuration file for the samst driver.	StorageTek ASM
/kernel/fs/samfs	Sun Solaris 32-bit file system module.	StorageTek QFS StorageTek ASM
/kernel/fs/sparcv9/samfs	Sun Solaris 64-bit file system module.	StorageTek QFS StorageTek ASM
/kernel/sys/samsys	System call module.	StorageTek QFS StorageTek ASM
/kernel/sys/sparcv9/samsys	Sun Solaris 32- and 64-bit system call module.	StorageTek QFS StorageTek ASM
/var/log/webconsole/host.conf	StorageTek ASM QFS Manager configuration file.	StorageTek ASM QFS Manager
/var/opt/SUNWsamfs/faults	Faults history file.	StorageTek QFS StorageTek ASM

The StorageTek QFS and StorageTek ASM file systems have dynamically loadable components that are stored in the Sun Solaris /kernel directory (see Table 6). You can determine the modules that are loaded by using the modinfo(1M) command. Typically, the kernel loads the file system module at boot time. Alternatively, you can load the file system module when the file system is first mounted after the Sun software is installed.

After the StorageTek QFS or StorageTek ASM software is installed, it creates files that it uses for fault notification. Table 7 lists these files. When the software detects faults serious enough to merit user attention, the software

uses these trap and log files to convey fault information through the ASM QFS Manager software.

Table 7. Files Created - Fault Notification

File	Description	Used By
`/opt/SUNWsamfs/sbin/sendtrap`	Sends trap information.	StorageTek QFS
		StorageTek ASM
`/opt/SUNWsamfs/sbin/tapealert_trap`	Sends `tapealert`(1 M) traps.	StorageTek ASM
`/opt/SUNWsamfs/sbin/tapealert_log`	Records `tapealert`(1 M) faults.	StorageTek ASM
`/opt/SUNWsamfs/sbin/fault_log`	Records faults.	StorageTek QFS
		StorageTek ASM

The software creates the files listed in Table 5 with -rwxr-x--- permissions. Do not change these file permissions. If execute permissions are lost, for example, the system writes messages such as the following to /var/adm/messages:

```
SUNW,SUNWsamfs,sysevent.conf, line1: no execute access to /opt/
SUNWsamfs/sbin/tapealert_trap - No such file or directory.
```

Site Files

The configuration procedures in this manual direct you to create several files. The StorageTek QFS and StorageTek ASM software uses these site files.

Table 8 and Table 9 list the site files you create. Some of the files in these lists are optional, depending on your configuration, and others are required.

Table 8 shows the required site files. These are files that you must create at your site in order to use the StorageTek QFS and StorageTek ASM software.

Table 8. Required Site Files

File	Description	Used By
`/etc/opt/SUNWsamfs/LICENSE.4.1`	License file. For more information, see the licensing information pertinent to your installation in "Obtaining a Software License Key" on page 17. This is a required file.	StorageTek QFS StorageTek ASM
`/etc/opt/SUNWsamfs/mcf`	Master configuration file. For more information, see the `mcf`(4) man page. This is a required file.	StorageTek QFS StorageTek ASM

Table 9 shows the optional site files. This is a partial list of the files that you might or might not create depending on the software packages you install and the features you use.

Table 9. Optional Site Files

File	Description	Used by
`/etc/opt/SUNWsamfs/archiver.cmd`	Archiver command file. For more information, see the `archiver.cmd`(4) man page or see the StorageTek ASM Storage and Archive Management Guide.	StorageTek ASM
`/etc/opt/SUNWsamfs/samfs.cmd`	File system mount parameter command file. For more information, see the `samfs.cmd`(4) man page or see the StorageTek QFS and StorageTek ASM File System Administration Guide.	StorageTek QFS StorageTek ASM

Table 9. Optional Site Files (Continued)

File	Description	Used by
`/etc/opt/SUNWsamfs/recycler.cmd`	Recycler command file. For more information, see the `recycler.cmd`(4) man page or see the StorageTek ASM Storage and Archive Management Guide.	StorageTek ASM
`/etc/opt/SUNWsamfs/releaser.cmd`	Releaser command file. For more information, see the `releaser.cmd`(4) man page or see the StorageTek ASM Storage and Archive Management Guide.	StorageTek ASM
`/etc/opt/SUNWsamfs/preview.cmd`	Previewer command file. For more information, see the `preview.cmd`(4) man page or see the StorageTek ASM Storage and Archive Management Guide.	StorageTek ASM
`/etc/opt/SUNWsamfs/defaults.conf`	Miscellaneous default values. For more information, see the `defaults.conf`(4) man page.	StorageTek QFS StorageTek ASM

Modified System Files

During installation, StorageTek QFS and StorageTek ASM software adds information to certain Sun Solaris system files. These system files are ASCII text files. Sun Solaris uses these files to identify loadable kernel modules by number rather than by name.

The StorageTek QFS and StorageTek ASM software adds information to the following files:

/etc/name_to_sysnum. This is the system call information file, and it is used by both StorageTek QFS and StorageTek ASM software. The samsys system call number can vary depending on the system call numbers in use by the Sun Solaris software. If no samsys entry exists, the system adds the following line:

```
samsys 182
```

Certain Solaris OS patches might either remove or introduce conflicts with the samsys entry. For information on installing Solaris OS patches in a StorageTek QFS or StorageTek ASM environment, see "Installing Sun Solaris Patches" on page 31.

- /etc/name_to_major. This file maps drivers to major numbers. The StorageTek ASM software uses this file. The samst and samrd major numbers can vary depending on the major numbers in use by the Sun Solaris software. The system adds the lines shown in Figure 7.

Figure 7. CODE EXAMPLE - Lines Added to /etc/name_to_major

```
samst 63
samrd 64
```

- /etc/security/auth_attr. This file is the authorization description database, and it is used by both StorageTek QFS and StorageTek ASM software. The system adds the lines shown in Figure 8

Figure 8. CODE EXAMPLE - Lines Added to /etc/security/auth_attr

```
com.sun.netstorage.samqfs.web.read:::ASM Read Access::
com.sun.netstorage.samqfs.web.write:::ASM Write Access::
com.sun.netstorage.samqfs.web.*:::ASM All Access::
```

- /etc/user_attr. This file is the extended user attributes database. The ASM QFS Manager uses this file. The system adds the lines shown in Figure 9.

Figure 9. CODE EXAMPLE - Lines Added to /etc/user_attr

```
SAMadmin::::type=role;auths=com.sun.netstorage.samqfs.web.*
samadmin::::type=normal;roles=SAMadmin
```

Installing Sun Solaris Patches

Certain Sun Solaris patches overwrite the /etc/name_to_sysnum file. The /etc/name_to_sysnum file identifies loadable kernel modules by number rather than by name. If a patch overwrites the /etc/name_to_sysnum file, it removes the StorageTek QFS and StorageTek ASM samsys system call number entry. Without a system call number, you can cause a system panic or a mount failure to occur when you attempt to mount StorageTek QFS or StorageTek ASM file systems.

Figure 10 shows the messages that the Solaris OS writes to the /var/adm/messages file.

Figure 10. CODE EXAMPLE - Messages Generated When the System Call Number is Missing

```
WARNING: system call missing from bind file
WARNING: ASM-QFS: modload(samsys) failed.
WARNING: The file /etc/name_to_sysnum must contain a "samsys" entry.
WARNING: The ASM QFS system call number must be unique in /etc/name_to_sysnum
WARNING: and not assigned in /usr/include/sys/syscall.h  (Note: entries named
WARNING: "SYS_reserved_#" are available). The suggested default ASM QFS entry
WARNING: in /etc/name_to_sysnum is "samsys 182". If system call 182 cannot
WARNING: be used for ASM-QFS, use an alternate entry, such as "samsys 183".
WARNING: After changing /etc/name_to_sysnum a reboot is required.
```

To avoid this problem, use the following procedure for installing Solaris OS patches.

To Install Solaris OS Patches

1. **Idle archiving and stop the storage and archive manager. (Optional)**

    Perform this step only if you are using the StorageTek ASM file system. You do not have to perform this step if you are using the StorageTek QFS file system. Type the following commands:

    ```
    # samcmd aridle
    # samd stop
    ```

2. **Use the** cp**(1) command to save your current** /etc/name_to_sysnum **file to an alternate location.**

    For example:

    ```
    # cp /etc/name_to_sysnum /etc/name_to_sysnum.old
    ```

3. **Install one or more Solaris OS patches.**

    For information about this, consult the documentation that came with your Solaris OS patch.

4. **Use** vi**(1) or another editor to open the** /etc/name_to_sysnum **file and search for lines containing the string samsys.**

    Depending on your search results, go to one of the following procedures:

    - If your /etc/name_to_sysnum file does not contain any lines containing the samsys string, you need to add them. Go to "To Add a samsys Entry to /etc/name_to_sysnum" on page 33 for information on doing this.

    - If your /etc/name_to_sysnum file contains a samsys entry line, you need to verify that it is still a valid entry. Go to "To Verify a samsys

To Add a samsys Entry to /etc/name_to_sysnum

1. **Use** more**(1) or another viewer to examine file** /usr/include/sys/syscall.h **and select an available system call number for the samsys entry.**

   Within file /usr/include/sys/syscall.h, entries containing the string SYS_reserved_# indicate available system call numbers. StorageTek recommends that you use number 182 for StorageTek QFS and StorageTek ASM operations.

2. **Use** vi**(1) or another editor to open file** /etc/name_to_sysnum. **(Optional)**

   Do not perform this step if you already have this file open.

3. **Verify that the system call number you chose in Step 1 is available in** /etc/name_to_sysnum**.**

   Search through this file for the number you chose.

   If your installation is already using 182 for a different application, you need to find the next available system call number and use it for the StorageTek QFS and StorageTek ASM software. Repeat Step 1, Step 2, and Step 3 as often as necessary until you determine that the system call number you selected for StorageTek QFS and StorageTek ASM operations is unique.

   The rest of this procedure is written assuming that 182 is an available system call number at your site. Modify the instructions in this procedure if you select another number.

4. **Add the** samsys **line that is recommended for the 4.1 releases.**

   To add number 182, add the following line to /etc/name_to_sysnum:

   ```
   samsys 182
   ```

5. **Add the following** samsys **line if you plan to fall back to the 3.5.0 releases. (Optional)**

   If you want to be able to fall back to the StorageTek QFS and StorageTek ASM 3.5.0 releases, add the following line:

   ```
   samsys64 181
   ```

6. **Save and close** /etc/name_to_sysnum**.**

7. **Reboot the system.**

8. **Delete the backup file when all is determined to be running correctly.**

For example:

```
# rm /etc/name_to_sysnum.old
```

To Verify a samsys Entry in /etc/name_to_sysnum

1. **Use** more**(1) or another viewer to examine file** /usr/include/sys/syscall.h **and verify that the system call number for the samsys entry is still available.**

   Within file /usr/include/sys/syscall.h, entries containing the string SYS_reserved_# indicate available system call numbers. StorageTek recommends that you use number 182 for StorageTek QFS and StorageTek ASM operations.

2. **Use** vi**(1) or another editor to open file** /etc/name_to_sysnum**. (Optional)**

   Do not perform this step if you already have this file open.

3. **Verify that the system call number you chose in Step 1 is still available in** /etc/name_to_sysnum**.**

   Search through this file for the number you chose.

   It is possible that your installation is already using 182 for a different application. If this is the case, you need to find the next available system call number and use it for the StorageTek QFS and StorageTek ASM software.

   The rest of this procedure is written assuming that 182 is an available system call number at your site. Modify the instructions in this procedure if you select another number.

4. **Determine which** samsys **lines exist in your** /etc/name_to_sysnum **file and edit the file as necessary.**

   Table 10 shows the lines that could exist and prescribes the action to take.

Table 10. Guidelines for Choosing System Call Numbers

Line	Action to Take
samsys 180	Consider changing this line to use the new default of 182.
samsys 181	Consider changing this line to use the new default of 182.

Table 10. Guidelines for Choosing System Call Numbers

Line	Action to Take
`samsys64 181`	Consider deleting this line. Retain references to `samsys64` only if you want to be able to fall back to the 3.5.0 releases.
`samsys 182`	Retain this line. This is the line that StorageTek recommends for use with the 4.1 releases. If another application at your site already uses 182, however, you cannot use this line for the StorageTek QFS and StorageTek ASM 4.1 releases. For more information about this, see Step 1

5. **Save and close** /etc/name_to_sysnum**.**

6. **Reboot the system.**

7. **Delete the backup file when all is determined to be running correctly.**

    For example:

```
# rm /etc/name_to_sysnum.old
```

StorageTek Protected

StorageTek QFS Initial Installation Procedure

<div style="text-align:right">3</div>

This chapter describes the procedure for installing and configuring StorageTek QFS standalone software for the first time. Use this procedure if this is the initial installation of the StorageTek QFS standalone software package at your site. If you are upgrading StorageTek QFS software on an existing server, see the "StorageTek QFS Upgrade Procedure" in Chapter 4.

The procedure in this chapter describes obtaining the packages, installing the software packages on your server or node, and configuring the software to match the hardware at your site.

You can install and configure your StorageTek QFS file system entirely using Solaris operating system (OS) commands, or you can use a combination of commands and the StorageTek ASM QFS Manager, which is a graphical user interface (GUI) configuration tool, to complete the procedure. "Enabling the StorageTek ASM QFS Manager (Optional)" on page 40 describes enabling the tool and shows the configuration steps you can perform by using the tool.

You must be logged in as superuser to complete most of the procedures in this chapter.

■ Ensuring that the Installation Prerequisites Are Met

The chapter called "System Requirements and Preinstallation Tasks" on page 1 describes the items you need to verify before you install and configure the StorageTek QFS software. If you have not yet completed the system verification steps, complete them now before you proceed. The steps described in that chapter for verifying the system requirements and performing preinstallation tasks are as follows:

- "Server Requirements" on page 2
- "Solaris Operating System Requirements" on page 2
- "Planning Your File System and Verifying Disk Cache" on page 3
- "Verifying Disk Space" on page 8
- "Obtaining a Software License Key" on page 16
- "Obtaining the Release Files" on page 17

■ Adding the Packages on the StorageTek QFS Server

The StorageTek QFS software uses the Sun Solaris packaging utilities for adding and deleting software. The pkgadd(1M) utility prompts you to confirm various actions necessary to install the packages.

1. **Become superuser.**

2. **Use the cd(1) command to change to the directory where the software package release files reside.**

   When you completed your preinstallation tasks, you obtained the release files as described in "Obtaining the Release Files" on page 18. Use the cd(1) command to change to the directory that contains the release files. Changing to the appropriate directory differs, depending on your release media, as follows:

- If you downloaded the release files, change to the directory to which you downloaded the files.
- If you obtained the release files from a CD-ROM, use one of the following commands:

  - If you are installing the software on a Solaris 2.8 platform, use the following command:

```
# cd /cdrom/cdrom0/2.8
```

  - If you are installing the software on a Solaris 2.9 platform, use the following command:

```
# cd /cdrom/cdrom0/2.9
```

3. **Use the pkgadd(1M) command to add the SUNWqfsr and SUNWqfsu packages.**

   For example:

```
# pkgadd -d . SUNWqfsr SUNWqfsu
```

4. Enter yes or y as the answer to each of the questions.

■ Enabling the StorageTek QFS Software License

You need a license key to run the StorageTek QFS software. For information on obtaining license keys, see "Obtaining a Software License Key" on page 17.

The StorageTek QFS file system uses an encrypted license key. The license key consists of an encoded alphanumeric string.

To Enable the StorageTek QFS Software License

1. Create the **/etc/opt/SUNWsamfs/LICENSE.4.1** file.

2. Starting in column one, place the license key you have obtained from your ASP or from StorageTek on the first line in the **/etc/opt/SUNWsamfs/LICENSE.4.1** file.

   The key must start in column one. No other keywords, host IDs, comments, or other information can appear in the /etc/opt/SUNWsamfs/LICENSE.4.1 file.

■ Setting Up PATH and MANPATH Variables

To Set Up PATH and MANPATH Variables

1. For users who need to access the StorageTek QFS user commands (for example, `sls(1)`), add `/opt/SUNWsamfs/bin` to the users' `PATH` variables.

2. For users, such as superusers, who need to access the administrator commands, add `/opt/SUNWsamfs/sbin` to the `PATH` variable.

3. For users who need to access the StorageTek QFS man pages, add `/opt/SUNWsamfs/man` to the `MANPATH variable`.

4. Use `vi`(1) or another editor to edit your system setup files to include the correct paths to commands and man pages.

   a. In the Bourne or Korn shells, edit the `.profile` file, change the `PATH` and `MANPATH` variables, and export the variables.

      shows how your `.profile` file might look after editing

Figure 11. Finished .profile File

■ Rebooting the System

1. Reboot the server by issuing the `touch`(1) and `init`(1M) commands.

    Figure 12 shows the commands to use to reboot.

Figure 12. Commands to Reboot the Server

```
# touch /reconfigure
# init 6
```

Changes to the `/etc/name_to_sysnum` file are enabled at this time.

■ Enabling the StorageTek ASM QFS Manager (Optional)

Perform this step if you want to be able to use the StorageTek ASM QFS Manager to configure, control, monitor, or reconfigure your StorageTek QFS environment.

The procedures in this section are as follows:

*   "To Install the StorageTek ASM QFS Manager Software".

*   "To Invoke the StorageTek ASM QFS Manager for the First Time" on page 42. Use this procedure to invoke the StorageTek ASM QFS Manager software.

*   "To Use the StorageTek ASM QFS Manager for Configuration" on page 44. Use this procedure to decide which configuration tasks you want to perform using the StorageTek ASM QFS Manager software.

In addition to the information in this section, this manual's appendix, "ASM QFS Manager Software Notes" in Appendix A , describes other aspects of using the StorageTek ASM QFS Manager.

To Install the StorageTek ASM QFS Manager Software

1. Ensure that you have met the install requirements in "Verifying Requirements for the ASM QFS Manager (Optional)" on page 20.

2. Log in to the server that you want to use as the management station.

    This can be the same server upon which you installed the `SUNWsamfsr` and `SUNWsamfsu` packages.

3. Become superuser.

4. Use the `cd`(1) command to change to the directory where the software package release files reside on your server.

When you completed your preinstallation tasks, you obtained the release files as described in "Obtaining the Release Files" on page 17. Use the cd(1) command to change to the directory that contains the release files.

For example, if you obtained the release files from a CD-ROM, use the following command:

```
# cd /cdrom/cdrom0
```

If you downloaded the release files, change to the directory to which you downloaded the files.

5. Execute the samqfsmgr_setup script to install the StorageTek ASM QFS Manager software.

    For example:

```
# samqfsmgr_setup
```

6. Answer the questions as prompted by the samqfsmgr_setup script.

    During the installation procedure, you are asked to answer questions about your environment. The script prompts you to enter passwords for the SAMadmin role and for the samadmin and samuser login IDs.

    The samqfsmgr_setup script automatically installs the following:

    *   The TomCat, Java Runtime Environment (JRE), JATO, and Sun Web Console packages. If you have existing versions of these software packages that are not compatible with StorageTek ASM QFS Manager, the installation software asks you whether you want the appropriate levels to be installed at this time.

    *   The SUNWsamqfsuiu package.

    *   The SUNWsamqfsuir package.

    After installing the packages, it starts the TomCat Web Server, enables logging, and creates the SAMadmin role.

7. Log into the StorageTek QFS server and become superuser.

8. Use the ps(1) and grep(1) commands to make sure that the rpcbind service is running.

    For example:

```
# ps -ef | grep rpcbind
```

9. Examine the output from the preceding commands.

The output should contain a line similar to the following:

```
root   269    1  0   Feb 08 ?        0:06 /usr/sbin/rpcbind
```

If `rpcbind` does not appear in the output, enter the following command:

```
# /usr/sbin/rpcbind
```

10. Start the `sam-mgmtrpcd` daemon. (Optional)

    Perform this step if you did not elect to have this daemon started automatically.

    Enter the following command to start the `sam-mgmtrpcd` daemon:

```
# /opt/SUNWsamfs/sbin/sam-mgmtrpcd
```

The system automatically restarts this daemon every time you reboot the server. If you kill this daemon, it restarts.

The `syslogd` daemon performs detailed tracing of the native code. For more information on tracing, see “ASM QFS Manager Software Notes” on page 211.

To Invoke the StorageTek ASM QFS Manager for the First Time

After the StorageTek ASM QFS Manager is installed, you can log in to the software using two possible user names (`samadmin` and `samuser`) and two different roles (`SAMadmin` or `no role`). The tasks you can perform using the StorageTek ASM QFS Manager differ depending on the user name and the role you assume at login. These differences are as follows:

- If you log in as `samadmin`, you can choose from one of two roles.

  - The role of `SAMadmin` grants you full adminstrator privileges to configure, monitor, control, and reconfigure the devices in your StorageTek QFS environment.

    Only the StorageTek QFS adminstrator should log in using the `SAMadmin` role. All other users should log in as `samuser`.

  - The role of `no role` only allows you to monitor the environment. You cannot change or reconfigure it in any way.

- If you log in as `samuser`, you can only monitor the environent. You cannot change or reconfigure it in any way.

With regard to system administration, be aware that the Solaris OS root user on the server that hosts the StorageTek ASM QFS Manager is not necessarily

the administrator of the StorageTek ASM QFS Manager. Only `samadmin` has administrator priviledges for the StorageTek ASM QFS Manager application. The root user is the administrator of the management station.

Perform this procedure if you want to invoke the StorageTek ASM QFS Manager and use it, rather than commands, to perform some of the configuration steps.

1. Log in to the management station web server.

2. From a web browser, invoke the StorageTek ASM QFS Manager software.

   The URL is as follows:

   ```
   https://hostname:6789
   ```

   For *hostname*, type the name of the host. If you need to specify a domain name in addition to the host name, specify the *hostname* in this format: *hostname*.*domainname*.

   Note that this URL begins with `https`, not `http`. The Sun Web Console login screen appears.

3. At the User Name prompt, enter `samadmin`.

4. At the `Password` prompt, enter the password you entered when you answered questions during the the `samqfsmgr_setup` script's processing in "To Install the StorageTek ASM QFS Manager Software" on page 40.

5. Click on the `SAMadmin` role.

   Only the StorageTek QFS administrator should ever log in with the `SAMadmin` role.

6. At the `Role Password` prompt, enter the password you entered in Step 4.

7. Click on `Log In`.

8. Click on `StorageTek ASM QFS Manager 1.0`.

   You are now logged into the StorageTek ASM QFS Manager.

   - If you want to configure your environment at this time using the StorageTek ASM QFS Manager, stay at this screen and add the server that you want to administer. If you need help accomplishing this task, click on Help. After you add the servers, see "To Use the StorageTek ASM QFS Manager for Configuration" on page 44 for more information on configuring your environment using the StorageTek ASM QFS Manager.

- If you want to quit using the StorageTek ASM QFS Manager at this time, click `Log Out`.

- If you want to create additional accounts at this time, see "ASM QFS Manager Software Notes" on page 211.

To Use the StorageTek ASM QFS Manager for Configuration

This manual guides you through the configuration process using Solaris OS commands, but you can also use the StorageTek ASM QFS Manager, instead of commands, to accomplish many of the tasks.

1. Click on `Help`, in the upper right corner of the screen, to access the StorageTek ASM QFS Manager online documentation.

2. Complete the configuration tasks.

   Table 11 shows the rest of the steps you must perform to install and configure a StorageTek QFS file system and the means by which you can accomplish each task.

   Perform the configuration steps in Table 11 in the order they appear. You can open a terminal window next to the StorageTek ASM QFS Manager window for use when you have to alternate between using commands and using the StorageTek ASM QFS Manager.

Table 11. StorageTek QFS Installation Tasks

Tasks	Accomplish Through GUI	Accomplish Through Commands
"Defining the StorageTek QFS Configuration by Creating the mcf File" on page 46	Yes	Yes
"Editing the defaults.conf File (Optional)" on page 59	No	Yes
"Verifying the License and mcf Files" on page 59	No	Yes
"Creating the samfs.cmd File (Optional)" on page 61	Yes	Yes
"Updating the /etc/vfstab File and Creating the Mount Point" on page 62	Yes	Yes

Table 11. StorageTek QFS Installation Tasks

Tasks	Accomplish Through GUI	Accomplish Through Commands
"Initializing the File System" on page 64	Yes	Yes
"Mounting the File System" on page 65	Yes	Yes
"Sharing the File System With NFS Client Systems (Optional)" on page 65	No	Yes
"Mounting the File System on the NFS Client Systems (Optional)" on page 67	No	Yes
"Establishing Periodic Dumps Using qfsdump(1M)" on page 68	No	Yes
"Backing Up Configuration Files (Optional)" on page 70	No	Yes
"Configuring the Remote Notification Facility (Optional)" on page 70	No	Yes
"Adding the Administrator Group (Optional)" on page 73	No	Yes
"Configuring System Logging" on page 74	No	Yes
"Configuring Other StorageTek Products (Optional)" on page 75	Not applicable	Not applicable

Table 11 describes several installation steps as optional. The only required installation steps that you still must perform using Solaris OS commands are as follows:

- "Verifying the License and mcf Files" on page 59. You need to verify that your license file is installed and working correctly, but if you use StorageTek ASM QFS Manager to create your `mcf` file, you do not need to verify your `mcf` file.

- "Establishing Periodic Dumps Using qfsdump(1M)" on page 68. Performing this step is essential to preserving your data.

The other installation steps in Table 11 are necessary — or are highly recommended— depending on your environment.

■ Defining the StorageTek QFS Configuration by Creating the mcf File

Each StorageTek QFS environment is unique. The system requirements and hardware used differ from site to site. It is up to you, the system administrator at your site, to set up the specific configuration for your StorageTek QFS environment.

The master configuration file, `/etc/opt/SUNWsamfs/mcf`, defines the topology of the equipment managed by the StorageTek QFS file system. This file specifies the devices and file systems included in the environment. You assign each piece of equipment a unique Equipment Identifier in the `mcf` file.

To configure StorageTek QFS devices, create an `mcf` file in `/etc/opt/SUNWsamfs/mcf` that contains a line for each device and family set in your configuration. The `mcf` contains information that enables you to identify the disk slices to be used and to organize them into StorageTek QFS file systems.

There are examples of `mcf` files in `/opt/SUNWsamfs/examples`.

Note: For information on file system design considerations, see the *StorageTek QFS and StorageTek ASM File System Administration Guide.*

The following section describe activities related to creating and maintaining the `mcf` file:

- "To Create an mcf File" on page 47
- "Creating an mcf File on a Sun Cluster Node" on page 50
- "Configuration Examples" on page 51

Note: The instructions for creating the `mcf` file differ depending on whether you are creating a StorageTek QFS environment or a StorageTek ASM QFS Manager environment.

If you are installing the StorageTek QFS software, all configuration instructions are contained in this section.

If you are creating a StorageTek ASM QFS Manager environment, the instructions for configuring the file system portion of the `mcf` file are contained in this section. The instructions for library and drive configuration are contained in "Defining the StorageTek ASM Configuration by Creating the mcf File" on page 113.

To Create an mcf File

When you create the `mcf` file, follow these guidelines:

- Delimit the fields in each line with spaces or tabs.
- Begin each comment line entered into this file with a pound sign (#).
- Use a dash (-) to indicate optional fields that are omitted.

Figure 13 shows the fields of each line entry in the `mcf` file.

Figure 13. mcf File Fields

```
#
# Sun QFS file system configuration
#
# Equipment        Equip  Equip Fam   Dev    Additional
# Identifier       Ord    Type  Set   State  Parameters
# ----------       -----  ----- ----  -----  ----------
```

Table 12 shows the information to be contained in each field and whether or not the field is a required or optional field.

Table 12. StorageTek QFS mcf File Fields

Field	Description
Equipment Identifier	*Required*. Enter either the name of the file system or a /dev/dsk entry for a disk partition or disk slice.
	If this field contains the name of a file system, it is limited to 31 characters in length. Enter this same file system name in the Family Set fields for all devices to be included in this file system.
	If this field contains an entry for a disk partition or disk slice, it is limited to 127 characters in length, and the format is as follows:
	For raw partitions on a formatted disk: `/dev/dsk/c`*n*`t`*n*`d`*n*`s`*n*
	For volumes controlled by a Volume Manager: `/dev/vx/...` or `/dev/md/...`
Equipment Ordinal	*Required*. Enter a unique integer such that 1 *eq_ord* 65534.

Table 12. StorageTek QFS mcf File Fields (Continued)

Field	Description
Equipment Type	*Required.* Enter the code for the Equipment Type, as follows:
	The `ma` Equipment Type defines a file system in a StorageTek QFS file system.
	The `mm` Equipment Type defines a metadata device.
	The `mr` and `md` Equipment Type defines a round-robin or striped data device.
	The g*XXX* Equipment Type defines a striped group data device. Striped groups start with the letter `g`, followed by a 1-, 2-, or 3-digit integer. For example, `g2` or `g14` are both valid values for a striped group.
	For more information on Equipment Types, see the `mcf`(4) man page.
Family Set	*Required.* Enter the name of the file system to which this device belongs. The system organizes all devices with the same Family Set name into a StorageTek QFS file system. Limited to 31 characters.
	If this line is the first in a series of lines that defines devices for a particular file system, enter the same name you entered in the Equipment Identifier field.
	If this line defines a device within a file system, enter the file system name in this field.
Device State	*Optional.* If specified, this field should contain either the keyword `on` or a dash character (`-`). Enter a state for the device for when the StorageTek QFS file system is initialized.

Table 12. StorageTek QFS mcf File Fields (Continued)

Field	Description
Additional Parameters	*Optional*. This field is used only if you are running the StorageTek QFS shared file system. The StorageTek QFS file system must be configured and tested on a host system prior to configuring the StorageTek QFS shared file system. For information on configuring the StorageTek QFS shared file system, see the *StorageTek QFS and StorageTek ASM File System Administration Guide*.
Equipment Identifier	*Required*. Enter either the name of the file system or a /dev/dsk entry for a disk partition or disk slice.
	If this field contains the name of a file system, it is limited to 31 characters in length. Enter this same file system name in the Family Set fields for all devices to be included in this file system.
	If this field contains an entry for a disk partition or disk slice, it is limited to 127 characters in length, and the format is as follows:
	For raw partitions on a formatted disk: `/dev/dsk/c`*n*`t`*n*`d`*n*`s`*n*
	For volumes controlled by a Volume Manager: `/dev/vx/...` or `/dev/md/...`

For more information on this file, see the `mcf`(4) man page. There is an example of an `mcf` file located in `/opt/SUNWsamfs/examples/mcf`.

CAUTION: Make sure you specify disk partitions that are not in use on your system. Do not use overlapping partitions. If a StorageTek QFS file system attempts to use a partition that is already in use, the software usually issues a message to indicate that the device is busy.

If you give the wrong partition names, you risk damaging user or system data. This is true when creating any type of file system. The risk is greatest if the partition named contains a UFS file system that is not mounted currently.

Figure 14 shows file system entries in an `mcf` file for a StorageTek QFS file system.

Figure 14. Example StorageTek QFS mcf File

```
#
# Sun QFS file system configuration
#
# Equipment        Equip  Equip Fam   Dev     Additional
# Identifier       Ord    Type  Set   State   Parameters
# ----------       -----  ----- ----  -----   ----------
qfs1               1      ma    qfs1
/dev/dsk/c1t0d0s0 11      mm    qfs1  on
/dev/dsk/c1t1d0s4 12      mr    qfs1  on
/dev/dsk/c1t2d0s4 13      mr    qfs1  on
/dev/dsk/c1t3d0s4 14      mr    qfs1  on
```

Creating an mcf File on a Sun Cluster Node

Depending on the type of storage you specify, a file system installed on a node in a Sun Cluster environment has the potential to be local, global, or highly available. Writing an `mcf` file for a local or global StorageTek QFS file system on a Sun Cluster node is no different from writing any other kind of `mcf` file, but the disk devices behave differently depending on how you specify them in the Equipment Identifier field. This section explains what to specify in the Equipment Identifier field.

The characteristics of local, global, and highly available file systems are as follows:

* Local file system. A file system that is configured on disks that are accessible only to the host system upon which the StorageTek QFS software is installed. In a Sun Cluster environment, local file systems are accessible only to the node upon which they are created.

* Global file system. A file system that is configured on global disk devices. Global disk devices are accessible to all nodes in a Sun Cluster and are defined in the `/dev/global` directory. If a node with a global file system fails, all nodes lose access to that file system. File systems created on global devices are not necessarily highly available.

* Highly available file system. A file system that is configured from highly available global devices in a Sun Cluster environment.

If you are creating a StorageTek QFS file system as a local or global file system in a Sun Cluster environment, use the information in Figure 15 on page 51 when writing the Equipment Identifier field for a local or global file

system in a Sun Cluster. Table 13 contains information on the kinds of disks that can be used to configure a StorageTek QFS file system.

Table 13. Equipment Identifier Field Content in a Sun Cluster mcf File

Name and Format	Notes
Global device: `/dev/global/rdsk/d0s0`	Global devices are accessible from all nodes in a Sun Cluster, even if these devices are not physically attached to all nodes.
Solaris Volume Manager (SVM): `/dev/md/diskset/dsk/d0`	Devices configured with SVM can be local or global.
VERITAS Volume Manager (VxVM): `/dev/vx/dsk/diskgroup/v0`	Devices configured with VxVM can be local or global.

Note: For more information on using StorageTek QFS file systems in a Sun Cluster environment, see the README file or see the *StorageTek QFS and StorageTek ASM 4.1 Release Notes.*

Configuration Examples

The following configuration examples are for a local StorageTek QFS file system installed in a Sun Solaris OS.

Configuration Example 1

This example shows how to configure two StorageTek QFS file systems using a server that has a desktop array connected by a SCSI attachment.

You can use the `format`(1M) command to determine how the disks are partitioned. Figure 15 shows the `format`(1M) command's output.

Figure 15. format(1M) Command Output for Configuration Example 1

```
# format < /dev/null
Searching for disks...done

AVAILABLE DISK SELECTIONS:
       0. c0t10d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /sbus@3,0/SUNW,fas@3,8800000/sd@a,0
       1. c0t11d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /sbus@3,0/SUNW,fas@3,8800000/sd@b,0
       2. c6t2d0 <SUN9.0G cyl 4924 alt 2 hd 27 sec 133>
          /pci@7,4000/SUNW,isptwo@3/sd@2,0
       3. c6t3d0 <SUN9.0G cyl 4924 alt 2 hd 27 sec 133>
          /pci@7,4000/SUNW,isptwo@3/sd@3,0
       4. c6t4d0 <SUN9.0G cyl 4924 alt 2 hd 27 sec 133>
          /pci@7,4000/SUNW,isptwo@3/sd@4,0
       5. c6t5d0 <SUN9.0G cyl 4924 alt 2 hd 27 sec 133>
```

Figure 15. format(1M) Command Output for Configuration Example 1 (Continued)

```
            /pci@7,4000/SUNW,isptwo@3/sd@5,0
     6. c8t2d0 <SUN9.0G cyl 4924 alt 2 hd 27 sec 133>
            /pci@b,4000/SUNW,isptwo@3/sd@2,0
     7. c8t3d0 <SUN9.0G cyl 4924 alt 2 hd 27 sec 133>
            /pci@b,4000/SUNW,isptwo@3/sd@3,0
     8. c8t4d0 <SUN9.0G cyl 4924 alt 2 hd 27 sec 133>
            /pci@b,4000/SUNW,isptwo@3/sd@4,0
     9. c8t5d0 <SUN9.0G cyl 4924 alt 2 hd 27 sec 133>
            /pci@b,4000/SUNW,isptwo@3/sd@5,0
Specify disk (enter its number):
#


                              # format(1M) shows the partition layout of all
drives.
# format /dev/rdsk/c6t2d0s2      # Only the last lines of format(1M) output are
shown.

Part      Tag    Flag    Cylinders      Size              Blocks
  0 unassigned    wm      0             0        (0/0/0)           0
  1 unassigned    wm      0             0        (0/0/0)           0
  2     backup    wu      0 - 4923      8.43GB   (4924/0/0) 17682084
  3 unassigned    wm      0             0        (0/0/0)           0
  4 unassigned    wm      0 - 1229      2.11GB   (1230/0/0)  4416930
  5 unassigned    wm   1230 - 2459      2.11GB   (1230/0/0)  4416930
  6 unassigned    wm   2460 - 3689      2.11GB   (1230/0/0)  4416930
  7 unassigned    wm   3690 - 4919      2.11GB   (1230/0/0)  4416930
```

To Configure the System

Begin writing the `mcf` file for this configuration example by defining the file system and its disk partitions, as follows:

1. Write the `mcf` file.

    a. Make an `ma` entry for the first file system.

    b. Make an `mm` entry listing the partition(s) that comprise the metadata for the `qfs1` file system.

    c. Make a series of `mr` entries listing the partitions that comprise the file data for the `qfs1` file system.

    d. Make similar entries for the second (`qfs2`) file system.

    The finished `mcf` file defines the following two file systems:

    - The `qfs1` file system, which is created on slice `4` of the following disks: `c8t2d0` (metadata), `c6t2d0` (file data), and `c6t3d0` (file data).

    - The `qfs2` file system, which is created on slice 5 of the following disks: `c8t2d0` (metadata), `c6t2d0` (file data), and `c6t3d0` (file data).

Figure 16 shows the resulting `mcf` file.

Figure 16. mcf File for StorageTek QFS Example 1

```
# cat /etc/opt/SUNWsamfs/mcf
#
# Equipment        Eq   Eq    Family   Device   Additional
# Identifier       Ord  Type    Set     State   Parameters
#-----------       ---  ----  ------   ------   ----------
#
qfs1               10    ma   qfs1       on
/dev/dsk/c8t2d0s4  11    mm   qfs1       on
/dev/dsk/c6t2d0s4  12    mr   qfs1       on
/dev/dsk/c6t3d0s4  13    mr   qfs1       on
#
qfs2               20    ma   qfs2       on
/dev/dsk/c8t2d0s5  21    mm   qfs2       on
/dev/dsk/c6t2d0s5  22    mr   qfs2       on
/dev/dsk/c6t3d0s5  23    mr   qfs2       on
```

> **Note:** Modifying the `/etc/vfstab` file is a later step in this chapter's configuration procedure. This step shows the `/etc/vfstab` file modifications only for completeness' sake.

2. Modify the `/etc/vfstab` file.

Make entries in the `/etc/vfstab` file for the `qfs1` and `qfs2` file systems you defined in the `mcf` file. The last two lines in Figure 17 show entries for these new file systems.

Figure 17. /etc/vfstab File for StorageTek QFS Example 1

```
# cat /etc/vfstab
# device            device                          file            mount
# to                to                  mount       system  fsck    at      mount
# mount             fsck                point       type    pass    boot    params
# -----             ----                -----       ----    ----    ----    ------
fd                  -                   /dev/fd     fd      -       no      -
/proc               -                   /proc       proc    -       no      -
/dev/dsk/c0t10d0s1  -                   -           swap    -       no      -
/dev/dsk/c0t10d0s0  /dev/rdsk/c0t10d0s0 /           ufs     1       no      logging
swap                -                   /tmp        tmpfs   -       yes     -
qfs1                -                   /qfs1       samfs   -       yes     stripe=1
qfs2                -                   /qfs2       samfs   -       yes     stripe=1
```

> **Note:** Modifying the `/etc/vfstab` file is a later step in this chapter's configuration procedure. This step shows the `/etc/vfstab` file modifications only for completeness' sake.

Configuration Example 2

This example illustrates a StorageTek QFS file system that uses round-robin allocation on four disk drives.

This example assumes the following:

- The metadata device is a single partition (s1) used on controller 8, disk 4.

- The data devices consist of four disks attached to controller 6. Each disk is on a separate target (1-4).

To Configure the System

This example introduces the round-robin data layout. For more information on data layout, see the *StorageTek QFS and StorageTek ASM File System Administration Guide*.

1. Write the mcf file.

   Figure 18 shows the mcf file for this round-robin disk configuration.

Figure 18. mcf File for StorageTek QFS Example 2

```
# cat /etc/opt/SUNWsamfs/mcf
#
# Equipment        Eq   Eq     Family   Device   Additional
# Identifier       Ord  Type    Set     State    Parameters
#-----------       ---  ----   ------   ------   ----------
#
qfs3               10   ma     qfs3       on
/dev/dsk/c8t4d0s4  11   mm     qfs3       on
/dev/dsk/c6t2d0s4  12   mr     qfs3       on
/dev/dsk/c6t3d0s4  13   mr     qfs3       on
/dev/dsk/c6t4d0s4  14   mr     qfs3       on
/dev/dsk/c6t5d0s4  15   mr     qfs3       on
```

> **Note:** Modifying the /etc/vfstab file and using the sammkfs(1M) command are later steps in this chapter's configuration procedure. This step shows these steps only for completeness' sake.

2. Modify the /etc/vfstab file.

   Edit the /etc/vfstab file to explicitly set round-robin on the file system by specifying stripe=0 in the mount params field. Figure 19 shows stripe=0 for the qfs3 file system.

Figure 19. /etc/vfstab File for StorageTek QFS Example 2

```
# cat /etc/vfstab
#device              device                          file             mount
#to                  to                   mount      system  fsck  at      mount
#mount               fsck                 point      type    pass  boot    params
#-----               ----                 -----      ----    ----  ----    ------
fd                   -                    /dev/fd    fd      -     no      -
/proc                -                    /proc      proc    -     no      -
/dev/dsk/c0t10d0s1   -                    -          swap    -     no      -
/dev/dsk/c0t10d0s0   /dev/rdsk/c0t10d0s0  /          ufs     1     no      logging
swap                 -                    /tmp       tmpfs   -     yes     -
qfs3                 -                    /qfs3      samfs   -     yes     stripe=0
```

3. Run the sammkfs(1M) command.

Initialize the StorageTek QFS file system by using the sammkfs(1M) command. The default DAU is 64 kilobytes, but the following example sets the DAU size to 128 kilobytes:

```
# sammkfs -a 128 qfs1
```

Configuration Example 3

This example illustrates a StorageTek QFS file system. It stripes file data to four disk drives. This example assumes the following:

- The metadata device is a single partition (s6) used on controller 0, LUN 0.

- The data devices consist of four disks attached to controller 6. Each disk is on a separate disk (2-5).

To Configure the System

1. Write the mcf file.

Write the mcf file using the disk configuration assumptions. Figure 20 shows a sample mcf file for a striped disk configuration.

Figure 20. mcf File for StorageTek QFS Example 3

```
# Equipment        Eq   Eq    Family  Device  Additional
# Identifier       Ord  Type  Set     State   Parameters
#-----------       ---  ----  ------  ------  ----------
#
qfs4               40   ma    qfs4      on
/dev/dsk/c8t4d0s4  41   mm    qfs4      on
/dev/dsk/c6t2d0s4  42   mr    qfs4      on
/dev/dsk/c6t3d0s4  43   mr    qfs4      on
/dev/dsk/c6t4d0s4  44   mr    qfs4      on
/dev/dsk/c6t5d0s4  45   mr    qfs4      on
```

> **Note:** Modifying the /etc/vfstab file and using the sammkfs(1M) command are later steps in this chapter's configuration procedure. This step shows these steps only for completeness' sake.

2. Modify the /etc/vfstab file.

Set the stripe width by using the stripe= option. Figure 21 shows the /etc/vfstab file with a mount parameter of stripe=1 set for the qfs4 file system.

Figure 21. /etc/vfstab File for StorageTek QFS Example 3

```
# cat /etc/vfstab
#
#device            device                    file         mount
#to                to              mount    system fsck   at    mount
```

Figure 21. /etc/vfstab File for StorageTek QFS Example 3 (Continued)

```
#mount              fsck                 point    type    pass  boot  params
#-----              ----                 -----    -----   ----  ----  ------
fd                  -                    /dev/fd  fd      -     no    -
/proc               -                    /proc    proc    -     no    -
/dev/dsk/c0t10d0s1  -                    -        swap    -     no    -
/dev/dsk/c0t10d0s0  /dev/rdsk/c0t10d0s0  /        ufs     1     no    logging
swap                -                    /tmp     tmpfs   -     yes   -
qfs4                -                    /qfs4    samfs   -     yes   stripe=1
```

The `stripe=1` specification stripes file data across all four of the `mr` data disks with a stripe width of one disk allocation unit (DAU). Note that the DAU is the allocation unit you set when you use the `sammkfs`(1M) command to initialize the file system.

3. Run the `sammkfs`(1M) command.

    Initialize the StorageTek QFS file system by using the `sammkfs`(1M) command. The following example sets the DAU size to 128 kilobytes:

    ```
    # sammkfs -a 128 qfs1
    ```

    With this striped disk configuration, any file written to this file system is striped across all of the devices in increments of 128 kilobytes. Files less than the aggregate stripe width times the number of devices still use 128 kilobytes of disk space. Files larger than 128 kilobytes have space allocated for them as needed in total space increments of 128 kilobytes. The file system writes metadata to device 41 only.

Configuration Example 4

Striped groups allow you to group RAID devices together for very large files. With striped groups, however, there is only one DAU per striped group. This method of writing huge DAUs across RAID devices saves system update time. Striped groups are useful for writing very large files to a group of RAID devices.

Note: A DAU is the minimum disk space allocated. The minimum disk space allocated in a striped group is as follows:

allocation_unit x *number of disks in the group*

Writing a single byte of data fills the entire striped group. Make sure that you understand the effects of using striped groups with your file system.

The devices within a striped group must be the same size. It is not possible to increase the size of a striped group. You can add additional striped groups to the file system, however.

This example configuration illustrates a StorageTek QFS file system that separates the metadata onto a low-latency disk. The mcf file defines two striped groups on four drives. This example assumes the following:

- The metadata device is a single partition (s5) used on controller 8, disk 4.

- The data devices consist of four disks (two groups of two identical disks) attached to controller 6. Each device is on a separate disk (2-5).

To Configure the System

1. Write the mcf file.

   Write the mcf file by using the disk configuration assumptions. Figure 22 shows a sample mcf file for a striped group configuration.

Figure 22. mcf File for StorageTek QFS Example 4

```
# cat /etc/opt/SUNWsamfs/mcf
#
# Equipment          Eq    Eq     Family   Device   Additional
# Identifier         Ord   Type    Set     State    Parameters
#-----------         ---   ----   ------   ------   ----------
#
qfs5                 50    ma     qfs5      on
/dev/dsk/c8t4d0s5    51    mm     qfs5      on
/dev/dsk/c6t2d0s5    52    g0     qfs5      on
/dev/dsk/c6t3d0s5    53    g0     qfs5      on
/dev/dsk/c6t4d0s5    54    g1     qfs5      on
/dev/dsk/c6t5d0s5    55    g1     qfs5      on
```

Note: Modifying the /etc/vfstab file and using the sammkfs(1M) command are later steps in this chapter's configuration procedure. This procedure shows these steps only for completeness' sake.

2. Modify the /etc/vfstab file.

   Use the the stripe= option to set the stripe width. Figure 23 on page 58 shows the /etc/vfstab file with a mount parameter of stripe=0, which specifies a round-robin allocation from striped group g0 to striped group g1.

Figure 23. /etc/vfstab File for StorageTek QFS Example 4

```
# cat /etc/vfstab
#device              device                          file          mount
#to                  to                     mount    system  fsck  at     mount
#mount               fsck                   point    type    pass  boot   params
#-----               ----                   -----    ----    ----  ----   ------
fd                   -                      /dev/fd  fd      -     no     -
/proc                -                      /proc    proc    -     no     -
/dev/dsk/c0t10d0s1   -                      -        swap    -     no     -
/dev/dsk/c0t10d0s0   /dev/rdsk/c0t10d0s0    /        ufs     1     no     logging
swap                 -                      /tmp     tmpfs   -     yes    -
qfs5                 -                      /qfs5    samfs   -     yes    stripe=0
```

3. Run the `sammkfs`(1M) command.

    Initialize the StorageTek QFS file system by using the `sammkfs`(1M) command. The `-a` option is not used with striped groups because the DAU is equal to the size of an allocation, or the size, of each group.

    ```
    # sammkfs qfs5
    ```

    In this example, there are two striped groups, `g0` and `g1`. With `stripe=0` in `/etc/vfstab`, devices 12 and 13 are striped; devices 14 and 15 are striped; and files are round robined around the two striped groups. You are actually treating a striped group as a bound entity. After you configure a stripe group, you cannot change it without issuing another `sammkfs`(1M) command.

    Note: If you change the `mcf` file after the StorageTek QFS file system is in use, you must convey the new `mcf` specifications to the StorageTek QFS software. For information on propagating `mcf` file changes to the system, see the *StorageTek QFS and StorageTek ASM File System Administration Guide*.

■ Initializing the Environment

To Initialize the Environment

- Type the `samd`(1M) `config` command to initialize the StorageTek QFS environment.

  For example:

  ```
  # samd config
  ```

■ Editing the defaults.conf File (Optional)

The `/opt/SUNWsamfs/examples/defaults.conf` file contains default settings for the StorageTek QFS environment. You can change these settings at any time after the initial installation. To determine if you want to change any default settings now, examine the `defaults.conf`(4) man page to discern the types of behaviors this file controls.

To Set Up Default Values

1. Read the `defaults.conf`(4) man page and examine this file to determine if you want to change any of the defaults.

2. Use the `cp`(1) command to copy `/opt/SUNWsamfs/examples/defaults.conf` to its functional location.

   For example:

```
# cp /opt/SUNWsamfs/examples/defaults.conf /etc/opt/SUNWsamfs/defaults.conf
```

3. Use `vi`(1) or another editor to edit the file.

   Edit the lines that control aspects of the system that you want to change. Remove the pound character (`#`) from column 1 of the lines you change.

4. Use the `pkill`(1M) command to send a SIGHUP signal to the `sam-fsd`(1M) daemon.

   For example:

```
# pkill -HUP sam-fsd
```

This command restarts the `sam-fsd`(1M) daemon and enables the daemon to recognize the changes in the `defaults.conf` file.

■ Verifying the License and mcf Files

At this point in the installation and configuration process, the following files exist on your StorageTek QFS server:

- `/etc/opt/SUNWsamfs/LICENSE.4.1`

- `/etc/opt/SUNWsamfs/mcf`

This procedure shows you how to verify the correctness of these configuration files.

To Verify the License File

- Enter the `samcmd`(1M) `l` (lowercase L) command to verify the license file.

  The `samcmd`(1M) output includes information on features that are enabled. If the output you receive is not similar to that shown in Figure 24, return to "Enabling the StorageTek QFS Software License" on page 39.

Figure 24. Using samcmd(1M)

```
# samcmd l

License information samcmd     4.1    Fri Feb 27 16:24:12 2004

hostid = xxxxxxx

License never expires

Fast file system feature enabled

QFS stand alone feature enabled

Shared filesystem support enabled

SAN API support enabled
```

To Verify the mcf File

- Enter the `sam-fsd`(1M) command to verify the `mcf` file.

  Examine the output for errors, as follows:

  - If your `mcf` file is free from syntax errors, the `sam-fsd`(1M) the output is similar to that shown in Figure 25. It contains information about the file systems and other system information.

Figure 25. sam-fsd(1M) Output Showing No Errors

```
# sam-fsd
Trace file controls:
sam-amld      off

sam-archiverd off

sam-catserverd off

sam-fsd       off

sam-rftd      off

sam-recycler  off

sam-sharefsd  off

sam-stagerd   off
```

Figure 25. sam-fsd(1M) Output Showing No Errors (Continued)

```
sam-serverd    off

sam-clientd    off

sam-mgmt       off

License: License never expires.
```

- If your `mcf` file contains syntax or other errors, however, it notes the errors in its output.

  If your `mcf` file has errors, refer to and to the `mcf`(4) man page for information on how to create this file correctly.

Note: If you change the `mcf` file after the StorageTek QFS file system is in use, you must convey the new `mcf` specifications to the StorageTek QFS software. For information on propagating `mcf` file changes to the system, see the *StorageTek QFS and StorageTek ASM File System Administration Guide*.

■ Creating the `samfs.cmd` File (Optional)

You can create the `/etc/opt/SUNWsamfs/samfs.cmd` file as the place from which the system reads mount parameters. If you are configuring multiple StorageTek QFS systems with multiple mount parameters, consider creating this file.

You can specify mount parameters in the following ways:

- On the `mount`(1M) command. Mount options specified here override those specified in the `/etc/vfstab` file and in the `samfs.cmd` file.

- In the `/etc/vfstab` file. Mount options specified here override those specified in the `samfs.cmd` file.

- In the `samfs.cmd` file.

You can manage certain features more easily from a `samfs.cmd` file. These features include the following:

- Striping.

- Readahead, which specifies the number of bytes that are read ahead when performing paged I/O.

- Writebehind, which specifies the number of bytes that are written behind when performing paged I/O.

- Qwrite, which enables simultaneous reads and writes to the same file from different threads.

For more information on the /etc/vfstab file, see "Updating the /etc/vfstab File and Creating the Mount Point" on page 62. For more information on the mount(1M) command, see the mount_samfs(1M) man page.

To Create the samfs.cmd File

- Use vi(1) or another editor to create the samfs.cmd file.

  Create lines in the samfs.cmd file to control mounting, performance features, or other aspects of file system management. For more information on the samfs.cmd file, see the *StorageTek QFS and StorageTek ASM File System Administration Guide*, or see the samfs.cmd(4) man page.

  Figure 26 shows a samfs.cmd file for a StorageTek QFS file system.

Figure 26. Example samfs.cmd File for a StorageTek QFS File System

```
qwrite   # Global mount option. Enables qwrite for all file
systems
fs=qfs1  # Enables mount options for the qfs1 file system only
   trace # Enables file system tracing for qfs1 only
```

■ Updating the /etc/vfstab File and Creating the Mount Point

The example in this procedure assumes that /qfs1 is the mount point of the qfs1 file system.

To Update the /etc/vfstab File and Create the Mount Point

1. Use vi(1) or another editor to open the /etc/vfstab file and create an entry for each StorageTek QFS file system.

   Figure 27 shows header fields and entries for a local StorageTek QFS file system.

Figure 27. Example /etc/vfstab File Entries for a StorageTek QFS File System

```
#DEVICE    DEVICE   MOUNT   FS     FSCK  MOUNT    MOUNT
#TO MOUNT  TO FSCK  POINT   TYPE   PASS  AT BOOT  PARAMETERS
#
qfs1       -        /qfs1   samfs  -     yes      stripe=1
```

Table 14 shows the various fields in the /etc/vfstab file and their contents.

Table 14. Fields in the /etc/vfstab File

Field	Field Title and Contents
1	Device to mount. The name of the StorageTek QFS file system to mount. This must be the same as the file system's Family Set name specified in the mcf file.
2	Device to fsck(1M). Must be a dash (-) character. The dash indicates that there are no options. This prevents the Solaris system from performing an fsck(1M) on the StorageTek QFS file system. For more information about this process, see the fsck(1M) or samfsck(1M) man page.
3	Mount point name. For example, /qfs1.
4	File system type. Must be samfs.
5	fsck(1M) pass. Must be a dash (-) character. A dash indicates that there are no options.
6	Mount at boot. Specifying yes in this field requests that the StorageTek QFS file system be mounted automatically at boot time. Specifying no in this field indicates that you do not want to mount the file system automatically. For information about the format of these entries, see the mount_samfs(1M) man page.
7	Mount parameters. A list of comma-separated parameters (with no spaces) that are used in mounting the file system. You can specify mount options on the mount(1M) command, in the /etc/vfstab file, or in a samfs.cmd file. Mount options specified on the mount(1M) command override those specified in the /etc/vfstab file and in the samfs.cmd file. Mount options specified in the /etc/vfstab file override those in the samfs.cmd file. For example, stripe=1 specifies a stripe width of one DAU. For a list of available mount options, see the mount_samfs(1M) man page.

2. Use the mkdir(1) command to create the file system mount point.

   The mount point location differs depending on where the file system is to be mounted, as follows:

   • The file system can be mounted as a file system on a standalone server.

- The file system can be mounted as a local file system on one node of a Sun Cluster. Such a file system is not highly available in the Sun Cluster.

The following examples illustrate this.

Example 1. This example assumes that /qfs1 is the mount point of the qfs1 file system. This is a local file system. It can exist on a standalone server or on a local node in a Sun Cluster. For example:

```
# mkdir /qfs1
```

■ Initializing the File System

This procedure shows how to use the sammkfs(1M) command and the Family Set names that you have defined to initialize a file system.

Note: The sammkfs(1M) command sets one tuning parameter, the disk allocation unit (DAU). You cannot reset this parameter without reinitializing the file system. For information about how the DAU affects tuning, see the *StorageTek QFS and StorageTek ASM File System Administration Guide* or see the sammkfs(1M) man page.

To Initialize a File System

- Use the sammkfs(1M) command to initialize a file system for each Family Set defined in the mcf file.

  Figure 28 shows the command to use to initialize a file system with the Family Set name of qfs1.

Figure 28. Initializing Example File System qfs1

```
# sammkfs -a 128 qfs1
Building 'qfs1' will destroy the contents of devices:
               /dev/dsk/c1t0d0s0
               /dev/dsk/c3t1d0s6
               /dev/dsk/c3t1d1s6
               /dev/dsk/c3t2d0s6
Do you wish to continue? [y/N]
```

Enter y in response to this message to continue the file system creation process.

CAUTION: Running sammkfs(1M) creates a new file system. It removes all references to the data currently contained in the partitions associated with the file system in the /etc/opt/SUNWsamfs/mcf file.

Mounting the File System

The mount(1M) command mounts a file system. It also reads the
/etc/vfstab and samfs.cmd configuration files. For information on the
mount(1M) command, see the mount_samfs(1M) man page.

To Mount the File System

1. Issue the mount(1M) command to mount the file system.

    Specify the file system mount point as the argument. For example:

    ```
    # mount /qfs1
    ```

2. Issue the mount(1M) command with no arguments to verify the mount.

    This step confirms whether the file system is mounted and shows how to
    set permissions. Figure 29 shows the output from a mount(1M) command
    issued to verify whether example file system qfs1 is mounted.

Figure 29. Using the mount(1M) Command to Verify that a File System is Mounted

```
# mount
<<< information deleted >>>
/qfs1 on qfs1 read/write/setuid/dev=8001b1 on Mon Jan 14 12:21:03 2002
<<< information deleted >>>
```

3. Issue the chmod(1) and chown(1) commands to change the permissions
    and ownership of the file system's root directory. (Optional)

    If this is the first time the file system has been mounted, it is typical to
    perform this step. Figure 30 shows the commands to use to change file
    system permissions and ownership.

**Figure 30. Using chmod(1M) and chown(1M) to Change File System
Permissions and Ownership**

```
# chmod 755 /qfs1
# chown root:other /qfs1
```

Sharing the File System With NFS Client Systems (Optional)

Perform this procedure if you want a local StorageTek QFS file system to be
NFS shared.

Run the Sun Solaris share(1M) command to make the file system available
for mounting by remote systems. The share(1M) commands are typically

placed in the /etc/dfs/dfstab file and are executed automatically by the Sun Solaris OS when you enter init(1M) state 3.

To NFS Share the File System

1. Use vi(1) or another editor to add a share(1M) command to the /etc/dfs/dfstab file.

   For example, add a line like the following to direct the Solaris OS to NFS share the new StorageTek QFS file system:

   ```
   share -F nfs -o rw=client1:client2 -d "QFS" /qfs1
   ```

2. Use the ps(1) and grep(1) commands to determine whether or not nfs.server is running.

   Figure 31 shows these commands and their output.

Figure 31. Commands and Output Showing NFS Activity

```
# ps -ef | grep nfsd
    root   694     1  0   Apr 29 ?        0:36 /usr/lib/nfs/nfsd -a 16
en17     29996 29940  0 08:27:09 pts/5   0:00 grep nfsd
# ps -ef | grep mountd
    root   406     1  0   Apr 29 ?       95:48 /usr/lib/autofs/automountd
    root   691     1  0   Apr 29 ?        2:00 /usr/lib/nfs/mountd
en17     29998 29940  0 08:27:28 pts/5   0:00 grep mountd
```

In Figure 31, the lines that contain /usr/lib/nfs indicate that the NFS server is mounted.

3. Start the NFS server. (Optional)

   Perform this step if the nfs.server server is not running. Use the following command:

   ```
   # /etc/init.d/nfs.server start
   ```

4. Type the share(1M) command at a root shell prompt. (Optional)

   Perform this step if you want to NFS share the new StorageTek QFS file system immediately.

   If there are no NFS shared file systems when the Sun Solaris OS boots, the NFS server is not started. Figure 32 on page 67 shows the commands

to use to enable NFS sharing. You must change to run level 3 after adding the first share entry to this file.

Figure 32. NFS Commands

```
# init 3
# who -r
.       run-level 3  Dec 12 14:39    3    2  2
# share
-           /qfs1  -   "QFS"
```

Some NFS mount parameters can affect the performance of an NFS mounted StorageTek QFS file system. You can set these parameters in the /etc/vfstab file as follows:

- timeo = *n*. This value sets the NFS timeout to *n* tenths of a second. The default is 11 tenths of a second. For performance purposes, StorageTek recommends using the default value. You can increase or decrease the value appropriately to your system.

- rsize = *n*. This value sets the read buffer size to *n* bytes. In NFS 2, change the default value (8192) to 32768. In NFS 3, retain the default value of 32768.

- wsize = *n*. This value sets the write buffer size to *n* bytes. In NFS 2, change the default value (8192) to 32768. In NFS 3, retain the default value of 32768.

For more information on these parameters, see the mount_nfs(1M) man page.

■ Mounting the File System on the NFS Client Systems (Optional)

Perform this procedure if you have shared the file system with NFS client systems.

On the client systems, mount the server's StorageTek QFS file system at a convenient mount point.

To Mount the File System on Clients

1. On the client systems, use vi(1) or another editor to edit the /etc/vfstab file and add a line to mount the server's StorageTek QFS file system at a convenient mount point.

   The following example line mounts server:/qfs1 on the /qfs1 mount point:

   ```
   server:/qfs1    -    /qfs1    nfs    -    no intr,timeo=60
   ```

In this example, `server:/qfs1` is mounted on `/qfs1`, and information is entered into the `/etc/vfstab` file.

2. Save and close the `/etc/vfstab` file.

3. Enter the `mount`(1M) command.

The following mount(1M) command mounts the `qfs1` file system:

```
client# mount /qfs1
```

The automounter can also do this, if you prefer. Follow your site procedures for adding `server:/qfs1` to your automounter maps. For more information on automounting, see the `automountd`(1M) man page.

Note: At times, there might be a significant delay in the StorageTek QFS file system's response to NFS client requests. This can occur in a StorageTek QFS shared file system. As a consequence, the system might generate an error instead of retrying until the operation completes.

To avoid this situation, StorageTek recommends that clients mount the file system with either the `hard` option enabled or with the `soft`, `retrans`, and `timeo` options enabled. If you use the `soft` option, also specify `retrans=120` (or greater) and `timeo=3000`.

■ Establishing Periodic Dumps Using qfsdump(1M)

File systems are made up of directories, files, and links. The StorageTek QFS file system keeps track of all the files in the `.inodes` file. The `.inodes` file resides on a separate metadata device. The file system writes all file data to the data devices.

It is important to use the `qfsdump`(1M) command periodically to create a dump file of metadata and file data. The `qfsdump`(1M) command saves the relative path information for each file contained in a complete file system or in a portion of a file system. This protects your data in the event of a disaster.

Create dump files at least once a day. The frequency depends on your site's requirements. By dumping file system data on a regular basis, you can restore old files and file systems. You can also move files and file systems from one server to another.

The following are some guidelines for creating dump files:

• The `qfsdump`(1M) command dumps file names, inode information, and data. This command creates full dumps of specified files and directories. An incremental dump is not available. Because of these factors, a `qfsdump`(1M) dump file can be very large. The `qfsdump`(1M) command does not have any tape management, size estimations, or incremental

dump facilities as does `ufsdump`(1M). In addition, the `qfsdump`(1M) command does not support volume overflow, so you need to weigh space considerations and make sure that the size of the file system does not exceed the size of the dump media.

- The `qfsdump`(1M) command dumps all the data of a sparse file, and the `qfsrestore`(1M) command restores all the data. These commands do not, however, preserve file qualities that enable sparse files to be characterized as sparse. This can lead to files occupying more space on dump files and on restored file systems than anticipated.

- You issue the `qfsdump`(1M) command on a mounted file system. Inconsistencies can arise as new files are being created on disk. Dumping file systems during a quiet period (a time when files are not being created or modified) is a good idea and minimizes these inconsistencies.

- Ensure that you dump metadata and data for all StorageTek QFS file systems. Look in `/etc/vfstab` for all file systems of type `samfs`.

You can run the `qfsdump`(1M) command manually or automatically. Even if you implement this command to be run automatically, you might need to run it manually from time to time depending on your site's circumstances. In the event of a disaster, you can use the `qfsrestore`(1M) command to recreate your file system. You can also restore a single directory or file. For more information, see the `qfsdump`(1M) man page and see the *StorageTek ASM, ASM-QFS, and ASM/QFS-Standalone Disaster Recovery Guide*.

For more information on creating dump files, see the `qfsdump`(1M) man page. The following sections describe procedures for issuing this command both manually and automatically.

To Run the qfsdump(1M) Command Automatically

1. Make an entry in `root`'s `crontab` file so that the `cron` daemon runs the `qfsdump`(1M) command periodically.

   For example:

   ```
   10 0 * * * (cd /qfs1; /opt/SUNWsamfs/sbin/qfsdump -f /dev/rmt/0cbn)
   ```

   This entry executes the `qfsdump`(1M) command at 10 minutes after midnight. It uses the `cd`(1) command to change to the mount point of the `qfs1` file system, and it executes the `/opt/SUNWsamfs/sbin/qfsdump` command to write the data to tape device `/dev/rmt/0cbn`.

2. Using the previous step as a guide, make similar `crontab` file entries for each file system. (Optional)

   Perform this step if you have more than one StorageTek QFS file system.

   Make sure you save each dump file in a separate file.

To Run the qfsdump(1M) Command Manually

1. Use the `cd`(1) command to go to the directory that contains the mount point for the file system.

    For example:

    ```
    # cd /qfs1
    ```

2. Create a dump file by issuing the `qfsdump`(1M) command and writing the output to a file system outside of the one you are dumping.

    For example:

    ```
    # qfsdump -f /save/qfs1/dump_file
    ```

■ Backing Up Configuration Files (Optional)

StorageTek QFS regularly accesses several files that have been created as part of this installation and configuration procedure. You should back up these files regularly to a file system that is outside the file system in which they reside. In the event of a disaster, you can restore these files from your backup copies.

Note: StorageTek strongly recommends that you back up your environment's configuration files because they will be needed in the event of a file system disaster.

The following files are among those that you should back up regularly and whenever you modify them:

*   `/etc/opt/SUNWsamfs/mcf`
*   `/etc/opt/SUNWsamfs/LICENSE.4.1`
*   `/etc/opt/SUNWsamfs/samfs.cmd`

For more information on the files you should protect, see the *StorageTek ASM, ASM-QFS, and ASM/QFS-Standalone Disaster Recovery Guide*.

■ Configuring the Remote Notification Facility (Optional)

The StorageTek QFS software can be configured to notify you when potential problems occur in its environment. The system sends notification messages to a management station of your choice. The Simple Management Network Protocol (SNMP) software within the software manages the exchange of information between network devices such as servers, automated libraries, and drives.

The StorageTek QFS and StorageTek ASM Management Information Base (MIB) defines the types of problems, or events, that the StorageTek QFS software can detect. The software can detect errors in configuration, `tapealert`(1M) events, and other atypical system activity. For complete information on the MIB, see `/opt/SUNWsamfs/mibs/SUN-ASM-MIB.mib`.

The following sections describe how to enable and how to disable remote notification.

To Enable Remote Notification

1. Ensure that the management station is configured and known to be operating correctly.

   "Verifying the Network Management Station (Optional)" on page 21 describes this prerequisite.

2. Use `vi`(1) or another editor to examine file `/etc/hosts`.

   For example, Figure 33 shows an `/etc/hosts` file that defines a management station. In this example, the management station's hostname is `mgmtconsole`.

Figure 33. Example /etc/hosts File

```
999.9.9.9       localhost
999.999.9.999   loggerhost      loghost
999.999.9.998   mgmtconsole
999.999.9.9     samserver
```

   Examine the `/etc/hosts` file to ensure that the management station to which notifications should be sent is defined. If it is not defined, add a line that defines the appropriate host.

3. Save your changes to `/etc/hosts` and exit the file.

4. Use `vi`(1) or another editor to open file `/opt/SUNWsamfs/sbin/sendtrap`.

5. Locate the `TRAP_DESTINATION='hostname'` directive in `/opt/SUNWsamfs/sbin/sendtrap`.

   This line specifies that the remote notification messages be sent to port 161 of the server upon which the StorageTek QFS software is installed. Note the following:

   • If you want to change the hostname or/and port, replace the `TRAP_DESTINATION` directive line with `TRAP_DESTINATION="`*mgmt_console_name*`:`*port*`"`. Note the use of quotation marks (`"  "`) rather than apostrophes (`'  '`) in the new directive.

- If you want to send remote notification messages to multiple hosts, specify the directive in the following format:

```
TRAP_DESTINATION="mgmt_console_name:port [ mgmt_console_name:port]"
```

For example:

```
TRAP_DESTINATION="localhost:161 doodle:163 mgmt_station:1162"
```

6. Locate the `COMMUNITY="public"` directive in `/etc/opt/SUNWsamfs/sbin/sendtrap`.

   This line acts as a password. It prevents unauthorized viewing or use of SNMP trap messages. Examine this line and determine the following:

   - If your management station's community string is also set to `public`, you do not have to edit this value.

   - If your management station's community string is set to a value other than `public`, edit the directive and replace `public` with the value that is used in your management station.

7. Save your changes to `/etc/opt/SUNWsamfs/sbin/sendtrap` and exit the file.

To Disable Remote Notification

The remote notification facility is enabled by default. If you want to disable remote notification, perform this procedure.

1. Use the `cp`(1) command to copy file `/opt/SUNWsamfs/examples/defaults.conf` to `/etc/opt/SUNWsamfs/defaults.conf`. (Optional)

   Perform this step if file `/etc/opt/SUNWsamfs/defaults.conf` does not exist.

2. Use `vi`(1) or another editor to open file `/etc/opt/SUNWsamfs/defaults.conf`.

   Find the line in `defaults.conf` that specifies SNMP alerts. The line is as follows:

```
#alerts=on
```

3. Edit the line to disable SNMP alerts.

Remove the # symbol and change on to off. After editing, the line is as follows:

```
alerts=off
```

4. Save your changes to /etc/opt/SUNWsamfs/defaults.conf and exit the file.

5. Use the pkill(1M) command to send a SIGHUP signal to the sam-fsd(1M) daemon.

The format for this command is as follows:

```
# pkill -HUP sam-fsd
```

This command restarts the sam-fsd(1M) daemon and enables the daemon to recognize the changes in the defaults.conf file.

■ Adding the Administrator Group (Optional)

By default, only the superuser can execute StorageTek QFS administrator commands. However, during installation you can create an administrator group. Members of the administrator group can execute all administrator commands except for star(1M), samfsck(1M), samgrowfs(1M), sammkfs(1M), and samd(1M). The administrator commands are located in /opt/SUNWsamfs/sbin.

After installing the package, you can use the set_admin(1M) command to add or remove the administrator group. You must be logged in as superuser to use the set_admin(1M) command. You can also undo the effect of this selection and make the programs in /opt/SUNWsamfs/sbin executable only by the superuser. For more information on this command, see the set_admin(1M) man page.

To Add the Administrator Group

1. Choose an administrator group name or select a group that already exists within your environment.

2. Use the groupadd(1M) command, or edit the /etc/group file.

The following is an entry from the /etc/group file that designates an administrator group for the StorageTek QFS software. In this example, the samadm group consists of both the adm and operator users.

```
samadm::1999:adm,operator
```

■ Configuring System Logging

The StorageTek QFS system logs errors, cautions, warnings, and other messages using the standard Sun Solaris `syslog`(3) interface. By default, the StorageTek QFS facility is `local7`.

To Enable Logging

1. Use `vi`(1) or another editor to open the `/etc/syslog.conf` file.

    Read in the line from the following file:

    `/opt/SUNWsamfs/examples/syslog.conf_changes`

    The line is similar, if not identical, to the following line:

    ```
    local7.debug    /var/adm/sam-log
    ```

    Note: The preceding entry is all one line and has a TAB character (not a space) between the fields.

    This step assumes that you want to use `local7`, which is the default. If you set logging to something other than `local7` in the `/etc/syslog.conf` file, edit the `defaults.conf` file and reset it there, too. For more information, see the `defaults.conf`(4) man page.

2. Use commands to append the logging line from `/opt/SUNWsamfs/examples/syslog.conf_changes` to your `/etc/syslog.conf` file.

    Figure 34 shows the commands to use to append the logging lines.

Figure 34. Using cp(1) and cat(1) to Append Logging Lines to /etc/syslog.conf

```
# cp /etc/syslog.conf /etc/syslog.conf.orig
# cat /opt/SUNWsamfs/examples/syslog.conf_changes >> /etc/syslog.conf
```

3. Create an empty log file and send the `syslogd` process a HUP signal.

    Figure 35 shows the command sequence to create a log file in `/var/adm/sam-log` and send the HUP to the `syslogd` daemon.

Figure 35. Creating an Empty Log File and Sending a HUP Signal to syslogd

```
# touch /var/adm/sam-log
# pkill -HUP syslogd
```

For more information, see the `syslog.conf`(4) and `syslogd`(1M) man pages.

4. Use the `log_rotate.sh`(1M) command to enable log file rotation. (Optional)

Log files can become very large, and the `log_rotate.sh`(1M) command can help in managing log files. For more information, see the `log_rotate.sh`(1M) man page.

■ Configuring Other StorageTek Products (Optional)

The StorageTek QFS installation and configuration process is complete. You can configure other StorageTek QFS products at this time. For example, if you want to configure a StorageTek QFS shared file system, see the *StorageTek QFS and StorageTek ASM File System Administration Guide*.

StorageTek QFS Upgrade Procedure

4

This chapter describes upgrading a server to a new release of the StorageTek software. Use this procedure if you are upgrading your StorageTek QFS file system. You must perform all the tasks in this chapter as superuser.

The main tasks, which must be completed in order, are as follows:

- "Ensuring that the Installation Prerequisites are Met for the StorageTek QFS 4.1 Release" on page 77
- "Backing Up Existing File Systems (Optional)" on page 78
- "Unsharing the File Systems (Optional)" on page 811
- "Unmounting the File Systems" on page 82
- "Removing Existing StorageTek QFS Software" on page 83
- "Adding the Packages" on page 84
- "Updating the License Keys" on page 85
- "Enabling the ASM QFS Manager (Optional)" on page 86
- "Verifying the License and mcf Files" on page 86
- "Modifying the /etc/vfstab File (Optional)" on page 88
- "Reinitializing and Restoring the File Systems (Optional)" on page 88
- "Checking the File System (Optional)" on page 89
- "Mounting the File Systems" on page 90
- "Recompiling API-Dependent Applications (Optional)" on page 90

■ Ensuring that the Installation Prerequisites are Met for the StorageTek QFS 4.1 Release

The chapter called "System Requirements and Preinstallation Tasks" on page 1 describes the items you need to verify before you upgrade to the StorageTek QFS 4.1 release. If you have not yet completed the system verification steps, complete them now before you proceed. The steps

described in that chapter that pertain to verifying the system requirements for your upgrade to 4.1 are as follows:

- "Server Requirements" on page 2
- "Solaris Operating System Requirements" on page 2
- "Verifying Disk Space" on page 8
- "Obtaining a Software License Key" on page 16
- "Obtaining the Release Files" on page 17
- "Verifying Compatibilities" on page 19
- "Verifying Requirements for the ASM QFS Manager (Optional)" on page 20
- "Verifying the Network Management Station (Optional)" on page 21

■ Backing Up Existing File Systems (Optional)

Perform this procedure if you are currently using a version 1 superblock with either a QFS 3.5.0 system or a StorageTek QFS 4.0 system and you want to reinitialize your file systems with a version 2 superblock. In "Reinitializing and Restoring the File Systems (Optional)" on page 88, you reinitialize the file systems and restore your data.

Perform this task as a precautionary measure if you suspect that your current `qfsdump`(1M) file is incorrect or outdated.

The following sections explain the differences between these two superblocks and present the procedure for backing up your file systems:

- "Using the Version 1 and Version 2 Superblocks" on page 79
- "To Back Up Each File System" on page 80

Figure 36 on page 79 shows using the `samfsinfo`(1M) command to retrieve information about the `qfs2` file system. The second line of output indicates that this file system is using a version 2 superblock.

Figure 36. Using samfsinfo(1M)

```
# samfsinfo qfs2
samfsinfo: filesystem qfs2 is mounted.
name: qfs2         version:    2     shared
time:      Sun Sep 28 08:20:11 2003
count:    3
capacity:       05aa8000           DAU:         64
space:          0405ba00
meta capacity: 00b4bd20            meta DAU:    16
meta space:     00b054c0
ord  eq   capacity       space    device
  0  21   00b4bd20    00b054c0   /dev/md/dsk/d0
  1  22   02d54000    01f43d80   /dev/dsk/c9t50020F2300010D6Cd0s6
  2  23   02d54000    02117c80   /dev/dsk/c9t50020F2300010570d0s6
```

Using the Version 1 and Version 2 Superblocks

The StorageTek QFS 4.0 and 4.1 releases support both a version 1 superblock and a version 2 superblock. Only the version 2 superblock supports the following features:

- Access Control Lists (ACLs)

- StorageTek QFS shared file system

- md devices in StorageTek QFS or Storagetek ASM QFS (ma) file systems

- Dual-sized disk allocation units (DAUs) on mm devices

The StorageTek QFS 4.1 release supports both the version 1 and version 2 superblocks. You can use the sammkfs(1M) command to create a version 2 superblock, but you cannot initialize any file systems with version 1 superblocks. In addition, it is not possible to move files from a file system with a version 2 superblock back to a file system with a version 1 superblock.

After you reinitialize a file system, you can use the qfsrestore(1M) command to restore files to the new file system from the dump file created in this installation task.

The following paragraphs describe the effects of these superblocks when upgrading to the 4.1 StorageTek QFS file system:

- If you are upgrading from a QFS 3.5.0 system, note that the QFS 3.5.0 software supported the version 1 superblock only. If you are upgrading from the QFS 3.5.0 release to the StorageTek QFS 4.1 release, you must back up your file systems now if you want to reinitialize these file systems with a version 2 superblock.

- If you are upgrading from a StorageTek QFS 4.0 system, note that the StorageTek QFS 4.0 file system allowed you to initialize file systems with

either a version 1 or a version 2 superblock. If you want to reinitialize any of the file systems that have a version 1 superblock, and remake them with a version 2 superblock, back up these file systems now.

Note: The StorageTek QFS 4.1 software does not allow you to initialize a file system with a version 1 superblock. The StorageTek QFS 4.1 file system only allows you to initialize file systems with the version 2 superblock.

To Back Up Each File System

1. Become superuser from a console connection. (Optional)

   If you have not already logged in as `root`, do so now.

2. Use the `boot`(1M) command to boot the system in single-user mode.

   For example:

   ```
   # boot -s
   ```

3. Use the `mount`(1M) command to mount the StorageTek QFS file system.

   For example:

   ```
   # mount /qfs1
   ```

4. Use the `qfsdump`(1M) command to back up the file data and metadata of each StorageTek QFS file system.

   The `qfsdump`(1M) command dumps file names, inode information, and file data. The destination of the `qfsdump`(1M) output (generally a file) must be as large or larger than the StorageTek QFS file system you are backing up. The destination location must have enough space (disk or tape) to hold the amount of file data and metadata you are dumping. For more information on using the `qfsdump`(1M) command, see "Establishing Periodic Dumps Using qfsdump(1M)" on page 68 or see the `qfsdump`(1M) man page.

   Dump each file system to a location outside of the StorageTek QFS file system. For more information, see the `qfsdump`(1M) man page.

   For example, if you have a file system named `qfs1` (mounted at `/qfs1`) that you want to back up. Your choices are as follows:

a. You can write the qfsdump(1M) output to a tape device.

Figure 37 shows how to write to a tape in device /dev/rmt/1cbn.

Figure 37. Writing qfsdump(1M) Output to a Tape Device

```
# cd /qfs1
# qfsdump -f /dev/rmt/1cbn
```

b. You can write the qfsdump(1M) output to a file in a UFS file system

Figure 38 shows how to write to a file in a UFS file system.

Figure 38. Writing qfsdump(1M) Output to a File in the UFS File System

```
# cd /qfs1
# qfsdump -f /save/qfs/qfs1.bak
```

c. You can intialize a new StorageTek QFS file system, using a StorageTek QFS 4.1 or later release, and perform the qfsrestore(1M) directly into that new StorageTek QFS file system.

This alternative is applicable only if you already have the StorageTek QFS software installed and operational as a file system somewhere in your environment. Pursuing this alternative assumes that you want to use the features supported by the StorageTek QFS 4.1 release and the version 2 superblock.

For example, assume that you want to write the dump file into a second StorageTek QFS file system called qfs2 (mounted at /qfs2). Make sure that you initialized the qfs2 file system using StorageTek QFS 4.1 software. Figure 39 shows how to accomplish this using commands.

Figure 39. Writing qfsdump(1M) Output to a StorageTek QFS File System

```
# mount /qfs2
# cd /qfs1
# qfsdump -f - | (cd /qfs2; qfsrestore -f -)
```

5. Repeat these steps for each StorageTek QFS file system in your environment.

For more information on backing up your file systems, see the *ASM, ASM-QFS, and ASM/QFS-Standalone Disaster Recovery Guide*.

■ Unsharing the File Systems (Optional)

Perform this procedure if your StorageTek QFS file systems are NFS shared file systems.

To Unshare the File Systems

1. Use the `unshare`(1M) command on the StorageTek QFS file system.

    For example, the following command unshares the `qfs1` file system:

    ```
    # unshare /qfs1
    ```

■ Unmounting the File Systems

There are several ways to unmount a file system. Any of the following methods can accomplish this task. The easiest method is presented first. After the file system is unmounted, you can proceed to "Removing Existing StorageTek QFS Software" on page 83.

To Unmount Using the umount(1M) Command

1. Using the `umount`(1M) command, unmount each StorageTek QFS file system.

    If you are unmounting a file system from a Solaris 8 or 9 OS, you can use the `-f` option to the `umount`(1M) command. The `-f` option forces a file system to unmount.

To Unmount Using the fuser(1M), kill(1), and umount(1M) Commands

If `umount`(1M) is not successful, it might be because you or another user are using files or because you or another user have changed to directories in the file system.

1. Use the `fuser`(1M) command to determine whether or not any processes are still busy.

    For example, the following command queries the `qfs1` file system:

    ```
    # fuser -uc /qfs1
    ```

2. If any processes are still busy, use the `kill`(1M) command to terminate them.

3. Using the `umount`(1M) command, unmount each StorageTek QFS file system.

To Unmount by Editing the /etc/vfstab File and Rebooting

1. Edit the `/etc/vfstab` file.

   For all StorageTek QFS file systems, change the Mount at Boot field from `yes` or `delay` to `no`.

2. Reboot your system.

■ Removing Existing StorageTek QFS Software

The following section describes how to remove StorageTek QFS software from a release prior to 4.1.

To Remove Software From a 4.0 Release

1. Use the `pkginfo`(1) command to determine which StorageTek QFS software packages are installed on your system.

   For example:

   ```
   # pkginfo | grep qfs
   ```

2. Use the `pkgrm`(1M) command to remove the existing StorageTek QFS software.

   You must remove all existing StorageTek QFS packages before installing the new packages. If you are using any optional StorageTek QFS packages, you should make sure that you remove these packages before removing the main `SUNWqfs` package. The install script prompts you to confirm several of the removal steps.

   The following example command removes the `SUNWcqfs`, the `SUNWfqfs`, and the `SUNWjqfs` localized packages:

   ```
   # pkgrm SUNWcqfs SUNWfqfs SUNWjqfs SUNWqfs
   ```

   Note: The `SUNWqfs` package must be the last package removed. The 4.1 release does not include any localized software packages.

To Remove Software From a 3.5.0 Release

1. Use the `pkginfo`(1) command to determine which StorageTek QFS software packages are installed on your system.

   For example:

   ```
   # pkginfo | grep LSC
   ```

2. Use the `pkgrm`(1M) command to remove the existing StorageTek QFS software.

   You must remove all existing StorageTek QFS packages before installing the new packages. If you are using any optional StorageTek QFS packages, make sure that you remove these packages before removing the main `LSCqfs` package. The install script prompts you to confirm several of the removal steps.

   The following example command removes the `LSCdoc` package and the `LSCqfs` package:

   ```
   # pkgrm LSCdoc LSCqfs
   ```

   Note: The `LSCqfs` package must be the last package removed.

   Note: If you are upgrading from a StorageTek QFS release prior to the StorageTek QFS 4.0 release, you must remove both the `LSCdoc` and `LSCqfs` packages, in that order. When you install the new StorageTek QFS 4.1 package, you will install a `SUNWqfsr` and a `SUNWqfsu` package.

■ Adding the Packages

The StorageTek QFS software packages use the Sun Solaris packaging utilities for adding and deleting software. The `pkgadd`(1M) command prompts you to confirm various actions necessary to upgrade the StorageTek QFS package.

During the installation, the system detects the presence of conflicting files and prompts you to indicate whether or not you want to continue with the installation. You can go to another window and copy the files you want to save to an alternate location.

To Add the Packages

1. Use the cd(1) command to change to the directory where the software package release files reside.

   When you completed your preinstallation tasks, you obtained the release files as described in "Obtaining the Release Files" on page 17. Use the cd(1) command to change to the directory that contains the release files. Changing to the appropriate directory differs, depending on your release media, as follows:

   • If you downloaded the release files, change to the directory to which you downloaded the files.

   • If you obtained the release files from a CD-ROM, use one of the following commands:

     - If you are installing the software on a Solaris 2.8 platform, use the following command:

```
# cd /cdrom/cdrom0/2.8
```

     - If you are installing the software on a Solaris 2.9 platform, use the following command:

```
# cd /cdrom/cdrom0/2.9
```

2. Use the pkgadd(1M) command to upgrade the SUNWqfsr and SUNWqfsu packages.

   For example:

```
# pkgadd -d . SUNWqfsr SUNWqfsu
```

3. Enter yes or y as the answer to each of the questions.

■ Updating the License Keys

A license key is required to run the StorageTek QFS software. For information on license keys, see "Obtaining a Software License Key" on page 16.

The StorageTek QFS file system uses an encrypted license key. The license key consists of an encoded alphanumeric string.

To License the StorageTek QFS Software (Optional)

Perform this procedure if you are upgrading from the QFS 3.5.0 release.

You do not need to perform this procedure if you are upgrading from the StorageTek QFS 4.0 release. The system copies your 4.0 license to the correct location when the upgrade is complete.

1. Verify whether the license file exists.

   The license file is as follows:

   `/etc/opt/SUNWsamfs/LICENSE.4.1`

2. If the `/etc/opt/SUNWsamfs/LICENSE.4.1` file does not exist, create it.

3. Starting in column one, place the license key you have obtained from your ASP or from StorageTek on the first line in the `/etc/opt/SUNWsamfs/LICENSE.4.1` file.

   The key must start in column one. No other keywords, host IDs, comments, or other information can appear in the `/etc/opt/SUNWsamfs/LICENSE.4.1` file.

   The license keys allow the system to run indefinitely unless you were issued a temporary license. Use the `samcmd`(1M) `l` command to determine whether you were issued a temporary license.

■ Enabling the ASM QFS Manager (Optional)

Perform this step if you want to be able to use the StorageTek ASM QFS Manager.

The StorageTek ASM QFS Manager is an online interface to StorageTek QFS that enables you to configure many of the components in a StorageTek QFS environment. You can use this tool to control, monitor, configure, and reconfigure the environment's components.

For information on enabling the StorageTek ASM QFS Manager, see .

■ Verifying the License and mcf Files

The following files exist on your StorageTek QFS server:

- `/etc/opt/SUNWsamfs/LICENSE.4.1`
- `/etc/opt/SUNWsamfs/mcf`

The procedures in this task show you how to verify the correctness of these files.

To Verify the License File

1. Use the samd(1M) config to initialize the StorageTek QFS software.

   For example:

   ```
   # samd config
   ```

2. Enter the samcmd(1M) l (lowercase L) command to verify the license file.

   The samcmd(1M) output includes information on features that are enabled. If the output you receive is not similar to that shown in Figure 40, return to "Updating the License Keys" on page 85.

Figure 40. Using samcmd(1M)

```
# samcmd l

License information samcmd    4.1    Fri Feb 27 16:24:12 2004

hostid = xxxxxxx

License never expires

Fast file system feature enabled

QFS stand alone feature enabled

Shared filesystem support enabled

SAN API support enabled
```

To Verify the mcf File

• Enter the sam-fsd(1M) command to verify the mcf file.

   Examine the output for errors, as follows:

   - If your mcf file is free from syntax errors, the sam-fsd(1M) output is similar to that shown in Figure 41. It contains information about the file systems and other system information.

Figure 41. sam-fsd(1M) Output Showing No Errors

```
# sam-fsd
Trace file controls:
sam-amld      off

sam-archiverd off

sam-catserverd off

sam-fsd       off
```

Figure 41. sam-fsd(1M) Output Showing No Errors (Continued)

```
sam-rftd       off

sam-recycler   off

sam-sharefsd   off

sam-stagerd    off

sam-serverd    off

sam-clientd    off

sam-mgmt       off

License: License never expires.
```

- If your `mcf` file contains syntax or other errors, however, it notes the errors in its output.

    If your `mcf` file has errors, refer to "Defining the StorageTek QFS Configuration by Creating the mcf File" on page 46 and to the `mcf`(4) man page for information on how to create this file correctly.

Note: If you change the `mcf` file after the StorageTek QFS file system is in use, you must convey the new `mcf` specifications to the StorageTek QFS software. For information on propagating `mcf` file changes to the system, see the *StorageTek QFS and StorageTek ASM File System Administration Guide*.

■ Modifying the /etc/vfstab File (Optional)

Perform this task if you modified the `/etc/vfstab` file in "Unmounting the File Systems" on page 82.

To Modify the /etc/vfstab File

- Edit this file again, and change the Mount at Boot field for all StorageTek QFS file systems from `no` to `yes` or `delay`.

■ Reinitializing and Restoring the File Systems (Optional)

In this task, you reinitialize your file systems and restore the saved data into the new file systems. This task completes the process initiated in "Backing Up Existing File Systems (Optional)" on page 78. To accomplish this, use the `sammkfs`(1M) and `qfsrestore`(1M) commands on each file system.

Note: The StorageTek QFS 4.1 software does not allow you to initialize a file system with a version 1 superblock. The StorageTek QFS 4.1 file

system only allows file systems to be initialized with the version 2 superblock. If you are upgrading from 3.5.0, or if you are upgrading from 4.0 using version 1 superblocks, be aware that issuing a 4.1 sammkfs(1M) command at this point reinitializes your file system with a version 2 superblock.

To Reinitialize and Restore the File Systems

1. Use the samfsinfo(1M) command to retrieve information on the file system.

   You can examine the output from the samfsinfo(1M) command to determine the DAU size specified on the sammkfs(1M) command when the file system was created. The DAU size is in the samfsinfo(1M) output. Use this DAU size again when you perform Step 2.

2. Use the sammkfs(1M) command to initialize a new StorageTek QFS file system.

   The following example sammkfs(1M) command reinitializes a file system named qfs1 with StorageTek QFS 4.1 feature capabilities:

   ```
   # sammkfs qfs1
   ```

   For more information on the options to the sammkfs(1M) command, see the sammkfs(1M) man page.

3. Use the qfsrestore(1M) command to restore the dumped data into the new file system.

   For example, the commands in Figure 42 assume that you have a file system named qfs1 (mounted at /qfs1) that you want to back up from files dumped to qfs1.bak, which exists outside of the StorageTek QFS file system:

Figure 42. Using qfsrestore(1M) to Restore Files into the New File System

```
# cd /qfs1
# qfsrestore -f /save/qfs/qfs1.bak
```

■ Checking the File System (Optional)

Perform this task if you did not perform .

- Use the samfsck(1M) command to check your existing file systems for inconsistancies.

  Do this for each StorageTek QFS file system.

■ Mounting the File Systems

Use the `mount`(1M) command to mount your StorageTek QFS file system.

To Mount the File System

1. Use the `mount`(1M) command to mount the file systems.

   In the following example, `qfs1` is the name of the file system to be mounted:

   ```
   # mount qfs1
   ```

■ Recompiling API-Dependent Applications (Optional)

If you are running applications that use the StorageTek QFS application programming interface (API), you need to complete this task.

Because file headers, the calling sequence, and other elements of the API can change from release to release, you should recompile all applications that depend on the API at this time.

CAUTION: Failure to recompile API-dependent applications at this point can cause your applications to generate unexpected results.

StorageTek ASM Initial Installation Procedure

<div style="text-align: right">**5**</div>

This chapter describes the procedure for installing and configuring the StorageTek ASM software for the first time. Use this procedure if this is the initial installation of the StorageTek ASM software package at your site.

If you are upgrading StorageTek ASM software on an existing server, see "StorageTek ASM Upgrade Procedure" in Chapter 6.

The procedures in this chapter describe copying and installing the software packages onto your server and configuring the software to match the hardware at your site. You must have superuser (root) access to perform most of the tasks described in this chapter.

You can install and configure your StorageTek ASM file system entirely using Solaris commands, or you can use a combination of commands and StorageTek ASM QFS Manager, which is a graphical user interface (GUI) configuration tool, to complete the procedure. "Enabling the StorageTek ASM QFS Manager (Optional)" on page 107 describes enabling the tool and shows the configuration steps you can perform by using the tool.

For most of the procedures in this chapter, you must have `root` access.

■ Ensuring that the Installation Prerequisites are Met

The chapter called "System Requirements and Preinstallation Tasks" on page 1 describes the items you need to verify before you install and configure the StorageTek ASM software. If you have not yet completed the system verification steps, complete them now before you proceed. The steps described in that chapter for verifying the system requirements and performing preinstallation tasks are as follows:

- "Server Requirements" on page 2
- "Solaris Operating System Requirements" on page 2
- "Planning Your File System and Verifying Disk Cache" on page 3
- "Verifying Disk Space" on page 8
- "Verifying Removable Media Devices (Optional)" on page 9
- "Obtaining a Software License Key" on page 16

- "Obtaining the Release Files" on page 17
- "Verifying Compatibilities" on page 19
- "Verifying Requirements for the ASM QFS Manager (Optional)" on page 20
- "Verifying the Network Management Station (Optional)" on page 21

■ Adding the Packages on the StorageTek ASM Server

The StorageTek ASM software uses the Sun Solaris packaging utilities for adding and deleting software. The `pkgadd`(1M) utility prompts you to confirm various actions necessary to install the packages.

To Add the Packages

1. Become superuser.

2. Use the `cd`(1) command to change to the directory where the software package release files reside.

   When you completed your preinstallation tasks, you obtained the release files as described in "Obtaining the Release Files" on page 17. Use the `cd`(1) command to change to the directory that contains the release files. Changing to the appropriate directory differs, depending on your release media, as follows:

   - If you downloaded the release files, change to the directory to which you downloaded the files.

   - If you obtained the release files from a CD-ROM, use one of the following commands:

     - If you are installing the software on a Solaris 2.8 platform, use the following command:

     ```
     # cd /cdrom/cdrom0/2.8
     ```

     - If you are installing the software on a Solaris 2.9 platform, use the following command:

     ```
     # cd /cdrom/cdrom0/2.9
     ```

3. Use the `pkgadd`(1M) command to add the `SUNWsamfsr` and `SUNWsamfsu` packages.

For example:

```
# pkgadd -d . SUNWsamfsr SUNWsamfsu
```

4. Enter `yes` or `y` as the answer to each of the questions.

When you install `SUNWsamfsr` and `SUNWsamfsu`, you are asked if you want to define an administrator group. Select `y` to accept the default (no administrator group) or select `n` if you want to define an administrator group. You can also reset permissions on certain commands later by using the `set_admin`(1M) command. For more information on this command, see the `set_admin`(1M) man page.

5. Examine `/tmp/ASM_install.log`.

File `/tmp/ASM_install.log` is the StorageTek ASM log file.

This file should show that the `pkgadd`(1M) command added the `SUNWsamfsr` and `SUNWsamfsu` software packages. Make sure that it also installed the StorageTek ASM `samst` driver. If all files installed properly, the following message appears:

```
Restarting the sysevent daemon
```

◼ Verifying and Updating the st.conf and samst.conf Files (Optional)

Perform this procedure if you plan to enable archiving to tape or magneto-optical media. You do not need to perform this procedure if you plan to archive to disk.

This task introduces you to the the process of verifying, and perhaps updating, the following two files:

- The `/kernel/drv/st.conf` file, which lists configuration information for tape drives attached to the server through a SCSI or Fibre Channel attachment.

- The `/kernel/drv/samst.conf` file, which lists configuration information for the following devices that the StorageTek ASM software recognizes by default:

  - Direct-attached automated libraries.

  - Magneto-optical drives attached to the server through a SCSI or Fibre Channel attachment.

The StorageTek ASM package includes the `/opt/SUNWsamfs/examples/st.conf_changes` file. This file includes configuration information for the following kinds of tape drives:

- Tape drives that are not supported in the Solaris kernel by default.

- Tape drives that are supported in the Solaris kernel but are supported with settings that do not accommodate StorageTek ASM software.

This task includes the following procedures:

- "To Verify Device Types" on page 94

- "To Add Tape Devices to the /kernel/drv/st.conf File (Optional)" on page 95

- "To Verify or Add a Target Device, LUN, or World Wide Name to the st.conf File" on page 99

- "To Verify or Add Device Support in the samst.conf File (Optional)" on page 101

- "To Verify that all Devices are Configured" on page 103

To Verify Device Types

1. Obtain the list of devices that you created when you completed the step called "To Create a List of Devices" on page 13.

   "To Create a List of Devices" on page 13 is a procedure in which you enumerate the devices you want to include in your StorageTek ASM environment. If you have not already taken an inventory of your devices and listed them in Table 2 on page 14, do so now. For the rest of the procedures in this installation, this manual refers to Table 2 as your inventory list.

   The procedures in this task include an example that assumes your inventory list is as shown in Table 15.

Table 15. An Example Inventory List - Devices to be Configured

Device Name, Manufacturer, and Model	Target ID	LUN	World-Wide Node Name
SCSI-Attached Tape Drives			
QUANTUM DLT7000	1	0	Not applicable
QUANTUM DLT7000	2	0	Not applicable
Fibre Channel-Attached Tape Drives			
STK 9840	Not Applicable	0	500104f00043abfc
STK 9840	Not Applicable	0	500104f00045eeaf
IBM ULT3580-TD1	Not Applicable	0	500104f000416304

Table 15. An Example Inventory List - Devices to be Configured

Device Name, Manufacturer, and Model	Target ID	LUN	World-Wide Node Name
IBM ULT3580-TD1	Not Applicable	0	500104f000416303
SCSI-Attached Automated Libraries			
STK 9730	0	0	Not applicable
STK L700	Not applicable	0	500104f00041182b

Note: The device names in Table 15 are represented as they appear in the discovery output.

2. Proceed on to the next step in this installation and configuration procedure.

    Depending on the devices on your inventory list, you need to complete one or more of the following procedures:

    •   If there are any tape drives that you want to include in your StorageTek ASM environment, go to "To Add Tape Devices to the /kernel/drv/ st.conf File (Optional)" on page 95.

    •   If there are any magneto-optical drives, SCSI-attached automated libraries, or Fibre Channel-attached automated libraries that you want to include in your StorageTek ASM environment, go to "To Verify or Add Device Support in the samst.conf File (Optional)" on page 101.

To Add Tape Devices to the /kernel/drv/st.conf File (Optional)

Perform this pocedure if you have tape drives that you want to include in your StorageTek ASM environment.

In this procedure, you make entries for each unique tape drive type that you want to include in your StorageTek ASM environment. For each unique tape drive that is on your inventory list, there must be a corresponding entry in the `st.conf` file.

1. Use the `cp`(1) command to copy `/kernel/drv/st.conf` to a backup file.

    For example:

```
# cp /kernel/drv/st.conf /kernel/drv/st.conf.orig
```

2. Use `vi`(1) or another editor to open file `/kernel/drv/st.conf`.

3. Find the line that contains the `tape-config-list` string.

   This line is as follows:

   ```
   #tape-config-list=
   ```

Remove the pound character (#) from column 1 of this line.

4. Use `vi`(1) or another editor to open file
   `/opt/SUNWsamfs/examples/st.conf_changes.`

5. Search file `/opt/SUNWsamfs/examples/st.conf_changes` to find
   the first device on your inventory list.

   In the example inventory list, the first drive you need to find is the Quantum
   DLT 7000 tape drive. Find the line that contains the following entry:

   ```
   "QUANTUM DLT7000", "DLT 7000 tape drive", "dlt7-tape",
   ```

   This is the device definition for the Quantum DLT 7000 tape drive.

6. Copy the line containing the device definition you need from
   `st.conf_changes` to `st.conf` so it appears after the `tape-config-list` line.

   Figure 43 shows how the `st.conf` file looks at this point.

Figure 43. st.conf With Its First Device Definition Entry

```
...
tape-config-list=
"QUANTUM DLT7000", "DLT 7000 tape drive", "dlt7-tape",
...
```

7. Examine the line you just copied and note the final string enclosed in
   quotation marks.

   In this example, the final string is "`dlt7-tape`".

8. Search file `/opt/SUNWsamfs/examples/st.conf_changes` to find
   another line that begins with the final string you noted in Step 7.

   The line you are looking for is called the tape configuration value.

   In this example, it is as follows:

   ```
   dlt7-tape =    1,0x36,0,0xd679,4,0x82,0x83,0x84,0x85,3;
   ```

9. Copy the tape configuration line from Step 8 to file `st.conf`.

   Put the device configuration line *after* the device definition line you copied
   in from Step 6.

For this example, Figure 44 shows the lines now contained in the
`st.conf` file.

Figure 44. st.conf With a Device Entry and the Device Entry's Tape Configuration Value

```
...
tape-config-list=
"QUANTUM DLT7000", "DLT 7000 tape drive", "dlt7-tape",
dlt7-tape =    1,0x36,0,0xd679,4,0x82,0x83,0x84,0x85,3;
...
```

10. Decide whether you want to configure more devices in the `st.conf` file.

    If this is the last or only device you want to configure, proceed to Step 17.

    If you have more devices to configure, proceed to Step 11.

11. Search file `/opt/SUNWsamfs/examples/st.conf_changes` to find the next device on your inventory list.

    In our example inventory list, the next drive you need to find is the StorageTek 9840 tape drive. Find a line that contains the following entry:

```
"STK     9840", "STK 9840 Fast Access", "CLASS_9840",
```

    This is the device definition for the StorageTek 9840 tape drive.

12. Copy the line containing the device definition you need from `st.conf_changes` to `st.conf` so it appears after preceding device definition line.

    Figure 45 shows how the `st.conf` file looks at this point.

Figure 45. st.conf with Another Device Definition Entry

```
...
tape-config-list=
"QUANTUM DLT7000", "DLT 7000 tape drive", "dlt7-tape",
"STK     9840", "STK 9840 Fast Access", "CLASS_9840",
...
```

13. Examine the line you just copied and note the final string enclosed in quotation marks.

    In this example, the final string is "`CLASS_9840`".

14. Search file `/opt/SUNWsamfs/examples/st.conf_changes` to find another line that begins with the final string you noted in Step 13.

    The line you are looking for is called the tape configuration value.

In this example, it is as follows:

```
CLASS_9840 = 1,0x36,0,0x1d679,1,0x00,0;
```

15. Copy the tape configuration line from Step 14 to file `st.conf`.

    Put the device configuration line *after* the device configuration line you copied in from Step 9.

    For this example, Figure 46 shows the tape drive configuration lines now contained in the `st.conf` file.

Figure 46. st.conf With a Device Entry and the Device Entry's Tape Configuration Value

```
...
tape-config-list=
"QUANTUM DLT7000", "DLT 7000 tape drive", "dlt7-tape",
"STK     9840", "STK 9840 Fast Access", "CLASS_9840",
dlt7-tape =    1,0x36,0,0xd679,4,0x82,0x83,0x84,0x85,3;
CLASS_9840 = 1,0x36,0,0x1d679,1,0x00,0;
...
```

16. Decide whether you want to configure more devices in the `st.conf` file.

    If you have more devices to configure, go back to Step 11.

    If this is the last device you want to configure, proceed to Step 17.

    For example, Figure 47 shows the `st.conf` file after you have added definitions for the Quantum DLT 7000, the StorageTek 9840, and the IBM ULT3580 tape drives.

Figure 47. st.conf Configured for Multiple Devices (Intermediate Format)

```
...
tape-config-list=
"QUANTUM DLT7000", "DLT 7000 tape drive", "dlt7-tape",
"STK     9840", "STK 9840 Fast Access", "CLASS_9840",
"IBM     ULT3580-TD1",  "IBM 3580 Ultrium",     "CLASS_3580",
dlt7-tape =    1,0x36,0,0xd679,4,0x82,0x83,0x84,0x85,3;
CLASS_9840 = 1,0x36,0,0x1d679,1,0x00,0;
CLASS_3580 = 1,0x24,0,0x418679,2,0x00,0x01,0;
...
```

17. Replace the comma (`,`) at the end of the last device definition line with a semicolon (`;`).

Figure 48 shows the resulting `st.conf` file if you have multiple devices configured.

Figure 48. st.conf Configured for Multiple Devices (Final Format)

```
...
tape-config-list=
"QUANTUM DLT7000", "DLT 7000 tape drive", "dlt7-tape",
"STK     9840", "STK 9840 Fast Access", "CLASS_9840",
"IBM     ULT3580-TD1", "IBM 3580 Ultrium",    "CLASS_3580";
dlt7-tape =   1,0x36,0,0xd679,4,0x82,0x83,0x84,0x85,3;
CLASS_9840 = 1,0x36,0,0x1d679,1,0x00,0;
CLASS_3580 = 1,0x24,0,0x418679,2,0x00,0x01,0;
...
```

Note: Some device configuration lines in `st.conf_changes` support more than one device definition, but you need only one device definition line in the `st.conf` file for such devices. For example, the Sony SDT-5000 and the Sony SDT-5200 both have "`DAT`" as the final string in their device definition lines. If your environment is to include both of these Sony devices, only one instance of the `DAT = 1,0x34,0,0x0439,1,0x00,0;` device definition needs to appear in the `st.conf` file.

Save your changes and proceed to "To Verify or Add a Target Device, LUN, or World Wide Name to the st.conf File".

You do not need to close out of the `st.conf` file at this point because you continue editing `st.conf` in the next procedure. It is a good idea to save your changes, however.

To Verify or Add a Target Device, LUN, or World Wide Name to the st.conf File

Perform this procedure if you have tape drives that you want to include in your StorageTek ASM environment. You typically perform this procedure after you have completed "To Add Tape Devices to the /kernel/drv/st.conf File (Optional)" on page 95.

For each tape drive on your hardware inventory list that is attached through a SCSI interface, you must confirm that an entry in the `st.conf` file defines that interface. This procedure shows how to verify and, if necessary, add target ID and LUN entries. Do not use this procedure to add interface information for magneto-optical drives.

1. Use `vi`(1) or another editor to open file `/kernel/drv/st.conf`. (Optional)

    If you left the file open for editing from the previous procedure ("To Add Tape Devices to the /kernel/drv/st.conf File (Optional)" on page 95), you do not need to perform this step.

2. Find the list of SCSI target IDs and LUNs in the `st.conf` file. (Optional)

   Perform this step only if you have tape drives you want to include that are attached through a SCSI interface.

   In the `st.conf` file, look for entries that have the following format:

   ```
   name="st" class="scsi" target=target lun=lun;
   ```

   target is the target ID for each SCSI drive found. *lun* is the corresponding LUN for each SCSI drive found.

3. In the list of SCSI targets and LUNs, find the entry that corresponds to a SCSI target and LUN that are on your inventory list.

   For example, the two Quantum DLT 7000 drives are attached to LUN 0 and have target IDs 1 and 2. Figure 49 shows the two lines that correspond to those interfaces.

Figure 49. Example SCSI Target ID and LUN Information

```
name="st" class="scsi" target=1 lun=0;
name="st" class="scsi" target=2 lun=0;
```

   Note that the preceding two lines might extend over two lines in `st.conf` if they contain return characters.

   If you cannot find the SCSI target and LUN you need, proceed to Step 5.

4. Ensure that the lines identified in Step 3 are not preceded by pound (#) characters.

   A pound (#) character marks a line as a comment. If the SCSI target and LUN lines you need have a pound character in column one, delete the pound character. Proceed to Step 6.

5. Create a line for the SCSI target and LUN that you need. (Optional)

   Perform this step if the SCSI target and LUN line you need is not already listed in `st.conf`.

   Use the format shown in Step 2 as a model for the line you add.

6. Decide whether you need to configure more SCSI targets and LUNs in `st.conf`.

   If you have more SCSI targets and LUNs to configure, go back to Step 3.

   If you do not have more SCSI targets and LUNs to configure, proceed to Step 7.

7. Create lines for each device attached through a Fibre Channel interface. (Optional)

Perform this step only if you have tape drives attached through a Fibre Channel interface in your inventory list and you are not using the Sun SAN Foundation Software I/O stack.

Fibre Channel interfaces are not included in the `st.conf` file by default. At the end of the SCSI target ID and LUN list, create a line for each Fibre Channel interface. Use the following format for the Fibre Channel interface definition lines:

```
name="st" parent="fp" lun=lun fc-port-wwn="world-wide-name"
```

For *lun*, specify the LUN for the drive.

For *world-wide-name*, specify the World Wide Name for drive.

For example, Figure 50 shows the lines to add to support the StorageTek 9840 and IBM ULT3580 tape drives included in the inventory list that are attached through Fibre Channel interfaces.

Figure 50. Fibre Channel Interface Definition Lines for the st.conf File

```
name="st" parent="fp" lun=0 fc-port-wwn="500104f00043abfc"
name="st" parent="fp" lun=0 fc-port-wwn="500104f00045eeaf"
name="st" parent="fp" lun=0 fc-port-wwn="500104f000416304"
name="st" parent="fp" lun=0 fc-port-wwn="500104f000416303"
```

8. Save your changes and exit the `st.conf` file.

    Proceed to "To Verify or Add Device Support in the samst.conf File (Optional)" on page 101 if you have any of the following devices in your inventory list:

    *   Magneto-optical drives

    *   Automated libraries attached through a SCSI or a Fibre Channel interface.

To Verify or Add Device Support in the samst.conf File (Optional)

Perform this step if you have magneto-optical drives or if you have automated libraries attached through a SCSI or a Fibre Channel interface. You do not need to perform this step if you have only network-attached automated libraries.

The `/kernel/drv/samst.conf` file contains a list of SCSI and Fibre Channel entries. This procedure shows you how to verify entries for your devices and to update the file if necessary. The `samst.conf` file works with the `/opt/SUNWsamfs/examples/inquiry.conf` file to define the devices that can be included in a StorageTek ASM environment. The

inquiry.conf file lists all devices that are supported, so you do not need to verify or edit that file.

1. Use the cp(1) command to copy the /kernel/drv/samst.conf file to a backup file.

   For example:

   ```
   # cp /kernel/drv/samst.conf /kernel/drv/samst.conf.orig
   ```

2. Use vi(1) or another editor to open the /kernel/drv/samst.conf file.

3. Find the list of SCSI targets and LUNs in the samst.conf file. (Optional)

   Perform this step only if you have SCSI-attached magneto-optical drives or SCSI-attached libraries that you want to include.

   In the samst.conf file, the entries you are looking for have the following format:

   ```
   name="samst" class="scsi" target=target lun=lun;
   ```

   target is the target ID for each SCSI drive found. *lun* is the corresponding LUN for each SCSI drive found.

4. In the list of SCSI targets and LUNs, find the entry that corresponds to a SCSI target ID and LUN that are on your inventory list.

   For example, the StorageTek 9730 automated library is attached to target 0 and LUN 0. The following line corresponds to that interface:

   ```
   name="samst" class="scsi" target=0 lun=0;
   ```

   Note that the preceding line might extend over two lines in st.conf if it contains return characters.

   If you cannot find the SCSI target and LUN you need, proceed to Step 6.

5. Ensure that the lines identified in Step 3 are not preceded by pound (#) characters.

   A pound (#) character marks a line as a comment. If the SCSI target and LUN lines you need have a pound character in column one, delete the pound character. Proceed to Step 7.

6. Create a line for the SCSI target and LUN that you need. (Optional)

   Perform this step if the SCSI target and LUN line you need is not already listed in samst.conf.

   Use the format shown in Step 3 as a model for the line you add.

7. Decide whether you need to configure more SCSI targets and LUNs in `samst.conf`.

   If you have more SCSI targets and LUNs to configure, go back to Step 4.

   If you do not have more SCSI targets and LUNs to configure, proceed to Step 8.

8. Create lines for the first device in your inventory list that is attached through a Fibre Channel interface. (Optional)

   Perform this step only if you have Fibre Channel-attached magneto-optical drives or Fibre Channel-attached automated libraries that you want to include.

   Fibre Channel interfaces are not included in the `samst.conf` file by default. At the end of the SCSI target and LUN list, create a line for each Fibre Channel interface. Use the following format for the Fibre Channel interface definition lines:

   ```
   name="samst" parent="fp" lun=lun fc-port-wwn="world-wide-name"
   ```

   For *lun*, specify the LUN for the drive.

   For *world-wide-name*, specify the World Wide Name for drive.

   The following example shows the line to add to support the StorageTek L700 tape drive on the example inventory list that is attached through a Fibre Channel interface:

   ```
   name="samst" parent="fp" lun=0 fc-port-wwn="500104f00041182b"
   ```

9. Repeat Step 8 for each device that is attached through a Fibre Channel interface. (Optional)

10. Save your changes and exit the `samst.conf` file.

To Verify that all Devices are Configured

1. Issue a `cfgadm`(1M) command to verify the devices included in the StorageTek ASM environment.

   For example:

Figure 51. Output From cfgadm(1M)

```
# cfgadm -al
Ap_Id                          Type         Receptacle   Occupant     Condition
c0                             scsi-bus     connected    configured   unknown
c0::dsk/c0t6d0                 CD-ROM       connected    configured   unknown
c1                             fc-private   connected    configured   unknown
c1::500000e0103c3a91           disk         connected    configured   unknown
```

Figure 51. Output From cfgadm(1M) (Continued)

```
c2                              scsi-bus    connected    unconfigured unknown
c3                              scsi-bus    connected    unconfigured unknown
c4                              scsi-bus    connected    configured   unknown
c4::dsk/c4t1d0                  disk        connected    configured   unknown
c4::dsk/c4t2d0                  disk        connected    configured   unknown
c5                              fc-fabric   connected    configured   unknown
c5::100000e00222ba0b            disk        connected    unconfigured unknown
c5::210000e08b0462e6            unknown     connected    unconfigured unknown
c5::210100e08b2466e6            unknown     connected    unconfigured unknown
c5::210100e08b27234f            unknown     connected    unconfigured unknown
c5::500104f00043abfc            tape        connected    configured   unknown
c5::500104f00043bc94            tape        connected    configured   unknown
c5::500104f00045eeaf            tape        connected    configured   unknown
c5::500104f000466943            tape        connected    configured   unknown
c5::500104f00046b3d4            tape        connected    configured   unknown
c5::500104f0004738eb            tape        connected    configured   unknown
c6                              fc          connected    unconfigured unknown
c7                              scsi-bus    connected    unconfigured unknown
c8                              scsi-bus    connected    unconfigured unknown
usb0/1                          usb-kbd     connected    configured   ok
usb0/2                          usb-mouse   connected    configured   ok
usb0/3                          unknown     empty        unconfigured ok
usb0/4                          unknown     empty        unconfigured ok
```

Examine the output to make sure that it shows all the devices you want to configure in your StorageTek ASM environment. If a device is not shown as being configured, and it should be, you can use the cfgadm(1M) command to configure it. For more information, see the cfgadm(1M) man page.

Because of a bug in the cfgadm(1) command, you might receive a device busy error similar to that shown in Figure 52.

Figure 52. cfgadm(1M) Output Showing a Device Busy Error that can be Ignored

```
# cfgadm -c configure -o force_update c4::500104f000489fe3
cfgadm: Library error: failed to create device node: 500104f00043abfc: Device
busy
```

Despite the error, the cfgadm(1M) command completely processes the request.

Handling Errors in the st.conf File

Errors can occur if the st.conf file is not configured properly during StorageTek ASM software installation. The following example shows typical error messages and provides suggestions for problem resolution.

The following message is found in the sam-log file:

```
May 18 12:38:18 baggins genu-30[374]: Tape device 31 is default
type. Update '/kernel/drv/st.conf'.
```

Figure 53 shows the device log messages that correspond to the `sam-log` message.

Figure 53. Error Messages in the Device Log File

```
1999/05/18 12:34:27*0000 Initialized. tp
1999/05/18 12:34:28*1002 Device is QUANTUM , DLT7000
1999/05/18 12:34:28*1003 Serial CX901S4929, rev 2150
1999/05/18 12:34:28*1005 Known as Linear Tape(lt)
1999/05/18 12:34:32 0000 Attached to process 374
1999/05/18 12:38:18 1006 Slot 1
1999/05/18 12:38:18 3117 Error: Device is type default. Update /kernel/drv/
st.conf
```

The preceding messages indicate that the appropriate changes have not been made to `/kernel/drv/st.conf`.

■ Enabling the StorageTek ASM Software License

You need a license key to run the StorageTek ASM software. For information on obtaining license keys, see "Obtaining a Software License Key" on page 16.

The StorageTek ASM environments use encrypted license keys. The license keys consist of encoded alphanumeric strings. You receive one or more license keys depending on the system configuration and the products being licensed.

To License the StorageTek ASM Software

1. Create the `/etc/opt/SUNWsamfs/LICENSE.4.1` file.

2. Starting in column one, place the license keys you have obtained from your ASP or from StorageTek on the first line and on successive lines in the `/etc/opt/SUNWsamfs/LICENSE.4.1` file.

   The key must start in column one. No other keywords, host IDs, comments, or other information can appear in the `/etc/opt/SUNWsamfs/LICENSE.4.1` file.

■ Setting Up PATH and MANPATH Variables

To Set Up PATH and MANPATH Variables

1. For users who need to access the StorageTek ASM user commands (for example, `sls`(1)), add `/opt/SUNWsamfs/bin` to the users' `PATH` variables.

2. For users, such as superusers, who need to access the administrator commands, add `/opt/SUNWsamfs/sbin` to the `PATH` variable.

3. For users who need to access the StorageTek ASM man pages, add `/opt/SUNWsamfs/man` to the `MANPATH` variable.

4. Use `vi`(1) or another editor to edit your system setup files to include the correct paths to commands and man pages.

   a. In the Bourne or Korn shells, edit the `.profile` file, change the `PATH` and `MANPATH` variables, and export the variables.

      Figure 54 shows how your `.profile` file might look after editing.

Figure 54. Finished .profile File

```
PATH=$PATH:/opt/SUNWsamfs/bin:/opt/SUNWsamfs/sbin
MANPATH=$MANPATH:/opt/SUNWsamfs/man
export PATH MANPATH
```

   b. In the C shell, edit the `.login` and `.cshrc` files.

      When you are finished editing, the `path` statement in your `.cshrc` file might look like the following line:

```
set path = ($path /opt/SUNWsamfs/bin /opt/SUNWsamfs/sbin)
```

      Figure 55 shows how the `MANPATH` in your .login file might look like after editing.

Figure 55. Finished MANPATH in the .login File

```
setenv MANPATH /usr/local/man:opt/SUNWspro/man:/$OPENWINHOME/\
share/man:/usr/share/man:/opt/SUNWsamfs/man
```

■ Rebooting the System

Note: Failure to reboot the system at this time can cause the `st` and `samst` modules to remain unconfigured.

To Reboot the System

1. Reboot the server by issuing the touch(1) and init(1M) commands.

   Figure 56 shows the commands to use to reboot.

Figure 56. Commands to Reboot the Server

```
# touch /reconfigure
# init 6
```

   Changes to the `st.conf,` `samst.conf,` and the `/etc/name_to_sysnum` files are enabled at this time.

■ Enabling the StorageTek ASM QFS Manager (Optional)

Perform this step if you want to be able to use the StorageTek ASM QFS Manager to configure, control, monitor, or reconfigure your StorageTek ASM environment.

The procedures in this section are as follows:

- "To Install the StorageTek ASM QFS Manager Software" on page 107.

- "To Invoke the StorageTek ASM QFS Manager for the First Time" on page 109. Use this procedure to invoke the StorageTek ASM QFS Manager software.

- "To Use the StorageTek ASM QFS Manager for Configuration" on page 110. Use this procedure to decide which configuration tasks you want to perform using the StorageTek ASM QFS Manager software.

In addition to the information in this section, this manual's appendix, Appendix A, "ASM QFS Manager Software Notes", describes other aspects of using the StorageTek ASM QFS Manager.

To Install the StorageTek ASM QFS Manager Software

1. Ensure that you have met the installation requirements described in "Verifying Requirements for the ASM QFS Manager (Optional)" on page 20.

2. Log in to the server that you want to use as the management station.

   This can be the same server upon which you installed the SUNWsamfsr and SUNWsamfsu packages.

3. Become superuser.

4. Use the cd(1) command to change to the directory where the software package release files reside on your server.

   When you completed your preinstallation tasks, you obtained the release files as described in "Obtaining the Release Files" on page 17. Use the cd(1) command to change to the directory that contains the release files.

   For example, if you obtained the release files from a CD-ROM, use the following command:

   ```
   # cd /cdrom/cdrom0
   ```

   If you downloaded the release files, change to the directory to which you downloaded the files.

5. Execute the samqfsmgr_setup script to install the StorageTek ASM QFS Manager software.

   For example:

   ```
   # samqfsmgr_setup
   ```

6. Answer the questions as prompted by the samqfsmgr_setup script.

   During the installation procedure, you are asked to answer questions about your environment. The script prompts you to enter passwords for the SAMadmin role and for the samadmin and samuser login IDs.

   The samqfsmgr_setup script automatically installs the following:

   • The TomCat, Java Runtime Environment (JRE), JATO, and Sun Web Console packages. If you have existing versions of these software packages that are not compatible with StorageTek ASM QFS Manager, the installation software asks you whether you want the appropriate levels to be installed at this time.

   • The SUNWsamqfsuiu package.

   • The SUNWsamqfsuir package.

   After installing the packages, it starts the TomCat Web Server, enables logging, and creates the SAMadmin role.

7. Log into the StorageTek ASM server and become superuser.

8. Use the ps(1) and grep(1) commands to make sure that the rpcbind service is running.

   For example:

   ```
   # ps -ef | grep rpcbind
   ```

9. Examine the output from the preceding commands.

   The output should contain a line similar to the following:

   ```
   root   269    1  0   Feb 08 ?       0:06 /usr/sbin/rpcbind
   ```

   If rpcbind does not appear in the output, enter the following command:

   ```
   # /usr/sbin/rpcbind
   ```

10. Start the sam-mgmtrpcd daemon. (Optional)

    Perform this step if you did not elect to have this daemon started automatically.

Enter the following command to start the `sam-mgmtrpcd` daemon:

```
# /opt/SUNWsamfs/sbin/sam-mgmtrpcd
```

The system automatically restarts this daemon every time you reboot the server. If you kill this daemon, it restarts.

The `syslogd` daemon performs detailed tracing of the native code. For more information on tracing, see Appendix A, "ASM QFS Manager Software Notes".

To Invoke the StorageTek ASM QFS Manager for the First Time

After the StorageTek ASM QFS Manager is installed, you can log in to the software using two possible user names (`samadmin` and `samuser`) and two different roles (`SAMadmin` or `no role`). The tasks you can perform using the StorageTek ASM QFS Manager differ depending on the user name and the role you assume at login. These differences are as follows:

- If you log in as `samadmin`, you can choose from one of two roles.

  - The role of `SAMadmin` grants you full adminstrator privileges to configure, monitor, control, and reconfigure the devices in your StorageTek ASM environment.

    Only the StorageTek ASM adminstrator should log in using the `SAMadmin` role. All other users should log in as `samuser`.

  - The role of `no role` only allows you to monitor the environment. You cannot change or reconfigure it in any way.

- If you log in as `samuser`, you can only monitor the environent. You cannot change or reconfigure it in any way.

With regard to system administration, be aware that the Solaris root user on the server that hosts the StorageTek ASM QFS Manager is not necessarily the administrator of the StorageTek ASM QFS Manager. Only `samadmin` has administrator priviledges for the StorageTek ASM QFS Manager application. The root user is the administrator of the management station.

Perform this procedure if you want to invoke the StorageTek ASM QFS Manager and use it, rather than commands, to perform some of the configuration steps.

1. Log in to the management station web server.

2. From a web browser, invoke the StorageTek ASM QFS Manager software.

The URL is as follows:

```
https://hostname:6789
```

For *hostname*, type the name of the host. If you need to specify a domain name in addition to the host name, specify the *hostname* in this format: *hostname*.*domainname*.

Note that this URL begins with `https`, not `http`. The Sun Web Console login screen appears.

3. At the `User Name` prompt, enter `samadmin`.

4. At the `Password` prompt, enter the password you entered when you answered questions during the the `samqfsmgr_setup` script's processing in "To Install the StorageTek ASM QFS Manager Software" on page 107.

5. Click on the `SAMadmin` role.

Only the StorageTek ASM administrator should ever log in with the `SAMadmin` role.

6. At the `Role Password` prompt, enter the password you entered in Step 4.

7. Click on `Log In`.

8. Click on `SAM-QFS Manager`.

You are now logged into the StorageTek ASM QFS Manager.

- If you want to configure your environment at this time using the StorageTek ASM QFS Manager, stay at this screen and add the server that you want to administer. If you need help accomplishing this task, click on Help. After you add the servers, see "To Use the StorageTek ASM QFS Manager for Configuration" on page 110 for more information on configuring your environment using the StorageTek ASM QFS Manager.

- If you want to quit using the StorageTek ASM QFS Manager at this time, click `Log Out`.

- If you want to create additional accounts at this time, see Appendix A, "ASM QFS Manager Software Notes".

To Use the StorageTek ASM QFS Manager for Configuration

This manual guides you through the configuration process using Solaris OS commands, but you can also use the StorageTek ASM QFS Manager, instead of commands, to accomplish many of the tasks.

1. Click on `Help`, in the upper right corner of the screen, to access the StorageTek ASM QFS Manager online documentation.

2. Configure your parameters file for network-attached libraries. (Optional)

   If you want to use StorageTek ASM QFS Manager to configure your StorageTek ASM environment and you want to include network-attached libraries in this configuration, create your parameters file *before* you create your `mcf` file. For information on creating a parameters file, see "Creating Parameters Files for Network-Attached Automated Libraries (Optional)" on page 129.

   Note: This is not the order in which these tasks are performed if you want to use commands to create these files. If you want to use commands to configure your StorageTek ASM environment, you create your `mcf` file first, and then you create the parameters files for network-attached libraries.

3. Complete the configuration tasks.

   Perform the configuration tasks in Table 16 in the order they appear. You can open a terminal window next to the StorageTek ASM QFS Manager window for use when you have to alternate between using commands and using the StorageTek ASM QFS Manager.

   Table 16 StorageTek ASM QFS Manager shows the rest of the tasks you must perform to complete your StorageTek ASM configuration and the means by which you can accomplish each

Table 16. StorageTek ASM Installation Tasks

Task	Accomplish Through StorageTek ASM QFS Manager	Accomplish Through Commands
"Creating Parameters Files for Network-Attached Automated Libraries (Optional)" on page 129	No	Yes
"Defining the StorageTek ASM Configuration by Creating the mcf File" on page 113	Yes	Yes
"Initialize the StorageTek ASM Environment" on page 150	Yes	Yes
"Checking the Drive Order (Optional)" on page 150	Yes	Yes
"Creating the archiver.cmd File (Optional)" on page 156	Yes	Yes

Table 16. StorageTek ASM Installation Tasks (Continued)

Task	Accomplish Through StorageTek ASM QFS Manager	Accomplish Through Commands
"Enabling Disk Archiving (Optional)" on page 163	Yes	Yes
"Editing the defaults.conf File (Optional)" on page 167	No	Yes
"Verifying the License and mcf Files" on page 170	No	Yes
"Labeling Removable Media Cartridges (Optional)" on page 171	No	Yes
"Populating the Catalog (Optional)" on page 173	Yes	Yes
"Creating the samfs.cmd File (Optional)" on page 178	Yes	Yes
"Updating the /etc/vfstab File and Creating the Mount Point" on page 179	Yes	Yes
"Initializing the File System" on page 181	Yes	Yes
"Mounting the File System" on page 181	Yes	Yes
"Sharing the File System With NFS Client Systems (Optional)" on page 182	No	Yes
"Mounting the File System on NFS Client Systems (Optional)" on page 184	No	Yes
"Writing Periodic Dump Files By Using samfsdump(1M)" on page 185	No	Yes
"Backing Up Configuration Files (Optional)" on page 187	No	Yes
"Configuring the Remote Notification Facility (Optional)" on page 187	No	Yes
"Adding the Administrator Group (Optional)" on page 190	No	Yes
"Configuring System Logging" on page 190	No	Yes
"Configuring Other StorageTek Products (Optional)" on page 192	Not applicable	Not applicable

Table 16 describes several installation steps as optional. The only required installation steps that you still must perform using Solaris OS commands are as follows:

- "Verifying the License and mcf Files" on page 170. You need to use Solaris OS commands to verify that your license file is installed and working correctly and that your `archiver.cmd`(4) file is free from syntax errors. If you use StorageTek ASM QFS Manager to create your `mcf` file, however, you do not need to verify your `mcf` file.

- "Writing Periodic Dump Files By Using samfsdump(1M)" on page 185. Performing this step is essential to preserving your data.

The other installation steps in Table 16 are necessary — or are highly recommended— depending on your environment. For example, if you have network-attached automated libraries, you must perform "Populating the Catalog (Optional)" on page 173. Read through the documentation for the tasks described in the preceding list and decide which steps you need to perform.

■ Defining the StorageTek ASM Configuration by Creating the mcf File

Each StorageTek ASM software environment is unique. The system requirements and hardware differ from site to site. The StorageTek ASM environments support a wide variety of tape and optical devices, automated libraries, and disk drives. It is up to you, the system administrator at your site, to set up the specific configuration for your environment.

The master configuration file, `/etc/opt/SUNWsamfs/mcf`, defines the equipment topology that the StorageTek ASM file system manages. This file specifies the devices, automated libraries, and file systems included in the environment. You assign each piece of equipment a unique Equipment Identifier in the `mcf` file.

There are examples of `mcf` files in `/opt/SUNWsamfs/examples`.

Note: For information on file system design considerations, see the *StorageTek QFS and StorageTek ASM File System Administration Guide*.

To configure a StorageTek ASM environment, create the `/etc/opt/SUNWsamfs/mcf` file. The `mcf` file has two kinds of entries:

- File system device entries. These are the disk devices to be used. In the `mcf` file, you organize them into one or more StorageTek ASM file systems.

- Removable media device entries. These are lines for each device, and you organize the devices into Family Sets. The `mcf` file contains information

that enables you to identify the drives to be used and associate them with the automated libraries to which they are attached.

Note: The instructions for creating the `mcf` file differ depending on whether you are creating a StorageTek ASM environment or a StorageTek ASM QFS environment.

If you are installing the StorageTek ASM software, all configuration instructions are contained in this section.

If you are creating a StorageTek ASM QFS environment, the instructions for configuring the file system portion of the `mcf` file are contained in "Defining the StorageTek QFS Configuration by Creating the mcf File" on page 46. The instructions for library and drive configuration are contained in this section.

To Create an mcf File

When you create the `mcf` file, follow these guidelines:

* Delimit the fields in each line with spaces or tabs.
* Begin each comment line entered into this file with a pound sign (#).
* Use a dash (-) to indicate optional fields that are omitted.
Figure 57 shows the `mcf` file fields.

Figure 57. mcf File Fields

```
#
# StorageTek ASM file system configuration
#
# Equipment       Equip  Equip Fam   Dev    Additional
# Identifier      Ord    Type  Set   State  Parameters
# ----------      -----  ----- ----  -----  ----------
```

The `mcf` file can contain both comment lines and lines that pertain to a device. The types of lines that can pertain to a device are as follows:

* Family Set parent identifiers and family set devices
* Family Set member devices

- Standalone devices
  Table 17 shows the information to be contained in each field and whether or not the field is a required or optional field.

Table 17. mcf File Fields

Field	Description
Equipment Identifier	*Required.* This field specifies the physical device with which to interact. This field can contain information on file system devices or removable media devices. File System Devices • For the initial line in a group of file system definition lines, specify the file system name. This must be the same name as the Family Set name specified in the Family Set field, and it is limited to 31 characters. • If the device is a file system member device, specify a `/dev/dsk` entry. This field is limited to 127 characters. Removable Media Devices The Equipment Identifier field is limited to 127 characters for lines that define removable media devices. • If the device is a direct-attached automated library or optical drive, specify a `/dev/samst` entry. • If the device is a network-attached automated library, specify the full path name to the parameters file for that library. Each automated library in the StorageTek ASM environment must have its own identification line in the `mcf` file. To specify more than one library in the `mcf` file, put each on a separate line. • If the device is a tape drive, specify one of the following: 1. The `/dev/rmt/`*n*`cbn` entry. 2. The path to a different symbolic link that points to the same special file that the `/dev/rmt/`*n*`cbn` link points to. If you specify the tape drive in this manner, create the link before mounting the file system.
Equipment Ordinal	*Required.* Specify a unique integer number. All devices and parent identifiers must be assigned a unique Equipment Ordinal. Enter a unique integer such that 1 ≤ *eq_ord* ≤ 65534. The number selected affects the order in which devices are displayed in the user interfaces. Lower numbers are displayed first.

Table 17. mcf File Fields (Continued)

Field	Description
Equipment Type	*Required.* This field provides information that the software uses to determine how to interact with a particular device. Enter the two- or three-character mnemonic for the device type. Most equipment can use the generic equipment types of `od` (optical disk), `tp` (tape), and `rb` (robot). For specific Equipment Types, see the `mcf`(4) man page.
Family Set	*Required for most devices.* A Family Set parent line identifies groups of devices configured to work together as a group, for example, a library and its drives. For a parent device (for example, a library), enter a descriptive name for the Family Set. The Family Set name binds its members, as follows: • If the device is a file system disk device, enter the file system name. • If the device is a member device that is associated with a Family Set parent device (that is, a file system or automated library), enter the Family Set name for the parent device. • If the device is a standalone device such as a manually loaded drive, use the dash (`-`) to indicate that this field is omitted. This field is limited to 31 characters.
Device State	*Optional.* Enter a state for the device for when the file system is initialized. This state could be `on`, `off`, `unavail`, `down`, or a dash (`-`) for default behavior.
Additional Parameters	*Optional.* If you include information in the Additional Parameters field, what you can specify varies by device type, as follows: • If the device is a disk, specify the `/dev/rdsk` entry. This is similar to the `/dev/dsk` entry in the Equipment Identifier field. • If the device is an automated library, specify an alternate path to the library's media catalog file or specify the default path to the library catalog file (`/var/opt/SUNWsamfs/catalog/`*family_set_name*). For tape and magneto-optical devices, this field should be left blank.

Note: If you change the `mcf` file after the StorageTek ASM file system is in use, you must convey the new `mcf` specifications to the StorageTek ASM software. For information on propagating `mcf` file changes to the system, see the *StorageTek QFS and StorageTek ASM File System Administration Guide*

Identifying Peripherals Using the /var/adm/messages File

When your system boots, a series of messages are written to `/var/adm/messages`. These messages identify the Sun Solaris hardware path to each of the peripherals on your system. To display information from the latest system reboot, search backward from the end of the file.

As Figure 58 shows, each SCSI peripheral has three lines. Note that the third line wraps to the next line in Figure 58 and that the sixth field, `samst2`, indicates that these lines are associated with each other.

Figure 58. SCSI Peripheral Lines in the /var/adm/messages File

```
# tail -200 /var/adm/messages | more
Aug 23 11:52:54 baggins unix: samst2: Vendor/Product ID = HP      C1716T
Aug 23 11:52:54 baggins unix: samst2 at esp0: target 2 lun 0
Aug 23 11:52:54 baggins unix: samst2 is /iommu@0,10000000/sbus@0,10001000/
espdma@5,8400000/esp@5,8800000/samst@2,0
```

Note: For readability, the preceding output, and many other outputs that are wider than 80 characters, have been wrapped for inclusion in this manual.

The first line displays the vendor and product information that the SCSI peripheral reported to the Sun Solaris kernel.

The second line displays the SCSI bus, SCSI target ID, and LUN of the peripheral.

The third line displays the peripheral's hardware path. This path is reflected in the `/devices` directory. Symbolic links (symlinks) to the `/devices` directory are set up in the `/dev/st`, `/dev/samst`, and `/dev/rmt` directories.

Matching the symbolic link to the correct peripheral is the key to configuring a StorageTek ASM environment. Use the `ls`(1) command with the `-l` option in both the `/dev/st`, `/dev/samst` and `/dev/rmt` directories to display the path name of the peripheral.

Optionally, you can set up the device down notification script at this point. The `dev_down.sh`(1M) man page contains information about setting up this script, which sends email to root when a device is marked `down` or `off`. For more information, see the `dev_down.sh`(1M) man page.

Example StorageTek ASM Configuration

Assume that the following equipment is to be included in a StorageTek ASM configuration:

- Two Seagate ST15230W 4-gigabyte disk drives used as cache for the file system

- One StorageTek 9730 30-slot automated library that contains two DLT tape drives

- One manually loaded DLT 2000 drive

- One HP Model C1710T magneto-optical automated library containing two HP Model C1716 magneto-optical drives

- One manually loaded HP Model C1716 magneto-optical drive

This equipment is connected to three SCSI buses with the following SCSI targets:

- The server's internal, single-ended, SCSI bus with the target IDs shown in Table 18.

Table 18. Target IDs for the Server's Internal Single-Ended SCSI Bus

Target ID	Equipment
2	Manually loaded magneto-optical drive
3	The Sun Solaris internal hard disk
4	Manually loaded DLT drive

- A differential SCSI bus connected to the HP Model C1710T automated library and file system disks with target IDs shown in Table 19.

Table 19. Target IDs for the SCSI Bus Connected to the HP Model C1710T Automated Library

Target ID	Equipment
0 and 1	Seagate 4-gigabyte disks
2	HP C1710T automated library
5	First optical drive
6	Second optical drive

- A differential SCSI bus connected to the StorageTek 9730 automated library and tape drives with target IDs shown in Table 20.

Table 20. Target IDs for the SCSI Bus Connected to the StorageTek 9730 Automated Library

Target ID	Equipment
0	StorageTek 9730 automated library
1	First DLT 7000 drive
2	Second DLT 7000 drive

Example StorageTek ASM Disk Cache Configuration

Figure 59 shows the output from the Sun Solaris `format`(1M) command. It reports how the disks are partitioned.

Figure 59. format(1M) Command Example

```
1. c1t0d0 <SEAGATE-ST15230W-0168 cyl 3974 alt 2 hd 19 sec 111>
/iommu@0,10000000/sbus@0,10001000/QLGC,isp@1,10000/sd@0,0
Current partition table (original) :
Total disk cylinders available: 3974 + 2 (reserved cylinders)
Part    Tag          Flag    Cylinders      Size          Blocks
0       root         wm      0-3499         3.52GB        (3500/0/0)
1       unassigned   wm      3500-3972      487.09MB      (473/0/0)
2       backup       wu      0-3973         4.00GB        (3974/0/0)
3       unassigned   wm      0              0             (0/0/0)
4       unassigned   wm      0              0             (0/0/0)
5       unassigned   wm      0              0             (0/0/0)
6       unassigned   wm      0              0             (0/0/0)
7       unassigned   wm      0              0             (0/0/0)
2. c1t1d0 <SEAGATE-ST15230W-0168 cyl 3974 alt 2 hd 19 sec 111>
 /iommu@0,10000000/sbus@0,10001000/QLGC,isp@1,10000/sd@1,0
Current partition table (original):
Total disk cylinders available: 3974 + 2 (reserved cylinders)
Part    Tag          Flag    Cylinders      Size          Blocks
0       root         wm      1000-3973      2.99GB        (2974/0/0)
1       unassigned   wu      0              0             (0/0/0)
2       backup       wu      0-3973         4.00GB        (3974/0/0)
3       unassigned   wm      0              0             (0/0/0)
4       unassigned   wm      0              0             (0/0/0)
5       unassigned   wm      0-999          1.01GB        (1000/0/0)
6       unassigned   wm      0              0             (0/0/0)
7       unassigned   wm      0              0             (0/0/0)
```

This example creates one StorageTek ASM file system (samfs1) on partition 0 of disk c1t0d0 and partition 5 of c1t1d0. It creates another file system (samfs2) on partition 1 of disk c1t0d0 and partition 0 of disk c1t1d0.

The following procedure explains how to begin writing the mcf file for this example configuration by defining the file systems and their disk partitions.

To Write the mcf File

1. Make an `ms` (mass storage) entry for the first file system.

   An `ms` entry is the Equipment Identifier for a StorageTek ASM file system. The name of this file system (`samfs1`) is used later when writing the `/etc/vfstab` entry for the file system and creating the file system. Note that the name as specified in the Equipment Identifier field must be the same as the Family Set name for the file system.

2. Make a series of `md` (magnetic disk) entries listing the partitions that comprise the `samfs1` file system member devices.

3. Make similar entries for the second (`samfs2`) file system.

   Figure 60 shows the `mcf` with the file systems defined.

Figure 60.   StorageTek ASM mcf File Showing the File Systems

```
# Disk cache configuration for 2 file systems: samfs1, samfs2
#
# Equipment       Eq    Eq   Fam.   Dev.    Additional
# Identifier      Ord   Type Set    State   Parameters
#-----------      ---   --   ------ ------  ------------------
samfs1            10    ms   samfs1
/dev/dsk/c1t0d0s0 11    md   samfs1   on
/dev/dsk/c1t1d0s5 12    md   samfs1   on
#
samfs2            20    ms   samfs2
/dev/dsk/c1t1d0s0 21    md   samfs2   on
/dev/dsk/c1t0d0s1 22    md   samfs2   on
```

> **CAUTION:**   Make sure you specify disk partitions that are not in use on your system. Do not use overlapping partitions. If a StorageTek ASM file system attempts to use a partition that is already in use, the software usually issues a message to indicate that the device is busy.
>
> If you give the wrong partition names, you risk damaging user or system data. This is true when initializing any type of file system. Make sure you specify only disk partitions that are not already in use on your system. Do not use overlapping partitions.

Configuring a Manually Loaded Magneto-optical Drive

The HP Model C1716T is target ID 2 on the internal SCSI bus.

To Configure the Drive

1. Examine the /var/adm/messages file to find the messages for these devices.

   Figure 61 shows the information in /var/adm/messages associated with the HP Model C1716T and target 2. Note that the third line wraps to the next line in this example.

Figure 61. Information in /var/adm/messages

```
Aug 23 11:52:54 baggins unix: samst2: Vendor/Product ID = HP    C1716T
Aug 23 11:52:54 baggins unix: samst2 at esp0: target 2 lun 0
Aug 23 11:52:54 baggins unix: samst2 is /iommu@0,10000000/sbus@0,10001000/
espdma@5,8400000/esp@5,8800000/samst@2,0
```

2. Issue the cd(1) command to change to the /dev/samst directory.

3. Use the ls(1) and grep(1) commands to find the correct symbolic link.

   For example, use the following ls(1) command:

```
# ls -l | grep "samst@2"
```

   The preceding ls(1) command searches for a symbolic link that points to the hardware path shown in Figure 62.

Figure 62. Path to samst@2

```
lrwxrwxrwx   1 root     other        88 Aug 23 12:27 c0t2u0 -> /devices/
iommu@0,10000000/sbus@0,10001000/espdma@5,8400000/esp@5,8800000/
samst@2,0:a,raw
```

   The Sun samst driver uses the name /dev/samst/c0t2u0 when referencing the device.

4. Use an editor to open the /etc/opt/SUNWsamfs/mcf file.

5. Add an entry for the drive to the mcf file.

   Add the following entry in /etc/opt/SUNWsamfs/mcf:

```
wed
```

   This entry contains the device name (/dev/samst/c0t2u0), a unique Equipment Ordinal (30), the Equipment Type of the drive (od), a dash (-) to indicate that a Family Set name is not associated with the drive, and the device state (on).

Configuring a Magneto-Optical Library

The HP C1710T automated library has three SCSI devices: the robotic mechanism and the two magneto-optical drives that the automated library loads and unloads.

To Configure the Magneto-Optical Library

1. Examine the `/var/adm/messages` file to find the messages for these devices.

   Figure 63 shows these messages.

Figure 63. /var/adm/messages for the HP Library and two Drives

```
Aug 23 11:52:56 baggins unix: samst16: Vendor/Product ID = HP      C1710T
Aug 23 11:52:56 baggins unix: samst16 at QLGC,isp0: target 2 lun 0
Aug 23 11:52:56 baggins unix: samst16 is /iommu@0,10000000/sbus@0,10001000/
QLGC,isp@1,10000/samst@2,0

Aug 23 11:52:56 baggins unix: samst19: Vendor/Product ID = HP      C1716T
Aug 23 11:52:56 baggins unix: samst19 at QLGC,isp0: target 5 lun 0
Aug 23 11:52:56 baggins unix: samst19 is /iommu@0,10000000/sbus@0,10001000/
QLGC,isp@1,10000/samst@5,0

Aug 23 11:52:56 baggins unix: samst20: Vendor/Product ID = HP      C1716T
Aug 23 11:52:56 baggins unix: samst20 at QLGC,isp0: target 6 lun 0
Aug 23 11:52:56 baggins unix: samst20 is /iommu@0,10000000/sbus@0,10001000/
QLGC,isp@1,10000/samst@6,0
```

2. Issue the `cd`(1) command to change to the `/dev/samst` directory.

3. Use `ls`(1) and `grep`(1) commands to find the symbolic links for the devices.

   Figure 64 shows the `ls`(1) commands to use to search for the three symbolic links that point to the `/devices` files with the same Sun Solaris hardware paths shown in Figure 63.

Figure 64. ls(1) and grep(1) Commands Used to Find Symbolic Links for the Devices in Figure 63

```
# ls -l | grep "samst@2"
lrwxrwxrwx   1 root     other        74 Aug 23 12:27 c1t2u0 -> /devices/
iommu@0,10000000/sbus@0,10001000/QLGC,isp@1,10000/samst@2,0:a,raw
# ls -l | grep "samst@5"
lrwxrwxrwx   1 root     other        74 Aug 23 12:27 c1t5u0 -> /devices/
iommu@0,10000000/sbus@0,10001000/QLGC,isp@1,10000/samst@5,0:a,raw
# ls -l | grep "samst@6"
lrwxrwxrwx   1 root     other        74 Aug 23 12:27 c1t6u0 -> /devices/
iommu@0,10000000/sbus@0,10001000/QLGC,isp@1,10000/samst@6,0:a,raw
```

4. Use an editor to open the `/etc/opt/SUNWsamfs/mcf` file.

5. Add entries for the library and drives to the `/etc/opt/SUNWsamfs/mcf` file.

    Figure 65 shows the `mcf` file entries.

Figure 65. mcf File Entries for the HP Library and its Drives

```
/dev/samst/c1t2u0  50  rb  hp30  on
/dev/samst/c1t5u0  51  od  hp30  on
/dev/samst/c1t6u0  52  od  hp30  on
```

The first line defines the automated library itself. It contains the `/dev/samst` name for the device (`/dev/samst/c1t2u0`) followed by a unique Equipment Ordinal (`50`), the Equipment Identifier (`rb`, for a generic SCSI-attached library), the Family Set identifier specified on all devices associated with this library (`hp30`), and the Device State (`on`).

The two remaining lines define the drives inside the library. They are similar to the manually loaded drives defined in the previous section except that instead of a dash, they include the Family Set name of the library where they reside (`hp30`).

Note: The order of drives as specified in the `mcf` file must match the logical order of the drives in a SCSI-attached automated library. The first drive defined in the `mcf` must be the first logical drive in the library, and so on. For more information, see your hardware documentation for the logical orientation of drives. Incorrect configuration can cause cartridges to be mounted in the wrong drives, which will lead to total inoperability of this software.

Configuring a Manually Loaded DLT Drive

When configuring DLT drives, be sure to add the DLT definitions to the `/kernel/drv/st.conf` file (see "Verifying and Updating the st.conf and samst.conf Files (Optional)" on page 93). DLT drives are not part of the standard Sun Solaris configuration, and the software does not recognize them if they are configured incorrectly.

To Configure the DLT Drive

1. Examine the `/var/adm/messages` file to find the messages for these devices.

    Figure 66 shows the `/var/adm/messages` file lines that refer to the manual DLT drive.

Figure 66. Information in /var/adm/messages

```
Feb 25 13:23:29 collie scsi: [ID 365881 kern.info] /pci@1f,4000/scsi@5,1/st@0,0
(st21):
Feb 25 13:23:29 collie          <Vendor 'DEC     ' Product 'DLT2000        '>
Feb 25 13:23:29 collie scsi: [ID 193665 kern.info] st21 at glm3: target 0 lun 0
Feb 25 13:23:29 collie genunix: [ID 936769 kern.info] st21 is /pci@1f,4000/
scsi@5,1/st@0,0
```

2. Use the `ls`(1) and `grep`(1) commands to search for the symbolic links that point to the `/devices` files with the same Sun Solaris hardware paths shown in the `/var/adm/messages` file.

   Figure 67 shows the `ls`(1) and `grep`(1) commands to use to locate the DLT drive identified as `scsi@5`.

Figure 67. ls(1) and grep(1) Commands Used to Find Symbolic Links for the Device in Figure 66

```
# ls -l /dev/rmt|grep 'pci@1f,4000/scsi@5,1/st@0'|grep cbn
lrwxrwxrwx   1 root     other         45 Feb 14 09:48 0cbn -> ../
../devices/pci@1f,4000/scsi@5,1/st@0,0:cbn
```

When making the `mcf` entry, always use the `b` and `n` options. Figure 68 shows the symbolic link for a drive that supports compression. If the drive supports compression, and if you want compression in the hardware, use `cbn` as the prefix.

Figure 68. Symbolic Link Showing a Drive With that Supports Compression

```
lrwxrwxrwx   1 root     other         85 Aug 15 11:37 /dev/rmt/0cbn
-> ../../devices/iommu@0,10000000/sbus@0,10001000/
espdma@5,8400000/esp@5,8800000 st@4,0:cbn
```

3. Use `vi`(1) or another editor to open the `/etc/opt/SUNWsamfs/mcf` file.

4. Add the `/etc/opt/SUNWsamfs/mcf` entry.

   For example:

```
/dev/rmt/0cbn  40  tp  -  on
```

The first entry on the line is the `st` driver name for the device (`/dev/rmt/0cbn`), followed by a unique Equipment Ordinal (`40`), the Equipment Type (`tp` for a generic tape), a dash (`-`) to indicate that a Family Set name is not associated with the manually mounted device, and the Device State (`on`).

For tape drives, you can leave the Additional Parameters field empty.

Configuring a DLT Library

The last piece of equipment to define is the STK 9730 automated library. This automated library has three SCSI devices: the robotic mechanism and the two DLT 7000 tape drives that the robot loads and unloads.

To Configure the DLT Library

1. Examine the /var/adm/messages to find the messages for these devices.

    Figure 69 shows the /var/adm/messages file.

Figure 69. Information in /var/adm/messages

```
Feb  4 09:42:17 server1 samst: [ID 902828 kern.notice] samst42:     Vendor/
Product ID = STK    9730
Feb  4 09:42:17 server1 scsi: [ID 193665 kern.info] samst42 at glm3: target 0
lun 0
Feb  4 09:42:17 server1 genunix: [ID 936769 kern.info] samst42 is /pci@6,4000/
scsi@2,1/samst@0,0
Feb  4 13:20:21 server1 scsi: [ID 365881 kern.info] /pci@6,4000/scsi@2,1/st@1,0
(st22):
Feb  4 13:20:21 server1     <DLT 7000 tape drive>
Feb  4 13:20:21 server1 scsi: [ID 193665 kern.info] st22 at glm3: target 1 lun
0
Feb  4 13:20:21 server1 genunix: [ID 936769 kern.info] st22 is /pci@6,4000/
scsi@2,1/st@1,0
Feb  4 13:20:21 server1 scsi: [ID 365881 kern.info] /pci@6,4000/scsi@2,1/st@2,0
(st23):
Feb  4 13:20:21 server1     <DLT 7000 tape drive>
Feb  4 13:20:21 server1 scsi: [ID 193665 kern.info] st23 at glm3: target 2 lun
0
Feb  4 13:20:21 server1 genunix: [ID 936769 kern.info] st23 is /pci@6,4000/
scsi@2,1/st@2,0
```

2. Issue the cd(1) command to change to the /dev/samst directory.

3. Use the ls(1) and grep(1) commands to find the symbolic links that point to the /devices files with the same Sun Solaris hardware paths shown in the /var/adm/messages file.

    Figure 70 shows the ls(1) and grep(1) commands to use to locate the symbolic links.

Figure 70. ls(1) and grep(1) Commands Used to Find Symbolic Links for the Device in Figure 69

```
# cd /dev/samst
# ls -l | grep "samst@0"
lrwxrwxrwx  1 root    other       49 Feb  4 09:42 c6t0u0 -> ../
../devices/pci@6,4000/scsi@2,1/samst@0,0:a,raw
```

4. Use the `ls`(1) and `grep`(1) commands to find a symbolic link in `/dev/rmt` that points to the tape devices.

   Note in Figure 71 that the automated library does not have this additional link.

Figure 71. ls(1) and grep(1) Commands to Use to Find the Tape Devices

```
# cd /dev/rmt
# ls -l | grep cbn
lrwxrwxrwx   1 root     root          44 Feb  3 15:38 0cbn -> ../
../devices/pci@6,4000/scsi@2,1/st@1,0:cbn
lrwxrwxrwx   1 root     root          44 Feb  3 15:38 1cbn -> ../
../devices/pci@6,4000/scsi@2,1/st@2,0:cbn
```

Again, there are multiple symbolic links in the directory that point to the same hardware path. To enable hardware compression, choose the one with the `cbn` suffix. If your drive does not support hardware compression, choose the symbolic link that ends with `bn`.

5. Use `vi`(1) or another editor to open the `/etc/opt/SUNWsamfs/mcf` file.

6. Add the `/etc/opt/SUNWsamfs/mcf` entries.

   Figure 72 shows the `mcf` file entries for this library and its drives.

Figure 72. mcf File Entries for the StorageTek Library and its Drives

```
/dev/samst/c2t0u0  60  rb  9730  on
/dev/rmt/0cbn      61  tp  9730  on
/dev/rmt/1cbn      62  tp  9730  on
```

The first line defines the automated library and includes the `/dev/samst` name (`/dev/samst/c2t0u0`). It also contains a unique Equipment Ordinal (`60`), the Equipment Type (`rb`, for the generic robot Equipment Type), a Family Set name for the robot and the drive (`9730`), and the Device State (`on`).

The second line defines the first DLT tape drive inside the library. These entries refer to the Equipment Identifier for this tape device (`/dev/rmt/0cbn`), the Equipment Ordinal for the device (`61`), the Equipment Type (`tp`), the Family Set Name (`9730`), and the Device State (`on`).

The third line defines the second DLT tape drive inside the automated library. These entries refer to the Equipment Identifier for this tape device (`/dev/rmt/1cbn`), the Equipment Ordinal for the device (`62`), the Equipment Type (`tp`), the Family Set name (`9730`), and the Device State (`on`).

7. Add the DLT definitions to the `/kernel/drv/st.conf` file. (Optional)

   Perform this step if you are configuring DLT drives.

shows how to add definitions to the `/kernel/drv/st.conf` file. DLT drives are not part of the standard Sun Solaris configuration.

shows the completed `mcf` file.

Figure 73. Completed mcf File

```
# Equipment          Eq   Eq    Family  Dev   Additional
# Identifier          Ord  Type  Set     Sta   Parameters
#
samfs1               10   ms    samfs1
/dev/dsk/c1t0d0s0    11   md    samfs1  on
/dev/dsk/c1t1d0s5    12   md    samfs1  on
#
samfs2               20   ms    samfs2
/dev/dsk/c1t1d0s0    21   md    samfs2  on
/dev/dsk/c1t0d0s1    22   md    samfs2  on
#
/dev/samst/c0t2u0    30   od    -       on
#
/dev/rmt/0cbn        40   tp    -       on
#
/dev/samst/c1t2u0    50   rb    hp30    on
/dev/samst/c1t5u0    51   od    hp30    on
/dev/samst/c1t6u0    52   od    hp30    on
#
/dev/samst/c2t0u0    60   rb    9730    on
/dev/rmt/0cbn        61   tp    9730    on
/dev/rmt/1cbn        62   tp    9730    on
```

Example mcf File Entries for Network-Attached Libraries

The following examples show `mcf` file entries for network-attached devices. In these examples, note that the first line of each library definition is the full path to a file. This file is the parameters file for that library.

If you are using a network-attached library, you create the parameters files for network attached libraries in .

Example 1. Figure 74 shows the `mcf` file for an ADIC/Grau network-attached automated library.

Figure 74. ADIC/Grau Automated Library mcf File Entries

```
#
# Sample mcf file entries for a GRAU library - DLT
#
/etc/opt/SUNWsamfs/grau50  50   gr   gr50  -
/dev/rmt/0cbn              51   lt   gr50  -
/dev/rmt/1cbn              52   lt   gr50  -
#
# Sample mcf file entries for a GRAU library - HP optical
#
/etc/opt/SUNWsamfs/grau60  60   gr   gr60  -
/dev/samst/c1t1u0          61   od   gr60  -
```

Example 2. Figure 75 shows the `mcf` file for a Fujitsu LMF network-attached automated library.

Figure 75. Fujitsu LMF Automated Library mcf File Entries

```
#
# Sample mcf file entries for an LMF library
#
/etc/opt/SUNWsamfs/lmf50 50  fj  fj50  -
/dev/rmt/0cbn            51  fd  fj50  -
/dev/rmt/1cbn            52  fd  fj50  -
```

Example 3. Figure 76 shows the `mcf` file for an IBM 3494 network-attached automated library.

Figure 76. IBM 3494 Automated Library mcf File Entries

```
# The mcf file entries.
#
# IBM 3494 library
#
/etc/opt/SUNWsamfs/ibm50 50      im      ibm3494e - ibmcat
/dev/rmt/1bn             51      tp      ibm3494e
/dev/rmt/2bn             52      tp      ibm3494e
```

Example 4. Figure 77 shows the `mcf` file for a Sony network-attached automated library.

Figure 77. Sony Network-Attached Automated Library mcf File Entries

```
#
# Sample mcf file entries for a Sony network-attached library
#
/etc/opt/SUNWsamfs/sonyfile 100   pe  psc  on
/dev/rmt/1cbn               101   so  psc  on
/dev/rmt/2cbn               102   so  psc  on
```

Example 5. Figure 78 shows the `mcf` file for a StorageTek ACSLS-attached automated library.

Figure 78. StorageTek Automated Library mcf File Entries

```
# Equipment              Eq   Eq   Family   Dev   Additional
# Identifier             Ord  Ty   Set      St    Parameters
#
/etc/opt/SUNWsamfs/stk50 50   sk   sk50     on
/dev/rmt/0cbn            51   sg   sk50     on
/dev/rmt/1cbn            52   sg   sk50     on
```

For more information, see the `mcf`(4) man page. There are example `mcf` files located in `/opt/SUNWsamfs/examples/mcf`.

■ Creating Parameters Files for Network-Attached Automated Libraries (Optional)

Perform this step if you want to include network-attached automated libraries in your StorageTek ASM environment.

Automated libraries can be included in a StorageTek ASM environment either by attaching them to the server directly or by attaching them to the environment's network. Libraries attached through a SCSI or Fibre Channel attachment are *direct-attached* libraries. Libraries attached through a network attachment are *network-attached* libraries. In this task, you create a parameters file for each network-attached library to be included in your environment.

To configure a network-attached library in your StorageTek ASM environment, find your library in the following list and go to the page indicated:

- "ADIC/Grau Automated Libraries" on page 130

- "Fujitsu LMF Automated Libraries" on page 132

- "IBM 3494 Automated Libraries" on page 134

- "Sony Network-Attached Automated Libraries" on page 138

- "StorageTek ACSLS-Attached Automated Libraries" on page 141

- "Shared Drives" on page 149 describes the shared drives feature that some libraries support.

Note: The examples and the discussions in the following subsections mention both the parameters files for network-attached automated libraries and the `mcf` file. The StorageTek ASM `mcf` file is the main configuration file for StorageTek ASM software. You created your `mcf` file in "Defining the StorageTek ASM Configuration by Creating the mcf File" on page 113. The parameters file and the `mcf` file are both mentioned in this section because the two files reference each other.

ADIC/Grau Automated Libraries

The ADIC/Grau automated library operates within StorageTek ASM environments through the `grauaci` interface. The `grauaci` interface is the interface between the StorageTek ASM software and the ADIC/Grau library. This interface uses the DAS/ACI 3.10 interface supplied by ADIC/Grau. For more information on the DAS/ACI interface, see your ADIC/Grau documentation.

To Configure the Parameters File for an ADIC/Grau Automated Library

1. Ensure that the ADIC/Grau automated library is prepared for inclusion in a StorageTek ASM environment.

   Ensure that the following are true:

   - The ADIC/Grau automated library must be operational.

   - The ADIC/Grau library is operating on the DAS server.

   - Both the `avc` (avoid volume contention) and the `dismount` parameters must be set to `true` in the DAS configuration file for this client.

2. Use the `cd`(1) command to change to the `/etc/opt/SUNWsamfs` directory.

   The parameters file can be written to any directory, but Sun recommends that you write it to `/etc/opt/SUNWsamfs`.

   When you created your `mcf` file, in "Defining the StorageTek ASM Configuration by Creating the mcf File" on page 113, you included the full path name to the parameters file in the `mcf` file. Make sure that the `mcf` file points to the correct location for the parameters file you create in this procedure.

3. Use `vi`(1) or another editor to open a file.

   It is a good idea to name the new file to correspond to the library you are configuring. For example, you could invoke `vi`(1) as follows:

   ```
   # vi grau50
   ```

4. Edit the ADIC/Grau parameters file to consist of a list of *keyword* = *value* parameter lines.

   The various *keyword* values identify the ADIC/Grau automated libraries, the drives associated with the libraries, and the server name. All *keyword* and *value* entries are case sensitive, so enter them exactly as specified in the DAS configuration file and in the StorageTek ASM `mcf` file.

Include the following types of *keyword = value* parameters in the ADIC/Grau parameters file:

- `client = ` *client_id*. For *client_id*, specify the name of the client as defined in the DAS configuration file. This is a required parameter.

- `server = ` *server_id*. For *server_id*, specify the host name of the server running the DAS server code. This is a required parameter.

- `acidrive ` *drive_id = path*. For *drive_id*, specify the name of the drive as configured in the DAS configuration file. For *path*, specify the path to the drive as entered in the Equipment Identifier field of the StorageTek ASM `mcf` file. There must be one `acidrive` line for every drive assigned to the client.

Comments can appear anywhere on any line, but they must begin with a pound sign (#). The system ignores characters to the right of the pound sign.

If the ADIC/Grau library contains various media types, then there is a media changer for each media type. Each media changer has a unique client name in the DAS configuration, a unique library catalog, and a unique parameters file.

The following code examples show two ADIC/Grau parameters files. Figure 79 and Figure 80 on page 132 define one ADIC/Grau automated library supporting DLT tape and one ADIC/Grau automated library supporting a Hewlett Packard optical drive.

Figure 79 shows the parameters file for library `grau50`.

Figure 79. Parameters File /etc/opt/SUNWsamfs/grau50

```
# This is file: /etc/opt/SUNWsamfs/grau50
#
client = DASclient
server = DAS-server
#
# the name "drive1" is from the DAS configuration file
#
acidrive drive1 = /dev/rmt/0cbn      # a comment
#
# the name "drive2" is from the DAS configuration file
#
acidrive drive2 = /dev/rmt/1cbn      # a comment
```

Figure 80 shows the parameters file for `grau60`.

Figure 80. Parameters File /etc/opt/samfs/grau60

```
# This is file: /etc/opt/SUNWsamfs/grau60
#
client = DASclient
server = DAS-server
acidrive DH03 = /dev/samst/c1t1u0
#
# the name "DH03" is from the DAS configuration file
```

5. Repeat this procedure and create a parameters file for each ADIC/Grau library that you want to configure.

    Figure 74 on page 128 in "Defining the StorageTek ASM Configuration by Creating the mcf File" on page 113 shows the `mcf` file that corresponds with the ADIC/Grau network-attached automated library parameters file example that was created in this procedure. The example `mcf` points to files `grau50` and `grau60` in the `/etc/opt/SUNWsamfs` directory.

Diagnostic Information

The following directory contains diagnostic information that can be useful when troubleshooting:

```
/var/opt/SUNWsamfs/.grau
```

The system creates files in this directory that are named `graulog`-*eq*, where *eq* is the Equipment Ordinal as defined in the `mcf` file. For more information on this, see the `grauaci`(7) and the `mcf`(4) man pages.

Fujitsu LMF Automated Libraries

The Fujitsu LMF automated library operates in StorageTek ASM environments through the LMF interface supplied by Fujitsu. The `fujitsulmf` interface is the interface between the StorageTek ASM software and the Fujitsu LMF automated libraries. For more information on LMF, see the *LMF MTL Server/ Client User's Guide* or the *LMF ASM-FS Linkage Operations Guide*. You can obtain both of these publications from the Fujitsu Corporation.

To Configure the Parameters File for a Fujitsu LMF Automated Library

The Fujitsu LMF parameters file identifies the drives in the automated library. Create one parameters file for each automated library.

1. Ensure that the Fujitsu LMF automated library is prepared for inclusion in a StorageTek ASM environment.

   Ensure that the following are true:

   - The Fujitsu LMF automated library is operational.

   - The Fujitsu LMF software package is installed and working.

2. Use the `cd`(1) command to change to the `/etc/opt/SUNWsamfs` directory.

   The parameters file can be written to any directory, but Sun recommends that you write it to `/etc/opt/SUNWsamfs`.

   When you created your `mcf` file, in "Defining the StorageTek ASM Configuration by Creating the mcf File" on page 113, you included the full path name to the parameters file in the `mcf` file. Make sure that the `mcf` file points to the correct location for the parameters file you create in this procedure.

3. Use `vi`(1) or another editor to open a file.

   It is a good idea to name the new file to correspond to the library you are configuring. For example, you could invoke `vi`(1) as follows:

   ```
   # vi lmf50
   ```

4. Edit the Fujitsu LMF parameters file to consist of a list of *drivename = value* parameter lines.

   The parameters file consists of `lmfdrive` *drivename = value* definition lines and comment lines. There must be one `lmfdrive` line for each drive assigned to the client automated library. Comments can appear anywhere on any line, but they must begin with a pound sign (#). The system ignores characters to the right of the pound sign.

   All *drivename* and *value* information is case sensitive. Figure 81 on page 134 shows the values you can specify for *drivename* and *value*.

Figure 81. The drivename and value Arguments

Argument	Definition
drivename	The name of the drive according to the LMF configuration.
value	The path to the drive. This path must match the Equipment Identifier field of the mcf file.

Figure 82 shows a parameters file for a Fujitsu LMF automated library.

Figure 82. Parameters File /etc/opt/SUNWsamfs/lmf50

```
#
# This is file /etc/opt/SUNWsamfs/lmf50
#
# The name "LIB001DRV000" is from the LMF configuration.
#
lmfdrive LIB001DRV000 = /dev/rmt/0cbn   # defines first drive
#
# the name "LIB001DRV001" is from the LMF configuration
#
lmfdrive LIB001DRV001 = /dev/rmt/1cbn  # defines second drive
```

5. Repeat this procedure and create a parameters file for each Fujitsu LMF library that you want to configure.

    Figure 75 on page 128 in "Defining the StorageTek ASM Configuration by Creating the mcf File" on page 113 shows the `mcf` file that corresponds with the Fujitsu LMF network-attached automated library parameters file that was created in this procedure. The example `mcf` file points to file `lmf50` in the `/etc/opt/SUNWsamfs` directory.

IBM 3494 Automated Libraries

The IBM 3494 automated tape library operates in StorageTek ASM environments with the assistance of the IBM `lmcpd` daemon package. You can obtain the IBM `lmcpd` daemon package from IBM.

To Configure the Parameters File for an IBM 3494 Automated Library

The IBM 3494 automated library can be used as a single physical library or as multiple logical libraries. If you divide this library into multiple logical libraries, create a parameters file for each logical library.

1. Ensure that the IBM 3494 automated library is prepared for inclusion in a StorageTek ASM environment.

Ensure that the following are true:

- The IBM 3494 automated library is operational.
- The IBM `lmcpd` daemon package is installed and working.
- The `/etc/ibmatl.conf` file is configured and working.

2. Use the `cd`(1) command to change to the `/etc/opt/SUNWsamfs` directory.

   The parameters file can be written to any directory, but Sun recommends that you write it to `/etc/opt/SUNWsamfs`.

   When you created your `mcf` file, in "Defining the StorageTek ASM Configuration by Creating the mcf File" on page 113, you included the full path name to the parameters file in the `mcf` file. Make sure that the `mcf` file points to the correct location for the parameters file you create in this procedure.

3. Use `vi`(1) or another editor to open a file.

   It is a good idea to name the new file to correspond to the library you are configuring. For example, you could invoke `vi`(1) as follows:

```
# vi ibm50
```

4. Edit the IBM 3494 parameters file to consist of a list of *keyword = value* and *pathname = value* pairs.

All arguments are case-sensitive. Table 21 shows how to specify the parameters.

Table 21. IBM 3494 Parameters File Arguments

Parameter	Meaning
`name` = *name*	This is the name assigned by you, the system administrator, and specified in the `/etc/ibmatl.conf` file. This is also the symbolic name of the library. This parameter must be supplied, there is no default.
`category` = *hexnumber*	The category is a hexadecimal number such that `0x0001` < *hexnumber* < `0xfeff`. The StorageTek ASM software sets the `category` to this *hexnumber* for media under its control. The default is `4`. If you have divided your physical library into multiple logical libraries, create a parameters file for each logical library and make sure that the `category` = *hexnumber* parameter is different in each logical library. This parameter determines which tapes are assigned to which library. When you import media into the library, it is added to the catalog, and its `category`= value is changed to the value specified by this `category` = *hexnumber* parameter.

Table 21. IBM 3494 Parameters File Arguments (Continued)

Parameter	Meaning
access = *permission*	For *permission*, specify either `shared` or `private`. • Specify `private` if you are using the library as one physical library. Default. • Specify `shared` if you are dividing the library into multiple logical libraries.
device-pathname = *device-number* [`shared`]	
	Specify a *device-pathname* entry for every drive in the library attached to this machine. Each *device-pathname* must match the Equipment Identifier of an entry in the `mcf` file. The *device-number* is the device number as described in the IBM documentation. You can derive this number by running the IBM `mtlib` utility obtained from IBM. The `shared` parameter is optional. You can specify it if the drive is shared with other StorageTek ASM servers. For more information about shared drives, see "Shared Drives" on page 149.

Figure 83 shows an example `/etc/ibmatl.conf` file. Information for this file was obtained from the `mtlib` utility supplied by IBM.

Figure 83. Example /etc/ibmatl.conf File

```
#
# This is file: /etc/ibmatl.conf
# Set this file up according the documentation supplied by IBM.
3493a    198.174.196.50   test1
```

After the `lmcpd` daemon is running, you can use IBM's `mtlib` utility to get the device numbers. Figure 84 shows output from `mtlib`.

Figure 84. Output From mtlib

```
# mtlib -l 3493a -D
0, 00145340 003590B1A00
1, 00145350 003590B1A01
```

Figure 85 shows a sample parameters file and `mcf` entries for an IBM 3494 library.

Figure 85. Parameters File /etc/opt/SUNWsamfs/ibm50

```
#
# This is file: /etc/opt/SUNWsamfs/ibm50
#
name = 3493a                        # From /etc/ibmatl.conf
/dev/rmt/1bn = 00145340             # From mtlib output
/dev/rmt/2bn = 00145350 shared      # From mtlib output
access=private
category = 5
```

5. Repeat this procedure and create a parameters file for each IBM 3494 library that you want to configure.

    You must create a parameters for file for each physical or logical library you want to include in the StorageTek ASM environment.

    Figure 76 on page 128 in "Defining the StorageTek ASM Configuration by Creating the mcf File" on page 113 shows the `mcf` file that corresponds with the IBM 3494 network-attached automated library parameters file that was created in this procedure. The example `mcf` file points to file `ibm50` in the `/etc/opt/SUNWsamfs` directory.

Sony Network-Attached Automated Libraries

A Sony network-attached automated library operates within the StorageTek ASM environment through the DZC-8000S Application Interface Library package. This software package provides the application programmer interface (API) to the PetaSite Controller (PSC). For more information on the DZC-8000S interface, see the *Sony PetaSite Application Interface Library DZC-8000S*, which is available from Sony.

Note: The information in this section applies only to Sony automated libraries that are network-attached through a Sony DZC-8000S interface. If you want to include Sony direct-attached B9 and B35 automated libraries or Sony direct-attached 8400 PetaSite automated libraries, you do not need this information because you do not need to create a parameters file for your library.

To Configure the Parameters File for a Sony Network-Attached Automated Library

1. Ensure that the Sony network-attached automated library is prepared for inclusion in a StorageTek ASM environment.

    Ensure that the following are true:

    • The Sony network-attached automated library is operational.

- The Sony PSC configuration file is installed and working.

2. Use the `cd`(1) command to change to the `/etc/opt/SUNWsamfs` directory.

   The parameters file can be written to any directory, but Sun recommends that you write it to `/etc/opt/SUNWsamfs`.

   When you created your `mcf` file, in "Defining the StorageTek ASM Configuration by Creating the mcf File" on page 113, you included the full path name to the parameters file in the `mcf` file. Make sure that the `mcf` file points to the correct location for the parameters file you create in this procedure.

3. Use `vi`(1) or another editor to open a file.

   For example, you could invoke `vi`(1) as follows:

   ```
   # vi sonyfile
   ```

4. Edit the Sony parameters file to consist of a list of *keyword = value* parameter lines.

   The Sony parameters file consists of a list of *keyword = value* parameter lines. The various *keyword* values identify the Sony automated libraries, the drives associated with the libraries, and the host name. All *keyword* and *value* entries are case sensitive, so enter them exactly as used in the configuration file and in the StorageTek ASM `mcf` file.

   Table 22 on page 140 shows the *keyword = value* parameters that must appear in the Sony parameters file. All parameters are required.

Table 22. Sony Network-Attached Automated Library Parameters

Parameter	Meaning
`userid` = *user-id*	For *user-id*, specify a number in the range 0 *user-id* 65535. If you specify a number other than 0, it must be the PSC ID. The `userid` parameter identifies the user during initialization of the PetaSite automated library functions.
`server` = *server_id*	For *server_id* specify the host name of the server running the PSC server code.
`sonydrive` *drive_id* = *path* [shared]	
	There must be one `sonydrive` line for every drive defined in the `mcf` file.
	For *drive_id*, specify the drive bin number as configured in the PSC configuration file.
	For *path*, specify the path to the drive as entered in the Equipment Identifier field of the StorageTek ASM `mcf` file.
	The `shared` keyword is optional. You can configure this library to share its media drives with two or more StorageTek ASM processes from two or more hosts. For more information on implementing shared drives, see "Shared Drives" on page 149 or see the `sony`(7) man page.

Comments can appear anywhere on any line, but they must begin with a pound sign (#). The system ignores characters to the right of the pound sign.

Figure 86 shows the parameters file, `/etc/opt/SUNWsamfs/sonyfile`.

Figure 86. Parameters File /etc/opt/SUNWsamfs/sonyfile

```
#
# This is file: /etc/opt/SUNWsamfs/sonyfile
#
# The userid identifies the user during initialization of
# the PetaSite library functions
#
userid = 65533
#
# europa is the hostname for the server running
# the DZC-8000S server code.
#
server = europa
```

Figure 86. Parameters File /etc/opt/SUNWsamfs/sonyfile (Continued)

```
#
# The bin numbers 1001 and 1002 are from the PSC
# configuration file.
#
sonydrive 1001 = /dev/rmt/1cbn
sonydrive 1002 = /dev/rmt/2cbn shared
```

5. Repeat this procedure and create a parameters file for each Sony network-attached library that you want to configure.

   in "Defining the StorageTek ASM Configuration by Creating the mcf File" on page 113 shows the `mcf` file that corresponds with the Sony network-attached automated library parameters file that was created in this procedure. The example `mcf` file points to file `sonyfile` in the `/etc/opt/SUNWsamfs` directory.

StorageTek ACSLS-Attached Automated Libraries

In many respects, the StorageTek ASM systems interoperate with a StorageTek ACSLS-attached automated library in a manner similar to direct-attached automated libraries. However, a StorageTek ACSLS-attached automated library requires additional steps in the installation and configuration procedure as compared to a direct-attached automated library.

The ACSLS software package supplied by StorageTek controls the automated library. Daemon software controls the StorageTek automated library through the ACSAPI interface.

To Configure the Parameters File for a StorageTek ACSLS-Attached Automated Library

1. Ensure that the StorageTek ACSLS-attached automated library is prepared for inclusion in a StorageTek ASM environment.

   Ensure that the following are true:

   - The StorageTek ACSLS automated library is operational.
   - The StorageTek ACSLS software package is installed and working.

2. Use the `cd`(1) command to change to the `/etc/opt/SUNWsamfs` directory.

   The parameters file can be written to any directory, but Sun recommends that you write it to `/etc/opt/SUNWsamfs`.

   When you created your `mcf` file, in "Defining the StorageTek ASM Configuration by Creating the mcf File" on page 113, you included the full path name to the parameters file in the `mcf` file. Make sure that the `mcf`

file points to the correct location for the parameters file you create in this procedure.

3. Use `vi`(1) or another editor to open a file.

    For example, you could invoke `vi`(1) as follows:

    ```
    # vi stk50
    ```

4. Edit the StorageTek parameters file to consist of a list of *keyword = value* parameter lines.

    Each line of the parameters file must begin with a keyword or a comment. Table 23 shows the keywords to use.

Table 23. StorageTek ACSLS-Attached Automated Library Parameters

Parameter	Meaning
`access` = *userid*	Specifies the user identification. For *userid*, enter the *userid* used by StorageTek for access control. This is an optional entry to the parameters file. If the `access` = parameter is not supplied, the access control string is a null string. This indicates that there is no *userid*.
`hostname` = *hostname*	Specifies the host name of the server. For *hostname*, enter the host name of the server running the StorageTek ACSLS interface.
`portnum` = *portnum*	Specifies the port number used for communication between ACSLS and the StorageTek ASM software. For information on what to enter for the *portnum* argument, see the `stk`(7) man page.

Table 23. StorageTek ACSLS-Attached Automated Library Parameters (Continued)

Parameter	Meaning
ssihost = *hostname*	Specifies the name of the server when you are using a multihomed StorageTek ASM server. This is the name of the StorageTek ASM server on the LAN that connects to the ACSLS host.
	Specify this directive only if you are including a multihomed StorageTek ASM server in your environment. The default is the name of the local host.
csi_hostport = *csi_port*	This firewall environment variable specifies the port to which the SSI sends its ACSLS requests on the ACSLS server. Setting this variable eliminates queries to the portmapper on the ACSLS server. Instead, it sends requests to this port on the ACSLS server.
	For *csi_port*, specify either 0 or a value such that 1024 ≤ *csi_port* ≤ 65535. Setting this variable to zero or leaving it unset causes the system to query the portmapper on the ACSLS server.

Table 23. StorageTek ACSLS-Attached Automated Library Parameters (Continued)

Parameter	Meaning
`capid` = (`acs` = *acsnum*, `lsm` = *lsmnum*, `cap` = *capnum*)	
	Specifies the CAP (Cartridge Access Port), in terms of the StorageTek library, to be used when the `export`(1M) `-f` command is specified. The `capid` description starts with an open parenthesis followed by three `keyword` = *value* pairs followed by a closing parenthesis.
	Use a comma (as shown), a colon, or a space to separate the *keyword* = *value* pairs.
	For *acsnum*, specify the ACS number for this CAP as configured in the StorageTek library.
	For *lsmnum*, specify the LSM number for this CAP as configured in the StorageTek library.
	For *capnum*, specify the CAP number for this CAP as configured in the StorageTek library.

Table 23. StorageTek ACSLS-Attached Automated Library Parameters (Continued)

Parameter	Meaning
capacity = (*index* = *value*[, *index* = *value*] . . .)	

Table 23. StorageTek ACSLS-Attached Automated Library Parameters (Continued)

Parameter	Meaning
	Sets the capacity of the cartridges supported by StorageTek. Use a comma to separate the *index* = *value* pairs and enclose them in parentheses.
	For *index*, specify the index of the `media_type` file supplied by StorageTek and located in the following ACSLS directory:

	`/export/home/ACSSS/data/`
	`internal/mixed_media/`
	`media_types.dat`

	For *value*, enter the capacity of the cartridge type in units of 1024 bytes. Table 24 shows the capacity defaults that were current at the time of the StorageTek ASM 4.1 release. In general, it is necessary only to supply a capacity entry for an index of new cartridge types or to override the capacity supported by StorageTek.
device_path_name = (`acs` = *value*, `lsm` = *value*, `panel` = *value*, `drive` = *value*) [`shared`]	

Table 23. StorageTek ACSLS-Attached Automated Library Parameters (Continued)

Parameter	Meaning
	Specifies the path to the device on the client. Specify one *device_path_name* = entry for each drive attached to this client. This parameter describes the drive within the StorageTek automated library. This description starts with an open parenthesis followed by four *keyword* = *value* pairs and a closing parenthesis.
	Use a comma (as shown), a colon, or a space to separate the *keyword* = *value* pairs. For the *value* arguments, use the information supplied by the ACSLS query drive command. Table 25 shows the *value* specifications.
	The shared keyword can follow the specification for the device path name. This specifies that the drive can be shared between two or more StorageTek ASM processes from two or more hosts. For more information on implementing shared drives, see "Shared Drives" on page 149 or see the stk(7) man page.

Table 24 shows the capacity defaults.

Table 24. Capacity Defaults

Index	Type	Capacity
0	3480	210 MB (215040)
1	3490E	800 MB (819200)
2	DD3A	10 GB (10485760)
3	DD3B	25 GB (26214400)
4	DD3C	50 GB (52428800)
5	DD3D	0 (DD3 cleaning tape)
6	DLTIII	10 GB (10485760)

Table 24. Capacity Defaults (Continued)

Index	Type	Capacity
7	DLTIV	20 GB (20971520)
8	DLTIIIXT	15 GB (15728640)
9	STK1R (9840)	20 GB (20971520)
10	STK1U	0 (STK1R cleaning tape)
11	EECART	1.6 GB (16777216)
12	JCART	0 GB (foreign label)
13	STK2P (T9940A)	60 GB (62914560)
14	STK2W	0 GB (T9940A cleaning tape)
15	KLABEL	0 GB (unsupported)
16	LTO-100G	100 GB (104857600)
17	LTO-50G	50 GB (52428800)
18	LTO-35G	35 GB (36700160)
19	LTO-10G	10 GB (10485760)
20	LTO-CLN2	0 GB (cleaning tape)
21	LTO-CLN3	0 GB (cleaning tape)
22	LTO-CLN1	0 GB (cleaning tape)
23	SDLT	110 GB (115343360)
24	LTO-CLNU	0 GB (cleaning tape)
25	Virtual	0 GB (unsupported)
26	LTO-200G	200 GB (209715200)

Table 25 shows the *value* specifications.

Table 25. The value Specifications

Value	Content
`acs`	ACS number for the drive as configured in the StorageTek library
`lsm`	LSM number for the drive as configured in the StorageTek library
`panel`	PANEL number for the drive as configured in the StorageTek library
`drive`	DRIVE number for the drive as configured in the StorageTek library

Figure 87 shows a parameters file for a StorageTek ACSLS-attached automated library:

Figure 87. Parameters File /etc/opt/SUNWsamfs/stk50

```
#
#  This is file: /etc/opt/SUNWsamfs/stk50
#
hostname = baggins
portnum = 50014
access = some_user  # No white space allowed in user_id
capacity = ( 7 = 20971520, 9 = 20971520 )
ssi_inet_port = 0
csi_hostport = 0
capid = (acs=0, lsm=1, cap=0)
/dev/rmt/0cbn = (acs=0, lsm=1, panel=0, drive=1) shared
/dev/rmt/1cbn = (acs=0, lsm=1, panel=0, drive=2)
```

5. Repeat this procedure and create a parameters file for each ACSLS-attached library that you want to configure.

Figure 78 on page 129 in "Defining the StorageTek ASM Configuration by Creating the mcf File" on page 113 shows the mcf file that corresponds with the StorageTek ACSLS-attached automated library parameters file that was created in this procedure. The example mcf file points to file stk50 in the /etc/opt/SUNWsamfs directory.

Shared Drives

Typically, the StorageTek ASM processes have exclusive control over a library's drives as declared in the host system's mcf file. In many cases, drives are defined in individual mcf files that are used by independent copies of StorageTek ASM processes. If a process is not using a drive, the drive stays idle.

The shared drives capability enables two or more mcf files to define the same drive, and this makes the drive available to more than one StorageTek ASM process. The shared drives capability enables each StorageTek ASM process to share a drive, but it does not allow the processes to share media. Each StorageTek ASM process must still maintain its own set of VSNs. Processes cannot share a single piece of media.

This feature can be useful, for example, if a library is attached to more than one host system in a StorageTek ASM environment. The shared drives capability enables you to keep the drives in a library busy. The StorageTek ASM processes coordinate the use of the drive.

You can configure some network-attached libraries to share one or all media drives between multiple StorageTek ASM processes on multiple host systems. The following types of libraries support shared drives:

• IBM 3494 libraries that use the lmcpd interface

- Sony libraries that use the DZC-8000S interface
- StorageTek ACSLS-attached libraries

Each of the preceding libraries requires you to create a parameters file. To implement one or more shared drives, make sure that the `shared` keyword is specified in the parameters file for each drive that is to be shared. The placement of the `shared` keyword is specific to each manufacturer's library, so see the preceding vendor-specific sections for more information.

By default, a cartridge in a shared drive can be idle for 60 seconds before being unloaded. To change this timing, specify the `shared_unload` directive in the `defaults.conf` file. For more information on this directive, see the `defaults.conf`(4) man page.

■ Initialize the StorageTek ASM Environment

1. Use the `samd`(1M) `config` command to initialize the StorageTek ASM environment.

   For example:

   ```
   # samd config
   ```

■ Checking the Drive Order (Optional)

Perform this step if you are archiving to removable media.

The main objective of this task is to develop a list of drive number identifiers and the tape devices to which they are correlated. Because every automated library is a little different, this step in StorageTek ASM configuration process differs from library to library.

The drive order check procedure differs depending on whether your automated library has a front panel and whether it has tape or magneto-optical drives. Use one of the following procedures to check the drive order of each library:

To Check the Drive Order of Tape or Magneto-Optical Libraries With a Front Panel

This procedure has two main phases:

- Mapping the drives to SCSI target IDs. This is accomplished through the following:

    - Visual examination of the automated library's front panel.

    - Physical examination of the drives.

    For information on the order in which the drives appear in the front panel, consult the documentation from the vendor. This differs from library to library.

    - Mapping the SCSI target IDs to tape devices by using output from the ls(1M) command. Figure 88 shows example ls(1M) output with drive identification information.

Figure 88. Using ls(1) to Retrieve Tape Device Information

```
230-gort# ls -l /dev/rmt/?
lrwxrwxrwx   1 root     root          42 Jan 10  2000 /dev/rmt/0 ->
../../devices/pci@1f,4000/scsi@2,1/st@2,0:
lrwxrwxrwx   1 root     root          42 Jan 10  2000 /dev/rmt/1 ->
../../devices/pci@1f,4000/scsi@4,1/st@5,0:
lrwxrwxrwx   1 root     root          42 Jan 10  2000 /dev/rmt/2 ->
../../devices/pci@1f,4000/scsi@4,1/st@6,0:
lrwxrwxrwx   1 root     other         40 Dec 13  2000 /dev/rmt/3 ->
../../devices/pci@1f,4000/scsi@4/st@1,0:
lrwxrwxrwx   1 root     root          40 Jun 20  2001 /dev/rmt/4 ->
../../devices/pci@1f,4000/scsi@4/st@2,0:
lrwxrwxrwx   1 root     root          40 Jun 20  2001 /dev/rmt/5 ->
../../devices/pci@1f,4000/scsi@4/st@3,0:
lrwxrwxrwx   1 root     root          40 Jun 20  2001 /dev/rmt/6 ->
../../devices/pci@1f,4000/scsi@4/st@4,0:
lrwxrwxrwx   1 root     root          40 Sep 14  2001 /dev/rmt/7 ->
../../devices/pci@1f,4000/scsi@2/st@2,0:
lrwxrwxrwx   1 root     root          40 Sep 14  2001 /dev/rmt/8 ->
../../devices/pci@1f,4000/scsi@2/st@3,0:
lrwxrwxrwx   1 root     root          40 Sep 14  2001 /dev/rmt/9 ->
../../devices/pci@1f,4000/scsi@2/st@4,0:
231-gort#
```

The procedure that follows is a framework for an iterative process. The actual steps you perform differ depending on your specific library. Consult your vendor documentation and follow this procedure to check the order of tape and magneto-optical drive devices for libraries with a front panel.

1. Use the samd(1M) start command to start the StorageTek ASM software.

   For example:

   ```
   # samd start
   ```

2. Verify the order of the drives.

   If the automated library contains more than one drive, list the drives in the mcf file in the same order that the drives are viewed by the automated library's controller. The drive order that the media changer controller recognizes can be different from the order of the devices as reported in the /var/adm/messages file.

3. Verify the order in which the drives are recognized by the automated library's controller.

   Check the SCSI target IDs or world wide numbers displayed by the control panel of the automated library. For optical drives, read the SCSI target IDs displayed on the control panel for your automated library. The order in which the drive targets are reported should be the order in which they are configured in the mcf file.

   To determine whether the drives become active when loaded with a cartridge, you can visually inspect the drives or you can use the samu(1M) utility's r display.

   Refer to your hardware maintenance manual for instructions on identifying and setting target addresses.

To Check the Drive Order of Tape Libraries Without a Front Panel

1. Use the samd(1M) start commaned to start the software.

   For example:

   ```
   # samd start
   ```

2. Use the samcmd(1M) unavail command to make the drive state unavailable to the StorageTek ASM file system.

   Use this command in the following format:

   ```
   samcmd unavail eq
   ```

   For *eq,* specify the Equipment Ordinal, as specified in the mcf file, of the drive you are testing.

For more information about the samcmd(1M) command's format, see the `samcmd`(1M) man page.

3. Use the `samload`(1M) command to load a cartridge into the drive.

   Use this command in one of the following formats:

   ```
   samload mediatype.vsn deq
   ```

   or:

   ```
   samload eq:slot deq
   ```

   Table 26 shows the arguments for these commands.

Table 26. Arguments for samcmd(1M) load

Argument	Meaning
eq	The Equipment Ordinal of the automated library being addressed as defined in the `mcf` file.
slot	The number of a storage slot in an automated library as recognized in the library catalog.
media_type	The media type. For a list of valid media types, see the `mcf`(4) man page.
vsn	The volume serial name assigned to the volume.
deq	The destination drive you are testing.

For more information about the samload(1M) command's format, see the `samload`(1M) man page.

4. Use the `mt`(1) command to determine if the correct drive responds while under StorageTek ASM control.

   Use this command in the following format:

   ```
   mt -f /dev/rmt/x status
   ```

   For *x*, specify the raw tape device entry as specified in the `mcf` file.

   Figure 89 shows `mt`(1) command output that indicates that a tape is in the drive.

Figure 89. Status Message Showing that a Tape is in a Drive

```
# mt -f /dev/rmt/0 status
DLT 7000 tape drive tape drive:
   sense key(0x2)= Not Ready   residual= 0   retries= 0
   file no= 0    block no= 0
```

If the tape did not load or the drive did not return a status, the drive might not be listed in the proper order in the `mcf`. Make sure the order is correct in the `mcf` file, and repeat this test.

5. Repeat this procedure for each drive in the library.

If your automated library contains more than one drive, list the drives in the `mcf` file in the same order that the drives are viewed by the automated library's controller. The drive order that the media changer controller recognizes can be different from the order of the devices as reported in the `/var/adm/messages` file.

Make sure you check *each* drive in a library.

If you change any information in the `mcf` file as a result of this procedure, you must propagate the changes to the rest of the system. For information on propagating `mcf` file changes, see the *StorageTek QFS and StorageTek ASM File System Administration Guide*.

To Check the Drive Order of Magneto-Optical Libraries Without a Front Panel

1. Use the `samd`(1M) `start` command to start the software.

   For example:

   ```
   # samd start
   ```

2. Use the `samcmd`(1M) `unavail` command to make the drive state unavailable to the StorageTek ASM file system.

   Use this command in the following format:

   ```
   samcmd unavail eq
   ```

   For *eq,* specify the Equipment Ordinal, as specified in the `mcf` file, of the drive you are testing.

   For more information about the samcmd(1M) command's format, see the `samcmd`(1M) man page.

3. Use the `samload`(1M) command to load a cartridge into the drive.

   Use this command in one of the following formats:

   ```
   samload mediatype.vsn deq
   ```

or:

```
samload eq:slot deq
```

Table 26 shows the arguments for these commands.

Table 27. Arguments for samcmd(1M) load

Argument	Meaning
eq	The Equipment Ordinal of the automated library being addressed as defined in the `mcf` file.
slot	The number of a storage slot in an automated library as recognized in the library catalog.
media_type	The media type. For a list of valid media types, see the `mcf`(4) man page.
partition	A side of a magneto-optical disk. The partition must be 1 or 2.
vsn	The volume serial name assigned to the volume.
deq	The destination drive you are testing.

For more information about the samload(1M) command's format, see the `samload`(1M) man page.

4. Use the `dd`(1M) command to determine if the correct drive reponds while under StorageTek ASM control.

Use this command in the following format:

```
/bin/dd if=device_path bs=2k iseek=3374 of=/tmp/foo count=10
```

For *device_path*, specify the `samst` device entry as specified in the `mcf` file.

Figure 90 shows a status message that indicates that an optical catridge is in the selected device:

Figure 90. dd(1M) Showing a Cartridge in a Drive

```
# dd if=/dev/samst/c0t3u0 bs=2k iseek=3374 of=/tmp/junk count=10
10+0 records in
10+0 records out
```

Figure 91 shows a status message that indicates that an optical catridge is not in the selected device:

Figure 91. dd(1M) Showing That a Cartridge is Not in the Drive

```
# dd if=/dev/samst/c0t5u0 bs=2k iseek=3374 of=/tmp/junk1 count=10
read: I/O error
0+0 records in
0+0 records out
```

If the optical catridge did not load or if the device returned messages like those in Figure 91, the drives might not be listed in the correct order in the `mcf` file. Make sure the order is correct in the `mcf` file, repeat this test.

5. Repeat this procedure for each drive in the library.

If your automated library contains more than one drive, list the drives in the `mcf` file in the same order that the drives are viewed by the automated library's controller. The drive order that the media changer controller recognizes can be different from the order of the devices as reported in the `/var/adm/messages` file.

Make sure you check *each* drive in a library.

If you change any information in the `mcf` file, you must propagate the changes to the rest of the system. For information on propagating `mcf` file changes, see the *StorageTek QFS and StorageTek ASM File System Administration Guide*

■ Creating the archiver.cmd File (Optional)

The archiver copies files from a StorageTek ASM file system to volumes on removable media cartridges or to disk partitions in another file system. You can tune the archiver operations to suit the types of files at your site and your site's data protection needs by creating an archiver command file to reside in `/etc/opt/SUNWsamfs/archiver.cmd`. This installation task guides you through the process of configuring an `archiver.cmd` file.

By default, the archiver automatically archives all files under all StorageTek ASM mount points. You are not required to create an `archiver.cmd` file, but archiver efficiency and performance increases if you tune the archiver to your site. The default settings for the archiver are as follows:

• The archiver archives all files to all available volumes in all configured libraries.

• The archiver makes one copy of each file.

• The archive age for all files is four minutes.

• The archive interval is 10 minutes.

To Create an archiver.cmd File

1. Use vi(1) or another editor to create file
   /etc/opt/SUNWsamfs/archiver.cmd.

2. Add directives to satisfy the archiving needs at your site.

   You can divide your archiver.cmd file into two main areas, as follows:

   • The first part of this file is for *global directives* that apply to all file
     systems defined in your mcf file. You specify these directives at the top
     of the file.

   • The second part of this file is for *file-system specific directives* that
     apply to only one file system. These directives must come after the
     global directives. For an individual file system, these directives
     override the global directives. The file-system specific directives are
     specified toward the bottom and are headed by an fs=*name* directive
     for each file system mentioned.

Certain directives are typically specified globally and others are typically
specified only for individual file systems.

Figure 92 shows a simple archiver.cmd file.

Figure 92. Simple archiver.cmd File

```
# archiver.cmd
# One file system = samfs
# One automated media library with 5 sg drives = aml

archivemeta = off  # Do not archive meta data

archmax = sg 2G  # A reasonable size for tarballs

fs = samfs
logfile = /var/opt/SUNWsamfs/log/archiver.samfs
data .
    1 -norelease 10m
    2 -norelease 30m

params
# Start scheduling archive requests in a timely, efficient manner
allsets -startage 20m -startcount 1000 -startsize 100G

# Assure that the Archive Sets are not mixed on the tapes
allsets -reserve set

# Recycling has lower priority
allsets -priority rearchive -10

# Use multiple tape drives efficiently
allsets -drivemin 10G -drivemax 20G -tapenonstop
allsets.1 -drives 3
allsets.2 -drives 2
```

Figure 92. Simple archiver.cmd File (Continued)

```
endparams

vsns
# Use all available volumes
allsets sg .*
endvsns
```

Figure 92 shows a simple `archiver.cmd` file that you can add to or change as needed. A site should need to add directives only to accommodate more archive sets, copies, and VSN usage. Figure 95 on page 161 shows a more complex `archiver.cmd` file.

For information on some directives that are commonly found in `archiver.cmd` files, see "Archiver Command File Directives" on page 158. For comprehensive information on the `archiver.cmd` directives, see the `archiver.cmd`(4) man page and see the information on the archiver in the *StorageTek ASM Storage and Archive Management Guide*.

3. Close the `archiver.cmd` file.

4. Verify the `archiver.cmd` file for correctness.

Enter the following command:

```
# archiver -lv
```

5. Correct any errors in the `archiver.cmd` file before proceeding to the next task in this installation and configuration procedure.

Archiver Command File Directives

This section shows some of the recommended `archiver.cmd` file directives.

Specifying a Log File: logfile=pathname Directive

This directive specifies the file to which the archiver writes log messages. This log file contains information about each file that is archived, rearchived, or automatically unarchived. The log consists of a list of all archived files and their location on archive media. Specify this directive as a global directive so it affects all file systems configured in your `mcf` file. This archiver log information is important in disaster recovery situations if recent metadata is not available or not trustworthy.

Determining the Number of Archive Copies: copy_number [-norelease] [archive_age] Directive

By default, the archiver creates one archive copy of each file. For better data protection, however, you should define two archive copies for each file and write the copies to physically different pieces of media.

The *copy_number* portion of this directive can be `1`, `2`, `3`, or `4`, which specifies that the archiver write from one to four archive copies. If you create more than one archive copy on more than one type of media, your data is better protected in the event that a piece of media is found to be faulty.

This directive also allows you to specify a `-norelease` option. The `-norelease` option prevents a file from being released from disk cache until *all* archive copies are made. By default, the releaser begins freeing up online disk cache when *one* archive copy is made. By specifying `-norelease`, you can avoid disk cache thrashing.

The *archive_age* specification for this directive allows you to specify the interval between the last time the file is written and when the file is archived. The interval is specified with an integer number and one of `s`, `m`, `h`, `d`, `w`, `y` to signify seconds, minutes, hours, days, weeks, or years.

Reserving Volumes: vsns and endvsns Directives

A set of reserved VSNs specifies individual VSN identifiers. These are the VSNs to be used as archive media for an archive set. As Figure 93 shows, the `vsns` and `endvsns` directives surround the VSN identifiers.

Figure 93. Fragment of an archiver.cmd File Showing Reserved VSNs

```
vsns
builds.2    sg    .*
builds.3    li    .*
support.2   sg    .*
support.3   li    .*
archive.2   sg    .*
archive.3   li    .*
samdev.1    sg    .*
samdev.2    li    .*
endvsns
```

You can accomplish the goal of creating archive copies on two different types of media by using reserved VSNs.

Determining Whether Metadata is Archived: archivemeta=on|off Directives

Depending on your file system characteristics, you might want to archive file system metadata frequently and to multiple volumes, or you might not want to archive it at all. By default, `archivemeta=on` is enabled.

File system metadata changes when files are moved to different directories or when files are renamed. If this directory information changes rapidly and is important to your site, you might want to archive it frequently and to different media types.

Depending on how frequently you want the metadata archived, the result can be excessive drive activity as archive media is loaded and unloaded. If frequent loading and unloading is not desirable, you can go to the other extreme and specify that metadata not be archived by using the `archivemeta=off` directive.

Defining Archive Sets: the Archive Set Naming Directive

By default, files are archived as part of an archive set that has the same name as the file system. You can associate files into more meaningful groups by defining archive sets. This directive has the following format:

```
archive_set_name path
```

Figure 94 shows archive set assignment directives that assign files to archive sets `audiofiles` and `xrayfiles`.

Figure 94. Archive Set Assignment Directives

```
xrayfiles medical/radiology/rochester/xrays
audiofiles net/home/cleveland/audio
```

Setting the Maximum Archive File Size: archmax=media size Directive

The `archmax=` directive specifies the maximum size of an archive file. The archiver groups user files to form this archive file. The maximum possible size of this archive file depends on your archive media's capacity, as follows:

- For tapes, the default is `archmax=512M`, which is 512 megabytes.

- For magneto-optical disks, the default is `archmax=5M`, which is 5 megabytes.

Depending on your archive media, you might want to specify that a larger or smaller archive file be written. Using the `archmax` directive can improve archiver performance by reducing the number of starts and stops to write tape marks.

Setting Miscellaneous Directives

The `archiver.cmd` file supports several other miscellaneous directives for tuning your site's archive policies. Directives are available for specifying an archive interval, the number of drives to use when archiving, and many other activities.

In addition, other directives in the `archiver.cmd` file control staging, releasing, and recycling behavior in conjunction with the `stager.cmd`, `recycler.cmd`, and `releaser.cmd` files.

For more information on all the directives that can appear in the `archiver.cmd` file, see the *StorageTek ASM Storage and Archive Management Guide*.

Advanced Archiver Command File Example

Figure 92 on page 157 shows a simple `archiver.cmd` file. Figure 95 shows a more advanced `archiver.cmd` file.

Figure 95. An Advanced archiver.cmd File

```
#### Fri Jun  8 14:44:30 CDT 2001      ####
### Implemented ReservedVSNs feature #####
### using VSNs CFX.*                   ####

interval = 1h
logfile = /opt/logs/archive.log
archmax = li 5G
archmax = sg 2G
archmax = lt 3500M
archmax = at 1G
#
#  mounted on /support
#
fs = samfs2
        1 7y
no_archive tmp
support .
        2 -norelease 4h
        3 -norelease 4h

# mounted on /builds
#
fs = samfs3
        1 10y
interval = 2h
no_archive daily
builds  .
        2 8h
        3 8h
#
# mounted on /archive
#
fs = samfs4
        1 7y
archive .
        2 1h
        3 1h
#
# mounted on /samdev
#
```

Figure 95. An Advanced archiver.cmd File (Continued)

```
fs = samfs6
        1 7y
samdev  .
        1 -norelease 1h
        2 -norelease 1h

# We're not doing .inode copies.  File system data is archived
# yearly.  Plan to use samfsdumps for restores when needed.
params
#allsets -offline_copy stageahead
allsets -offline_copy direct
builds.2 -drives 2
builds.2 -reserve set
support.2 -reserve set
samdev.1 -reserve set
samdev.1 -offline_copy none
samdev.2 -offline_copy none
endparams

vsns
builds.2        sg      .*
builds.3        li      .*
#builds.4       at      -pool rmt_pool
#
support.2       sg      .*
support.3       li      .*
#support.4      at      -pool rmt_pool
#
archive.2       sg      .*
archive.3       li      .*
#archive.4      at      -pool rmt_pool
#
samdev.1        sg      .*
samdev.2        li      .*
#
samfs2.1        i7      TAPE19
samfs3.1        i7      TAPE19
samfs4.1        i7      TAPE19
samfs6.1        i7      TAPE19
endvsns
```

■ Enabling Disk Archiving (Optional)

Disk archiving is the process of writing archive copies of file data to online disk in another file system. The file system to which the archive copies are written can be any UNIX file system. The destination file system does not have to be a StorageTek ASM file system, but the host system to which archive files are written must have at least one StorageTek ASM file system installed on it.

Disk archiving differs from traditional archiving in several ways. For example, it does not use automated libraries or removable media cartridges. You can, however, specify that one set of archive copies be written to disk and another set be written to other archive media. For additional information on disk archiving, see the *StorageTek ASM Storage and Archive Management Guide*.

If you plan to enable disk archiving, complete the following procedures:

- "To Enable Disk Archiving on the Host that Contains the Files to be Archived" on page 163. Perform this procedure on the host system that contains the files to be archived.

- "To Enable Disk Archiving on the Host to Which the Archive Copies Will be Written (Optional)". Perform this procedure on the host system to which the archive copies will be written. There must be at least one StorageTek ASM file system created on this host. If you want to create your source files and write your archive copies to the same host system, you do not need to perform this procedure.

To Enable Disk Archiving on the Host that Contains the Files to be Archived

1. Become superuser on the host system that contains the files you want to archive.

2. Use `vi`(1) or another editor to create (or to open) file `/etc/opt/SUNWsamfs/archiver.cmd`.

   If you are archiving to disk only, or if you have not yet created an `archiver.cmd` file, you create the `archiver.cmd` file in this step.

   If you created an `archiver.cmd` file in "Creating the archiver.cmd File (Optional)" on page 156, you reopen the file in this step.

3. Edit the `archiver.cmd` file to add disk archive set directives.

Figure 96 shows a fragment from an `archiver.cmd` file that defines disk archive sets.

Figure 96. /etc/opt/SUNWsamfs/archiver.cmd on the Client

```
# This is the part of the archiver.cmd file that defines
# disk archive sets.
#
params
archset1.1 -disk_archive disk01
archset2.1 -disk_archive disk02
archset3.1 -disk_archive disk03
endparams
```

For more information on specifying archive sets, see the `archiver.cmd`(4) man page or see the *StorageTek ASM Storage and Archive Management Guide*.

4. Save and close the `archiver.cmd` file.

5. Use `vi`(1) or another editor to create a file named `diskvols.conf`.

    The `diskvols.conf` file specifies the online disk directories to which the archive copies will be written.

    Note: If you are configuring a StorageTek ASM file system for the first time at your site, write the archive copies to disk in a file system that is on the same host that the source files reside on. This is because you have not yet installed the StorageTek ASM software on another host. If you configure a StorageTek ASM file system on another host at a later time, you can modify your configuration files.

    Figure 97 shows an example `diskvols.conf` file:

Figure 97. Example diskvols.conf File on the Client

```
# This is file sourceserver:/etc/opt/SUNWsamfs/diskvols.conf
# on the client.
#
# VSN_name [host_name:] path
#
disk01 otherserver:/sam/archset1
disk02 otherserver:/sam/archset2
disk03 /sam/archset3
```

Figure 97 shows a `diskvols.conf` file that archives files from three archive sets. The disk volumes named `disk01` and `disk02` reside in a file system on the server system named `otherserver`. Disk volume `disk03` resides on the same host as the files to be archived.

As Figure 97 shows, the `diskvols.conf` file can contain comment lines that begin with a pound character (#), and it must contain data in two fields: the VSN name field and the path field. You can leave the host name field blank if you are archiving to a file system that resides on the same

host system as the source files, but if specified, it must be followed by a colon character (:). Table 28 shows the information that must appear in this file.

Table 28. Format of the diskvols.conf File

Field Name	Content
VSN Name	A unique alphanumeric name for the disk VSN to receive the archive copies. Can be up to 31 characters long.
Host Name	The name of the host to which archive copies will be written. This is an optional field. If you are archiving to disk on another host, you must use this field to specify the name of the destination server to receive the archive copies.
	If a host name is specified, it must be followed by a colon (`:`).
	If you are archiving to a file system that resides on the same server as the source file system, you do not need to specify the host name.
Path	The full path, relative to the mount point, to the directory to receive the archive files. This directory must be in place before archiving can commence, and the destination file system must be mounted.
	The Path should be specified relative to the mount point. For example, if archive copies are to be written to the `vsns` directory in the `archivefs1` file system, you would specify `/archivefs1/vsns` in the Path field.
	StorageTek recommends that the destination directory be created with write permission granted only to `root`.

For more information about the `diskvols.conf` file, see the `diskvols.conf`(4) man page.

The following additional rules pertain to the `diskvols.conf` file:

- You can include comments in the `diskvols.conf` file. A pound character (#) indicates a comment, and all text to the right of the # is ignored.

- You can continue lines. To continue a line, put an apostrophe character (') at the end.

6. Save and close the `diskvols.conf` file.

7. Create directories in the file system to which the archive copies will be written.

Figure 98 shows the commands to create the directories to which archive copies will be written.

Figure 98. Creating Archive Copy Directories

```
# mkdir sam
# cd sam
# mkdir archset1
# mkdir archset2
```

8. Use the `archiver`(1M) command with its `-lv` options to verify the correctness of the `archiver.cmd`(4) file.

    Enter the following command:

```
# archiver -lv
```

The preceding command verifies the `archiver.cmd` file syntax for errors. If any are found, correct them before proceeding.

To Enable Disk Archiving on the Host to Which the Archive Copies Will be Written (Optional)

Perform this procedure only if you are writing your archive copies to a host system that is different from the host system upon which the source files reside. In this situation, you are creating a client/server environment:

- The client is the host that contains the source files.

- The server is the host to which the archive copies are written. There must be at least one StorageTek ASM file system created on the server host.

Note: If you are installing a StorageTek ASM file system for the first time at your site, you cannot use this procedure because you cannot enable the writing of archive copies to a different host. If you configure a StorageTek ASM file system on another host at a later time, you can modify your configuration files.

1. Become superuser on the server system.

    This is the system to which the archive copies will be written.

2. Use the `cd`(1) command to change to the file system to which you want to write the archive copies.

    For example:

```
# cd /ufs1
```

3. Create directories in the file system to which the archive copies will be written.

Figure 99 shows the commands to create the directories to which archive copies will be written.

Figure 99. Creating Archive Copy Directories

```
# mkdir sam
# cd sam
# mkdir archset1
# mkdir archset2
```

4. Use vi(1) or another editor to create file /etc/opt/SUNWsamfs/ diskvols.conf.

This file contains the clients and endclients directives and names the client system upon which the the files to be archived reside.

For more information on disk archiving, see the *StorageTek ASM Storage and Archive Management Guide*.

Figure 100. Example diskvols.conf File on the Server

```
# This is
# file destination_server:/etc/opt/SUNWsamfs/diskvols.conf
# on the server
#
clients
sourceserver
endclients
```

5. Save and close the diskvols.conf file.

■ Editing the defaults.conf File (Optional)

The /opt/SUNWsamfs/examples/defaults.conf file contains directives that control automated library actions in a StorageTek ASM environment. You can change these settings at any time after the initial installation. If you change the information in the defaults.conf file after the system is up and running, for example, to accommodate changes in your site's library information, you must issue commands to propagate the defaults.conf file changes to the file system. The procedures for propagating the defaults.conf file changes are described in the *StorageTek QFS and StorageTek ASM File System Administration Guide*.

Figure 101 shows lines from an example defaults.conf file. This file shows several parameters that can affect the configuration of an automated library.

Figure 101. Example defaults.conf File

```
exported_media = unavailable
attended = yes
tape = lt
log = LOG_LOCAL7
```

Figure 101. Example defaults.conf File (Continued)

```
timeout = 300
# trace
# all on
# endtrace
labels = barcodes_low
lt_delay = 10
lt_unload = 7
lt_blksize = 256
```

Another sample file is located in `/opt/SUNWsamfs/examples/defaults.conf`.

To Customize Default Values for Your Site

1. Read the `defaults.conf`(4) man page to determine the defaults you want to change.

2. Use the `cp`(1) command to copy `/opt/SUNWsamfs/examples/defaults.conf` to its functional location.

   For example:

```
# cp /opt/SUNWsamfs/examples/defaults.conf /etc/opt/SUNWsamfs/defaults.conf
```

3. Use `vi`(1) or another editor to edit the file.

   Edit the lines that control aspects of the system that you want to change. Remove the pound character (#) from column 1 of the lines you change.

4. Use the `pkill`(1M) command to send a SIGHUP signal to the `sam-fsd`(1M) daemon.

   For example:

```
# pkill -HUP sam-fsd
```

   This command restarts the `sam-fsd`(1M) daemon and enables the daemon to recognize the changes in the `defaults.conf`(4) file.

Features You Can Control From defaults.conf

The following sections describe two of the more common features you can control from this file. For more information on the `defaults.conf`(4) file, see the `defaults.conf`(4) man page.

Barcodes

If you have a tape library that uses a barcode reader, you can configure the system to set the tape label equal to the first or last characters of the barcode

label. You can accomplish this by setting the `labels` directive in the `defaults.conf` file, as shown in .

Table 29. The labels Directive in the defaults.conf File

Directive	Action
`labels = barcodes`	Uses the first six characters of the barcode as the label. This setting enables the archiver to label new media on blank media automatically if the tape is chosen. Default.
`labels = barcodes_low`	Uses the last six characters of the barcode as the label.
`labels = read`	Reads the label from the tape. This setting prevents the archiver from labeling new media automatically.

If `labels = barcodes` or `labels = barcodes_low` is in effect, the StorageTek ASM system writes a label before the write is started for any tape that is mounted for a write operation that is write enabled, unlabeled, and has a readable barcode.

Drive Timing Values

You can set the load, unload, and unload wait time for devices using the *dev*_`delay` and *dev*_`unload` directives, respectively. These directives allow you to set these times to an interval that meets your site's requirements.

The format of the *dev*_`delay` directive is as follows:

```
dev_delay = seconds
```

For *dev*, specify the device type as specified in the `mcf`(4) man page.

For *seconds*, specify an integer number specifying the minimum elapsed time between a cartridge being loaded and the same cartridge's ability to be unloaded. The default is `30`.

The format of the *dev*_`unload` parameter is as follows:

```
dev_unload = seconds
```

For *dev*, specify the device type as specified in the `mcf`(4) man page.

For *seconds*, specify an integer number for the amount of time to wait after an `unload` command is issued. This gives the automated library time to eject the cartridge, open the door, and perform other operations before the cartridge is removed. The default is `0`.

For example:

```
hp_delay = 10
lt_unload = 7
```

■ **Verifying the License and** `mcf` **Files**

At this point in the installation and configuration process, the following files exist on your StorageTek ASM server:

- `/etc/opt/SUNWsamfs/LICENSE.4.1`

- `/etc/opt/SUNWsamfs/mcf`

The procedures in this task show you how to verify the correctness of these configuration files.

To Verify the License File

1. Enter the `samcmd`(1M) `l` (lowercase L) command to verify the license file.

   The `samcmd`(1M) output includes information on features that are enabled. If the output you receive is not similar to that shown in Figure 102, return to "Enabling the StorageTek ASM Software License" on page 105.

Figure 102. Using samcmd(1M)

```
# samcmd l

License information samcmd     4.1.71 Fri Feb 27 16:24:12 2004
License: License never expires.
hostid = xxxxxxxx

License never expires

Remote sam server feature enabled

Remote sam client feature enabled

Migration toolkit feature enabled

Fast file system feature enabled

Data base feature enabled

Foreign tape support enabled

Segment feature enabled

Shared filesystem support enabled

SAN API support enabled
```

Figure 102. Using samcmd(1M) (Continued)

```
Robot type ATL 2640, P1000, or Sun L1000 Library is present and
licensed

    0 tp slots not licensed

    30 lt slots present and licensed

Robot type STK ACSLS Library is present and licensed

    0 tp slots not licensed

    500 sg slots present and licensed

    500 li slots licensed
```

To Verify the mcf File

1. Enter the sam-fsd(1M) command to verify the mcf file.

   If your mcf file is free from syntax errors, the sam-fsd(1M) output includes information about the file systems, archiving, and other system information. If your mcf file contains syntax or other errors, however, the output is similar to that shown in Figure 103.

Figure 103. Example sam-fsd(1M) Output

```
# sam-fsd
13: /dev/dsk/c1t1d0s0   10     md     samfs1   on      /dev/rdsk/
c1t1d0s0
 *** Error in line 13: Equipment name '/dev/dsk/c1t1d0s0' already
in use by eq 10
72: /dev/rmt/3cbn       45     ug     l1000   on
 *** Error in line 72: Equipment name '/dev/rmt/3cbn' already in
use by eq 44
2 errors in '/etc/opt/SUNWsamfs/mcf'
sam-fsd: Read mcf /etc/opt/SUNWsamfs/mcf failed.
```

If your mcf file has errors, refer to "Defining the StorageTek ASM Configuration by Creating the mcf File" on page 113 and to the mcf(4) man page for information on how to create this file correctly.

■ Labeling Removable Media Cartridges (Optional)

If you have standalone tape or optical devices, or if your automated library has no barcode reader, you must perform this task.

To prepare cartridges, use the tplabel(1M) command for tapes or use the odlabel(1M) command for optical disks. These commands create a cartridge label that the StorageTek ASM software can read.

The `tplabel`(1M) command has the following format:

```
tplabel -new -vsn new_vsn eq:slot
```

Table 30. Arguments for the tplabel(1M) Command

Argument	Meaning
new_vsn	The new volume serial name.
eq	The Equipment Ordinal of the automated library or manually loaded drive being addressed as defined in the `mcf` file.
slot	The number of a storage slot in an automated library as recognized in the library catalog. This argument is not applicable for manually loaded drives.

The `odlabel`(1M) command has the following format:

```
# odlabel -new -vsn new_vsn eq:slot:partition
```

Table 31. Arguments for the odlabel(1M) Command

Argument	Meaning
new_vsn	The new volume serial name.
eq	The Equipment Ordinal of the automated library or manually loaded drive being addressed as defined in the `mcf` file.
slot	The number of a storage slot in an automated library as recognized in the library catalog. This argument does not apply to manually loaded drives.
partition	A side of a magneto-optical disk. The partition must be 1 or 2.

You can use the cartridges after you issue these commands. Both the `tplabel`(1M) and the `odlabel`(1M) commands accept a `-old` option that you can use to relabel previously labeled cartridges. For more information about these commands, see the `tplabel`(1M) and `odlabel`(1M) man pages.

Example 1. The following command labels a tape:

```
# tplabel -vsn TAPE01 -new 50:0
```

Example 2. The following command labels one side of an optical disk:

```
# odlabel -vsn OPTIC01 -new 30:1:1
```

If you are not using an automated library with a barcode reader, label all cartridges manually before using the StorageTek ASM system.

If your library uses barcodes, `labels = barcodes` is set by default, and the result is that the first six characters are used for the VSN.

If your library uses barcodes, and you want the last six characters to become the VSN for the cartridge, edit the `/etc/opt/SUNWsamfs/defaults.conf` file and include the following line:

```
labels = barcodes_low
```

When the software loads a barcoded cartridge for a write operation, it writes a label on the cartridge before the write begins. The cartridge must be write enabled, unlabeled, and have a readable barcode.

■ Populating the Catalog (Optional)

Perform this step if you have a network-attached automated library configured in your StorageTek ASM environment.

After you mount the StorageTek ASM file systems, the software creates catalogs for each automated library configured in the `mcf` file. If you have a network-attached automated library, however, you need to populate the library's catalog. There are several ways to populate an automated library. The appropriate method depends on the number of volumes you want to include in the catalog.

The following sections describe various methods for populating an automated library's catalog:

- "To Populate an Automated Library With Many Volumes" on page 174. You can use this procedure for ADIC/Grau, Fujitsu LMF, Sony Network-Attached, StorageTek ACSLS-Attached, and IBM 3494 automated libraries.

- "To Populate an Automated Library With A Small Number of Volumes" on page 175. You can use this procedure for ADIC/Grau, Fujitsu LMF, Sony Network-Attached, StorageTek ACSLS-Attached, and IBM 3494 automated libraries.

- "To Populate an IBM 3494 Automated Library" on page 176. This is an additional procedure for populating an IBM 3494 library. You can use this procedure only if you are using the library as one physical library

(`access=private` in the `mcf` file). Do not use this procedure if you divided the library into multiple logical libraries.

- "To Populate a Library Quickly (StorageTek ACSLS-Attached Libraries Only)" on page 176. This is an alternative, and in some cases faster, method of populating the catalog of a StorageTek ACSLS-attached automated library.

Note: The slot position of a tape in a network-attached automated library has no relationship to the slot number of the volume in a StorageTek ASM library catalog.

To Populate an Automated Library With Many Volumes

1. Use `vi`(1) or another editor to create an input file that contains the slot number, the volume's VSN, the barcode number, and the media type.

   Note the following when creating the input file:

   - The file has four fields in each row. Each row identifies a volume. For each volume, specify the slot number, the VSN, the bar code, and the media type.

   - Use a space character or a tab character to separate the fields in this file.

   - If a VSN contains one or more space characters, enclose the VSN name in quotation marks (" ").

   Figure 104 shows example file `input_vsns`.

Figure 104. Example File input_vsns

```
0 TAPE01  "TAPE 01" lt
1 TAPE02  TAPE02  lt
2 TAPE03  TAPE03  lt
```

2. Use the `build_cat`(1M) command to create the catalog.

   The syntax for the `build_cat`(1M) command is as follows:

```
build_cat input-file catalog-file
```

Argument	Content
input-file	Specify the name of an input file. Typically, this is a file containing a list of VSNs.
catalog-file	Specify the full path to the library catalog. By default, the StorageTek ASM software creates a catalog and writes it to `/var/opt/SUNWsamfs/catalog/`*family-set-name*, where *family-set-name* is derived from the `mcf` file entry for this automated library. Alternatively, if you have specified a catalog name in the Additional Parameters field of the `mcf` file, use that catalog file name for *catalog-file*.

For example, you can specify the following `build_cat`(1M) command:

```
# build_cat input_vsns /var/opt/SUNWsamfs/catalog/grau50
```

For more information on the `build_cat`(1M) command, see the `build_cat`(1M) man page.

To Populate an Automated Library With A Small Number of Volumes

1. Use the `import`(1M) command to import catalog entries into the default catalog.

   The syntax for the `import`(1M) command is as follows:

   ```
   import -v VSN eq
   ```

Argument	Content
VSN	Specify the VSN identifier for a volume.
	If a VSN name contains one or more space characters, enclose the VSN name in quotation marks (" ").
eq	Specify the Equipment Ordinal as specified for the device in the `mcf` file.

   For example:

   ```
   # import -v TAPE01 50
   ```

   In the preceding `import`(1M) command, note the following:

   • `TAPE01` is the VSN.

- `50` is the Equipment Ordinal of the automated library as specified in the `mcf` file.

The cartridges must be physically present in the automated library for the `import`(1M) commands to be successful. If a cartridge is not present, the entry goes into the historian.

For more information on the `import`(1M) command, see the `import`(1M) man page.

2. **Repeat Step 1 for each cartridge you want to include in the catalog.**

To Populate an IBM 3494 Automated Library

1. Insert the media cartridges you want to include in this library's catalog through the mail slot.

The library automatically builds a catalog that includes the media that you put into the slot.

Note: Do not use this method to populate an IBM 3494 automated library that has been divided into multiple logical libraries. Use this method only if `access=private` in the IBM 3494 parameters file. If you have an IBM 3494 library that is divided into multiple logical libraries (`access=shared` in the IBM 3494 parameters file), use one of the following methods to populate the catalog: "To Populate an Automated Library With Many Volumes" on page 174 or "To Populate an Automated Library With A Small Number of Volumes" on page 175.

To Populate a Library Quickly (StorageTek ACSLS-Attached Libraries Only)

If you have an ACSLS-Attached library, you can use the `import`(1M) command with its `-c` and `-s` options to import from a pool of VSNs. This procedure is a faster method for populating a library catalog than the methods described in "To Populate an Automated Library With Many Volumes" on page 174 and "To Populate an Automated Library With A Small Number of Volumes" on page 175.

For more information on this, see the `import`(1M) man page. You can use this method only if you have a StorageTek ACSLS-attached automated library.

StorageTek ACSLS-Attached Automated Libraries — Common Problems and Error Messages

If errors exist in the configuration files for StorageTek ACSLS-attached automated library, the system generates several error messages. The

following examples show common problems and the messages that the system generates.

Example 1. Figure 105 shows the messages generated when there are syntax errors in the StorageTek parameters file. Check your StorageTek parameters file for syntax errors and remember that each line must begin with a keyword or a comment. For more information on the StorageTek parameters file, see the `stk`(7) man page.

Figure 105. Errors From an Incorrect StorageTek Parameters File

```
May 23 09:26:13 baggins stk-50[3854]: initialize: Syntax error in
stk configuration file line 4.
May 23 09:26:13 baggins stk-50[3854]: initialize: Syntax error in
stk configuration file line 5.
```

Example 2. Assume that you receive two sets of error messages. Figure 106 shows the first set.

Figure 106. Error Messages from a Misconfigured StorageTek Library

```
May 23 09:29:48 baggins stk-50[3854]: main: Waiting for 2
drive(s) to initialize
May 23 09:29:59 baggins stk-50[3854]: main: Waiting for 2
drive(s) to initialize
May 23 09:30:39 baggins stk-50[3854]: main: Waiting for 2
drive(s) to initialize
```

The following is the second set:

```
May 23 09:31:19 baggins stk-50[3854]: main: 2 drive(s) did not
initialize.
```

Figure 107 shows the `samu`(1M) utility's `:r` display.

Figure 107. Output Shown in samu(1M)'s :r Display

```
ty   eq   status       act   use   state     vsn
sg   51   --------p     0    0%   off
          drive set off due to ACS reported state
sg   52   --------p     0    0%   off
          drive set off due to ACS reported state
lt   61   --------p     0    0%   off
          drive set off due to ACS reported state
tp   62   ----------    0    0%   off
          empty
```

Drives that are hung in an initializing state or that do not initialize usually indicate a configuration error. Verify that ACSLS is up and running. Verify the host name. Determine whether you can you ping the host name using the `ping`(1M) command.

Check the `portnum` specification in the StorageTek parameters file. In ACSLS 5.3, for example, the default port number, 50004, is used for a different application. Try a higher port number, such as 50014.

Example 3. Figure 108 shows messages generated after the `import`(1M) command was used to import a VSN to the library catalog, but the VSN was not in the StorageTek automated library. The cartridge must be present in the ACSLS-managed automated library before the `import`(1M) command can be successful.

Figure 108. Message Generated After an Attempted import(1M)

```
May 20 15:09:33 baggins stk-50[6117]: view_media
returned:STATUS_VOLUME_NOT_IN_LIBRARY
May 20 15:09:33 baggins stk-50[6117]: add_to_cat_req: view_media:
failed:STATUS_VOLUME_NOT_IN_LIBRARY. A
```

The `sam-stkd` daemon uses the `ssi.sh` script to ensure that a copy of the SSI daemon, `ssi_so`, is running. If `ssi_so` exits, the daemon starts another. If your site has its own version of `ssi.sh`, you should modify it to wait for a `SIGTERM` signal and then exit. The daemon sends a `SIGTERM` signal to stop the process. File `/opt/SUNWsamfs/examples/ssi.sh` contains an example `ssi.sh` script. The system copies the `ssi.sh` script to `/etc/opt/SUNWsamfs/scripts/ssi.sh` during installation if one does not already exist.

■ Creating the samfs.cmd File (Optional)

You can create the `/etc/opt/SUNWsamfs/samfs.cmd` file as the place from which the system reads mount parameters. If you are configuring multiple StorageTek ASM systems with multiple mount parameters, consider creating this file.

You can specify mount parameters in the following ways:

- On the `mount`(1M) command. Mount options specified here override those specified in the `/etc/vfstab` file and in the `samfs.cmd` file.

- In the `/etc/vfstab` file. Mount options specified here override those specified in the `samfs.cmd` file.

- In the `samfs.cmd` file.

For more information about the `/etc/vfstab` file, see "Updating the /etc/ vfstab File and Creating the Mount Point" on page 179. For more information on the `mount`(1M) command, see the `mount_samfs`(1M) man page.

To Create the samfs.cmd File

1. Use vi(1) or another editor to create the samfs.cmd file.

   Create lines in the samfs.cmd file to control mounting, performance features, or other aspects of file system management. For more information on the samfs.cmd file, see the *StorageTek QFS and StorageTek ASM File System Administration Guide*, or see the samfs.cmd(4) man page.

■ Updating the /etc/vfstab File and Creating the Mount Point

The example in this procedure assumes that /samfs1 is the mount point of the samfs1 file system.

To Update the /etc/vfstab File and Create the Mount Point

1. Use vi(1) or another editor to open the /etc/vfstab file and create an entry for each StorageTek ASM file system.

   Figure 109 shows header fields and entries for a StorageTek ASM file system.

Figure 109. Example /etc/vfstab File Entries for a StorageTek ASM File System

```
#DEVICE     DEVICE    MOUNT    FS      FSCK   MOUNT    MOUNT
#TO MOUNT   TO FSCK   POINT    TYPE    PASS   AT BOOT  PARAMETERS
#
samfs1      -         /samfs1  samfs   -      yes      high=80,low=60
```

Table 32 shows the various fields in the /etc/vfstab file and their content.

Table 32. /etc/vfstab File Fields

Field	Field Title and Content
1	Device to mount. The name of the StorageTek ASM file system to mount. This must be the same as the file system's Family Set name specified in the mcf file.
2	Device to fsck(1M). Must be a dash (-) character. The dash indicates that there are no options. This prevents the Solaris system from performing an fsck(1M) on the StorageTek ASM file system. For more information about this process, see the fsck(1M) or samfsck(1M) man page.
3	Mount point. For example, /samfs1.

Table 32. /etc/vfstab File Fields (Continued)

Field	Field Title and Content
4	File system type. Must be `samfs`.
5	`fsck`(1M) pass. Must be a dash (-) character. A dash indicates that there are no options.
6	Mount at boot. Specifying `yes` in this field requests that the StorageTek ASM file system be mounted automatically at boot time. Specifying `no` in this field indicates that you do not want to mount the file system automatically. For information about the format of these entries, see the `mount_samfs`(1M) man page.
7	Mount parameters. A list of comma-separated parameters (with no spaces) that are used in mounting the file system. You can specify mount options on the `mount`(1M) command, in the `/etc/vfstab` file, or in a `samfs.cmd` file. Mount options specified on the `mount`(1M) command override those specified in the `/etc/vfstab` file and in the `samfs.cmd` file. Mount options specified in the `/etc/vfstab` file override those in the `samfs.cmd` file. For a list of available mount options, see the `mount_samfs`(1M) man page.

2. Use the `mkdir`(1M) command to create the mount point.

   For example:

```
# mkdir /samfs1
```

■ Initializing the File System

This procedure shows how to use the sammkfs(1M) command and the Family Set names that you have defined to initialize a file system.

Note: The sammkfs(1M) command sets one tuning parameter, the disk allocation unit (DAU). You cannot reset this parameter without reinitializing the file system. For information about how the DAU affects tuning, see the *StorageTek QFS and StorageTek ASM File System Administration Guide* or see the sammkfs(1M) man page.

To Initialize the File System

1. Use the sammkfs(1M) command to initialize a file system for each Family Set name defined in the mcf file.

   Figure 110 shows the command to initialize a file system with the Family Set name of samfs1.

Figure 110. Initializing Example File System samfs1

```
# sammkfs samfs1
sammkfs: Configuring file system
Building 'samfs1' will destroy the contents of devices:
              /dev/dsk/c2t0d0s3
              /dev/dsk/c2t0d0s7
Do you wish to continue? [y/N] y
total data kilobytes       = 16777728
total data kilobytes free  = 16777152
#
```

The actual numbers returned vary from file system to file system.

CAUTION: Running the sammkfs(1M) command creates a new file system. It removes all data currently contained in the partitions associated with the file system in the /etc/opt/SUNWsamfs/mcf file.

■ Mounting the File System

The mount(1M) command mounts a file system and reads the /etc/vfstab configuration file. For information on the mount(1M) command, see the mount_samfs(1M) man page.

To Mount the File System

1. Issue the `mount`(1M) command to mount the file system.

    Specify the file system mount point as the argument. For example:

    ```
    # mount samfs1
    ```

2. Issue the `mount`(1M) command with no arguments to verify the mount.

    This step confirms whether the file system is mounted and shows how to set permissions. Figure 111 shows the output from a `mount`(1M) command issued to verify whether example file system `samfs1` is mounted.

Figure 111. Using the mount(1M) Command to Verify that a File System is Mounted

```
# mount
<<< information deleted >>>
/samfs1 on samfs1 read/write/setuid/intr/largefiles/onerror=panic/dev=8001e3
on Thu Feb  5 11:01:23 2004
<<< information deleted >>>
```

3. Issue the `chmod`(1) and `chown`(1) commands to change the permissions and ownership of the file system's root directory. (Optional)

    If this is the first time the file system has been mounted, it is typical to perform this step. Figure 112 shows the commands to use to change file system permissions and ownership.

Figure 112. Using chmod(1M) and chown(1M) to Change File System Permissions and Ownership

```
# chmod 755 /samfs1
# chown root:other /samfs1
```

■ Sharing the File System With NFS Client Systems (Optional)

Perform this task if you want the StorageTek ASM file system to be NFS shared.

Run the Sun Solaris `share`(1M) command to make the file system available for mounting by remote systems. The `share`(1M) commands are typically placed in the `/etc/dfs/dfstab` file and are executed automatically by the Sun Solaris OS when you enter `init`(1M) state 3.

To NFS Share the File System

1. Use `vi`(1) or another editor to add a `share`(1M) command to the `/etc/dfs/dfstab` file.

   For example, add a line like the following to direct the Solaris OS to NFS share the new StorageTek ASM file system:

   ```
   share -F nfs -o rw=client1:client2 -d "ASM-FS" /samfs1
   ```

2. Use the `ps`(1) command to determine whether or not `nfs.server` is running.

   Figure 113 shows these commands and their output.

Figure 113. Commands and Output Showing NFS Activity

```
# ps -ef | grep nfsd
    root    694     1  0   Apr 29 ?         0:36 /usr/lib/nfs/nfsd -a 16
 en17     29996 29940  0 08:27:09 pts/5     0:00 grep nfsd
# ps -ef | grep mountd
    root    406     1  0   Apr 29 ?        95:48 /usr/lib/autofs/automountd
    root    691     1  0   Apr 29 ?         2:00 /usr/lib/nfs/mountd
 en17     29998 29940  0 08:27:28 pts/5     0:00 grep mountd
```

In Figure 113, the lines that contain `/usr/lib/nfs` indicate that the NFS server is mounted.

3. Start the NFS server. (Optional)

   Perform this step if `nfs.server` is not running.

   Use the following command:

   ```
   # /etc/init.d/nfs.server start
   ```

4. Type the `share`(1M) command at a `root` shell prompt. (Optional)

   Perform this step if you want to NFS share the file system immediately.

   If there are no NFS shared file systems when the Sun Solaris OS boots, the NFS server is not started. Figure 114 shows the commands to use to enable NFS sharing. You must change to run level 3 after adding the first share entry to this file.

Figure 114. NFS Commands

```
# init 3
# who -r
.        run-level 3  Dec 12 14:39     3    2   2
# share
-          /samfs1  -    "ASM-FS"
```

Some NFS mount parameters can affect the performance of an NFS mounted StorageTek ASM file system. You can set these parameters in the `/etc/vfstab` file as follows:

- `timeo = n`. This value sets the NFS timeout to *n* tenths of a second. The default is eleven tenths of a second. For performance purposes, StorageTek recommends using the default value. You can increase or decrease the value appropriately to your system.

- `rsize = n`. This value sets the read buffer size to *n* bytes. In NFS 2, change the default value (8192) to 32768. In NFS 3, retain the default value of 32768.

- `wsize = n`. This value sets the write buffer size to *n* bytes. In NFS 2, change the default value (8192) to 32768. In NFS 3, retain the default value of 32768.

For more information on these parameters, see the `mount_nfs`(1M) man page.

■ Mounting the File System on NFS Client Systems (Optional)

Perform this task if you have shared the file system with NFS client systems.

On the client systems, mount the server's StorageTek ASM file system at a convenient mount point.

To Mount the File System on Clients

1. On the client systems, use `vi`(1) or another editor to edit the `/etc/vfstab` file and add a line to mount the server's StorageTek ASM file system at a convenient mount point.

   The following example line mounts `server:/samfs1` on the `/samfs1` mount point:

   ```
   server:/samfs1   -   /samfs1   nfs   -   yes   hard,intr,timeo=60
   ```

   In this example, `server:/samfs1` is mounted on `/samfs1`, and information is entered into the `/etc/vfstab` file.

2. Save and close the `/etc/vfstab` file.

3. Enter the `mount`(1M) command.

   For example:

   ```
   client# mount /samfs1
   ```

The automounter can also do this, if you prefer. Follow your site procedures for adding `server :/samfs1` to your automounter maps. For more information on automounting, see the `automountd`(1M) man page.

Note: At times, there might be a significant delay in the StorageTek ASM file system's response to NFS client requests. This can occur if a requested file resides on a cartridge that must be loaded into a DLT tape drive, if all tape drives are full, or if drives are slow. As a consequence, the system might generate an error instead of retrying until the operation completes.

To avoid this situation, StorageTek recommends that clients mount the file system with either the `hard` option enabled or with the `soft`, `retrans`, and `timeo` options enabled. If you use the `soft` option, also specify `retrans=120` (or greater) and `timeo=3000`.

■ Writing Periodic Dump Files By Using samfsdump(1M)

It is important to use the `samfsdump`(1M) command periodically to create a metadata dump file.

When using the `samfsdump`(1M) command, please note the following:

- The `samfsdump`(1M) command dumps file names and inode information, not data. That is, the dump file does not include the archive data stored in your file system. The dump file does include the inode and directory structure information necessary to quickly locate the data on your archive media. This information is necessary for recovering from a file system failure. For more information on this, see the `samfsdump`(1M) man page.

- You can use the `-u` option to the `samfsdump`(1M) command to dump metadata and file data for files that have not yet been archived. A `samfsdump`(1M) dump taken using the `-u` option can be very large. The `samfsdump`(1M) command does not have any tape management or estimations as does `ufsdump`(1M). You need to weigh the tradeoffs of space and unarchived data when using the `-u` option. For more information about these commands, see the `samfsdump`(1M) and `ufsdump`(1M) man pages.

- You can use the `samfsrestore`(1M) command to restore the metadata dump file after initializing the file system if a failure occurs.

For more information about using the `samfsdump`(1M) command, see the `samfsdump`(1M) man page. Also see the information on metadata, disaster preparation, and recovery in the *StorageTek ASM, ASM-QFS, and ASM/QFS-Standalone Disaster Recovery Guide*.

The following sections describe procedures for issuing this command both automatically and manually.

To Run the samfsdump(1M) Command Automatically

1. Make an entry in the root user's `crontab` file so the `cron` daemon runs the `samfsdump`(1M) command periodically.

   Figure 115 shows a cron(1) entry.

Figure 115. cron(1) Entry to Run samfsdump(1M) Automatically

```
0 0 * * * find /csd.directory/sam -type f -mtime +7 \
-print| xargs -l1 rm -f; cd /sam; \
/opt/SUNWsamfs/sbin/samfsdump -f \
/csd.directory/sam/'date +\%y\%m\%d'
```

This example `crontab` entry uses a StorageTek ASM file system mounted on `/sam`. Replace `/csd.directory` with an existing directory of your choice. This entry causes the commands to execute each day at midnight. First, the old dumps are renamed and a new dump is created in `/csd.directory/sam/`*yymmdd*. After that, `cron`(1M) emails the `samfsdump`(1M) output to `root`.

2. Using the previous step as a guide, make similar `crontab` entries for each file system. (Optional)

   If you have multiple StorageTek ASM file systems, make similar entries for each. Make sure you save each dump in a separate file.

To Run the samfsdump(1M) Command Manually

1. Use the `cd`(1) command to go to the directory that contains the mount point for the file system.

   For example:

```
# cd /samfs1
```

   In this example, `samfs1` is a StorageTek ASM mount point.

2. Issue the `samfsdump`(1M) command.

   The following command writes the output to a file system outside of the one you are dumping:

```
# samfsdump -T -u -f /dumpster/dump.file
```

   In this example, `dump.file` is the newly created dump structure.

■ Backing Up Configuration Files (Optional)

StorageTek ASM regularly accesses several files that have been created as part of this installation and configuration procedure. Back up these files regularly to a file system that is outside the file system in which they reside. In the event of a disaster, you can restore these files from your backup copies.

Note: StorageTek strongly recommends that you back up your environment's configuration files because they will be needed in the event of a file system disaster.

The following files are among those that you should back up regularly and whenever you modify them:

- `/etc/opt/SUNWsamfs/mcf`
- `/etc/opt/SUNWsamfs/LICENSE.4.1`
- `/etc/opt/SUNWsamfs/samfs.cmd`
- /etc/opt/SUNWsamfs/archiver.cmd

For more information on the files you should protect, see the *StorageTek ASM, ASM-QFS, and ASM/QFS-Standalone Disaster Recovery Guide*.

■ Configuring the Remote Notification Facility (Optional)

The StorageTek ASM software can be configured to notify you when potential problems occur in its environment. The system sends notification messages to a management station of your choice. The Simple Management Network Protocol (SNMP) software within the software manages the exchange of information between network devices such as servers, automated libraries, and drives.

The StorageTek QFS and StorageTek ASM Management Information Base (MIB) defines the types of problems, or events, that the StorageTek QFS software can detect. The software can detect errors in configuration, `tapealert`(1M) events, and other atypical system activity. For complete information on the MIB, see /opt/SUNWsamfs/mibs/SUN-SAM-MIB.mib.

The following sections describe how to enable and how to disable remote notification.

To Enable Remote Notification

1. Ensure that the management station is configured and known to be operating correctly.

   "Verifying the Network Management Station (Optional)" on page 21 describes this prerequisite.

2. Use `vi`(1) or another editor to open file `/etc/hosts`.

    Examine the `/etc/hosts` file to ensure that the management station to which notifications should be sent is defined.

    For example, Figure 116 shows an `/etc/hosts` file that defines a management station. In this example, the management station's hostname is `mgmtconsole`.

Figure 116. Example /etc/hosts File

```
999.9.9.9        localhost
999.999.9.999    loggerhost       loghost
999.999.9.998    mgmtconsole
999.999.9.9      samserver
```

3. Save your changes to `/etc/hosts` and exit the file.

4. Use `vi`(1) or another editor to open file `/opt/SUNWsamfs/sbin/sendtrap`.

5. Locate the `TRAP_DESTINATION=`hostname` directive in `/opt/SUNWsamfs/sbin/sendtrap`.

    This line specifies that the remote notification messages be sent to port 161 of the server upon which the StorageTek ASM software is installed. Note the following:

    •   If you want to change the hostname or/and port, replace the `TRAP_DESTINATION` directive line with `TRAP_DESTINATION="`management-console-name`:`port`"`. Note the use of quotation marks (`" "`) rather than apostrophes (`' '`) in the new directive.

    •   If you want to send remote notification messages to multiple hosts, specify the directive in the following format:

```
TRAP_DESTINATION="mgmt_console_name:port [ mgmt_console_name:port]"
```

    For example:

```
TRAP_DESTINATION="localhost:161 doodle:163 mgmt_station:1162"
```

6. Locate the `COMMUNITY="public"` directive in `/etc/opt/SUNWsamfs/sbin/sendtrap`.

    This line acts as a password. It prevents unauthorized viewing or use of SNMP trap messages. Examine this line and determine the following:

    •   If your management station's community string is also set to `public`, you do not have to edit this value.

- If your management station's community string is set to a value other than `public`, edit the directive and replace `public` with the value that is used in your management station.

7. Save your changes to `/etc/opt/SUNWsamfs/sbin/sendtrap` and exit the file.

To Disable Remote Notification

The remote notification facility is enabled by default. If you want to disable remote notification, perform this procedure.

1. Use the `cp`(1) command to copy file `/opt/SUNWsamfs/examples/defaults.conf` to `/etc/opt/SUNWsamfs/defaults.conf`. (Optional)

   Perform this step if file `/etc/opt/SUNWsamfs/defaults.conf` does not exist.

2. Use `vi`(1) or another editor to open file `/etc/opt/SUNWsamfs/defaults.conf`.

   Find the line in `defaults.conf` that specifies SNMP alerts. The line is as follows:

   ```
   #alerts=on
   ```

3. Edit the line to disable SNMP alerts.

   Remove the `#` symbol and change `on` to `off`. After editing, the line is as follows:

   ```
   alerts=off
   ```

4. Save your changes to `/etc/opt/SUNWsamfs/defaults.conf` and exit the file.

5. Use the `pkill`(1M) command to send a SIGHUP signal to the `sam-fsd`(1M) daemon.

   The format for this command is as follows:

   ```
   # pkill -HUP sam-fsd
   ```

   This command restarts the `sam-fsd`(1M) daemon and enables the daemon to recognize the changes in the `defaults.conf` file.

■ Adding the Administrator Group (Optional)

By default, only the superuser can execute the StorageTek ASM administrator commands. However, during installation you can supply an administrator group name. The `pkgadd`(1M) process prompts you for this group name during StorageTek ASM installation.

Members of the administrator group can execute all administrator commands except for `star`(1M), `samfsck`(1M), `samgrowfs`(1M), `sammkfs`(1M), and `samd`(1M). The administrator commands are located in `/opt/SUNWsamfs/sbin`.

You can use the `set_admin`(1M) command to add or remove the administrator group after installing the package. This action performs the same function that occurs when you select an administrator group during the package install. You must be logged in as superuser to use the `set_admin`(1M) command. You can also undo the effect of this selection and make the programs in `/opt/SUNWsamfs/sbin` executable only by the superuser. For more information on this command, see the `set_admin`(1M) man page.

To Add the Administrator Group

1. Choose a group name or select a group that already exists within your environment.

2. Use the `groupadd`(1M) command, or edit the `/etc/group` file.

   The following is an entry from the group file designating an administrator group for the StorageTek ASM software. In this example, the `samadm` group consists of both the `adm` and `operator` users.

   ```
   samadm::1999:adm,operator
   ```

■ Configuring System Logging

The StorageTek ASM systems log errors, cautions, warnings, and other messages using the standard Sun Solaris `syslog`(3) interface. By default, the StorageTek ASM facility is `local7`.

To Enable Logging

1. Use vi(1) or another editor to open the `/etc/syslog.conf` file.

   Read in the line from the following file:

   ```
   /opt/SUNWsamfs/examples/syslog.conf_changes
   ```

The line is similar, if not identical, to the following line:

```
local7.debug   /var/adm/sam-log
```

Note: The preceding entry is all one line and has a TAB character (not a space) between the fields.

This step assumes that you want to use `local7`, which is the default. If you set logging to something other than `local7` in the `/etc/syslog.conf` file, edit the `defaults.conf` file and reset it there, too. For more information, see the `defaults.conf`(4) man page.

2. Use commands to append the logging line from `/opt/SUNWsamfs/examples/syslog.conf_changes` to your `/etc/syslog.conf` file.

   Figure 117 shows the commands to use to append the logging lines.

Figure 117. Using cp(1) and cat(1) to Append Logging Lines to /etc/syslog.conf

```
# cp /etc/syslog.conf /etc/syslog.conf.orig
# cat /opt/SUNWsamfs/examples/syslog.conf_changes >> /etc/syslog.conf
```

3. Create an empty log file and send the `syslogd` a HUP signal.

   Figure 118 shows the command sequence to create a log file in `/var/adm/sam-log` and send the HUP to `syslogd`.

Figure 118. Creating an Empty Log File and Sending a HUP Signal to syslogd

```
# touch /var/adm/sam-log
# pkill -HUP syslogd
```

For more information, see the `syslog.conf`(4) and `syslogd`(1M) man pages.

4. Use the `log_rotate.sh`(1M) command to enable log file rotation. (Optional)

   Log files can become very large, and the `log_rotate.sh`(1M) command can help in managing log files. For more information, see the `log_rotate.sh`(1M) man page.

■ Configuring Other StorageTek Products (Optional)

The StorageTek ASM installation and configuration process is complete. You can configure other StorageTek ASM products at this time. For example, if you want to configure StorageTek ASM-Remote, see the *StorageTek ASM Remote Administration Guide*.

StorageTek ASM Upgrade Procedure

<div style="text-align: right">6</div>

This chapter explains how to upgrade a server to a new release of the StorageTek ASM software. Use this procedure if you are upgrading your StorageTek ASM environment. You must perform all the tasks in this chapter as superuser.

The main tasks, which must be completed in order, are as follows:

■ Ensuring that the Installation Prerequisites are Met

The chapter called "System Requirements and Preinstallation Tasks" on page 1 describes the items you need to verify before you upgrade to the StorageTek ASM 4.1 release. If you have not yet completed the system verification steps, complete them now before you proceed. The steps described in that chapter for verifying the system requirements for your upgrade to 4.1 are as follows:

- "Server Requirements" on page 2

- "Solaris Operating System Requirements" on page 2

- "Verifying Disk Space" on page 8

- "Verifying Removable Media Devices (Optional)" on page 9

- "Obtaining a Software License Key" on page 16

- "Obtaining the Release Files" on page 17

- "Verifying Compatibilities" on page 19

- "Verifying Requirements for the ASM QFS Manager (Optional)" on page 20

- "Verifying the Network Management Station (Optional)" on page 21

■ Backing Up Each File System (Optional)

Perform this procedure if you are currently using a version 1 superblock with either an ASM 3.5.0 system or a StorageTek ASM 4.0 system and you want to reinitialize your file systems with a version 2 superblock. In "Reinitializing and Restoring the File Systems (Optional)" on page 207, you reinitialize the file systems and restore your data.

Perform this task as a precautionary measure if you suspect that your current samfsdump(1M) file is incorrect or outdated.

The following sections explain the differences between these two superblocks and present the procedure for backing up your file systems:

- "Using the Version 1 and Version 2 Superblocks" on page 195

- "To Back Up File Systems" on page 196

Figure 119 shows using the `samfsinfo`(1M) command to retrieve information about the `samfs4` file system. The second line of output indicates that this file system is using a version 2 superblock.

Figure 119. Using samfsinfo(1M)

```
# samfsinfo samfs4
samfsinfo: filesystem samfs4 is mounted.
name:      samfs4         version:     2
time:      Sat Sep 20 08:24:34 2003
count:     1
capacity:       04b00000          DAU:          16
space:          02e22ff0
ord  eq  capacity      space   device
  0  41  04b00000   02e22ff0   /dev/dsk/c9t50020F2300010570d0s1
```

Using the Version 1 and Version 2 Superblocks

The StorageTek ASM 4.0 and 4.1 releases support both a version 1 superblock and a version 2 superblock. Only the version 2 superblock supports the following features:

- Access Control Lists (ACLs)

- Dual-sized disk allocation units (DAUs) on `mm` devices

The StorageTek ASM 4.1 release supports both the version 1 and version 2 superblocks. You can use the `sammkfs`(1M) command to create a version 2 superblock, but you cannot initialize any file systems with version 1 superblocks. In addition, it is not possible to move files from a file system with a version 2 superblock back to a file system with a version 1 superblock.

After you reinitialize a file system, you can use the `samfsrestore`(1M) command to restore files to the new file system from the dump file created in this installation task.

The following paragraphs describe the effects of these superblocks when upgrading to the StorageTek ASM file system:

- If you are upgrading from an ASM 3.5.0 system, note that the an ASM 3.5.0 software supported the version 1 superblock only. If you are upgrading from the ASM 3.5.0 release to the StorageTek ASM 4.1 release, you must back up your file systems now if you want to reinitialize these file systems with a version 2 superblock.

- If you are upgrading from a StorageTek ASM 4.0 system, note that the StorageTek ASM 4.0 file system allowed you to initialize file systems with either a version 1 or a version 2 superblock. If you want to reinitialize any of the file systems that have a version 1 superblock, and remake them with a version 2 superblock, back up these file systems now.

Note: The StorageTek ASM 4.1 software does not allow you to initialize a file system with a version 1 superblock. The StorageTek ASM 4.1 file

system only allows you to initialize file systems with the version 2 superblock.

To Back Up File Systems

1. Become superuser from a console connection. (Optional)

   If you have not already logged in as `root`, do so now.

2. Make sure that all files are archived.

   The following example assumes that `sam1` is the mount point of the file system. You can complete this step by entering a command similar to the following:

   ```
   # sfind /sam1 ! -type d ! -archived > /tmp/notarchived.list
   ```

   The preceding command finds all files that are not archived and sends the output to a file. Depending on the size of your file system, this command can take a long time to complete.

   Examine this command's output. The files in this output are those that have not been archived. If you want any of these files to appear in the dump file, archive them now before you proceed to the next step. Alternatively, you can use the `-u` option to the `samfsdump`(1M) command to dump unarchived data if you suspect some files have not yet been archived. The `-u` option can create very large dump files, however, so you need to weigh space considerations when using this option.

3. Use the `samfsdump`(1M) command to back up each StorageTek ASM file system's metadata.

   Dump each file system's metadata to a location outside the StorageTek ASM file system.

   Figure 120 assumes that you have a file system mounted at `/sam1` that you want to back up to `samfs1.dump`, which exists outside of the StorageTek ASM file systems.

Figure 120. Using samfsdump(1M)

```
# cd /sam1
# samfsdump -f /csd_dump_dir/samfs1.dump
```

The `samfsdump`(1M) command dumps file names and inode information, not data. For more information, see the `samfsdump`(1M) man page.

You must back up the metadata information for each file system, so repeat the preceding steps for each file system in your StorageTek ASM environment.

For more information about backing up your file systems, see the *ASM, ASM-QFS, and ASM/QFS-Standalone Disaster Recovery Guide*.

■ Stopping the StorageTek ASM File System

To Stop the File System

1. Use the samcmd(1M) idle command to idle the drives in your system.

   This step enables the archiver, stager, and other processes to complete current operations. Use this command in the following format:

   ```
   samcmd idle eq
   ```

   For *eq*, specify the Equipment Ordinal of a device defined in your mcf file.

   You can also idle the drives by using the samu(1M) operator utility. For more information about the samcmd(1M) command, see the samcmd(1M) man page.

   Repeat this step for each removable media drive *eq* configured in your mcf file:

2. Use the samcmd(1M) aridle command to idle the archiver. (Optional)

   Perform this step only if you are upgrading from a StorageTek ASM 4.0 system.

   For example:

   ```
   # samcmd aridle
   ```

3. Issue the samd(1M) stop command to stop all operations.

   For example:

   ```
   # samd stop
   ```

■ Unsharing the File Systems (Optional)

Perform this procedure if your StorageTek ASM file systems are NFS shared file systems.

To Unshare the File Systems

1. Use the `unshare`(1M) command on the StorageTek ASM file system.

   For example, the following command unshares the `samfs1` file system:

   ```
   # unshare samfs1
   ```

■ Unmounting the File System

There are several ways to unmount a file system. Any of the following methods can accomplish this task. The easiest method is presented first. After the file system is unmounted, you can proceed to .

To Unmount Using the umount(1M) Command

1. Using the `umount`(1M) command, unmount each StorageTek ASM file system.

   If you are unmounting a file system from a Solaris 8 or 9 OS, you can use the `-f` option to the `umount`(1M) command. The `-f` option forces a file system to unmount.

To Unmount Using the fuser(1M), kill(1), and umount(1M) Commands

If `umount`(1M) is not successful, it might be because you or another user are using files or because you or another user have changed to directories in the file system.

1. Use the `fuser`(1M) command to determine whether or not any processes are still busy.

   For example, the following command queries the `samfs1` file system:

   ```
   # fuser -uc /samfs1
   ```

2. If any processes are still busy, use the `kill`(1M) command to terminate them.

3. Using the `umount`(1M) command, unmount each StorageTek ASM file system.

To Unmount by Editing the /etc/vfstab File and Rebooting

1. Edit the `/etc/vfstab` file.

   For all StorageTek ASM file systems, change the Mount at Boot field from `yes` or `delay` to `no`.

2. Reboot your system.

■ Removing Existing StorageTek ASM Software

The following section describes how to remove StorageTek ASM software from a release prior to 4.1.

To Remove Software from a 4.0 Release

1. Use the `pkginfo`(1) command to determine which StorageTek ASM packages are installed on your system.

   For example:

   ```
   # pkginfo | grep sam
   ```

2. Use the `pkgrm`(1M) command to remove the existing StorageTek ASM software.

   You must remove all existing StorageTek ASM packages before installing the new packages. If you are using any optional StorageTek ASM packages, you should make sure that you remove these packages before removing the main `SUNWsamfs` package. The install script prompts you to confirm several of the removal steps.

   The following example command removes the `SUNWcsamf`, the `SUNWfsamf`, and the `SUNWjsamf` localized packages in addition to the `SUNWsamfs` package:

   ```
   # pkgrm SUNWcsamf SUNWfsamf SUNWjsamf SUNWsamfs
   ```

   Note: The `SUNWsamfs` package must be the last package removed. The 4.1 release does not include any localized software packages.

To Remove Software from a 3.5.0 Release

1. Use the `pkginfo`(1) command to determine which StorageTek ASM software packages are installed on your system.

   For example:

   ```
   # pkginfo | grep LSC
   ```

2. Use the `pkgrm`(1M) command to remove the existing StorageTek ASM software.

   You must remove all existing StorageTek ASM packages before installing the new packages. If you are using any optional StorageTek ASM packages, make sure that you remove these packages before you remove the main `LSCsamfs` package. The install script prompts you to confirm several of the removal steps.

   The following example removes all of the ASM 3.5.0 packages:

   ```
   # pkgrm LSCsamfs, LSCibm, LSCstk, LSCdst, LSCsony, LSCgui, LSCjre, LSCdoc,
   LSCmigkit, LSCtools, LSCremote
   ```

   Note: LSC`samfs` package must be the last package removed.

   As part of the installation process, the system copies the existing `mcf` file and the catalog files to `/etc/opt/SUNWsamfs/samfs.old.`*date*.

   Note: If you are upgrading from an ASM or ASM QFS release prior to the 4.0 release, remove any installed `LSCibm`, `LSCstk`, `LSCdst`, `LSCsony`, `LSCgui`, `LSCjre`, `LSCdoc`, `LSCmigkit`, `LSCtools` or `LSCremote` packages *prior to* removing the `LSCsamfs` package. The new 4.1 package consists of the `SUNWsamfsr` and `SUNWsamfsu` packages, which include most of the packages distributed individually prior to the 4.0 release. The only package that is still available separately is the tools package, which is now available as the `SUNWsamtp` package. Contact your StorageTek sales representative for information on obtaining the 4.1 version of the `SUNWsamtp` package.

■ Adding the Packages

The StorageTek ASM software packages use the Sun Solaris packaging utilities for adding and deleting software. The `pkgadd`(1M) command prompts you to confirm various actions necessary to upgrade the packages.

During the installation, the system detects the presence of conflicting files and prompts you to indicate whether or not you want to continue with the

installation. You can go to another window and copy the files you want to save to an alternate location.

To Add the Packages

1. Use the `cd`(1) command to change to the directory where the software package release files reside.

   When you completed your preinstallation tasks, you obtained the release files as described in "Obtaining the Release Files" on page 17. Use the `cd`(1) command to change to the directory that contains the release files. Changing to the appropriate directory differs, depending on your release media, as follows:

   - If you downloaded the release files, change to the directory to which you downloaded the files.

   - If you obtained the release files from a CD-ROM, use one of the following commands:

     - If you are installing the software on a Solaris 2.8 platform, use the following command:

   ```
   # cd /cdrom/cdrom0/2.8
   ```

     - If you are installing the software on a Solaris 2.9 platform, use the following command:

   ```
   # cd /cdrom/cdrom0/2.9
   ```

2. Use the `pkgadd`(1M) command to upgrade the `SUNWsamfsr` and `SUNWsamfsu` packages.

   For example:

   ```
   # pkgadd -d . SUNWsamfsr SUNWsamfsu
   ```

3. Enter `yes` or `y` as the answer to each of the questions.

   When you install `SUNWsamfsr` and `SUNWsamfsu`, the system asks you if you want to define an administrator group. Select `y` to accept the default (no administrator group), or select `n` if you want to define an administrator group. You can use the `set_admin`(1M) command to reset permissions on certain commands later. For more information, see the `set_admin`(1M) man page.

4. Examine `/tmp/ASM_install.log`.

   File `/tmp/ASM_install.log` is the StorageTek ASM log file.

This file should show that the `pkgadd`(1M) command added the `SUNWsamfsr` and `SUNWsamfsu` software packages. Make sure that it also installed StorageTek ASM `samst` driver. If all files installed properly, the following message appears:

```
Restarting the sysevent daemon
```

Restoring File Changes (inquiry.conf and samst.conf)

StorageTek does not guarantee correct operation with peripherals other than those included in the `/opt/SUNWsamfs/examples/inquiry.conf` file supplied with the release. The installation script compares this file with an existing one, if any, in `/etc/opt/SUNWsamfs`. Figure 121 shows the warning message issued if these files differ.

Figure 121. Warning Message for Differing inquiry.conf Files

```
inquiry.conf has been updated.
/opt/SUNWsamfs/examples/inquiry.conf is the latest version;
please add your changes and copy this file to
/etc/opt/SUNWsamfs/inquiry.conf
```

If you have modified `/kernel/drv/samst.conf`, you need to merge any changes to it that might be needed for your configuration. The installation script compares this file with an existing one, if any, in `/kernel/drv/samst.conf`. The exact error message issued if the files differ depends on your Sun Solaris OS level. Figure 122 shows the beginning of the warning message issued if these files differ.

Figure 122. Warning Messages for Differing samst.conf Files

```
samst.conf has been updated.
/opt/SUNWsamfs/examples/samst.conf is the latest version;
please add your changes and copy it to /kernel/drv/samst.conf
```

Updating the License Keys

A license key is required to run the StorageTek ASM software. For information on license keys, see "Obtaining a Software License Key" on page 16.

The StorageTek ASM software uses encrypted license keys. The license keys consist of encoded alphanumeric strings. You receive one or more license keys depending on the system configuration and the products being licensed.

To License the StorageTek ASM Software (Optional)

Perform this procedure under the following circumstances:

- If you are upgrading from the ASM 3.5.0 release.

- If you are upgrading from the StorageTek ASM 4.0 release and you have added to or changed the equipment in your enviroment.

You do not need to perform this procedure if you are upgrading from the StorageTek ASM 4.0 release to the StorageTek ASM 4.1 release with the same equipment that you used in 4.0. The system copies your 4.0 license to the correct location when the upgrade is complete.

1. Verify whether the license file exists.

   The license file is as follows:

   `/etc/opt/SUNWsamfs/LICENSE.4.1`

2. If the `/etc/opt/SUNWsamfs/LICENSE.4.1` file does not exist, create it.

3. Starting in column one, place the license key you have obtained from your ASP or from StorageTek on the first line in the `/etc/opt/SUNWsamfs/LICENSE.4.1` file.

   The key must start in column one. No other keywords, host IDs, comments, or other information can appear in the `/etc/opt/SUNWsamfs/LICENSE.4.1` file.

   The license keys allow the system to run indefinitely unless you were issued a temporary license. Use the `samcmd`(1M) `l` command to determine whether you were issued a temporary license.

■ Enabling the ASM QFS Manager (Optional)

Perform this step if you want to be able to use the StorageTek ASM QFS Manager.

The StorageTek ASM QFS Manager is an online interface to StorageTek ASM that enables you to configure many of the components in a StorageTek ASM environment. You can use this tool to control, monitor, configure, and reconfigure the environment's components.

For information on enabling the StorageTek ASM QFS Manager, see "Enabling the StorageTek ASM QFS Manager (Optional)" on page 40.

■ Verifying the License, mcf, archiver.cmd, and stager.cmd Files

The following files exist on your StorageTek ASM server:

- `/etc/opt/SUNWsamfs/LICENSE.4.1`
- `/etc/opt/SUNWsamfs/mcf`

The following additional files can also exist on your StorageTek ASM server:

- `/etc/opt/SUNWsamfs/archiver.cmd`
- `/etc/opt/SUNWsamfs/stager.cmd`

The procedures in this task show you how to verify the correctness of these files.

To Verify the License File

1. Use the `samd`(1M) `config` command to initialize the StorageTek ASM environment.

    For example:

    ```
    # samd config
    ```

2. Enter the `samcmd`(1M) `l` (lowercase L) command to verify the license file.

    The `samcmd`(1M) output includes information on features that are enabled. If the output you receive is not similar to that shown in Figure 123, return to "Updating the License Keys" on page 202.

Figure 123. Using samcmd(1M)

```
# samcmd l

License information samcmd    4.1.71 Fri Feb 27 16:24:12 2004
License: License never expires.
hostid = xxxxxxxx

License never expires

Remote sam server feature enabled

Remote sam client feature enabled

Migration toolkit feature enabled

Fast file system feature enabled

Data base feature enabled

Foreign tape support enabled

Segment feature enabled

Shared filesystem support enabled

SAN API support enabled

Robot type ATL 2640, P1000, or Sun L1000 Library is present and
licensed

    0 tp slots not licensed

    30 lt slots present and licensed

Robot type STK ACSLS Library is present and licensed

    0 tp slots not licensed

    500 sg slots present and licensed

    500 li slots licensed
```

To Verify the mcf File

1. Enter the `sam-fsd`(1M) command to verify the `mcf` file.

    If your `mcf` file is free from syntax errors, the `sam-fsd`(1M) output
    includes information about the file systems, archiving, and other system

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information. If your `mcf` file contains syntax or other errors, however, the output is similar to that shown in Figure 124.

Figure 124. Example sam-fsd(1M) Output

```
# sam-fsd
13: /dev/dsk/c1t1d0s0   10      md      samfs1  on      /dev/rdsk/
c1t1d0s0
 *** Error in line 13: Equipment name '/dev/dsk/c1t1d0s0' already
in use by eq 10
72: /dev/rmt/3cbn       45      ug      l1000   on
 *** Error in line 72: Equipment name '/dev/rmt/3cbn' already in
use by eq 44
2 errors in '/etc/opt/SUNWsamfs/mcf'
sam-fsd: Read mcf /etc/opt/SUNWsamfs/mcf failed.
```

If your `mcf` file has errors, refer to "Defining the StorageTek QFS Configuration by Creating the mcf File" on page 46 and to the `mcf`(4) man page for information on how to create this file correctly.

Note: If you change the `mcf` file after the StorageTek ASM file system is in use, you must convey the new `mcf` specifications to the StorageTek ASM software. For information on propagating `mcf` file changes to the system, see the *StorageTek QFS and StorageTek ASM File System Administration Guide*.

To Remove Tracing Directives (Optional)

Perform this procedure only if you are upgrading from StorageTek ASM 3.5.0 to StorageTek ASM 4.1.

1. Examine your `archiver.cmd` and `stager.cmd` files and look for tracing directives.

   If tracing is implemented in your `archiver.cmd` file or `stager.cmd` file, edit these files now to remove the tracing directives. All system tracing in StorageTek ASM 4.1 is implemented in the `defaults.conf` file. Archiving and tracing are inhibited if tracing directives are present in the `archiver.cmd` file or `stager.cmd` file on a 4.1 system. For more information about these files, see the `archiver.cmd`(4), `stager.cmd`(4), and `defaults.conf`(4) man pages.

2. Edit your `archiver.cmd` and `stager.cmd` files to remove all directives that start with `trace =`.

3. Edit your `defaults.conf` file to reenable tracing.

   For information on how to enable tracing, see the `defaults.conf`(4) man page.

To Verify the archiver.cmd File (Optional)

Perform this step if you have an `archiver.cmd` file. If you do not have an `archiver.cmd` file, and you are using the archiver's defaults, you do not need to perform this step.

1. Enter the `archiver`(1M) `-lv` (lowercase L) command to verify the `archiver.cmd` file. (Optional)

   The command is as follows:

   ```
   # archiver -lv
   ```

   The output from this command can be quite lengthly. Examine it and verify that the archiving directives are as expected. If you have questions, see "Creating the samfs.cmd File (Optional)" on page 61 and see the `archiver.cmd`(4) man page.

■ Modifying the /etc/vfstab File (Optional)

If you modified the /etc/vfstab file in "Unmounting the File System" on page 198, you must complete this task.

To Modify the /etc/vfstab File

1. Edit this file again, and change the Mount at Boot field for all StorageTek ASM file systems from `no` to `yes` or `delay`.

■ Reinitializing and Restoring the File Systems (Optional)

In this task, you reinitialize your file systems and restore the saved data into the new file systems. This task completes the process initiated in "Backing Up Each File System (Optional)" on page 194. To accomplish this, use the `sammkfs`(1M) and `samfsrestore`(1M) commands on each file system.

Note: The StorageTek ASM 4.1 software does not allow you to initialize a file system with a version 1 superblock. The StorageTek ASM 4.1 file system only allows file systems to be initialized with the version 2 superblock. If you are upgrading from 3.5.0, or if you are upgrading from 4.0 using version 1 superblocks, be aware that issuing a 4.1 `sammkfs`(1M) command at this point reinitializes your file system with a version 2 superblock. After the 4.1 `sammkfs`(1M) command completes, you cannot use the `backto350`(1M) command to revert to a 3.5.0 environment.

To Reinitialize and Restore the File Systems

1. Use the `samfsinfo`(1M) command to retrieve information on the file system.

   You can examine the output from the `samfsinfo`(1M) command to determine the DAU size specified on the `sammkfs`(1M) command when the file system was created. The DAU size is in the `samfsinfo`(1M) output. Use this DAU size again when you perform Step 2.

2. Use the `sammkfs`(1M) command to initialize a new StorageTek ASM file system.

   The following example `sammkfs`(1M) command reinitializes a file system named `samfs1` with StorageTek ASM 4.1 feature capabilities.

   ```
   # sammkfs samfs1
   ```

   For more information on the options to the `sammkfs`(1M) command, see the `sammkfs`(1M) man page.

3. Use the `samfsrestore`(1M) command to restore the dumped data into the new file system.

   Figure 125 assumes that you have a file system named `samfs1` (mounted at `/samfs1`) that you want to back up from files dumped to `samfs1.bak`, which exists outside of the StorageTek ASM file system.

Figure 125. Using samfsrestore(1M)

```
# cd /samfs1
# samfsrestore -f /save/samfs/samfs1.bak
```

■ Checking the File System (Optional)

If you did not perform "Reinitializing and Restoring the File Systems (Optional)" on page 207, you are encouraged to complete this task.

1. Use the `samfsck`(1M) command to check your existing file systems for inconsistancies.

   Do this for each StorageTek ASM file system.

■ Mounting the File Systems

Use the `mount`(1M) command to mount your StorageTek QFS file system.

To Mount the File System

1. Use the `mount`(1M) command to mount the file systems.

    In the following example, `samfs1` is the name of the file system to be mounted:

    ```
    # mount samfs1
    ```

■ Recompiling API-Dependent Applications (Optional)

If you are running applications that use the StorageTek ASM application programming interface (API), you need to complete this task.

Because file headers, the calling sequence, and other elements of the API can change from release to release, you should recompile all applications that depend on the API at this time.

CAUTION: Failure to recompile API-dependent applications at this point can cause your applications to generate unexpected results.

First Edition
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ASM QFS Manager Software Notes

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A

</div>
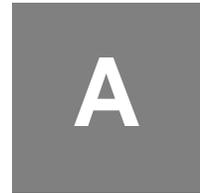
This appendix section contains additional information on using the StorageTek ASM QFS Manager. It includes the following topics:

■ Creating Additional Administrator and User Accounts

You can create additional administrator and guest accounts at any time after the initial StorageTek ASM QFS Manager Manager configuration. These guest accounts are local to the management station.

Aftering installing the StorageTek ASM QFS Manager, it creates the following two Solaris operating system (OS) login accounts and the following role:

- Accounts: `samadmin`, `samuser`
- Role: `SAMadmin`

The user account `samadmin` is assigned the `SAMadmin` role. This user has administrator privileges (read and write) for managing the StorageTek ASM QFS Manager, the StorageTek QFS software, and the StorageTek ASM software.

The user account `samuser` is assigned only `Guest` privileges. This user has read-only access to StorageTek QFS and StorageTek ASM operations.

If you remove the StorageTek ASM QFS Manager software, the system removes both the `samadmin` and `samuser` Solaris accounts and the `SAMadmin` role. However, the removal scripts do not remove any additional accounts that you create manually. It is your responsibility to use one or both of the following procedures to administer any accounts you add manually.

■ To Create Additional Administrator Accounts

An administrator account holder has administrator priviledges (read and write) for managing the StorageTek ASM QFS Manager, the StorageTek QFS software, and the StorageTek ASM software.

1. Log into the management station.

2. Type `useradd` *username*.

3. Type `passwd` *username*.

4. Type in the password as instructed on the screen.

5. Type `usermod -R SAMadmin` *username*.

Note: Do not use `root` as the *username*.

■ To Create Additional Guest Accounts

A guest account holder has read-only access to StorageTek QFS and StorageTek ASM operations.

1. Log into the management station.

2. Type `useradd` *account_name*.

3. Type `passwd` *account_name*.

4. Type in the password as instructed on the screen.

■ Removing the StorageTek ASM QFS Manager Software

The following procedures describe how to remove the StorageTek ASM QFS Manager software from a StorageTek QFS or StorageTek ASM environment. The following procedure shows you how to remove the ASM QFS Manager software from the StorageTek QFS or StorageTek ASM server.

■ To Remove the StorageTek ASM QFS Manager Software from the StorageTek QFS or StorageTek ASM Server

1. Log into the server upon which the ASM QFS Manager software is installed.

   This is the host upon which you ran the `samqfsmgr_setup` script at installation time.

2. Become superuser.

3. Remove the StorageTek ASM QFS Manager software.

   To remove all the applications that are installed with the StorageTek ASM QFS Manager software, type the following command:

   ```
   # /var/sadm/samqfsui/samqfsmgr_uninstall
   ```

   This script asks you to confirm removal of the TomCat Web Server and JRE packages.

■ Messages

This section shows some of the messages you might see when using the StorageTek ASM QFS Manager software.

Message: An unrecoverable error occurred during the page display. If the problem persists, please restart the web server.

Action Required: Click the HOME button to return to the Server Selection page, which is the default page of the StorageTek ASM QFS Manager 1.0 Application.
If the system cannot display the Server Selection page, enter the following command to restart the Web Server:

```
# /usr/sbin/smcwebserver restart
```

Message: HTTP 500 Internal server error

Action Required: Run the following command to restart the Web Server:

```
# /usr/sbin/smcwebserver restart
```

Message: The page cannot be displayed.

Action Required: Run the following command to restart the Web Server:

```
# /usr/sbin/smcwebserver restart
```

Message: Starting Sun(TM) Web Console Version 2.0.2.
Startup failed. See /var/log/webconsole/console_debug_log for detailed error information.

Action Required: Examine the contents of the following file:

```
/var/log/webconsole/console_debug_log
```

If the log says the port(6789) is in use by some other process, type commands shown in Figure 126.

Figure 126. Restarting the Web Console

```
# pkill -9 noaccess
# /usr/sbin/smcwebserver restart
```

Message: `Failed to create the filesystem`
`mount_samfs: fopen(mnttab) error: : Too many open files`

Explanation: The system generates this message if you are trying to create a file system with a large number of LUNs.

Action Required: To remedy this problem, use the following procedure:
1. Use the `ps`(1) and `grep`(1) commands to find the process ID for the `sam-mgmtrpcd` process.

   For example:

```
# ps -ef | grep sam-mgmtrpcd
```

2. Use the `plimit`(1) command to increase the descriptors for the process.

   For example:

```
# plimit -n 512 process-id
```

   For `process-id`, specify the process number.

3. Create the file system.

■ Log and Trace Files

The StorageTek ASM QFS Manager software enables logging after it is installed, but if you want tracing, you have to enable it manually. You do not need to create or modify any logging or tracing files for the StorageTek ASM QFS Manager software unless you want to enable logging for native code. Log rotation is not supported for log or trace files.

Table 33 lists the files that the StorageTek ASM QFS Manager uses for logging and tracing.

Table 33.   StorageTek ASM QFS Manager Log and Trace Files

Activity	File Location	Created by the User?
StorageTek ASM QFS Manager Logging	`/var/log/webconsole/samqfsui.log`	No
TomCat Web Console Logging	`/var/log/webconsole/console_debug_log`	No
Logging for native code	`/var/log/webconsole/` `samqfsui.trace_syslog`	Yes
Stack trace file	/var/log/webconsole/localhost_log.*yyyy-mm-dd*.txt	No
Tracing	`/var/webconsole/` `samqfsui.trace_mmdd_time`	No

The following sections describe the log and trace files.

■ StorageTek ASM QFS Manager Logging

The StorageTek ASM QFS Manager software creates the `samqfsui.log` log file when the application starts. It records information about operations that the user performs, and whether those operations were successful. Do not delete or modify this file. If you delete or modify this file, logging stops. When the webserver restarts, it erases the contents of this file and creates a new `samqfsui.log` file.

The StorageTek ASM QFS Manager software uses an additional file, `/var/webconsole/samqfsui.log.lck`, to ensure that only one process at a time writes to the log file. Do not delete or modify this lock file.

■ TomCat Web Server Logging

The Sun Common Console Framework creates the `/var/webconsole/console_debug_log` file. It includes console-specific information such as environment variable setting that the console uses and a record of users logged into the console.

If this file becomes too large, you can delete this file. The system creates another instance of this file the next time the web server restarts.

■ Tracing

The StorageTek ASM QFS Manager trace file records the following information:

- Messages regarding whether operations were successful.
- Functions invoked with the application stack. This can be verbose.
- Messages that are important to developers for debugging purposes.

Tracing is not enabled by default. Use the the following command to enable tracing or to adjust the tracing level:

```
# /opt/SUNWsamqfsui/bin/ui_tracelevel trace_level
```

For *trace_level*, specify one of the values shown in Table 34.

Table 34. Arguments for trace_level

trace_level	**Tracing Requested**
off	Disables tracing.
1	Enables tracing for very important messages only. This includes severe errors that occur within the application.
2	Enables tracing for moderately important messages. This includes level 1 messages as well as debugging statements within the application that are useful for developers.
3	Enables tracing for all messages. This includes level 1 and level 2 messages as well as entry and exit points of functions within the application on the stack.

The ui_tracelevel command creates the trace file. The trace file's name includes date and time extensions that indicate the date and time that the web server started. For example, trace file samqfsui.trace_0317_1838 is the name of the trace file created when the web server was restarted on March 17 at 6:38 PM. Do not delete this file until a different instance of a web server (for example, a web server that restarted after 6:38 PM) is running.

You can enable and disable tracing dynamically during run time by using the ui_tracelevel script.

To Enable Logging and Tracing for ASM QFS Manager Native Code

The syslog daemon performs detailed tracing of the native code. Use the following procedure to enable detailed tracing of native code.

1. Use the `touch`(1) command to create the trace file.

   For example:

   ```
   # touch /var/log/webconsole/samqfsui.trace_syslog
   ```

2. Use `vi`(1) or another editor to add the following line to the `/etc/syslog.conf` file:

   ```
   local6.debug   /var/log/webconsole/samqfsui.trace_syslog
   ```

   Use a tab character to separate the two fields in this line.

3. Type the following command:

   ```
   # pkill -HUP syslogd
   ```

4. Enable log file rotation. (Optional)

   Log files can become very large. Use `logadm`(1M) to manage the log file for the ASM QFS Manager.

   Note: You cannot use the `log_rotate.sh`(1M) script to manage the log file for the ASM QFS Manager.

■ Management Software Remote Procedure Call (RPC) Daemon Information

The following procedure provides troubleshooting information for the RPC daemon, `sam-mgmtrpcd`(1M).

To Determine Whether the RPC Daemon is Running

Perform the following procedure to verify whether or not the RPC daemon is running.

1. Log in to the StorageTek QFS or StorageTek ASM server.

2. Become superuser.

3. Type the `ps`(1) command and examine the output.

For example:

```
# ps -ef | grep rpc
```

In the ps(1) output, if you see a line with sam-mgmtrpcd(1M) in it, then the RPC daemon is up and running.

If the output shows that the RPC daemon is not running, type the following commands to start the RPC daemon and the web server:

```
# /opt/SUNWsamfs/sbin/sam-mgmtrpcd
```

Index

Symbols

115
Equipment Ordinal field
    StorageTek ASM and StorageTek ASM
        QFS Manager, 115
    StorageTek QFS, 47
Equipment Type field
    StorageTek ASM and StorageTek ASM
        QFS Manager, 116
    StorageTek QFS, 48

F

Family Set field
    StorageTek ASM and StorageTek ASM
        QFS Manager, 116
    StorageTek QFS, 48
Files
    .cshrc, 106
    .inodes, 68
    .login, 106
    .profile, 39, 106
    /etc/dfs/dfstab, 65, 182
    /etc/group, 73, 190
    /etc/name_to_major, 31
    /etc/name_to_sysnum, 30, 40, 106
    /etc/opt/SUNWsamfs/archiver.cmd,   29,
        158
    /etc/opt/SUNWsamfs/defaults.conf, 30
    /etc/opt/SUNWsamfs/inquiry.conf, 26
    /etc/opt/SUNWsamfs/LICENSE.4.0,   29,
        86, 203
    /etc/opt/SUNWsamfs/mcf, 29, 46, 113
    /etc/opt/SUNWsamfs/preview.cmd, 30
    /etc/opt/SUNWsamfs/recycler.cmd, 30
    /etc/opt/SUNWsamfs/releaser.cmd, 30
    /etc/opt/SUNWsamfs/samfs.cmd,   29,
        61, 178
    /etc/sysevent/config/SUNW,SUNWsam-
        fs,sysevent.conf, 27
    /etc/vfstab, 62, 83, 88, 120, 178, 179,
        199, 207
    /kernel/drv/samst, 27
    /kernel/drv/samst.conf, 27
    /kernel/ds/samfs, 27
    /kernel/fs/sparcv9/samfs, 27
    /kernel/sys/samsys, 27
    /kernel/sys/sparcv9/samsys, 27
    /opt/SUNWsamfs/examples/de-

faults.conf, 59, 167
    /opt/SUNWsamfs/sbin/fault_log, 28
    /opt/SUNWsamfs/sbin/sendtrap, 28
    /opt/SUNWsamfs/sbin/tapealert_log, 28
    /opt/SUNWsamfs/sbin/tapealert_trap, 28
    /var/adm/messages, 117
    /var/log/webconsole/host.conf, 27
    /var/opt/SUNWsamfs/faults, 27
    modified system files, 30
format(1M) command, 119
fsck(1M) command, 63, 179
Fujitsu LMF automated library
    configuration, 132
    fujitsulmf interface, 132
    overview, 132
    parameters file, 132, 133

G

Grau automated library, see ADIC/Grau au-
tomated library
grauaci interface, 130
group file, 73, 190
groupadd(1M) command, 73, 190
gXXX devices, 48

H

hardcopy publications, xix
http
    //www.support.storagetek.com, 209

I

IBM 3494 Libraries, 134
Inode files, 68
inquiry.conf file, 26
Installation
    StorageTek ASM QFS Manager, 91
    StorageTek ASM-QFS, 193
    StorageTek QFS, 37, 77

K

Korn shell, 39, 106

First Edition
StorageTek Protected

ABOUT STORAGETEK

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