StorageTek®

FLEXLINE™
ONLINE STORAGE SYSTEMS

INSTALLATION INSTRUCTIONS FOR LINUX
Open Systems Host Attach

PRODUCT TYPE
SOLUTIONS

FlexLine™ 200/300 Series

Installation Instructions for LINUX open systems disk host attach

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This edition contains 22 pages. See for the revision history and summary of changes made to this publication.

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Summary of Changes

Date	Edition	Description
Oct 2003	First	Initial release of the LINUX host attach instructions
Oct 2004	Second	Updates to reflect the new FlexLine terminology

LINUX - Installation Instructions   1

The following pages help assure that you order and configure a viable solution for your Intel-based PC running a LINUX operating system.

Customers and StorageTek sales or service personnel should be familiar with the Site Preparation Guide, SANtricity Storage Manager Concepts Guide, and the Storage Systems Planning Checklist for the FlexLine™ 200/300 Series storage systems.

The Quality Assurance Manager (or representative) should also be contacted ahead of the actual installation to conduct the prequalification process, and help complete the technical qualification worksheet (to ensure site readiness).

■ Introduction

This manual is organized to help plan your LINUX configuration, provide order information, and help to install and attach your storage system to the Linux host server running LINUX. The following should be used in conjunction with the Siebel configurator.

Plan your site configuration

Prior to placing an order for StorageTek storage equipment, one should make sure of the system needs. First measure the locations of each current and future host, storage system, and other network components. Fill in this form with the requested information.

✔	Parameter	Outcome
	Red Hat LINUX operating level	
	Distance between host and storage system	
	Distance between other devices	
	Number of HBAs needed (two are recommended)	
	Number of storage systems being installed	
	Number of FC cables needed	

CAUTION: On Red Hat LINUX 7.2, the storage system is limited to 500 Gigabyte volume sizes when being run with a LINUX host.

Select Host Adapter (s)

Pick the type and quantity of the QLogic fibre channel PCI Host Bus Adapters (HBAs) needed for your host systems.

Quantity	Description	Rating
	QLogic, 2310F/66 - Multi-mode optic, GBIC interface. Watch the gandalf/ctp/installation engineering web site for updates this manual.	2 Gb/sec

Note: Check the Connectivity Matrix on the Sales Community for updates to the HBAs and Drivers qualified to support the LINUX operating system.

Select the Fibre Channel Cables

Select the length of fiber optic cable and the quantity for connection to the host systems. The following are examples of optical cables for the FlexLine™ 200/ 300 Series storage systems that may be ordered through StorageTek. Write in the quantities needed.

Quantity	2 Gb FC Optical Cable Description	Part #
	10 meters (32.8 feet) LC to LC Duplex	10800221
	50 meters (164 feet) LC to LC Duplex	10800222
	100 meters (328 feet) LC to LC Duplex	10800223
Notes: Other lengths are available. Consult the Siebel Configurator.		

There are also LC to SC cables that would allow one to use a 2 Gb HBA with lower speed switches. The following cables are available in this event.

Quantity	FC Optical Cable Description	Part #
	10 meters (32.8 feet) LC to SC	10800231
	50 meters (164 feet) LC to SC	10800232
	100 meters (328 feet) LC to SC	10800233

If installing through a switch, you may be installing a set of the following.

Quantity	1 Gb FC Optical Cable Description	Part #
	10 meters (32.8 feet) SC to SC Duplex	10800134
	50 meters (164 feet) SC to SC Duplex	10800137
	100 meters (328 feet) SC to SC Duplex	10800138
Notes: Other lengths are available. Consult the Siebel Configurator.		

Check your quantities against your earlier distance measurements to ensure your order includes all cable attachments. One end mates with the HBA, and the other end, typically, mates with the storage system host interface.

LC-ended Fibre Channel short wave optical cables are used with a Small Form-factor Pluggable (SFP) Tranceivers that attach to the host minihubs.

Place your Order

The SANtricity Storage Manager GUI for LINUX does not support Host-agent management, so you must use Direct Network Management for LINUX or order Storage Manager for your particular management station (other than LINUX) for your installation.

Note: Unless there is an existing management station, cable connections to the management station should be via 10BaseT Ethernet.

Make sure that you have the following.

✔	Description
	Intel-based Server running LINUX. Check the connectivity information supplied on the Interop Tool for the latest OS support information. See Figure 1 below (best viewed at 125%).
	HBAs as recommended (certified) on the Interop Tool
	Fibre Channel optical cables to configure your storage system

Figure 1. Interop Tool
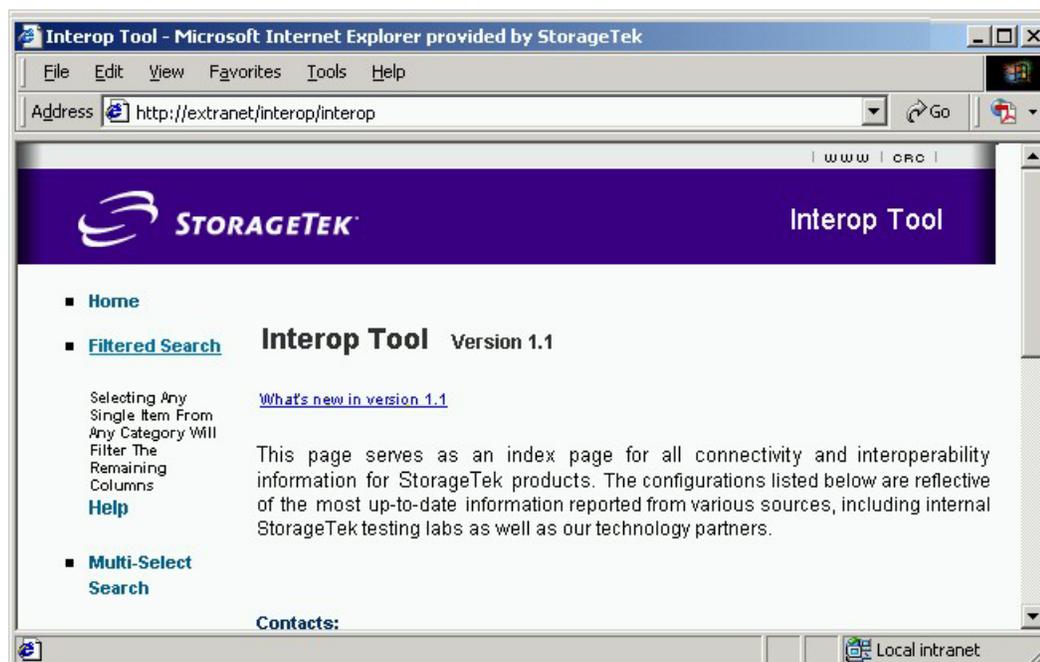
When you place a new order, a CD-ROM along with a CD insert, commonly called a Quick Start Guide will be in your storage system's host attach kit. The Quick Start Guide will walk you through your installation—first referring you to the Preconfiguration and Maintenance Setup Instructions, P/N 95966, and then to any special instructions written to support your particular operating system installation.

CD-ROM file structure

During your installation you will be asked to install files from the CD supplied in your host-attach kit. The CD is structured (in most cases) with three main folders (docs, software, and drivers). Inside the **docs** folder are subfolders with pertinent documentation. The following table shows the subfolder names.

Sales and Preinstall	Diagnostic and Service	Engineering Papers
Hardware Install Docs	Cabinet Docs	Miscellaneous
Software Install Docs	Release Notes	

Inside the **software** folder you will find install packages for client, runtime, and utilities.

Inside the **drivers** folder are your HBA drivers and configuration files, including a miscellaneous directory (misc) for special driver and failover information.

A special SMclient field CD is also available as a field tool, and it is required to fulfill your preconfiguration requirements. It has software for tasks and applications that may be necessary to upgrade your storage system.

Note: Refer also to the PDF documents and configuration and support files to assist with your installation.

■ Installation

Once you have ordered your hardware and software, read the following information on how to attach the storage system to a LINUX server.

Note: In addition to this document, reading the following recommended documents beforehand will assist with your installation.

- All documents inside the `/drivers/misc` folder
- Preconfiguration and Maintenance Setup Instructions, P/N 95966
- SANtricity Storage Manager Concepts Guide

Before You Begin

The materials needed for the installation are listed below. Check to see that you have each of these items. The following pages provide more information

about these materials (see headings) with specific steps and details on what to do.

In most cases, actual commands have been provided to help you with your installation, or help you configure or modify settings within the host or on your 200/300 Series storage system.

Before you begin, make sure you have these items:

1. An Intel-based PC or Server running LINUX

2. One or more QLogic HBAs - model 2310F (two with path failover)

Note: Watch the `CRC` as well as the `gandalf/ctp/installation` engineering web site for updates to this manual.

3. SFP Transceivers for the Control Module (Controller)

4. Fibre Channel cable(s) that will connect the host to the storage system

5. A storage system that is fully configured.

Note: If you don't have your storage system configured, you can attach your laptop (running SMclient field tool) to it or use Storage Manager 8.4x or 9.x (or better) for LINUX with the Direct Network Management software package. This will enable you to assign drives, LUNs, and volumes.

CAUTION: Unless there is already a management station, you must first setup the IP addresses on your storage system controllers via the serial port; and then use Direct Network Management from a laptop or any storage management station on the subnet.

Install the Storage System

Refer to the Site Preparation Guide and the Storage System Installation Guide, as needed.

After installing the hardware, read the Preconfiguration and Maintenance Setup Instructions, P/N 95966, and the SANtricity Storage Manager Concepts Guide. This will enable you to understand the proper configuration for the business environment, and to understand how to attach your laptop in order to configure the storage system for communication with your management station.

Note: The management station is used to configure and/or verify that the LUNs are set up as desired.

If you need more information about configuring LUNs, you may also refer to the SANtricity Storage Manager Installation Guide for LINUX.

Install SANtricity Storage Manager onto the customer's management station, and verify that the LUNs are set up as desired using your management station. Refer to the system configuration illustration on page 14.

Install the Host Components

The following instructions tell how to attach the QLA 2310F and other components onto your LINUX operating environment.

Before you perform these instructions, check to see that you:

- are running Red Hat Linux 7.2 or higher
- have the appropriate installation kit (HBAs, cables, etc.)
- know the configuration for your customer's site.

CAUTION: On Red Hat LINUX 7.2 the storage system is limited to 500 Gigabyte volume sizes when being run with a LINUX host.

1. Unless you have another management station, install Storage Manager 8.4x, 9.x (or newer). This can easily be done from the command line by typing:

   rpm -ivh *filename*

   for each package that you are installing. Make sure you install the runtime package first. Alternatively in the GUI, you can use the GUI package installers: `gnorpm (Gnome) or kpackage (KDE).` Refer to the Storage Manager Installation Guide for Netware.

   Note: If the CD does not auto-mount, it can be mounted at the mount point `/mnt/cdrom` using the command:
   `mount /dev/cdrom /mnt/cdrom.`

   The CD has three main folders (docs, software, and drivers). Inside the software folder are the Storage Manager components, with rpm files, which are used to load the software.

   The software packages are located in `/mnt/cdrom/software/`

   Note: If the software directory contains SM-tar.bin instead of .rpm files, extract the .rpm files by executing the command `SM-tar.bin` and then specify (in the command line) the directory where you want the files to be placed. Then proceed to install the needed .rpm files as explained in step one above.

2. Run Client.

   Note: If LINUX is your management station, use the following instructions.
   `Startx` (to start the GUI if needed)
   In the GUI, run `SMclient`
   or
   `Start menu >> Programs >> Utilities >> Storage Manager`

3. From your management station, verify or install the latest Firmware level to support the Storage Manager software. For example, blade system

installations currently require a minimum firmware level of: 05.46.xx.xx for BladeStore. Refer to the Sales Community and the Interop Tool for the latest FlexLine 200/300 Series connectivity information.

4. Verify or install the NVSRAM version appropriate to the hardware that you are using with the SANtricity Storage Manager software.

   Note: For example, one minimum level of NVSRAM for BladeStore Storage Manager 8.46 is N4884-546855-00x. Your particular NVSRAM level will depend on the controller (model 4884 in this case) and the software being used.

Driver Installation

Special drivers have been supplied (via CD) with your installation kit. Use the instructions included with the HBA driver to set up the drivers. Below are some instructions to help with the Qlogic driver installation on Red Hat 7.2, which may or may not help with other driver installations.

1. Copy the QLogic Driver(s) to your LINUX host.

   Insert installation CD into host CDROM drive

   Note: If the CD does not auto-mount, it can be mounted at the mount point `/mnt/cdrom` using the command:
   `mount /dev/cdrom /mnt/cdrom`

   Change directory to `/mnt/cdrom/drivers`

   Note: The following direction will work when using only the exact steps noted below.

   Follow the instructions* in the Readme file for installing the driver. *See section 5.2.1 (5.2.2 for SMP) steps 1, 5, and 6 only—for instructions on making a module (driver) from the source code that allows the use of the modprobe command (see section 8.3).

   Section 8.3 instructs you to copy the .o files to the `/lib/modules/2.4.7-10/kernel/drivers/scsi` directory.

   Note: The 2.4.7-10 in the path above refers to the kernel version that you are running under LINUX. Your kernel may be different, and may need to be substituted here.

2. Modify `/etc/modules.conf`

   Remove any lines containing:

   "alias scsi_host adapter qlogicfc (or qla2x00)"

   Add the following line.

   "options scsi_mod max_scsi_luns=32"

> **Note:** This line allows LINUX to see more than one LUN (LUN 0) per storage device in combination with creating a new ramdisk boot image in step 6 below.

3. Type: `depmod`

4. Type:
   `insmod loop`

5. Verify that the loop module is installed by using the *lsmod* command.

6. Type:

   `mkinitrd -f /boot/qlfoinitrd.img 2.4.7-10`
   or `mkinitrd -f /boot/qlfoinitrd.smp.img 2.4.7-10smp`

   > **Note:** The 2.4.7-10 in the path above refers to the kernel version that you are running under LINUX. Your kernel may be different, and may need to be substituted here.

> **Note:** The SMP kernel is for multi-processor platforms only.

7. Modify the `/etc/lilo.conf` so that it points to the ramdisk image that you just created. If not, make needed corrections.

   It is important that you duplicate the existing entry or create a new one using a different label—pointing the `initrd` entry to the new one that was created in step 6. Leave the original entry there for recovery purposes. Make the default label equal to the new label created.

8. Run `/sbin/lilo`

> **Note:** You should see the original LINUX label and your new label with an '*' by the latter.

Host Bus Adapters (HBAs) Installation

The following steps explain how to install the host adapters.

1. Quit any applications that are running and halt (down) the operating system.

2. Power off the Linux host, as appropriate.

3. Install the appropriate HBA (QLA 2310F) onto the host.

   > **Note:** There are many types of Intel-based PCs/servers. Locate the I/O card, which may be on a card module or behind an access panel. See examples below.
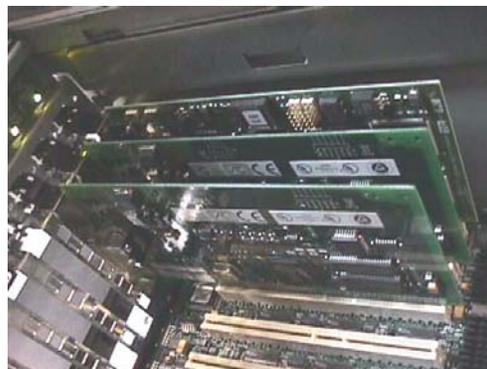
4. Power up the host.

Heterogeneous LINUX Installation Instructions

1. Set QLogic Host Adapter BIOS Settings by pressing Alt-Q on booting to access the QLogic BIOS utility, and verify settings:

In "Host Adaptor Settings"

- Frame Size = 2048

- Loop Reset Delay = 8

In "Advanced Adapter Settings"

- Execution Trottle = 255
- LUNs per Target = 0 (will be overridden by the driver)
- Enable Lip Reset = NO
- Enable Lip Full Login = YES
- Enable Target Reset = YES
- Login Retry Count = 30
- Port Down Retry Count = 12
- IOCB Allocation = 256
- >4GByte Addressing = Disabled (only used for greater than 4 Gigabytes of RAM)

Note: On the 23xx HBAs, check the extended firmware settings to verify the correct data rate and connection options.

2. Connect the storage system to the HBA(s). See next section.

Fibre Channel Cable Installation

Attach cables using the following procedures.

1. Route the fibre channel interface cables between the storage subsystem and the host or per your customer's system configuration plans.

2. Attach the fibre channel cables to the INPUT connectors on the controller's host interface cards.

The following photograph shows the controller end of the Fibre Channel (FC) shortwave (fiber-optic) cable.

Note: In most cases, FC cables attach directly to the host minihub cards via fiber-optic cables.
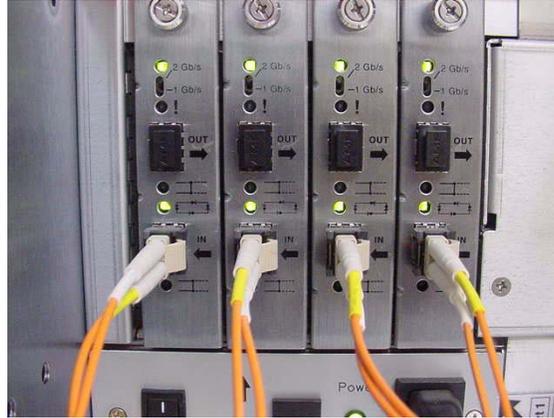
LC to LC Duplex cables using SFP connectors attach to a SFP Transceiver as shown in the following photograph.
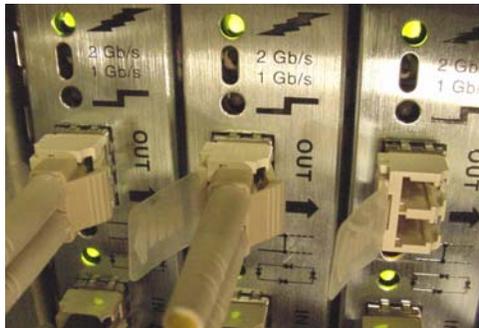
Make sure that your minihub switch speed corresponds with your HBA and switch speed. Also ensure that your host is attached to different controllers on the storage system's Control Module as shown below.

Host Minihub 1 and 3 are supported by Controller A

Host Minihub 2 and 4 are supported by Controller B
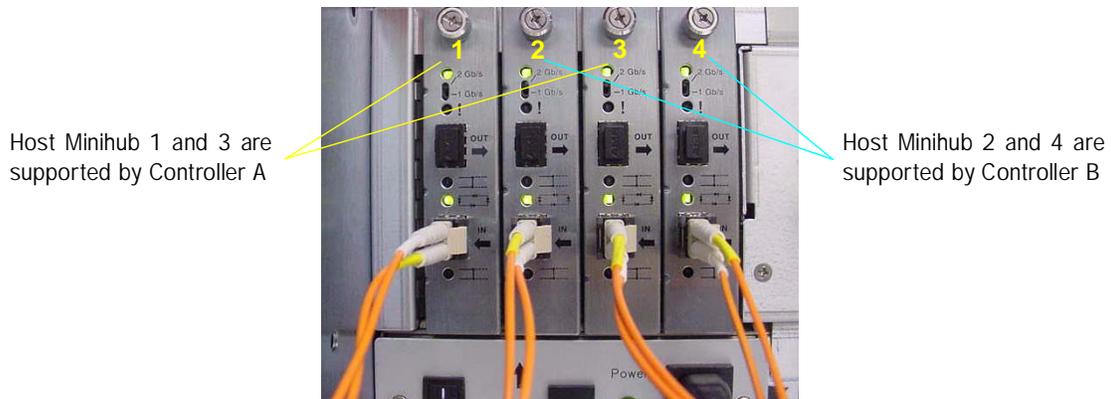
3. Connect the other end of the fibre cable to the Host Bus Adapter (HBA). See examples of LINUX server with Qlogic HBAs below.

    Note: Only certain kinds of HBAs work well. Verify that your HBA is certified to function. Use StorageTek's Interop Tool (Figure 1 on page 3) to obtain the latest connectivity/interoperability information (HBAs, drivers, and switches that are certified to work with your FlexLIne 200/300 Series storage systems).
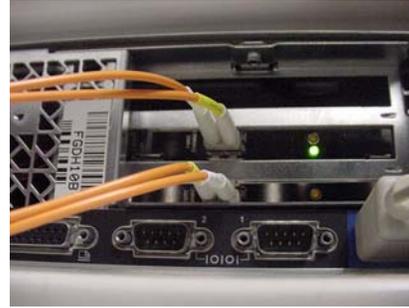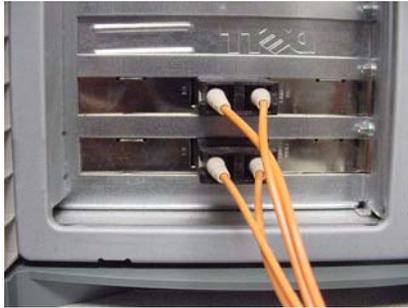
4. Continue to the Driver installation section.

Host Driver Configuration

The following instructions (below) explain how to load and configure the drivers.

1. Load the new driver by entering the following command.
    ```
    modprobe qla2300
    ```

Note: When using storage partitioning, it is important that the HBAs are defined as Host ports belonging to a host in the mappings view of the client.

2. Configure the driver settings.

    a. Without failover, go to step 3.

    b. For failover with the Qlogic driver, Qlogic has software to configure the failover paths. This software is called SANblade Manager or SANsurfer, and is downloadable from the Qlogic web site. To do this manually, modify the file named `/etc/modules.conf` according to the instructions below.

    > Add `options qla2300 ConfigRequired = 1` etc...

    Note: The default queue depth is 16. For many applications better performance is achieved by changing the queue depth to 255. This is done by adding the text "ql2xmaxqdepth=255" before "ConfigRequired," e.g.
    ```
    options qla2300 ql2xmaxqdepth=255
    ConfigRequired = 1
    ```
    etc...

=> use the Linux QLA2x00 FO Driver document and the `var/log/`messages file to create the "options" statement appropriate for your host.

Note: You can copy and paste from the messages file.

An example is provided on the CD
`/mnt/cdrom/drivers/misc/modules.conf`

Set up preferred paths, one line per HBA
Verify `qla01-control` set to 80

depmod -a

`rmmod qla2300` to remove driver w/o option

`modprobe qla2300` to install driver with options

3. Modify the `/etc/rc.modules` file by adding the line `modprobe qla2300;` or create the `rc.modules` file and add the line: `modprobe qla2300`. This file will cause the driver to load on boot.

Note: There is an example `rc.modules` file on the CD in the `/mnt/cdrom/drivers/misc` directory.

Verify that it has the executable file permissions set.

Setup the Server and Finalize the Install

1. Reboot the server, as appropriate; and verify that the drivers were automatically loaded by using the `lsmod` command.

2. Go to `/var/log/messages` to get information on configured devices

(sample lines will show up here on a later release)

Note: Configured devices are also displayed during boot-up.

3. Create a partition on each volume using the command `fdisk /dev/sd(*)`, where * is the identifier for a configured volume.

For example: `sdb, sdc`

4. Select Primary.

5. Select either 1, 2, 3, or 4 as the partition number.

6. Select start and end sectors for the partition.

7. Enter 'W' to write and exit.

8. Make file system on the partition using the command:
`mkfs -j /dev/sd*X` (where X equals the Partition Number from step 5).

> **Note:** We recommend the `-j` option to create an EXT3 file system (a journaling file system supported in the 2.4 kernel). This provides greater stability. Example: `mkfs -j /dev/sde1`
> Read your LINUX documentation for more information on the EXT3 file system. The EXT2 filesystem is not supported due to testing issues with large volumes.

9. Mount a file system.

   The following has been copied from the engineer's readme file that is on the storage system's Storage Manager for LINUX CD.

   You need to have a mount point for the volume. For each volume you can specify an entry in the `/etc/fstab` file, which will allow you to mount each device with a simple `'mount /dev/sd*X'` (the X is the partition number that you chose when you partitioned the device using 'fdisk'). This can easily and automatically be done using `'linuxconf'` in the `'access local drive'` section. If you don't have an entry in the `/etc/fstab` file, fear not; you can always `'mkdir'` a mount point and manually mount your device to that directory/mountpoint by typing something like `'mount /dev/sdc1 /newmountpoint'`.

Management Options

See the illustrations below for different ways to manage your storage system, or refer to the SANtricity Storage Manager Concepts Guide.

If you experience any problems, refer to the CD for additional support documentation.

> **Note:** The CRC, Documents on CD, and the engineering web pages will also have information that may be useful during your installation. The most recent documents (as well as tech tips, FAQs, notices and bulletins) will be on the CRC.
>
> Product information on the CRC can be obtained via:
>
>   Current Products >> Disk
>   Current Products >> Software

Install your Array Management Tool

Recommended: install Storage Manager for LINUX onto your Management Station. Refer to the SANtricity Storage Manager Concepts Guide as well as to the following illustrations.

MANAGEMENT STATION:
Intel-based HOST -
RUNNING LINUX

Fibre Channel
(I/O Path)

33569

Ethernet
(Array Management Path)
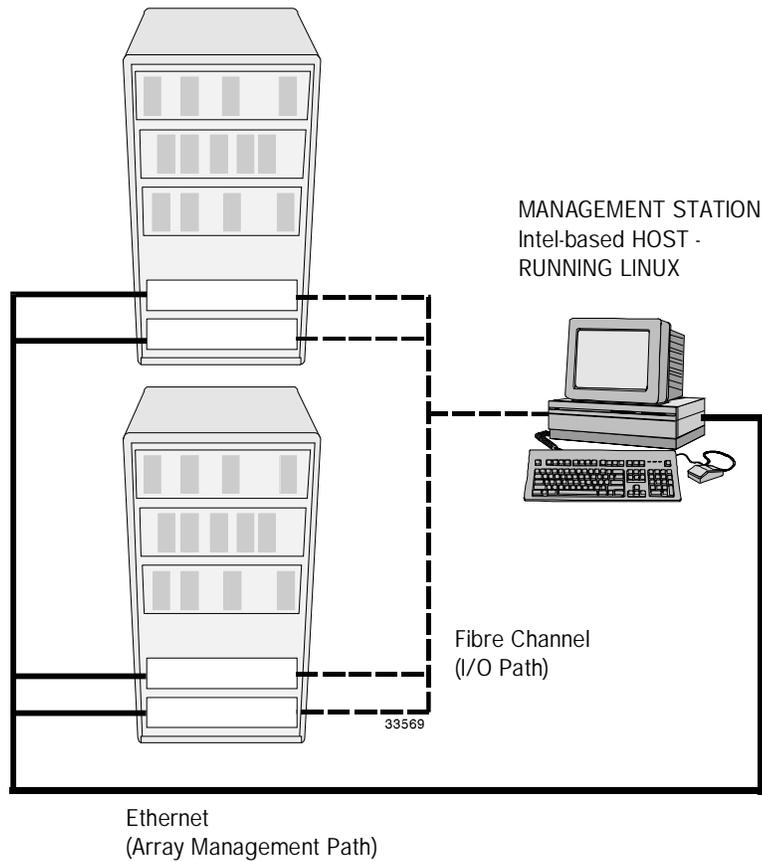
As appropriate, install Storage Manager for Windows (or other OS platform) as your Management Station.

Refer to the Concepts Guide as well as to the following illustration.
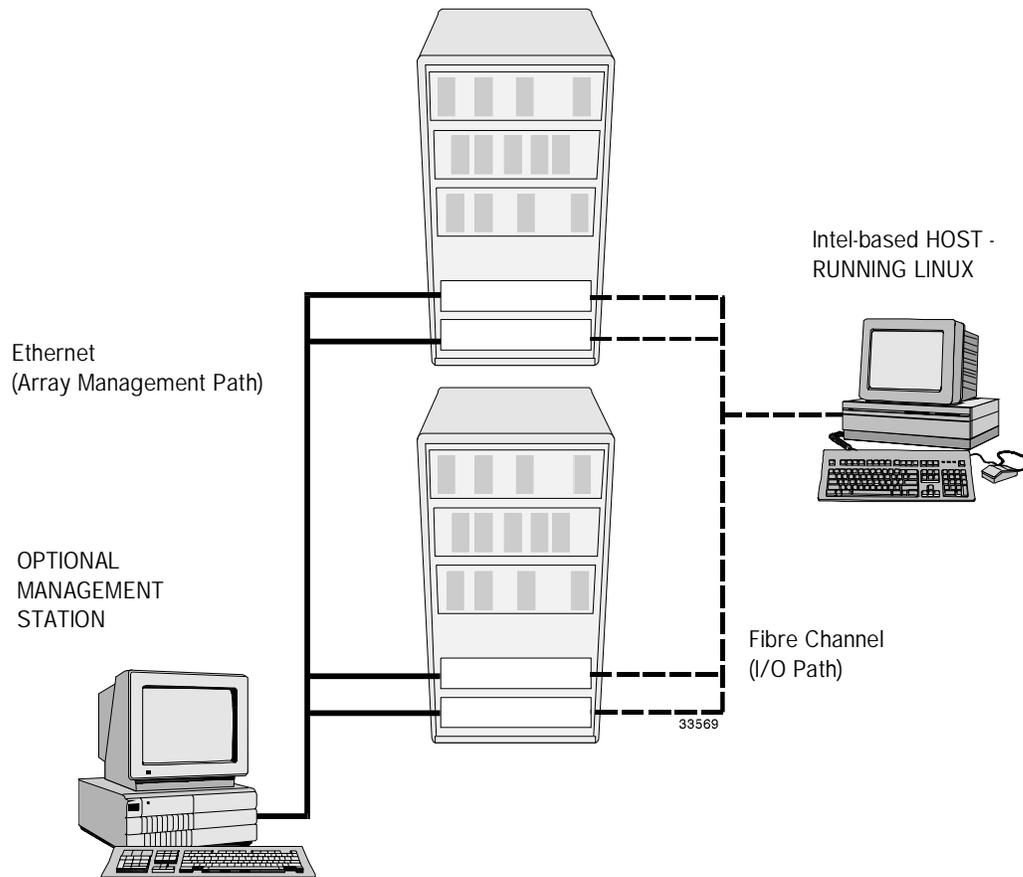
After your installation is complete, it is recommended that you monitor the CRC and the engineering web pages for updates to documentation. New releases of controller, ESM, drive firmware (drive code), and other software components may be found on the CRC.

Engineering web pages can be found at:

http://gandalf.stortek.com/ctp/

http://gandalf.stortek.com/ctp/manager/index.html

http://gandalf.stortek.com/ctp/installation/index.html

http://gandalf.stortek.com/ctp/numbers/

http://gandalf.stortek.com/ctp/zoning/

http://gandalf.stortek.com/ctp/tuning/

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