HP AlphaServer SC

Interconnect Installation and Diagnostics Manual

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This document describes how to install and maintain an AlphaServer SC Interconnect from the Hewlett-Packard Company ("HP").

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Operating System and Version:	HP Tru64 UNIX Version 5.1B, Patch Kit 3
Software Version:	Version 2.6
Maximum Node Count:	1024 nodes
Node Type:	HP AlphaServer ES45 HP AlphaServer ES40 HP AlphaServer DS20L

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- *Interconnect hardware developed by Quadrics, including switches and adapter cards*
- *Elan, which describes the PCI host adapter for use with the interconnect technology developed by Quadrics*
- *PFS or Parallel File System*
- *RMS or Resource Management System*

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Preface

Purpose of this Guide

The document describes how to install and maintain the HP AlphaServer SC Interconnect. The document includes descriptions of field replaceable units (FRUs), and information on how to replace these FRUs.

Intended Audience

This document is for those who install and maintain HP AlphaServer SC systems. Some sections may be helpful to end-users. Instructions in this document assume that you are an experienced UNIX® administrator who can configure and maintain hardware, operating systems, and networks.

Caution:

Only HP Service Personnel or other suitably qualified personnel should attempt to install or replace any component of the HP AlphaServer SC Interconnect.

According to safety regulations, the following precautions should be taken when replacing FRUs in a system:

- Remove the power cord from the AC outlet.
- Allow sufficient time (about 30 seconds) for the power capacitor to discharge.
- Wear a ground strap, and observe the appropriate antistatic procedure.

New and Changed Features

This section describes the changes in this manual for HP AlphaServer SC Version 2.6 since Version 2.5.

New Information

This manual contains the following new sections:

- Section 7.8: Drain Time Testing
- Section 7.9: Production Testing
- Section 7.10: Fat-Tree Network Maintenance

Changed Information

The following sections have been revised:

- Section 1.4: Standalone and Federated Configurations
- Section 3.1: Location of the HP AlphaServer SC Elan Adapter Card
- Section 4.4: Connecting Switch-Managing Nodes to HP AlphaServer SC 16-Port Switches
- Section 7.2: Upgrading the HP AlphaServer SC Interconnect Control Processor Software
- Section 7.3: Creating an Interconnect Configuration Using SC Viewer
- Section 7.4: Confirming the Operation of the HP AlphaServer SC Interconnect
- Section 7.7: HP AlphaServer SC Diagnostic Test Command Reference

Structure of This Guide

This document is organized as follows:

- Chapter 1: Introduction to the HP AlphaServer SC Interconnect
- Chapter 2: HP AlphaServer SC Interconnect Components
- Chapter 3: The HP AlphaServer SC Elan Adapter Card
- Chapter 4: The HP AlphaServer SC 16-Port Switch
- Chapter 5: The HP AlphaServer SC 128-Way Switch
- Chapter 6: The HP AlphaServer SC Clock Distribution Box
- Chapter 7: HP AlphaServer SC Interconnect Diagnostic Tests

- Appendix A: HP AlphaServer SC Interconnect: Field Replaceable Units (FRUs)
- Appendix B: HP AlphaServer SC Interconnect: Component Specifications
- Appendix C: Preventing Electrostatic Damage
- Appendix D: Cabinet Service Warning Label
- Appendix E: Default Wiring Topology for Federated Configurations

Terms Used in This Manual

Clusters of nodes within an HP AlphaServer SC system are called domains (except in the case of clustered management servers). However, as domain management in HP AlphaServer SC systems is based on cluster management in TruCluster Server, many of the terms used in domain management include the word "cluster" — for example, cluster alias, cluster quorum, cluster application availability (CAA), cluster root, cluster disk.

The term "LSF cluster" is used to describe a group of machines controlled by LSF. An LSF cluster can consist of one or more HP AlphaServer SC systems, or part of an HP AlphaServer SC system; it can also include additional machines of arbitrary architectures.

TruCluster Server Documentation

The *HP TruCluster* Server documentation set provides a wealth of information about clusters and cluster management; however, there are a number of differences between the management of domains in an HP AlphaServer SC system, and the management of TruCluster Server clusters. These differences are described in the *HP AlphaServer SC System Administration Guide*.

You should use the *HP TruCluster* Server documentation set to supplement the HP AlphaServer SC documentation set — if there is a conflict of information, use the instructions provided in the HP AlphaServer SC documentation set.

Related Documentation

You should have a hard copy or soft copy of the following documents:

- *HP AlphaServer SC Release Notes*
- *HP AlphaServer SC Installation Guide*
- *HP AlphaServer SC System Administration Guide*
- *HP AlphaServer SC Best Practices I/O Guide*
- *HP AlphaServer SC RMS Reference Manual*

- *HP AlphaServer SC User Guide*
- *Administering HP AlphaServer SC Platform LSF®*
- *HP AlphaServer SC Platform LSF® Reference*
- *Running Jobs with HP AlphaServer SC Platform LSF®*
- *HP AlphaServer SC Platform LSF® Quick Reference*
- HP *AlphaServer ES45 Owner's Guide*
- HP *AlphaServer ES40 Owner's Guide*
- HP *AlphaServer DS20L User's Guide*
- HP *StorageWorks HSG80 Array Controller CLI Reference Guide*
- HP *StorageWorks HSG80 Array Controller Configuration Guide*
- HP *StorageWorks Fibre Channel Storage Switch User's Guide*
- HP *StorageWorks Enterprise Virtual Array HSV Controller User Guide*
- HP *StorageWorks Enterprise Virtual Array Initial Setup User Guide*
- HP *StorageWorks Modular SAN Array 1000 User Guide*
- HP *SANworks Tru64 UNIX Kit for Enterprise Virtual Array Release Notes*
- HP *SANworks Tru64 UNIX Kit for Enterprise Virtual Array Installation and Configuration Guide*
- HP *SANworks Scripting Utility for Enterprise Virtual Array Reference Guide*
- HP *TruCluster Server Cluster Release Notes*
- HP *TruCluster Server Cluster Technical Overview*
- HP *TruCluster Server Cluster Hardware Configuration*
- HP *TruCluster Server Cluster Highly Available Applications*
- HP *Tru64 UNIX Release Notes*
- HP *Tru64 UNIX Installation Guide*
- HP *Tru64 UNIX Network Administration: Connections*
- HP *Tru64 UNIX Network Administration: Services*
- HP *Tru64 UNIX System Administration*
- HP *Tru64 UNIX System Configuration and Tuning*

- HP *Management and Configuration Guide for the HP ProCurve Series 4100GL Switches, Series 2600 Switches, and Switch 6108*
- *Summit Switch Hardware Installation Guide* from Extreme Networks, Inc.
- *ExtremeWare Software User Guide* from Extreme Networks, Inc.

Online documentation for the Message Passing Interface (MPI) is available on a `Documentation` link at `http://www-unix.mcs.anl.gov/mpi/mpich/`.

Abbreviations

Table 0–1 lists the abbreviations that are used in this document.

Table 0–1 Abbreviations

Abbreviation	Description
ATM	Asynchronous Transfer Mode
CD-ROM	Compact Disc — Read-Only Memory
CFS	Cluster File System
CPU	Central Processing Unit
DMA	Direct Memory Access
FRU	Field Replaceable Unit
HiPPI	High-Performance Parallel Interface
IP	Internet Protocol
JTAG	Joint Test Action Group
LED	Light-Emitting Diode
MPI	Message Passing Interface
NLS	Node-Level Switch
PERL	Practical Extraction and Reporting Language
PFS	Parallel File System
RAID	Redundant Array of Independent Disks
PSU	Power Supply Unit
RIS	Remote Installation Services
RMS	Resource Management System

Table 0–1 Abbreviations

Abbreviation	Description
RPM	Revolutions Per Minute
SC	SuperComputer
SCSI	Small Computer System Interface
SRM	System Resources Manager
TCL	Tool Command Language
TLS	Top-Level Switch

Documentation Conventions

Table 0–2 lists the documentation conventions that are used in this document.

Table 0–2 Documentation Conventions

Convention	Description
%	A percent sign represents the C shell system prompt.
$	A dollar sign represents the system prompt for the Bourne and Korn shells.
#	A number sign represents the superuser prompt.
P00>>>	A P00>>> sign represents the SRM console prompt.
`Monospace type`	Monospace type indicates file names, commands, system output, and user input.
Boldface type	Boldface type in interactive examples indicates typed user input. Boldface type in body text indicates the first occurrence of a new term.
Italic type	Italic (slanted) type indicates emphasis, variable values, placeholders, menu options, function argument names, and complete titles of documents.
UPPERCASE TYPE	Uppercase type indicates variable names and RAID controller commands.
Underlined type	Underlined type emphasizes important information.
< >	Angled brackets are used in screen output to indicate variable names.
[|] {|}	In syntax definitions, brackets indicate items that are optional and braces indicate items that are required. Vertical bars separating items inside brackets or braces indicate that you choose one item from among those listed.

Table 0–2 Documentation Conventions

Convention	Description
...	In syntax definitions, a horizontal ellipsis indicates that the preceding item can be repeated one or more times.
⋮	A vertical ellipsis indicates that a portion of an example that would normally be present is not shown.
cat(1)	A cross-reference to a reference page includes the appropriate section number in parentheses. For example, `cat(1)` indicates that you can find information on the `cat` command in Section 1 of the reference pages.
Ctrl/x	This symbol indicates that you hold down the first named key while pressing the key or mouse button that follows the slash.
Note	A note contains information that is of special importance to the reader.
`atlas`	`atlas` is an example system name.

HP-Specific Names and Part Numbers for Quadrics Components

Several HP AlphaServer SC Interconnect components are created by Quadrics. HP documents refer to Quadrics components using HP-specific names. Several Quadrics components also have a (different) Quadrics name. Table 0–3 shows how the HP-specific names and part numbers map to the equivalent Quadrics names.

Table 0–3 HP-Specific Names and Part Numbers for Quadrics Components

HP Part#	HP Name	Quadrics Name
3X-CCNBA-AA	HP AlphaServer SC 16-Port Switch	QM-S16
3X-CCNXA-BA	HP AlphaServer SC 128-Way Switch (new-type)	QM-S128F[1]
3X-CCNXE-CA	HP AlphaServer SC Top-Level Switch	QM-S128F[1]
3X-CCNXA-CA	HP AlphaServer SC Node-Level Switch	QM-S128F[1]
3X-CCNXA-AA	HP AlphaServer SC 128-Way Switch (old-type)	QM-S128
3X-CCNNA-AA	HP AlphaServer SC Elan Adapter Card	QM-400
3X-CCNXF-BA	HP AlphaServer SC 16-Port Switch Card (new-type)	QM-401X[2]
3X-CCNXF-AA	HP AlphaServer SC 16-Port Switch Card (old-type)	QM-401X[2]

Table 0–3 HP-Specific Names and Part Numbers for Quadrics Components

HP Part#	HP Name	Quadrics Name
3X-CCNXR-AA	HP AlphaServer SC High-Level Switch Card	QM-402[3]
3X-CCNCR-BA	HP AlphaServer SC Clock Card (new-type)	QM-408
3X-CCNCR-AA	HP AlphaServer SC Clock Card (old-type)	QM-403
3X-CCNXN-AA	HP AlphaServer SC 16-Link Null Card	QM-407
3X-CCNXP-AA	HP AlphaServer SC Interconnect Control Processor	QM-410
3X-CCNXC-AA	HP AlphaServer SC Clock Distribution Box	QM-SCLK

[1]The Quadrics part number QM-S128F corresponds to several components. The Quadrics part number refers to the basic empty chassis. Use the HP part numbers to distinguish between the different ways in which the chassis may be populated.

[2]The Quadrics part number QM-401X was not updated when this component was updated. Use the HP part number to distinguish between the new-type and old-type versions of this component.

[3]The Quadrics part number QM-402 and the HP part number 3X-CCNXR-AA were not updated when this component was updated. Use the revision number to distinguish between the new-type and old-type versions of this component.

Supported Node Types

HP AlphaServer SC Version 2.6 supports the following node types:

- HP AlphaServer ES45
- HP AlphaServer ES40
- HP AlphaServer DS20L

Multiple Domains

The example system described in this document is a 1024-node system, with 32 nodes in each of 32 domains. Therefore, the first node in each domain is Node 0, Node 32, Node 64, Node 96, and so on. To set up a different configuration, substitute the appropriate node name(s) for Node 32, Node 64, and so on in this manual.

For information about the domain types supported in HP AlphaServer SC Version 2.6, see Chapter 1 of the *HP AlphaServer SC System Administration Guide*.

Location of Online Documentation

Online documentation is located in the `/docs` directory of the *HP AlphaServer SC System Software* CD-ROM.

Comments on this Document

HP welcomes any comments and suggestions that you have on this document. Please send all comments and suggestions to your HP Customer Support representative.

1

Introduction to the HP AlphaServer SC Interconnect

This chapter provides an introduction to the HP AlphaServer SC Interconnect.

The information in this chapter is organized as follows:

- General Description (see Section 1.1 on page 1–2)
- Single-Rail and Dual-Rail Configurations (see Section 1.2 on page 1–3)
- Fat-Tree Topologies (see Section 1.3 on page 1–4)
- Standalone and Federated Configurations (see Section 1.4 on page 1–7)

1.1 General Description

The HP AlphaServer SC Interconnect provides the high-speed message passing and remote memory access capability for parallel applications.

The HP AlphaServer SC Interconnect has the following components:

- HP AlphaServer SC Interconnect switch(es)
- HP AlphaServer SC Elan adapter cards (in the nodes)
- Link cables (connecting nodes to switches, and node-level switches to top-level switches)
- JTAG cable (for HP AlphaServer SC Interconnect diagnostics and management)
- Ethernet cable (for new-type HP AlphaServer SC 128-way switches only)

There are several sizes of HP AlphaServer SC Interconnect switch:

- An **HP AlphaServer SC 16-port switch** can connect up to 16 nodes.
- A single **HP AlphaServer SC 128-way switch** can connect up to 128 nodes in a standalone configuration.
- To connect more than 128 nodes, you must connect several HP AlphaServer SC 128-way switches together — this is known as a **federated configuration**. A federated configuration contains two sorts of HP AlphaServer SC 128-way switch:
  - A **node-level switch** connects (up to 64) nodes.
  - A **top-level switch** connects the node-level switches.

For more information on standalone configurations and federated configurations, see Section 1.4 on page 1–7.

For more information on the HP AlphaServer SC Interconnect components, see Chapter 2.

Table 1–1 lists the IP naming convention for the HP AlphaServer SC Interconnect.

Table 1–1 HP AlphaServer SC IP Addresses

Component	IP Address Range
HP AlphaServer SC Interconnect control processor for Node-Level switch *N*, where *r* is the rail number and *N* is 0–31	`10.128.(128+`*r*`).(`*N*`+1)`
HP AlphaServer SC Interconnect control processor for Top-Level switch *T*, where *r* is the rail number and *T* is 0–15	`10.128.(128+`*r*`).(`*T*`+128)`

Caution:

The new-type HP AlphaServer SC 128-way switch looks very similar to the old-type switch. However, as well as the new HP AlphaServer SC Interconnect control processor and other updated components, there are several metalwork differences. For a description of the compatibility rules that you must obey when mixing old-type and new-type HP AlphaServer SC Interconnect hardware, see Section 2.12.3 on page 2–22.

1.2 Single-Rail and Dual-Rail Configurations

This section explains the difference between a single-rail configuration and a dual-rail configuration.

1.2.1 Single-Rail Configuration

A **single-rail** configuration is a configuration in which there is one HP AlphaServer SC Elan adapter card in the same slot position in each node, and all nodes are connected to one HP AlphaServer SC Interconnect switch network.

1.2.2 Dual-Rail Configuration

A **dual-rail** configuration is a configuration in which there are two HP AlphaServer SC Interconnects. Each node contains two HP AlphaServer SC Elan adapter cards, with each card connected to a different HP AlphaServer SC Interconnect switch network.

In a dual-rail configuration, the number of HP AlphaServer SC Interconnect hardware components required is doubled.

The hardware must be configured as follows for a dual-rail configuration:

- Each node must have two HP AlphaServer SC Elan adapter cards.
- Each HP AlphaServer SC Elan adapter card must be on a different PCI bus.
- The HP AlphaServer SC Elan adapter cards must be in the same slot positions on each node.
- The HP AlphaServer SC Elan adapter cards in a given slot position must be connected to the same HP AlphaServer SC Interconnect switch(es).
- Both HP AlphaServer SC Elan adapter cards in a given node must be connected to the same port on the corresponding HP AlphaServer SC Interconnect switches (that is, the node must have the same network ID on each HP AlphaServer SC Interconnect switch).
- Each rail has its own JTAG cable(s) and associated switch management.

1.3 Fat-Tree Topologies

The HP AlphaServer SC Interconnect supports several sizes of fat-tree topology, depending on the number of nodes in the HP AlphaServer SC system:

- An HP AlphaServer SC 16-port switch can connect up to 16 nodes in a **two-stage fat-tree topology**.
- A standalone HP AlphaServer SC 128-way switch can connect up to 128 nodes in a **three-stage fat-tree topology**.
- A federated configuration can connect up to 256 nodes in a **four-stage fat-tree topology**, and up to 1024 nodes in a **five-stage fat-tree topology**.

The fat-tree topology maximizes the cross-sectional bandwidth, to minimize the possibility of one transfer being blocked by another.

1.3.1 Stages 1 and 2: HP AlphaServer SC 16-Port Switch Card

Each HP AlphaServer SC 16-port switch card has eight Elite switch components. In an HP AlphaServer SC 16-port switch, in a standalone HP AlphaServer SC 128-way switch, or in a node-level switch in a federated configuration, four of these Elites connect to nodes.

Each of these four Elites can connect to four nodes (Stage 1). The same four Elites connect to each other using an additional four Elites (Stage 2).

Therefore, when an HP AlphaServer SC 16-port switch card is fully populated, each of its nodes can connect to 16 nodes in total (including itself), as shown in Figure 1–1.

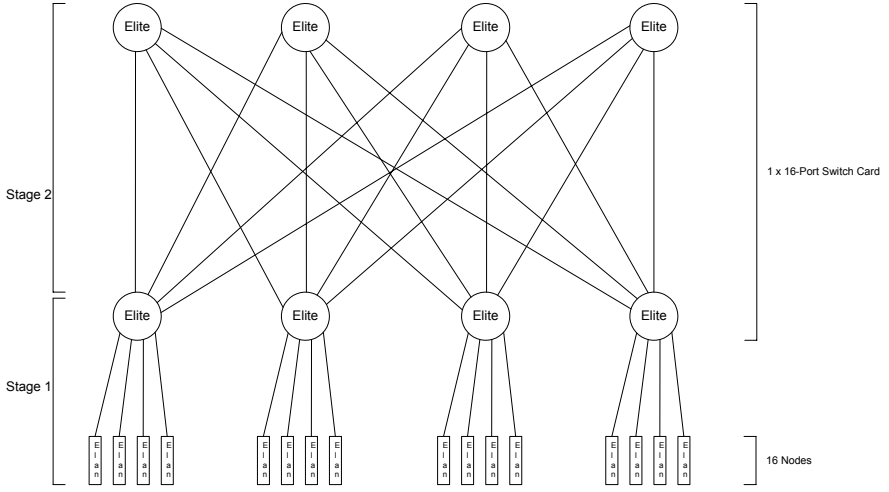


Figure 1–1 Two-Stage Fat-Tree Topology

1.3.2 Stage 3: Standalone HP AlphaServer SC 128-Way Switch and Node-Level Switch

In a standalone 128-way configuration (see Section 1.4.1 on page 1–7), a single chassis can contain up to eight HP AlphaServer SC 16-port switch cards. These HP AlphaServer SC 16-port switch cards connect to each other *via* 16 HP AlphaServer SC high-level switch cards, while maintaining the fat-tree topology.

Each HP AlphaServer SC high-level switch card contains a single Elite. Each Elite provides eight links — one to each HP AlphaServer SC 16-port switch card. Thus, each HP AlphaServer SC high-level switch card connects to each HP AlphaServer SC 16-port switch card (Stage 3).

Therefore, when all eight HP AlphaServer SC 16-port switch cards are fully populated, each node can connect to 128 nodes in total (including itself), as shown in Figure 1–2.

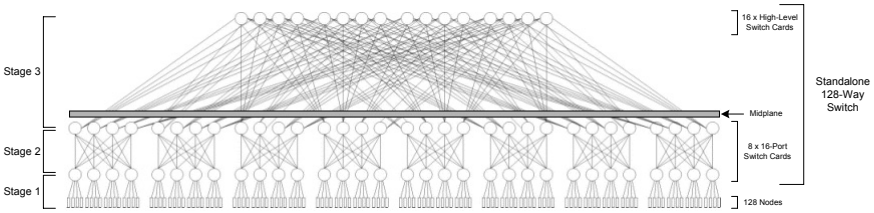


Figure 1–2 Three-Stage Fat-Tree Topology — Standalone Configuration

A node-level switch in a federated configuration (see Section 1.4.2 on page 1–8) can have up to four HP AlphaServer SC 16-port switch cards — the other four slots are populated with HP AlphaServer SC 16-link null cards. The HP AlphaServer SC 16-port switch cards within a node-level switch connect to each other *via* 16 HP AlphaServer SC high-level switch cards (Stage 3).

Therefore, when all four HP AlphaServer SC 16-port switch cards are fully populated, each node can connect to 64 nodes in total (including itself), as shown in Figure 1–3.

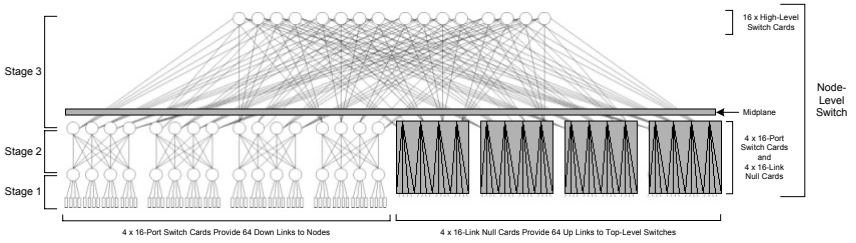


Figure 1–3 Three-Stage Fat-Tree Topology — Federated Configuration

Note:

Regardless of the number of HP AlphaServer SC 16-port switch cards, a standalone 128-way chassis or a node-level switch must always contain 16 HP AlphaServer SC high-level switch cards, to maintain the fat-tree topology.

Similarly, a node-level switch must always contain 4 HP AlphaServer SC 16-link null cards, to maintain the fat-tree topology.

1.3.3 Stages 4 and 5: Top-Level Switch

Each node-level switch in a federated configuration has 16 HP AlphaServer SC high-level switch cards. Each of these cards provides eight links — four downlinks and four uplinks.

As described in Section 1.3.2, the downlinks connect to the HP AlphaServer SC 16-port switch cards in the same node-level switch (one link to each card), providing the third stage of the fat-tree topology.

The uplinks are brought from the midplane of the switch to a set of connectors on the front panel of the HP AlphaServer SC 16-link null cards. These are then connected to HP AlphaServer SC 16-port switch cards in a set of top level switches (Stage 4). You can connect up to 256 nodes in a four-stage fat-tree topology.

Within an HP AlphaServer SC 16-port switch card in a top-level switch in a federated configuration, four Elites connect to each other using an additional four Elites (Stage 5). Each node can now connect to 1024 nodes in total (including itself), as shown in Figure 1–4.

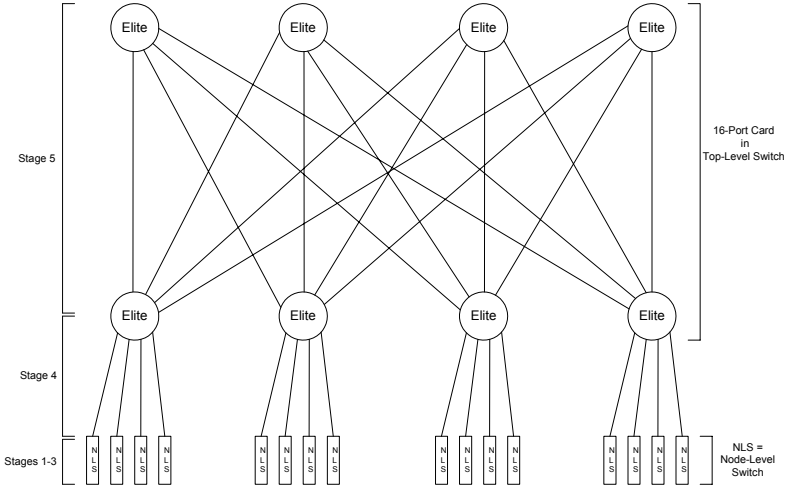


Figure 1–4 Five-Stage Fat-Tree Topology

The image in Figure 1–4 shows a single path connecting each node-level switch — that is, one HP AlphaServer SC 16-port switch card (in one top-level switch) connecting 1024 nodes. To maintain the fat-tree topology, the number of top-level switches is fixed and depends on the number of nodes, as described in Section 1.4.4 on page 1–12.

Figure 1–5 shows the connections for an HP AlphaServer SC system containing 1024 nodes. For simplicity, this figure shows only the connections for the first node-level switch and the first top-level switch, and each single line represents eight physical connections.

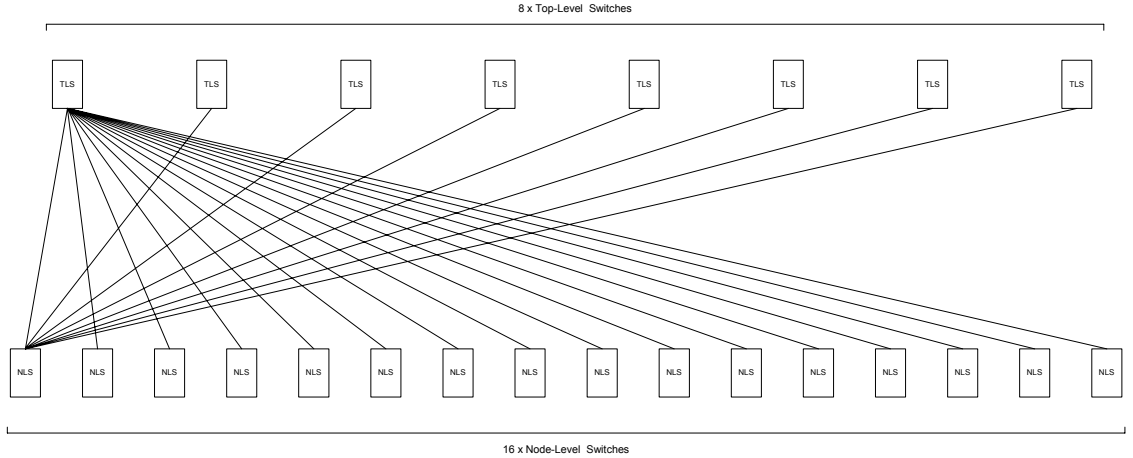


Figure 1–5 Federated Configuration Containing 1024 Nodes

1.4 Standalone and Federated Configurations

The information in this section is organized as follows:

- Standalone 128-Way Configuration (see Section 1.4.1 on page 1–7)
- Node-Level Switch (see Section 1.4.2 on page 1–8)
- Top-Level Switch (see Section 1.4.3 on page 1–10)
- Calculating the Number of Switches Required (see Section 1.4.4 on page 1–12)
- Switch-Naming Convention (see Section 1.4.5 on page 1–13)
- Connecting Switches in a Federated Configuration (see Section 1.4.6 on page 1–13)

1.4.1 Standalone 128-Way Configuration

You can use either the old-type or the new-type HP AlphaServer SC 128-way switch in a standalone configuration.

A standalone HP AlphaServer SC 128-way switch provides link ports for connecting up to 128 separate HP AlphaServer SC nodes, each fitted with an HP AlphaServer SC Elan adapter card.

The rear of the HP AlphaServer SC 128-way switch contains eight slots. These slots can contain up to eight HP AlphaServer SC 16-port switch cards, providing a maximum of 128 ports in total. Filler panels are attached to any unused rear slots. The link format is byte wide in each direction at 400 MHz. Link cables connect the HP AlphaServer SC Elan adapter cards (in the nodes) to the HP AlphaServer SC 16-port switch cards (in the HP AlphaServer SC 128-way switch).

The front of the HP AlphaServer SC 128-way switch contains 17 slots. These slots are populated with 16 HP AlphaServer SC high-level switch cards and one HP AlphaServer SC clock card.

In a standalone configuration, the nodes are connected in a three-stage fat-tree topology, with the lower two stages implemented by the HP AlphaServer SC 16-port switch cards and the top stage implemented by the 16 HP AlphaServer SC high-level switch cards. Regardless of the number of HP AlphaServer SC 16-port switch cards, a standalone 128-way chassis must always contain 16 HP AlphaServer SC high-level switch cards, to maintain the fat-tree topology.

Fat-tree topologies are described in more detail in Section 1.3 on page 1–4.

1.4.2 Node-Level Switch

The node-level switch is a new concept which is used in federated configurations only.

You must use a new-type HP AlphaServer SC 128-way switch as a node-level switch — you cannot use the old-type switches in federated configurations.

Figure 1–6 shows the front and rear respectively of a node-level switch (note that the cover has been removed from the front of the switch).

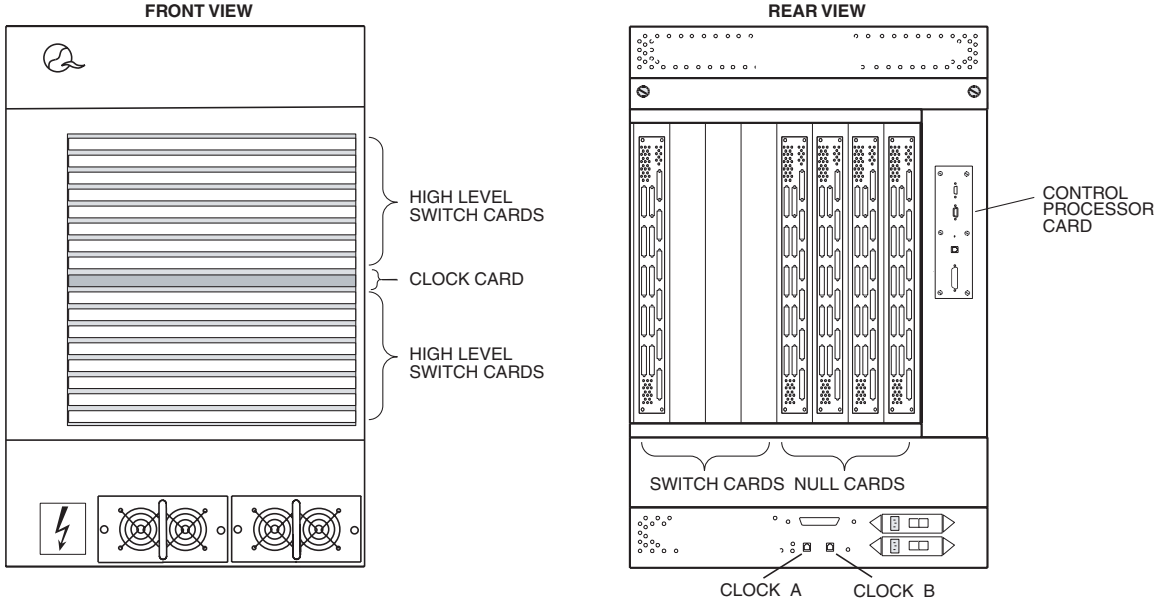


Figure 1–6 Node-Level Switch

The front of the node-level switch contains 17 horizontal slots:

- One HP AlphaServer SC clock card is inserted in the central slot (slot C, between slots 23 and 24).
- Sixteen HP AlphaServer SC high-level switch cards are inserted in the other slots (slots 16 to 23, and slots 24 to 31).

The rear of the node-level switch contains eight vertical slots:

- Up to four HP AlphaServer SC 16-port switch cards may be inserted in the leftmost slots (slots 0–3). Filler panels are attached to any unused rear slots in this range.
- Four HP AlphaServer SC 16-link null cards are inserted into the rightmost slots (slots 4–7). Each node-level switch must always contain four HP AlphaServer SC 16-link null cards, regardless of the number of HP AlphaServer SC 16-port switch cards used, to maintain the fat-tree topology.

Note that the port numbering on the HP AlphaServer SC 16-port switch card starts at the top of the card, whereas the port numbering on the HP AlphaServer SC 16-link null card starts at the bottom, as shown in Figure 1–7.

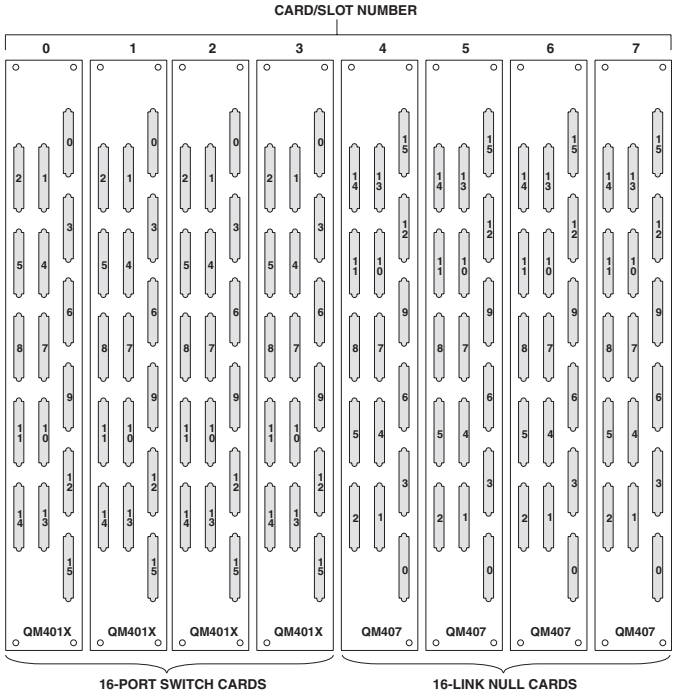


Figure 1–7 Slot Population in a Node-Level Switch

Each of the HP AlphaServer SC 16-port switch cards at the rear of the node-level switch provides 16 downlinks to HP AlphaServer SC nodes. A node-level switch can have up to four HP AlphaServer SC 16-port switch cards; therefore, each node-level switch can connect a maximum of 64 nodes. Link cables connect the HP AlphaServer SC Elan adapter cards in the nodes to the HP AlphaServer SC 16-port switch cards in the node-level switch. The link format is byte wide in each direction at 400 MHz.

Each of the 16 HP AlphaServer SC high-level switch cards at the front of the node-level switch provides eight links — four downlinks and four uplinks — as follows:

- The downlinks connect to the HP AlphaServer SC 16-port switch cards in the same node-level switch (one link to each card).
- The uplinks connect the node-level switch to the top-level switches. The uplinks are brought through the midplane of the switch to a set of connectors (or **buffer ports**) on the HP AlphaServer SC 16-link null cards at the rear of the node-level switch. Each node-level switch contains four HP AlphaServer SC 16-link null cards, providing 64 uplinks in total. Link cables connect the HP AlphaServer SC 16-link null cards in the node-level switches to the HP AlphaServer SC 16-port switch cards in the top-level switches.

  All uplinks are effectively identical — a packet can enter a node-level switch on any of the uplinks and connect to any node. The route to that node is independent of which uplink is used. When routing out of a node-level switch, the uplink is generally selected by adaptive routing, so that the unused links are used where possible.

Note:

Regardless of the number of HP AlphaServer SC 16-port switch cards, a node-level switch must always contain 16 HP AlphaServer SC high-level switch cards and four HP AlphaServer SC 16-link null cards, to maintain the fat-tree topology.

1.4.3 Top-Level Switch

The top-level switch is a new concept which is used in federated configurations only. A top-level switch provides link ports for connecting the node-level switches.

You must use a new-type HP AlphaServer SC 128-way switch as a top-level switch — you cannot use the old-type switches in federated configurations.

Figure 1–8 shows the front and rear respectively of a top-level switch (note that the cover has been removed from the front of the switch).

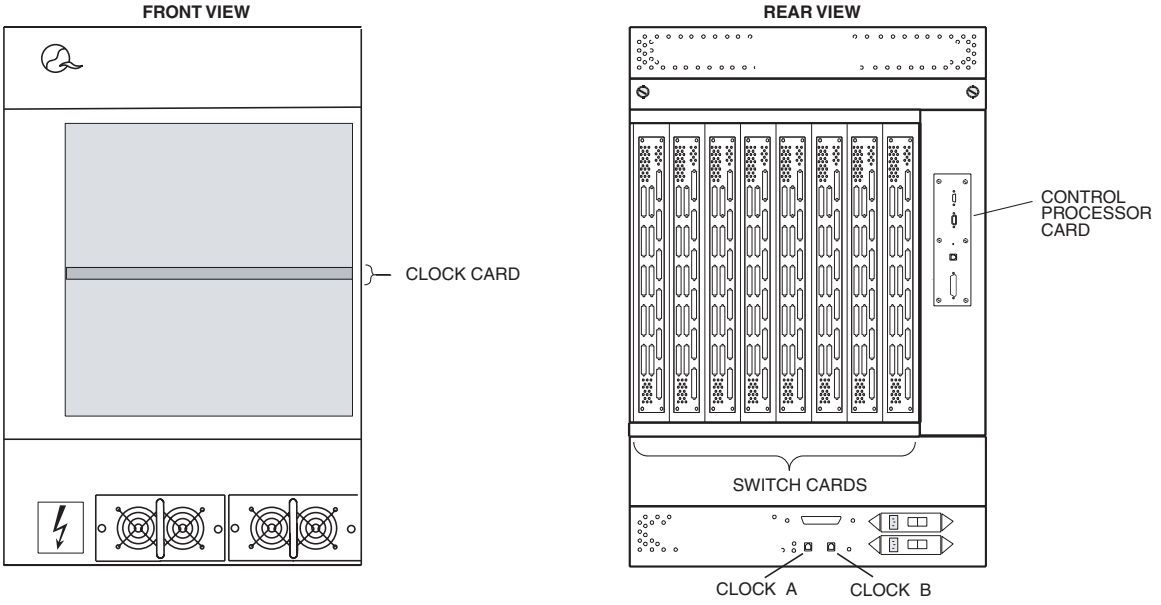


Figure 1–8 Top-Level Switch

The rear of the top-level switch contains eight vertical slots. These rear slots must contain eight HP AlphaServer SC 16-port switch cards, providing a maximum of 128 ports in total. Filler panels are attached to the unused rear slots. The link format is byte wide in each direction at 400 MHz. Link cables connect HP AlphaServer SC 16-port switch cards in the top-level switches to the HP AlphaServer SC 16-link null cards in the node-level switches.

The top-level switch contains eight independent HP AlphaServer SC 16-port switch cards; that is, the cards receive only power and ground from the chassis, and are not directly connected to each other topologically. Therefore, the top-level switch does not contain any HP AlphaServer SC high-level switch cards. The 17 slots at the front of the top-level switch are unpopulated, except for the central slot (slot C, between slots 23 and 24), which contains an HP AlphaServer SC clock card.

Regardless of the number of ports used, a top-level switch must always contain eight HP AlphaServer SC 16-port switch cards, to maintain the fat-tree topology.

Figure 1–9 shows how to populate the slots in the rear of the top-level switch.

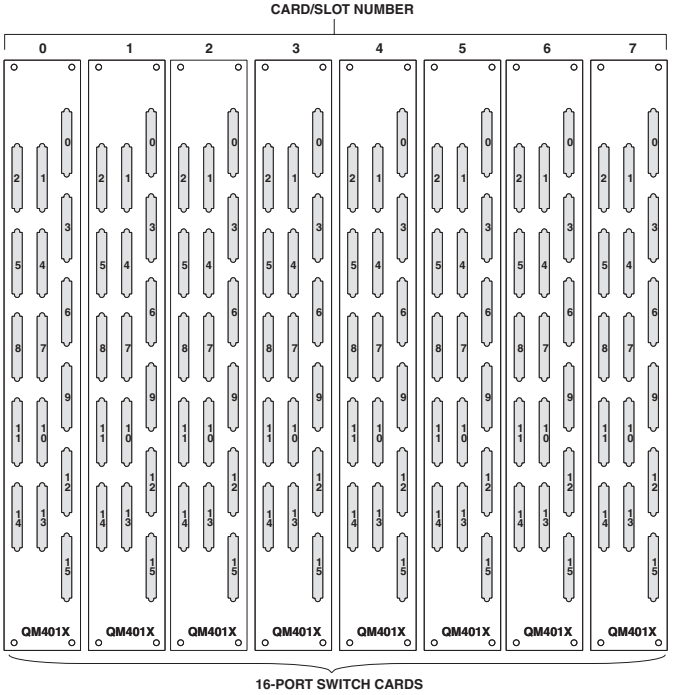


Figure 1–9 Slot Population in a Top-Level Switch

1.4.4 Calculating the Number of Switches Required

The number of switches required depends on the number of nodes in the HP AlphaServer SC system:

- Each node-level switch can connect up to 64 nodes.
- The number of top-level switches required is pre-defined, as shown in Table 1–2.

Table 1–2 Calculating the Number of Top-Level Switches Required

#Nodes	#Top-Level Switches Required
129–256	2
257–512	4
513–1024	8

1.4.5 Switch-Naming Convention

The switch module name is made up of the following:

- the prefix `QR`
- the rail number: `0` for single rail systems; `0` or `1` for dual rail systems
- the type of switch: `N` for node-level switch; `T` for top-level switch
- the switch number: both node-level and top-level switches start at `0`

For example, `QR0N00` is a node-level switch on rail `0`, and its switch number is `00`.

To make error reports easier to sort and read, numerical fields have a fixed field width, as shown in Table 1–3.

Table 1–3 Switch-Naming Convention

#Nodes	Node-Level Switches	Top-Level Switches
16	`QR0N00`	Not applicable
128	`QR0N00`	Not applicable
256	`QR0N00 – QR0N03`	`QR0T00 – QR0T01`
512	`QR0N00 – QR0N07`	`QR0T00 – QR0T04`
1024	`QR0N00 – QR0N15`	`QR0T00 – QR0T07`

These names are added to the `/etc/hosts` file during the installation process.

1.4.6 Connecting Switches in a Federated Configuration

You must connect the node-level switches to the top-level switches in a particular order. To explain this complex procedure, we introduce the concept of *linkgroups* and *portsets*:

- A **linkgroup** is composed of one link from each node-level switch.

  Links are numbered 0–15 (from bottom to top) on each HP AlphaServer SC 16-link null card. HP AlphaServer SC 16-link null cards are numbered 4–7 (from left to right) on each node-level switch.

  Each link in a particular linkgroup occupies the same position on its parent node-level switch — that is, the same link number on the same HP AlphaServer SC 16-link null card.

  For example, the first linkgroup contains Card 4 Link 0 from each node-level switch. The next linkgroup contains Card 4 Link 1 from each node-level switch. The last linkgroup contains Card 7 Link 15 from each node-level switch.

Within a linkgroup, the links must always be in the same order: the first link must be from the first node-level switch, the second link must be from the second node-level switch, and so on.

- A **portset** is a set of top-level switch ports to which a single linkgroup may be connected.

  Ports are numbered 0–15 (from top to bottom) on each HP AlphaServer SC 16-port switch card. HP AlphaServer SC 16-port switch cards are numbered 0–7 (from left to right) on each top-level switch.

  One portset is assigned to each linkgroup. The number of ports in a portset is either 4, 8, or 16 — this value is pre-defined depending on the number of nodes, as shown in Table 1–4. If the number of links in a linkgroup is less than the number of ports in a portset, the relevant top-level switch will have unused ports in each portset.

When connecting linkgroups to portsets, you must obey two rules:

1. The linkgroups must be connected in the correct order — that is, connect the first linkgroup to the first portset, then the second linkgroup to the second portset, and so on.
2. The links within each linkgroup must always be connected in the same order — that is, connect the first link in the linkgroup to the first port in the portset, then the second link to the second port, and so on.

Slight errors in configuration are difficult to diagnose from the effect on actual link traffic. For example, if two links into a top-level switch are exchanged, messages will be wrongly delivered, but only when the adaptive routing actually uses that particular switch.

The SC Viewer Interconnect tab allows you to perform the following tasks:

- Highlight connections that do not conform to the default connectivity rules, by running the `cabletest` script.
- Produce a mapping of port connections from top-level switches to node-level switches.
- Update the SC database to mirror the actual connectivity.

The SC Viewer Interconnect tab is described in Chapter 7.

Table 1–4 Linkgroups and Portsets

#Nodes	#Ports / Portset	#Links / Linkgroup	#Unused Ports / Portset
129–192	4	3	1
193–256	4	4	0
257–320	8	5	3
321–384	8	6	2
385–448	8	7	1
449–512	8	8	0
513–576	16	9	7
577–640	16	10	6
641–704	16	11	5
705–768	16	12	4
769–832	16	13	3
833–896	16	14	2
897–960	16	15	1
961–1024	16	16	0

Figure 1–10, Figure 1–11, and Figure 1–12 show a top-level switch with portset of 4, 8, and 16 respectively. All links marked 0 connect to node-level switch 0, all links marked 1 connect to node-level switch 1, and so on. The shading distinguishes the individual portsets.

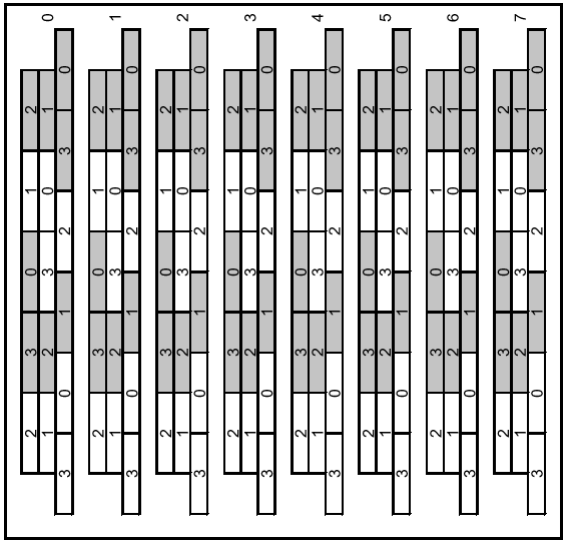


Figure 1–10 Top-Level Switch with Portset=4

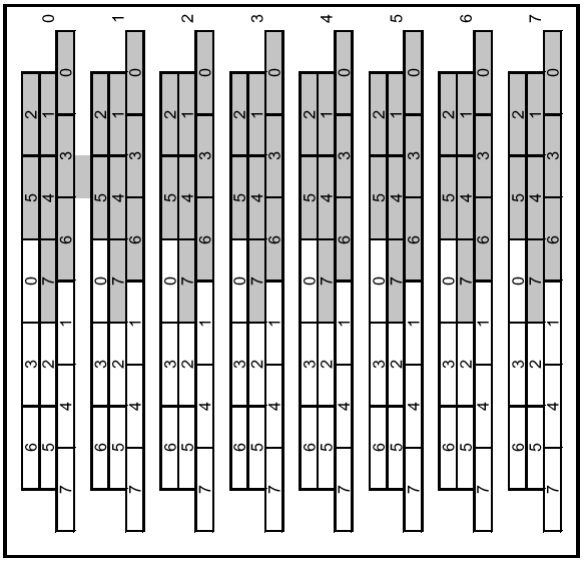


Figure 1–11 Top-Level Switch with Portset=8

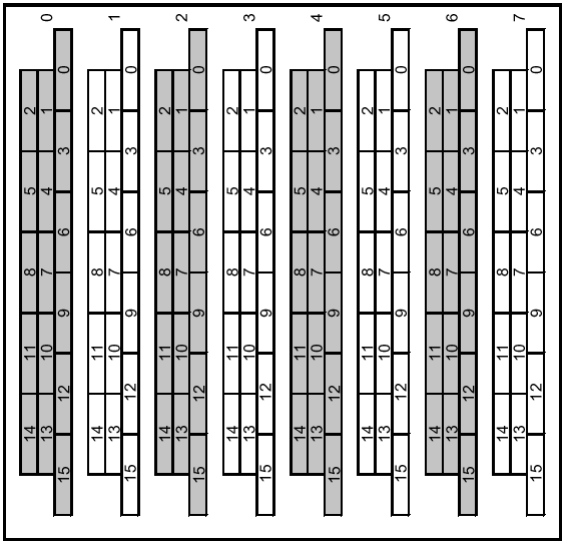


Figure 1–12 Top-Level Switch with Portset=16

For more information about connecting node-level switches to top-level switches, see Section 5.5 on page 5–16.

2

HP AlphaServer SC Interconnect Components

This chapter provides an overview of the HP AlphaServer SC Interconnect components.

The information in this chapter is organized as follows:

- Overview of HP AlphaServer SC Interconnect Components (see Section 2.1 on page 2–2)
- HP AlphaServer SC Elan Adapter Card (see Section 2.2 on page 2–4)
- HP AlphaServer SC 16-Port Switch (see Section 2.3 on page 2–5)
- HP AlphaServer SC 128-Way Switch (see Section 2.4 on page 2–7)
- HP AlphaServer SC 16-Port Switch Card (see Section 2.5 on page 2–11)
- HP AlphaServer SC 16-Link Null Card (see Section 2.6 on page 2–12)
- HP AlphaServer SC High-Level Switch Card (see Section 2.7 on page 2–13)
- HP AlphaServer SC Clock Card (see Section 2.8 on page 2–14)
- HP AlphaServer SC Clock Distribution Box (see Section 2.9 on page 2–16)
- HP AlphaServer SC Interconnect Control Processor (see Section 2.10 on page 2–17)
- HP AlphaServer SC Interconnect Cables (see Section 2.11 on page 2–18)
- Hardware Changes (see Section 2.12 on page 2–21)

2.1 Overview of HP AlphaServer SC Interconnect Components

Table 2–1 describes the HP AlphaServer SC Interconnect components. Table 2–2 on page 2–23 describes the compatibility issues when mixing new and old HP AlphaServer SC Interconnect hardware. Table A–1 on page A–1 describes the FRUs for all of the HP AlphaServer SC Interconnect components.

Table 2–1 HP AlphaServer SC Interconnect Components

HP Name	Quadrics Name	Component Description
HP AlphaServer SC Elan Adapter Card	QM-400	This is a high performance network adapter PCI card, based on the Quadrics Elan communications device. For more information, see Section 2.2 on page 2–4.
HP AlphaServer SC 16-Port Switch	QM-S16	This is a standalone, high-speed switch unit, housing a 16-way network switch card. It provides link ports for connecting up to 16 separate computer systems, each fitted with an HP AlphaServer SC Elan adapter card. It allows user processes and kernel threads to communicate between nodes. For more information, see Section 2.3 on page 2–5.
HP AlphaServer SC 16-Port Switch Card	QM-401X (old-type and new-type)	This provides link ports to connect 16 nodes to the HP AlphaServer SC Interconnect. It contains eight Elites connected in a two-stage fat-tree topology. For more information, see Section 2.5 on page 2–11.
HP AlphaServer SC 128-Way Switch	QM-S128F (new-type) and QM-S128 (old-type)	**The QM-S128F component supersedes the QM-S128 component.** This is a high-speed switch unit, housing up to eight rear cards (HP AlphaServer SC 16-port switch cards or HP AlphaServer SC 16-link null cards), together with sixteen HP AlphaServer SC high-level switch cards and a clock card. It allows user processes and kernel threads to communicate between nodes. It provides link ports for connecting up to 128 separate computer nodes, each fitted with an HP AlphaServer SC Elan adapter card, in a three-stage switch network (that is, a **standalone 128-way configuration**). To configure an HP AlphaServer SC system containing more than 128 nodes, several of these switches can be connected to each other in a five-stage switch network (that is, a **federated configuration**). Only the new-type HP AlphaServer SC 128-way switches can be used in a federated configuration. For more information, see Section 2.4 on page 2–7.

Table 2–1 HP AlphaServer SC Interconnect Components

HP Name	Quadrics Name	Component Description
HP AlphaServer SC 16-Link Null Card	QM-407	This provides buffer ports at the rear of a node-level switch, to bring uplinks through the midplane from the HP AlphaServer SC high-level switch cards at the front of the switch. This component is only used in a federated configuration. For more information, see Section 2.5 on page 2–11.
HP AlphaServer SC High-Level Switch Card	QM-402	This connects the HP AlphaServer SC 16-port switch cards together, in an HP AlphaServer SC 128-way switch. It provides the third stage of the fat-tree topology. For more information, see Section 2.7 on page 2–13.
HP AlphaServer SC Clock Card	QM-408 (new-type) and QM-403 (old-type)	**The QM-408 component supersedes the QM-403 component.** This provides the HP AlphaServer SC Interconnect with a global clock. It provides the management network interface that allows the `swmgr` process to monitor the switch for network errors, fan and PSU failures, and excessive temperatures. The new-type HP AlphaServer SC clock card can accept input signals from an external clock source — this is necessary to provide global clocking in a federated configuration. For more information, see Section 2.8 on page 2–14.
HP AlphaServer SC Clock Distribution Box	QM-SCLK	This component is an external clock source — this is necessary to provide global clocking in a federated configuration. This component is only used in a federated configuration. For more information, see Section 2.9 on page 2–16.
HP AlphaServer SC Interconnect Control Processor	QM-410	This component allows switch control functions to be executed over an Ethernet instead of *via* a parallel port. This component is only available in the new-type HP AlphaServer SC 128-way switch. For more information, see Section 2.10 on page 2–17.

2.2 HP AlphaServer SC Elan Adapter Card

Only one version of the HP AlphaServer SC Elan adapter card is available.

Figure 2–1 shows the HP AlphaServer SC Elan adapter card.

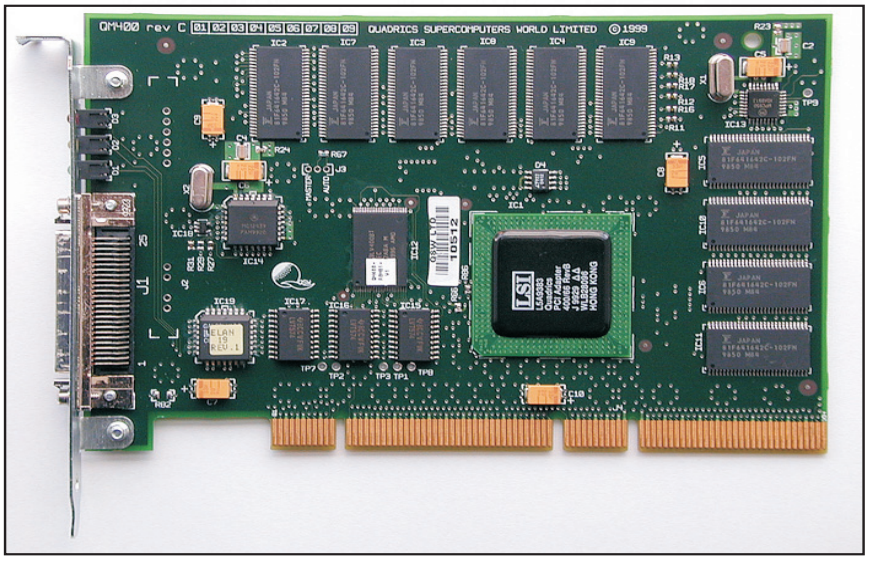


Figure 2–1 HP AlphaServer SC Elan Adapter Card

The HP AlphaServer SC Elan adapter card is a high-performance network interface card — a Universal, short, 66-MHz, 64-bit PCI card that conforms to PCI specification 2.1 — based on the Quadrics Elan communications device. Each node in an HP AlphaServer SC system requires at least one HP AlphaServer SC Elan adapter card. The card provides a single high-speed link for connection to an HP AlphaServer SC Interconnect switch.

The HP AlphaServer SC Elan adapter card has the following features:

- 100-MHz dedicated I/O processor
- 8KB of onboard cache and 64MB of SDRAM
- MMU with hardware tablewalk and 16 entry TLB
- DMA engine
- Byte wide, 400 MHz bi-directional links
- 0.5MB of flash memory

2.3 HP AlphaServer SC 16-Port Switch

Only one version of the HP AlphaServer SC 16-port switch is available.

Figure 2–2 shows the HP AlphaServer SC 16-port switch.

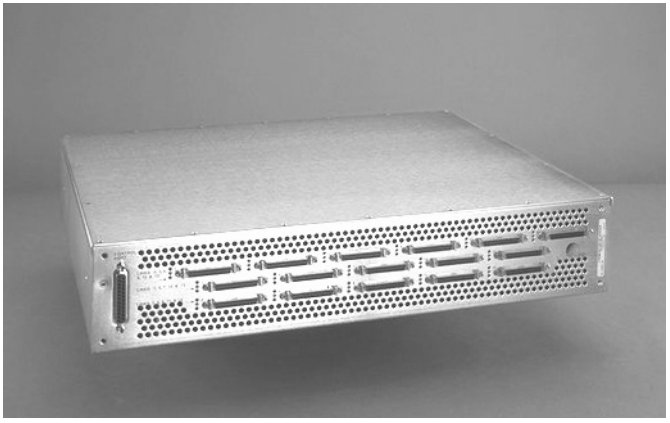


Figure 2–2 HP AlphaServer SC 16-Port Switch

The HP AlphaServer SC 16-port switch is a standalone, high-speed switch unit. It provides link ports for connecting up to 16 separate HP AlphaServer SC nodes, each fitted with an HP AlphaServer SC Elan adapter card.

The unit contains a single HP AlphaServer SC 16-port switch card. The HP AlphaServer SC 16-port switch card uses eight Quadrics Elite switch components. These eight switch components are arranged in a two-stage, fat-tree topology to create a 16-way switch.

The HP AlphaServer SC 16-port switch has a JTAG port, provided on a 25-pin DB socket at the rear of the switch. Use the 10-m IEEE1284 JTAG cable to connect this port to the parallel port of Node 0 (first rail) or Node 1 (second rail). The node that is connected to the switch by the JTAG cable is known as the **switch-managing node**, and the switch is described as a **directly-connected switch**.

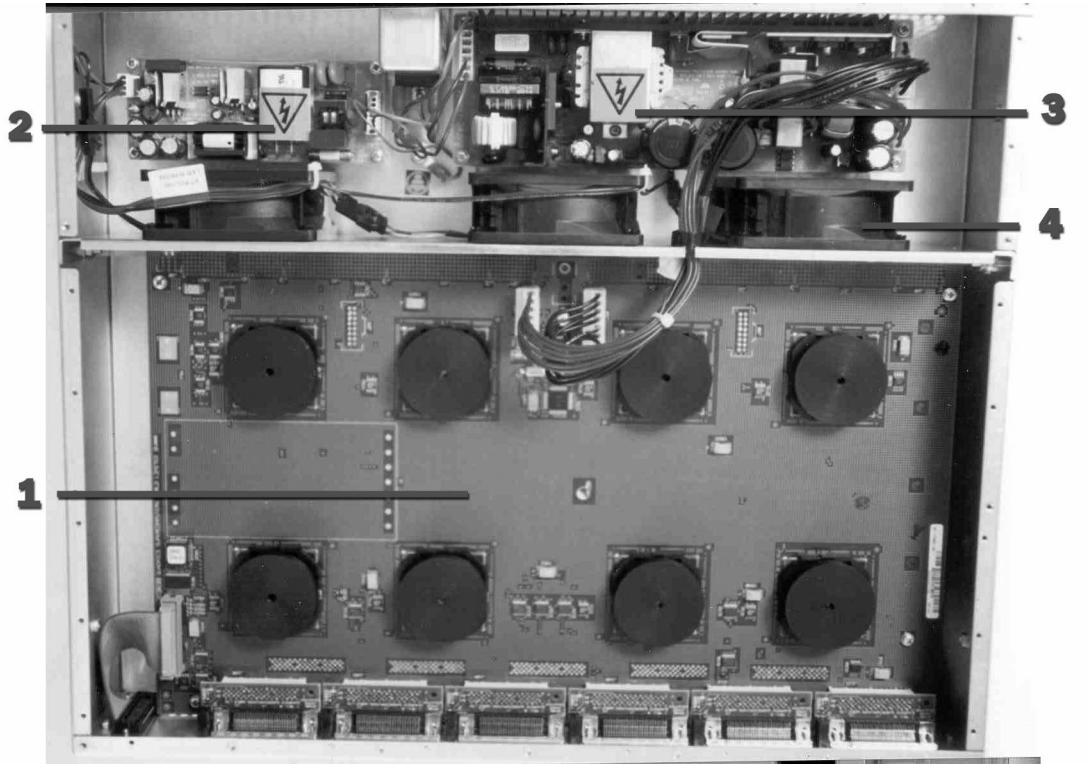
The HP AlphaServer SC 16-port switch has a 2-U high, 370-mm deep, screened enclosure, suitable for mounting in a standard 19" equipment rack (600-mm cabinet). U is a unit of measurement for rackmount equipment: 1 U = 1.75" = 4.44 cm.

The HP AlphaServer SC 16-port switch is air cooled, with the air flowing from front to rear through the unit.

The power consumption of the HP AlphaServer SC 16-port switch is less than 120 W. The unit uses Universal power supplies operating in the range 110-250 V AC (61-49 Hz). Power is supplied through a standard IEC320 power socket.

For more information about the physical specifications of the HP AlphaServer SC 16-port switch, see Appendix B.

Figure 2–3 shows the location of the fans and power supply units in the HP AlphaServer SC 16-port switch.



1 = HP AlphaServer SC 16-port switch card (complete swap box)
2 = HP AlphaServer SC 24-V power supply for 16-port chassis fans
3 = HP AlphaServer SC 3.3-V power supply for 16-port chassis circuit board
4 = HP AlphaServer SC fan assembly for 16-port chassis

Figure 2–3 HP AlphaServer SC 16-Port Switch with Top Cover Removed

2.4 HP AlphaServer SC 128-Way Switch

Two versions of the HP AlphaServer SC 128-way switch are available, as shown in Figure 2–4 and Figure 2–5. This section discusses the features that are common to both versions. Section 2.12 on page 2–21 describes the differences between the two versions.

Figure 2–4 shows the front and rear respectively of the new-type HP AlphaServer SC 128-way switch (note that the cover has been removed from the front of the switch).

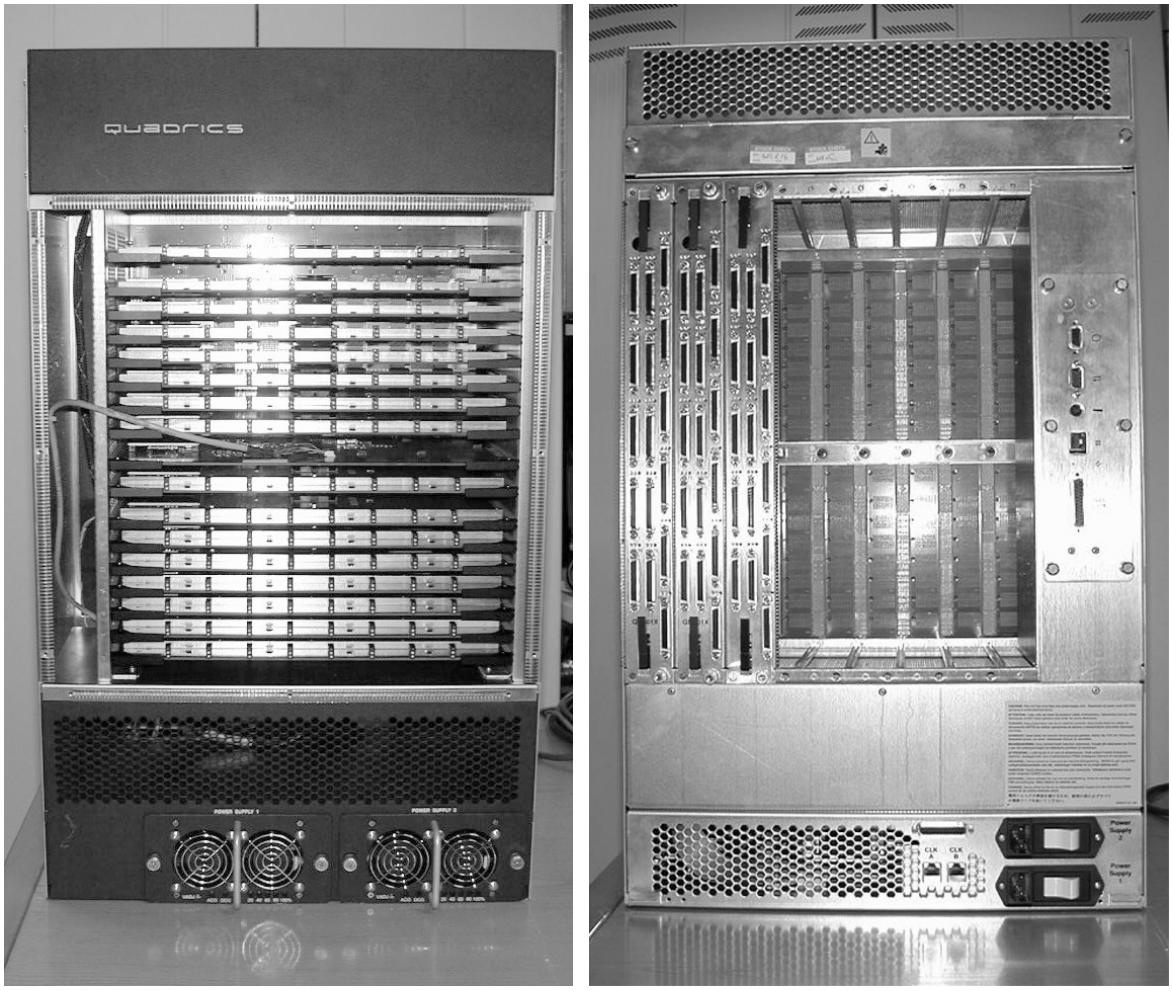


Figure 2–4 HP AlphaServer SC 128-Way Switch (New-Type) — Front and Rear

HP AlphaServer SC 128-Way Switch

Figure 2–5 shows the front and rear respectively of the old-type HP AlphaServer SC 128-way switch (note that the cover has been removed from the front of the switch).

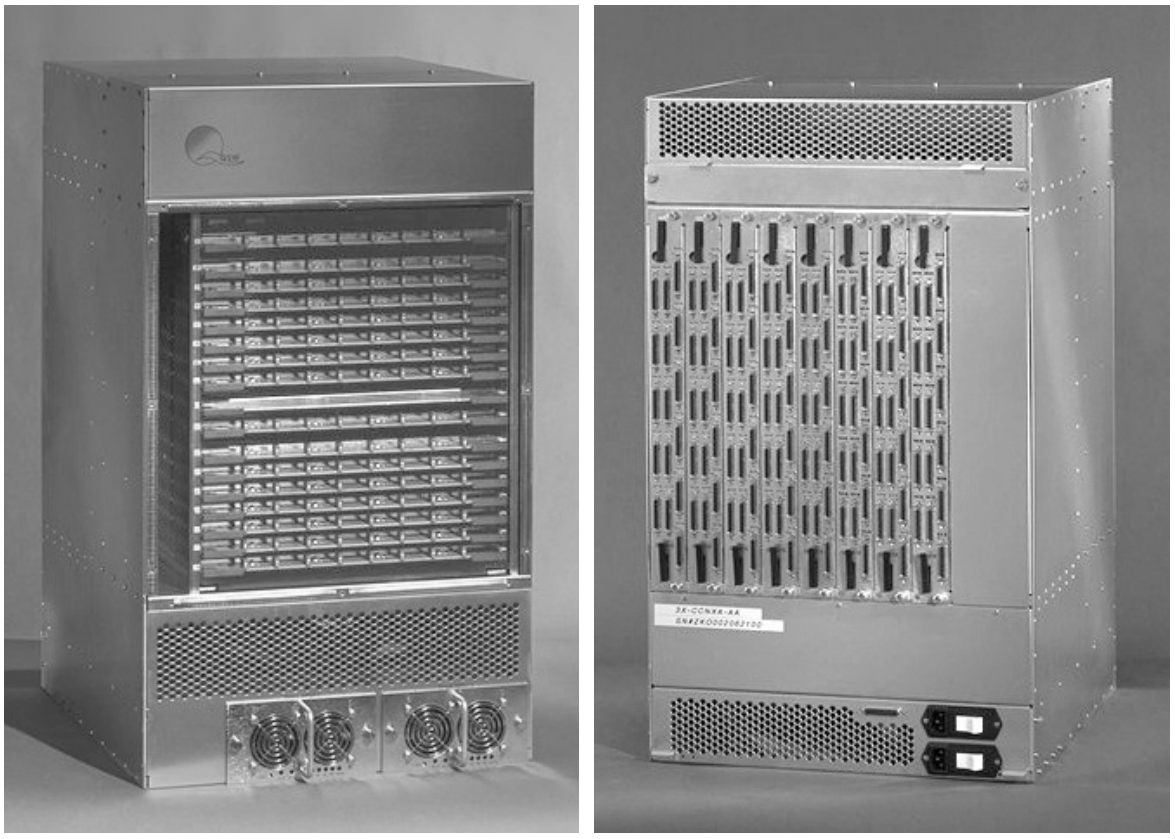


Figure 2–5 HP AlphaServer SC 128-Way Switch (Old-Type) — Front and Rear

The HP AlphaServer SC 128-way switch is a high-speed switch unit. The HP AlphaServer SC 128-way switch has a 17-U high, 450-mm deep, screened enclosure, suitable for mounting in a standard 19" equipment rack (600-mm cabinet). U is a unit of measurement for rackmount equipment: 1 U = 1.75" = 4.44 cm. The HP AlphaServer SC 128-way switch is air cooled, with the air flowing from front to rear through the unit.

The HP AlphaServer SC 128-way switch uses a pair of Universal 1000-W power supplies operating in the range 110-250 V AC (61-49 Hz). The switch can operate using a single power supply; if both supplies are present, the switch draws half of its power from each supply. Power is supplied through a pair of standard IEC320 power sockets — one IEC320 power socket for each power supply unit.

For information on how to install or replace the HP AlphaServer SC 128-way switch, see Section 5.1 on page 5–2 or Section 5.16 on page 5–36 respectively. For more information about the physical specifications of the HP AlphaServer SC 128-way switch, see Appendix B.

The remaining information in this section is organized as follows:

- Port and Slot Numbering in an HP AlphaServer SC 128-Way Switch (see Section 2.4.1)
- JTAG Port (see Section 2.4.2)

2.4.1 Port and Slot Numbering in an HP AlphaServer SC 128-Way Switch

Figure 2–6 shows how the slots are numbered in an HP AlphaServer SC 128-way switch.

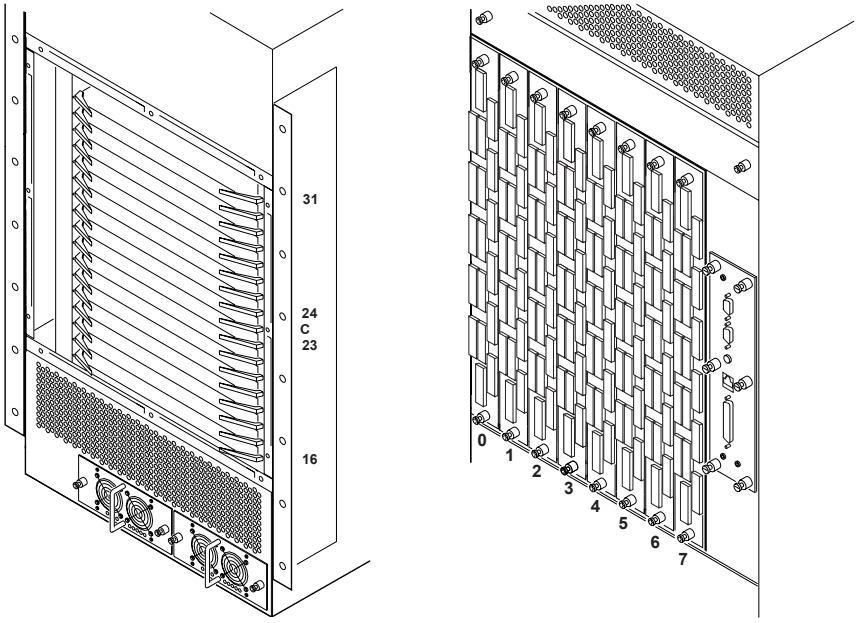


Figure 2–6 HP AlphaServer SC 128-Way Switch — Slot Numbering

At the front of the switch, there are 17 horizontal slots — 16 slots for the HP AlphaServer SC high-level switch cards and one slot for the HP AlphaServer SC clock card. These slots are numbered from bottom to top: 16 to 23, the clock card C, and then 24 to 31.

The eight vertical slots at the rear of the switch can be populated as follows:

- Up to eight HP AlphaServer SC 16-port switch cards (old-type switch or new-type switch)
- Four HP AlphaServer SC 16-link null cards and up to four HP AlphaServer SC 16-port switch cards (new-type switch only).

These rear slots are numbered 0 to 7 from left to right. Card 0 provides ports 0 to 15, card 1 provides ports 16 to 31, and so on.

The new-type HP AlphaServer SC 16-port switch cards have cable gaskets, which hide the port numbers on the HP AlphaServer SC 16-port switch card — a card showing the port numbers of the HP AlphaServer SC 16-port switch card is provided in a pocket in the switch cabinet.

2.4.2 JTAG Port

The HP AlphaServer SC 128-way switch has a JTAG port, provided on a 25-pin DB socket at the rear of the switch. The JTAG port allows you to monitor and manage the switch.

The HP AlphaServer SC 128-way switch may be shipped with two JTAG cables:

- If using an old-type HP AlphaServer SC 128-way switch, use the 10-m IEEE1284 JTAG cable to connect the JTAG port at the rear of the switch to the parallel port of a node. For such switches, the switch-management-server functions run on the nodes directly connected to the switches; these nodes are defined by the `swmserver` entries in the `servers` table of the SC database. By default, Node 0 performs switch management tasks for the first rail of the HP AlphaServer SC Interconnect network, and Node 1 manages the switch for the second rail. You can change this by moving the JTAG cables and updating the `servers` table in the SC database. The node that is connected to the switch by the JTAG cable is known as the **switch-managing node**, and the switch is described as a **directly-connected switch**.

  Note:

  Do not connect the switch JTAG port to a management server.

- If using a new-type HP AlphaServer SC 128-way switch, use the 1-m IEEE1284 JTAG cable to connect the JTAG port at the rear of the switch to the parallel port of the HP AlphaServer SC Interconnect control processor, which is also at the rear of the switch. For more information about the HP AlphaServer SC Interconnect control processor, see Section 2.10 on page 2–17.

  Note:

  If the JTAG port is not connected to the HP AlphaServer SC Interconnect control processor using the JTAG cable, the HP AlphaServer SC Interconnect control processor will not be able to access any of the cards in the switch chassis.

2.5 HP AlphaServer SC 16-Port Switch Card

Two versions of the HP AlphaServer SC 16-port switch card are available, as shown in Figure 2–7 and Figure 2–8. Section 2.12 on page 2–21 describes the hardware differences between the two versions.

Figure 2–7 shows a new-type HP AlphaServer SC 16-port switch card. Figure 2–8 shows an old-type HP AlphaServer SC 16-port switch card.

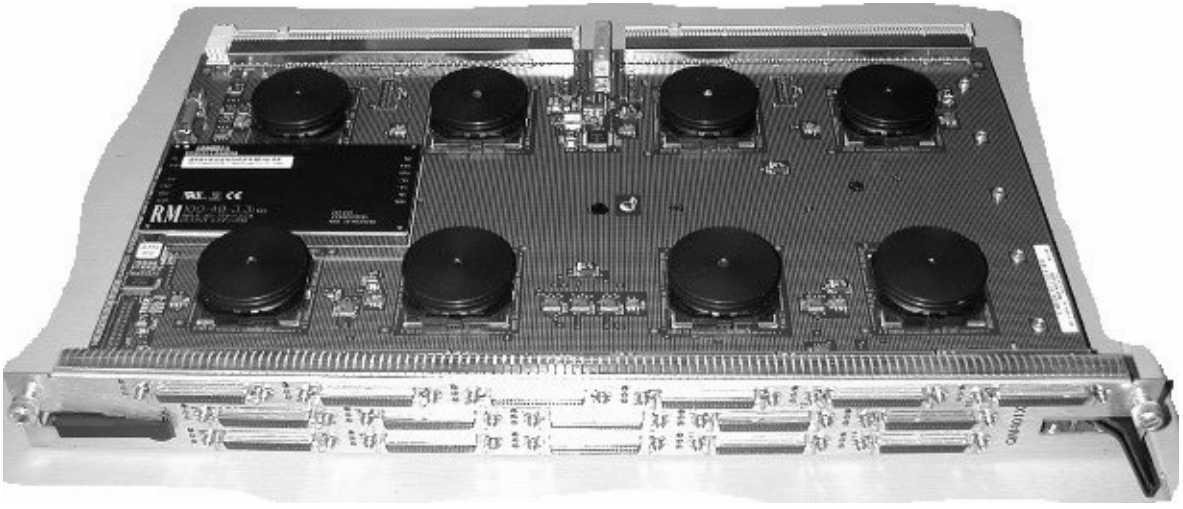


Figure 2–7 HP AlphaServer SC 16-Port Switch Card (New-Type)

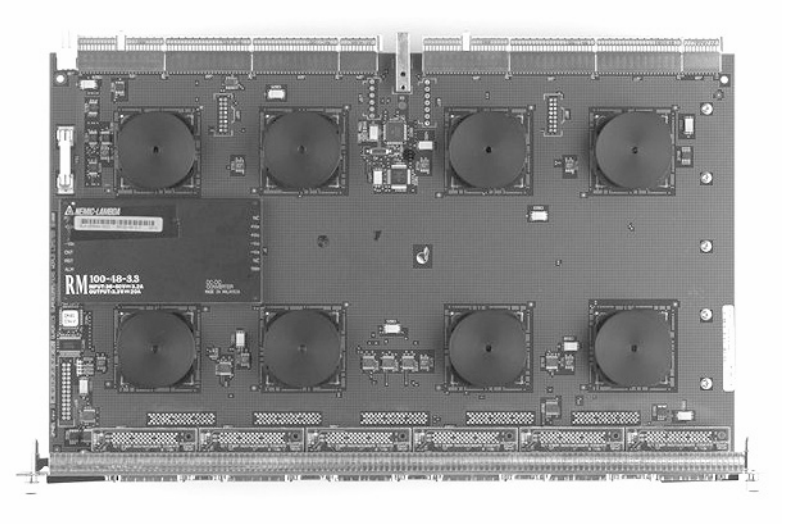


Figure 2–8 HP AlphaServer SC 16-Port Switch Card (Old-Type)

The HP AlphaServer SC 128-way switch enclosure has vertical slots at the rear for up to eight HP AlphaServer SC 16-port switch cards.

The HP AlphaServer SC 16-port switch card is a network switch card built from eight Quadrics Elite switch components. These eight switches are arranged in a two-stage fat-tree topology, to produce a 16-way switch.

The HP AlphaServer SC 16-port switch card has a screened front panel, a DC/DC convertor, and backplane connectors for use in the HP AlphaServer SC 128-way switch enclosure.

For details of how to install an HP AlphaServer SC 16-port switch card, see page 5–6. For details of how to replace an HP AlphaServer SC 16-port switch card, see page 5–19. For details of how to replace a fuse on an HP AlphaServer SC 16-port switch card, see page 5–23.

2.6 HP AlphaServer SC 16-Link Null Card

The HP AlphaServer SC 16-link null card is used only in the node-level switches in federated configurations. Only one version is available.

Figure 2–9 shows the HP AlphaServer SC 16-link null card.

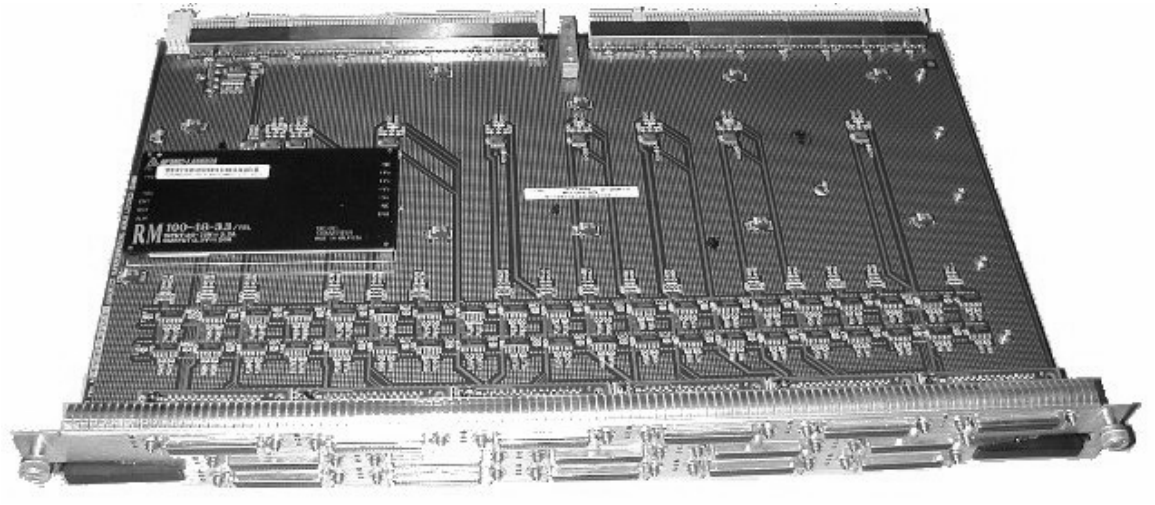


Figure 2–9 HP AlphaServer SC 16-Link Null Card

The HP AlphaServer SC 16-link null card brings the uplink connections from the HP AlphaServer SC high-level switch cards at the front of a node-level switch chassis (through the midplane) to a set of connectors on the HP AlphaServer SC 16-link null card at the rear of the switch chassis. The HP AlphaServer SC 16-link null card is similar to an HP AlphaServer SC 16-port switch card —

both have 16 HD50 connectors — but the HP AlphaServer SC 16-link null card has no Elite switch component. The HP AlphaServer SC 16-link null card is fitted with a surface-mounted resettable fuse.

For details of how to install an HP AlphaServer SC 16-link null card, see page 5–8. For details of how to replace an HP AlphaServer SC 16-link null card, see page 5–21.

2.7 HP AlphaServer SC High-Level Switch Card

Two versions of the HP AlphaServer SC high-level switch card are available.

Figure 2–10 shows an old-type HP AlphaServer SC high-level switch card.

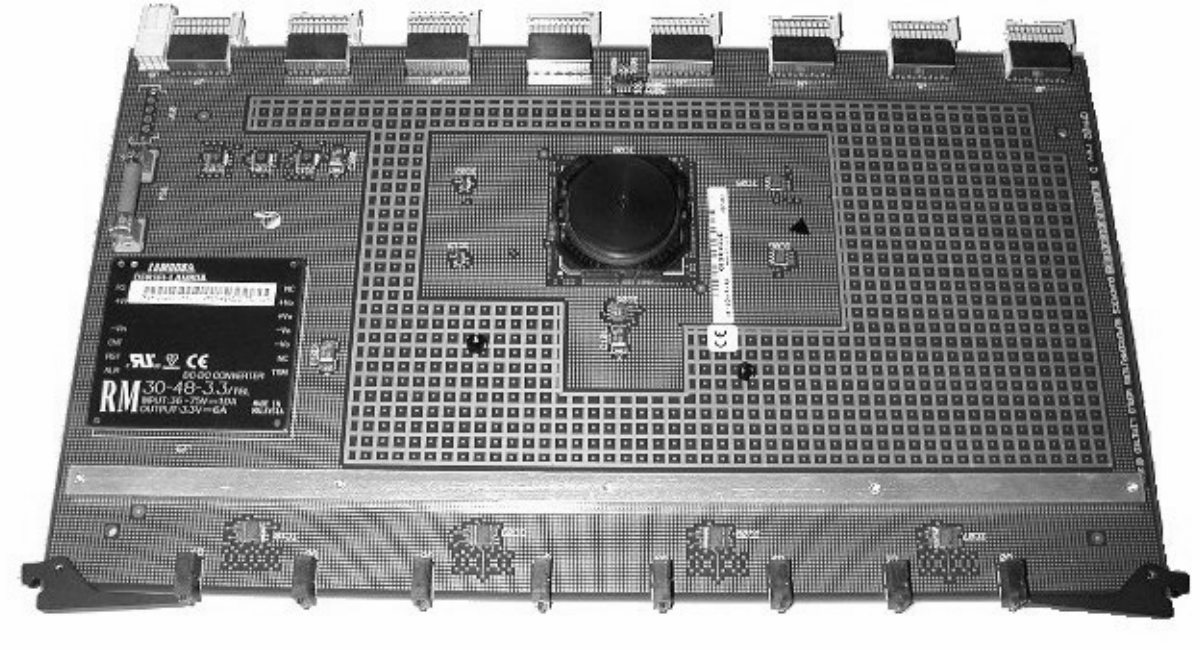


Figure 2–10 HP AlphaServer SC High-Level Switch Card (Old-Type)

The HP AlphaServer SC high-level switch card is a network switch card containing a single Elite switch component. It provides the third stage of the fat-tree topology. Standalone 128-way switches, and node-level switches in a federated configuration, contain 16 HP AlphaServer SC high-level switch cards in horizontal slots at the front of the switch chassis.

In a standalone 128-way switch, each HP AlphaServer SC high-level switch card provides eight downlinks; that is one downlink to each of the HP AlphaServer SC 16-port switch cards. For example, the HP AlphaServer SC high-level switch card in slot 16 connects the first link from each of the eight HP AlphaServer SC high-level switch cards in the rear of the chassis.

In a node-level switch, each HP AlphaServer SC high-level switch card provides four downlinks and four uplinks. The downlinks connect to the HP AlphaServer SC 16-port switch cards in the same node-level switch (one link to each card). The uplinks connect the node-level switch to the top-level switches. The uplinks are brought through the midplane of the switch to a set of connectors on the HP AlphaServer SC 16-link null cards at the rear of the node-level switch.

For details of how to install an HP AlphaServer SC high-level switch card, see page 5–8. For details of how to replace an HP AlphaServer SC high-level switch card, see page 5–21. For details of how to replace a fuse on an HP AlphaServer SC high-level switch card, see page 5–23.

2.8 HP AlphaServer SC Clock Card

Two versions of the HP AlphaServer SC clock card are available, as shown in Figure 2–11 and Figure 2–12. Section 2.12 on page 2–21 describes the hardware differences between the two versions.

Figure 2–11 shows the new-type HP AlphaServer SC clock card.

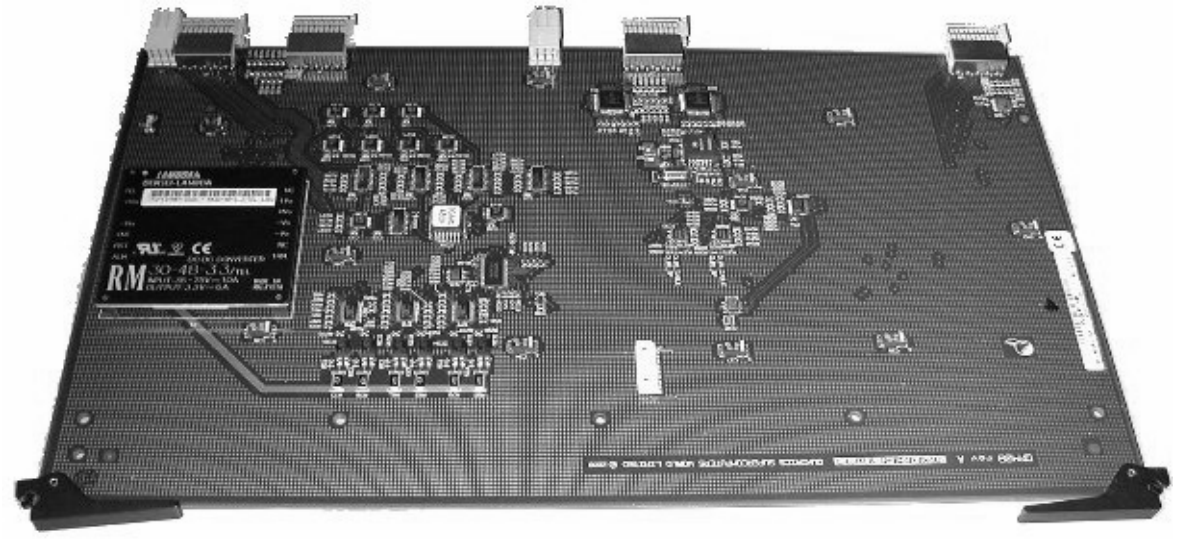


Figure 2–11 HP AlphaServer SC Clock Card (New-Type)

Figure 2–12 shows the old-type HP AlphaServer SC clock card.

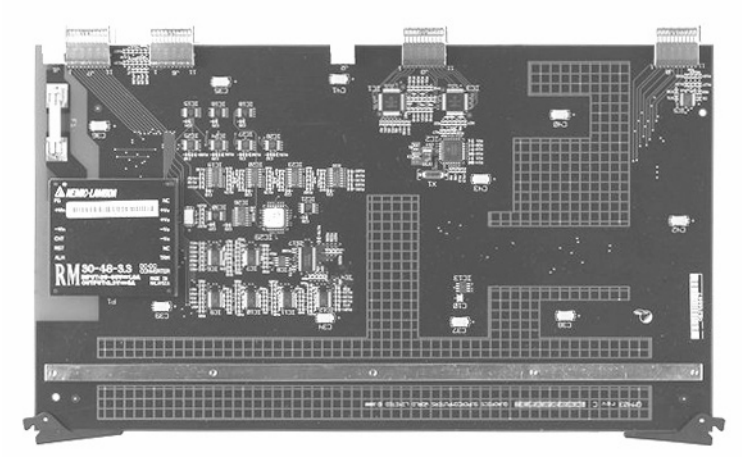


Figure 2–12 HP AlphaServer SC Clock Card (Old-Type)

The HP AlphaServer SC 128-way switch is supplied with one HP AlphaServer SC clock card. The HP AlphaServer SC clock card provides clock and JTAG distribution to the switch boards.

The new-type HP AlphaServer SC clock card has a new connector — you must attach the new internal clock cable to this connector, to connect the clock card to the two new external clock inputs on the power supply backplane tray (the internal clock cable splits into two just before it is connected to the power tray). The external clock inputs on the power supply backplane tray can be connected to HP AlphaServer SC clock distribution boxes, using clock distribution cables. Thus, the switch can operate off its internal clock, or off one of two external clocks.

The HP AlphaServer SC clock card is set to internal clocking by default, for use in standalone configurations. You may inadvertently change this setting, because the clock source multiplexor is controlled by a non-volatile register on the HP AlphaServer SC clock card in each HP AlphaServer SC 128-way switch. If you replace the HP AlphaServer SC clock card, you must reconfigure and verify the global clock.

When using a new-type HP AlphaServer SC 128-way switch in a standalone configuration, you must set the clock source to internal clocking, and you must fit external clock plugs to the external clock inputs (CLK A and CLK B), as described in step 7 on page 5–4.

When using an HP AlphaServer SC 128-way switch in a federated configuration, you must set the HP AlphaServer SC clock card to external clocking from an HP AlphaServer SC clock distribution box.

For details of how to install the HP AlphaServer SC clock card, see page 5–8.

For details of how to replace the HP AlphaServer SC clock card, see page 5–22.

For details of how to replace a fuse on the original type of HP AlphaServer SC clock card, see page 5–23. The updated HP AlphaServer SC clock card is fitted with a surface-mounted resettable fuse.

For details of how to verify or set the global clock source, see page 6–5.

2.9 HP AlphaServer SC Clock Distribution Box

The HP AlphaServer SC clock distribution box is used only in federated configurations. Only one version is available.

Figure 2–13 shows the HP AlphaServer SC clock distribution box.



Figure 2–13 HP AlphaServer SC Clock Distribution Box

The HP AlphaServer SC clock distribution box is a standalone clock source unit that provides synchronized clock signals for up to 24 HP AlphaServer SC 128-way switches (1024 nodes) in a federated configuration. (By linking together two or more HP AlphaServer SC clock distribution boxes, it is possible to provide clock signals for more than 24 HP AlphaServer SC 128-way switches. However, this functionality is not supported in HP AlphaServer SC Version 2.6.)

The HP AlphaServer SC clock distribution box has a 1-U high, 190-mm deep, screened enclosure, suitable for mounting in a standard 19" equipment rack (600-mm cabinet). U is a unit of measurement for rackmount equipment: 1 U = 1.75" = 4.44 cm.

The current consumption of the HP AlphaServer SC clock distribution box is less than 0.15 A. The power consumption of the HP AlphaServer SC clock distribution box is less than 15 W. The HP AlphaServer SC clock distribution box uses a Universal power supply operating in the range 90-254 V AC (61-49 Hz). Power is supplied through a standard IEC320 power socket.

In a federated configuration, you must use clock distribution cables to connect each HP AlphaServer SC 128-way switch to a single HP AlphaServer SC clock distribution box, by attaching the clock distribution cable to the CLK A input under the JTAG port at the rear of the switch chassis.

To provide failover, connect the CLK B inputs to a second HP AlphaServer SC clock distribution box. All HP AlphaServer SC 128-way switches must use the same clock source, and each switch must be tested as described in Section 6.4 on page 6–5, to ensure that the clock is being driven correctly.

For information on how to service the HP AlphaServer SC clock distribution box, see Chapter 6. For more information about the physical specifications of the HP AlphaServer SC clock distribution box, see Appendix B.

2.10 HP AlphaServer SC Interconnect Control Processor

The new-type HP AlphaServer SC 128-way switch enclosure has a dedicated slot for accepting the HP AlphaServer SC Interconnect control processor. This component cannot be placed in an old-type HP AlphaServer SC 128-way switch enclosure.

Figure 2–14 shows an HP AlphaServer SC Interconnect control processor.

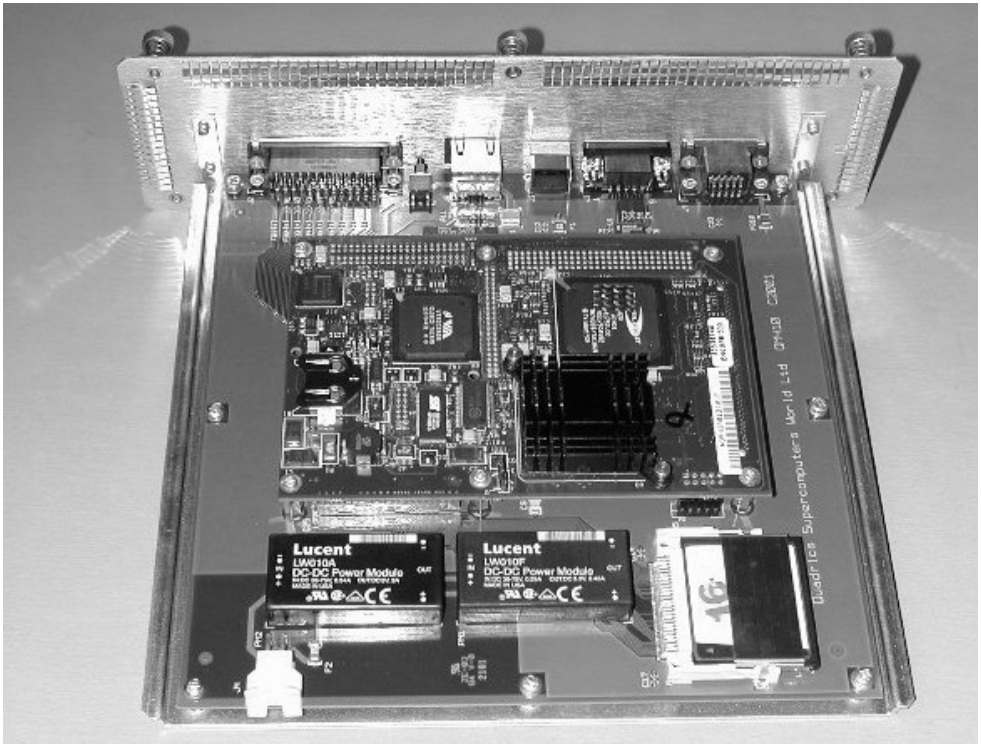


Figure 2–14 HP AlphaServer SC Interconnect Control Processor

The HP AlphaServer SC Interconnect control processor allows control functions to be executed over an Ethernet connection instead of the parallel port. The HP AlphaServer SC Interconnect control processor has no removable media, has an application in ROM, and is updateable.

The HP AlphaServer SC Interconnect control processor runs a monitoring process that collects configuration and status information from the switch and provides it to the switch network manager (`swmgr`). The switch network diagnostic (`jtest`) can be run on the control processor by connecting to its console (using the serial port or *via* telnet once IP configuration is complete). This simplifies the task of controlling a large number of switch chassis.

2.11 HP AlphaServer SC Interconnect Cables

This section describes the following:

- JTAG Cable (see Section 2.11.1 on page 2–18)
- Link Cable (see Section 2.11.2 on page 2–18)
- Clock Distribution Cable (see Section 2.11.3 on page 2–19)
- Ethernet Cable (see Section 2.11.4 on page 2–19)
- Guidelines for Working with Cables (see Section 2.11.5 on page 2–19)

2.11.1 JTAG Cable

The JTAG cable connects the parallel port on the switch-managing node to the JTAG port on the HP AlphaServer SC Interconnect switch. The JTAG cable is an IEEE1284 parallel-port cable, and is supplied with the HP AlphaServer SC Interconnect switch:

- The HP AlphaServer SC 16-port switch is supplied with one 10-m JTAG cable.
- The old-type HP AlphaServer SC 128-way switch is supplied with one 10-m JTAG cable.
- The new-type HP AlphaServer SC 128-way switch is supplied with one 1-m JTAG cable. Some new-type HP AlphaServer SC 128-way switches may also be supplied with one 10-m JTAG cable.

2.11.2 Link Cable

Each node is connected to the HP AlphaServer SC Interconnect switch by a link cable. In a federated configuration, node-level switches are connected to top-level switches by link cables.

Link cables are available in several different lengths: 3 m, 5 m, 10 m, 15 m, 20 m, and 25 m. For old-type HP AlphaServer SC 128-way switches, screw-fixing or springclip-fixing link cables may be used. For new-type HP AlphaServer SC 128-way switches, only springclip-fixing link cables may be used. Each link cable uses 20 sets of differential pairs — 10 pairs in each direction. There is an automatic link de-skew sequence when cables are connected.

2.11.3 Clock Distribution Cable

In a federated configuration, each HP AlphaServer SC Interconnect switch is connected to an HP AlphaServer SC clock distribution box by a shielded CAT5 clock distribution cable. Clock distribution cables are used with new-type HP AlphaServer SC 128-way switches only.

Clock distribution cables are available in several different lengths: 5 m, 10 m, 15 m, 20 m, and 25 m.

Note:

The clock distribution cables are very similar to the Ethernet cables — both are fitted with RJ45 connectors. When cabling the system, be sure not to mix the cables.

2.11.4 Ethernet Cable

The Ethernet cable connects the Ethernet port on the HP AlphaServer SC Interconnect control processor (on the HP AlphaServer SC Interconnect switch) to the Extreme Network Summit switch — this connects the HP AlphaServer SC 128-way switch to the management network. Ethernet cables are used with new-type HP AlphaServer SC 128-way switches only.

Note:

The Ethernet cables are very similar to the clock distribution cables — both are fitted with RJ45 connectors. When cabling the system, be sure not to mix the cables.

2.11.5 Guidelines for Working with Cables

This section provides guidelines on what you should and should not do when working with cables.

2.11.5.1 Cables: What You Should Do

When working with cables, do:

- Keep assemblies individually packaged until ready to be installed.
- Carefully uncoil the assembly to avoid kinks and check for damage.
- Provide a generous bend radius (six times the diameter of the cable).

- Carefully bundle cable lines around hinges.
- Provide adequate cable lengths at pivot points to allow free movement.
- Minimize pulling forces applied during installation.
- Use the connector body or pull tabs to disconnect assembly.
- Follow a routing path that has the least exposure to damage.
- Provide a service loop from the bundle to the connector.
- Support cables so that bundles cannot pull directly on the connection.
- Provide controlled pressure when tying cable lines together.
- Make sure that the connector is accurately aligned over the pins prior to mating.
- When connecting link cables, place a cable gasket between the cable head-shell and the switch faceplate. Cable gaskets are mandatory if using the new-type HP AlphaServer SC 128-way switch.
- Pull the connector straight off headers to prevent bent pins.
- Support the weight of cable bundles during installation.

2.11.5.2 Cables: What You Should Not Do

When working with cables:

- Do not allow an individual cable to kink.
- Do not force a twin-axial cable to bend along its major axis.
- Do not use tie wraps or harnessing ties that tightly compress the cable.
- Do not allow the cable to bend directly in the back of the metal connector.
- Do not route cables along the floor where they may be subject to compressive loads.
- Do not route cables around sharp edges.
- Do not run cables in an area where they can get pinched by a door or access panel.
- Do not allow cables to hang unsupported off the back of the connector.
- Do not use excessive pull forces when routing the cable.
- Do not pull on the cables to unplug an assembly.
- Do not force a connector onto its mating header.
- Do not use a cable assembly if you suspect that it has been damaged.
- Do not try to move a system by pulling on its cables.

2.12 Hardware Changes

Several HP AlphaServer SC Interconnect hardware components were changed so that HP AlphaServer SC Interconnect switches can be populated and connected together to build HP AlphaServer SC systems that are larger than 128 nodes.

The information in this section is organized as follows:

- Summary of Changed Features in New-Type HP AlphaServer SC 128-Way Switch (see page 2–21)
- How to Distinguish Between the New-Type Chassis and the Old-Type Chassis (see page 2–22)
- New-Type Hardware and Old-Type Hardware: Compatibility Issues (see page 2–22)

2.12.1 Summary of Changed Features in New-Type HP AlphaServer SC 128-Way Switch

The following features were changed in the new-type HP AlphaServer SC 128-way switch:

- A new HP AlphaServer SC Interconnect control processor was added to the rear of the chassis, to provide an Ethernet connection to the switch.
- The clocking system was modified, as follows:
  - The HP AlphaServer SC clock card was modified to operate off one of two external clock sources, or off its internal clock. These are required as the entire federated switch must operate at a common frequency (although phase does not matter).
  - A new internal clock cable was added to the chassis, to connect the clock card to the power supply backplane tray. This cable splits into two just before it is connected to the power tray.
  - Two RJ45 shielded connectors were added to the rear panel to accept external clock signals.

Note:

When using a new-type HP AlphaServer SC 128-way switch in a standalone configuration, you must set the clock source to internal clocking, and you must fit external clock plugs to the external clock inputs (CLK A and CLK B), as described in step 7 on page 5–4.

- The power supply backplane tray was modified, as follows:
  - Two RJ45 shielded connectors were added, to accept external clock signals.

  - A new power cable was provided, to connect the control processor to the power tray.
- The faceplate of the power supply units was modified.
- The fan tray was modified, as follows:
  - EMC-shielded gasketing was added.
  - The cutout in the chassis was modified.
- The HP AlphaServer SC 16-port switch card was modified — the new-type HP AlphaServer SC 16-port switch card contains additional gasketing for EMC compliance.
- The HP AlphaServer SC high-level switch card was modified — the new-type HP AlphaServer SC high-level switch card provides improved noise immunity for switch monitoring.
- New EMC shields are mandatory for the ejector handles and unused ports on the new-type HP AlphaServer SC 16-port switch cards, when used in a new-type HP AlphaServer SC 128-way switch.
- New EMC-shielded gaskets are mandatory for link cables, when connecting nodes to a new-type HP AlphaServer SC 128-way switch.
- New filler panels were provided for EMC compliance.
- New mounting brackets were provided; these brackets do not take up additional cabinet space.

2.12.2 How to Distinguish Between the New-Type Chassis and the Old-Type Chassis

The front of the new-type HP AlphaServer SC 128-way switch is painted black, and is labeled with “QM-S128F”. The front of the old-type HP AlphaServer SC 128-way switch is unpainted silver-colored metal, and is labeled with “QM-S128”.

The rear of the new-type HP AlphaServer SC 128-way switch has a control processor to the right of the HP AlphaServer SC 16-port switch cards, and has two RJ45 connectors fitted on the lower portion of the chassis. The rear of the old-type HP AlphaServer SC 128-way switch does not have a control processor, nor any RJ45 connectors.

2.12.3 New-Type Hardware and Old-Type Hardware: Compatibility Issues

In general, you cannot use old-type components in a new-type switch, but you can use most of the new-type components in both the old-type switch and the new-type switch. There are some exceptions; for example, you cannot use the new-type fan tray in the old-type chassis.

Table 2–2 describes the compatibility rules that you must obey when mixing old-type and new-type HP AlphaServer SC Interconnect hardware.

Table 2–2 New-Type and Old-Type Hardware: Compatibility Matrix

Part Number	Description	Old / New?	HP AlphaServer SC 128-Way Switch	
			Old-Type	New-Type
3X-CCNXF-AA	HP AlphaServer SC 16-port switch card	Old	Yes	No
3X-CCNXF-BA	HP AlphaServer SC 16-port switch card	New	Yes	Yes
3X-CCNXR-AA	HP AlphaServer SC high-level switch card	Old	Yes	No
3X-CCNXR-AA	HP AlphaServer SC high-level switch card	New	Yes	Yes
3X-CCNCR-AA	HP AlphaServer SC clock card	Old	Yes	No
3X-CCNCR-BA	HP AlphaServer SC clock card	New	Yes	Yes
3X-CCNCF-AA	Fan tray	Old	Yes	No
3X-CCNCF-CA	Fan tray	New	No	Yes
3X-CCNCP-AA	Power supply draw	Old	Yes	No
3X-CCNCP-DA	Power supply draw	New	Yes	Yes
3X-CCNCP-BA	Power supply backplane tray	Old	Yes	No
3X-CCNCP-CA	Power supply backplane tray	New	Yes	Yes
3X-CCNXB-AA	Mounting brackets	Old	Yes	No
3X-CCNXB-BA	Mounting brackets	New	Yes	Yes
3X-CCNCC-AA	ASSC filler panels	Old	Yes	No
3X-CCNCC-BA	ASSC filler panels	New	Yes	Yes
3X-CCNXP-AA	HP AlphaServer SC Interconnect control processor	New	No	Yes
3X-CCNXN-AA	HP AlphaServer SC 16-link null card	New	No	Yes
3X-CCNXC-AA	HP AlphaServer SC clock distribution box	New	No	Yes
2S-CCNXS-AA	EMC shields for unused ports	New	Optional	Mandatory
2S-CCNXS-BA	EMC shields for ejector covers for HP AlphaServer SC 16-port switch card (new-type cards only)	New	Optional, but can only be used on new-type cards	Mandatory
2S-CCNCG-AA	Cable gaskets	New	Optional	Mandatory
2S-CCNCT-AA	External clock plugs for unused external clock inputs	New	No	Mandatory

3

The HP AlphaServer SC Elan Adapter Card

The chapter describes how to install and service the HP AlphaServer SC Elan adapter cards.

The information in this chapter is organized as follows:

- Location of the HP AlphaServer SC Elan Adapter Card (see Section 3.1 on page 3–2)
- Installing an HP AlphaServer SC Elan Adapter Card (see Section 3.2 on page 3–5)
- Replacing an HP AlphaServer SC Elan Adapter Card (see Section 3.3 on page 3–6)
- Removing an HP AlphaServer SC Elan Adapter Card (see Section 3.4 on page 3–7)
- Freeing a Locked HP AlphaServer SC Elan Adapter Card (see Section 3.5 on page 3–7)

Caution:

Observe the appropriate antistatic procedure when handling HP AlphaServer SC Elan adapter cards.

3.1 Location of the HP AlphaServer SC Elan Adapter Card

You must install at least one HP AlphaServer SC Elan adapter card in every node. Do not install an HP AlphaServer SC Elan adapter card in a management server.

The HP AlphaServer SC Elan adapter card makes very heavy use of the PCI bus. Inter-node communication performance will be significantly reduced if the PCI bus is servicing other devices; in general, you should arrange that the HP AlphaServer SC Elan adapter card has exclusive use of one PCI bus. If this is not possible, try to ensure that the HP AlphaServer SC Elan adapter card does not share a PCI bus with any other high-speed device.

Table 3–1, Table 3–2, and Table 3–3 describe the PCI slot options for the supported HP AlphaServer SC node types.

Note:

These tables show the preferred locations for PCI option cards at the time of writing. For the latest PCI slot population rules, see the manufacturing COMPLY database.

Table 3–1 describes the PCI slot options for an HP AlphaServer DS20L.

Table 3–1 PCI Slot Options for an HP AlphaServer DS20L

Slot	Description	Part Number	Priority
0	Fibre Channel #1	DS-KGPSA-CA	1
1	AlphaServer SC Elan #1	3X-CCNNA-AA	1

Table 3–2 describes the PCI slot options for an HP AlphaServer ES45.

Table 3–2 PCI Slot Options for an HP AlphaServer ES45

Slot	Description	Part Number	Priority
1	Fibre Channel #3	3X-KZPSA-CA	1
	SCSI Adapter #2	3X-KZPEA-DB	2
	Gigabit Ethernet #1	DEGPA-SA	3
	Fibre Channel (2Gb) #2	3X-KGPSA-DA	4
	ATM Adapter (644M) #1	3X-DAPCA-FA	4
	ATM Adapter (155M) #1	3X-DAPBA-FA	4
	ATM Adapter UTP (155M) #1	3X-DAPCA-UA	4
2	Fibre Channel #4	3X-KZPSA-CA	1
	SCSI Adapter #3	3X-KZPEA-DB	2
	Gigabit Ethernet #2	DEGPA-SA	3
	Fibre Channel (2Gb) #3	3X-KGPSA-DA	4
	ATM Adapter (644M) #2	3X-DAPCA-FA	4
	ATM Adapter (155M) #2	3X-DAPBA-FA	4
	ATM Adapter UTP (155M) #2	3X-DAPCA-UA	4
3	HIPPI Adapter #1	KZPHA-AX	1
	Gigabit Ethernet #3	DEGPA-SA	2
	Graphics Card #2	SN-PBXGF-AB	3
	ATM Adapter (644M) #3	3X-DAPCA-FA	4
	ATM Adapter (155M) #3	3X-DAPBA-FA	4
	ATM Adapter UTP (155M) #3	3X-DAPCA-UA	4
4	AlphaServer SC Elan #2	3X-CCNNA-AA	1
	Fibre Channel (2Gb) #1	3X-KGPSA-DA	2
5	Fibre Channel (2Gb) #4	3X-KGPSA-DA	1
	Graphics Card #1	SN-PBXGF-AB	2
	Ethernet Card #2	3X-DE602-BB	3
6	Fibre Channel #2	3X-KZPSA-CA	1
	SCSI Adapter #5	3X-KZPEA-DB	2
7	HP AlphaServer SC Elan #1	3X-CCNNA-AA	1
8	Ethernet Card #1	3X-DE602-BB	1
9	Fibre Channel #1	3X-KZPSA-CA	1
	SCSI Adapter #4	3X-KZPEA-DB	2
10	SCSI Adapter #1	3X-KZPEA-DB	2

Table 3–3 describes the PCI slot options for an HP AlphaServer ES40.

Table 3–3 PCI Slot Options for an HP AlphaServer ES40

Slot	Description	Part Number	Priority
1	Graphics Card	SN-PBXGF-AB	1
		SN-PBXGK-BB	1
2	DO NOT USE		
3	HP AlphaServer SC Elan #1	3X-CCNNA-AA	1
4	DO NOT USE		
5	Ethernet Card #1	3X-DE602-AA	1
6	SCSI Adapter #1	3X-KZPCA-AA	1
7	Fibre Channel #1	DS-KGPSA-CA	1
8	Fibre Channel #2	DS-KGPSA-CA	1
9	Gigabit Ethernet #1	DEGPA-SA	1
	HIPPI Adapter #1	KZPHA-AX	1
	ATM Adapter (622M) #1	3X-DAPCA-FA	1
	ATM Adapter (155M) #1	3X-DAPBA-FA	1
	ATM Adapter UTP (155M) #1	3X-DAPBA-UA	1
	SCSI Adapter #2	3X-KZPCA-AA	1
10	AlphaServer SC Elan #2	3X-CCNNA-AA	1
	Gigabit Ethernet #1	DEGPA-SA	2
	HIPPI Adapter #1	KZPHA-AX	2
	ATM Adapter (622M) #1	3X-DAPCA-FA	2
	ATM Adapter (155M) #1	3X-DAPBA-FA	2
	ATM Adapter UTP (155M) #1	3X-DAPBA-UA	2
	SCSI Adapter #2	3X-KZPCA-AA	2

3.2 Installing an HP AlphaServer SC Elan Adapter Card

To install an HP AlphaServer SC Elan adapter card, perform the following tasks:

1. Halt the operating system on the node.
2. Power down the node.
3. Place the HP AlphaServer SC Elan adapter card on the antistatic mat.
4. Remove the appropriate side panel.
5. Remove the PCI filler panel from the appropriate PCI slot (see Section 3.1 on page 3–2).
6. Holding the HP AlphaServer SC Elan adapter card by its edges, push it into the slot.
7. Replace and tighten the Phillips screw that fastens the faceplate of the HP AlphaServer SC Elan adapter card to the rear panel of the node chassis.

   HP AlphaServer ES45 nodes have a Quick Release mechanism; however, it is mandatory to use the Phillips screw, due to the weight of the link cable.
8. Replace the side panel.
9. Connect the link cable from the faceplate of the HP AlphaServer SC Elan adapter card to the appropriate port on the HP AlphaServer SC Interconnect switch.
10. Power up the node.
11. Check the status LEDs at each end of the link cable: that is, on the HP AlphaServer SC Elan adapter card, and beside the corresponding port on the HP AlphaServer SC 16-port switch card (see Section 7.5 on page 7–34 for more information about these LEDs).

    The green LEDs at each end of the link cable should light — this indicates that the physical communication layer is operating correctly. Refer to Section 7.5.4.2 on page 7–39 if either of the green LEDs does not light.

    Ignore red LEDs on connected links when the switch is first powered up — these will be cleared by the switch manager. Ignore red LEDs on unconnected links.
12. Ensure that the node is at the SRM prompt.
13. Run the `elanpcitest` and `elanlinktest` diagnostic tests, as described in Chapter 7.
14. Boot the node.

For more information about installing PCI cards, please refer to the *Service Guide* for your HP AlphaServer SC node type.

3.3 Replacing an HP AlphaServer SC Elan Adapter Card

To replace an HP AlphaServer SC Elan adapter card, perform the following tasks:

1. Halt the operating system on the node.
2. Power down the node.
3. Place the new HP AlphaServer SC Elan adapter card on the antistatic mat.
4. Disconnect the link cable from the faceplate of the HP AlphaServer SC Elan adapter card.
5. Remove the appropriate side panel.
6. Unscrew the Phillips screw that fastens the faceplate of the HP AlphaServer SC Elan adapter card to the rear panel of the node chassis.
7. Holding the old HP AlphaServer SC Elan adapter card by its edges, pull it out of the slot.
8. Place the old HP AlphaServer SC Elan adapter card on the antistatic mat.
9. Holding the new HP AlphaServer SC Elan adapter card by its edges, push it into the slot.
10. Replace and tighten the Phillips screw that fastens the faceplate of the HP AlphaServer SC Elan adapter card to the rear panel of the node chassis.

    HP AlphaServer ES45 nodes have a Quick Release mechanism; however, it is mandatory to use the Phillips screw, due to the weight of the link cable.
11. Replace the side panel.
12. Connect the link cable from the faceplate of the HP AlphaServer SC Elan adapter card to the appropriate port on the HP AlphaServer SC Interconnect switch.
13. Power up the node.
14. Check the status LEDs at each end of the link cable: that is, on the HP AlphaServer SC Elan adapter card, and beside the corresponding port on the HP AlphaServer SC 16-port switch card (see Section 7.5 on page 7–34 for more information about these LEDs).

    The green LEDs at each end of the link cable should light — this indicates that the physical communication layer is operating correctly. Refer to Section 7.5.4.2 on page 7–39 if either of the green LEDs does not light.

    Ignore red LEDs on connected links when the switch is first powered up — these will be cleared by the switch manager. Ignore red LEDs on unconnected links.
15. Ensure that the node is at the SRM prompt.
16. Run the `elanpcitest` and `elanlinktest` diagnostic tests, as described in Chapter 7.
17. Boot the node.

For more information about replacing PCI cards, please refer to the *Service Guide* for your HP AlphaServer SC node type.

3.4 Removing an HP AlphaServer SC Elan Adapter Card

To remove an HP AlphaServer SC Elan adapter card, perform the following tasks:

1. Halt the operating system on the node.
2. Power down the node.
3. Disconnect the link cable from the faceplate of the HP AlphaServer SC Elan adapter card.
4. Remove the appropriate side panel.
5. Unscrew the Phillips screw that fastens the faceplate of the HP AlphaServer SC Elan adapter card to the rear panel of the node chassis.
6. Holding the HP AlphaServer SC Elan adapter card by its edges, pull it out of the slot.
7. Place the HP AlphaServer SC Elan adapter card on the antistatic mat.
8. Attach a PCI filler panel to the rear panel, using a Phillips screw.
9. Replace the side panel.
10. Power up the node.
11. Boot the node.

For more information about removing PCI cards, please refer to the *Service Guide* for your HP AlphaServer SC node type.

3.5 Freeing a Locked HP AlphaServer SC Elan Adapter Card

If you do not power down a node before connecting its link cable, the HP AlphaServer SC Elan adapter card may lock.

To free a locked HP AlphaServer SC Elan adapter card, perform the following steps:

1. Halt and then shut down the node.
2. Power down the node.
3. Power up the node.
4. Boot the node.

4

The HP AlphaServer SC 16-Port Switch

This chapter describes how to install and service the HP AlphaServer SC 16-port switch.

The information in this chapter is organized as follows:

- Installing the HP AlphaServer SC 16-Port Switch (see Section 4.1 on page 4–2)
- Powering Up the HP AlphaServer SC 16-Port Switch (see Section 4.2 on page 4–3)
- Connecting Nodes to the HP AlphaServer SC 16-Port Switch (see Section 4.3 on page 4–4)
- Connecting Switch-Managing Nodes to HP AlphaServer SC 16-Port Switches (see Section 4.4 on page 4–5)
- Replacing the HP AlphaServer SC 16-Port Switch (see Section 4.5 on page 4–6)
- Servicing the HP AlphaServer SC 16-Port Switch Power Supplies (see Section 4.6 on page 4–7)
- Servicing the HP AlphaServer SC 16-Port Switch Fans (see Section 4.7 on page 4–11)
- Replacing a Fuse in the IEC AC Power Inlet Connector (see Section 4.8 on page 4–13)
- Servicing the HP AlphaServer SC 16-Port Switch Card (see Section 4.9 on page 4–13)

Caution:

Observe the appropriate antistatic procedure when handling network cards.

4.1 Installing the HP AlphaServer SC 16-Port Switch

The HP AlphaServer SC 16-port switch can be installed in a standard cabinet, using the mounting brackets supplied.

WARNING:

Ensure that the rack is stable before starting installation of the HP AlphaServer SC 16-port switch. Ensure that the addition of this equipment does not create a hazardous condition in which the rack is unstable due to uneven loading.

Do not block airvents or otherwise restrict airflow when installing in a rackmount enclosure. Airflow through the unit is front to back.

For cable management purposes, you may find it more convenient to install the HP AlphaServer SC 16-port switch in the rear of the cabinet, rather than the front.

To install an HP AlphaServer SC 16-port switch in a rack, perform the following tasks:

1. Unpack the HP AlphaServer SC 16-port switch, and secure it in a suitable position in the front of the cabinet using the eight (6-32 x 0.375) screws provided — four on the front and four on the rear — as shown in Figure 4–1.

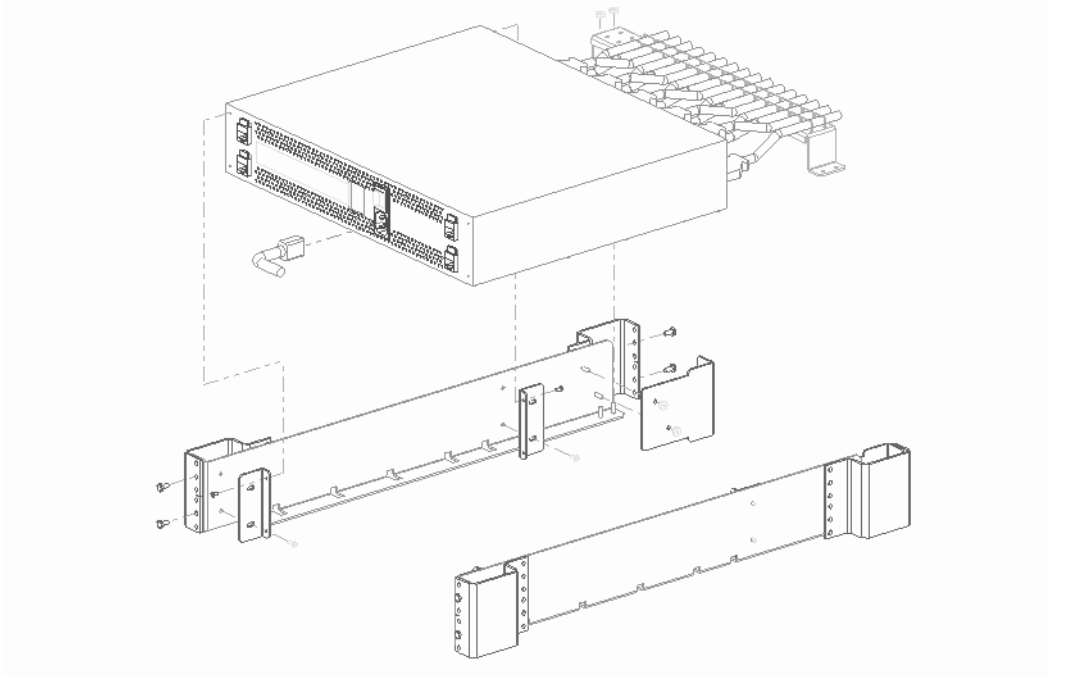


Figure 4–1 Installing the HP AlphaServer SC 16-Port Switch in a Rack

2. Connect the link cables from the HP AlphaServer SC Elan adapter card (in each node) to the appropriate port on the HP AlphaServer SC 16-port switch. Ensure that each link cable is correctly positioned on the HP AlphaServer SC 16-port switch, as described in Section 4.3 on page 4–4.
3. Connect the JTAG cable from the parallel port on the switch-managing node to the JTAG port on the HP AlphaServer SC 16-port switch. See Section 4.4 on page 4–5 for more details.
4. Power up the HP AlphaServer SC 16-port switch as described in Section 4.2 on page 4–3.
5. Power up all of the nodes that are connected to the HP AlphaServer SC 16-port switch, and ensure that they are at the SRM prompt.
6. Verify that the HP AlphaServer SC 16-port switch is working correctly by running the scripts described in Chapter 7.

4.2 Powering Up the HP AlphaServer SC 16-Port Switch

The HP AlphaServer SC 16-port switch uses Universal power supplies operating in the range 110-250 V AC (50/60 Hz). Power is supplied through a standard IEC320 power socket on the front panel, as shown in Figure 4–2.

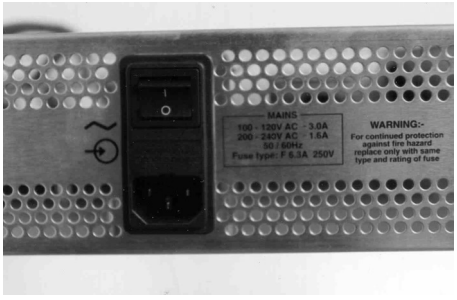


Figure 4–2 Power Switch on HP AlphaServer SC 16-Port Switch

Caution:

Ensure that the overall loading of the branch circuit is not exceeded by the addition of the HP AlphaServer SC 16-port switch.

Ensure that the power cable is adequate for marked power rating of unit (3.0 A at 110 V AC, 1.5 A at 220 V AC).

To power up an HP AlphaServer SC 16-port switch, perform the following steps:

1. Connect the power cable to a grounded AC power outlet, and to the IEC320 power socket on the front panel of the HP AlphaServer SC 16-port switch.
2. Press the power supply switch (above the IEC320 power socket) to power up the HP AlphaServer SC 16-port switch.

4.3 Connecting Nodes to the HP AlphaServer SC 16-Port Switch

The cables that connect the nodes to the HP AlphaServer SC Interconnect switch are called **link cables**.

The rear panel of the HP AlphaServer SC 16-port switch has connections for 16 HD50 connectors, as shown in Figure 4–3. The link cables connect these HD50 connectors (on the HP AlphaServer SC 16-port switch) to the HP AlphaServer SC Elan adapter cards (in each node).

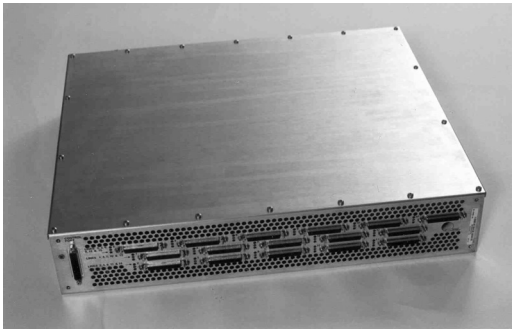


Figure 4–3 HP AlphaServer SC 16-Port Switch Rear Panel

To connect the link cables, first ensure that the HP AlphaServer SC 16-port switch is powered up and then perform the following steps for each node:

1. Ensure that the node is halted, and then powered down, before connecting the link cables.

   Note:

   If you do not power down the node, the HP AlphaServer SC Elan adapter card may lock. See Section 3.5 on page 3–7 for details on how to free a locked HP AlphaServer SC Elan adapter card.

2. Ensure that the HP AlphaServer SC Elan adapter card is seated correctly in the node (see Section 3.2 on page 3–5).
3. Connect one end of the link cable to the HP AlphaServer SC Elan adapter card in the node, and the other to one of the HD50 connectors on the rear panel. Take care to insert the cable connectors at the correct orientation to avoid bending any of the pins.

   Note:

   The rear panel legend shows a number next to each HD50 connector. These port numbers correspond to the network IDs that will be assigned to the connected nodes. Node 0 should be connected to port 0, Node 1 to port 1, and so on.

4. Ensure that both sides of the springclip, or both locking screws, are firmly connected at both ends of the cable.

   As each link cable is connected, label the cable with the port number and the board ID using the labels supplied.

   We recommend that you label all of the cables that are connected to the switch. Remember that all ports are in ascending order, and that this is directly representative of the node numbering in an HP AlphaServer SC system.

5. Power up the node and check the status LEDs at each end of the link cable. See Section 7.5 on page 7–34 for more information about these LEDs.

   The green LEDs at each end of the link cable should light — this indicates that the physical communication layer is operating correctly. Refer to Section 7.5.4.2 on page 7–39 if either of the green LEDs does not light.

   Ignore red LEDs on connected links when the switch is first powered up — these will be cleared by the switch manager. Ignore red LEDs on unconnected links.

4.4 Connecting Switch-Managing Nodes to HP AlphaServer SC 16-Port Switches

The JTAG port on the HP AlphaServer SC 16-port switch is used during initial installation by the network test programs described in Chapter 7. Once the system is running, this port is used by the switch network manager daemon `swmgr` to monitor the network for errors, check the status of fans and power supplies, and collect temperature readings.

To connect the switch-managing nodes to the HP AlphaServer SC 16-port switches, perform the following steps for each switch:

1. Each HP AlphaServer SC 16-port switch has a JTAG port, provided on a 25-pin DB socket. Using the 10-m JTAG cable provided, connect this port to the parallel port of the switch-managing node. Node 0 is the switch-managing node for the first rail (rail 0), and Node 1 is the switch-managing node for the second rail (rail 1).

   Note:

   This JTAG cable must be connected before you can run the diagnostic software. See Chapter 7 for details.

   ---

2. Ensure that the connectors at both ends of the JTAG cable are seated correctly.
3. Ensure that the HP AlphaServer SC Interconnect switch is powered up.
4. Verify that the HP AlphaServer SC 16-port switch is working correctly by running the scripts described in Chapter 7.

4.5 Replacing the HP AlphaServer SC 16-Port Switch

Caution:

Do not block air vents or otherwise restrict airflow when installing in a rackmount enclosure. Airflow through the unit is front to rear.

To replace the HP AlphaServer SC 16-port switch, perform the following steps:

1. Halt, and then power down, all of the nodes that are connected to the HP AlphaServer SC 16-port switch.

   Note:

   If you do not power down the nodes, the nodes will crash.

2. Power down the HP AlphaServer SC 16-port switch and remove the power cable, as shown in Figure 4–4.

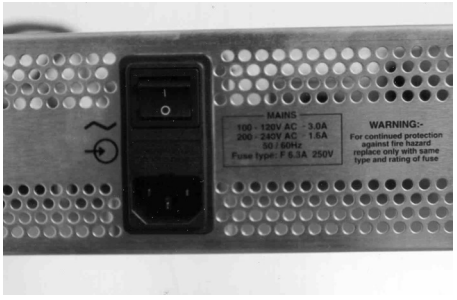


Figure 4–4 Power Switch on HP AlphaServer SC 16-Port Switch

3. Ensure that the link cables are adequately labeled as described in Section 4.3 on page 4–4, and then disconnect the link cables from HD50 connectors on the HP AlphaServer SC 16-port switch, as shown in Figure 4–5.

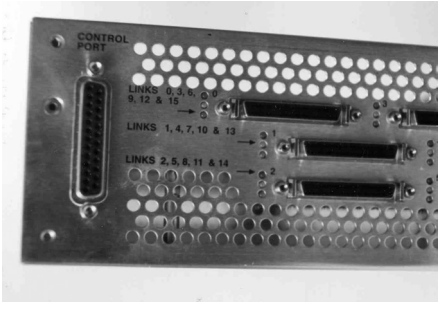


Figure 4–5 HP AlphaServer SC 16-Port Switch Connectors

4. Disconnect the JTAG cable from the JTAG port on the HP AlphaServer SC 16-port switch, as shown in Figure 4–5.
5. Remove the eight (6-32 x 0.375) screws securing the HP AlphaServer SC 16-port switch to the rack — four on the front and four on the rear — as shown in Figure 4–1.
6. Slide the HP AlphaServer SC 16-port switch out from the front of the rack.
7. Replace the HP AlphaServer SC 16-port switch.
8. Secure the HP AlphaServer SC 16-port switch to the rack.
9. Reconnect the link cables that you disconnected in step 3; that is, reconnect the nodes to the HD50 connectors on the HP AlphaServer SC 16-port switch. Ensure that each link cable is correctly positioned on the HP AlphaServer SC 16-port switch, as described in Section 4.3 on page 4–4.
10. Reconnect the JTAG cable that you disconnected in step 4; that is, reconnect the parallel port of the switch-managing node to the JTAG port on the HP AlphaServer SC 16-port switch. See Section 4.4 on page 4–5 for more details.
11. Power up the HP AlphaServer SC 16-port switch as described in Section 4.2 on page 4–3.
12. Power up all of the nodes that are connected to the HP AlphaServer SC 16-port switch, and ensure that they are at the SRM prompt.
13. Verify that the HP AlphaServer SC 16-port switch is working correctly by running the scripts described in Chapter 7.

4.6 Servicing the HP AlphaServer SC 16-Port Switch Power Supplies

The information in this section is organized as follows:

- Servicing the 3.3-V Power Supply for the 16-Port Chassis Circuit Board (see Section 4.6.1 on page 4–8)
- Servicing the 24-V Power Supply for the 16-Port Chassis Circuit Board (see Section 4.6.2 on page 4–9)

4.6.1 Servicing the 3.3-V Power Supply for the 16-Port Chassis Circuit Board

Figure 4–6 shows the 3.3-V power supply for the HP AlphaServer SC 16-port switch.

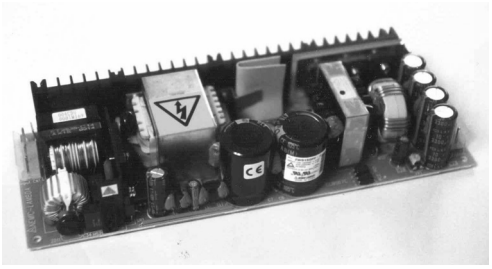


Figure 4–6 3.3-V Power Supply for the HP AlphaServer SC 16-Port Switch

To service the 3.3-V power supply for the 16-port chassis circuit board, perform the following steps:

1. Halt, and then power down, all of the nodes that are connected to the HP AlphaServer SC 16-port switch.

   Note:

   If you do not power down the nodes, the nodes will crash.

2. Power down the HP AlphaServer SC 16-port switch and remove the power cable, as shown in Figure 4–4 on page 4–6.
3. Ensure that the link cables are adequately labeled as described in Section 4.3 on page 4–4, and then disconnect the link cables from HD50 connectors on the HP AlphaServer SC 16-port switch, as shown in Figure 4–5 on page 4–6.
4. Disconnect the JTAG cable from the JTAG port on the HP AlphaServer SC 16-port switch, as shown in Figure 4–5 on page 4–6.
5. Remove the eight (6-32 x 0.375) screws securing the HP AlphaServer SC 16-port switch to the rack — four on the front and four on the rear — as shown in Figure 4–1 on page 4–2.
6. Slide the HP AlphaServer SC 16-port switch out from the front of the rack.

7. Remove the top cover by unscrewing the 18 M3 screws and lifting the cover up, as shown in Figure 4–7.

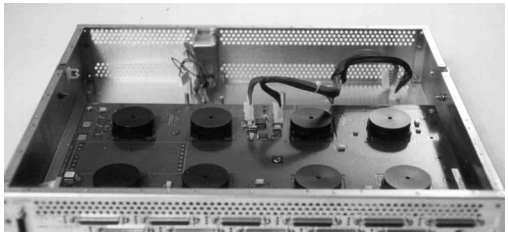


Figure 4–7 Removing the HP AlphaServer SC 16-Port Switch Top Cover

8. Disconnect the cables from connectors CN1, CN2, and CN3.
9. Remove the ground wire.
10. Remove the five M3 screws securing the board to the chassis.
11. Replace the board, and replace the screws that you removed in step 10.
12. Replace the ground wire.
13. Reconnect the cables to connectors CN1, CN2, and CN3.
14. Replace the cover.
15. Secure the HP AlphaServer SC 16-port switch to the rack and reconnect the JTAG and link cables, as described in Section 4.5 on page 4–6.
16. Power up the HP AlphaServer SC 16-port switch as described in Section 4.2 on page 4–3.
17. Verify that the HP AlphaServer SC 16-port switch is working correctly by running the scripts described in Chapter 7.

4.6.2 Servicing the 24-V Power Supply for the 16-Port Chassis Circuit Board

Figure 4–8 shows the 24-V power supply for the HP AlphaServer SC 16-port switch.

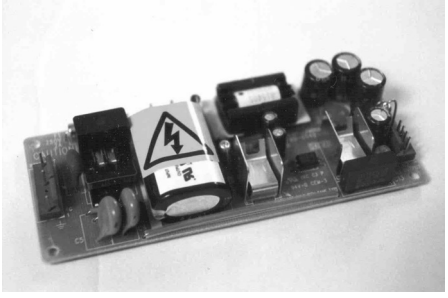


Figure 4–8 24-V Power Supply for the HP AlphaServer SC 16-Port Switch

Servicing the HP AlphaServer SC 16-Port Switch Power Supplies

To service the 24-V power supply for the 16-port chassis circuit board, perform the following steps:

1. Halt, and then power down, all of the nodes that are connected to the HP AlphaServer SC 16-port switch.

   Note:

   If you do not power down the nodes, the nodes will crash.

2. Power down the HP AlphaServer SC 16-port switch and remove the power cable, as shown in Figure 4–4 on page 4–6.
3. Ensure that the link cables are adequately labeled as described in Section 4.3 on page 4–4, and then disconnect the link cables from HD50 connectors on the HP AlphaServer SC 16-port switch, as shown in Figure 4–5 on page 4–6.
4. Disconnect the JTAG cable from the JTAG port on the HP AlphaServer SC 16-port switch, as shown in Figure 4–5 on page 4–6.
5. Remove the eight (6-32 x 0.375) screws securing the HP AlphaServer SC 16-port switch to the rack — four on the front and four on the rear — as shown in Figure 4–1 on page 4–2.
6. Slide the HP AlphaServer SC 16-port switch out from the front of the rack.
7. Remove the top cover by unscrewing the 18 M3 screws and lifting the cover up, as shown in Figure 4–7 on page 4–9.
8. Disconnect the cables from connectors CN1 and CN2.
9. Remove the four M3 screws securing the board to the chassis.
10. Replace the board, and replace the screws that you removed in step 9.
11. Reconnect the cables to connectors CN1 and CN2.
12. Replace the cover.
13. Secure the HP AlphaServer SC 16-port switch to the rack and reconnect the JTAG and link cables, as described in Section 4.5 on page 4–6.
14. Power up the HP AlphaServer SC 16-port switch as described in Section 4.2 on page 4–3.
15. Verify that the HP AlphaServer SC 16-port switch is working correctly by running the scripts described in Chapter 7.

4.7 Servicing the HP AlphaServer SC 16-Port Switch Fans

Figure 4–9 shows the fan tray of an HP AlphaServer SC 16-port switch.

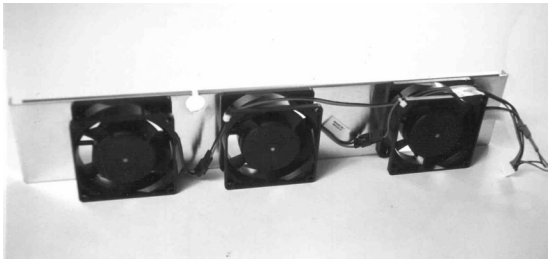


Figure 4–9 HP AlphaServer SC 16-Port Switch Fan Tray

To replace the fan tray in an HP AlphaServer SC 16-port switch, perform the following steps:

1. Halt, and then power down, all of the nodes that are connected to the HP AlphaServer SC 16-port switch.

   Note:

   If you do not power down the nodes, the nodes will crash.

2. Power down the HP AlphaServer SC 16-port switch and remove the power cable, as shown in Figure 4–4 on page 4–6.
3. Ensure that the link cables are adequately labeled as described in Section 4.3 on page 4–4, and then disconnect the link cables from HD50 connectors on the HP AlphaServer SC 16-port switch, as shown in Figure 4–5 on page 4–6.
4. Disconnect the JTAG cable from the JTAG port on the HP AlphaServer SC 16-port switch, as shown in Figure 4–5 on page 4–6.
5. Remove the eight (6-32 x 0.375) screws securing the HP AlphaServer SC 16-port switch to the rack — four on the front and four on the rear — as shown in Figure 4–1 on page 4–2.
6. Slide the HP AlphaServer SC 16-port switch out from the front of the rack.
7. Remove the top cover by unscrewing the 18 M3 screws and lifting the cover up, as shown in Figure 4–7 on page 4–9.
8. Remove the 3.3-V power supply, as described in Section 4.6.1 on page 4–8.
9. Remove the 24-V power supply, as described in Section 4.6.2 on page 4–9.

10. Remove the cable bushing from the fan tray by sliding the wires through the cut out in the fan tray, as shown in Figure 4–10.



Figure 4–10 Removing the Cable Bushing from the Fan Tray

11. Loosen the two M4 hex nuts on either side of the fan tray, securing the fan tray to the chassis, as shown in Figure 4–11.

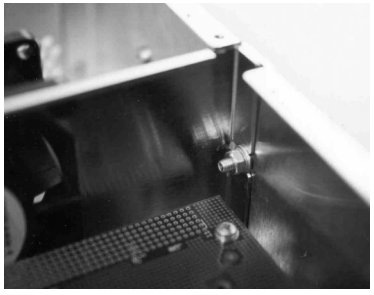


Figure 4–11 Loosening the Nuts Securing the Fan Tray to the Chassis

12. Tilt the fan tray bottom away from the HP AlphaServer SC 16-port switch card until the tray can be lifted free from the securing screws, and remove the fan tray, as shown in Figure 4–12.

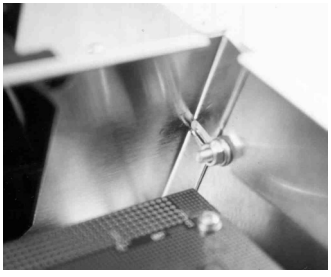


Figure 4–12 Removing the Fan Tray

13. Fit the new fan tray.

14. Refit the two M4 hex nuts on either side of the fan tray, and tighten to secure the fan tray to the chassis.
15. Replace the cable bushing in the fan tray by sliding the wires through the cut out in the fan tray, as shown in Figure 4–10 on page 4–12.
16. Replace the 24-V power supply, as described in Section 4.6.2 on page 4–9.
17. Replace the 3.3-V power supply, as described in Section 4.6.1 on page 4–8.
18. Replace the cover. Secure the HP AlphaServer SC 16-port switch to the rack and reconnect the JTAG and link cables, as described in Section 4.5 on page 4–6.
19. Refit the lid and reinstall the HP AlphaServer SC 16-port switch in its rack; then reconnect the link cables.
20. Power up the HP AlphaServer SC 16-port switch as described in Section 4.2 on page 4–3.
21. Verify that the HP AlphaServer SC 16-port switch is working correctly by running the scripts described in Chapter 7.

4.8 Replacing a Fuse in the IEC AC Power Inlet Connector

To replace a fuse in the IEC AC power inlet connector, perform the following steps:

1. Remove the power cord from the HP AlphaServer SC 16-port switch.
2. Remove the fuse cover.
3. Fit a new fuse. It must be a quick-blow 6.3-A, 250-V, 20-mm x 5-mm ceramic fuse (there is a space within the fuse cover; you can store a spare fuse there for future use).
4. Replace the fuse cover.
5. Replace the power cord.

4.9 Servicing the HP AlphaServer SC 16-Port Switch Card

If the HP AlphaServer SC 16-port switch card fails, you must replace the complete chassis, as described in Section 4.5 on page 4–6.

5

The HP AlphaServer SC 128-Way Switch

This chapter describes how to install and service the HP AlphaServer SC 128-way switch.

The information in this chapter is organized as follows:

- Installing the HP AlphaServer SC 128-Way Switch (see Section 5.1 on page 5–2)
- Powering Up the HP AlphaServer SC 128-Way Switch (see Section 5.2 on page 5–12)
- Checking Internal Links Within the HP AlphaServer SC 128-Way Switch (see Section 5.3 on page 5–13)
- Connecting Nodes to the HP AlphaServer SC 128-Way Switch (see Section 5.4 on page 5–13)
- Connecting Node-Level Switches to Top-Level Switches (see Section 5.5 on page 5–16)
- Connecting Switch-Managing Nodes to HP AlphaServer SC 128-Way Switches (see Section 5.6 on page 5–18)
- Replacing an HP AlphaServer SC 16-Port Switch Card (see Section 5.7 on page 5–19)
- Replacing an HP AlphaServer SC 16-Link Null Card (see Section 5.8 on page 5–21)
- Replacing an HP AlphaServer SC High-Level Switch Card (see Section 5.9 on page 5–21)
- Replacing the HP AlphaServer SC Clock Card (see Section 5.10 on page 5–22)
- Replacing a Fuse on an HP AlphaServer SC Interconnect Card (see Section 5.11 on page 5–23)
- Replacing an HP AlphaServer SC 128-Way Switch Power Supply Unit (see Section 5.12 on page 5–24)
- Replacing the HP AlphaServer SC 128-Way Switch Power Supply Backplane Tray (see Section 5.13 on page 5–26)
- Replacing the HP AlphaServer SC 128-Way Switch Fan Tray (see Section 5.14 on page 5–32)
- Replacing the HP AlphaServer SC Interconnect Control Processor (see Section 5.15 on page 5–35)
- Replacing an HP AlphaServer SC 128-Way Switch Chassis (see Section 5.16 on page 5–36)

5.1 Installing the HP AlphaServer SC 128-Way Switch

The information in this section is organized as follows:

- Installing the HP AlphaServer SC 128-Way Switch in a Cabinet (see Section 5.1.1 on page 5–2)
- Installing the HP AlphaServer SC 16-Port Switch Cards (see Section 5.1.2 on page 5–6)
- Installing the HP AlphaServer SC 16-Link Null Cards (see Section 5.1.3 on page 5–8)
- Installing the HP AlphaServer SC Clock Card and the HP AlphaServer SC High-Level Switch Cards (see Section 5.1.4 on page 5–8)
- Installing the HP AlphaServer SC Interconnect Control Processor (see Section 5.1.5 on page 5–10)

Caution:

Observe the appropriate antistatic procedure when handling network cards.

5.1.1 Installing the HP AlphaServer SC 128-Way Switch in a Cabinet

Figure 5–1 shows how to install an HP AlphaServer SC 128-way switch in a cabinet.

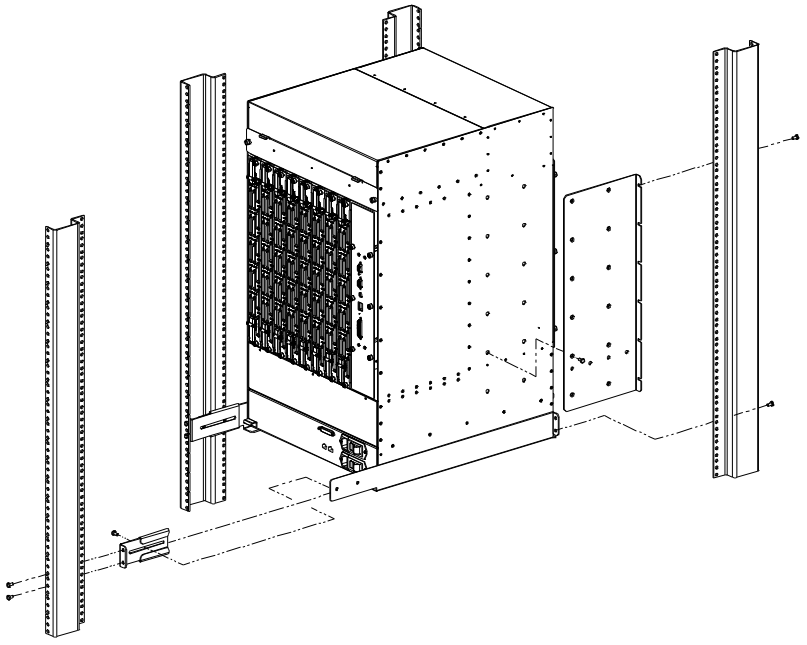


Figure 5–1 Installing an HP AlphaServer SC 128-Way Switch in a Cabinet

WARNING:

For personnel and equipment safety, we recommend that the installation of the HP AlphaServer SC 128-way switch be carried out by two people.

Ensure that the rack is stable before starting to install the HP AlphaServer SC 128-way switch.

A rackmount kit is provided with each HP AlphaServer SC 128-way switch. The rackmount kit consists of two sets of components:

- A pair of rackmount brackets
  Attach these brackets to the rails in the cabinet (front to back).
- A pair of switch-mounting brackets
  Attach these brackets to the switch, and bolt them to the vertical rails of the cabinet.

The HP AlphaServer SC 128-way switch should be securely bolted to the front of the cabinet. This leaves space for the cables at the rear.

Select a position for the HP AlphaServer SC 128-way switch in the cabinet where its weight does not compromise the overall mechanical stability of the rack.

Do not block air vents or otherwise restrict airflow when installing in a rackmount enclosure. Airflow through the unit is front to rear. Ensure that the switch is sufficiently ventilated so that its ambient temperature does not exceed the maximum value (35°C).

Ensure that the electrical supply, wiring, and over-current protection circuitry of the rack are rated to cope with the additional load from the HP AlphaServer SC 128-way switch, and that an adequate and reliable earth connection is provided for the rack.

To install the HP AlphaServer SC 128-way switch in a cabinet, perform the following steps:

1. Unpack the HP AlphaServer SC 128-way switch and rackmount kit.
2. Attach a switch-mounting bracket to each side of the switch. Use the 24 M5 flat-head screws provided (12 screws for each switch-mounting bracket), as shown in Figure 5–1.
3. Each rackmount bracket is shipped in two parts — one short part and one long part. Attach the rackmount brackets as follows, as shown in Figure 5–1:
   a. Attach the short part of each rackmount bracket to the rear of the cabinet, at the appropriate level in the cabinet.

      Use two of the 10-32 pan-head screws provided, for each rackmount bracket.

   b. From the front of the cabinet, slide the long part of each rackmount bracket into the short part.

c. Secure the long part of each rackmount bracket to the front of the cabinet, at the same cabinet level as in step a above.

   Use two of the 10-32 pan-head screws provided, for each rackmount bracket.

d. Secure the long part of each rackmount bracket to the short part.
   Use two of the 10-32 pan-head screws provided, for each rackmount bracket.

4. Slide the HP AlphaServer SC 128-way switch into the cabinet on the rackmount brackets.

5. Secure the chassis to the vertical rails of the rack by bolting the switch-mounting brackets to the front of the cabinet.

   Use the 12 10-32 pan-head screws provided (six on each switch-mounting bracket), as shown in Figure 5–1.

WARNING:

The HP AlphaServer SC 128-way switch is very heavy — 70 Kg when fully populated.

We recommend that two people hold the HP AlphaServer SC 128-way switch to distribute the weight, using lifting apparatus where available.

6. Install the HP AlphaServer SC 16-port switch cards, HP AlphaServer SC 16-link null cards (if this is a node-level switch), and HP AlphaServer SC high-level switch cards — if these cards have not been pre-installed — as described on page 5–6.

7. If this is an old-type switch, skip this step.

   If this is a new-type switch that will be used in a standalone configuration, fit external clock plugs to the external clock inputs (CLK A and CLK B).

   If this is a new-type switch that will be used in a federated configuration, connect the external clock inputs (CLK A and CLK B) to the clock distribution boxes, as described in Section 6.3 on page 6–4.

The external clock inputs are on the power supply backplane tray at the rear of the chassis, as shown in Figure 5–2.

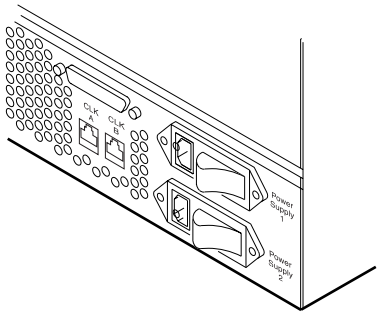


Figure 5–2 Clock Inputs on Power Supply Backplane Tray

8. Power up the switch unit.
9. Check the LEDs at the front of the HP AlphaServer SC 128-way switch.
10. Connect the link cables from each HP AlphaServer SC Elan adapter card (in the nodes) to the appropriate port on the HP AlphaServer SC 128-way switch.
11. Connect a JTAG cable to the JTAG port on the HP AlphaServer SC 128-way switch, as follows:
    - If this is an old-type switch, use the 10-m JTAG cable to connect the JTAG port to the parallel interface on the switch-managing node, as described in Section 5.6 on page 5–18.
    - If this is a new-type switch, use the 1-m JTAG cable to connect the JTAG port to the parallel interface on the HP AlphaServer SC Interconnect control processor (on the same HP AlphaServer SC 128-way switch), as described in Section 5.1.5 on page 5–10.
12. If this is a new-type switch, use an Ethernet cable to connect the Ethernet port on the HP AlphaServer SC Interconnect control processor to a 48-port Summit switch — this connects the HP AlphaServer SC 128-way switch to the management network.

Note:

The Ethernet cables are very similar to the clock distribution cables — both are fitted with RJ45 connectors. When cabling the system, be sure not to mix the cables.

13. Verify that the HP AlphaServer SC 128-way switch is working correctly by running the scripts described in Chapter 7.

5.1.2 Installing the HP AlphaServer SC 16-Port Switch Cards

The HP AlphaServer SC 128-way switch enclosure has vertical slots at the rear for up to eight old-type HP AlphaServer SC 16-port switch cards (old-type switch) or up to four new-type HP AlphaServer SC 16-port switch cards (new-type switch). See Table 2–2 on page 2–23 for more information on compatibility issues.

Figure 5–3 shows how to insert an HP AlphaServer SC 16-port switch card into a new-type HP AlphaServer SC 128-way switch.

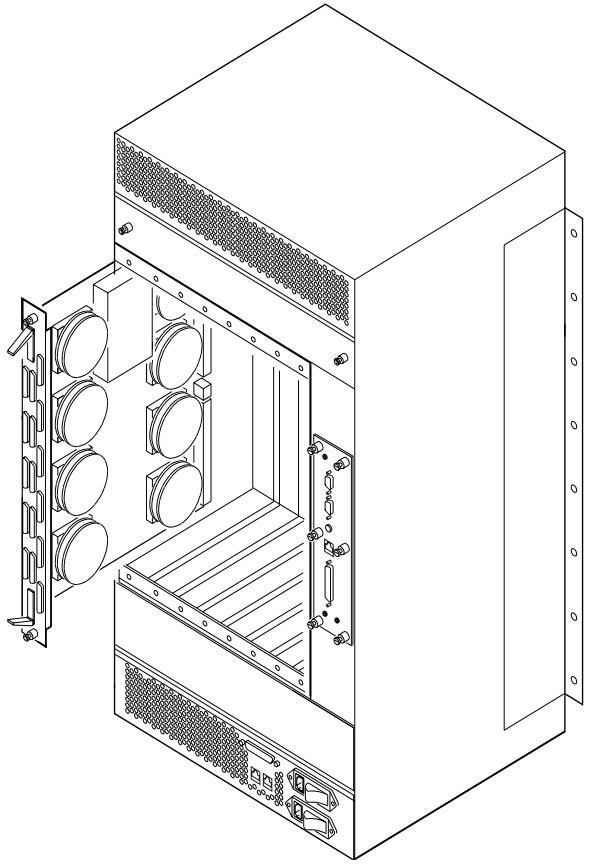


Figure 5–3 Inserting an HP AlphaServer SC 16-Port Switch Card

The HP AlphaServer SC 16-port switch cards are normally pre-installed in an HP AlphaServer SC 128-way switch. If they have been shipped separately, install the HP AlphaServer SC 16-port switch cards by performing the following steps:

1. Unpack the HP AlphaServer SC 16-port switch cards and insert them into the vertical slots at the rear of the HP AlphaServer SC 128-way switch, as shown in Figure 5–3. Start with the leftmost slot (slot 0) and fill the slots from left to right.
2. Snap the card in place by applying force evenly to the two ejector handles.
3. Secure the HP AlphaServer SC 16-port switch card faceplate to the chassis using the screws provided.
4. Fix filler panels to any unused slots. If using the new-type HP AlphaServer SC 128-way switch, you must use the new-type filler panels.
5. Fix two ejector handle covers to each card, and secure using the screws provided, as shown in Figure 5–4. The top ejector handle cover is marked T, and the bottom ejector handle cover is marked B.

   If using an old-type HP AlphaServer SC 16-port switch card, skip this step. Ejector handle covers cannot be used on the old-type HP AlphaServer SC 16-port switch card.

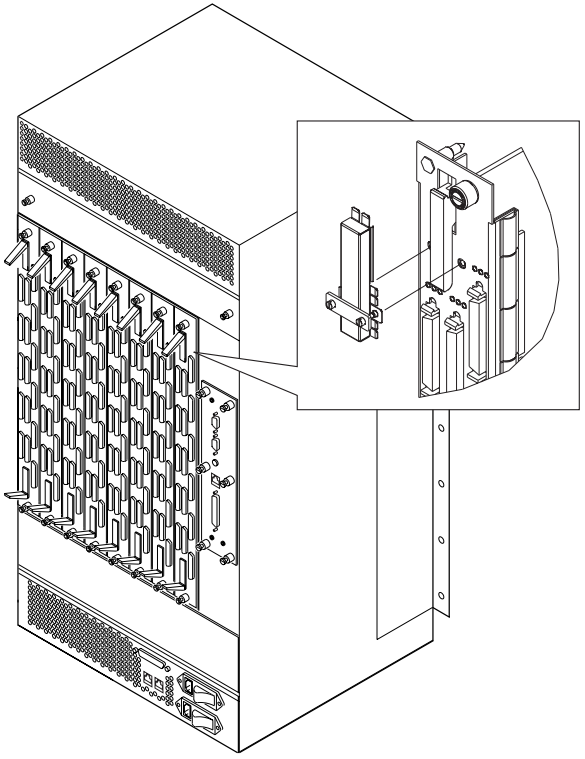


Figure 5–4 Fitting an Ejector Handle Cover to an HP AlphaServer SC 16-Port Switch Card

5.1.3 Installing the HP AlphaServer SC 16-Link Null Cards

The HP AlphaServer SC 16-link null cards are normally pre-installed in a node-level switch. If they have been shipped separately, install the HP AlphaServer SC 16-link null cards in the same way as the HP AlphaServer SC 16-port switch cards (see Section 5.1.2 on page 5–6), except that the HP AlphaServer SC 16-link null cards must be installed in slots 4 to 7 inclusive.

5.1.4 Installing the HP AlphaServer SC Clock Card and the HP AlphaServer SC High-Level Switch Cards

The HP AlphaServer SC 128-way switch is supplied with one HP AlphaServer SC clock card. There are two types of HP AlphaServer SC clock card; see Table 2–2 on page 2–23 for more information on compatibility issues.

Figure 5–5 shows how to insert the HP AlphaServer SC clock card into the front of a new-type HP AlphaServer SC 128-way switch enclosure.

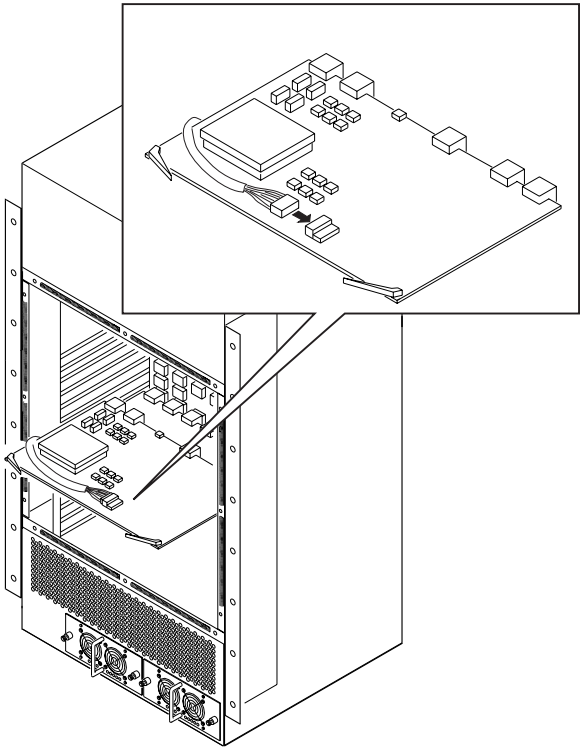


Figure 5–5 Inserting an HP AlphaServer SC Clock Card

Figure 5–6 shows how to insert HP AlphaServer SC high-level switch cards into a new-type HP AlphaServer SC 128-way switch.

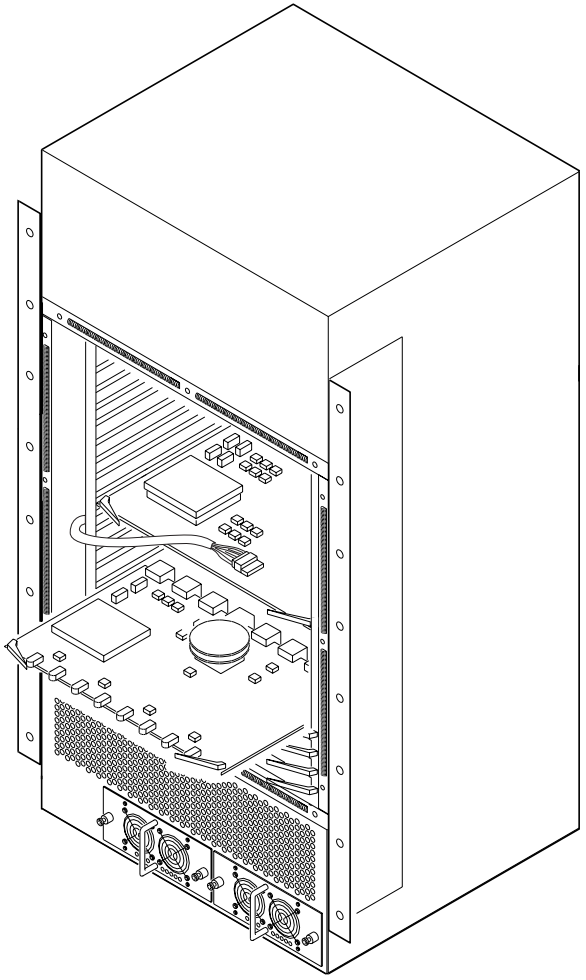


Figure 5–6 Inserting an HP AlphaServer SC High-Level Switch Card

The HP AlphaServer SC clock card and the HP AlphaServer SC high-level switch cards are normally pre-installed in an HP AlphaServer SC 128-way switch. If they have been shipped separately, install the HP AlphaServer SC clock card and the HP AlphaServer SC high-level switch cards by performing the following steps:

1. Remove the screws that secure the front panel of the HP AlphaServer SC 128-way switch to the chassis.

2. Remove the front panel. The HP AlphaServer SC 128-way switch enclosure has horizontal slots for 17 cards.
3. Unpack the new HP AlphaServer SC clock card and partially insert it into the central slot (slot C, between slots 23 and 24), as shown in Figure 5–5.
4. Connect the internal clock cable to the connector on the HP AlphaServer SC clock card (see Figure 5–5), to ensure correct polarity. The internal clock cable can be found adjacent to the central card slot, tucked away for security during transit.

   If using an old-type HP AlphaServer SC 128-way switch, skip this step. The old-type HP AlphaServer SC 128-way switch does not have a clock cable.
5. With the internal clock cable connected, fully insert the HP AlphaServer SC clock card.

Caution:

It is very important that the HP AlphaServer SC clock card be inserted in the central slot (slot C) and connected to the internal clock cable. The clock card has an additional connector to ensure that it cannot be put into the wrong slot, but it is possible for an HP AlphaServer SC high-level switch card to be incorrectly fitted in this position. To ensure that this does not occur, always fit the HP AlphaServer SC clock card first.

6. Snap the card ejector handles shut when the card is in place.
7. Unpack the HP AlphaServer SC high-level switch cards and insert them into the horizontal slots at the front of the HP AlphaServer SC 128-way switch, as shown in Figure 5–6. Starting at the bottom of the chassis, insert eight HP AlphaServer SC high-level switch cards below the HP AlphaServer SC clock card, snapping the card ejector handles shut when the card is in place. Then insert eight HP AlphaServer SC high-level switch cards above the clock card.
8. Fit the front panel and tighten the screws that secure the front panel to the chassis.

Caution:

The front panel should always be fitted during normal use, to ensure adequate cooling and EMC compliance.

5.1.5 Installing the HP AlphaServer SC Interconnect Control Processor

If using an old-type HP AlphaServer SC 128-way switch, skip this step. The old-type HP AlphaServer SC 128-way switch does not have an HP AlphaServer SC Interconnect control processor.

The new-type HP AlphaServer SC 128-way switch enclosure has a dedicated slot for accepting the HP AlphaServer SC Interconnect control processor.

Figure 5–7 shows how to insert an HP AlphaServer SC Interconnect control processor into an HP AlphaServer SC 128-way switch.

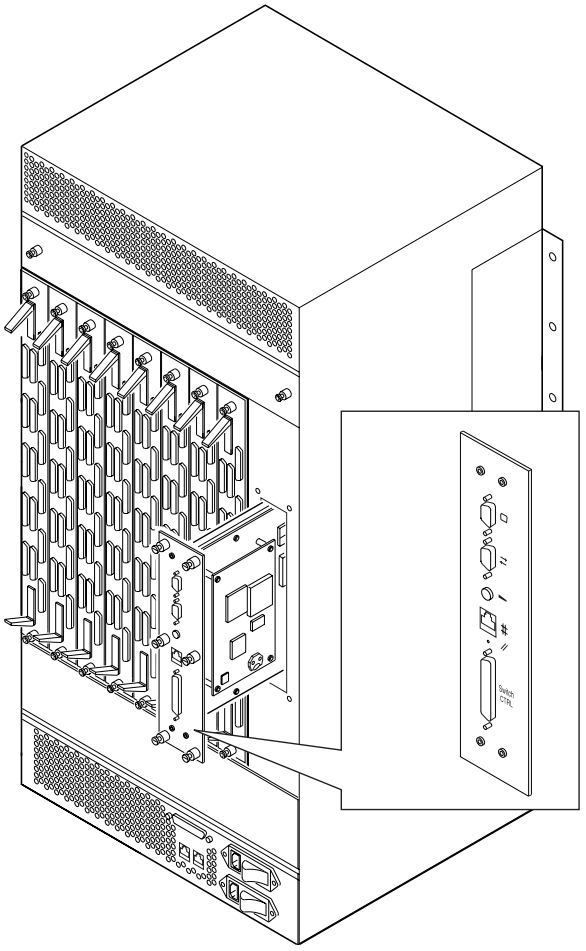


Figure 5–7 Installing an HP AlphaServer SC Interconnect Control Processor

The HP AlphaServer SC Interconnect control processor is normally pre-installed in an HP AlphaServer SC 128-way switch. If it has been shipped separately, install the HP AlphaServer SC Interconnect control processor by performing the following steps:

1. Unpack the HP AlphaServer SC Interconnect control processor, and insert it into the dedicated slot at the rear of the HP AlphaServer SC 128-way switch, as shown in Figure 5–7.
2. Once fully seated, evenly tighten the six fasteners to ensure a secure fitting.
3. Use the 1-m JTAG cable to connect the parallel port on the control processor to the JTAG port on the switch chassis.

4. Use an Ethernet cable to connect the Ethernet port on the HP AlphaServer SC Interconnect control processor to a 48-port Summit switch — this connects the HP AlphaServer SC 128-way switch to the management network.

Note:

The Ethernet cables are very similar to the clock distribution cables — both are fitted with RJ45 connectors. When cabling the system, be sure not to mix the cables.

5. Continue the installation of the HP AlphaServer SC hardware and software, as described in the *HP AlphaServer SC Installation Guide* and Section 7.2 on page 7–2 of this manual.

5.2 Powering Up the HP AlphaServer SC 128-Way Switch

The HP AlphaServer SC 128-way switch uses a pair of universal 1000-W power supplies operating in the range 90-255 V AC (50/60 Hz). Power is supplied through standard IEC320 power sockets on the rear panel of the chassis, as shown in Figure 5–8. Ensure that the power cables used are adequately rated.

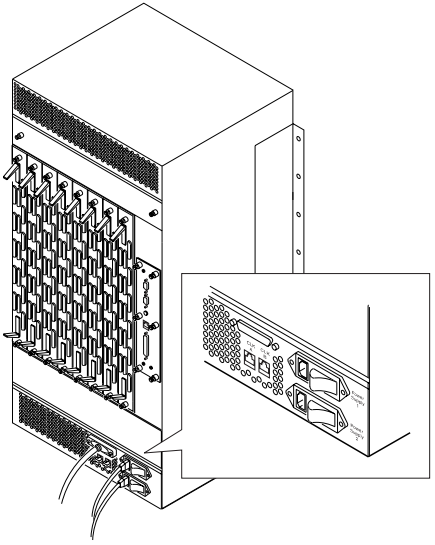


Figure 5–8 HP AlphaServer SC 128-Way Switch Cabling

Correct operation of the HP AlphaServer SC 128-way switch requires that one of the two power supply units (PSUs) be functioning. The other PSU can be swapped out for maintenance with no disruption to the operation of the HP AlphaServer SC 128-way switch. Once powered up, the correct operation of each PSU is indicated by the LEDs — see Section 7.5.3.1 on page 7–36 for more information. The status of each PSU together with temperature information can be seen from the `elanenvtest` script, as described in Section 7.7.1 on page 7–49. See Section 5.12 on page 5–24 for details of how to replace a PSU.

5.3 Checking Internal Links Within the HP AlphaServer SC 128-Way Switch

When you install an HP AlphaServer SC 16-port switch card, check the corresponding row of LEDs at the front of the HP AlphaServer SC 128-way switch, to verify the state of the internal links to this card. See Section 7.5.3.2 on page 7–36 for more information about these LEDs.

Ensure that the front green LEDs indicate that the link is working, before starting to connect the link cables (that is, before connecting any nodes to the switch). Refer to Section 7.5.4.3 on page 7–41 if any of the front green LEDs do not light. Ignore red LEDs on connected links when the switch is first powered up — these will be cleared by the switch manager. Ignore red LEDs on unconnected links.

5.4 Connecting Nodes to the HP AlphaServer SC 128-Way Switch

Link cables connect nodes to the HP AlphaServer SC Interconnect switch.

The HP AlphaServer SC 16-port switch cards in the rear panel of the HP AlphaServer SC 128-way switch have connections for HD50 connectors, as shown in Figure 4–5. Link cables are attached to these connectors and to the HP AlphaServer SC Elan adapter cards in each node, thus connecting the nodes to the switch.

To connect the link cables, first ensure that the HP AlphaServer SC 128-way switch is powered up and then perform the following steps for each node:

1. Ensure that the node is halted, and then powered down, before connecting the link cables.

   Note:

   If you do not power down the node, the HP AlphaServer SC Elan adapter card may lock. See Section 3.5 on page 3–7 for more details on how to free a locked HP AlphaServer SC Elan adapter card.

2. Ensure that the HP AlphaServer SC 16-port switch card is seated correctly in the HP AlphaServer SC Interconnect switch.
3. Ensure that the HP AlphaServer SC Elan adapter card is seated correctly in the node.
4. Connect one end of the link cable to the HP AlphaServer SC Elan adapter card in the node.
5. Place a cable gasket over one of the HD50 connectors on the new-type HP AlphaServer SC 16-port switch card. To attach a cable gasket, remove the paper from its two small adhesive pads, center the cable gasket around the HD50 connector, and press firmly.

   We recommend that you attach all cable gaskets before installing any link cables.

Note:

The front panel legend shows a number next to each HD50 connector. These port numbers correspond to the network IDs that will be assigned to the connected computer systems. Node 0 should be connected to port 0, Node 1 to port 1, and so on.

The cable gaskets will cover these port numbers — a plan showing the port numbers of the HP AlphaServer SC 16-port switch card is provided in a pocket in the switch cabinet.

Do not attach a cable gasket to an unused port — the EMC-shielded cover for unused ports (see step 8 on page 5–15) contains an integral gasket.

Cable gaskets can be used with, but are not supplied with, the old-type HP AlphaServer SC 16-port switch card (see Table 2–2 on page 2–23).

6. Connect the other end of the link cable to the HP AlphaServer SC 16-port switch card connector, at the same time sandwiching the cable gasket between the cable head-shell and the HP AlphaServer SC 16-port switch card faceplate (see Figure 5–9).

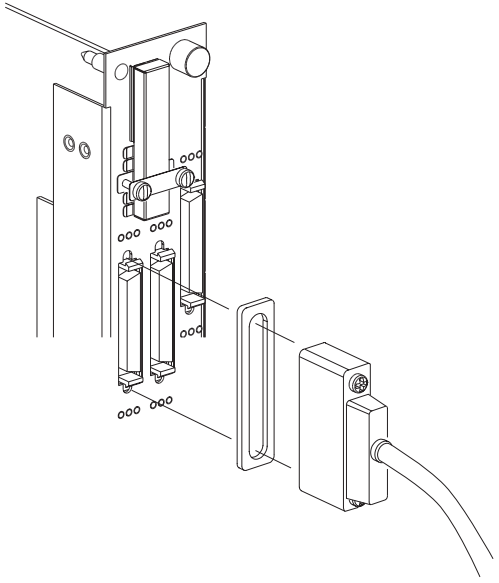


Figure 5–9 HP AlphaServer SC 128-Way Switch Link Connection

When populating a network, we recommend that you start with board 0 (the left hand side), connecting its links from the bottom (port 15) up one row of ports at a time. This makes cable management easier. When all ports on board 0 are connected, repeat the procedure for board 1, and so on.

Insert the cable connectors at the correct orientation to avoid bending any of the pins.

It is not necessary to fit a cable gasket at the HP AlphaServer SC Elan adapter card end of the link cable.

7. Ensure that both sides of the springclip, or both locking screws, are firmly connected at both ends of the cable.

   As each link cable is connected, label the link cable with the port number and the board ID using the labels supplied.

   We recommend that you label all of the cables that are connected to the switch. This will make it easier to change an HP AlphaServer SC 16-port switch card. Remember that all ports are in ascending order, and that this is directly representative of the node numbering in an HP AlphaServer SC system.

8. When all of the required cables are connected, fit all unused ports with an EMC-shielded connector cover, as shown in Figure 5–10. Connector covers are not necessary if using the old-type HP AlphaServer SC 128-way switch. Do not attach a cable gasket to an unused port — the EMC-shielded cover for unused ports contains an integral gasket.

Note:

All cables and covers must be securely fastened to ensure EMC compliance.

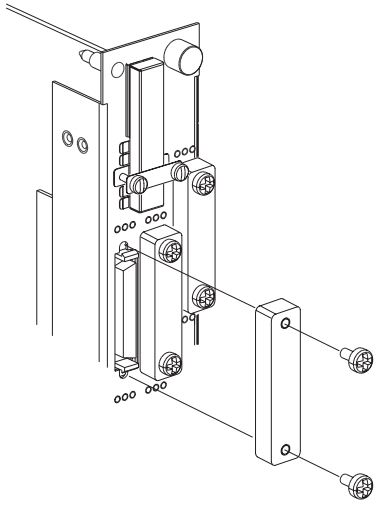


Figure 5–10 Installing a Shielded Connector Cover

9. Power up the nodes and check the status LEDs at each end of each link cable — that is, the LEDs on the nodes and the corresponding LEDs at the rear of the HP AlphaServer SC 128-way switch — to verify the state of the links between the switch and the nodes. See Section 7.5.3.3 on page 7–37 for more information about these LEDs. Refer to Section 7.5.4.2 on page 7–39 if the green LEDs do not light when the node is powered up.

5.5 Connecting Node-Level Switches to Top-Level Switches

The cables that connect the node-level switches to the top-level switches are called **link cables** — these are the same link cables as those used to connect the nodes to the node-level switches.

Note:

Only springclip-fixing link cables are supported for node-level switch to top-level switch connections — do not use screw-fixing link cables for these connections.

The HP AlphaServer SC 16-link null cards in the rear panel of the node-level switch have connections for HD50 connectors, as shown in Figure 4–5. Link cables are attached to these connectors and to the HP AlphaServer SC 16-port switch cards in the top-level switch, thus connecting the node-level switch to the top-level switch.

To connect the link cables, perform the following steps for each connection:

1. If they are not already powered up, power up the switches so that you can check the status LEDs at each end of each link cable (see step 9).
2. Ensure that the HP AlphaServer SC 16-link null card is seated correctly in the node-level switch.
3. Ensure that the HP AlphaServer SC 16-port switch card is seated correctly in the top-level switch.
4. Place a cable gasket over each of the HD50 connectors on the HP AlphaServer SC 16-link null cards. To attach a cable gasket, remove the paper from its two small adhesive pads, center the cable gasket around the HD50 connector, and press firmly.

   We recommend that you attach all cable gaskets before installing any link cables.

   Note:

   The front panel legend shows a number next to each HD50 connector. Note that the connector numbering on the HP AlphaServer SC 16-link null card starts at the bottom of the card, whereas the connector numbering on the HP AlphaServer SC 16-port switch card starts at the top.

   The cable gaskets will cover these connector numbers — a plan showing the connector numbers of the HP AlphaServer SC 16-link null card is provided in a pocket in the switch cabinet.

5. Connect one end of the link cable to the HP AlphaServer SC 16-link null card in the node-level switch.

6. Connect the other end of the link cable to the appropriate HP AlphaServer SC 16-port switch card in the appropriate top-level switch, at the same time sandwiching the cable gasket between the cable head-shell and the HP AlphaServer SC 16-port switch card faceplate (see Figure 5–9).

   When connecting the node-level switches to the top-level switches, we recommend that you start with Card 4 Link 0 in the node-level switches, connecting its links from the bottom (Link 0), and connecting one link from each node-level switch at a time. This makes cable management easier. When all ports on board 4 are connected, repeat the procedure for board 5, and so on. Ensure that you are connecting the correct linkgroup from the node-level switches to the correct portset on the top-level switch, as described in Section 1.4.6 on page 1–13.

   Insert the cable connectors at the correct orientation to avoid bending any of the pins.

7. Ensure that both sides of the springclip are firmly connected at both ends of the cable.

   As each link cable is connected, label the link cable with the port number and the board ID using the labels supplied.

   We recommend that you label all of the cables that are connected to the switch.

8. When all of the required cables are connected, fit all unused ports on the HP AlphaServer SC 16-port switch cards with an EMC-shielded connector cover, as shown in Figure 5–10. Do not attach a cable gasket to an unused port — the EMC-shielded cover for unused ports contains an integral gasket.

   Note:

   All cables and covers must be securely fastened to ensure EMC compliance.

9. Check the status LEDs at each end of each link cable — that is, the LEDs on the HP AlphaServer SC 16-link null cards on the node-level switches, and the corresponding LEDs on the HP AlphaServer SC 16-port switch cards on the top-level switches — to verify the state of the links between the switches. See Section 7.5.3 on page 7–35 for more information about these LEDs.

Refer to Section 7.5.4.4 on page 7–42 if the green LEDs do not light when the switches are powered up.

5.6 Connecting Switch-Managing Nodes to HP AlphaServer SC 128-Way Switches

If using old-type HP AlphaServer SC 128-way switches, connect the switch-managing nodes to the switches by perform the following steps for each switch:

1. Each HP AlphaServer SC 128-way switch has a JTAG port, provided on a 25-pin DB socket. Using the 10-m JTAG cable provided, connect this port to the parallel port of the switch-managing node. Node 0 is the switch-managing node for the first rail (rail 0), and Node 1 is the switch-managing node for the second rail (rail 1).

   Note:

   This JTAG cable must be connected before you can run the diagnostic software. See Chapter 7 for details.

2. Ensure that the connectors at both ends of the JTAG cable are seated correctly.
3. Ensure that the HP AlphaServer SC Interconnect switch is powered up.
4. If the switch-managing node is halted, boot it. For dual-rail systems, if the second switch-managing node is halted, boot it.

   If this is a single-rail configuration and the switch-managing node was already running when steps 1, 2, or 3 were performed, restart the `swmserver` daemon as follows:

   ```
   # scrun -n atlas0 '/sbin/init.d/rms restart'
   ```

   If this is a dual-rail configuration and the switch-managing node for rail 0 was already running when steps 1, 2, or 3 were performed for rail 0, restart the `swmserver` daemon as follows:

   ```
   # scrun -n atlas0 '/sbin/init.d/rms restart'
   ```

   If this is a dual-rail configuration and the switch-managing node for rail 1 was already running when steps 1, 2, or 3 were performed for rail 1, restart the `swmserver` daemon as follows:

   ```
   # scrun -n atlas1 '/sbin/init.d/rms restart'
   ```

   Check for errors in the `/var/rms/adm/log/error.log` file.

5. To check that the JTAG cable is connected and operating correctly, log onto the switch-managing node and run the `elanenvtest` script as follows:

   ```
   # cd /usr/opt/qswdiags
   # elanenvtest
   ```

   If the `elanenvtest` script does not find any problems in a single-rail configuration, the output is as follows:

   ```
   ============ Executing Switch Chassis Test =============
   ======= Switch Chassis Test successfully completed =====
   ```

If the `elanenvtest` script does not find any problems in a dual-rail configuration, the output is as follows:

```
================= Executing Switch Chassis Test ===============

Modules          : 0 (QR0N00)  1 (QR1N00)

        QR0N00 (QMS128) :: OK

        QR1N00 (QMS128) :: OK

================= Switch Chassis Test Passed ==================
```

If the `elanenvtest` script fails, take the appropriate action (see Section 7.7.1.2 on page 7–50).

For more information on the `elanenvtest` command, see Section 7.7.1 on page 7–49.

The JTAG port is used during initial installation by the network test programs described in Chapter 7. Once the system is running, this port is used by the switch network manager daemon `swmgr` to monitor the network for errors, check the status of fans and power supplies, and collect temperature readings.

5.7 Replacing an HP AlphaServer SC 16-Port Switch Card

The HP AlphaServer SC 16-port switch cards are installed in vertical slots at the rear of the HP AlphaServer SC 128-way switch enclosure (see Figure 5–3 on page 5–6). There are two types of HP AlphaServer SC 16-port switch card; see Table 2–2 on page 2–23 for more information on compatibility issues.

Note:

It is possible to replace an HP AlphaServer SC 16-port switch card while the HP AlphaServer SC 128-way switch is powered on.

To replace an HP AlphaServer SC 16-port switch card in an HP AlphaServer SC 128-way switch, perform the following steps:

1. If this is a standalone switch, or a node-level switch in a federated configuration: halt, and then power down, all of the nodes that are connected to the HP AlphaServer SC 16-port switch card that is being replaced.

   Note:

   If you do not power down the nodes, the nodes will crash.

2. Ensure that the link cables are adequately labeled as described in Section 5.4 on page 5–13 or Section 5.5 on page 5–16, and then disconnect the link cables from the HP AlphaServer SC 16-port switch card that is being replaced.

3. Remove the ejector handle covers from the HP AlphaServer SC 16-port switch card that is being replaced, by loosening their captive screws (captive screws remain attached when unscrewed).

   If using an old-type HP AlphaServer SC 16-port switch card, skip this step. Ejector handle covers cannot be used on the old-type HP AlphaServer SC 16-port switch card.

4. Detach the HP AlphaServer SC 16-port switch card, by loosening the captive screws that secure the faceplate to the chassis.

5. Unlock the card ejector handles, and slide the old HP AlphaServer SC 16-port switch card out of the slot by applying force evenly to the two ejector handles, or by using the new HP AlphaServer SC 16-port switch card extraction tool.

6. Unpack the new HP AlphaServer SC 16-port switch card and insert it into the appropriate slot.

   Note:

   If adding extra HP AlphaServer SC 16-port switch cards, start with the leftmost empty slot, and fill slots from left to right.

7. Slide in the replacement card and engage the two ejector handles.

8. Using the ejector handles, seat the card fully into the chassis.

9. Secure the HP AlphaServer SC 16-port switch card faceplate to the chassis using the captive screws.

10. Refit the two ejector handle covers by tightening their captive screws. The top ejector handle cover is marked T, and the bottom ejector handle cover is marked B.

    If using an old-type HP AlphaServer SC 16-port switch card, skip this step. Ejector handle covers cannot be used on the old-type HP AlphaServer SC 16-port switch card.

11. Fix filler panels to any unused slots. If using the new-type HP AlphaServer SC 128-way switch, you must use the new-type filler panels.

12. Reconnect the link cables that you disconnected in step 2. Ensure that each link cable is correctly positioned on the HP AlphaServer SC 128-way switch. If using the new-type switch, use a cable gasket with each link cable, and fit a connector cover to each unused port. See Section 5.4 on page 5–13 for more details.

    Note:

    If this is a standalone switch, or a node-level switch in a federated configuration, ensure that the nodes are still powered off before reconnecting the link cables.

13. If this is a standalone switch, or a node-level switch in a federated configuration, power up the nodes.

14. Verify the state of the links by checking the LEDs, as described in Section 7.5 on page 7–34.
15. Verify that the HP AlphaServer SC 128-way switch is working correctly by running the scripts described in Chapter 7.

5.8 Replacing an HP AlphaServer SC 16-Link Null Card

HP AlphaServer SC 16-link null cards are installed in vertical slots at the rear of a node-level switch (see Figure 1–7 on page 1–9). Replace the HP AlphaServer SC 16-link null cards in the same way as the HP AlphaServer SC 16-port switch cards (see Section 5.1.2 on page 5–6).

Caution:

We recommend that you do not replace an HP AlphaServer SC 16-link null card while the HP AlphaServer SC 128-way switch is powered on. If the card is in the active path, the nodes connected to the switch will crash.

5.9 Replacing an HP AlphaServer SC High-Level Switch Card

The HP AlphaServer SC high-level switch cards are in horizontal slots at the front of the HP AlphaServer SC 128-way switch enclosure (see Figure 5–6 on page 5–9).

Note:

We recommend that you do not replace an HP AlphaServer SC high-level switch card while the HP AlphaServer SC 128-way switch is powered on. If the card is in the active path, the nodes connected to the switch will crash.

To replace an HP AlphaServer SC high-level switch card in an HP AlphaServer SC 128-way switch, perform the following steps:

1. Remove the fasteners that secure the front panel to the chassis.
2. Remove the front panel from the HP AlphaServer SC 128-way switch. The HP AlphaServer SC 128-way switch enclosure has horizontal slots for 17 cards.
3. Unlock the card ejector handles for the card to be replaced, and slide the old HP AlphaServer SC high-level switch card out of the slot.
4. Unpack the new HP AlphaServer SC high-level switch card and insert it into the appropriate slot.
5. Snap the card ejector handles shut when the card is in place.
6. Refit the front panel, and tighten the fasteners that secure it to the chassis. This is essential to maintain correct airflow for cooling.
7. Verify the state of the links by checking the LEDs, as described in Section 7.5.3 on page 7–35.

8. Verify that the HP AlphaServer SC 128-way switch is working correctly by running the scripts described in Chapter 7.

5.10 Replacing the HP AlphaServer SC Clock Card

The HP AlphaServer SC clock card is in a horizontal slot at the front of the HP AlphaServer SC 128-way switch enclosure (see Figure 5–5 on page 5–8). There are two types of HP AlphaServer SC clock card; see Table 2–2 on page 2–23 for more information on compatibility issues.

To replace the HP AlphaServer SC clock card in an HP AlphaServer SC 128-way switch, perform the following steps:

1. If this is a standalone switch, or a node-level switch in a federated configuration: halt, and then power down, all of the nodes that are connected to the HP AlphaServer SC 128-way switch.

   Note:

   If you do not power down the nodes, the nodes will crash.

2. Power down the HP AlphaServer SC 128-way switch and remove the power cables.

   WARNING:

   The HP AlphaServer SC 128-way switch has two power cables — disconnect both power cables before servicing the switch, to avoid electrical shock.

   The HP AlphaServer SC clock card is not hot-swappable; the system must be powered down when replacing it.

3. Remove the fasteners that secure the front panel to the chassis.
4. Remove the front panel from the HP AlphaServer SC 128-way switch. The HP AlphaServer SC 128-way switch enclosure has horizontal slots for 17 cards.
5. Unlock the card ejector handles for the card in slot C (the slot between slots 23 and 24, as shown in Figure 2–6 on page 2–9), and slide the old HP AlphaServer SC clock card a small distance out of the slot.
6. Disconnect the internal clock cable, and slide the card completely out of the chassis.

   The old-type HP AlphaServer SC clock card does not have a clock cable.
7. Unpack the new HP AlphaServer SC clock card and partially insert it into slot C, as shown in Figure 5–5.
8. Connect the internal clock cable to the connector on the HP AlphaServer SC clock card.

   If using an old-type HP AlphaServer SC 128-way switch, skip this step. The old-type HP AlphaServer SC 128-way switch does not have a clock cable.
9. With the internal clock cable connected, fully insert the HP AlphaServer SC clock card.

Caution:

It is very important that the HP AlphaServer SC clock card be inserted in the central slot (slot C) and connected to the internal clock cable. The clock card has an additional connector to ensure that it cannot be put into the wrong slot, but it is possible for an HP AlphaServer SC high-level switch card to be incorrectly fitted in this position. To ensure that this does not occur when inserting several cards, always fit the HP AlphaServer SC clock card first.

10. Snap the card ejector handles shut when the card is in place.
11. Refit the front panel and tighten the fasteners that secure it to the chassis. This is essential to maintain correct airflow for cooling.
12. Power up the HP AlphaServer SC 128-way switch, as described in Section 5.2 on page 5–12.
13. If this is a standalone switch, or a node-level switch in a federated configuration, power up the nodes.
14. Verify the state of the links by checking the LEDs, as described in Section 7.5 on page 7–34.
15. Reconfigure and test the clock, as described in Section 6.4 on page 6–5.
    If using an old-type HP AlphaServer SC 128-way switch, skip this step.
16. Verify that the HP AlphaServer SC clock card is working correctly, by running the `elanenvtest` script (see Section 7.7.1 on page 7–49).
17. Verify that the HP AlphaServer SC 128-way switch is working correctly by running the scripts described in Chapter 7.

5.11 Replacing a Fuse on an HP AlphaServer SC Interconnect Card

To replace a fuse on an HP AlphaServer SC Interconnect card, remove the card and replace the fuse in accordance with the specifications in Table 5–1.

Table 5–1 Fuse Specifications for HP AlphaServer SC Interconnect Cards

Card	Fuse ID	Voltage	Current	Characteristic
HP AlphaServer SC 16-port switch card	FS1	250 V	7 A	Quick Blow
HP AlphaServer SC high-level switch card	FS1	250 V	3 A	Quick Blow
Old-type HP AlphaServer SC clock card[1]	F1	250 V	3 A	Quick Blow

[1]The new-type HP AlphaServer SC clock cards and the HP AlphaServer SC 16-link null cards are fitted with a surface-mounted resettable fuse.

5.12 Replacing an HP AlphaServer SC 128-Way Switch Power Supply Unit

The HP AlphaServer SC 128-way switch is supplied with two power supply units (PSUs). These are installed in the front of the enclosure, as shown in Figure 5–11.

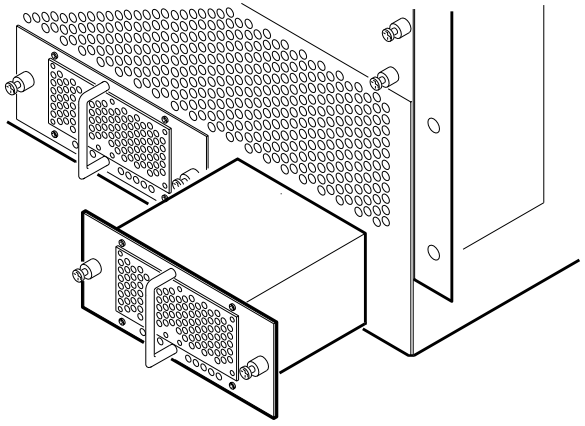


Figure 5–11 HP AlphaServer SC 128-Way Switch PSU

These Universal 1000-W PSUs operate in the range 90-255 V AC (50/60 Hz). Power is supplied through a pair of standard IEC320 power sockets — one IEC320 power socket for each power supply unit. There are two types of PSU; see Table 2–2 on page 2–23 for more information on compatibility issues.

The switch can operate with only one of the two PSUs functioning correctly. The other PSU can be swapped out with no disruption to the operation of the switch.

The PSUs have been updated — two versions are available. The new-type PSUs can be used in an old-type switch, but the old-type PSUs cannot be used in a new-type switch.

5.12.1 Replacing Both Power Supply Units in an HP AlphaServer SC 128-Way Switch

To replace both power supply units in an HP AlphaServer SC 128-way switch, perform the following steps:

1. If this is a standalone switch, or a node-level switch in a federated configuration: halt, then power down, all of the nodes that are connected to the HP AlphaServer SC 128-way switch.

   Note:

   If you do not power down the nodes, the nodes will crash.

2. Power down the HP AlphaServer SC 128-way switch and remove the power cables.

WARNING:

The HP AlphaServer SC 128-way switch has two power cables — disconnect both power cables before servicing the switch, to avoid electrical shock.

3. Undo the two panel fasteners, one at each end of the PSU front panel.
4. Disengage the old PSUs from the power supply backplane and slide them out of the chassis using the handle on the PSU front panel, as shown in Figure 5–11.

WARNING:

High energy hazard — do not place your hand or any tool or anything other than a replacement PSU in the open power supply bay. Do not leave the switch unattended.

5. Unpack the new PSUs and save the packaging.
6. Slide the new PSUs into the slots until the connectors are docked in position.
7. Tighten the panel fasteners at each end of the PSU front panel (see step 4).
8. Power up the HP AlphaServer SC 128-way switch, as described in Section 5.2 on page 5–12.
9. If this is a standalone switch, or a node-level switch in a federated configuration, power up the nodes.
10. Verify that the power supply units are working correctly, by running the `elanenvtest` script (see Section 7.7.1 on page 7–49).
11. Verify that the HP AlphaServer SC 128-way switch is working correctly by running the scripts described in Chapter 7.
12. Pack up the old PSUs using the packaging saved in step 5, and return the replaced products using standard field service processes.

5.12.2 Replacing One Power Supply Unit in an HP AlphaServer SC 128-Way Switch

To replace one of the PSUs in an HP AlphaServer SC 128-way switch, perform the following steps:

1. Power down the faulty PSU, using the switch at the rear of the chassis.
2. Undo the two panel fasteners, one at each end of the PSU front panel.

3. Slide the old PSU out of the chassis using the handle on the PSU front panel, as shown in Figure 5–11.

WARNING:

High energy hazard — do not place your hand or any tool or anything other than a replacement PSU in the open power supply bay. Do not leave the switch unattended.

4. Unpack the new PSU and save the packaging.
5. Slide the new PSU into the slot until the connector is docked in position.
6. Tighten the panel fasteners at each end of the PSU front panel (see step 2).
7. Verify that the power supply units are working correctly, by running the `elanenvtest` script (see Section 7.7.1 on page 7–49).
8. Verify that the HP AlphaServer SC 128-way switch is working correctly by running the scripts described in Chapter 7.
9. Pack up the old PSU using the packaging saved in step 4, and return the replaced product using standard field service processes.

5.13 Replacing the HP AlphaServer SC 128-Way Switch Power Supply Backplane Tray

The HP AlphaServer SC 128-way switch power supply backplane tray is situated at the rear of the chassis, below the vertical card slots, as shown in Figure 5–12.

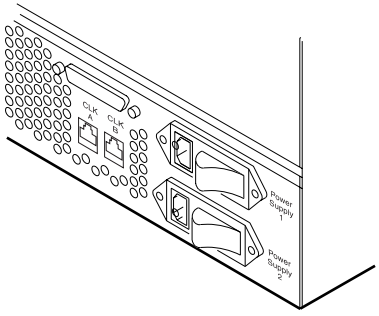


Figure 5–12 Location of Power Supply Backplane Tray

The HP AlphaServer SC 128-way switch power supply backplane tray has been updated — two versions are available — see Figure 5–13 and Figure 5–14.

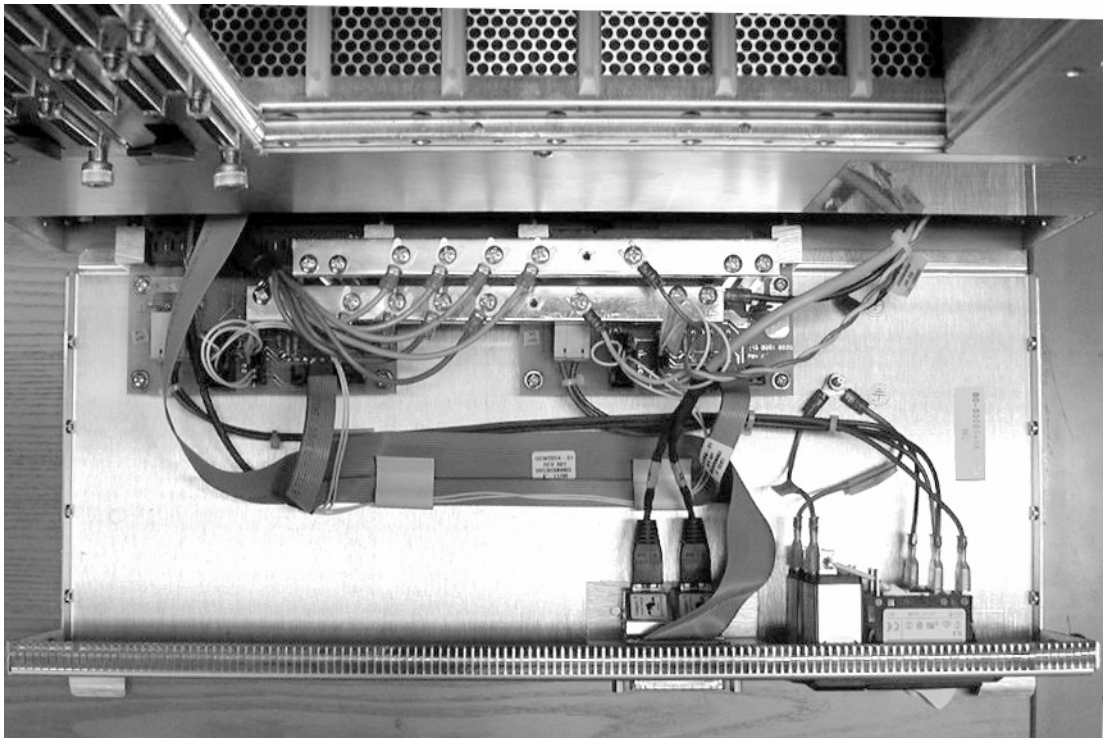


Figure 5–13 HP AlphaServer SC 128-Way Switch Power Supply Backplane Tray (New-Type)

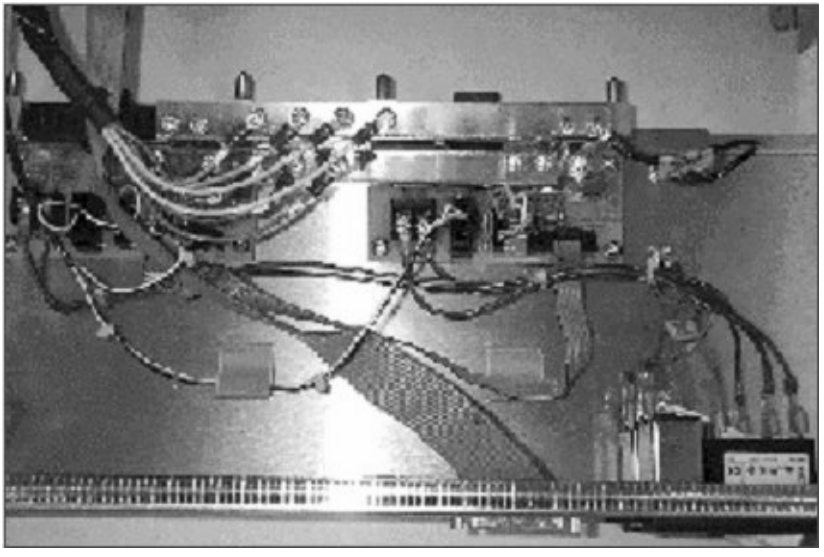


Figure 5–14 HP AlphaServer SC 128-Way Switch Power Supply Backplane Tray (Old-Type)

Replacing the HP AlphaServer SC 128-Way Switch Power Supply Backplane

To replace the power supply backplane tray in an HP AlphaServer SC 128-way switch, perform the following steps:

1. If this is a standalone switch, or a node-level switch in a federated configuration: halt, and then power down, all of the nodes that are connected to the HP AlphaServer SC 128-way switch.

   Note:

   If you do not power down the nodes, the nodes will crash.

2. Power down the HP AlphaServer SC 128-way switch and remove the power cables at the rear of the chassis.

   WARNING:

   The HP AlphaServer SC 128-way switch has two power cables — disconnect both power cables before servicing the switch, to avoid electrical shock.

3. Ensure that the link cables are adequately labeled as described in Section 5.4 on page 5–13 or Section 5.5 on page 5–16, and then disconnect the link cables from HD50 connectors on the rear panel of the HP AlphaServer SC 128-way switch.

   Remove the link cables a row at a time, starting at the top right. This gives sufficient space to remove and replace the cable without damaging the connector pins.

4. Disconnect the JTAG cable from the JTAG port on the HP AlphaServer SC 128-way switch.

5. If this is a new-type switch in a standalone configuration, remove the external clock plugs from the external clock inputs (CLK A and CLK B), under the JTAG port.

   If this is a new-type switch in a federated configuration, disconnect the clock cables from the external clock inputs (CLK A and CLK B).

6. Remove both power supply units from the switch, as described in Section 5.12 on page 5–24, to decrease the weight of the switch.

7. Remove the six 10-32 pan-head screws from each switch-mounting bracket; these screws secure the HP AlphaServer SC 128-way switch to the rack.

8. Slide the switch out from the front of the rack. Remove the switch from the rack and place it on a sturdy work surface.

WARNING:

The HP AlphaServer SC 128-way switch is very heavy — 70 Kg when fully populated.

For personnel and equipment safety, we recommend that two people hold the HP AlphaServer SC 128-way switch to distribute the weight, using lifting apparatus where available.

Ensure that the rack is stable before starting to remove the HP AlphaServer SC 128-way switch.

9. Remove the six M3 screws from each side of the power supply backplane tray.
10. Carefully pull the power supply backplane tray towards the rear of the chassis using the two handles provided. The tray cannot be fully removed until the associated cables have been disconnected.
11. Unscrew the hex nuts holding the JTAG cable in place.
12. Disconnect the DC Good cable from the two backplane boards located in the tray.
13. Disconnect the four yellow and four gray wires, and the control processor power cable, from the bus bars, by removing the screws (see Figure 5–13).

    The old-type HP AlphaServer SC 128-way switch does not have an HP AlphaServer SC Interconnect control processor power cable (see Figure 5–14).
14. Carefully detach the internal clock cable from the power supply backplane tray. The internal clock cable splits into two just before it is connected to the power tray — disconnect both internal-clock-cable connectors from the power tray.

    If using an old-type HP AlphaServer SC 128-way switch, skip this step. The old-type HP AlphaServer SC 128-way switch does not have an internal clock cable.
15. Fully remove the faulty tray.
16. Fit the new tray, as follows:
    - If you are fitting an old-type tray into an old-type switch, simply insert the tray.
    - If you are fitting a new-type tray into an old-type switch, remove the control processor power cable and internal clock cable from the tray, before inserting the tray in the switch. These cables are not used in an old-type switch.

- If you are fitting a new-type tray into a new-type switch, remove the control processor power cable and internal clock cable from the tray, before inserting the tray in the switch (the original cables are still attached to the control processor and clock card respectively). Store the new cables in a safe place, in case you need to replace the original cables later.

Note:

Do not put an old-type power supply backplane tray into a new-type HP AlphaServer SC 128-way switch.

17. Carefully reattach the internal-clock-cable connectors to the new power tray.

    If using an old-type HP AlphaServer SC 128-way switch, skip this step. The old-type HP AlphaServer SC 128-way switch does not have an internal clock cable.

18. Secure the wires and the control processor power cable to the bus bars, using the screws removed in step 13.

    The old-type HP AlphaServer SC 128-way switch does not have an HP AlphaServer SC Interconnect control processor cable.

19. Reconnect the DC Good cable to the two backplane boards on the tray.
20. Secure the hex nuts holding the JTAG cable in place.
21. Push the power supply backplane tray towards the front of the chassis using the two handles provided.
22. Secure the power supply backplane tray to the chassis using the screws removed in step 9.
23. Secure the HP AlphaServer SC 128-way switch to the rack by bolting the switch-mounting brackets, using the screws removed in step 7. Bolt the switch to the front of the cabinet; this leaves space for the cables at the rear.

WARNING:

The HP AlphaServer SC 128-way switch is very heavy — 70 Kg when fully populated.

For personnel and equipment safety, we recommend that two people hold the HP AlphaServer SC 128-way switch to distribute the weight, using lifting apparatus where available.

Ensure that the rack is stable before starting to replace the HP AlphaServer SC 128-way switch.

24. Reconnect the link cables that you disconnected in step 3; that is, reconnect the nodes to the HD50 connectors on the HP AlphaServer SC 128-way switch. Ensure that each cable is correctly positioned on the HP AlphaServer SC 128-way switch. See Section 5.4 on page 5–13 for more details.

    Note:

    Ensure that the nodes are still powered off.

25. Reconnect the JTAG cable that you disconnected in step 4. See Section 5.6 on page 5–18 for more details.
26. Re-insert the PSUs into the new HP AlphaServer SC 128-way switch, as described in Section 5.12 on page 5–24.
27. Reconnect the power cables at the rear of the chassis and power up the new HP AlphaServer SC 128-way switch, as described in Section 5.2 on page 5–12.
28. If installing a new-type power supply backplane tray in a standalone configuration, ensure that external clock plugs are fitted to the external clock inputs (CLK A and CLK B), as described in step 7 on page 5–4.

    If installing the power supply backplane tray in a switch in a federated configuration, reconnect the clock distribution cables that you disconnected in step 5.
29. If this is a standalone switch, or a node-level switch in a federated configuration, power up all of the nodes that are connected to the HP AlphaServer SC 128-way switch.

5.14 Replacing the HP AlphaServer SC 128-Way Switch Fan Tray

The HP AlphaServer SC 128-way switch fan tray is situated at the rear of the chassis, above the vertical card slots, as shown in Figure 5–15. There are two types of fan tray; see Table 2–2 on page 2–23 for more information on compatibility issues.

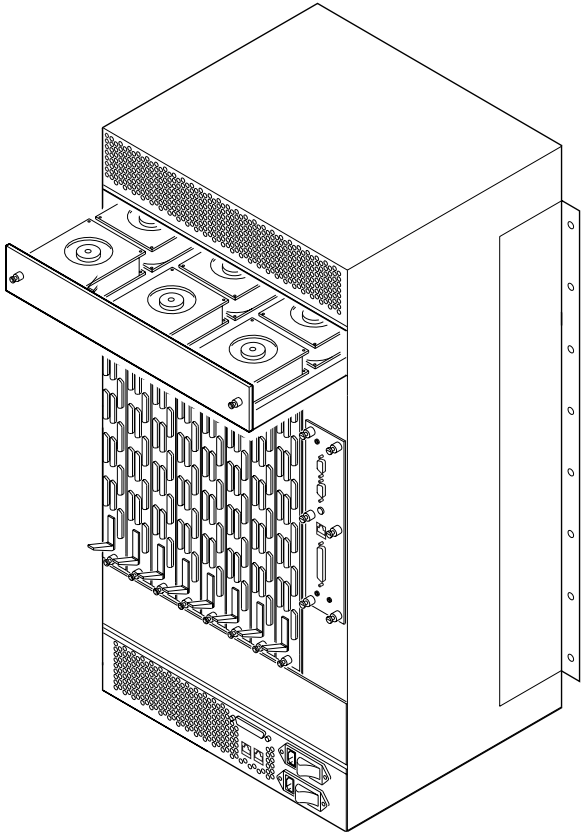


Figure 5–15 HP AlphaServer SC 128-Way Switch Fan Tray

Acceptable fan speeds are in the range 3000-4000 RPM; fan speeds less than 3000 RPM or greater than 4000 RPM will result in an error. The normal operating speed is approximately 3300 RPM.

It is possible to service the fan tray of an HP AlphaServer SC 128-way switch while the switch is powered on. For example, the diagnostics (see Chapter 7) might indicate that one fan has problems — running at a higher or lower speed than the recommended speed.

In this case, you may choose to replace the fan tray while the switch is powered on. Note, however, that if replacing the fan tray while the switch is powered on, you must insert the new tray within 2 minutes of sliding the old tray out (see Section 5.14.1 on page 5–33).

Caution:

Any one fan may fail in a tray, and not affect thermal performance because the switch will be adequately cooled. However, if a second fan fails, the temperature will steadily increase and is likely to cause thermal issues. Therefore, if any fan fails, you should replace the fan tray.

The switch manager will log the high temperatures in the `events` table in the RMS database. Unless you regularly monitor the `events` table, you may not be aware of the high temperatures.

To identify failed fans, run the `elanenvtest` script as described in Section 7.7.1 on page 7–49. The `elanenvtest` script also indicates high temperatures — the maximum ambient temperature is 35°C — a temperature of over 40°C will result in a warning, a temperature of over 50°C will result in an error.

This section describes both ways of replacing the fan tray:

- Replacing the Fan Tray While the HP AlphaServer SC 128-Way Switch is Powered On (see Section 5.14.1 on page 5–33)
- Replacing the Fan Tray When the HP AlphaServer SC 128-Way Switch is Powered Off (see Section 5.14.2 on page 5–34)

The fan tray has been updated — two versions are available. The new-type fan tray can be used only in a new-type switch; the old-type fan tray can be used only in an old-type switch.

5.14.1 Replacing the Fan Tray While the HP AlphaServer SC 128-Way Switch is Powered On

If you wish to replace the fan tray while the switch is powered on, you must insert the new tray within 2 minutes of sliding the old tray out. You may wish to ask a colleague to help.

To replace the fan tray in an HP AlphaServer SC 128-way switch while the switch is powered on, perform the following steps:

1. Unpack the new fan tray, so that you are ready to insert it immediately after removing the old fan tray. Save the packaging.
2. Remove the two panel fasteners — one at each end of the fan tray — that secure the fan tray to the chassis.
3. Slide the fan tray out (see Warning) using the two handles provided, as shown in Figure 5–15 on page 5–32.

WARNING:

Slide the fan tray out a small distance to disconnect its power, wait 5 seconds to allow the fans to slow or stop, and then remove the fan tray without touching the fans.

4. Within 2 minutes of removing the old fan tray, slide the new fan tray into the slot until the connector is docked in position.

Caution:

The switch will operated normally without fan cooling for up to 2 minutes. The fan tray must be replaced within this time.

5. Tighten the panel fasteners at each end of the fan tray.
6. Verify the operation of the HP AlphaServer SC 128-way switch by running the `elanenvtest` script, as described in Section 7.7.1 on page 7–49.
7. Pack up the old fan tray using the packaging saved in step 1, and return the replaced product using standard field service processes.

5.14.2 Replacing the Fan Tray When the HP AlphaServer SC 128-Way Switch is Powered Off

To replace the fan tray in an HP AlphaServer SC 128-way switch when the switch is powered off, perform the following steps:

1. If this is a standalone switch, or a node-level switch in a federated configuration: halt, and then power down, all of the nodes that are connected to the HP AlphaServer SC 128-way switch.

Note:

If you do not power down the nodes, the nodes will crash.

2. Power down the HP AlphaServer SC 128-way switch and remove the power cables.

WARNING:

The HP AlphaServer SC 128-way switch has two power cables — disconnect both power cables before servicing the switch, to avoid electrical shock.

3. Remove the two panel fasteners — one at each end of the fan tray — that secure the fan tray to the chassis.
4. Slide the fan tray out (see Warning) using the two handles provided, as shown in Figure 5–15 on page 5–32.

WARNING:

Slide the fan tray out a small distance, wait 5 seconds to allow the fans to slow or stop, and then remove the fan tray without touching the fans.

5. Unpack the new fan tray and slide it into the slot until the connector is docked in position. Save the packaging.
6. Tighten the panel fasteners at each end of the fan tray.
7. Power up the HP AlphaServer SC 128-way switch, as described in Section 5.2 on page 5–12.
8. If this is a standalone switch, or a node-level switch in a federated configuration, power up the nodes.
9. Verify the operation of the fan tray by running the `elanenvtest` script, as described in Section 7.7.1 on page 7–49.
10. Verify that the HP AlphaServer SC 128-way switch is working correctly by running the scripts described in Chapter 7.
11. Pack up the old fan tray using the packaging saved in step 5, and return the replaced product using standard field service processes.

5.15 Replacing the HP AlphaServer SC Interconnect Control Processor

To replace the HP AlphaServer SC Interconnect control processor in an HP AlphaServer SC 128-way switch, perform the following steps:

1. If this is a standalone switch, or a node-level switch in a federated configuration: shut down (to the SRM prompt) all of the nodes that are connected to the HP AlphaServer SC 128-way switch.

   Note:

   If you do not shut down the nodes, the nodes will crash.

2. Power down the HP AlphaServer SC 128-way switch and remove the power cables at the rear of the chassis.

   WARNING:

   The HP AlphaServer SC 128-way switch has two power cables — disconnect both power cables before servicing the switch, to avoid electrical shock.

3. Disconnect the JTAG cable from the parallel port on the HP AlphaServer SC Interconnect control processor.
4. Disconnect the Ethernet cable from the HP AlphaServer SC Interconnect control processor.
5. Disconnect any other peripheral devices connected to the HP AlphaServer SC Interconnect control processor.

6. Undo the six fasteners and remove the HP AlphaServer SC Interconnect control processor.
7. Disconnect the internal power cable that connects the control processor to the power tray.
8. Slide in the replacement processor and press home until fully seated.
9. Reconnect the internal power cable that connects the control processor to the power tray.
10. Evenly tighten the six fasteners to ensure a secure fixing.
11. Reconnect all peripheral devices.
12. Reconnect the Ethernet cable to the HP AlphaServer SC Interconnect control processor.
13. Reconnect the JTAG cable to the parallel port on the HP AlphaServer SC Interconnect control processor.
14. Reconnect the power cables at the rear of the chassis and power up the HP AlphaServer SC 128-way switch.
15. Upgrade the HP AlphaServer SC Interconnect control processor software and configure its IP address, as described in Section 7.2 on page 7–2.
16. If this is a standalone switch, or a node-level switch in a federated configuration, boot all of the nodes that are connected to the HP AlphaServer SC 128-way switch.

5.16 Replacing an HP AlphaServer SC 128-Way Switch Chassis

If you identify a problem with the HP AlphaServer SC 128-way switch midplane, you must replace the HP AlphaServer SC 128-way switch chassis.

WARNING:

For personnel and equipment safety, we recommend that the replacing of the HP AlphaServer SC 128-way switch chassis be carried out by two people.

Ensure that the rack is stable before starting to replace the HP AlphaServer SC 128-way switch chassis.

To replace the HP AlphaServer SC 128-way switch chassis, perform the following steps:

1. If this is a standalone switch, or a node-level switch in a federated configuration: halt, and then power down, all of the nodes that are connected to the HP AlphaServer SC 128-way switch.

Note:

If you do not power down the nodes, the nodes will crash.

2. Power down the HP AlphaServer SC 128-way switch and remove the power cables.

WARNING:

The HP AlphaServer SC 128-way switch has two power cables — disconnect both power cables before servicing the switch, to avoid electrical shock.

3. Ensure that the link cables are adequately labeled as described in Section 5.4 on page 5–13 or Section 5.5 on page 5–16, and then disconnect the link cables from HD50 connectors on the rear panel of the HP AlphaServer SC 128-way switch.

   Remove the link cables a row at a time, starting at the top right. This gives sufficient space to remove and replace the cable without damaging the connector pins.

4. Disconnect the JTAG cable from the JTAG port on the HP AlphaServer SC 128-way switch.

5. If this is a new-type switch in a standalone configuration, remove the external clock plugs from the external clock inputs (CLK A and CLK B), under the JTAG port.

   If this is a new-type switch in a federated configuration, disconnect the clock cables from the external clock inputs (CLK A and CLK B).

6. To decrease the weight of the switch, remove the following FRUs:

   a. HP AlphaServer SC 16-port switch cards (see Section 5.7 on page 5–19)

   b. HP AlphaServer SC high-level switch cards (see Section 5.9 on page 5–21)

   c. HP AlphaServer SC clock card (see Section 5.10 on page 5–22)

   d. PSUs (see Section 5.12 on page 5–24)

   e. Fan tray (see Section 5.14 on page 5–32)

   f. Control processor (see Section 5.15 on page 5–35)

      The old-type HP AlphaServer SC 128-way switch does not have a control processor.

7. Remove the six 10-32 pan-head screws from each switch-mounting bracket; these screws secure the HP AlphaServer SC 128-way switch to the rack.

8. Slide the switch out from the front of the rack. Remove the switch from the rack and place it on a sturdy work surface.

WARNING:

We recommend that two people hold the HP AlphaServer SC 128-way switch. An empty chassis is lighter than the recommended weight threshold for one person, but may be awkward to handle.

9. Transfer the switch-mounting brackets from the old switch chassis to the new switch chassis.
10. Slide the new HP AlphaServer SC 128-way switch chassis into the front of the rack.
11. Secure the HP AlphaServer SC 128-way switch to the rack by bolting the switch-mounting brackets, using the screws removed in step 7.

    Note:

    Bolt the switch to the front of the cabinet; this leaves space for the cables at the rear.

12. Replace the FRUs that you removed in step 6.
13. Reconnect the link cables that you disconnected in step 3. Ensure that each cable is correctly positioned on the HP AlphaServer SC 128-way switch. See Section 5.4 on page 5–13 for more details.

    Note:

    If this is a standalone switch or node-level switch, ensure that the nodes are still powered off.

14. If this is a standalone switch, ensure that external clock plugs are fitted to the external clock inputs (CLK A and CLK B), as described in step 7 on page 5–4.

    If this is a switch in a federated configuration, reconnect the clock distribution cables that you disconnected in step 5.
15. Reconnect the JTAG cable that you disconnected in step 4. See Section 5.6 on page 5–18 for more details.
16. Connect the power cables and power up the new HP AlphaServer SC 128-way switch, as described in Section 5.2 on page 5–12.
17. If this is a standalone switch, or a node-level switch in a federated configuration, power up the nodes.
18. Verify the state of the links by checking the LEDs, as described in Section 7.5 on page 7–34.
19. Verify that the HP AlphaServer SC 128-way switch is working correctly by running the scripts described in Chapter 7.

6

The HP AlphaServer SC Clock Distribution Box

This chapter describes the HP AlphaServer SC clock distribution box.

The information in this chapter is organized as follows:

- Installing the HP AlphaServer SC Clock Distribution Box in a 19" Rack (see Section 6.1 on page 6–2)
- Powering Up the HP AlphaServer SC Clock Distribution Box (see Section 6.2 on page 6–3)
- Connecting Switches to the HP AlphaServer SC Clock Distribution Box (see Section 6.3 on page 6–4)
- Verifying or Setting the Clock Source (see Section 6.4 on page 6–5)
- Replacing the HP AlphaServer SC Clock Distribution Box (see Section 6.5 on page 6–6)
- Replacing a Fuse in the IEC AC Power Inlet Connector (see Section 6.6 on page 6–8)

6.1 Installing the HP AlphaServer SC Clock Distribution Box in a 19" Rack

The HP AlphaServer SC clock distribution box can be installed in a standard cabinet, using the mounting brackets that are attached to the HP AlphaServer SC clock distribution box.

WARNING:

Ensure that the rack is stable before starting installation of the HP AlphaServer SC clock distribution box. Ensure that the addition of this equipment does not create a hazardous condition in which the rack is unstable due to uneven loading.

Ensure that the electrical supply, wiring and over-current protection circuitry of the rack are rated to cope with the additional load from the HP AlphaServer SC clock distribution box. Also ensure that an adequate and reliable earth connection is provided for the rack.

Do not block air vents or otherwise restrict airflow when installing in a rackmount enclosure.

The HP AlphaServer SC clock distribution box has no forced cooling, it relies on convection. The vents are on both sides, so there is a degree of side-side cooling — air can flow out of the enclosure. Ensure that the HP AlphaServer SC clock distribution box is sufficiently ventilated so that its ambient temperature does not exceed the maximum value (35°C).

For cable management purposes, you may find it more convenient to install the HP AlphaServer SC clock distribution box in the rear of the cabinet, rather than the front.

To install an HP AlphaServer SC clock distribution box in a rack, perform the following tasks:

1. Unpack the HP AlphaServer SC clock distribution box, and secure it in a suitable position by bolting the box-mounted brackets to the top and rear of the cabinet using four (6-32 x 0.375) screws — two on each side — as shown in Figure 6–1.

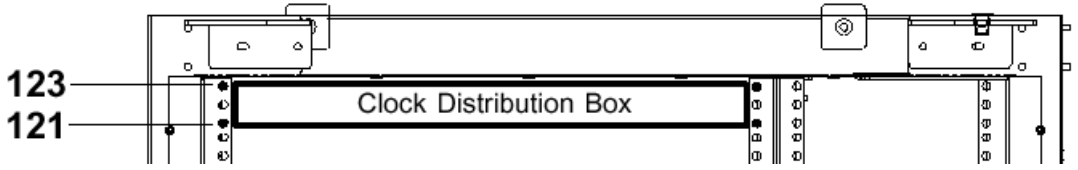


Figure 6–1 Installing the HP AlphaServer SC Clock Distribution Box in a Rack

2. Connect the cables from the CLK A port or CLK B port (on each HP AlphaServer SC 128-way switch) to the appropriate port on the HP AlphaServer SC clock distribution box. Ensure that each cable is correctly positioned on the HP AlphaServer SC clock distribution box, as described in Section 6.3 on page 6–4.

Note:

The clock distribution cables are very similar to the Ethernet cables — both are fitted with RJ45 connectors. When cabling the system, be sure not to mix the cables.

3. Power up the HP AlphaServer SC clock distribution box as described in Section 6.2 on page 6–3.
4. Power up all of the switches that are connected to the HP AlphaServer SC clock distribution box.
5. Verify that the HP AlphaServer SC clock distribution box is working correctly, as described in Section 6.4 on page 6–5.

6.2 Powering Up the HP AlphaServer SC Clock Distribution Box

The HP AlphaServer SC clock distribution box uses a Universal power supply operating in the range 90-254 V AC (61-49 Hz). Power is supplied through a standard IEC320 socket on the front panel, as shown in Figure 6–2.

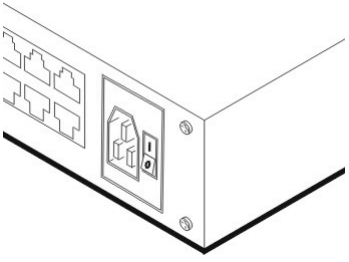


Figure 6–2 Power Switch on an HP AlphaServer SC Clock Distribution Box

Caution:

Ensure that the overall loading of the branch circuit is not exceeded by the addition of the HP AlphaServer SC clock distribution box.

Ensure that the power cable is adequate for the marked power rating of the unit (0.15 A at 240 V AC).

To power up an HP AlphaServer SC clock distribution box, perform the following steps:

1. Connect the power cable to a grounded AC power outlet, and to the IEC320 power socket on the front panel of the HP AlphaServer SC clock distribution box.
2. Press the power supply switch (beside the IEC320 power socket) to power up the HP AlphaServer SC clock distribution box.

6.3 Connecting Switches to the HP AlphaServer SC Clock Distribution Box

The shielded CAT5 cables that connect the HP AlphaServer SC 128-way switches to the HP AlphaServer SC clock distribution box are called **clock distribution cables**.

The front panel of the HP AlphaServer SC clock distribution box has connections for 25 CAT5 connectors, as shown in Figure 6–3.

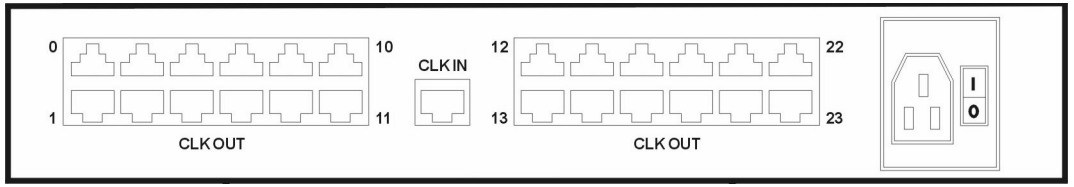


Figure 6–3 HP AlphaServer SC Clock Distribution Box Front Panel

The ports labelled 0–11 and 12–23 are clock outputs for connection to HP AlphaServer SC 128-way switches in a federated configuration. The port labelled CLKIN is not used in HP AlphaServer SC Version 2.6.

To connect the clock distribution cables, perform the following steps for each HP AlphaServer SC 128-way switch:

1. Connect one end of the clock distribution cable to the CLK A port on each HP AlphaServer SC 128-way switch, and the other to one of the CAT5 connectors on the front panel of the HP AlphaServer SC clock distribution box.

   Note:

   The front panel legend shows a number next to each CAT5 connector. Node-level switch 0 should be connected to port 0, node-level switch 1 to port 1, and so on.

2. Cables have RJ45 connectors at each end. Ensure that the connectors are firmly connected at both ends of the cable.

   As each clock distribution cable is connected, label the cable with the port number and the switch number using the labels supplied.

   We recommend that you label all of the cables that are connected to the switch.

3. Repeat steps 1 and 2 to connect the CLK B port on each HP AlphaServer SC 128-way switch to a second HP AlphaServer SC clock distribution box, to provide a backup clock.

Caution:

When connecting clock distribution cables, it is essential that CLK A and CLK B signals are not mixed between HP AlphaServer SC 128-way switches; that is, you must connect all CLK A ports to one HP AlphaServer SC clock distribution box, and connect all CLK B ports to a second HP AlphaServer SC clock distribution box.

We recommend that you completely install and test the CLK A network, before configuring the CLK B network.

6.4 Verifying or Setting the Clock Source

The HP AlphaServer SC clock card is set to internal clocking by default. To verify or set the clock source, you must use `jtest`, the switch network diagnostic program.

WARNING:

You can crash your machine by inappropriate use of the `jtest` command. Access to `jtest` is restricted to root users. Certain commands should only be used as directed by an appropriately qualified engineer.

To verify or set the clock source, perform the following steps:

1. Log onto any node and invoke `jtest` on each HP AlphaServer SC 128-way switch, as follows:

```
# /usr/opt/qswdiags/bin/jtest switch [switch...]
```

   for example:

```
# /usr/opt/qswdiags/bin/jtest QR0N00 QR0T00
```

   For more information about switch names, see Section 1.4.5 on page 1–13.

2. Run the `info` command to check the current clock setting, as follows:

```
jtest> modules -1
jtest> info
.
.
.
QNX Module: QR0T00 Type: QMS16X8 Clock 0.0 src local Temperature: 30
.
.
.
```

3. If necessary, set the clock source.

Caution:

Do not change the clock source on an individual switch that forms part of an active federated configuration — change all switches together, using SC Viewer.

- To set the clock source to CLK A, run the following command:
  ```
  jtest> clksrc A
  ```
- To set the clock source to CLK B, run the following command:
  ```
  jtest> clksrc B
  ```
- If using a new-type HP AlphaServer SC 128-way switch in a standalone 128-way configuration, you must set the clock source to internal clocking. To do so, run the following command:
  ```
  jtest> clksrc local
  ```
  If using a new-type HP AlphaServer SC 128-way switch in a standalone 128-way configuration, you must also fit external clock plugs to the external clock inputs (CLK A and CLK B), as described in step 7 on page 5–4.

4. Rerun the `info` command to check the clock setting, as follows:
   ```
   jtest> info
   .
   .
   .
   QNX Module: QR0T00 Type: QMS16X8 Clock 0.0 src A Temperature: 30
   .
   .
   .
   ```
5. Test the clock, as follows:
   ```
   jtest> eclock
   module QR0T00: clock frequency 399.9 source A
   ```
   To test the clock, the HP AlphaServer SC 128-way switch must contain at least one HP AlphaServer SC 16-port switch card or HP AlphaServer SC high-level switch card.

   The output should report a frequency of 400 MHz (plus or minus 0.5 MHz). If the clock is not being driven correctly, the value will be out by a larger amount.

6. Exit from `jtest`, as follows:
   ```
   jtest> quit
   ```

6.5 Replacing the HP AlphaServer SC Clock Distribution Box

Before replacing an HP AlphaServer SC clock distribution box, you must ensure that the federated configuration is using an alternate clock source. For example, before replacing the HP AlphaServer SC clock distribution box that connects the CLK A ports, you must set the

clock source on each switch to CLK B, and *vice versa*. If a valid alternate clock source is thus available, it is possible to replace the HP AlphaServer SC clock distribution box without powering down the HP AlphaServer SC 128-way switches.

However, if an alternate clock source is not available, the federated configuration will cease to function reliably when the HP AlphaServer SC clock distribution box is powered off. In such cases, you should first power down all of the nodes and HP AlphaServer SC 128-way switches, to avoid node crashes.

To replace an HP AlphaServer SC clock distribution box, perform the following steps:

1. If you have an alternate clock source, set the clock source for each HP AlphaServer SC 128-way switch to that alternate clock source, as described in Section 6.4 on page 6–5.

   If you do not have an alternate clock source, halt and then power down all of the nodes and switches.
2. Press the power supply switch (beside the IEC320 power socket) to power down the HP AlphaServer SC clock distribution box.
3. Disconnect the power cable from the IEC320 power socket on the front panel of the HP AlphaServer SC clock distribution box.
4. Ensure that the clock distribution cables are adequately labeled as described in Section 6.3 on page 6–4, and then disconnect the cables from the ports on the HP AlphaServer SC clock distribution box.
5. Remove the HP AlphaServer SC clock distribution box from the rack, by removing the four screws — two on each side — that secure the HP AlphaServer SC clock distribution box to the cabinet.
6. Unpack the new HP AlphaServer SC clock distribution box, and secure it in a suitable position by bolting the box-mounted brackets to the top and rear of the cabinet using four (6-32 x 0.375) screws — two on each side — as shown in Figure 6–1 on page 6–2.
7. Reconnect the clock distribution cables that you disconnected in step 4; that is, reconnect the HP AlphaServer SC 128-way switches to the HP AlphaServer SC clock distribution box. Ensure that each cable is correctly positioned on the HP AlphaServer SC clock distribution box, as described in Section 6.3 on page 6–4.
8. Power up the HP AlphaServer SC clock distribution box as described in Section 6.2 on page 6–3.
9. If you powered down nodes and switches in step 1, power them up again.
10. Verify that the HP AlphaServer SC clock distribution box is working correctly, as described in Section 6.4 on page 6–5.

6.6 Replacing a Fuse in the IEC AC Power Inlet Connector

This section describes how to replace a fuse in the IEC AC power inlet connector. There are no other field replaceable items in an HP AlphaServer SC clock distribution box.

To replace a fuse in the IEC AC power inlet connector, perform the following steps:

1. Completely disconnect the HP AlphaServer SC clock distribution box from the power source, by removing the power cord from the front panel.
2. Remove the fuse cover.
3. Fit a new fuse. It must be a slow-blow 500-mA, 250-V, 20-mm x 5-mm ceramic fuse (there is a space within the fuse cover; you can store a spare fuse there for future use).
4. Replace the fuse cover.
5. Replace the power cord.

7

HP AlphaServer SC Interconnect Diagnostic Tests

This chapter describes the HP AlphaServer SC Interconnect diagnostic tests.

The chapter is organized as follows:

- Introduction (see Section 7.1 on page 7–2)
- Upgrading the HP AlphaServer SC Interconnect Control Processor Software (see Section 7.2 on page 7–2)
- Creating an Interconnect Configuration Using SC Viewer (see Section 7.3 on page 7–12)
- Confirming the Operation of the HP AlphaServer SC Interconnect (see Section 7.4 on page 7–17)
- LEDs in an HP AlphaServer SC System (see Section 7.5 on page 7–34)
- Adding a Node After Installation (see Section 7.6 on page 7–43)
- HP AlphaServer SC Diagnostic Test Command Reference (see Section 7.7 on page 7–45)
- Drain Time Testing (see Section 7.8 on page 7–77)
- Production Testing (see Section 7.9 on page 7–78)
- Fat-Tree Network Maintenance (see Section 7.10 on page 7–78)

Note:

This chapter refers to several `sra` commands. To display help information for these commands, run the `sra help` command, as follows:

```
# sra help [command_name]
```

For more information, see Chapter 16 of the *HP AlphaServer SC System Administration Guide*.

7.1 Introduction

The HP AlphaServer SC Interconnect diagnostic software is provided as part of the HP AlphaServer SC system software. This diagnostic software allows you to identify faulty components in an HP AlphaServer SC Interconnect.

Before you can use the diagnostic software, you must complete all of the following tasks:

- You must install the HP AlphaServer SC Interconnect diagnostic software — on the management server (if used) and on the first node of each domain — before executing the diagnostic tests. See the *HP AlphaServer SC Installation Guide* for instructions on how to install the diagnostic software.
- You must ensure that the JTAG cables are correctly connected before executing the diagnostic tests. See Chapter 4 or Chapter 5 for more information on connecting JTAG cables.
- You must ensure that the HP AlphaServer SC Interconnect control processors are running the correct software version, as described in Section 7.2.
- You must ensure that the SC Viewer Interconnect tab has been correctly defined, as described in Section 7.3.

7.2 Upgrading the HP AlphaServer SC Interconnect Control Processor Software

Note:

This section does not apply to HP AlphaServer SC 16-port switches or old-type HP AlphaServer SC 128-way switches. Such switches are known as **directly-connected** switches, and do not have any firmware. This section only applies to the new-type HP AlphaServer SC 128-way switches containing an HP AlphaServer SC Interconnect control processor.

In HP AlphaServer SC Version 2.6, the software (also known as firmware) running on the HP AlphaServer SC Interconnect control processors has changed, and must be upgraded. The new software image is packaged in the SWM subset, which is part of the HP AlphaServer SC Version 2.6 system software.

Note:

This upgrade is mandatory — if you fail to upgrade the software, the diagnostics will not work.

You must perform all steps in the sequence defined in this section.

You must perform these steps for each HP AlphaServer SC Interconnect switch — that is, node-level switches and top-level switches.

To upgrade the software on an HP AlphaServer SC Interconnect control processor, you must perform the following steps. Each of these steps is described in more detail in the specified sections, as follows:

1. Assign a static IP address to each HP AlphaServer SC Interconnect control processor, as described in Section 7.2.1 on page 7-3.
2. Upgrade the software on each HP AlphaServer SC Interconnect control processor. For more information, see Section 7.2.2 on page 7-6.
3. Configure the HP AlphaServer SC Interconnect control processor for TFTP, as described in Section 7.2.3 on page 7-10.

7.2.1 Using the Serial Port to Assign a Static IP Address

Each HP AlphaServer SC Interconnect control processor is connected to the management network *via* an Ethernet cable. To connect to the HP AlphaServer SC Interconnect control processors over the management network, you must first assign an IP address to each HP AlphaServer SC Interconnect control processor.

Connect to the HP AlphaServer SC Interconnect control processor by using either the serial port, or a standard keyboard and VGA monitor.

Check the title of the first menu that is displayed when you connect to the HP AlphaServer SC Interconnect control processor:

- If the title is "`Quadrics Switch Control 1.0`", perform the steps described in Section 7.2.1.1.
- If the title is "`Quadrics Switch Control -- (NONAME)`", perform the steps described in Section 7.2.1.2.

7.2.1.1 Configuring the IP Address When Running Pre-Version 3 Software

To configure the IP address of an HP AlphaServer SC Interconnect control processor that is running pre-Version 3 software, perform the following steps:

1. When you connect to the serial port, the following menu appears:

```
Quadrics Switch Control 1.0
1. Show network settings
2. Change network settings
3. Run jtest
4. Run /bin/sh
5. Firmware upgrade
6. Quit
```

Enter **2**, to change the network settings.

2. The following menu appears:
```
Quadrics Switch Control
Select Protocol
1. BOOTP
2. STATIC
3. Abort
```
Enter **2**, to select STATIC configuration.

3. You are prompted for several static configuration values. Calculate these values very carefully, using the following example for guidance:
```
Enter IP address [default 10.128.128.1] q to abort: 10.128.128.1
Enter netmask address [default 255.255.0.0] q to abort: 255.255.0.0
Enter gateway address [default n] n for none, q to abort:
10.128.0.1
```

Note:

The IP address of each switch type must conform to the rules listed in Table 7–1 on page 7–7.

4. To force the changes to take effect, reboot the HP AlphaServer SC Interconnect control processor.
5. Repeat steps 1 to 4 inclusive for each HP AlphaServer SC Interconnect switch — that is, node-level switches and top-level switches.

7.2.1.2 Configuring the IP Address When Running Version 3 (or Higher) Software

To configure the IP address of an HP AlphaServer SC Interconnect control processor that is running Version 3 (or higher) software, perform the following steps:

1. When you connect to the serial port, the following menu appears:
```
Quadrics Switch Control -- (NONAME)
1. Show network settings
2. Change network settings
3. Run jtest
4. Run /bin/sh
```

```
5. Firmware upgrade
6. Quit
7. Reboot
```

Enter **2**, to change the network settings.

2. The following menu appears:

```
Quadrics Switch Control
Select Protocol
1. BOOTP
2. STATIC
3. Abort
```

Enter **2**, to select STATIC configuration.

3. You are prompted for several static configuration values. Calculate these values very carefully, using the following example for guidance:

```
Enter rail : 0
Enter type (N for Node, S for Supertop, T for Top) (q to abort): T
Enter location (0-127) (q to abort): 0
Enter IP address [default 10.128.128.128] q to abort:
Setting default y
Enter netmask address [default 255.255.0.0] q to abort: 255.255.0.0
Enter TFTP server IP address [default ] q to abort: 10.128.101.1
Enter TFTP upgrade filename [default upgrade.tar] (q to abort):
upgrade.tar
```

Note:

The rail, type, location, and IP address of each switch type must conform to the rules listed in Section 7.2.2 on page 7-6.

---

4. The following menu reappears:

```
Quadrics Switch Control -- (NONAME)
1. Show network settings
2. Change network settings
3. Run jtest
4. Run /bin/sh
5. Firmware upgrade
6. Quit
7. Reboot
```

Enter **7**, to reboot the HP AlphaServer SC Interconnect control processor.

After approximately 1 minute, the HP AlphaServer SC Interconnect control processor comes online with static configuration.

5. Repeat steps 1 to 4 inclusive for each HP AlphaServer SC Interconnect switch — that is, node-level switches and top-level switches.

7.2.2 Upgrading the Control Processor Software

Upgrading the software is a two-stage process. The first upgrade stage fixes a bug in the upgrade process itself. The second upgrade stage successfully upgrades all binaries on the control processor to the version shipped with HP AlphaServer SC Version 2.6. If you only perform one upgrade stage, then you will find that the firmware version reported by the `info` command within `jtest` will not indicate the new release 3-03031311. In this case, you should perform the second stage (see step 11 on page 7–8) and then verify that the version reported by `jtest` is correct.

The method (either BOOTP or TFTP) you use to upgrade the software in the HP AlphaServer SC Interconnect control processors depends on the current firmware revision on the processors. You must first identify the current revision as described in this section. Then, if the HP AlphaServer SC Interconnect control processor is running software revision 3-02071015 or higher, upgrade the software using TFTP, as described in Section 7.2.2.2 on page 7–9; otherwise, upgrade the software using BOOTP, as described in Section 7.2.2.1 on page 7–6.

You only need to determine which upgrade process to use once in the lifetime of each HP AlphaServer SC Interconnect control processor. In future HP AlphaServer SC releases, TFTP will be used for upgrading the software.

To identify the current software revision on an HP AlphaServer SC Interconnect control processor, run the `jtest` command, as follows:

```
atlasms# jtest QR0T00
jtest: initialising module QR0T00
jtest> info
QNX Module: QR0T00 Type: QMS16X8 Clock 0.0 src A Temperature: 30
Software version: 1-01100210 ip: 10.128.128.128 mac:
00:40:53:06:03:2f
Gateway: unknown Protocol: unknown Upgrade file: unknown tftp
server: unknown
QM401 : 0 1 2 3 4 5 6 7
QM408 : 61
jtest> quit
```

In the example above, the software version is `1-01100210`.

You must check the current software revision on each individual HP AlphaServer SC Interconnect control processor.

7.2.2.1 Upgrading the Software Using BOOTP

To upgrade the software using BOOTP, perform the following steps:

1. Check that all `/etc/hosts` entries are correct.

When the `sra setup` command was originally run on your system, the `/etc/hosts` file was populated with an entry for each HP AlphaServer SC Interconnect switch. Each such entry listed an IP address and alias for the switch, similar to the following:

```
10.128.128.128 QR0T00
```

a. Check that each IP address conforms to the rules given in Table 7–1.

Table 7–1 HP AlphaServer SC IP Addresses

Component	IP Address Range
HP AlphaServer SC Interconnect control processor for Node-Level switch *N*, where *r* is the rail number and *N* is 0–31	`10.128.(128+`*r*`).(`*N*`+1)`
HP AlphaServer SC Interconnect control processor for Top-Level switch *T*, where *r* is the rail number and *T* is 0–15	`10.128.(128+`*r*`).(`*T*`+128)`

b. Check that each alias conforms to the switch-naming convention described in Section 1.4.5 on page 1–13.

If the `/etc/hosts` file is not correctly populated, make the appropriate changes now.

2. Run the `jtest` command to identify the current MAC address of each HP AlphaServer SC Interconnect control processor, as follows:

```
atlasms# jtest QR0T00
jtest> info
QNX Module: QR0T00 Type: QMS16X8 Clock 0.0 src A Temperature: 30
Software version: 1-01100210 ip: 10.128.128.128 mac:
00:40:53:06:03:2f
Gateway: unknown Protocol: unknown Upgrade file: unknown tftp
server: unknown
QM401 : 0 1 2 3 4 5 6 7
QM408 : 61
jtest> quit
```

You will need the `ip` and `mac` values from this output, to populate the `ip` and `ha` values respectively in the `QR`*xxxx* entries in the `/etc/bootptab` file (see step 3).

3. Populate the `/etc/bootptab` file on the RIS server (`atlasms` or `atlas0`) with entries similar to the following:

```
.ris.quadrics:hn:vm=rfc1048
.ris.qnx:tc=.ris.quadrics:bf=/ris/upgrade.tar:sa=10.128.101.1:
QR0T00:tc=.ris.qnx:gw=10.128.0.1:ha=00405306032f:ip=10.128.128.128:ht=ethernet:
```

Note:

The `/etc/bootptab` file should contain one `QR`*xxxx* entry for each switch, but just one `.ris.quadrics` entry and one `.ris.qnx` entry for all switches.

4. Check that the `/ris/upgrade.tar` file exists on the RIS server, as follows:
   ```
   atlasms# ls -l -L /usr/upgrade.tar
   ```
   On an HP AlphaServer SC RIS server, this file is a symbolic link pointing to the file that ships as part of the HP AlphaServer SC SWM subset.
5. Stop and start the `joind` daemon on the RIS server, as follows:
   ```
   atlasms# /sbin/init.d/dhcp stop
   atlasms# /sbin/init.d/dhcp start
   ```
6. Telnet to the HP AlphaServer SC Interconnect control processor, as follows:
   ```
   atlasms# telnet QR0T00
   ```
7. The following menu is displayed:
   ```
   Quadrics Switch Control 1.0
   1. Show network settings
   2. Change network settings
   3. Run jtest
   4. Run /bin/sh
   5. Firmware upgrade
   6. Quit
   ```
   Enter **2**, to change the network settings.
8. The following menu is displayed:
   ```
   Quadrics Switch Control
   Select Protocol
   1. BOOTP
   2. STATIC
   3. Abort
   ```
   Enter **1**, to select BOOTP configuration.
9. The following menu is displayed again:
   ```
   Quadrics Switch Control 1.0
   1. Show network settings
   2. Change network settings
   3. Run jtest
   4. Run /bin/sh
   5. Firmware upgrade
   6. Quit
   ```
   Enter **5**, to select firmware upgrade.
10. The telnet session may appear to hang while the upgrade commences. Disconnect the telnet session as follows:
    ```
    CTRL/]
    close
    ```

After approximately 2 minutes, the first stage of the upgrade completes. You must now perform the second stage of the upgrade.

11. Repeat steps 1 to 10 inclusive on the HP AlphaServer SC Interconnect control processor.
12. Repeat steps 1 to 11 inclusive for each HP AlphaServer SC Interconnect switch — that is, all node-level switches and all top-level switches.

When you have finished upgrading the software on all HP AlphaServer SC Interconnect switches, proceed to Section 7.2.3 on page 7-10 and follow the instructions for configuring the HP AlphaServer SC system for TFTP for future upgrades.

7.2.2.2 Upgrading the Software Using TFTP

To upgrade the software using TFTP, perform the following steps:

1. Check that all `/etc/hosts` entries are correct.

   When the `sra setup` command was originally run on your system, the `/etc/hosts` file was populated with an entry for each HP AlphaServer SC Interconnect switch. Each such entry listed an IP address and alias for the switch, similar to the following:
   `10.128.128.128 QR0T00`

   a. Check that each IP address conforms to the rules given in Table 7–1 on page 7–7.

   b. Check that each alias conforms to the switch-naming convention described in Section 1.4.5 on page 1–13.

   If the `/etc/hosts` file is not correctly populated, make the appropriate changes now.

2. If TFTP has been disabled in the `/etc/inetd.conf` file, you will need to enable it again. You should also assign a relative pathname (using the `-r` parameter) for the `tftpd` entry so that the upgrade file will be found by the upgrade mechanism. For example, a suitable line for the `/etc/inetd.conf` file is as follows:

   ```
   tftp dgram udp wait root /usr/sbin/tftpd tftpd -r /ris /tmp /var/adm/ris /ris
   ```

3. When you have changed the `/etc/inetd.conf` file, restart the `inetd` daemon by running the following command:
   `atlasms# /usr/sbin/inetd -h`

4. Run the `jtest` command to upgrade the software on the HP AlphaServer SC Interconnect control processor as shown in the following example. You can access more than one control processor simultaneously by adding other processor aliases to the command line:

   ```
   atlasms# jtest QR0N00
   jtest: initialising module QR0N00
   jtest> m -1
   jtest> reboot upgrade
   Confirm upgrade of modules: QR0N00
   (yes/no): yes
   jtest: reboot/upgrade QR0N00
   jtest>
   ```

After approximately 2 minutes, the first stage of the upgrade completes. You must now perform the second stage of the upgrade.

5. Repeat step 4 on the HP AlphaServer SC Interconnect control processor.

6. Repeat steps 1 to 5 inclusive for each HP AlphaServer SC Interconnect switch, that is, all node-level switches and all top-level switches.

When you have finished upgrading the software on all HP AlphaServer SC Interconnect switches, proceed to Section 7.3 on page 7-12 and follow the instructions for creating an interconnect configuration using SC Viewer.

7.2.3 Configuring the HP AlphaServer SC System for TFTP for Future Upgrades

If you already used the TFTP mechanism to upgrade the software, as described in Section 7.2.2.2 on page 7-9, then it is not necessary to perform the steps in this section; instead, you can proceed to Section 7.3 on page 7-12.

Note:

Before configuring an HP AlphaServer SC Interconnect control processor for TFTP, you must ensure that it is running software release 3-03031311. For instructions on how to identify the current software version, see Section 7.2.2 on page 7–6.

If necessary, upgrade the software as described in Section 7.2.2 on page 7–6.

To configure an HP AlphaServer SC Interconnect control processor for TFTP for future upgrades, perform the following steps:

1. Telnet to the HP AlphaServer SC Interconnect control processor, as follows:
```
atlasms# telnet QR0T00
Login: quadrics
Password: system
```
2. The following menu is displayed:
```
Quadrics Switch Control -- (NONAME)
1. Show network settings
2. Change network settings
3. Run jtest
4. Run /bin/sh
5. Firmware upgrade
6. Quit
7. Reboot
```
Enter **2**, to change the network settings.

3. The following menu is displayed:
```
Quadrics Switch Control
Select Protocol
1. BOOTP
2. STATIC
3. Abort
```
Enter **2**, to select STATIC configuration.

4. You are prompted for several static configuration values. Calculate these values very carefully, using the following example for guidance:

```
Enter rail : 0
Enter type (N for Node, S for Supertop, T for Top) (q to abort): T
Enter location (0-127) (q to abort): 0
Enter IP address [default 10.128.128.128] q to abort:
Setting default y
Enter netmask address [default 255.255.0.0] q to abort: 255.255.0.0
Enter TFTP server IP address [default ] q to abort: 10.128.101.1
Enter TFTP upgrade filename [default upgrade.tar] (q to abort):
upgrade.tar
```

Note:

The rail, type, location, and IP address of each switch type must conform to the rules listed in Section 7.2.2 on page 7–6.

5. The following menu is displayed again:

```
Quadrics Switch Control -- (NONAME)
1. Show network settings
2. Change network settings
3. Run jtest
4. Run /bin/sh
5. Firmware upgrade
6. Quit
7. Reboot
```

   Enter **7**, to reboot the HP AlphaServer SC Interconnect control processor.

   After approximately 1 minute, the HP AlphaServer SC Interconnect control processor comes online with static configuration.

6. The TFTP method of upgrading does not use the `/etc/bootptab` file — it depends only on the existence of the `/ris/upgrade.tar` file on the RIS server. Therefore, on the RIS server, you should remove the `/etc/bootptab` entry corresponding to the HP AlphaServer SC Interconnect control processor just upgraded. Such `/etc/bootptab` entries will not be needed again; removing them now will prevent confusion later.

   For this QR0T00 example, remove the following `/etc/bootptab` entry:

```
QR0T00:tc=.ris.qnx:gw=10.128.0.1:ha=00405306032f:ip=10.128.128.128:ht=ethernet:
```

7. Repeat steps 1 to 6 inclusive for each HP AlphaServer SC Interconnect switch — that is, node-level switches and top-level switches.

8. When you have upgraded all of the HP AlphaServer SC Interconnect control processors, remove the following entries from the `/etc/bootptab` file on the RIS server:

```
.ris.quadrics:hn:vm=rfc1048
.ris.qnx:tc=.ris.quadrics:bf=/ris/upgrade.tar:sa=10.128.101.1:
```

7.3 Creating an Interconnect Configuration Using SC Viewer

Use the SC Viewer Interconnect tab to create the network configuration. Once you have created the network configuration, you can view various aspects of the HP AlphaServer SC Interconnect: status, links in reset, clock source, and so on.

Note:

You must perform all steps in the sequence defined in this section.

You must perform these steps for each HP AlphaServer SC Interconnect switch — that is, node-level switches and top-level switches.

This section is organized as follows:

- Stopping Event Manager While Configuring SC Viewer Interconnect (see Section 7.3.1)
- Populating the Switch Modules Table (see Section 7.3.2)
- Defining the SC Viewer Interconnect Configuration (see Section 7.3.3)

7.3.1 Stopping Event Manager While Configuring SC Viewer Interconnect

If an HP AlphaServer SC Interconnect configuration is not correctly defined in SC Viewer or is undergoing change, the event load on the SC database may be high, and the RMS event manager may have difficulty in handling the event load. This may be seen as an excessive load on the `msqld` daemon, or the event-manager server may exit on systems where there are many unhandled events but low physical memory.

To alleviate this problem, run the following commands:

```
atlasms# rcontrol stop server=eventmgr
atlasms# rmsquery "update events set handled=1"
atlasms# rcontrol start server=eventmgr
```

You may decide that the event manager should remain disabled while you are defining the SC Viewer Interconnect configuration, because many events may be generated. If so, the event manager will be restarted automatically when you run the `rmsctl start` command at the end of the procedure for defining the SC Viewer interconnect configuration (described in the Section 7.3.3 on page 7-15).

7.3.2 Populating the Switch Modules Table

The node acting as the `rmshost` system runs a `swmgr` server daemon to communicate with, and collect information from, each HP AlphaServer SC Interconnect switch in the HP AlphaServer SC system. Each new-type switch has an HP AlphaServer SC Interconnect control processor running a `swmserver` daemon — these `swmserver` daemons

communicate with the swmgr daemon. Each swmserver daemon will record vital information in the switch_modules table; therefore, the switch_modules table must be accurately populated.

When installing or upgrading an HP AlphaServer SC system, the switch_modules table may become populated with incorrect or inaccurate information. Therefore, you must clean the switch_modules table prior to starting SC Viewer.

The method used to clean the switch_modules table depends on whether the switch has an HP AlphaServer SC Interconnect control processor:

- Switch Does Not Have an HP AlphaServer SC Interconnect Control Processor (see Section 7.3.2.1)
- Switch Has an HP AlphaServer SC Interconnect Control Processor (see Section 7.3.2.2)

7.3.2.1 Switch Does Not Have an HP AlphaServer SC Interconnect Control Processor

HP AlphaServer SC 16-port switches, and old-type HP AlphaServer SC 128-way switches, do not have an HP AlphaServer SC Interconnect control processor; therefore, these switches do not have an Ethernet connection to the management network. In such switches, known as directly-connected switches, the JTAG cable connects the parallel port of a node to the JTAG port of the switch.

To ensure that the switch_modules table is correctly populated, perform the following steps (where atlas0 and atlas1 are the nodes that are directly connected to the first and second rail respectively):

1. Update the /etc/hosts file to define QR0N00 and QR1N00 as host aliases for atlas0 and atlas1, as shown in the following example:

   ```
   10.128.0.1 QR0N00  # Where first rail is attached to atlas0
   10.128.0.2 QR1N00  # Where second rail (optional) is attached to atlas1
   ```

   If the node monitoring these switches is different for any reason, then these entries should be changed to suit. The /etc/hosts file should be changed on the management server and on all domains.

2. Create a manual entry in the switch_modules table for each directly-connected switch, as follows:

   ```
   atlasms# rcontrol create server=swmserver hostname=atlas0 port=7200 \
   rms=0 args=0 autostart=1
   atlasms# rcontrol create server=swmserver hostname=atlas1 port=7200 \
   rms=0 args=1 autostart=1
   ```

3. Restart RMS on the nodes, as shown in the following example:

   ```
   atlasms# scrun -n 'atlas[0-1]''/sbin/init.d/rms restart'
   ```

For more information about directly-connected switches, and single- and dual-rail configurations, see Chapter 1.

7.3.2.2 Switch Has an HP AlphaServer SC Interconnect Control Processor

If each switch in the HP AlphaServer SC Interconnect has an HP AlphaServer SC Interconnect control processor, the `switch_modules` table is populated automatically.

To ensure that the `switch_modules` table is correctly populated, perform the following steps:

1. Update the `/etc/hosts` file to define the IP addresses for the HP AlphaServer SC Interconnect control processor cards in `QR0N00` and `QR1N00` as follows:
   ```
   10.128.128.1 QR0N00  # For the first rail
   10.128.129.1 QR1N00  # For the second rail (optional)
   ```
   The `/etc/hosts` file should be changed on the management server and on all domains.

   Note:

   In the case of federated installations, these entries in the `/etc/hosts` file are created automatically by the `sra setup` command. In this case, the values should be examined for accuracy now.

2. Stop the switch-manager server, as follows:
   ```
   atlasms# rcontrol stop server=swmgr
   ```
3. Remove all existing entries from the `switch_modules` table, as follows:
   ```
   atlasms# rmsquery "delete from switch_modules"
   ```
4. Restart the switch-manager server, as follows:
   ```
   atlasms# rcontrol start server=swmgr
   ```
5. Reboot the HP AlphaServer SC Interconnect control processors, as follows (this example shows six switches in a 256-way network):
   ```
   atlasms# jtest QR0T00 QR0T01 QR0N00 QR0N01 QR0N02 QR0N03
   jtest: initialising module QR0T00
   jtest: initialising module QR0T01
   jtest: initialising module QR0N00
   jtest: initialising module QR0N01
   jtest: initialising module QR0N02
   jtest: initialising module QR0N03
   jtest> modules -1
   jtest> reboot
   Confirm reboot of modules: QR0T00 QR0T01 QR0N00 QR0N01 QR0N02 QR0N03
   (yes/no): yes
   jtest: reboot QR0T00
   jtest: reboot QR0T01
   jtest: reboot QR0N00
   jtest: reboot QR0N01
   jtest: reboot QR0N02
   jtest: reboot QR0N03
   jtest> quit
   ```

If you cannot connect using `jtest`, or if you cannot reboot using `jtest`, telnet to each HP AlphaServer SC Interconnect control processor in turn and reboot it from the main menu (see step 5 on page 7–11).

6. Within approximately 2 minutes, the `swmserver` daemon on each HP AlphaServer SC Interconnect control processor will have registered with the `swmgr` daemon. Verify that all `swmserver` daemons have registered, as follows:
   ```
   atlasms# rmsquery "select * from switch_modules"
   ```

7.3.3 Defining the SC Viewer Interconnect Configuration

To define the SC Viewer Interconnect configuration, perform the following steps:

1. Remove the existing network definition information from the `attributes` table, as follows:
   ```
   atlasms# rmsquery "delete from attributes where name='network-type'"
   atlasms# rmsquery "delete from attributes where name='network-levels'"
   ```
   This will cause SC Viewer to create a new Interconnect view, in step 4.
2. Stop the RMS daemons in all places, as follows:
   ```
   atlasms# rmsctl stop
   ```
   This prevents the `swmgr` daemon from becoming confused when data in the `switch_modules` table changes when creating a new Interconnect view.

   The RMS daemons will be restarted later in this sequence, at which point the daemons will populate the database with their state information.
3. If not working directly on the graphics console, ensure that the DISPLAY environment variable is appropriately set.
4. Start SC Viewer, as follows:
   ```
   atlasms# scviewer
   ```

While trying to display the Interconnect view, SC Viewer will realize that the network type is undefined, and displays a dialog box as shown in Figure 7–1.

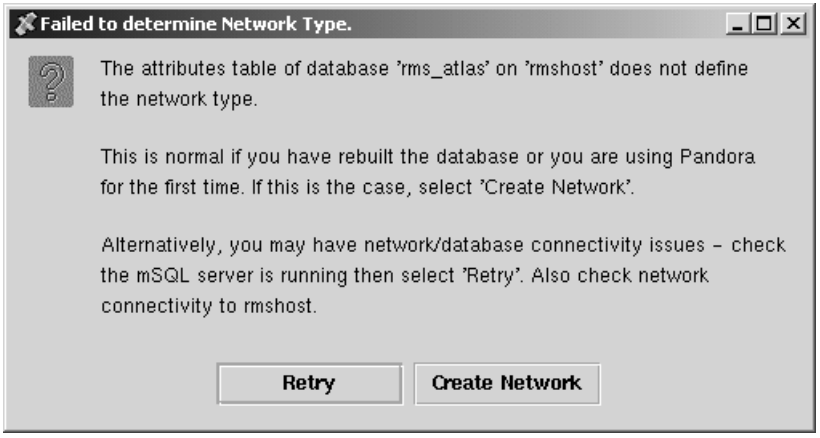


Figure 7–1 Failed to Determine Network Type Dialog Box

5. Click on the Create Network button to display the Network Parameters dialog box, as shown in Figure 7–2.

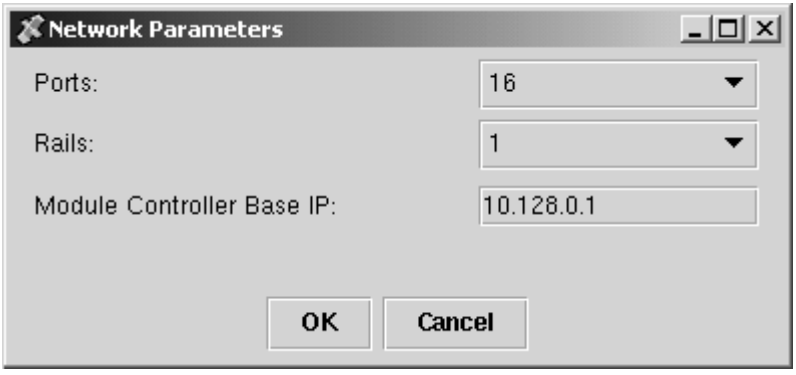


Figure 7–2 Network Parameters Dialog Box

6. Enter the appropriate information in the Network Parameters dialog box, as follows:
   a. Select the appropriate number of `Ports` for your system, from the drop-down list.

      Remember that this number should reflect the *potential* size of the HP AlphaServer SC Interconnect, and not the actual number of nodes in the system.

      Based on the fat-tree topology (see Section 1.3 on page 1–4), the potential size is typically a power of two. For example, a 192-node system is created on an HP AlphaServer SC Interconnect with a potential size of 256 ports.

   b. Select the appropriate number of `Rails` for your system, from the drop-down list.

c. Set the appropriate `Module Controller Base IP` address for your system (you can usually accept the default value).

d. Click on the OK button to close the Network Parameters dialog box and save the new HP AlphaServer SC Interconnect configuration information to several SC database tables. The SC Viewer main screen appears, showing the SC System Overview tab.

7. Exit from SC Viewer.

8. Restart RMS on all nodes, to ensure that the `rmsd` daemon on all nodes correctly recognizes the new HP AlphaServer SC Interconnect configuration, as follows:
```
atlasms# rmsctl start
```

7.4 Confirming the Operation of the HP AlphaServer SC Interconnect

Note:

All tests described in this section are mandatory and should not be skipped.

Perform all steps in the sequence defined, and using only the parameters described, in this section — these commands will produce output that is easy to interpret, allowing you to find problems one at a time.

Most of the tests are valid for all network types — 16-way, 128-way, and federated configurations. Certain tests do not apply to some hardware components or network types, as noted at the start of the relevant section. For more information about each hardware component and network type, see Chapter 2.

Run these tests on each rail.

The information in this section is organized as follows:

- Assign a Common Clock Source Per Rail (see Section 7.4.1)
- Verify the Clock Frequency On Each Switch Module (see Section 7.4.2)
- Use elanenvtest to Verify the Switch Modules (see Section 7.4.3)
- Show Links in Reset (see Section 7.4.4)
- Run elanpcitest on All Nodes (see Section 7.4.5)
- Run elanlinktest on All Nodes (see Section 7.4.6)
- Run riscabletest on Each Node-Level Switch (see Section 7.4.7)
- Run a Simple Boot-Time Check (see Section 7.4.8)

- Use elan_level_test to Check All Node Cables (see Section 7.4.9)
- Use cabletest to Check All Uplinks (see Section 7.4.10)
- Use elan_level_test to Check Each Node-Level Switch (see Section 7.4.11)
- Use elan_level_test to Check All Uplinks (see Section 7.4.12)
- Use elansoaktest to Test the Entire HP AlphaServer SC Interconnect (see Section 7.4.14)
- Use neterror to Identify Any Faulty Components (see Section 7.4.15)

7.4.1 Assign a Common Clock Source Per Rail

Note:

This test applies only to new-type HP AlphaServer SC 128-way switches.

All HP AlphaServer SC Interconnect switches on the same rail must operate on the same clock frequency:

- In non-federated configurations, the clock frequency is set by the local clock source.
- In federated configurations, the clock frequency is set by either the A or B clock source.

To assign the clock source, perform the following steps:

1. Stop the switch-manager server, as follows:
   ```
   atlasms# rcontrol stop server=swmgr
   ```
   This prevents the `swmgr` daemon from becoming confused when data in the `switch_modules` table changes when updating the clock source.
2. If not working directly on the graphics console, ensure that the DISPLAY environment variable is appropriately set.
3. Start SC Viewer, as follows:
   ```
   atlasms# scviewer
   ```
4. Select the Interconnect tab, as shown in Figure 7–3.

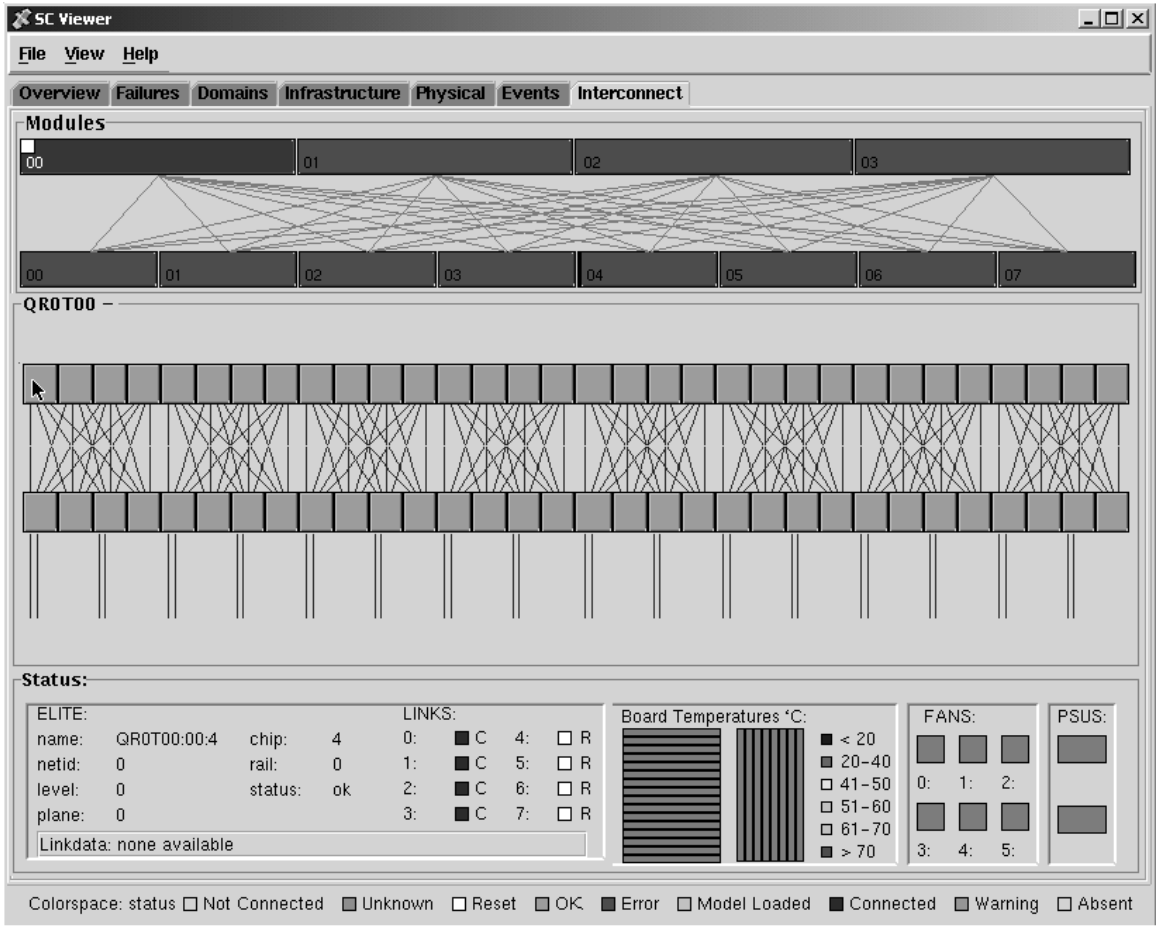


Figure 7–3 SC Viewer Interconnect Tab

5. Click the right mouse button in the Modules pane of the Interconnect tab, to display the Network Panel Menu, as shown in Figure 7–4.

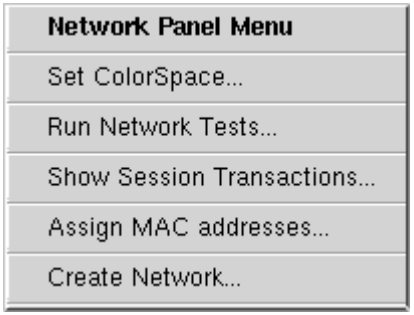


Figure 7–4 Network Panel Menu

6. Select the *Set ColorSpace...* option. The Color Space Selection dialog box appears, as shown in Figure 7–5.

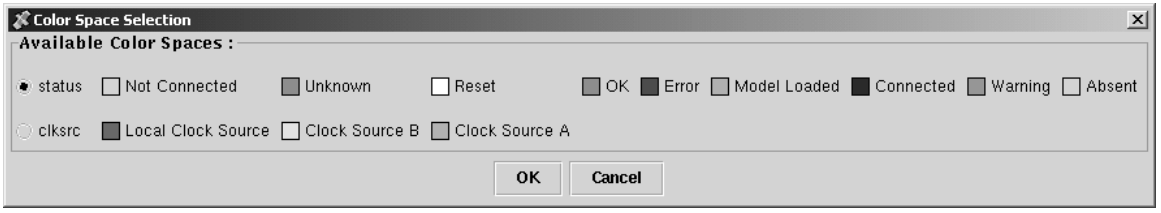


Figure 7–5 Color Space Selection Dialog Box

7. Select the `clksrc` radio button.
8. Click on the OK button to close the Color Space Selection dialog box.

The Modules pane of the Interconnect tab now indicates the clock source for each module, using the color code specified in the Color Space Selection dialog box (for example, yellow indicates clock source B).

The Modules pane should indicate that all of the switch modules are operating from the same clock source. If any modules are operating from a different clock source, perform the following steps:

1. Use the left mouse button to select all such modules.
2. Move the cursor to the Interconnect tab background (that is, not on a module) and click the right mouse button to display the Network Panel Menu, as shown in Figure 7–4.

3. Select the *Run Network Tests...* option. The Network Test Harness dialog box appears, as shown in Figure 7–6.

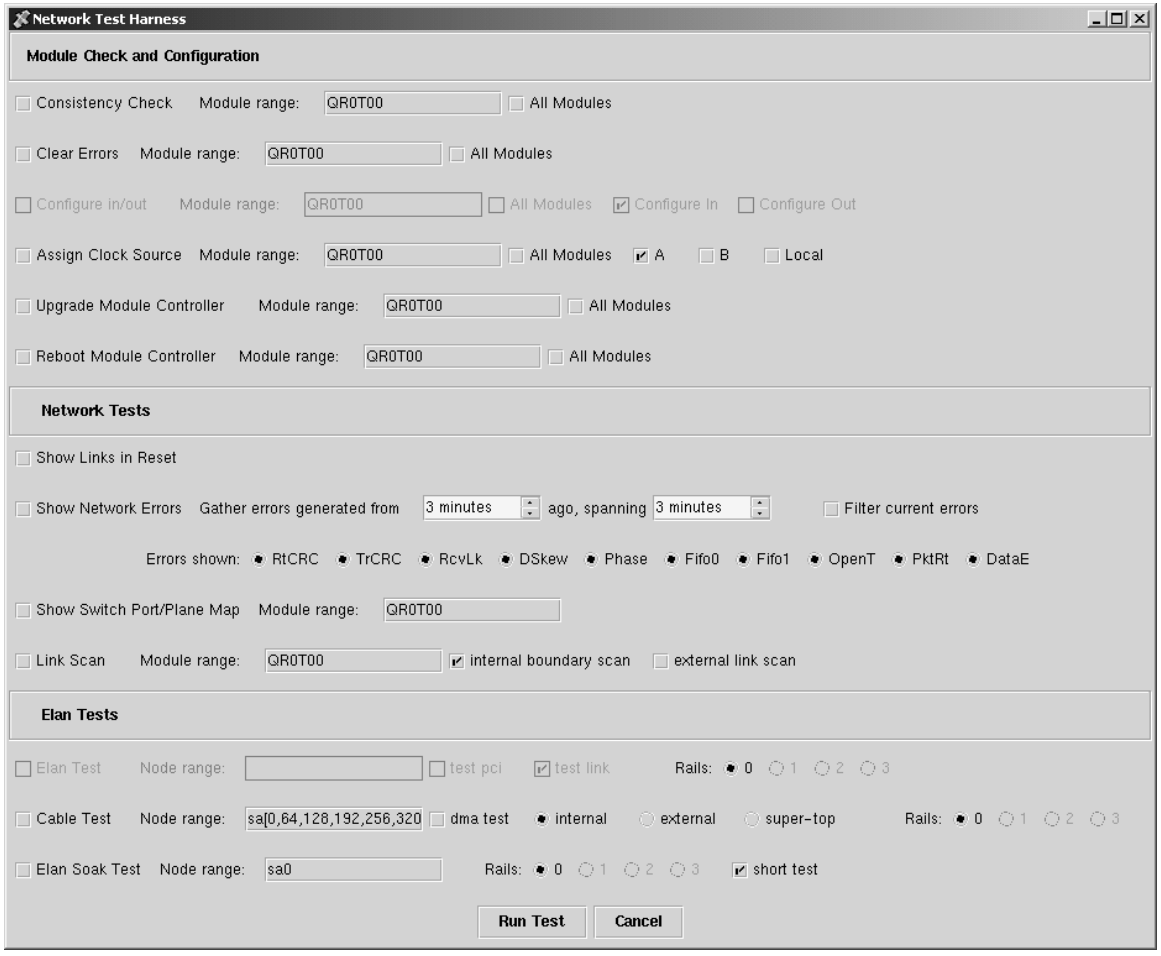


Figure 7–6 Network Test Harness Dialog Box

4. Set a common clock source for the rail, as follows:
   a. Select the `Assign Clock Source` checkbox.
   b. Specify the `Module range` to which this clock source should apply.
   c. Choose the appropriate clock source by selecting the `A`, `B`, or `Local` checkbox.
5. Click on the Run Test button to force the change to take effect.
6. Exit from SC Viewer.
7. Restart the switch-manager server, as follows:

```
atlasms# rcontrol start server=swmgr
```

7.4.2 Verify the Clock Frequency On Each Switch Module

Note:

This test applies only to new-type HP AlphaServer SC 128-way switches.

Once you have assigned a common clock source for each rail as described in Section 7.4.1, you must verify that the clock source is functioning correctly.

To verify the clock frequency, use the `jtest` command as shown in the following example (this example shows six switches in a 256-way network):

```
atlasms# jtest QR0T00 QR0T01 QR0N00 QR0N01 QR0N02 QR0N03
jtest: initialising module QR0T00
jtest: initialising module QR0T01
jtest: initialising module QR0N00
jtest: initialising module QR0N01
jtest: initialising module QR0N02
jtest: initialising module QR0N03
jtest> modules -1
jtest> eclock
module QR0T00: clock frequency 399.9 source A
module QR0T01: clock frequency 399.9 source A
module QR0N00: clock frequency 399.9 source A
module QR0N01: clock frequency 400.0 source A
module QR0N02: clock frequency 401.7 source A
module QR0N03: clock frequency 398.6 source A
jtest> quit
```

The clock frequency on all modules should be approximately 400 (Hz), and the same source should be used for each module (`source A` in this example).

A small amount of clock frequency drift (2 or 3 Hz) is acceptable. Entries may be created in the `events` table to report the drift — you should handle such entries as follows:

- If the drift is not excessive, you can ignore these entries and assume that the clock configuration is operational.
- If any module reports a significantly different clock frequency (for example, 120Hz) you should investigate. This difference is typically caused by a disconnected or faulty clock distribution cable — reseat or replace this cable as appropriate. If problems persist, you may decide to assign the other clock source to all modules within a rail, and resolve the problems later.

7.4.3 Use elanenvtest to Verify the Switch Modules

To verify that the various switch modules provide a consistent and valid network, run the `elanenvtest` script to check the environment data on each switch, as follows:

```
atlasms# cd /usr/opt/qswdiags
atlasms# ./elanenvtest
```

In federated configurations, the `elanenvtest` script will also verify the consistency of the clock source, and of the software revision in the switches, for each rail.

The `elanenvtest` script reads the switch module names from the SC database and communicates directly with the switch-manager servers for each switch, to determine the state of the switch. The load is not significant; therefore, you can run the `elanenvtest` script without impact on a production system.

Typical problems found by the `elanenvtest` script include the following:

- Incorrect information in the `switch_modules` table (see Section 7.3.2)
- Switch-manager server daemon (RMS) is not running on switch-managing node (see Section 7.3.2.1 on page 7–13)
- Incorrect configuration of clock settings (see Section 7.4.1 and Section 7.4.2)
- Incorrect software version on the HP AlphaServer SC Interconnect control processor (see Section 7.2)
- Problems with the HP AlphaServer SC Interconnect control processor IP address (see Section 7.2)
- Problems with the HP AlphaServer SC Interconnect control processor Ethernet cable (see Section 5.1.5 on page 5–10)
- Problems with the HP AlphaServer SC Interconnect control processor JTAG cable (see Section 5.1.5 on page 5–10)
- Basic problems with environment conditions (temperature, fan speeds, and so on) on the switches themselves (see Chapter 4 or Chapter 5)

For more information on the `elanenvtest` script, see Section 7.7.1.

7.4.4 Show Links in Reset

Depending on the number of nodes installed and the number of potential ports that your network can support, some links may be expected to be in reset (or unconnected). For example, a 192-node system has an HP AlphaServer SC Interconnect with 256 potential ports. In this situation, the fourth node-level switch (QR0N03) is not installed; therefore, associated links to the top-level switch remain in reset.

To view the links in reset, perform the following steps:

1. If not working directly on the graphics console, ensure that the DISPLAY environment variable is appropriately set.
2. Start SC Viewer, as follows:
   `atlasms# scviewer`
3. Select the Interconnect tab, as shown in Figure 7–3 on page 7–19.
4. Click the right mouse button to display the Network Panel Menu, as shown in Figure 7–4 on page 7–20.
5. Select the *Run Network Tests...* option. The Network Test Harness dialog box appears, as shown in Figure 7–6 on page 7–21.
6. Select the `Show Links in Reset` checkbox.
7. Click on the Run Test button to run the test.
8. When the test has completed, the contents of the Interconnect tab are updated. Any switches with an amber color have links that are in reset. Select each switch in turn and investigate why the particular links are in reset. If any links in reset are unexpected, reseat or replace the relevant link cables.
9. Repeat the network test as often as required, until the expected link condition is attained throughout.
10. When the network is working correctly, reboot all nodes in the system, to ensure that all nodes have the same understanding of the size and configuration of the network. Problems can arise if nodes on one node-level switch believe that the network is a different shape or size to that understood by nodes on another node-level switch. Such situations can arise if links are in reset when the nodes are first booted, and the links in reset are later solved.

7.4.5 Run elanpcitest on All Nodes

Note:

If all nodes are already fully installed and booted, you can skip this test.

The `elanpcitest` script must pass cleanly on all nodes before the system can be considered to be operating correctly. This script verifies that the HP AlphaServer SC Elan adapter cards are seated correctly and communicating correctly over the PCI bus. This test verifies that all Elan registers can be accessed.

The `elanpcitest` script can be executed very early in the installation of a system, using a RIS-booted environment. The `elanpcitest` script will automatically test both rails in a dual-rail system.

Before running the `elanpcitest` script, ensure that the following tasks have been performed:

- The `sra setup` command has been run, as described in Chapter 5 or Chapter 6 (depending on the system configuration) of the *HP AlphaServer SC Installation Guide*.
- The HP AlphaServer SC Interconnect control processor software has been upgraded, as described in Section 7.2.
- The SC Viewer Interconnect tab has been defined, as described in Section 7.3.

To run the `elanpcitest` script, ensure that all nodes are at the SRM prompt, and run the following command:

```
atlasms# sra elancheck -nodes 'atlas[0-1023]' -test elan
```

Check the resulting screen output for any failures, and reseat or replace any affected HP AlphaServer SC Elan adapter cards.

For more information about the `elanpcitest` script, see Section 7.7.2 on page 7–55.

7.4.6 Run elanlinktest on All Nodes

Note:

If all nodes are already fully installed and booted, you can skip this test.

The `elanlinktest` script must pass cleanly on all nodes before the system can be considered to be operating correctly. This script verifies that the HP AlphaServer SC Elan adapter cards are communicating correctly with the node-level switches, using a data loopback test.

The `elanlinktest` script can be executed very early in the installation of a system, using a RIS-booted environment. The `elanlinktest` script will automatically test both rails in a dual-rail system.

Before running the `elanlinktest` script, ensure that the following tasks have been performed:

- The `sra setup` command has been run, as described in Chapter 5 or Chapter 6 (depending on the system configuration) of the *HP AlphaServer SC Installation Guide*.
- The HP AlphaServer SC Interconnect control processor software has been upgraded, as described in Section 7.2.
- The SC Viewer Interconnect tab has been defined, as described in Section 7.3.

To run the `elanlinktest` script, ensure that all nodes are at the SRM prompt, and run the following command:

```
atlasms# sra elancheck -nodes 'atlas[0-1023]' -test link
```

Check the resulting screen output for any failures, and reseat or replace the link cables to any affected nodes.

For more information about the `elanlinktest` script, see Section 7.7.3 on page 7–57.

7.4.7 Run riscabletest on Each Node-Level Switch

Note:

If all nodes are already fully installed and booted, you can skip this test.

Non-federated configurations will not contain any top-level switches, so you can skip this test for such configurations.

The `riscabletest` script must pass cleanly on all node-level switches before the system can be considered to be operating correctly.

The `riscabletest` script can be executed very early in the installation of a system, using a RIS-booted environment.

Before running the `riscabletest` script, ensure that the following tasks have been performed:

- The `sra setup` command has been run, as described in Chapter 5 or Chapter 6 (depending on the system configuration) of the *HP AlphaServer SC Installation Guide*.
- The HP AlphaServer SC Interconnect control processor software has been upgraded, as described in Section 7.2.
- The SC Viewer Interconnect tab has been defined, as described in Section 7.3.
- The `elanpcitest` script has passed cleanly on all nodes, as described in Section 7.4.5.
- The `elanlinktest` script has passed cleanly on all nodes, as described in Section 7.4.6.

To run the `riscabletest` script, perform the following steps:

1. Ensure that the first node of the node-level switch is at the SRM prompt, and run the following command:
   ```
   atlasms# sra script -node atlas0 -script riscabletest
   ```
2. Check the resulting screen output for any failures, and reseat or replace the link cables to any affected nodes.
3. Repeat steps 1 and 2 for each node-level switch, substituting the appropriate node number in the command as shown in the following examples:
   ```
   atlasms# sra script -node atlas64 -script riscabletest
   atlasms# sra script -node atlas128 -script riscabletest
   ```

For more information about the `riscabletest` script, see Section 7.7.6 on page 7–65.

7.4.8 Run a Simple Boot-Time Check

To ensure that all nodes in a network have booted with a similar understanding of the network size and shape, search the console logs as follows:

For rail 0:

```
atlasms# cd /var/sra/logs ; for i in atlas*.log
> do
> grep "numnodes=" $i | grep "elan0" | tail -1
> done | sort
```

For rail 1:

```
atlasms# cd /var/sra/logs ; for i in atlas*.log
> do
> grep "numnodes=" $i | grep "elan1" | tail -1
> done | sort
```

The following example shows the output returned for rail 0:

```
atlas0.log: 29/Aug/2002 07:30:26 elan0: nodeid=0 level=5
numnodes=512
atlas64.log: 29/Aug/2002 07:31:32 elan0: nodeid=64 level=5
numnodes=512
atlas128.log: 29/Aug/2002 07:31:12 elan0: nodeid=128 level=5
numnodes=512
atlas192.log: 29/Aug/2002 07:33:41 elan0: nodeid=192 level=5
numnodes=512
```

If all nodes on each rail have a similar `numnodes` value and similar `level` value, the HP AlphaServer SC system has passed this simple boot check.

You may see an `adaptive routing ok` message at the end of a line of output, as shown in the following example:

```
28/Aug/2002 10:22:03 elan0: nodeid=192 level=5 numnodes=512 (adaptive
routing ok)
```

This implies that the Elan code has discovered that some node-level to top-level links (also known as **uplinks**) are in reset, but at least one uplink on every switch appears not to be in reset — therefore, an adaptive route is possible. While it is possible to operate with adaptive routing, it is not advisable to do so, as performance will be impacted.

In such circumstances, a domain will typically boot without problems. However, performance will drop significantly when using MPI or SCFS file systems, because packets are first directed to the uplinks in reset before being retransmitted over the working uplinks. The performance degradation is most obvious when communicating between nodes that are attached to different node-level switches.

Note:

You should fix this problem as soon as possible, using the diagnostic tools described in Section 7.4.10 on page 7–29 and Section 7.4.12 on page 7–32.

7.4.9 Use elan_level_test to Check All Node Cables

This test can be run on a working system. It will use RMS to run a single CPU job on all nodes in the named partition. This is the full extent of the impact on the system performance. The test will take no more than 10 minutes (including timeout handlers for failing nodes). The named RMS partition should be running, and all nodes should be booted and configured into the partition.

Earlier, you ran the `elanpcitest` and `elanlinktest` scripts to verify basic Elan operation in each node. While these tests are useful, the amount of data passed is light, and the amount of checking that is completed at the end of each test is trivial.

To check the link cable from each node to each node-level switch, run the following commands:

For rail 0:

```
atlasms# /usr/opt/sra/bin/elan_level_test level1 -d /var/sra/diag/quadrics \
-r 0 -clean -partition parallel
```

For rail 1:

```
atlasms# /usr/opt/sra/bin/elan_level_test level1 -d /var/sra/diag/quadrics \
-r 1 -clean -partition parallel
```

The `elan_level_test` script will pass a significant amount of data from the node on each rail tested, and will examine the control registers afterwards for any errors.

To understand the `elan_level_test` script output, see Section 7.7.7.2 on page 7–67.

Problems found by this test may be caused by faulty HP AlphaServer SC Elan adapter cards or faulty HP AlphaServer SC 16-port switch cards. However, the problems are typically caused by link cables being badly seated in the nodes, or bent pins in the cables connected to the nodes. Check and reseat both ends of the affected link cables. If the problems persist, replace the affected link cables.

Errors reported by this test can also be found by checking the various link tables and event tables in the SC database. However, the `elan_level_test` script will allow you to pinpoint errors with particular routes immediately on the screen, without needing to examine error tables or statistics elsewhere.

7.4.10 Use cabletest to Check All Uplinks

Note:

Non-federated configurations will not contain any top-level switches, so you can skip this test for such configurations.

This test can be run on a working system. It will run on the first node of each node-level switch and will use up to one CPU of performance for the duration of the test. The test will take no more than 5 minutes (including timeout handlers for failing nodes).

Earlier, you ran the RIS-booted version of the `cabletest` script. While that test was useful, it checked for operating links only — it did not test for missing links or links reporting occasional data loss under heavier load.

You can now run the `cabletest` script again, but with different parameters, to provide additional test coverage for all uplinks. This test runs on one node within each node-level chassis — it does not matter if the other nodes are not booted or are unavailable within a node-level chassis. This is different to the `elan_level_test` script, which requires that all nodes be booted and configured into the partition. Using the specified nodes, the `cabletest` script sequentially tests all uplinks from that node-level chassis.

To use the `cabletest` script to check all uplinks, run commands similar to the following:

For rail 0:

```
atlasms# scrun -n 0 /usr/opt/qswdiags/bin/cabletest -c QMF256 -n 0 \
-dma -D 0 -verbose -missing
atlasms# scrun -n 64 /usr/opt/qswdiags/bin/cabletest -c QMF256 -n 64 \
-dma -D 0 -verbose -missing
atlasms# scrun -n 128 /usr/opt/qswdiags/bin/cabletest -c QMF256 -n 128 \
-dma -D 0 -verbose -missing
```

For rail 1:

```
atlasms# scrun -n 0 /usr/opt/qswdiags/bin/cabletest -c QMF256 -n 0 \
-dma -D 1 -verbose -missing
atlasms# scrun -n 64 /usr/opt/qswdiags/bin/cabletest -c QMF256 -n 64 \
-dma -D 1 -verbose -missing
atlasms# scrun -n 128 /usr/opt/qswdiags/bin/cabletest -c QMF256 -n 128 \
-dma -D 1 -verbose -missing
```

Depending on the size of the HP AlphaServer SC Interconnect, you may need to change the value of the `-n` parameter (in both the `scrun` command and in the `cabletest` command), and the value of the `-c` parameter. For more information about the syntax of the `cabletest` command, see Section 7.7.5.1 on page 7–61.

The `cabletest` script will pass a significant amount of data from the node on each rail tested. The script will sequentially traverse every link between node-level and top-level switch.

To understand the output from the `cabletest` script, see Section 7.7.5.2 on page 7–63.

Problems found by the `cabletest` script are typically caused by badly seated link cables between a node-level switch and a top-level switch. Check and reseat both ends of the affected link cables. If the problems persist, replace the affected link cables.

There is a known problem with the `cabletest` script — it generates a core file when testing a bad uplink. If the `cabletest` script generates a core file, you should identify and fix the bad uplink.

Errors reported by this test can also be found by checking the various link tables and event tables in the SC database. However, the `cabletest` script will allow you to pinpoint errors with particular routes immediately on the screen, without needing to examine error tables or statistics elsewhere.

7.4.11 Use elan_level_test to Check Each Node-Level Switch

This test can be run on a working system. It will use RMS to run a single CPU job on all nodes in the named partition. This is the full extent of the impact on the system performance. The test will take no more than 10 minutes (including timeout handlers for failing nodes). The named RMS partition should be running, and all nodes should be booted and configured into the partition.

Note:

This test is designed to run in parallel from every node and test every possible link in the HP AlphaServer SC Interconnect. Therefore, you must ensure that all nodes are booted and configured into the partition before running this test. Otherwise, those parts of the HP AlphaServer SC Interconnect that are typically exercised by the unavailable nodes will remain untested when the diagnostic has completed.

This test has two parts:

- Test the HP AlphaServer SC 16-Port Switch Cards (see Section 7.4.11.1)
- Test the HP AlphaServer SC High-Level Switch Cards (see Section 7.4.11.2)

7.4.11.1 Test the HP AlphaServer SC 16-Port Switch Cards

Test the HP AlphaServer SC 16-port switch cards at node level by running the following commands:

For rail 0:

```
atlasms# /usr/opt/sra/bin/elan_level_test level2 -d /var/sra/diag/quadrics \
-r 0 -clean -partition parallel
```

For rail 1:

```
atlasms# /usr/opt/sra/bin/elan_level_test level2 -d /var/sra/diag/quadrics \
-r 1 -clean -partition parallel
```

7.4.11.2 Test the HP AlphaServer SC High-Level Switch Cards

Note:

HP AlphaServer SC 16-port switches will not contain any HP AlphaServer SC high-level switch cards, so you can skip Section 7.4.11.2 for such switches.

Test the HP AlphaServer SC high-level switch cards by running the following commands:

For rail 0:

```
atlasms# /usr/opt/sra/bin/elan_level_test level3 -d /var/sra/diag/quadrics \
-r 0 -clean -partition parallel
```

For rail 1:

```
atlasms# /usr/opt/sra/bin/elan_level_test level3 -d /var/sra/diag/quadrics \
-r 1 -clean -partition parallel
```

The `elan_level_test` script will pass a significant amount of data from the node on each rail tested, and traverse every route possible within the node-level switches, examining the control registers afterwards for any errors.

To understand the `elan_level_test` script output, see Section 7.7.7.2 on page 7–67.

Problems found by the test are typically caused by clocking problems in the HP AlphaServer SC Interconnect, or bad seating of boards in the node-level chassis, or faulty HP AlphaServer SC 16-port switch cards in the chassis. Repeat the test as often as required to localize the problem to a specific network component.

Errors reported by this test can also be found by checking the various link tables and event tables in the SC database. However, the `elan_level_test` script will allow you to pinpoint errors with particular routes immediately on the screen, without needing to examine error tables or statistics elsewhere.

7.4.12 Use elan_level_test to Check All Uplinks

Note:

Non-federated configurations will not contain any top-level switches, so you can skip this test for such configurations.

This test can be run on a working system. It will use RMS to run a single CPU job on all nodes in the named partition. This is the full extent of the impact on the system performance. The test will take no more than 10 minutes (including timeout handlers for failing nodes). The named RMS partition should be running, and all nodes should be booted and configured into the partition.

Note:

This test is designed to run in parallel from every node and test every possible link in the HP AlphaServer SC Interconnect. Therefore, you must ensure that all nodes are booted and configured into the partition before running this test. Otherwise, those parts of the HP AlphaServer SC Interconnect that are typically exercised by the unavailable nodes will remain untested when the diagnostic has completed.

Test each link cable from each node-level switch to each top-level switch by running the following commands:

For rail 0:

```
atlasms# /usr/opt/sra/bin/elan_level_test level4 -d /var/sra/diag/quadrics \
-r 0 -clean -partition parallel
```

For rail 1:

```
atlasms# /usr/opt/sra/bin/elan_level_test level4 -d /var/sra/diag/quadrics \
-r 1 -clean -partition parallel
```

The `elan_level_test` script will pass a significant amount of data from the node on each rail tested, and examine the control registers afterwards for any errors. The script tests all uplinks in parallel — each node tests one specific uplink.

To understand the `elan_level_test` script output, see Section 7.7.7.2 on page 7–67.

Problems found by this test are typically caused by badly seated link cables between a node-level switch and a top-level switch. Check and reseat both ends of the affected link cables. If the problems persist, replace the affected link cables, and check the relevant HP AlphaServer SC high-level switch card and HP AlphaServer SC 16-link null card in the node-level switch, and the relevant HP AlphaServer SC 16-port switch card in the top-level switch.

Errors reported by this test can also be found by checking the various link tables and event tables in the SC database. However, the `elan_level_test` script will allow you to pinpoint errors with particular routes immediately on the screen, without needing to examine error tables or statistics elsewhere.

7.4.13 Use elan_level_test to Check Each Top-Level Switch

This test can be run on a working system. It uses RMS to run a single CPU job on all nodes in the named partition. This is the full extent of the impact on system performance. The test will take no more than 10 minutes (including timeout handlers for failing nodes). The named RMS partition should be running, and all nodes should be booted and configured into the partition.

Note:

This test is designed to run in parallel from every node, and test every possible link in the HP AlphaServer SC Interconnect. Therefore, you must ensure that all nodes are booted and configured into the partition before running this test. Otherwise, those parts of the HP AlphaServer SC Interconnect that are typically exercised by the unavailable nodes will remain untested when the diagnostic has completed.

Test the HP AlphaServer SC 16-port switch cards in the top-level switches by running the following commands:

For rail 0:

```
atlasms# /usr/opt/sra/bin/elan_level_test level5 -d /var/sra/diag/quadrics \
-r 0 -clean -partition parallel
```

For rail 1:

```
atlasms# /usr/opt/sra/bin/elan_level_test level5 -d /var/sra/diag/quadrics \
-r 1 -clean -partition parallel
```

7.4.14 Use elansoaktest to Test the Entire HP AlphaServer SC Interconnect

This test can be run on a working system. It will use RMS to run a single CPU job on all nodes in the `root` partition. This significantly impacts the system performance. The test will take approximately 1 hour (including timeout handlers for failing nodes). All nodes should be booted and configured into the `root` partition.

To run the `elansoaktest` script, ensure that all nodes are booted and configured into the `root` partition, and run the following commands:

```
atlasms# cd /usr/opt/qswdiags
atlasms# ./elansoaktest
```

Check the script output (see Section 7.7.9.2 on page 7–73).

7.4.15 Use neterror to Identify Any Faulty Components

This test can be run on a working system. It will generate a report based on existing information in the SC database. This significantly impacts the performance of the `msqld` daemon. Depending on the size of the system, the test may take several minutes.

Use the `neterror` script as follows:

```
atlasms# cd /usr/opt/qswdiags
atlasms# ./neterror
////////////////////////////////////////////////////////////////////////
//  Quadrics Network Error Report                                     //
//  Execution Date: Thu Mar 14 11:30:04 EST 2002                      //
//  Platform:  OSF1 safe V5.1 1885 alpha                              //
//  Collecting error(s) occurred since Wed Mar 13 11:30:04 2002       //
////////////////////////////////////////////////////////////////////////

o==========o======o============================o============================o
|   Date    | Rail |       Fault Position       |     Error Detected At      |
o==========o======o============================o============================o
| Mar 14    |  0   | Switch Board 57 (QM402) or | Switch Board 57 [57:0:5]   |
| 09:16:09 |       |  Switch Board 5  (QM401)   |  TrCRC(511)                |
o----------o------o----------------------------o----------------------------o
atlasms#
```

The output of the script indicates possible fault locations.

Use the `rmsquery` command to identify the location of each switch board, as follows:

```
atlasms# rmsquery -v "select * from switch_boards where name='5' "
name  module  rail  slot  type    status  temp  PN       FN       EC  SN   MN
-------------------------------------------------------------------------------
5     QR0T00  0     5     QM401X  ok      28    QM401Xc  QM401Xc  00  070  0000
atlasms#
```

Replace the faulty component.

7.5 LEDs in an HP AlphaServer SC System

The information in this section is organized as follows:

- HP AlphaServer SC Elan Adapter Card LEDs (see Section 7.5.1 on page 7–35)
- HP AlphaServer SC 16-Port Switch LEDs (see Section 7.5.2 on page 7–35)
- HP AlphaServer SC 128-Way Switch LEDs (see Section 7.5.3 on page 7–35)
- Using LEDs to Identify Faulty Components (see Section 7.5.4 on page 7–38)

See Section 7.5.4 on page 7–38 for additional information on how to check the LEDs.

7.5.1 HP AlphaServer SC Elan Adapter Card LEDs

There is an LED stack on the HP AlphaServer SC Elan adapter card on each HP AlphaServer ES40 or HP AlphaServer ES45 node. The LED stack contains three LEDs, arranged from left to right in the following order: Red, Yellow, and Green. See Section 7.5.4.1 on page 7–38 for a description of LED status.

The LEDs on the HP AlphaServer SC Elan adapter cards (and the LEDs on the HP AlphaServer SC 16-port switch cards at the rear of the HP AlphaServer SC Interconnect switch) indicate the status of the links between the nodes and the switch. Each LED stack indicates the status of a link between an HP AlphaServer SC Elan adapter card (in a node) and an HP AlphaServer SC 16-port switch card (in the switch).

Table 7–2 and Table 7–3 on page 7–39 describe the expected LED behavior when powering up and booting a node. If the green LED does not light when the node is powered up, identify the source of the fault as described in Section 7.5.4.2 on page 7–39.

7.5.2 HP AlphaServer SC 16-Port Switch LEDs

There are 16 LED stacks on the rear panel of the HP AlphaServer SC 16-port switch (that is, an LED stack for each connector). The LED stacks each contain three LEDs, arranged from top to bottom in the following order: Red, Yellow, and Green. See Section 7.5.4.1 on page 7–38 for a description of LED status.

The LEDs on the rear panel of the HP AlphaServer SC Interconnect switch (and the LEDs on the nodes) indicate the status of the links between the switch and the nodes. Each LED stack indicates the status of a link between an HP AlphaServer SC Elan adapter card (in a node) and the HP AlphaServer SC 16-port switch card (in the switch).

Table 7–2 and Table 7–3 on page 7–39 describe the expected LED behavior when powering up and booting a node. If the green LEDs do not light when the nodes are powered up, identify the source of the fault as described in Section 7.5.4.2 on page 7–39.

7.5.3 HP AlphaServer SC 128-Way Switch LEDs

There are four sets of LEDs on an HP AlphaServer SC 128-way switch:

- HP AlphaServer SC 128-Way Switch PSU LEDs (see Section 7.5.3.1 on page 7–36)
- HP AlphaServer SC High-Level Switch Card LEDs (see Section 7.5.3.2 on page 7–36)
- HP AlphaServer SC 16-Port Switch Card LEDs (see Section 7.5.3.3 on page 7–37)
- HP AlphaServer SC 16-Link Null Card LEDs (see Section 7.5.3.4 on page 7–37)

7.5.3.1 HP AlphaServer SC 128-Way Switch PSU LEDs

There are five green LEDs on each of the two power supply units (PSUs) in an HP AlphaServer SC 128-way switch. The correct operation of each PSU is indicated by the illumination of one or more of its green LEDs — one LED for each 200 W being drawn.

When both PSUs are operating normally, one LED should light on each PSU, indicating that the switch is using 20% of the power of each PSU (if the switch chassis is full).

If one PSU is removed, one to three of the LEDs on the other PSU should light, indicating that the switch is using 20–60% of the power of that PSU (if the switch chassis is full).

The PSUs on the new-type switch chassis have two additional LEDs:

- ACG is the AC power good LED, which lights if the AC inlet supply is working.
- DCG is the DC power good LED, which lights if the unit is producing DC power.

See Section 5.2 on page 5–12 and Section 5.12 on page 5–24 for more information about the PSUs.

7.5.3.2 HP AlphaServer SC High-Level Switch Card LEDs

The HP AlphaServer SC high-level switch card LEDs are visible through the front panel of the HP AlphaServer SC 128-way switch.

In a standalone configuration, these LEDs indicate the status of the internal links; that is, the link between the HP AlphaServer SC high-level switch card (at the front of the switch) and the HP AlphaServer SC 16-port switch card (at the rear of the switch).

In a federated configuration, these LEDs indicate the status of the links between the HP AlphaServer SC high-level switch card (at the front of the node-level switch) and the HP AlphaServer SC 16-port switch card (at the rear of the top-level switch).

These LEDs are arranged in stacks — three LEDs in each stack, and eight stacks on each HP AlphaServer SC high-level switch card. Each LED stack shows the state of the link between:

- The HP AlphaServer SC high-level switch card on which the LED stack is located, and
- The corresponding port on the HP AlphaServer SC 16-port switch card that is immediately behind the LED stack (in a standalone configuration)

  or

  The port on the top-level HP AlphaServer SC 16-port switch card that is connected to the corresponding link on the HP AlphaServer SC 16-link null card that is immediately behind the LED stack (in a federated configuration).

The LEDs in each stack are arranged from top to bottom in the following order: Red, Yellow, and Green. See Section 7.5.4.1 on page 7–38 for a description of LED status.

If the green LEDs do not light when the switch is powered up, identify the source of the fault as described in Section 7.5.4.3 on page 7–41.

7.5.3.3 HP AlphaServer SC 16-Port Switch Card LEDs

The LEDs on the HP AlphaServer SC 16-port switch cards at the rear of a node-level switch (and the LEDs on the HP AlphaServer SC Elan adapter cards in the nodes) indicate the status of the links between the switch and the nodes.

The LEDs on the HP AlphaServer SC 16-port switch cards at the rear of a top-level switch (and the LEDs on the corresponding HP AlphaServer SC high-level switch cards and HP AlphaServer SC 16-link null cards in the node-level switches) indicate the status of the links between the node-level switch and the top-level switch.

There are 16 LED stacks on each HP AlphaServer SC 16-port switch card (that is, an LED stack for each connector) at the rear of the HP AlphaServer SC 128-way switch. The LED stacks each contain three LEDs, arranged from left to right in the following order: Green, Yellow, and Red. See Section 7.5.4.1 on page 7–38 for a description of LED status.

Table 7–2 and Table 7–3 on page 7–39 describe the expected LED behavior when powering up and booting a node. If the green LED does not light when the node is powered up, follow the procedure described in Section 7.5.4.2 on page 7–39 to identify the source of the fault.

7.5.3.4 HP AlphaServer SC 16-Link Null Card LEDs

The LEDs on the HP AlphaServer SC 16-link null cards at the rear of the node-level switch (and the LEDs on the corresponding HP AlphaServer SC high-level switch card at the front of the node-level switch, and on the HP AlphaServer SC 16-port switch cards in the top-level switches) indicate the status of the links between the node-level switch and the top-level switch.

There are 16 LED stacks on each HP AlphaServer SC 16-link null card (that is, an LED stack for each connector) at the rear of the HP AlphaServer SC 128-way switch. The LED stacks each contain three LEDs, arranged from left to right in the following order: Green, Yellow, and Red. See Section 7.5.4.1 on page 7–38 for a description of LED status.

Table 7–2 and Table 7–3 on page 7–39 describe the expected LED behavior when connecting a node-level switch to a top-level switch. If the green LED does not light when the switches are powered up, follow the procedure described in Section 7.5.4.4 on page 7–42 to identify the source of the fault.

Note:

The link status information on the HP AlphaServer SC 16-link null card is obtained from the switch chip on the HP AlphaServer SC high-level switch card that drives it. This is implemented by a program running on the HP AlphaServer SC Interconnect control processor.

If the HP AlphaServer SC Interconnect control processor is not running, the LED status information on the HP AlphaServer SC 16-link null card will not be valid. In these circumstances, the link status can still be observed on the LEDs on the HP AlphaServer SC high-level switch cards, although these are on the opposite side of the switch chassis to the link cable connection.

7.5.4 Using LEDs to Identify Faulty Components

The information in this section is organized as follows:

- LED Status (see Section 7.5.4.1 on page 7–38)
- Checking the Node-to-Switch Link Cable LEDs (see Section 7.5.4.2 on page 7–39)
- Checking the HP AlphaServer SC High-Level Switch Card LEDs (see Section 7.5.4.3 on page 7–41)
- Checking the Switch-to-Switch Link Cable LEDs (see Section 7.5.4.4 on page 7–42)

7.5.4.1 LED Status

Most of the LEDs are arranged in stacks of three: Green, Yellow, and Red. The color of the LED indicates the state of a link, as follows:

- Green LED indicates that the link is connected.
- Yellow LED indicates that the link is active.
- Red LED indicates that an error has occurred on the link.

Table 7–2 describes the expected LED behavior when powering up and booting the nodes.

Table 7–3 describes the expected LED behavior when powering up the node-level switch and top-level switch in a federated configuration.

Table 7–2 Expected LED Behavior When Powering Up and Booting a Node

Sequence of Events	Node LEDs	Switch LEDs
Node powered off	None	Red
Node powered off and link cable disconnected	None	Red
Node powered off and link cable connected	None	Red
Node powered on and at SRM prompt	Green	Red and Green
Node booting	Green, and Yellow flashes briefly	Red and Green
Node booted and at login prompt	Green	Green
System in use	Green, and Yellow is either solid or intermittent	Green

Table 7–3 Expected LED Behavior When Powering Up a Federated Configuration

Sequence of Events	Node-Level Switch (NLS) LEDs		Top-Level Switch (TLS)
	Front LEDs (High-Level Card)	**Rear LEDs** (Null Card)	**Rear LEDs** (16-Port Card)
NLS and TLS powered off	None	None	None
NLS powered on, TLS powered off	Red	Red	None
NLS and TLS powered on	Red	Red	Red
NLS and TLS powered on, link cable connected to NLS only	Red	Red	Red
NLS and TLS powered on, link cable connected to TLS only	Red	Red	Red
NLS and TLS powered on, link cable connecting NLS to TLS	Green	Green	Green
System in use	Green, and Yellow is either solid or intermittent	Green, and Yellow is either solid or intermittent	Green, and Yellow is either solid or intermittent

7.5.4.2 Checking the Node-to-Switch Link Cable LEDs

The node-to-switch link cable LEDs — that is, the LEDs at either end of the link cables that attach the nodes to the HP AlphaServer SC Interconnect switch — are the HP AlphaServer SC Elan adapter card LEDs (see Section 7.5.1 on page 7–35) and the HP AlphaServer SC 16-port switch card LEDs (see Section 7.5.2 on page 7–35).

The node-to-switch link cable LEDs indicate the status of the link between the HP AlphaServer SC Elan adapter card on the node and the HP AlphaServer SC 16-port switch card on the switch.

Note:

Ignore red LEDs on connected links when the switch is first powered up — these will be cleared by the switch manager.

Ignore red LEDs on unconnected links.

If the green LED is lit at one end of the link cable but not the other, the LEDs are faulty — replace the appropriate component.

If a node has successfully booted and the green LEDs at each end of a link cable are not lit, the link is not working. To determine where the fault lies, perform the following steps:

1. Check that the node is correctly connected to the switch (see Section 4.3 on page 4–4 or Section 5.4 on page 5–13).
2. Halt and power down the node.
3. The fault is most likely due to a faulty link cable, the easiest component to change.
4. Replace the link cable with another link cable (that you know is operating correctly) from the HP AlphaServer SC Interconnect[1], and go to step 5.
5. Power up the node and check the LEDs at each end of the link cable.
   - If both green LEDs are lit and the fault moves with the original link cable, you have completed the diagnostic process. The fault is in the original link cable — replace the original link cable.
   - If the green LED is lit at one end of the link cable but not the other, you have completed the diagnostic process. The LEDs are faulty — replace the component.
   - If neither green LED is lit, go to step 6.
6. Halt and power down the node, and connect the link cable to a different port (a port that you know is operating correctly) on the switch. Go to step 7.
7. Power up the node and check the LEDs at each end of the link cable.
   - If the green LEDs are lit — that is, the fault has not moved to the new port — you have completed the diagnostic process. The fault is in the original HP AlphaServer SC 16-port switch card.
     - If using an HP AlphaServer SC 16-port switch, replace the original HP AlphaServer SC 16-port switch, as described in Section 4.5 on page 4–6.
     - If using an HP AlphaServer SC 128-way switch, replace the original HP AlphaServer SC 16-port switch card, as described in Section 5.7 on page 5–19.
   - If the green LED is lit at one end of the link cable but not the other, you have completed the diagnostic process. The LEDs are faulty — replace the component.
   - If the green LEDs are still not lit, go to step 8.
8. Power down the node and replace the HP AlphaServer SC Elan adapter card with an HP AlphaServer SC Elan adapter card (that you know is operating correctly) from the HP AlphaServer SC Interconnect[1]. Go to step 9.
9. Power up the node and check the LEDs at each end of the link cable.
   - If the green LEDs are lit and the fault moves with the original HP AlphaServer SC Elan adapter card, you have completed the diagnostic process. The fault is in the original HP AlphaServer SC Elan adapter card — replace the original HP AlphaServer SC Elan adapter card, as described in Section 3.3 on page 3–6.

1. Halt and power down a node before removing its link cable or HP AlphaServer SC Elan adapter card.

- If the green LED is lit at one end of the link cable but not the other, you have completed the diagnostic process. The LEDs are faulty — replace the component.
- If the green LEDs are still not lit, go to step 10.

10. Check the node's PCI I/O system, as described in the *Service Guide* for your HP AlphaServer SC node type.

    If the node's PCI I/O system is not faulty, you have completed the diagnostic process. The original LEDs are faulty — replace the appropriate component(s).

7.5.4.3 Checking the HP AlphaServer SC High-Level Switch Card LEDs

Note:

Ignore red LEDs on connected links when the switch is first powered up — these will be cleared by the switch manager. Ignore red LEDs on unconnected links.

The HP AlphaServer SC high-level switch card LEDs are visible through the front panel of the HP AlphaServer SC 128-way switch. These LEDs indicate the status of the internal links; that is, the links between the HP AlphaServer SC high-level switch cards (at the front of the switch) and the HP AlphaServer SC 16-port switch cards (at the rear of the switch), as described in Section 7.5.3.2 on page 7–36.

If a green LED on an HP AlphaServer SC high-level switch card does not light, an internal link is not working. Use the following procedure to determine where the fault lies:

1. Replace the HP AlphaServer SC high-level switch card that you suspect is faulty by swapping it with another HP AlphaServer SC high-level switch card (that you know is operating correctly) from the HP AlphaServer SC Interconnect.
2. Check the LEDs through the front panel of the HP AlphaServer SC 128-way switch.

   If the green LED now lights and the fault moved with the original HP AlphaServer SC high-level switch card, you have completed the diagnostic process. Replace the original HP AlphaServer SC high-level switch card.

   Otherwise, go to step 3.
3. Halt and power down all nodes connected to the HP AlphaServer SC 16-port switch card that you suspect is faulty.
4. Disconnect the link cables from the HP AlphaServer SC 16-port switch card that you suspect is faulty.
5. Halt and power down all nodes connected to another HP AlphaServer SC 16-port switch card (that you know is operating correctly) in the HP AlphaServer SC Interconnect.

   Disconnect the link cables from this card.

6. Replace the HP AlphaServer SC 16-port switch card that you suspect is faulty (see step 3) by swapping it with the HP AlphaServer SC 16-port switch card that you know is operating correctly (see step 5).
7. Check the LEDs through the front panel of the HP AlphaServer SC 128-way switch.

   If the green LED now lights and the fault moved with the original HP AlphaServer SC 16-port switch card, you have completed the diagnostic process. Replace the original HP AlphaServer SC 16-port switch card. Reconnect the link cables to the nodes that you powered down in steps 3 and 5, and power up the nodes.

   If the fault has not moved, replace the switch.

See Section 5.3 on page 5–13 for more information about the internal links.

7.5.4.4 Checking the Switch-to-Switch Link Cable LEDs

The switch-to-switch link cable LEDs — that is, the LEDs at either end of the link cables that attach the node-level switches to the top-level switches — are the HP AlphaServer SC high-level switch card LEDs (see Section 7.5.3.2 on page 7–36), the HP AlphaServer SC 16-link null card LEDs (see Section 7.5.3.4 on page 7–37), and the HP AlphaServer SC 16-port switch card LEDs (see Section 7.5.3.3 on page 7–37).

The switch-to-switch link cable LEDs indicate the status of the link between the HP AlphaServer SC high-level switch card (*via* the HP AlphaServer SC 16-link null card) on the node-level switch and the HP AlphaServer SC 16-port switch card on the top-level switch.

Note:

Ignore red LEDs on connected links when the switch is first powered up — these will be cleared by the switch manager.

Ignore red LEDs on unconnected links.

If the green LED is lit at one end of the link cable but not the other, the LEDs are faulty — replace the appropriate component.

If the switches have been powered up and connected to each other and any of the three green LEDs for each link cable are not lit, the link is not working. To determine where the fault lies, perform the following steps:

1. Check that the node-level switch is correctly connected to the top-level switch (see Section 5.5 on page 5–16), and that all cards are correctly seated in each switch.
2. Check the LEDs on the HP AlphaServer SC high-level switch card in the node-level switch and the LEDs on the HP AlphaServer SC 16-port switch card on the top-level switch.

If both green LEDs are not lit, perform each of the following tasks in the specified order, until both green LEDs are lit:

a. Check the clock distribution cables that are connected to each switch.

b. Check the clock source setting and clock frequency on each switch.

c. Check the link cable.

d. Check the HP AlphaServer SC 16-link null card on the node-level switch.

e. Check the HP AlphaServer SC 16-port switch card in the top-level switch.

f. Check the HP AlphaServer SC high-level switch card in the node-level switch.

Replace each component in turn with a component that you know is operating correctly, to identify the faulty component. Replace the faulty component.

The green LEDs on the HP AlphaServer SC high-level switch card in the node-level switch and on the HP AlphaServer SC 16-port switch card on the top-level switch are now lit, indicating a good connection from the node-level switch to the top-level switch.

3. Check that the LEDs on the HP AlphaServer SC high-level switch card at the front of the node-level switch are the same as the LEDs on the HP AlphaServer SC 16-link null card at the rear of the node-level switch.

   The LEDs on the HP AlphaServer SC 16-link null card simply echo the status of the corresponding LEDs on the HP AlphaServer SC high-level switch card. The HP AlphaServer SC Interconnect control processor maps the LED status from the HP AlphaServer SC high-level switch card to the HP AlphaServer SC 16-link null card.

   If both green LEDs are not lit, perform each of the following tasks in the specified order, until both green LEDs are lit:

   a. Check the JTAG cable.

   b. Check the HP AlphaServer SC Interconnect control processor.

   c. Check the HP AlphaServer SC Interconnect control processor software version (see Section 7.2 on page 7–2).

   d. Check the HP AlphaServer SC 16-link null card.

   Replace each component in turn with a component that you know is operating correctly, to identify the faulty component. Replace the faulty component.

7.6 Adding a Node After Installation

This section describes how to check that the following components of a newly installed node are functioning correctly:

- The HP AlphaServer SC Elan adapter card in the node.

- The PCI interface between the node and the HP AlphaServer SC Elan adapter card.
- The link cable connecting the HP AlphaServer SC Elan adapter card to the HP AlphaServer SC Interconnect switch.
- The port on the HP AlphaServer SC Interconnect switch to which this node is connected.

To test a single node, perform the following steps (where `atlas` is an example system name, and `atlas30` is the newly installed node):

1. Ensure that the newly installed node is at the SRM prompt (`P00>>>`).
2. Log in to the management server.
3. Check that the newly installed node can access its HP AlphaServer SC Elan adapter card, by running the following command on the management server:
   `# sra elancheck -test elan -nodes atlas30`

   If the test completes successfully, go to step 4.

   If the test fails, determine which component is faulty, as follows:

   a. Power down the newly installed node (`atlas30`) and replace the HP AlphaServer SC Elan adapter card (with one that you know is operating correctly) as described in Section 3.3 on page 3–6.

   b. Power up the node (to the SRM prompt) and run the above `sra elancheck` command on the management server again. If the test runs successfully, the fault is in the original HP AlphaServer SC Elan adapter card — replace the HP AlphaServer SC Elan adapter card.

   c. If the `sra elancheck` command still fails, there is a problem with the PCI I/O system in the newly installed node (`atlas30`). Refer to the *Service Guide* for your HP AlphaServer SC node type for information on how to change this.
4. Connect the newly installed node to the HP AlphaServer SC Interconnect switch, as follows:

   - Power up the HP AlphaServer SC Interconnect switch.
   - Using the link cable, connect the HP AlphaServer SC Elan adapter card (on the newly installed node) to the HP AlphaServer SC 16-port switch card (on the HP AlphaServer SC Interconnect switch).
   - Ensure that the connectors at both ends of the link cable are seated correctly.

   Ignore all LEDs at this stage.
5. Check that the newly installed node can access the HP AlphaServer SC 16-port switch card on the HP AlphaServer SC Interconnect switch, by running the following command from another node — for example, `atlas22`:
   `atlas22# sra elancheck -test link -nodes atlas30`

If the test completes successfully, the installation test procedure is completed.

If the test fails, determine which component is faulty, as follows:

a. Power down the newly installed node (`atlas30`), and use a link cable (that you know is operating correctly) to connect its HP AlphaServer SC Elan adapter card to the HP AlphaServer SC 16-port switch card (see step 4).

b. Power up the node (to the SRM prompt), and run the `sra elancheck -test link` command from `atlas22` again. If the test completes successfully, you have completed the diagnostic process. The fault is in the original link cable — replace the link cable.

c. If the test still fails, power down the newly installed node and connect the link cable to a different port (a port that you know is operating correctly) on the HP AlphaServer SC Interconnect switch. It is not necessary to power down the switch.

d. Power up the newly installed node (to the SRM prompt), and run the `sra elancheck -test link` command from `atlas22` again. If the test completes successfully, you have completed the diagnostic process. The fault is in the original HP AlphaServer SC 16-port switch card — replace the HP AlphaServer SC 16-port switch card.

e. If the test still fails, the HP AlphaServer SC Elan adapter card may be faulty. To check this, power down the newly installed node and replace the HP AlphaServer SC Elan adapter card (with one that you know is operating correctly) as described in Section 3.3 on page 3–6.

f. Power up the newly installed node (to the SRM prompt), and run the `sra elancheck -test link` command again. If the test completes successfully, you have completed the diagnostic process. The fault is in the original HP AlphaServer SC Elan adapter card — replace the HP AlphaServer SC Elan adapter card.

g. If the test still fails, the HP AlphaServer SC Interconnect switch is faulty — replace the HP AlphaServer SC Interconnect switch.

7.7 HP AlphaServer SC Diagnostic Test Command Reference

The HP AlphaServer SC software includes diagnostic tests that you can use to confirm the correct operation of, and to identify and isolate faults in, the components of the HP AlphaServer SC Interconnect.

Most of the diagnostics scripts are stored in the `/usr/opt/qswdiags` directory or the `/usr/opt/qswdiags/bin` subdirectory; the `elan_level_test` script is stored in the `/usr/opt/sra/scripts` directory. Unless you are using the `sra elancheck` command (see Section 7.7.4 on page 7–59), you should run the scripts from the directory in which they are stored.

Table 7–4 lists the HP AlphaServer SC diagnostic tests.

Table 7–4 HP AlphaServer SC Diagnostic Tests

Test Name	Description	Components Tested	System Impact
`elanenvtest`	Checks the population of the switch chassis, the operating temperature, fan and power supply status, and clock frequency. Also checks the consistency of software version, clock source, and SC Viewer Interconnect tab definition. To run this test, RMS must be installed — and the switch manager must be operating — on the switch-managing node(s). See Section 7.7.1 on page 7–49 for more information about the `elanenvtest` test.	• Fans • Power supply units • Clock source • HP AlphaServer SC Interconnect control processors • JTAG cables • Ethernet cables	Low (sequence of switch-manager commands)
`elanpcitest`	Tests the ability of a node to access the HP AlphaServer SC Elan adapter card memory through the PCI bus. This test may be run on a node whether or not RMS is running. If a node does not yet have software installed or cannot boot from disk, you can use the `sra elancheck` command to run this test. The `sra elancheck` command RIS-boots the node and, when booted, runs `elanpcitest`. If using the `sra elancheck` command, the node being tested must be at the SRM prompt. See Section 7.7.2 on page 7–55 for more information about the `elanpcitest` test. See Section 7.7.4 on page 7–59 for more information about the `sra elancheck` command.	• HP AlphaServer SC Elan adapter cards in specified node • PCI bus on specified node	Low (affects only node being tested; does not pass significant amount of data)

Table 7–4 HP AlphaServer SC Diagnostic Tests

Test Name	Description	Components Tested	System Impact
`elanlinktest`	Tests the ability of a node to reach the HP AlphaServer SC 16-port switch card to which it is connected *via* the link cable. This test may be run on a node whether or not RMS is running. If a node does not yet have software installed or cannot boot from disk, you can use the `sra elancheck` command to run this test. The `sra elancheck` command RIS-boots the node and, when booted, runs `elanlinktest`. If using the `sra elancheck` command, the node being tested must be at the SRM prompt. See Section 7.7.3 on page 7–57 for more information about the `elanlinktest` test. See Section 7.7.4 on page 7–59 for more information about the `sra elancheck` command.	• HP AlphaServer SC Elan adapter cards in specified node • PCI bus on specified node • Link cables to specified node • HP AlphaServer SC 16-port switch card to which specified node is connected	Medium (affects only node being tested; passes reasonable amount of loopback data over local link cable)
`cabletest`	Tests all of the uplinks in a federated configuration, from one node connected to each node-level switch. This test may be run on a node whether or not RMS is running. If a node does not yet have software installed or cannot boot from disk, you can use the `riscabletest` script to run this test. The `riscabletest` script RIS-boots the node and, when booted, runs `cabletest`. If using the `riscabletest` script, the node being used must be at the SRM prompt. See Section 7.7.5 on page 7–61 for more information about the `cabletest` test. See Section 7.7.6 on page 7–65 for more information about the `riscabletest` test.	• Link cable to node from which test is run • HP AlphaServer SC 16-port switch card to which specified node is connected • HP AlphaServer SC high-level switch cards in this node-level switch • HP AlphaServer SC 16-link null cards in this node-level switch • Link cables from this node-level switch to all top-level switches • All HP AlphaServer SC 16-port switch cards in top-level switch	Medium (uses only one node to initiate test; tests each link serially; passes reasonable amount of data)

Table 7–4 HP AlphaServer SC Diagnostic Tests

Test Name	Description	Components Tested	System Impact
`elan_level_test`	Tests all of the uplinks and internal links in an HP AlphaServer SC Interconnect, from all nodes. See Section 7.7.7 on page 7–65 for more information about the `elan_level_test` test.	Depends on level specified: • Level 1 — as for `elanlinktest` • Level 2 — as for Level 1, and HP AlphaServer SC 16-port switch cards in node-level switch • Level 3 — as for Level 2, and HP AlphaServer SC high-level switch cards at node level • Level 4 — as for `cabletest` • Level 5 — as for Level 4, and HP AlphaServer SC 16-port switch cards in top-level chassis	High (runs only from specified nodes; uses the `prun` command; requires an RMS partition; passes significant amount of data; exercises all routes within each level)
`elansoaktest`	Tests the ability of all nodes' HP AlphaServer SC Elan adapter cards to send data to, and receive data from, all nodes configured in the system. This is the most comprehensive diagnostic test. To run this test, RMS must be up and running on the switch-managing node(s) and on all connected nodes. See Section 7.7.9 on page 7–72 for more information about the `elansoaktest` test.	• Link cables to nodes • HP AlphaServer SC 16-port switch cards in node-level switches • HP AlphaServer SC high-level switch cards • HP AlphaServer SC 16-link null cards • Link cables from node-level switches to top-level switches • HP AlphaServer SC 16-port switch cards in top-level switches	High (can run for short (20 minutes) or long (overnight) periods; passes significant amount of data; runs on all nodes; loads all routes)
`neterror`	Diagnoses errors in an HP AlphaServer SC system that is in use, by checking the contents of the SC database. See Section 7.7.10 on page 7–74 for more information about the `neterror` script.	None — simply generates report based on hardware status (current and historical) stored in SC database	High impact on SC database (many `rmsquery` operations involving complex join statements) No impact on nodes or HP AlphaServer SC Interconnect

This section describes the following HP AlphaServer SC scripts:

- elanenvtest (see Section 7.7.1 on page 7–49)
- elanpcitest (see Section 7.7.2 on page 7–55)
- elanlinktest (see Section 7.7.3 on page 7–57)
- sra elancheck (see Section 7.7.4 on page 7–59)
- cabletest (see Section 7.7.5 on page 7–61)
- riscabletest (see Section 7.7.6 on page 7–65)
- elan_level_test (see Section 7.7.7 on page 7–65)
- Understanding Route Strings (see Section 7.7.8 on page 7–68)
- elansoaktest (see Section 7.7.9 on page 7–72)
- neterror (see Section 7.7.10 on page 7–74)

7.7.1 elanenvtest

The information in this section is organized as follows:

- Running elanenvtest (see Section 7.7.1.1 on page 7–49)
- Interpreting elanenvtest Script Output (see Section 7.7.1.2 on page 7–50)

7.7.1.1 Running elanenvtest

The `elanenvtest` script checks that the switch chassis is populated correctly and that all boards can be accessed *via* the JTAG interface. The `elanenvtest` script reads the switch module names from the SC database and communicates directly with the switch-manager servers for each switch, to determine the state of the switch. It checks the status of the fans and power supplies, and the temperature readings from each of the thermistors. The load is not significant; therefore, you can run the `elanenvtest` script without impact on a production system.

Run the `elanenvtest` script with the `-h` option to display help information, as follows:

```
# ./elanenvtest -h
elanenvtest: QsNet Switch Environment and Consistency Test
usage: elanenvtest -h -v -r <rail>
   -h               generate this message
   -v               verbose mode
   -r <rail>        specify rail (default is all switches)
```

To run the `elanenvtest` script, perform the following steps:

1. Change to the directory in which the diagnostic scripts are stored, as follows:
   ```
   # cd /usr/opt/qswdiags
   ```

2. Run the script, as follows:
   # **./elanenvtest**
3. Check the script output (see Section 7.7.1.2 on page 7–50).

7.7.1.2 Interpreting elanenvtest Script Output

The `elanenvtest` script runs on all switches found in the `switch_modules` table, regardless of the number of rails or whether the configuration is federated or not. The `elanenvtest` script simply interrogates each switch in the table, in the order found in the `switch_modules` table.

If the `elanenvtest` script does not find any problems in a dual-rail system with directly-connected switches, the output is as follows:

```
# cd /usr/opt/qswdiags
# ./elanenvtest

================= Executing Switch Chassis Test ===============
Modules          : 0 (QR0N00)  1 (QR1N00)
   QR0N00 (QMS16) :: OK
   QR1N00 (QMS16) :: OK
   QR0N00 (QMS16) :: Link state ok
   QR1N00 (QMS16) :: Link state ok
================= Switch Chassis Test Passed ==================
```

If the `elanenvtest` script does not find any problems in a federated configuration, the output is similar to the following — in this example, the HP AlphaServer SC system utilizes a dual-rail 256-node network:

```
# cd /usr/opt/qswdiags
# ./elanenvtest

================= Executing Switch Chassis Test ===============
Modules         : 0 (QR0N00) 1 (QR0N01) 2 (QR0N02) 3 (QR0N03)
                : 4 (QR1N01) 5 (QR1N01) 6 (QR1N02) 7 (QR1N03)
                : 8 (QR0T00) 9 (QR0T01) 10(QR1T00) 11(QR1T01)

   QR0N00 (QMS64U64D) :: OK
   QR0N01 (QMS64U64D) :: OK
   QR0N02 (QMS64U64D) :: OK
   QR0N03 (QMS64U64D) :: OK
   QR1N00 (QMS64U64D) :: OK
   QR1N01 (QMS64U64D) :: OK
```

```
   QR1N02 (QMS64U64D) :: OK
   QR1N03 (QMS64U64D) :: OK
   QR0T00 (QMS16X8) :: OK
   QR0T01 (QMS16X8) :: OK
   QR1T00 (QMS16X8) :: OK
   QR1T01 (QMS16X8) :: OK

   QR0N00 (QMS64U64D) :: Link state ok
   QR0N01 (QMS64U64D) :: Link state ok
   QR0N02 (QMS64U64D) :: Link state ok
   QR0N03 (QMS64U64D) :: Link state ok
   QR1N00 (QMS64U64D) :: Link state ok
   QR1N01 (QMS64U64D) :: Link state ok
   QR1N02 (QMS64U64D) :: Link state ok
   QR1N03 (QMS64U64D) :: Link state ok
   QR0T00 (QMS16X8) :: Link state ok
   QR0T01 (QMS16X8) :: Link state ok
   QR1T00 (QMS16X8) :: Link state ok
   QR1T01 (QMS16X8) :: Link state ok
================= Switch Chassis Test Passed ==================
```

If the `elanenvtest` script finds a problem, the output will include a warning or error:

- The `elanenvtest` script reports a warning if any of the boards are missing, if a temperature reading exceeds 40°C, if one or more fans has failed, or if a power supply has failed.
- The `elanenvtest` script reports an error if a temperature reading exceeds 50°C.

Table 7–5 lists the errors and warnings that may be generated by the `elanenvtest` script.

Table 7–5 elanenvtest Error and Warning Messages

Message Code	Cause of Message
0	Partially populated switch
1	Thermistor returned 0
2	Temperature is in the range [40 - 50] (warning)
3	Temperature is over 50 (error)
4	Fan speed is out of range [1000 - 4000]
5	PSU failure

Table 7–5 elanenvtest Error and Warning Messages

Message Code	Cause of Message
6	Cannot contact RMS server
7	Cannot access switch (general timeout condition)
8	No boards detected

A full list of temperature measurements for each board, of the fan speeds, and of power supply status values can be obtained by running the `elanenvtest` script with the `-v` option:

```
# ./elanenvtest -v
============ Executing Switch Chassis Test =============
========================================================
Boards Status
========================================================
Board 00: temperatures are 39 31 32 33
Board 01: temperatures are 35 30 29 33
Board 02: temperatures are 35 30 28 34
Board 03: temperatures are 37 31 27 34
Board 04: temperatures are 35 30 27 34
Board 05: temperatures are 34 30 27 35
Board 06: temperatures are 36 30 28 35
Board 07: temperatures are 34 30 28 32
Board 16: temperature is 26
Board 17: temperature is 26
Board 18: temperature is 27
Board 19: temperature is 27
Board 20: temperature is 26
Board 21: temperature is 27
Board 22: temperature is 25
Board 23: temperature is 25
Board 24: temperature is 27
Board 25: temperature is 28
Board 26: temperature is 25
Board 27: temperature is 27
Board 28: temperature is 28
Board 29: temperature is 28
Board 30: temperature is 28
Board 31: temperature is 28
Board 61: temperature is 28
========================================================
Fans Status
========================================================
Fan 1: speed is 3200
Fan 2: speed is 3220
Fan 3: speed is 3220
Fan 4: speed is ****
Fan 5: speed is 3180
Fan 6: speed is 3220
========================================================
```

```
PSU Status
=========================================================
PSU 1: status is off
PSU 2: status is on
=========================================================
Warnings and Errors
=========================================================
Warning (4): Fan 4 failed, fan tray should be replaced
Warning (5): Single PSU fail, replace unit 1
======== Switch test completed with 2 warnings ========
```

Boards Status

The `Boards Status` section of the `elanenvtest -v` output should contain an entry for each switch board 0-7 and 16-31 and the clock card (board 61).

The maximum ambient temperature is 35°C — a temperature of over 40°C will result in a warning, a temperature of over 50°C will result in an error.

- If any of these boards is missing, the `elanenvtest` script returns a `Partially populated switch` warning, as follows:
  ```
  ============ Executing Switch Chassis Test =============
  Warning (0): Partially populated switch
  ======== Switch test completed with 1 warning =========
  ```
- If any temperature reading exceeds 40°C, the `elanenvtest` script reports a warning similar to the following:
  ```
  ============ Executing Switch Chassis Test =============
  Warning (2): Board 4 is hot (over 40 degrees)
  ======== Switch test completed with 1 warning =========
  ```
- If any temperature reading exceeds 50°C, the `elanenvtest` script reports an error similar to the following:
  ```
  ============ Executing Switch Chassis Test =============
  Error (3): Board 4 is hot (over 50 degrees)
  ======== Switch test completed with 1 warning =========
  ```

For information on replacing boards, see Chapter 5.

Fans Status

The `Fans Status` section of the `elanenvtest -v` output should contain an entry for each fan, with a valid speed. The normal operating speed is approximately 3300 RPM; fan speeds less than 3000 RPM or greater than 4000 RPM will result in an error.

An invalid speed is indicated by four asterisks (`****`) in the `elanenvtest -v` output, as shown in the following example:

```
=========================================================
Fans Status
=========================================================
Fan 1: speed is 3200
Fan 2: speed is 3220
```

```
Fan 3: speed is 3220
Fan 4: speed is ****
Fan 5: speed is 3180
Fan 6: speed is 3220
=======================================================
```

If any fan has failed, the `elanenvtest` script reports an error similar to the following:

```
============ Executing Switch Chassis Test =============
Warning (4): Fan 4 failed, fan tray should be replaced
======== Switch test completed with 1 warning =========
```

For information on replacing fans, see Chapter 4 or Chapter 5.

PSU Status

The `PSU Status` section of the `elanenvtest -v` output should contain an entry for each PSU, and the status of the PSU should be `on`, as shown in the following example:

```
=======================================================
PSU Status
=======================================================
PSU 1: status is off
PSU 2: status is on
=======================================================
```

If any PSU has failed, the `elanenvtest` script reports an error similar to the following:

```
============ Executing Switch Chassis Test =============
Warning (5): Single PSU fail, replace unit 1
======== Switch test completed with 1 warning =========
```

where `unit 1` refers to the PSU on the left, and `unit 2` refers to the PSU on the right.

For information on replacing power supply units, see Chapter 4 or Chapter 5.

JTAG Problems

The `elanenvtest` script will report one of the following errors if the switch cannot be accessed *via* the JTAG interface:

- If the switch cannot be accessed because the RMS server daemon (`swmserver`) is not responding:

  ```
  Error: can't contact the RMS server
  ```

  For directly-connected switches, the probable cause of this error is that RMS is not running on the switch-managing node.

  For switches containing an HP AlphaServer SC Interconnect control processor, check the operation of the HP AlphaServer SC Interconnect control processor (IP address, Ethernet cable, JTAG cable).

- If a timeout condition occurs while accessing the switch:

  ```
  Cannot access switch, check cable, clock card and power supplies
  ```

This error indicates that the JTAG cable is not connected, that the clock card is not functioning, or that both power supplies have failed or are missing.

Check the JTAG cable connection, as described in Section 4.4 on page 4–5 or Section 5.6 on page 5–18.

Other Warnings and Errors

The `elanenvtest` script may also report one of the following errors:

- Inconsistent HP AlphaServer SC Interconnect control processor software version (see Section 7.2 on page 7–2)
- Inconsistent clock source (see Section 7.4.1 on page 7–18)
- Inconsistent clock frequency (see Section 7.4.2 on page 7–22)
- Inconsistent SC Viewer Interconnect configuration (see Section 7.3 on page 7–12)
- Failure to receive recent status updates from a `swmserver` daemon (see Section 7.3.2 on page 7–12)
- Maximum clock source deviation of 0.200 MHz exceeded (see Chapter 6)

7.7.2 elanpcitest

The information in this section is organized as follows:

- Running elanpcitest (see Section 7.7.2.1 on page 7–55)
- Using elanpcitest to Test a Booted Node (see Section 7.7.2.2 on page 7–56)
- Using elanpcitest to Test a Halted Node (see Section 7.7.2.3 on page 7–56)
- Interpreting elanpcitest Script Output (see Section 7.7.2.4 on page 7–57)

7.7.2.1 Running elanpcitest

The `elanpcitest` script tests the ability of a node to access its HP AlphaServer SC Elan adapter card through the PCI bus, by reading from and writing to the memory of the HP AlphaServer SC Elan adapter card. This test has a performance impact on the PCI bus in the node being tested.

Note:

Run the `elanpcitest` script on each node that has an HP AlphaServer SC Elan adapter card.

Do not run the `elanpcitest` script on a management server. A management server does not have an HP AlphaServer SC Elan adapter card; therefore, the `elanpcitest` script cannot run on a management server.

Run the `elanpcitest` script with the `-h` option to display help information, as follows:

```
# /usr/opt/qswdiags/bin/elanpcitest -h
Usage: elanpcitest [-h] [-l <length>] [-r <reps>] [-D <device>] [-T <seconds>] [-v] [-s]
   -h                  print this message
   -l <length>         size of memory block  (4k)
   -r <repetitions>    number of repetitions (1)
   -D <device>         select network rail   (see mask)
   -M <device_mask>    select network mask   (3)
   -T <seconds>        set the timeout value (60)
   -t transaction      set db transaction handle (none)
   -m machine          set db machine name       (none)
   -v                  increase verbose mode (0)
   -s                  toggle silent mode    (true)
```

You can run the `elanpcitest` script in two ways, depending on whether you are testing a booted node (see Section 7.7.2.2 on page 7–56) or a halted node (see Section 7.7.2.3 on page 7–56).

7.7.2.2 Using elanpcitest to Test a Booted Node

To run the `elanpcitest` script on a booted node, perform the following steps:

1. Log on to the booted node.
2. Run the script, as follows:
   `# /usr/opt/qswdiags/bin/elanpcitest`
3. Check the script output, as described in Section 7.7.2.4 on page 7–57.

7.7.2.3 Using elanpcitest to Test a Halted Node

To run the `elanpcitest` script on a halted node, perform the following steps:

1. Ensure that the halted node (for example, `atlas2`) is at the SRM prompt.
2. Log on to the management server.
3. Run the script by specifying the `-test elan` option to the `sra elancheck` command (see Section 7.7.4 on page 7–59 for more information about this command):
   `atlasms# sra elancheck -nodes atlas2 -test elan`
4. Check the script output, as described in Section 7.7.2.4 on page 7–57.

7.7.2.4 Interpreting elanpcitest Script Output

If the `elanpcitest` script completes successfully in a dual-rail configuration, the output is as follows:

```
elanpcitest: accessing Network Adapter for rail 0 please wait...
elanpcitest: test completed successfully
elanpcitest: accessing Network Adapter for rail 1 please wait...
elanpcitest: test completed successfully
```

If the `elanpcitest` script completes successfully in a single-rail configuration, the output is as follows:

```
elanpcitest: accessing Network Adapter for rail 0 please wait...
elanpcitest: test completed successfully
elanpcitest: accessing Network Adapter for rail 1 please wait...
elanpcitest: rail 1 is not present
```

If the `elanpcitest` script fails, the output is as follows:

```
elanpcitest: accessing Network Adapter for rail x please wait...
elanpcitest: test failed
```

If the `elanpcitest` script fails, identify and replace the faulty component.

7.7.3 elanlinktest

The information in this section is organized as follows:

- Running elanlinktest (see Section 7.7.3.1 on page 7–57)
- Using elanlinktest to Test a Booted Node (see Section 7.7.3.2 on page 7–58)
- Using elanlinktest to Test a Halted Node (see Section 7.7.3.3 on page 7–58)
- Interpreting elanlinktest Script Output (see Section 7.7.3.4 on page 7–58)

7.7.3.1 Running elanlinktest

The `elanlinktest` script tests the ability of a node to reach the HP AlphaServer SC 16-port switch card to which it is directly connected *via* the link cable, by running the Elan DMA test. This test has a performance impact on the HP AlphaServer SC Elan adapter cards and nodes being tested, but not on any other components in the HP AlphaServer SC system.

Note:

Run the `elanlinktest` script on each node that has an HP AlphaServer SC Elan adapter card.

Do not run the `elanlinktest` script on a management server. A management server does not have an HP AlphaServer SC Elan adapter card; therefore, the `elanlinktest` script cannot run on a management server.

Run the `elanlinktest` script with the `-h` option to display help information, as follows:

```
# /usr/opt/qswdiags/bin/elanlinktest -h
Usage: elanlinktest [-h] [-l <length>] [-D <device>] [-T <seconds>] [-v] [-s]
   -h print this message
   -l <length>        DMA length                (1000000)
   -D <device>        select network rail       (see mask)
   -M <device_mask>   select network mask       (3)
   -T <seconds>       set the timeout value     (10)
   -t transaction     set db transaction handle (none)
   -m machine         set db machine name       (none)
   -v                 increase verbose mode     (0)
   -s                 toggle silent mode        (true)
```

You can run the `elanlinktest` script in two ways, depending on whether you are testing a booted node (see Section 7.7.3.2 on page 7–58) or a halted node (see Section 7.7.3.3 on page 7–58).

7.7.3.2 Using elanlinktest to Test a Booted Node

To run the `elanlinktest` script on a booted node, perform the following steps:

1. Log on to the booted node.
2. Run the script, as follows:
   `# /usr/opt/qswdiags/bin/elanlinktest`
3. Check the script output, as described in Section 7.7.3.4 on page 7–58.

7.7.3.3 Using elanlinktest to Test a Halted Node

To run the `elanlinktest` script on a halted node, perform the following steps:

1. Ensure that the halted node (for example, `atlas2`) is at the SRM prompt.
2. Log on to the management server.
3. Run the script by specifying the `-test link` option to the `sra elancheck` command (see Section 7.7.4 on page 7–59 for more information about this command):
   `atlasms# sra elancheck -nodes atlas2 -test link`
4. Check the script output, as described in Section 7.7.3.4 on page 7–58.

7.7.3.4 Interpreting elanlinktest Script Output

If the `elanlinktest` script completes successfully in a dual-rail configuration, the output is as follows:

```
elanlinktest: testing connection with Network Switch Card for rail 0
elanlinktest: test completed successfully
elanlinktest: testing connection with Network Switch Card for rail 1
elanlinktest: test completed successfully
```

If the `elanlinktest` script completes successfully in a single-rail configuration, the output is as follows:

```
elanlinktest: testing connection with Network Switch Card for rail 0
elanlinktest: test completed successfully
elanlinktest: testing connection with Network Switch Card for rail 1
elanlinktest: rail 1 is not present
```

If the `elanlinktest` script fails, the output is as follows:

```
elanlinktest: testing connection with Network Switch Card for rail x
elanlinktest: test failed
```

If the `elanlinktest` script fails, identify and replace the faulty component.

7.7.4 sra elancheck

Use the `sra elancheck` command to test that a node can access:

- Its HP AlphaServer SC Elan adapter card
- The HP AlphaServer SC Interconnect

The `sra elancheck` command uses the remote installation services (RIS) utility to boot the specified node(s) and then runs the diagnostics on the node(s). You can use the `sra elancheck` command to test a single node or a range of nodes; for example, all nodes in the system, all nodes in a domain, or any subset of nodes.

Before you can run the `sra elancheck` command, the management server (or Node 0) must be up and running, and configured as follows:

- The RIS utility must be configured.
- The HP AlphaServer SC software must be installed.
- The SRA utility must be installed.
- The HP AlphaServer SC Interconnect diagnostics software must be installed.

For more information about the above tasks, see the *HP AlphaServer SC Installation Guide*.

Ideally, you should run the `sra elancheck` command when installing the system. With one `sra elancheck` command, you can check all of the nodes and verify all of the HP AlphaServer SC Elan adapter cards and all of the links to the HP AlphaServer SC Interconnect switch. You should ensure that the `sra elancheck` command completes successfully before starting to install an HP AlphaServer SC system.

The `sra elancheck` command has a performance impact on each node on which it is run.

The syntax of the `sra elancheck` command is as follows:

```
sra elancheck -nodes nodes
     [-display yes|no] [-log filename]
     [-width width] [-test elan|link|all]
```

The -test option indicates the type of test that you wish to run, as shown in Table 7–6.

Table 7–6 sra elancheck -test Option

Value	Description
elan	Runs the elanpcitest script to check that the node can access its HP AlphaServer SC Elan adapter card across its PCI bus. For more information about the elanpcitest script, see Section 7.7.1 on page 7–49.
link	Runs the elanlinktest script to check that the node's HP AlphaServer SC Elan adapter card can access the HP AlphaServer SC Interconnect switch. For more information about the elanlinktest script, see Section 7.7.3 on page 7–57.
all	Runs the elanpcitest script followed by the elanlinktest script. This is the default option.

For example, to run the elanpcitest and elanlinktest tests on the first eight nodes, enter the following command (where atlas is an example system name):

```
# sra elancheck -nodes 'atlas[0-7]' -test all
```

The sra elancheck command causes the following actions on each node:

- Initiates a bootp command on the node.
- Boots the node from the RIS server.
- Copies drivers and scripts to the node.
- Initiates the elanpcitest and elanlinktest scripts on the node, depending on which (if any) -test argument is specified.
- Displays details of the command output on screen or in the sra log file.

Note:

This procedure does not interfere with the node's local boot disk. The sra elancheck command can be safely run before or after node installation.

The sra elancheck command will report one of the status values listed in Table 7–7.

Table 7–7 Status Values Reported by the sra elancheck Command

Status Value	Description
`Passed`	The test(s) passed — the devices operated correctly.
`Failed-Driver`	The software driver was unable to load and access the HP AlphaServer SC Elan adapter card.
`Failed-Elan`	The `elanpcitest` test failed.
`Failed-Link`	The `elanlinktest` test failed.
`Other errors`	Other errors may be reported. These include failure to RIS boot the node and timeout on any operation. They do not indicate failures of the devices being tested.

If the `sra elancheck` command fails, identify the source of the failure as described in Section 7.6 on page 7–43.

For more information about the syntax of the `sra elancheck` command, see Chapter 16 of the *HP AlphaServer SC System Administration Guide*.

7.7.5 cabletest

The information in this section is organized as follows:

- Running cabletest (see Section 7.7.5.1 on page 7–61)
- Interpreting cabletest Script Output (see Section 7.7.5.2 on page 7–63)

7.7.5.1 Running cabletest

Note:

The `cabletest` script applies only to federated configurations.

The `cabletest` script may be run on any node that has an HP AlphaServer SC Elan adapter card, but is usually run on the first node of each node-level switch.

The `cabletest` script should be repeated for each rail.

Do not run the `cabletest` script on a management server. A management server does not have an HP AlphaServer SC Elan adapter card; therefore, the `cabletest` script cannot run on a management server.

Run the `cabletest` script with the `-h` option to display help information, as follows:

```
# ./cabletest -h
Usage:
     -device,   -D : set device number
       -mask,   -M : set device mask
     -config,   -c : network type
      -super,   -S : test super top
       -node,   -n : node id
        -dma       : turns on dma testing
   -internal,   -i : turns on internal testing
-transaction,   -t : set db transaction handle
    -machine,   -m : set db machine name
    -missing       : report missing cables
       -reps       : number of dma reps (depricated)
       -time       : time limit per batch seconds (10)
       -size       : size of dma in Kb (1024)
    -verbose,   -v : set verbose output
       -very,  -vv : set very verbose output
      -check       : set data check (slow)
     -errTol       : set err tolerance in ErrPerGByte (0)
   -speedTol       : tolerace as percent of max (5)
     -dmaerr       : show dma error type
```

The most commonly-used arguments are as follows:

- `-D` (device) specifies the network rail number. Valid values are `0` or `1`. The default value is `0`.
- `-config` specifies the network configuration. Valid values are `QMS16`, `QMS128`, `QMF256`, `QMF512`, `QMF1024`. The default value is `QMS16`.
- `-node` specifies the node identifier. Valid values are `0` to [*number_of_nodes_specified_by_-config* `- 1`]. The default value is `0`.
- `-dma` specifies that DMA testing should be activated. By default, DMA testing is not activated.
- `-internal` specifies that internal testing should be activated. By default, internal testing is not activated.
- `-missing` specifies that missing cables should be reported. By default, missing cables are not reported.
- `-reps` specifies the number of Direct Memory Access (DMA) repetitions. Valid values are `1` to `10000` inclusive. The default value is `100`.

- `-size` specifies the size of the DMA in KB. Valid values are `1` to `1024` inclusive. The default value is `64`.
- `-verbose` specifies verbose output. By default, output is not verbose.

Boards are identified by their slot number, as follows:

- An HP AlphaServer SC 16-port switch has one HP AlphaServer SC 16-port switch card in slot 0.
- A standalone HP AlphaServer SC 128-way switch has:
  - 8 HP AlphaServer SC 16-port switch cards in slots 0 to 7 (from left to right), and
  - 16 HP AlphaServer SC high-level switch cards in slots 16 to 31 (from bottom to top)
- A node-level switch has:
  - 4 HP AlphaServer SC 16-port switch cards in slots 0 to 3 (from left to right),
  - 4 HP AlphaServer SC 16-link null cards in slots 4 to 7 (from left to right), and
  - 16 HP AlphaServer SC high-level switch cards in slots 16 to 31 (from bottom to top)
- A top-level switch has:
  - 8 HP AlphaServer SC 16-port switch cards in slots 0 to 7 (from left to right)

To run the `cabletest` script, perform the following steps:

1. Log on to the first node that has an HP AlphaServer SC Elan adapter card (Node 0).
2. Run the script as shown in the following example, where the network is a single-rail 512-way network:
   ```
   atlas0# /usr/opt/qswdiags/bin/cabletest -c QMF512 -n  128 -dma -D 0 -verbose
   ```
3. Check the script output, as described in Section 7.7.5.2 on page 7–63.

7.7.5.2 Interpreting cabletest Script Output

If the `cabletest` script does not find any problems, the output is similar to the following:

```
Testing : 4,7,6,M,0,0,2
Testing : 4,6,6,M,0,0,2
Testing : 4,4,6,M,0,0,2
```

If the `cabletest` script finds a problem in the HP AlphaServer SC Interconnect, it will report that problem using one of the following formats:

- `Unexpected link in reset QR0N01:18:0:7 route=4,6,7,M,0,0,0`
- `Unexpected link QR0T00:00:4:0 exp=0 found=1 route=4,4,4,4,M,1,0,0,0`

Unexpected Link in Reset

An `unexpected link in reset` error usually indicates that a cable is faulty, disconnected, or not seated correctly.

In this example, the location of the fault is indicated as `QR0N01:18:0:7`, which means Link #7 of Elite #0 of Board #18 of Switch QR0N01:

- Switch QR0N01 is the second node-level switch.
- Board 18 is an HP AlphaServer SC high-level switch card; therefore, there is only one Elite chip on this card.
- From this Elite chip, links 0-3 inclusive communicate with the HP AlphaServer SC 16-port switch cards, while links 4-7 inclusive communicate with the HP AlphaServer SC 16-link null cards. Link 7 communicates with the HP AlphaServer SC 16-link null card in slot 7.
- Board 18 is the third card from the bottom of the chassis; therefore, the affected port on the HP AlphaServer SC 16-link null card is the third port, which is port 2.

In conclusion, this `cabletest` error has indicated a problem with the link (to the top-level switch) from port 2 on the HP AlphaServer SC 16-link null card in slot 7 in the second node-level switch.

Unexpected Link

An `unexpected link` error usually indicates that one end of a particular link cable has been connected to an incorrect port on the top-level switch. These errors usually occur in sets of four or eight, as shown in the following example:

```
atlas64: Unexpected link QR0T00:00:4:0 exp=0 found=1
route=4,4,4,4,M,1,0,0,0
atlas64: Unexpected link QR0T00:00:5:0 exp=0 found=1
route=4,4,4,5,M,1,0,0,0
atlas64: Unexpected link QR0T00:00:6:0 exp=0 found=1
route=4,4,4,6,M,1,0,0,0
atlas64: Unexpected link QR0T00:00:7:0 exp=0 found=1
route=4,4,4,7,M,1,0,0,0
atlas64: Unexpected link QR0T00:00:4:1 exp=1 found=0
route=4,5,4,4,M,1,0,0,0
atlas64: Unexpected link QR0T00:00:5:1 exp=1 found=0
route=4,5,4,5,M,1,0,0,0
atlas64: Unexpected link QR0T00:00:6:1 exp=1 found=0
route=4,5,4,6,M,1,0,0,0
atlas64: Unexpected link QR0T00:00:7:1 exp=1 found=0
route=4,5,4,7,M,1,0,0,0
```

To identify the location of these problems, examine the board-chip-link and route values, and interpret these using your knowledge of the current shape and size of the network.

In this example, the problem was diagnosed as crossed-over cables on the following routes:

- QR0N01, board 4, port 0 to QR0T00, board 0, port 1
- QR0N01, board 4, port 1 to QR0T00, board 0, port 5

For further information on interpreting the route value, see Section 7.7.8 on page 7–68.

If a visual inspection of the links to the top-level chassis does not reveal the problem, you can send a copy of the problem report to your HP Customer Support representative for diagnosis.

7.7.6 riscabletest

Note:

The `riscabletest` script applies only to federated configurations.

If a node does not yet have software installed or cannot boot from disk, you can use the `riscabletest` script to run the `cabletest` test. The `riscabletest` script RIS-boots the node and, when booted, runs the `cabletest` test. If using the `riscabletest` script, the node being used must be at the SRM prompt.

To run the `cabletest` script, perform the following steps:

1. Ensure that the first node of the node-level switch is at the SRM prompt, and run the following command:
   ```
   atlasms# sra script -node atlas0 -script riscabletest
   ```
2. Check the resulting screen output for any failures, and reseat or replace the link cables to any affected nodes.
3. Repeat steps 1 and 2 for each node-level switch, substituting the appropriate node number in the command as shown in the following examples:
   ```
   atlasms# sra script -node atlas64 -script riscabletest
   atlasms# sra script -node atlas128 -script riscabletest
   ```

For more information about the `cabletest` script, see Section 7.7.5 on page 7–61.

7.7.7 elan_level_test

The information in this section is organized as follows:

- Running elan_level_test (see Section 7.7.7.1 on page 7–65)
- Interpreting elan_level_test Script Output (see Section 7.7.7.2 on page 7–67)

7.7.7.1 Running elan_level_test

The `elan_level_test` script is executed on the specified nodes using the `prun` command. Each node runs the script and an algorithm calculates a static route from that node's Node ID; therefore, each node is responsible for testing a specific path.

The data from each node's execution of a speed test and the `elandebug` command is saved in the specified directory for each level tested. You can parse the results at any time on any node by pointing the script to the directory containing the data.

The syntax of the `elan_level_test` command is as follows:

```
elan_level_test level [-d directory] [-parse|noparse] [-v] [-t
timeout]
    [-r rail] [-clean] [-partition partition] [-B base]
    [-N nodes] [-V version]
```

where

- *level* specifies the level of test to be run:
  - Specify `level1` to test the link cables connecting the nodes to the switch.
  - Specify `level2` to test the HP AlphaServer SC 16-port switch cards at node level.
  - Specify `level3` to test the HP AlphaServer SC high-level switch cards.
  - Specify `level4` to test the link cables connecting the node-level switches to the top-level switches.
  - Specify `level5` to test the HP AlphaServer SC 16-port switch cards at the top level.
- *directory* specifies the directory in which the logs are, or should be, placed. The default value is the current directory.

Note:

This directory must be globally available.

- `-parse` specifies that the tests should not be rerun — the existing logs should be parsed.
- `-noparse` specifies that the tests should be run but the results should not be analyzed.
- `-v` specifies that a warning should be printed if any errors are found.
- *timeout* specifies the length of time in seconds that `elan_level_test` should wait for any test to finish. The default value is `300`.
- *rail* specifies the rail number to be tested. The default value is `0`.
- `-clean` clears out the directories if you are doing a test. It will clear out all log files in the level directory.
- *partition* specifies the partition on which the test should run. The default value is `parallel`.
- *base* specifies the base node for the command. The default value is `0`.
- *nodes* specifies the number of nodes on which the command should run. The default value is `all`.

- *version* specifies the HP AlphaServer SC system software version. Valid values are 2 (Version 2.0), 24 (Version 2.4 and Version 2.4A), and 25 (Version 2.5). The default value is 25.

7.7.7.2 Interpreting elan_level_test Script Output

Each test level within elan_level_test is cumulative — if you do not fix level 1 errors before running level 3 tests, the level 3 results will report the same issues from level 1 and potentially more issues from level 3.

Note:

You should fix the problems at each level before proceeding to the next level.

Understanding Level 1 Test Output — Node Cabling

Example 7–1

```
level1: atlas1
route: -RD
Error:
InputterCRCErrors 92(1)

level1: atlas25
route: -RD
Error:
DmaPacketAckErrors 82(1)
```

For the two problems shown in Example 7–1, the diagnosis is straightforward. The problems are isolated problems with atlas1 and atlas25. Reseating or replacing the cable to these nodes will probably solve these problems. If the problems persist, you may need to replace the HP AlphaServer SC Elan adapter cards in the nodes, or perhaps the HP AlphaServer SC 16-port switch card serving the affected nodes.

Example 7–2

```
level1: atlas128
route: -RD
Error:
DmaPacketAckErrors 14877(13)

level1: atlas129
route: -RD
Error:
DmaPacketAckErrors 619(2)
ThreadPacketAckErrors 1(1)

level1: atlas130
route: -RD
Error:
DmaPacketAckErrors 360(3)
```

```
level1: atlas131
route: -RD
Error:
DmaPacketAckErrors 295(1)
```

For the four problems shown in Example 7–2, the nodes involved are consecutive and all served by a single Elite chip from an HP AlphaServer SC 16-port switch card. It is quite possible that one Elite chip is faulty or that an entire HP AlphaServer SC 16-port switch card is faulty. The HP AlphaServer SC 16-port switch card in question should be replaced.

For further information on interpreting the route value, see Section 7.7.8 on page 7–68.

Understanding Level 3 Test Output — Node-Level Chassis

The problems that can be experienced at this level are similar to the level 1 problems. The problems may be localized to 16 consecutive nodes, indicating a problem with a single HP AlphaServer SC 16-port switch card. The route value will be important in locating the exact cause of the failure.

For further information on interpreting the route value, see Section 7.7.8 on page 7–68.

Understanding Level 4 Test Output — Links to Top-Level Chassis

Example 7–3

```
level4: atlas293
route: -R5,5,6,D,D,D,D
ERROR: Test incomplete

level4: atlas293
route: -R5,5,6,D,D,D,D
Error:
InputterCRCErrors 2(1)
DmaNetworkErrors 2(1)
DmaIdentifyNetworkErrors 2(1)
DmaPacketAckErrors 2(1)
```

For further information on interpreting the route value, see Section 7.7.8 on page 7–68.

7.7.8 Understanding Route Strings

A **route string** is used both on the command line and in the result reports of many diagnostic tests. To understand and locate problems in the fat-tree topology, you must be able to interpret these route strings.

Figure 7–7 on page 7–70 illustrates a simple route string, showing one HP AlphaServer SC high-level switch card and one HP AlphaServer SC 16-port switch card in the node-level switch, and one HP AlphaServer SC 16-port switch card in the top-level switch. The dark

lines reflect the route string 7,7,4,7,M,0,0,0 from `atlas0`. The route string is created by concatenating the link numbers used to traverse the network. To interpret these route strings, use your knowledge of the current shape and size of the network, and of basic cabling flows.

Figure 7–8 on page 7–71 represents a single node-level switch, showing the HP AlphaServer SC high-level switch cards, HP AlphaServer SC 16-port switch cards, and HP AlphaServer SC 16-link null cards. (For clarity, the HP AlphaServer SC clock card has been omitted, as it is not directly involved in route-string calculation.)

Figure 7–8 shows which uplinks correspond to which route strings, by providing a matrix of the first three digits of every route string.

If any diagnostic test fails and reports a failing route string, perform the following steps:

1. Identify the relevant node-level switch — this is simply the switch to which the node reporting the problem is connected.
2. Check the first three digits of the failing route string against Figure 7–8, to identify the faulty uplink from the node-level switch identified in step 1.
3. Repair or replace the components associated with the faulty uplink.

For further information on a case-by-case basis, you can send a copy of the problem report to your HP Customer Support representative for diagnosis.

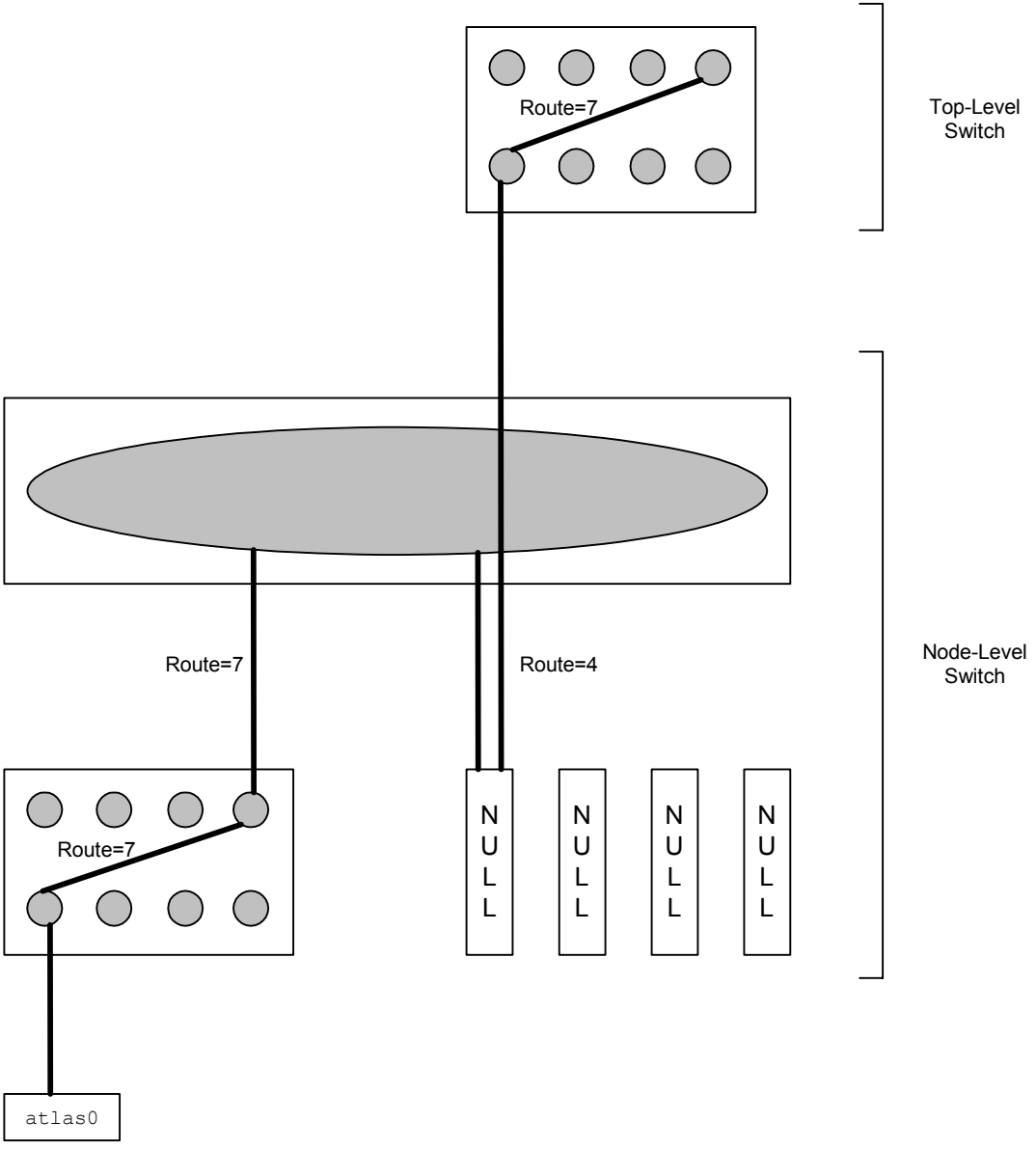


Figure 7–7 Routing Example

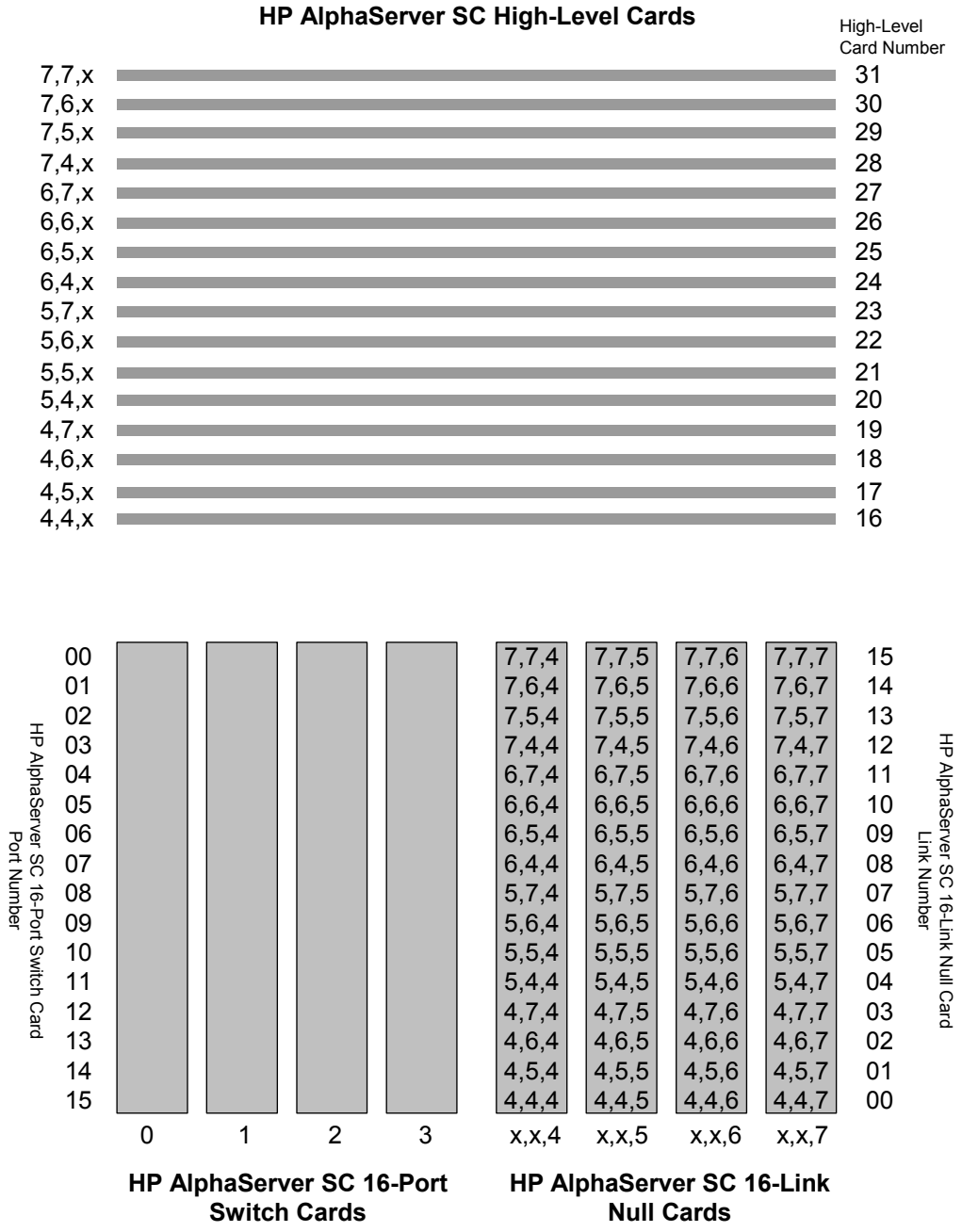


Figure 7–8 Routing in a Node-Level Switch

7.7.9 elansoaktest

The information in this section is organized as follows:

- Running elansoaktest (see Section 7.7.9.1 on page 7–72)
- Interpreting elansoaktest Script Output (see Section 7.7.9.2 on page 7–73)

7.7.9.1 Running elansoaktest

The `elansoaktest` script tests the network from all connected nodes at the same time, by running Elan DMA tests over all nodes (simultaneously) while collecting and reporting Elan statistics and network errors. This test impacts the performance of all nodes being tested.

Note:

You can start the `elansoaktest` script from any node, including a management server. However, the `elansoaktest` procedures contained in the script will run only on each configured-in node that has an HP AlphaServer SC Elan adapter card.

Use the `elansoaktest` script only during an installation or planned maintenance. To diagnose errors in a production system, run the `neterror` script instead to avoid generating load on the HP AlphaServer SC Interconnect.

Run the `elansoaktest` script with the `-h` option to display help information, as follows:

```
# ./elansoaktest -h
Usage: elansoaktest [-hkpsv] [-l <levels>] [-r <rail>]

        -h              this message
        -k              keep logfiles (see /var/sra/diag/quadrics)
        -l <levels>     specify network levels (2, 3 or 5)
        -p              partial network (skips static test)
        -r <rail>       select network rail (default 0)
        -s              run a short test
        -v              verbose

The short test (which takes 4-5 minutes) is a confidence builder
not an exhaustive test. The full test takes approximately 1 hour.

If running elansoaktest from a management server you must specify
the number of network levels because a management server does
not contain an Elan card.
Use -l2 for a 16-port network and -l3 for a 128-port network
and -l5 for a 512 or 1024 port network
```

Note:

Before running the `elansoaktest` script, you should run the `elanenvtest` script (see Section 7.7.1 on page 7–49), to confirm that the switch is powered up and that its JTAG cable (the cable connecting the switch-managing node to the JTAG port of the switch) is connected correctly.

To run the `elansoaktest` script, perform the following steps:

1. Ensure that all nodes are up and running, and configured in.

   Note:

   Any nodes that are down, or that are configured out, will not be tested.

2. Log on to a switch-managing node.
3. Change to the directory in which the diagnostic scripts are stored, as follows:
   `# cd /usr/opt/qswdiags`
4. Run the script, as follows:
   `# ./elansoaktest`

   If using a partially-populated HP AlphaServer SC 128-way switch (that is, less than 16 HP AlphaServer SC high-level switch cards), set the `-p` flag.

   To run a short test, set the `-s` flag.
5. Check the script output (see Section 7.7.9.2 on page 7–73).

7.7.9.2 Interpreting elansoaktest Script Output

If the `elansoaktest` script does not find any problems, the output is as follows:

```
** No errors detected **
```

If the `elansoaktest` script finds a problem, the output is similar to the following:

```
////////////////////////////////////////////////////////////////////
// Quadrics Network Error Report //
// Execution Date: Mon Dec 16 15:32:03 BST 2002 //
// Platform: OSF1 atlas0 V5.1B 910 alpha //
// Collecting error(s) occurred since Sun Dec 15 15:32:03 2002 //
////////////////////////////////////////////////////////////////////
o==========o======o============================o============================o
|   Date    | Rail |       Fault Position       |     Error Detected At      |
|
o==========o======o============================o============================o
|  Dec 17   |  0   | Switch Board 2 (QM401)     |  Switch Board 2 [2:6:0]    |
| 15:20:29  |      |                            |  RtCRC(2) TrCRC(4) RcvLk(6)|
|           |      |                            |  DataE(12) Fifo0(14) Fifo1(16)
o----------o------o----------------------------o----------------------------o
|  Dec 17   |  1   | Switch Board 18 (QM402) or |  Switch Board 18 [18:0:1]  |
| 15:20:46  |      |   Switch Board 1 (QM401)   |  RtCRC(1) TrCRC(1) RcvLk(1)|
|           |      |                            |  DataE(1) Fifo1(1) OpenT(1)|
o----------o------o----------------------------o----------------------------o
```

The above example shows two errors. The first error is on an internal link in an HP AlphaServer SC 16-port switch card. The second error is on a link between an HP AlphaServer SC 16-port switch card and an HP AlphaServer SC high-level switch card.

The `elansoaktest` script sends the report (described above) to the standard output. Additional information is logged in the `/var/sra/diag/quadrics` directory — when used with the `-k` option, the `elansoaktest` script creates a tar file in this directory, containing diagnostic information that may be useful in the event of an error.

7.7.10 neterror

The information in this section is organized as follows:

- Overview of neterror (see Section 7.7.10.1 on page 7–74)
- Running neterror (see Section 7.7.10.2 on page 7–75)
- neterror Script Output (see Section 7.7.10.3 on page 7–75)

7.7.10.1 Overview of neterror

Note:

`neterror` is not really a diagnostic script — it does not create new information, it generates reports based on existing information. However, it can be run on a regular basis to identify errors that have occurred during normal operation of the system.

The `swmgr` daemon on the `rmshost` system periodically gathers error statistics from the switch-manager servers, which run either on the switch-managing nodes (for directly-connected switches) or on the HP AlphaServer SC Interconnect control processors (in the new-type HP AlphaServer SC 128-way switches). Similarly, errors detected by individual HP AlphaServer SC Elan adapter cards are identified and recorded by the `rmsd` daemon on each node. These statistics are logged in the `link_errors` table in the SC database. To help you to interpret these results, a PERL (Practical Extraction and Reporting Language) script is available — `neterror`.

The `neterror` script analyzes network errors logged by the `swmgr` and `rmsd` daemons. The `neterror` command extracts network error logs from the `link_errors` table in the RMS database, collates them, and prints a report of the field replaceable units (FRUs) that could be responsible for each error. The `neterror` command is called by the `elansoaktest` script, but can also be used from the command line or as part of a periodic error-logging script. The `neterror` script can be used to detect if a network error has occurred during the execution of a parallel application. This test has no impact on nodes, but significantly impacts the performance of the `msqld` daemon while the complex query is running.

7.7.10.2 Running neterror

Run the `neterror` script with the `-h` option to display help information, as follows:

```
# ./neterror -h
Usage: neterror [-h] [-A <secs>] [-D <days>] [-H <hours>] [-felan <file>]
[-felite <file>] [-l <logfile>]
   -h                print this message
   -D <days>         extract errors that occurred in the last D days
   -H <hours>        extract errors that occurred in the last H hours
   -A <secs>         extract errors that occurred since UTC time secs
   -felan <file>     process a file containing elan errors
   -felite <file>    process a file containing elite errors
By default neterror logs to the screen and generates a report
in /tmp/neterror.html. Use the -l option to change this.
Example:
   neterror -H 48
Extracts errors that occurred in the last 48 hours. The default
is to report all of the errors that occurred in the last 24 hours.
```

To run the `neterror` script, perform the following steps:

1. Log on to the switch-managing node.
2. Change to the directory in which the diagnostic scripts are stored, as follows:
   `# cd /usr/opt/qswdiags`
3. Run the script, as follows:
   `# ./neterror`
4. Check the script output (see Section 7.7.10.3 on page 7–75).

7.7.10.3 neterror Script Output

If the `neterror` script does not find any problems, the output is as follows:

```
** No errors detected **
```

If an error occurs, the `neterror` script generates a four-column table reporting the following information for each error:

- Date: When the error occurred.
- Rail: Where the error occurred.
- Fault Position: List of possible locations of the fault generating the error.
- Error Detected At: Components in which the error was detected, and a short description of the error.

Depending on the type of switch being tested, the Fault Position column can specify one or more of several components, as described in Table 7–8.

Table 7–8 Fault Position Column Entries

Switch Type	Fault Position Column Entry	Component Description
HP AlphaServer SC 16-port switch	`Cable from Elan 0 on Node N to Switch`	The link cable connecting Node *N* to the switch.
	`Elan Adapter 0 on Node N`	The HP AlphaServer SC Elan adapter card in Node *N*.
	`Switch Board 0 (QM401)`	The HP AlphaServer SC 16-port switch card in the switch.
HP AlphaServer SC 128-way switch	`Cable from Elan 0 on Node N to Switch`	The link cable connecting Node *N* to the switch.
	`Elan Adapter 0 on Node N`	The HP AlphaServer SC Elan adapter card in Node *N*.
	`Switch Board X (QM401)`	The HP AlphaServer SC 16-port switch card in slot *X* at the rear of the switch, where the slots are numbered (left to right) from 0 to 7.
	`Switch Board X (QM402)`	The HP AlphaServer SC high-level switch card in slot *X* at the front of the switch, where the slots are numbered (bottom to top) from 16 to 31.

Note:

A node is identified by its network position. As more than one HP AlphaServer SC Elan adapter card can be plugged into a node, an index is used to distinguish between HP AlphaServer SC Elan adapter cards sited in the same node.

For each entry in the error report table generated by the `neterror` script, starting with the first entry, identify the faulty component by checking the Fault Position column:

- If the Fault Position column contains only one component, that component is faulty.
- If the Fault Position column contains more than one component, it is likely that only one of the listed components is faulty.

Replace the faulty component.

7.8 Drain Time Testing

HP recommends that you run a series of tests at least once every two weeks, to ensure the stability of the HP AlphaServer SC Interconnect, and for preventative maintenance purposes. HP also recommends that you archive the results of these tests for reference purposes and as proof of known instances in time when the system was operating correctly.

The tests listed below can be run during drain time (a period when users are asked to quit the system so that a series of planned diagnostics can be run). With the exception of the `cabletest` test, all of these tests can be run as scheduled jobs on all nodes.

Note:

The tests must be carried out in the sequence shown in Table 7–9.

Table 7–9 describes the tests that can be run during drain time.

Table 7–9 Drain Time Testing

Sequence	Test	Task	Described in:
1	`elanenvtest`	Check chassis PSUs, fans, clock frequency and source, firmware version.	Section 7.4.3 on page 7–23.
2	Simple boot-time check	Check that all nodes have correct `numnodes` and `level` values, and have correct IDs from the Interconnect network.	Section 7.4.8 on page 7–27
3	`elan_level_test level1` (both rails)	Test links between nodes and node-level switch.	Section 7.4.9 on page 7–28
4	`cabletest` (both rails)	Test all links between node-level chassis and top-level chassis.	Section 7.4.10 on page 7–29
5	`elan_level_test level2` `elan_level_test level3` (both rails)	Test all node-level switch links up to level 3.	Section 7.4.11 on page 7–30
6	`elan_level_test level4` (both rails)	Test all node-level switch links up to level 4 (top-level chassis).	Section 7.4.12 on page 7–32
7	`elan_level_test level5` (both rails)	Test all node-level switch links up to level 5.	Section 7.4.11 on page 7–30

7.9 Production Testing

Table 7–10 lists the tests that can be carried out during production time.

Table 7–10 Production Time Testing

Test	Task	Described in:
`elanenvtest`	Check chassis PSUs, fans, clock frequency and source, firmware version.	Section 7.4.3 on page 7–23.
`neterror`	Parse the database for link error entries	Section 7.4.15 on page 7–34

If an error is found during the execution of the `neterror` test, HP recommends that you perform the tests described in Section 7.8 on page 7-77, to confirm the identity of the faulty component. When you have corrected the error, run the tests again, to confirm that the system is operating correctly, before returning to production mode.

7.10 Fat-Tree Network Maintenance

The HP AlphaServer SC Interconnect transfers data from one node to another by routing packets up from an HP AlphaServer SC Elan adapter card to an Elite that is high enough in the network to be able to send the packets down to the destination node. Within a large network, there are many such broadcast trees that can be used to transfer data from one node to another. However, a broken link (typically a faulty cable between switch modules), or a link with a high rate of errors, can reduce the communication bandwidth.

In HP AlphaServer SC Version 2.6, the `swctrl` utility has been provided to help in the maintenance of a fat-tree network. You can use the `swctrl` utility to check for errors, and to configure links and broadcast trees in and out of a fat-tree network.

The `swctrl` utility is a shell with built-in sub-commands. You can access the sub-commands *via* the `swctrl:` shell, as follows:

```
# swctrl
swctrl: help

Usage:  help    all|command

Commands

       check   [modules <name> ... ] | [ tree [id] ]
       clear   [modules <name> ... ]
       configure {in|out } { link m:b:c:l|tree <t> [ rail <r> ] }
       exit
       get     param [modules <name> ... ]
       help    all|command
       info
```

```
        quit
        reboot  [upgrade ] [modules <name> ... ]
        scan    scan {internal|external } [ modules <name> ... ]
        set     attr value [option value ... ]
        show
        verbose

swctrl: quit
#
```

You can also access the `swctrl` sub-commands directly from the UNIX shell. This is the method used in the examples in this section, which describes the following `swctrl` commands:

- The swctrl info Command (see Section 7.10.1 on page 7–79)
- The swctrl check Command (see Section 7.10.2 on page 7–80)
- The swctrl configure Command (see Section 7.10.3 on page 7–80)
- The swctrl set Command (see Section 7.10.4 on page 7–82)

Caution:

You should only use the `swctrl` utility to configure the network when all other avenues of correction have been exhausted. The `swctrl` utility is only provided as backup for all the other diagnostic and servicing methods described in this manual. Applications and file systems using the network may be adversely affected when the `swctrl` utility is used to configure the network. For this reason, it should only be used during a period of planned down time and should not be used during production.

If reported problems on a broadcast tree cannot be repaired quickly, the tree should be configured out. By configuring out a whole broadcast tree, you ensure that the Elite's adaptive routing hardware (which works on the way up) avoids the broken link.

7.10.1 The swctrl info Command

You can use the `swctrl info` command to view information on the entire network, as shown in the following example:

```
# swctrl info
Network type    : QMS128
Rails           : 2
Broadcast tree  : 4 4
Modules         : 0 (QR0N00)  1 (QR1N00)
```

```
Module: QR1N00 Type: QMS128 Clock 399.9 src local ...

Module: QR0N00 Type: QMS128 Clock 399.9 src local ...
```

Broadcast tree top switch IDs are shown independently for each rail.

7.10.2 The swctrl check Command

You can use the `swctrl check` command to check the status of the switch modules themselves and the internal link state of each module, as shown in the following example:

```
# swctrl check
Modules          : 0 (QR0N00)  1 (QR1N00)

    QR0N00 (QMS128) :: No update since 15:41 on 08/23/03
    QR1N00 (QMS128) :: Maximum clock deviation of 0.200 MHz
                       exceeded (reported 398.900 Hz from source local)

    QR0N00 (QMS128) :: 0:5:0 Link state reset
    QR1N00 (QMS128) :: Link state ok
```

The first stage of output from the command reports the switch module status. The `swctrl check` command performs many of the same checks that the `elanvtest` command performs, and you can use the information given in Section 7.7.1.2 Interpreting elanenvtest Script Output, on page 7–50, to help you to interpret the possible problem reports output by the `swctrl check` command.

The second stage of output from the `swctrl check` command identifies each link by its module and its board, chip, and link information, and shows the state of the link.

7.10.3 The swctrl configure Command

You can use the `swctrl configure` command to configure a link, or an entire broadcast tree, in or out of the network.

To configure a link in or out of the network, use the following command syntax:

`swctrl configure in|out` *`link m:b:c:l`*

where:

- *`m`* is the name of the module
- *`b`* is the ID of board slot
- *`c`* is the ID of the chip
- *`l`* is the link number

The link will be held in reset when it is configured out.

To configure a broadcast tree in or out of the network, use the following syntax:
`swctrl configure in|out tree t rail r`

where:

- *t* is the ID of the top switch of the tree
- *r* is the number of the rail

All links down from the top switch are held in reset when configured out.

The number of broadcast trees depends on the network type. Table 7–11 shows the IDs and locations of the trees.

Note:

A % sign in a formula for calculating the location indicates that the remainder part of the quotient is used. For example, for port 256, with a default tree of 4, the result would be chip 0, in slot 1, on switch module 0.

Table 7–11 Broadcast Tree IDs and Locations

Port	Network Type	Default Broadcast Tree ID	Possible Broadcast Tree ID (t)	Location
16	QMS16	0	0-3	Selects chip 4+t on the HP AlphaServer SC 16-port switch card.
128	QMS128	4	0-15	Selects HP AlphaServer SC high-level switch card in slot 16+t
256	QMF256	4	0-63	Selects chip t%4 on the HP AlphaServer SC 16-port switch card in slot (t%8)/4 of top switch module t/32.
512	QMF512	4	0-63	Selects the HP AlphaServer SC 16-port switch card in slot (t%16)/2 of top switch module t/16. Note that each HP AlphaServer SC 16-port switch card provides two top switches in this configuration.
1024	QMF1024	4	0-63	Selects the HP AlphaServer SC 16-port switch card in slot t%8 of top switch module t/8.
1024S[1]	QMF1024S	4	0-63	Selects the HP AlphaServer SC 16-port switch card in slot (t%4)*2 of top switch module t/4.

Table 7–11 Broadcast Tree IDs and Locations

Port	Network Type	Default Broadcast Tree ID	Possible Broadcast Tree ID (t)	Location
1536	QMF1536	4	0-31	Selects the HP AlphaServer SC 16-port switch card in slot t%8 of top switch module t/8.
3072	QMF3072	4	0-255	Selects chip t%4 on the HP AlphaServer SC 16-port switch card in slot (t%8)/4 of super top switch module t/32.

[1]A 1024-way segment of a large federated system.

7.10.4 The swctrl set Command

You can use the `swctrl set` command to set the following network attributes:

- `clock-source`
- `network-type`
- `broadcast-tree`

The syntax for the `swctrl set` command is as follows:

`swctrl set` *`attr value`* `[modules` *`name1 name2...`*`]`

where:

- *`attr`* is the name of the attribute you want to set.
- *`value`* is the value for the attribute.
- *`name1`*, *`name2`*,... are the names of the modules for which the attribute is to be set. If no module is specified, the attribute is set on all modules.

For example:

```
# swctrl set clock-source A
# swctrl set broadcast-tree 2
```

In systems that have an HP AlphaServer SC Interconnect control processor, there are additional attributes that both control and reflect the status of the processor. These include the following:

- `network.sshd_on`
- `network.bootp.gateway`
- `network.bootp.tftpserver_ip`
- `network.bootp.upgrade_filename`
- `network.gateway`

- network.ip
- network.name
- network.netmask
- network.protocol
- network.tftpserver_ip
- network.upgrade_filename
- swmserver.linkstate
- swmserver.resend-interval
- upgrade.version
- watchdog.last_error
- watchdog.reboot_count
- watchdog.swmserver

The swctrl command can be used to get and set these attributes, as shown in the following example:

```
# swctrl get network.tftpserver_ip
QR0N00       10.128.101.1
```

The swctrl command can be used to create attributes, as shown in the following example:

```
# swctrl set new-attribute 123
# swctrl get new-attribute
QR0N00       123
```

Note:

The network-type and clock-source attributes will normally be set from SC Viewer. The option to set these attributes using the swctrl utility is provided as a backup, and is not recommended for normal use.

Care should be taken when working with the attributes for the HP AlphaServer SC Interconnect control processor, as inappropriate changes will affect the ability to control and monitor the interconnect.

A

HP AlphaServer SC Interconnect: Field Replaceable Units (FRUs)

Table A–1 describes the Field Replaceable Units (FRUs) for the HP AlphaServer SC Interconnect.

Table A–1 HP AlphaServer SC Interconnect: FRU Descriptions

Part Number	Description
3X-CCNNA-AA	HP AlphaServer SC Elan adapter card
3X-CCNBA-AA	HP AlphaServer SC 16-port switch (complete swap box) with mounting brackets and 10-m JTAG cable
3X-CCNBP-AA	HP AlphaServer SC 3.3-V power supply for 16-port chassis circuit board
3X-CCNBP-BA	HP AlphaServer SC 24-V power supply for 16-port chassis fans
3X-CCNBF-AA	HP AlphaServer SC fan assembly for 16-port chassis
3X-CCNBB-AA	HP AlphaServer SC mounting brackets for 16-port chassis
3X-CCNCA-AA	Old-type HP AlphaServer SC 128-way chassis with midplane, wiring harnesses, and power supply backplane tray — no cards, power supply, or fans
3X-CCNCA-BA	New-type HP AlphaServer SC 128-way chassis with midplane, wiring harnesses, and power supply backplane tray — no cards, control processor draw, power supply, or fans
3X-CCNCP-AA	Old-type HP AlphaServer SC 1000-W Universal power supply draw for 128-way chassis
3X-CCNCP-DA	New-type HP AlphaServer SC 1000-W Universal power supply draw for 128-way chassis, with modified cutouts for improved EMC shielding; this FRU is black in color
3X-CCNCP-BA	Old-type HP AlphaServer SC power supply backplane shelf for 128-way chassis
3X-CCNCP-CA	New-type HP AlphaServer SC power supply backplane shelf for 128-way chassis, with internal clock cable and control processor power cable

Table A–1 HP AlphaServer SC Interconnect: FRU Descriptions

Part Number	Description
3X-CCNCF-AA	Old-type HP AlphaServer SC fan tray assembly for 128-way chassis, includes 6 fans and wiring
3X-CCNCF-CA	New-type HP AlphaServer SC fan tray assembly for 128-way chassis, includes 6 fans and wiring
3X-CCNCR-AA	Old-type HP AlphaServer SC clock card for 128-way chassis
3X-CCNCR-BA	New-type HP AlphaServer SC clock card for 128-way chassis
3X-CCNXC-AA	HP AlphaServer SC clock distribution box for new-type 128-way chassis
3X-CCNXF-AA	Old-type HP AlphaServer SC 16-port switch card for 128-way chassis
3X-CCNXF-BA	New-type HP AlphaServer SC 16-port switch card for 128-way chassis
3X-CCNXN-AA	HP AlphaServer SC 16-link null card for new-type 128-way chassis
3X-CCNXR-AA	HP AlphaServer SC high-level switch card for 128-way chassis
3X-CCNXP-AA	HP AlphaServer SC Interconnect control processor; this FRU is a draw containing a control processor and DC-to-DC convertor, and flash
3X-CCNCC-AA	Old-type HP AlphaServer SC filler panels for 128-way chassis
3X-CCNCC-BA	New-type HP AlphaServer SC filler panels for 128-way chassis, with improved EMC shielding
3X-CCNXB-AA	Old-type HP AlphaServer SC mounting brackets for 128-way chassis
3X-CCNXB-BA	New-type HP AlphaServer SC zero U mounting brackets for 128-way chassis
3X-CCNXT-AA	HP AlphaServer SC 16-port switch card extraction tool
2S-CCNXS-AA	HP AlphaServer SC EMC-shielded port covers (quantity: 16)
2S-CCNXS-BA	HP AlphaServer SC EMC-shielded ejector handle covers (quantity: 2)
2S-CCNCG-AA	HP AlphaServer SC EMC-shielded cable gaskets (quantity: 17)
2S-CCNCT-AA	External clock plugs for unused external clock inputs (quantity: 2)
3X-BN62C-02	HP AlphaServer SC 1-m JTAG cable (connects to the HP AlphaServer SC Interconnect control processor)
3X-BN62C-01	HP AlphaServer SC 10-m JTAG cable (connects to the parallel port on the switch-managing node)
3X-BN62A-03	HP AlphaServer SC 3-m link cable
3X-BN62A-05	HP AlphaServer SC 5-m link cable
3X-BN62A-10	HP AlphaServer SC 10-m link cable
3X-BN62A-15	HP AlphaServer SC 15-m link cable

Table A–1 HP AlphaServer SC Interconnect: FRU Descriptions

Part Number	Description
3X-BN62A-20	HP AlphaServer SC 20-m link cable
3X-BN62A-25	HP AlphaServer SC 25-m link cable
3X-BN62D-05	HP AlphaServer SC 5-m clock distribution cable
3X-BN62D-10	HP AlphaServer SC 10-m clock distribution cable
3X-BN62D-15	HP AlphaServer SC 15-m clock distribution cable
3X-BN62D-20	HP AlphaServer SC 20-m clock distribution cable
3X-BN62D-25	HP AlphaServer SC 25-m clock distribution cable

B

HP AlphaServer SC Interconnect: Component Specifications

This appendix provides the following information:

- HP AlphaServer SC Elan Adapter Card Specifications (see Section B.1 on page B–2)
- HP AlphaServer SC 16-Port Switch Specifications (see Section B.2 on page B–3)
- Old-Type HP AlphaServer SC 128-Way Switch Specifications (see Section B.3 on page B–5)
- New-Type HP AlphaServer SC 128-Way Switch Specifications (see Section B.4 on page B–7)
- HP AlphaServer SC Clock Distribution Box Specifications (see Section B.5 on page B–9)

B.1 HP AlphaServer SC Elan Adapter Card Specifications

The specifications of the HP AlphaServer SC Elan Adapter Card are organized as follows:

- Physical Characteristics (see Section B.1.1 on page B–2)
- Environmental Characteristics (see Section B.1.2 on page B–2)
- Electrical Characteristics (see Section B.1.3 on page B–3)

B.1.1 Physical Characteristics

The dimensions of the HP AlphaServer SC Elan adapter card are as follows:

- Depth 22 mm
- Width 125 mm
- Length 175 mm
- Weight 0.15 Kg

The dimensions of the HP AlphaServer SC Elan adapter card shipping container are as follows:

- Depth 25 mm
- Width 125 mm
- Length 300 mm
- Weight 0.25 Kg

B.1.2 Environmental Characteristics

The maximum ambient room temperature at which the HP AlphaServer SC Elan adapter card can operate is 35°Celsius (95°Fahrenheit).

The environmental characteristics of the HP AlphaServer SC Elan adapter card are as follows:

- Operating Temperature (°C) 5 – 35
- Storage Temperature (°C) -40 – 50
- Operating Humidity (%) 10 – 90 (non-condensing)
- Storage Humidity (%) 10 – 90 (non-condensing)
- Max Operating Altitude 3037 m (10 000 ft)
- Max Shipping Altitude 12 190 m (40 000 ft)

B.1.3 Electrical Characteristics

The electrical characteristics of the HP AlphaServer SC Elan adapter card are as follows:

- Nominal Voltage (VDC): 3.3 / 5.0
- Max Power Consumption (W): < 15

B.2 HP AlphaServer SC 16-Port Switch Specifications

The specifications of the HP AlphaServer SC 16-port switch are organized as follows:

- Physical Characteristics (see Section B.2.1 on page B–3)
- Environmental Characteristics (see Section B.2.2 on page B–4)
- Electrical Characteristics (see Section B.2.3 on page B–4)

B.2.1 Physical Characteristics

The dimensions of the HP AlphaServer SC 16-port switch enclosure are as follows:

- Depth 9 cm (2 U)
- Width 44 cm (mountable on 19" rack)
- Length 37 cm
- Weight 6.0 Kg

The dimensions of the HP AlphaServer SC 16-port switch shipping container are as follows:

- Depth 19 cm
- Width 52 cm
- Length 46 cm
- Weight 7.0 Kg

B.2.2 Environmental Characteristics

The maximum ambient room temperature at which the HP AlphaServer SC 16-port switch can operate is 35°Celsius (95°Fahrenheit). Air inlet temperature must not exceed this value.

The environmental characteristics of the HP AlphaServer SC 16-port switch are as follows:

- Operating Temperature (°C) 5 – 35
- Storage Temperature (Not tested)
- Operating Humidity (%) 20 – 80
- Storage Humidity (%) 10 – 90
- Max Operating Altitude 3037m (10 000ft)
- Max Shipping Altitude 12 190m (40 000ft)
- Operating Vibration (Hz) 10 – 500
- Operating Shock 7.5G, 10 +/- 3ms
- Nominal Heat Dissipation (W) 80
- Maximum Heat Dissipation (W) 120
- Airflow Front to Rear

B.2.3 Electrical Characteristics

The electrical characteristics of the HP AlphaServer SC 16-port switch are as follows:

- Nominal Voltage (Vac): 120 / 240
- Voltage Range (Vac): 110–128 / 220–250
- Power Source Phase: Single Phase
- Nominal Frequency (Hz): 60 / 50
- Frequency Range (Hz): 59–61 / 49–51
- Max Steady State RMS Current (A): 2.0 / 1.25
- Max Power Consumption (W): 120

B.3 Old-Type HP AlphaServer SC 128-Way Switch Specifications

The specifications of the old-type HP AlphaServer SC 128-way switch are organized as follows:

- Physical Characteristics (see Section B.3.1 on page B–5)
- Environmental Characteristics (see Section B.3.2 on page B–6)
- Electrical Characteristics (see Section B.3.3 on page B–6)

B.3.1 Physical Characteristics

The dimensions of the old-type HP AlphaServer SC 128-way switch enclosure are as follows:

- Depth 91.5 cm (13 U)
- Width 44 cm (mountable on 19" rack)
- Length 48 cm
- Weight 70 Kg

The dimensions of the old-type HP AlphaServer SC 128-way switch shipping container are as follows:

- Depth 72 cm
- Width 65 cm
- Length 60 cm
- Weight 15 Kg

B.3.2 Environmental Characteristics

The maximum ambient room temperature at which the old-type HP AlphaServer SC 128-way switch can operate is 35°Celsius (95°Fahrenheit). Air inlet temperature must not exceed this value.

The environmental characteristics of the old-type HP AlphaServer SC 128-way switch are as follows:

- Operating Temperature (°C) 5 – 35
- Storage Temperature (Not tested)
- Operating Humidity (%) 10 – 90
- Storage Humidity (%) 10 – 90
- Max Operating Altitude 3037 m (10 000 ft)
- Max Shipping Altitude 12 190 m (40 000 ft)
- Operating Vibration
- Operating Shock
- Nominal Heat Dissipation 680 W
- Maximum Heat Dissipation 720 W
- Airflow Front to Rear

B.3.3 Electrical Characteristics

The electrical characteristics of the old-type HP AlphaServer SC 128-way switch are as follows:

- Nominal Voltage (Vac): 120 / 240
- Voltage Range (Vac): 110–128 / 220–250
- Power Source Phase: Single Phase
- Nominal Frequency (Hz): 60 / 50
- Frequency Range (Hz): 59–61 / 49–51
- Max Steady State RMS Current (A): 6.0 / 3.25
- Max Power Consumption (W): 1000

B.4 New-Type HP AlphaServer SC 128-Way Switch Specifications

The specifications of the new-type HP AlphaServer SC 128-way switch are organized as follows:

- Physical Characteristics (see Section B.4.1 on page B–7)
- Environmental Characteristics (see Section B.4.2 on page B–8)
- Electrical Characteristics (see Section B.4.3 on page B–8)

B.4.1 Physical Characteristics

The dimensions of the new-type HP AlphaServer SC 128-way switch enclosure are as follows:

- Depth 75 cm (17 U)
- Width 44 cm (mountable on 19" rack)
- Length 48 cm
- Weight 70 Kg

The dimensions of the new-type HP AlphaServer SC 128-way switch shipping container are as follows:

- Depth 90 cm
- Width 85 cm
- Length 60 cm
- Weight 15 Kg

B.4.2 Environmental Characteristics

The maximum ambient room temperature at which the new-type HP AlphaServer SC 128-way switch can operate is 35°Celsius (95°Fahrenheit). Air inlet temperature must not exceed this value.

The environmental characteristics of the new-type HP AlphaServer SC 128-way switch are as follows:

- Operating Temperature (°C) 5 – 35
- Storage Temperature (Not tested)
- Operating Humidity (%) 10 – 90
- Storage Humidity (%) 10 – 90
- Max Operating Altitude 3037 m (10 000 ft)
- Max Shipping Altitude 12 190 m (40 000 ft)
- Operating Vibration DEC Standard 102
- Operating Shock DEC Standard 102
- Nominal Heat Dissipation 680 W
- Maximum Heat Dissipation 720 W
- Airflow Front to Rear

B.4.3 Electrical Characteristics

The electrical characteristics of the new-type HP AlphaServer SC 128-way switch are as follows:

- Nominal Voltage (Vac): 120 / 240
- Voltage Range (Vac): 110–128 / 220–250
- Power Source Phase: Single Phase
- Nominal Frequency (Hz): 60 / 50
- Frequency Range (Hz): 59–61 / 49–51
- Max Steady State RMS Current (A): 6.0 / 3.25
- Max Power Consumption (W): 1000

B.5 HP AlphaServer SC Clock Distribution Box Specifications

The specifications of the HP AlphaServer SC clock distribution box are organized as follows:

- Physical Characteristics (see Section B.5.1 on page B–9)
- Environmental Characteristics (see Section B.5.2 on page B–10)
- Electrical Characteristics (see Section B.5.3 on page B–10)

B.5.1 Physical Characteristics

The dimensions of the HP AlphaServer SC clock distribution box enclosure are as follows:

- Depth 4.3 cm (1 U)
- Width 48.3 cm (mountable on 19" rack)
- Length 19.0 cm
- Weight 3.3 Kg

The dimensions of the HP AlphaServer SC clock distribution box shipping container are as follows:

- Depth 13.0 cm
- Width 56.5 cm
- Length 29.5 cm
- Weight 4.0 Kg

B.5.2 Environmental Characteristics

The maximum ambient room temperature at which the HP AlphaServer SC clock distribution box can operate is 35°Celsius (95°Fahrenheit). Air inlet temperature must not exceed this value.

The environmental characteristics of the HP AlphaServer SC clock distribution box are as follows:

- Operating Temperature (°C) 5 – 35
- Storage Temperature (Not tested)
- Operating Humidity (%) 20 – 80
- Storage Humidity (%) 10 – 90
- Max Operating Altitude 3037 m (10 000 ft)
- Max Shipping Altitude 12 190 m (40 000 ft)
- Operating Vibration (Hz) 10 – 500
- Operating Shock 7.5 G, 10 +/- 3 ms
- Nominal Heat Dissipation (W) 5
- Maximum Heat Dissipation (W) 10
- Airflow Side to Side

B.5.3 Electrical Characteristics

The electrical characteristics of the HP AlphaServer SC clock distribution box are as follows:

- Nominal Voltage (Vac): 100 – 240
- Voltage Range (Vac): 90 – 254
- Power Source Phase: Single Phase
- Nominal Frequency (Hz): 60 / 50
- Frequency Range (Hz): 59–61 / 49–51
- Max Steady State RMS Current (A): 0.15
- Max Power Consumption (W): 15

C

Preventing Electrostatic Damage

WARNING:

Static electricity can damage printed circuit boards and disk drives. These components should not be touched unless antistatic precautions have been taken. Unless advised otherwise, do not disconnect the power cords from the system or the power outlets. The power cord grounds the system unit, preventing damage to the components. Please refer to the appropriate host-specific documentation for more information.

To prevent electrostatic damage, the following two pieces of equipment are required:

- Antistatic wrist or foot strap
- Antistatic mat (or equivalent)

You should also remove any jewelry that may conduct electricity.

Preventing Electrostatic Damage

When installing or removing static-sensitive components, the antistatic equipment is deployed as follows:

1. Attach one end of the antistatic strap to the system chassis sheet metal, as shown in Figure C–1, and the other end to the wrist or foot. Attach these according to the instructions supplied with the antistatic strap. Leave the strap in place until the installation (or removal) procedure is complete.

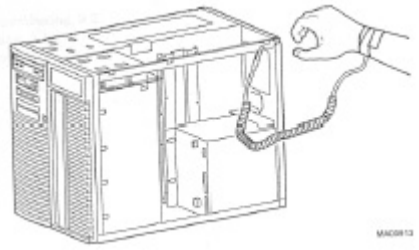
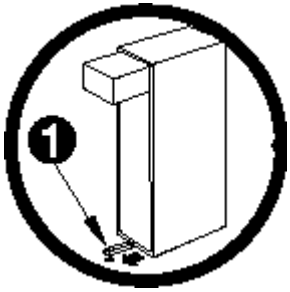


Figure C–1 Use of Antistatic Straps

2. Place the static-sensitive components (that are being installed or removed) on the antistatic mat.

D

Cabinet Service Warning Label



Caution:

In order to meet stability requirements, stabilizer foot at front of cabinet must be fully extended during servicing.

Vorsicht!

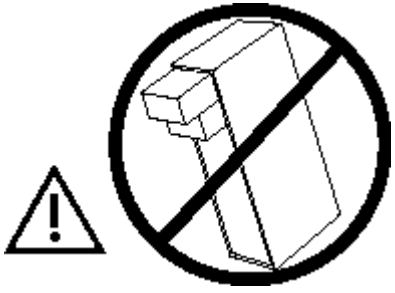
Um den Stabilitatserfordernissen zu entsprechen, muß der Stabilisatorfuß an der Vorderseite des Gehauses während der Wartung voll ausgestellt sein.

Attention:

Pour maintenir le meuble en position stable, étendre complétement le pied de stabilisation qui se trouve sur le devant du meuble, pendant toute la duree l'entretien.

Cuidado:

Para satisfacer los requisitos de estabilidad, la pata del estabilizador, en el frente del armario, deberá estar completamente extendida, durante el servicio de mantenimiento.



Warning:

Cabinet may become unstable if more than one component is extended. Ensure cabinet is adequately stabilized before extending a single component.

Achtung:

Die Stabilität des Gehäuses könnte beeinträchtigt werden, wenn mehr als eine Komponente erweitert wird. Stellen Sie deshalb sicher, daß das Gehäuse vor Erweiterung irgendeiner Komponent ausreichend stabilisiert ist.

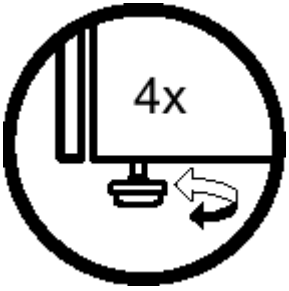
Avertissement:

L'armoire peut devenir instable en cas d'extension de plusieurs composants. Assurez–vous que l'armoire est parfaitement stabilisée avant d'effectuer une extension de composant.

Aviso:

El gabinete puede quedar inestable si, por cualquier razón, se extrae más de un componente a la vez. Antes de extraer un componente, asegurese de que el receptáculo quede totalmente estable.

Cabinet Service Warning Label



Caution:

To meet stability requirements and ensure the cabinet is level, the leveler feet at each corner of the cabinet must be lowered so that the cabinet rests on the leveler feet and not on the casters.

Attention:

Pour des raisons de stabilité et d'equilibre, les pieds de stabilisation situés à chaque coin de l'armoire doivent être abaissés afin que l'armoire repose sur chaque pied et non sur les roulettes.

Vorsicht:

Um den Stabilitätsanforderungen gerecht zu werden und sicherzustellen, daß das Gehäuse gerade steht, müssen die Ausgleichsfußchen herausgezogen werden, damit das Gehäuse auf diesen Fußchen steht und nicht auf den Rollen.

Precaución:

Para cumplir los requisitos de estabilidad del gabinete, los pies niveladores de cada esquina del mismo deben ser bajados, de tal forma que el gabinete quede apoyado en éstos y no en las ruedas pivotantes.

Warning: High Leakage Current:

Grounding circuit continuity is vital for safe operation of machine. Never operate machine with grounding connector disconnected.

Avertissement, courant de fuite élevé:

La continuité du circuit de mise à la terre est vitale pour un fonctionnement sûr de la machine. Ne jamais faire marcher la machine quand le connecteur de mise a la terre est débranché.

Warnung, Hoher Verluststrom:

Die Kontinuität des Erdverbindungkreises ist für den sicheren Betrieb der Maschine unertäßlich. Die Maschine niemals mit getrenntem Erdanschluß betätigen.

Advertencia, fuga elevada de corriente:

La continuidad del circuito de puesta a tierra es de vital importancia para el funcionamiento sin peligros de la máquina. No hacer funcionar nunca la máquina con el conector de tierra desconectado.

Caution:

Multiple power cords may be utilized for each component within the cabinet. Multiple AC entries may provide power to different areas within the cabinet. Ensure all power cords have been disconnected as required for servicing the equipment.

Attention:

Plusieurs cordons d'alimentation peuvent être utilisés pour chaque composant de l'armoire. Plusieurs entrées AC peuvent fournir une alimentation à differentes parties de l'armoire. Veillez à debrancher tous les cordons d'alimentation du matériel.

Vorsicht:

Für jede Komponente innerhalb des Gehauses können mehrere Netzkabel verwendet werden. Mehrere Netzanschlusse können Strom an die verschiedenen Bereiche innerhalb des Gehäuses liefern. Stellen Sie deshalb vor der Wartung des Geräts unbedingt sicher, daß alle Netzkabel gezogen sind.

Precaución:

Es posible utilizar cables de alimentación para cada componente del gabinete. Pueden suministrarse varias entradas de CA en distintas áreas del gabinete. Cuando se realicen tareas de mantenimiento en el equipo, compruebe que todos los cables se han desconectado previamente.

E

Default Wiring Topology for Federated Configurations

This appendix illustrates the default wiring topology for the most common federated network sizes. Only rail 0 is shown in each case — for dual-rail networks, all components are replicated.

Figure E–2 to Figure E–8 show how the node-level switches are connected to the top-level switches, depending on the number of nodes in the HP AlphaServer SC system.
See Table E–1 to identify which figure applies to your system.

Table E–1 How to Connect the Node-Level Switches to the Top-Level Switches

Number of Nodes	See...
256	Figure E–2
512	Figure E–3 and Figure E–4
1024	Figure E–5, Figure E–6, Figure E–7, and Figure E–8

The switch naming convention used in these figures is shown in Figure E–1.

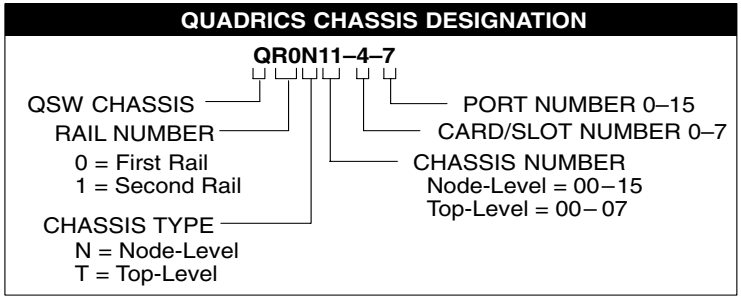


Figure E–1 Switch Naming Convention

Remember that the port numbering on the HP AlphaServer SC 16-link null card starts at the bottom of the card (in slots 4 to 7 inclusive in the node-level switches), whereas the port numbering on the HP AlphaServer SC 16-port switch card starts at the top, as shown in Figure 1–7 on page 1–9.

Default Wiring Topology for Federated Configurations

Node Level Chassis 0

ORIGIN	DESTINATION
QR0N00–4–0	QR0T00–0–0
QR0N00–4–1	QR0T00–0–4
QR0N00–4–2	QR0T00–0–8
QR0N00–4–3	QR0T00–0–12
QR0N00–4–4	QR0T00–1–0
QR0N00–4–5	QR0T00–1–4
QR0N00–4–6	QR0T00–1–8
QR0N00–4–7	QR0T00–1–12
QR0N00–4–8	QR0T00–2–0
QR0N00–4–9	QR0T00–2–4
QR0N00–4–10	QR0T00–2–8
QR0N00–4–11	QR0T00–2–12
QR0N00–4–12	QR0T00–3–0
QR0N00–4–13	QR0T00–3–4
QR0N00–4–14	QR0T00–3–8
QR0N00–4–15	QR0T00–3–12
QR0N00–5–0	QR0T00–4–0
QR0N00–5–1	QR0T00–4–4
QR0N00–5–2	QR0T00–4–8
QR0N00–5–3	QR0T00–4–12
QR0N00–5–4	QR0T00–5–0
QR0N00–5–5	QR0T00–5–4
QR0N00–5–6	QR0T00–5–8
QR0N00–5–7	QR0T00–5–12
QR0N00–5–8	QR0T00–6–0
QR0N00–5–9	QR0T00–6–4
QR0N00–5–10	QR0T00–6–8
QR0N00–5–11	QR0T00–6–12
QR0N00–5–12	QR0T00–7–0
QR0N00–5–13	QR0T00–7–4
QR0N00–5–14	QR0T00–7–8
QR0N00–5–15	QR0T00–7–12
QR0N00–6–0	QR0T01–0–0
QR0N00–6–1	QR0T01–0–4
QR0N00–6–2	QR0T01–0–8
QR0N00–6–3	QR0T01–0–12
QR0N00–6–4	QR0T01–1–0
QR0N00–6–5	QR0T01–1–4
QR0N00–6–6	QR0T01–1–8
QR0N00–6–7	QR0T01–1–12
QR0N00–6–8	QR0T01–2–0
QR0N00–6–9	QR0T01–2–4
QR0N00–6–10	QR0T01–2–8
QR0N00–6–11	QR0T01–2–12
QR0N00–6–12	QR0T01–3–0
QR0N00–6–13	QR0T01–3–4
QR0N00–6–14	QR0T01–3–8
QR0N00–6–15	QR0T01–3–12
QR0N00–7–0	QR0T01–4–0
QR0N00–7–1	QR0T01–4–4
QR0N00–7–2	QR0T01–4–8
QR0N00–7–3	QR0T01–4–12
QR0N00–7–4	QR0T01–5–0
QR0N00–7–5	QR0T01–5–4
QR0N00–7–6	QR0T01–5–8
QR0N00–7–7	QR0T01–5–12
QR0N00–7–8	QR0T01–6–0
QR0N00–7–9	QR0T01–6–4
QR0N00–7–10	QR0T01–6–8
QR0N00–7–11	QR0T01–6–12
QR0N00–7–12	QR0T01–7–0
QR0N00–7–13	QR0T01–7–4
QR0N00–7–14	QR0T01–7–8
QR0N00–7–15	QR0T01–7–12

Node Level Chassis 1

ORIGIN	DESTINATION
QR0N01–4–0	QR0T00–0–1
QR0N01–4–1	QR0T00–0–5
QR0N01–4–2	QR0T00–0–9
QR0N01–4–3	QR0T00–0–13
QR0N01–4–4	QR0T00–1–1
QR0N01–4–5	QR0T00–1–5
QR0N01–4–6	QR0T00–1–9
QR0N01–4–7	QR0T00–1–13
QR0N01–4–8	QR0T00–2–1
QR0N01–4–9	QR0T00–2–5
QR0N01–4–10	QR0T00–2–9
QR0N01–4–11	QR0T00–2–13
QR0N01–4–12	QR0T00–3–1
QR0N01–4–13	QR0T00–3–5
QR0N01–4–14	QR0T00–3–9
QR0N01–4–15	QR0T00–3–13
QR0N01–5–0	QR0T00–4–1
QR0N01–5–1	QR0T00–4–5
QR0N01–5–2	QR0T00–4–9
QR0N01–5–3	QR0T00–4–13
QR0N01–5–4	QR0T00–5–1
QR0N01–5–5	QR0T00–5–5
QR0N01–5–6	QR0T00–5–9
QR0N01–5–7	QR0T00–5–13
QR0N01–5–8	QR0T00–6–1
QR0N01–5–9	QR0T00–6–5
QR0N01–5–10	QR0T00–6–9
QR0N01–5–11	QR0T00–6–13
QR0N01–5–12	QR0T00–7–1
QR0N01–5–13	QR0T00–7–5
QR0N01–5–14	QR0T00–7–9
QR0N01–5–15	QR0T00–7–13
QR0N01–6–0	QR0T01–0–1
QR0N01–6–1	QR0T01–0–5
QR0N01–6–2	QR0T01–0–9
QR0N01–6–3	QR0T01–0–13
QR0N01–6–4	QR0T01–1–1
QR0N01–6–5	QR0T01–1–5
QR0N01–6–6	QR0T01–1–9
QR0N01–6–7	QR0T01–1–13
QR0N01–6–8	QR0T01–2–1
QR0N01–6–9	QR0T01–2–5
QR0N01–6–10	QR0T01–2–9
QR0N01–6–11	QR0T01–2–13
QR0N01–6–12	QR0T01–3–1
QR0N01–6–13	QR0T01–3–5
QR0N01–6–14	QR0T01–3–9
QR0N01–6–15	QR0T01–3–13
QR0N01–7–0	QR0T01–4–1
QR0N01–7–1	QR0T01–4–5
QR0N01–7–2	QR0T01–4–9
QR0N01–7–3	QR0T01–4–13
QR0N01–7–4	QR0T01–5–1
QR0N01–7–5	QR0T01–5–5
QR0N01–7–6	QR0T01–5–9
QR0N01–7–7	QR0T01–5–13
QR0N01–7–8	QR0T01–6–1
QR0N01–7–9	QR0T01–6–5
QR0N01–7–10	QR0T01–6–9
QR0N01–7–11	QR0T01–6–13
QR0N01–7–12	QR0T01–7–1
QR0N01–7–13	QR0T01–7–5
QR0N01–7–14	QR0T01–7–9
QR0N01–7–15	QR0T01–7–13

Node Level Chassis 2

ORIGIN	DESTINATION
QR0N02–4–0	QR0T00–0–2
QR0N02–4–1	QR0T00–0–6
QR0N02–4–2	QR0T00–0–10
QR0N02–4–3	QR0T00–0–14
QR0N02–4–4	QR0T00–1–2
QR0N02–4–5	QR0T00–1–6
QR0N02–4–6	QR0T00–1–10
QR0N02–4–7	QR0T00–1–14
QR0N02–4–8	QR0T00–2–2
QR0N02–4–9	QR0T00–2–6
QR0N02–4–10	QR0T00–2–10
QR0N02–4–11	QR0T00–2–14
QR0N02–4–12	QR0T00–3–2
QR0N02–4–13	QR0T00–3–6
QR0N02–4–14	QR0T00–3–10
QR0N02–4–15	QR0T00–3–14
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QR0N02–5–2	QR0T00–4–10
QR0N02–5–3	QR0T00–4–14
QR0N02–5–4	QR0T00–5–2
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QR0N02–5–6	QR0T00–5–10
QR0N02–5–7	QR0T00–5–14
QR0N02–5–8	QR0T00–6–2
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QR0N02–5–10	QR0T00–6–10
QR0N02–5–11	QR0T00–6–14
QR0N02–5–12	QR0T00–7–2
QR0N02–5–13	QR0T00–7–6
QR0N02–5–14	QR0T00–7–10
QR0N02–5–15	QR0T00–7–14
QR0N02–6–0	QR0T01–0–2
QR0N02–6–1	QR0T01–0–6
QR0N02–6–2	QR0T01–0–10
QR0N02–6–3	QR0T01–0–14
QR0N02–6–4	QR0T01–1–2
QR0N02–6–5	QR0T01–1–6
QR0N02–6–6	QR0T01–1–10
QR0N02–6–7	QR0T01–1–14
QR0N02–6–8	QR0T01–2–2
QR0N02–6–9	QR0T01–2–6
QR0N02–6–10	QR0T01–2–10
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QR0N02–7–5	QR0T01–5–6
QR0N02–7–6	QR0T01–5–10
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QR0N02–7–9	QR0T01–6–6
QR0N02–7–10	QR0T01–6–10
QR0N02–7–11	QR0T01–6–14
QR0N02–7–12	QR0T01–7–2
QR0N02–7–13	QR0T01–7–6
QR0N02–7–14	QR0T01–7–10
QR0N02–7–15	QR0T01–7–14

Node Level Chassis 3

ORIGIN	DESTINATION
QR0N03–4–0	QR0T00–0–3
QR0N03–4–1	QR0T00–0–7
QR0N03–4–2	QR0T00–0–11
QR0N03–4–3	QR0T00–0–15
QR0N03–4–4	QR0T00–1–3
QR0N03–4–5	QR0T00–1–7
QR0N03–4–6	QR0T00–1–11
QR0N03–4–7	QR0T00–1–15
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QR0N03–4–10	QR0T00–2–11
QR0N03–4–11	QR0T00–2–15
QR0N03–4–12	QR0T00–3–3
QR0N03–4–13	QR0T00–3–7
QR0N03–4–14	QR0T00–3–11
QR0N03–4–15	QR0T00–3–15
QR0N03–5–0	QR0T00–4–3
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QR0N03–6–8	QR0T01–2–3
QR0N03–6–9	QR0T01–2–7
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QR0N03–6–13	QR0T01–3–7
QR0N03–6–14	QR0T01–3–11
QR0N03–6–15	QR0T01–3–15
QR0N03–7–0	QR0T01–4–3
QR0N03–7–1	QR0T01–4–7
QR0N03–7–2	QR0T01–4–11
QR0N03–7–3	QR0T01–4–15
QR0N03–7–4	QR0T01–5–3
QR0N03–7–5	QR0T01–5–7
QR0N03–7–6	QR0T01–5–11
QR0N03–7–7	QR0T01–5–15
QR0N03–7–8	QR0T01–6–3
QR0N03–7–9	QR0T01–6–7
QR0N03–7–10	QR0T01–6–11
QR0N03–7–11	QR0T01–6–15
QR0N03–7–12	QR0T01–7–3
QR0N03–7–13	QR0T01–7–7
QR0N03–7–14	QR0T01–7–11
QR0N03–7–15	QR0T01–7–15

256 NODE CONFIGURATION

Figure E–2 Default Wiring Topology for 256-Port Federated Configuration

Node Level Chassis 0

ORIGIN	DESTINATION
QRON00–4–0	QROT00–0–0
QRON00–4–1	QROT00–0–8
QRON00–4–2	QROT00–1–0
QRON00–4–3	QROT00–1–8
QRON00–4–4	QROT00–2–0
QRON00–4–5	QROT00–2–8
QRON00–4–6	QROT00–3–0
QRON00–4–7	QROT00–3–8
QRON00–4–8	QROT00–4–0
QRON00–4–9	QROT00–4–8
QRON00–4–10	QROT00–5–0
QRON00–4–11	QROT00–5–8
QRON00–4–12	QROT00–6–0
QRON00–4–13	QROT00–6–8
QRON00–4–14	QROT00–7–0
QRON00–4–15	QROT00–7–8
QRON00–5–0	QROT01–0–0
QRON00–5–1	QROT01–0–8
QRON00–5–2	QROT01–1–0
QRON00–5–3	QROT01–1–8
QRON00–5–4	QROT01–2–0
QRON00–5–5	QROT01–2–8
QRON00–5–6	QROT01–3–0
QRON00–5–7	QROT01–3–8
QRON00–5–8	QROT01–4–0
QRON00–5–9	QROT01–4–8
QRON00–5–10	QROT01–5–0
QRON00–5–11	QROT01–5–8
QRON00–5–12	QROT01–6–0
QRON00–5–13	QROT01–6–8
QRON00–5–14	QROT01–7–0
QRON00–5–15	QROT01–7–8
QRON00–6–0	QROT02–0–0
QRON00–6–1	QROT02–0–8
QRON00–6–2	QROT02–1–0
QRON00–6–3	QROT02–1–8
QRON00–6–4	QROT02–2–0
QRON00–6–5	QROT02–2–8
QRON00–6–6	QROT02–3–0
QRON00–6–7	QROT02–3–8
QRON00–6–8	QROT02–4–0
QRON00–6–9	QROT02–4–8
QRON00–6–10	QROT02–5–0
QRON00–6–11	QROT02–5–8
QRON00–6–12	QROT02–6–0
QRON00–6–13	QROT02–6–8
QRON00–6–14	QROT02–7–0
QRON00–6–15	QROT02–7–8
QRON00–7–0	QROT03–0–0
QRON00–7–1	QROT03–0–8
QRON00–7–2	QROT03–1–0
QRON00–7–3	QROT03–1–8
QRON00–7–4	QROT03–2–0
QRON00–7–5	QROT03–2–8
QRON00–7–6	QROT03–3–0
QRON00–7–7	QROT03–3–8
QRON00–7–8	QROT03–4–0
QRON00–7–9	QROT03–4–8
QRON00–7–10	QROT03–5–0
QRON00–7–11	QROT03–5–8
QRON00–7–12	QROT03–6–0
QRON00–7–13	QROT03–6–8
QRON00–7–14	QROT03–7–0
QRON00–7–15	QROT03–7–8

Node Level Chassis 1

ORIGIN	DESTINATION
QRON01–4–0	QROT00–0–1
QRON01–4–1	QROT00–0–9
QRON01–4–2	QROT00–1–1
QRON01–4–3	QROT00–1–9
QRON01–4–4	QROT00–2–1
QRON01–4–5	QROT00–2–9
QRON01–4–6	QROT00–3–1
QRON01–4–7	QROT00–3–9
QRON01–4–8	QROT00–4–1
QRON01–4–9	QROT00–4–9
QRON01–4–10	QROT00–5–1
QRON01–4–11	QROT00–5–9
QRON01–4–12	QROT00–6–1
QRON01–4–13	QROT00–6–9
QRON01–4–14	QROT00–7–1
QRON01–4–15	QROT00–7–9
QRON01–5–0	QROT01–0–1
QRON01–5–1	QROT01–0–9
QRON01–5–2	QROT01–1–1
QRON01–5–3	QROT01–1–9
QRON01–5–4	QROT01–2–1
QRON01–5–5	QROT01–2–9
QRON01–5–6	QROT01–3–1
QRON01–5–7	QROT01–3–9
QRON01–5–8	QROT01–4–1
QRON01–5–9	QROT01–4–9
QRON01–5–10	QROT01–5–1
QRON01–5–11	QROT01–5–9
QRON01–5–12	QROT01–6–1
QRON01–5–13	QROT01–6–9
QRON01–5–14	QROT01–7–1
QRON01–5–15	QROT01–7–9
QRON01–6–0	QROT02–0–1
QRON01–6–1	QROT02–0–9
QRON01–6–2	QROT02–1–1
QRON01–6–3	QROT02–1–9
QRON01–6–4	QROT02–2–1
QRON01–6–5	QROT02–2–9
QRON01–6–6	QROT02–3–1
QRON01–6–7	QROT02–3–9
QRON01–6–8	QROT02–4–1
QRON01–6–9	QROT02–4–9
QRON01–6–10	QROT02–5–1
QRON01–6–11	QROT02–5–9
QRON01–6–12	QROT02–6–1
QRON01–6–13	QROT02–6–9
QRON01–6–14	QROT02–7–1
QRON01–6–15	QROT02–7–9
QRON01–7–0	QROT03–0–1
QRON01–7–1	QROT03–0–9
QRON01–7–2	QROT03–1–1
QRON01–7–3	QROT03–1–9
QRON01–7–4	QROT03–2–1
QRON01–7–5	QROT03–2–9
QRON01–7–6	QROT03–3–1
QRON01–7–7	QROT03–3–9
QRON01–7–8	QROT03–4–1
QRON01–7–9	QROT03–4–9
QRON01–7–10	QROT03–5–1
QRON01–7–11	QROT03–5–9
QRON01–7–12	QROT03–6–1
QRON01–7–13	QROT03–6–9
QRON01–7–14	QROT03–7–1
QRON01–7–15	QROT03–7–9

Node Level Chassis 2

ORIGIN	DESTINATION
QRON02–4–0	QROT00–0–2
QRON02–4–1	QROT00–0–10
QRON02–4–2	QROT00–1–2
QRON02–4–3	QROT00–1–10
QRON02–4–4	QROT00–2–2
QRON02–4–5	QROT00–2–10
QRON02–4–6	QROT00–3–2
QRON02–4–7	QROT00–3–10
QRON02–4–8	QROT00–4–2
QRON02–4–9	QROT00–4–10
QRON02–4–10	QROT00–5–2
QRON02–4–11	QROT00–5–10
QRON02–4–12	QROT00–6–2
QRON02–4–13	QROT00–6–10
QRON02–4–14	QROT00–7–2
QRON02–4–15	QROT00–7–10
QRON02–5–0	QROT01–0–2
QRON02–5–1	QROT01–0–10
QRON02–5–2	QROT01–1–2
QRON02–5–3	QROT01–1–10
QRON02–5–4	QROT01–2–2
QRON02–5–5	QROT01–2–10
QRON02–5–6	QROT01–3–2
QRON02–5–7	QROT01–3–10
QRON02–5–8	QROT01–4–2
QRON02–5–9	QROT01–4–10
QRON02–5–10	QROT01–5–2
QRON02–5–11	QROT01–5–10
QRON02–5–12	QROT01–6–2
QRON02–5–13	QROT01–6–10
QRON02–5–14	QROT01–7–2
QRON02–5–15	QROT01–7–10
QRON02–6–0	QROT02–0–2
QRON02–6–1	QROT02–0–10
QRON02–6–2	QROT02–1–2
QRON02–6–3	QROT02–1–10
QRON02–6–4	QROT02–2–2
QRON02–6–5	QROT02–2–10
QRON02–6–6	QROT02–3–2
QRON02–6–7	QROT02–3–10
QRON02–6–8	QROT02–4–2
QRON02–6–9	QROT02–4–10
QRON02–6–10	QROT02–5–2
QRON02–6–11	QROT02–5–10
QRON02–6–12	QROT02–6–2
QRON02–6–13	QROT02–6–10
QRON02–6–14	QROT02–7–2
QRON02–6–15	QROT02–7–10
QRON02–7–0	QROT03–0–2
QRON02–7–1	QROT03–0–10
QRON02–7–2	QROT03–1–2
QRON02–7–3	QROT03–1–10
QRON02–7–4	QROT03–2–2
QRON02–7–5	QROT03–2–10
QRON02–7–6	QROT03–3–2
QRON02–7–7	QROT03–3–10
QRON02–7–8	QROT03–4–2
QRON02–7–9	QROT03–4–10
QRON02–7–10	QROT03–5–2
QRON02–7–11	QROT03–5–10
QRON02–7–12	QROT03–6–2
QRON02–7–13	QROT03–6–10
QRON02–7–14	QROT03–7–2
QRON02–7–15	QROT03–7–10

Node Level Chassis 3

ORIGIN	DESTINATION
QRON03–4–0	QROT00–0–3
QRON03–4–1	QROT00–0–11
QRON03–4–2	QROT00–1–3
QRON03–4–3	QROT00–1–11
QRON03–4–4	QROT00–2–3
QRON03–4–5	QROT00–2–11
QRON03–4–6	QROT00–3–3
QRON03–4–7	QROT00–3–11
QRON03–4–8	QROT00–4–3
QRON03–4–9	QROT00–4–11
QRON03–4–10	QROT00–5–3
QRON03–4–11	QROT00–5–11
QRON03–4–12	QROT00–6–3
QRON03–4–13	QROT00–6–11
QRON03–4–14	QROT00–7–3
QRON03–4–15	QROT00–7–11
QRON03–5–0	QROT01–0–3
QRON03–5–1	QROT01–0–11
QRON03–5–2	QROT01–1–3
QRON03–5–3	QROT01–1–11
QRON03–5–4	QROT01–2–3
QRON03–5–5	QROT01–2–11
QRON03–5–6	QROT01–3–3
QRON03–5–7	QROT01–3–11
QRON03–5–8	QROT01–4–3
QRON03–5–9	QROT01–4–11
QRON03–5–10	QROT01–5–3
QRON03–5–11	QROT01–5–11
QRON03–5–12	QROT01–6–3
QRON03–5–13	QROT01–6–11
QRON03–5–14	QROT01–7–3
QRON03–5–15	QROT01–7–11
QRON03–6–0	QROT02–0–3
QRON03–6–1	QROT02–0–11
QRON03–6–2	QROT02–1–3
QRON03–6–3	QROT02–1–11
QRON03–6–4	QROT02–2–3
QRON03–6–5	QROT02–2–11
QRON03–6–6	QROT02–3–3
QRON03–6–7	QROT02–3–11
QRON03–6–8	QROT02–4–3
QRON03–6–9	QROT02–4–11
QRON03–6–10	QROT02–5–3
QRON03–6–11	QROT02–5–11
QRON03–6–12	QROT02–6–3
QRON03–6–13	QROT02–6–11
QRON03–6–14	QROT02–7–3
QRON03–6–15	QROT02–7–11
QRON03–7–0	QROT03–0–3
QRON03–7–1	QROT03–0–11
QRON03–7–2	QROT03–1–3
QRON03–7–3	QROT03–1–11
QRON03–7–4	QROT03–2–3
QRON03–7–5	QROT03–2–11
QRON03–7–6	QROT03–3–3
QRON03–7–7	QROT03–3–11
QRON03–7–8	QROT03–4–3
QRON03–7–9	QROT03–4–11
QRON03–7–10	QROT03–5–3
QRON03–7–11	QROT03–5–11
QRON03–7–12	QROT03–6–3
QRON03–7–13	QROT03–6–11
QRON03–7–14	QROT03–7–3
QRON03–7–15	QROT03–7–11

512 NODE CONFIGURATION

Figure E–3 Default Wiring Topology for 512-Port Federated Configuration (1 of 2)

Node Level Chassis 4

ORIGIN	DESTINATION
QR0N04–4–0	QR0T00–0–4
QR0N04–4–1	QR0T00–0–12
QR0N04–4–2	QR0T00–1–4
QR0N04–4–3	QR0T00–1–12
QR0N04–4–4	QR0T00–2–4
QR0N04–4–5	QR0T00–2–12
QR0N04–4–6	QR0T00–3–4
QR0N04–4–7	QR0T00–3–12
QR0N04–4–8	QR0T00–4–4
QR0N04–4–9	QR0T00–4–12
QR0N04–4–10	QR0T00–5–4
QR0N04–4–11	QR0T00–5–12
QR0N04–4–12	QR0T00–6–4
QR0N04–4–13	QR0T00–6–12
QR0N04–4–14	QR0T00–7–4
QR0N04–4–15	QR0T00–7–12
QR0N04–5–0	QR0T01–0–4
QR0N04–5–1	QR0T01–0–12
QR0N04–5–2	QR0T01–1–4
QR0N04–5–3	QR0T01–1–12
QR0N04–5–4	QR0T01–2–4
QR0N04–5–5	QR0T01–2–12
QR0N04–5–6	QR0T01–3–4
QR0N04–5–7	QR0T01–3–12
QR0N04–5–8	QR0T01–4–4
QR0N04–5–9	QR0T01–4–12
QR0N04–5–10	QR0T01–5–4
QR0N04–5–11	QR0T01–5–12
QR0N04–5–12	QR0T01–6–4
QR0N04–5–13	QR0T01–6–12
QR0N04–5–14	QR0T01–7–4
QR0N04–5–15	QR0T01–7–12
QR0N04–6–0	QR0T02–0–4
QR0N04–6–1	QR0T02–0–12
QR0N04–6–2	QR0T02–1–4
QR0N04–6–3	QR0T02–1–12
QR0N04–6–4	QR0T02–2–4
QR0N04–6–5	QR0T02–2–12
QR0N04–6–6	QR0T02–3–4
QR0N04–6–7	QR0T02–3–12
QR0N04–6–8	QR0T02–4–4
QR0N04–6–9	QR0T02–4–12
QR0N04–6–10	QR0T02–5–4
QR0N04–6–11	QR0T02–5–12
QR0N04–6–12	QR0T02–6–4
QR0N04–6–13	QR0T02–6–12
QR0N04–6–14	QR0T02–7–4
QR0N04–6–15	QR0T02–7–12
QR0N04–7–0	QR0T03–0–4
QR0N04–7–1	QR0T03–0–12
QR0N04–7–2	QR0T03–1–4
QR0N04–7–3	QR0T03–1–12
QR0N04–7–4	QR0T03–2–4
QR0N04–7–5	QR0T03–2–12
QR0N04–7–6	QR0T03–3–4
QR0N04–7–7	QR0T03–3–12
QR0N04–7–8	QR0T03–4–4
QR0N04–7–9	QR0T03–4–12
QR0N04–7–10	QR0T03–5–4
QR0N04–7–11	QR0T03–5–12
QR0N04–7–12	QR0T03–6–4
QR0N04–7–13	QR0T03–6–12
QR0N04–7–14	QR0T03–7–4
QR0N04–7–15	QR0T03–7–12

Node Level Chassis 5

ORIGIN	DESTINATION
QR0N05–4–0	QR0T00–0–5
QR0N05–4–1	QR0T00–0–13
QR0N05–4–2	QR0T00–1–5
QR0N05–4–3	QR0T00–1–13
QR0N05–4–4	QR0T00–2–5
QR0N05–4–5	QR0T00–2–13
QR0N05–4–6	QR0T00–3–5
QR0N05–4–7	QR0T00–3–13
QR0N05–4–8	QR0T00–4–5
QR0N05–4–9	QR0T00–4–13
QR0N05–4–10	QR0T00–5–5
QR0N05–4–11	QR0T00–5–13
QR0N05–4–12	QR0T00–6–5
QR0N05–4–13	QR0T00–6–13
QR0N05–4–14	QR0T00–7–5
QR0N05–4–15	QR0T00–7–13
QR0N05–5–0	QR0T01–0–5
QR0N05–5–1	QR0T01–0–13
QR0N05–5–2	QR0T01–1–5
QR0N05–5–3	QR0T01–1–13
QR0N05–5–4	QR0T01–2–5
QR0N05–5–5	QR0T01–2–13
QR0N05–5–6	QR0T01–3–5
QR0N05–5–7	QR0T01–3–13
QR0N05–5–8	QR0T01–4–5
QR0N05–5–9	QR0T01–4–13
QR0N05–5–10	QR0T01–5–5
QR0N05–5–11	QR0T01–5–13
QR0N05–5–12	QR0T01–6–5
QR0N05–5–13	QR0T01–6–13
QR0N05–5–14	QR0T01–7–5
QR0N05–5–15	QR0T01–7–13
QR0N05–6–0	QR0T02–0–5
QR0N05–6–1	QR0T02–0–13
QR0N05–6–2	QR0T02–1–5
QR0N05–6–3	QR0T02–1–13
QR0N05–6–4	QR0T02–2–5
QR0N05–6–5	QR0T02–2–13
QR0N05–6–6	QR0T02–3–5
QR0N05–6–7	QR0T02–3–13
QR0N05–6–8	QR0T02–4–5
QR0N05–6–9	QR0T02–4–13
QR0N05–6–10	QR0T02–5–5
QR0N05–6–11	QR0T02–5–13
QR0N05–6–12	QR0T02–6–5
QR0N05–6–13	QR0T02–6–13
QR0N05–6–14	QR0T02–7–5
QR0N05–6–15	QR0T02–7–13
QR0N05–7–0	QR0T03–0–5
QR0N05–7–1	QR0T03–0–13
QR0N05–7–2	QR0T03–1–5
QR0N05–7–3	QR0T03–1–13
QR0N05–7–4	QR0T03–2–5
QR0N05–7–5	QR0T03–2–13
QR0N05–7–6	QR0T03–3–5
QR0N05–7–7	QR0T03–3–13
QR0N05–7–8	QR0T03–4–5
QR0N05–7–9	QR0T03–4–13
QR0N05–7–10	QR0T03–5–5
QR0N05–7–11	QR0T03–5–13
QR0N05–7–12	QR0T03–6–5
QR0N05–7–13	QR0T03–6–13
QR0N05–7–14	QR0T03–7–5
QR0N05–7–15	QR0T03–7–13

Node Level Chassis 6

ORIGIN	DESTINATION
QR0N06–4–0	QR0T00–0–6
QR0N06–4–1	QR0T00–0–14
QR0N06–4–2	QR0T00–1–6
QR0N06–4–3	QR0T00–1–14
QR0N06–4–4	QR0T00–2–6
QR0N06–4–5	QR0T00–2–14
QR0N06–4–6	QR0T00–3–6
QR0N06–4–7	QR0T00–3–14
QR0N06–4–8	QR0T00–4–6
QR0N06–4–9	QR0T00–4–14
QR0N06–4–10	QR0T00–5–6
QR0N06–4–11	QR0T00–5–14
QR0N06–4–12	QR0T00–6–6
QR0N06–4–13	QR0T00–6–14
QR0N06–4–14	QR0T00–7–6
QR0N06–4–15	QR0T00–7–14
QR0N06–5–0	QR0T01–0–6
QR0N06–5–1	QR0T01–0–14
QR0N06–5–2	QR0T01–1–6
QR0N06–5–3	QR0T01–1–14
QR0N06–5–4	QR0T01–2–6
QR0N06–5–5	QR0T01–2–14
QR0N06–5–6	QR0T01–3–6
QR0N06–5–7	QR0T01–3–14
QR0N06–5–8	QR0T01–4–6
QR0N06–5–9	QR0T01–4–14
QR0N06–5–10	QR0T01–5–6
QR0N06–5–11	QR0T01–5–14
QR0N06–5–12	QR0T01–6–6
QR0N06–5–13	QR0T01–6–14
QR0N06–5–14	QR0T01–7–6
QR0N06–5–15	QR0T01–7–14
QR0N06–6–0	QR0T02–0–6
QR0N06–6–1	QR0T02–0–14
QR0N06–6–2	QR0T02–1–6
QR0N06–6–3	QR0T02–1–14
QR0N06–6–4	QR0T02–2–6
QR0N06–6–5	QR0T02–2–14
QR0N06–6–6	QR0T02–3–6
QR0N06–6–7	QR0T02–3–14
QR0N06–6–8	QR0T02–4–6
QR0N06–6–9	QR0T02–4–14
QR0N06–6–10	QR0T02–5–6
QR0N06–6–11	QR0T02–5–14
QR0N06–6–12	QR0T02–6–6
QR0N06–6–13	QR0T02–6–14
QR0N06–6–14	QR0T02–7–6
QR0N06–6–15	QR0T02–7–14
QR0N06–7–0	QR0T03–0–6
QR0N06–7–1	QR0T03–0–14
QR0N06–7–2	QR0T03–1–6
QR0N06–7–3	QR0T03–1–14
QR0N06–7–4	QR0T03–2–6
QR0N06–7–5	QR0T03–2–14
QR0N06–7–6	QR0T03–3–6
QR0N06–7–7	QR0T03–3–14
QR0N06–7–8	QR0T03–4–6
QR0N06–7–9	QR0T03–4–14
QR0N06–7–10	QR0T03–5–6
QR0N06–7–11	QR0T03–5–14
QR0N06–7–12	QR0T03–6–6
QR0N06–7–13	QR0T03–6–14
QR0N06–7–14	QR0T03–7–6
QR0N06–7–15	QR0T03–7–14

Node Level Chassis 7

ORIGIN	DESTINATION
QR0N07–4–0	QR0T00–0–7
QR0N07–4–1	QR0T00–0–15
QR0N07–4–2	QR0T00–1–7
QR0N07–4–3	QR0T00–1–15
QR0N07–4–4	QR0T00–2–7
QR0N07–4–5	QR0T00–2–15
QR0N07–4–6	QR0T00–3–7
QR0N07–4–7	QR0T00–3–15
QR0N07–4–8	QR0T00–4–7
QR0N07–4–9	QR0T00–4–15
QR0N07–4–10	QR0T00–5–7
QR0N07–4–11	QR0T00–5–15
QR0N07–4–12	QR0T00–6–7
QR0N07–4–13	QR0T00–6–15
QR0N07–4–14	QR0T00–7–7
QR0N07–4–15	QR0T00–7–15
QR0N07–5–0	QR0T01–0–7
QR0N07–5–1	QR0T01–0–15
QR0N07–5–2	QR0T01–1–7
QR0N07–5–3	QR0T01–1–15
QR0N07–5–4	QR0T01–2–7
QR0N07–5–5	QR0T01–2–15
QR0N07–5–6	QR0T01–3–7
QR0N07–5–7	QR0T01–3–15
QR0N07–5–8	QR0T01–4–7
QR0N07–5–9	QR0T01–4–15
QR0N07–5–10	QR0T01–5–7
QR0N07–5–11	QR0T01–5–15
QR0N07–5–12	QR0T01–6–7
QR0N07–5–13	QR0T01–6–15
QR0N07–5–14	QR0T01–7–7
QR0N07–5–15	QR0T01–7–15
QR0N07–6–0	QR0T02–0–7
QR0N07–6–1	QR0T02–0–15
QR0N07–6–2	QR0T02–1–7
QR0N07–6–3	QR0T02–1–15
QR0N07–6–4	QR0T02–2–7
QR0N07–6–5	QR0T02–2–15
QR0N07–6–6	QR0T02–3–7
QR0N07–6–7	QR0T02–3–15
QR0N07–6–8	QR0T02–4–7
QR0N07–6–9	QR0T02–4–15
QR0N07–6–10	QR0T02–5–7
QR0N07–6–11	QR0T02–5–15
QR0N07–6–12	QR0T02–6–7
QR0N07–6–13	QR0T02–6–15
QR0N07–6–14	QR0T02–7–7
QR0N07–6–15	QR0T02–7–15
QR0N07–7–0	QR0T03–0–7
QR0N07–7–1	QR0T03–0–15
QR0N07–7–2	QR0T03–1–7
QR0N07–7–3	QR0T03–1–15
QR0N07–7–4	QR0T03–2–7
QR0N07–7–5	QR0T03–2–15
QR0N07–7–6	QR0T03–3–7
QR0N07–7–7	QR0T03–3–15
QR0N07–7–8	QR0T03–4–7
QR0N07–7–9	QR0T03–4–15
QR0N07–7–10	QR0T03–5–7
QR0N07–7–11	QR0T03–5–15
QR0N07–7–12	QR0T03–6–7
QR0N07–7–13	QR0T03–6–15
QR0N07–7–14	QR0T03–7–7
QR0N07–7–15	QR0T03–7–15

512 NODE CONFIGURATION

Figure E–4 Default Wiring Topology for 512-Port Federated Configuration (2 of 2)

Node Level Chassis 0

ORIGIN	DESTINATION
QR0N00–4–0	QR0T00–0–0
QR0N00–4–1	QR0T00–1–0
QR0N00–4–2	QR0T00–2–0
QR0N00–4–3	QR0T00–3–0
QR0N00–4–4	QR0T00–4–0
QR0N00–4–5	QR0T00–5–0
QR0N00–4–6	QR0T00–6–0
QR0N00–4–7	QR0T00–7–0
QR0N00–4–8	QR0T01–0–0
QR0N00–4–9	QR0T01–1–0
QR0N00–4–10	QR0T01–2–0
QR0N00–4–11	QR0T01–3–0
QR0N00–4–12	QR0T01–4–0
QR0N00–4–13	QR0T01–5–0
QR0N00–4–14	QR0T01–6–0
QR0N00–4–15	QR0T01–7–0
QR0N00–5–0	QR0T02–0–0
QR0N00–5–1	QR0T02–1–0
QR0N00–5–2	QR0T02–2–0
QR0N00–5–3	QR0T02–3–0
QR0N00–5–4	QR0T02–4–0
QR0N00–5–5	QR0T02–5–0
QR0N00–5–6	QR0T02–6–0
QR0N00–5–7	QR0T02–7–0
QR0N00–5–8	QR0T03–0–0
QR0N00–5–9	QR0T03–1–0
QR0N00–5–10	QR0T03–2–0
QR0N00–5–11	QR0T03–3–0
QR0N00–5–12	QR0T03–4–0
QR0N00–5–13	QR0T03–5–0
QR0N00–5–14	QR0T03–6–0
QR0N00–5–15	QR0T03–7–0
QR0N00–6–0	QR0T04–0–0
QR0N00–6–1	QR0T04–1–0
QR0N00–6–2	QR0T04–2–0
QR0N00–6–3	QR0T04–3–0
QR0N00–6–4	QR0T04–4–0
QR0N00–6–5	QR0T04–5–0
QR0N00–6–6	QR0T04–6–0
QR0N00–6–7	QR0T04–7–0
QR0N00–6–8	QR0T05–0–0
QR0N00–6–9	QR0T05–1–0
QR0N00–6–10	QR0T05–2–0
QR0N00–6–11	QR0T05–3–0
QR0N00–6–12	QR0T05–4–0
QR0N00–6–13	QR0T05–5–0
QR0N00–6–14	QR0T05–6–0
QR0N00–6–15	QR0T05–7–0
QR0N00–7–0	QR0T06–0–0
QR0N00–7–1	QR0T06–1–0
QR0N00–7–2	QR0T06–2–0
QR0N00–7–3	QR0T06–3–0
QR0N00–7–4	QR0T06–4–0
QR0N00–7–5	QR0T06–5–0
QR0N00–7–6	QR0T06–6–0
QR0N00–7–7	QR0T06–7–0
QR0N00–7–8	QR0T07–0–0
QR0N00–7–9	QR0T07–1–0
QR0N00–7–10	QR0T07–2–0
QR0N00–7–11	QR0T07–3–0
QR0N00–7–12	QR0T07–4–0
QR0N00–7–13	QR0T07–5–0
QR0N00–7–14	QR0T07–6–0
QR0N00–7–15	QR0T07–7–0

Node Level Chassis 1

ORIGIN	DESTINATION
QR0N01–4–0	QR0T00–0–1
QR0N01–4–1	QR0T00–1–1
QR0N01–4–2	QR0T00–2–1
QR0N01–4–3	QR0T00–3–1
QR0N01–4–4	QR0T00–4–1
QR0N01–4–5	QR0T00–5–1
QR0N01–4–6	QR0T00–6–1
QR0N01–4–7	QR0T00–7–1
QR0N01–4–8	QR0T01–0–1
QR0N01–4–9	QR0T01–1–1
QR0N01–4–10	QR0T01–2–1
QR0N01–4–11	QR0T01–3–1
QR0N01–4–12	QR0T01–4–1
QR0N01–4–13	QR0T01–5–1
QR0N01–4–14	QR0T01–6–1
QR0N01–4–15	QR0T01–7–1
QR0N01–5–0	QR0T02–0–1
QR0N01–5–1	QR0T02–1–1
QR0N01–5–2	QR0T02–2–1
QR0N01–5–3	QR0T02–3–1
QR0N01–5–4	QR0T02–4–1
QR0N01–5–5	QR0T02–5–1
QR0N01–5–6	QR0T02–6–1
QR0N01–5–7	QR0T02–7–1
QR0N01–5–8	QR0T03–0–1
QR0N01–5–9	QR0T03–1–1
QR0N01–5–10	QR0T03–2–1
QR0N01–5–11	QR0T03–3–1
QR0N01–5–12	QR0T03–4–1
QR0N01–5–13	QR0T03–5–1
QR0N01–5–14	QR0T03–6–1
QR0N01–5–15	QR0T03–7–1
QR0N01–6–0	QR0T04–0–1
QR0N01–6–1	QR0T04–1–1
QR0N01–6–2	QR0T04–2–1
QR0N01–6–3	QR0T04–3–1
QR0N01–6–4	QR0T04–4–1
QR0N01–6–5	QR0T04–5–1
QR0N01–6–6	QR0T04–6–1
QR0N01–6–7	QR0T04–7–1
QR0N01–6–8	QR0T05–0–1
QR0N01–6–9	QR0T05–1–1
QR0N01–6–10	QR0T05–2–1
QR0N01–6–11	QR0T05–3–1
QR0N01–6–12	QR0T05–4–1
QR0N01–6–13	QR0T05–5–1
QR0N01–6–14	QR0T05–6–1
QR0N01–6–15	QR0T05–7–1
QR0N01–7–0	QR0T06–0–1
QR0N01–7–1	QR0T06–1–1
QR0N01–7–2	QR0T06–2–1
QR0N01–7–3	QR0T06–3–1
QR0N01–7–4	QR0T06–4–1
QR0N01–7–5	QR0T06–5–1
QR0N01–7–6	QR0T06–6–1
QR0N01–7–7	QR0T06–7–1
QR0N01–7–8	QR0T07–0–1
QR0N01–7–9	QR0T07–1–1
QR0N01–7–10	QR0T07–2–1
QR0N01–7–11	QR0T07–3–1
QR0N01–7–12	QR0T07–4–1
QR0N01–7–13	QR0T07–5–1
QR0N01–7–14	QR0T07–6–1
QR0N01–7–15	QR0T07–7–1

Node Level Chassis 2

ORIGIN	DESTINATION
QR0N02–4–0	QR0T00–0–2
QR0N02–4–1	QR0T00–1–2
QR0N02–4–2	QR0T00–2–2
QR0N02–4–3	QR0T00–3–2
QR0N02–4–4	QR0T00–4–2
QR0N02–4–5	QR0T00–5–2
QR0N02–4–6	QR0T00–6–2
QR0N02–4–7	QR0T00–7–2
QR0N02–4–8	QR0T01–0–2
QR0N02–4–9	QR0T01–1–2
QR0N02–4–10	QR0T01–2–2
QR0N02–4–11	QR0T01–3–2
QR0N02–4–12	QR0T01–4–2
QR0N02–4–13	QR0T01–5–2
QR0N02–4–14	QR0T01–6–2
QR0N02–4–15	QR0T01–7–2
QR0N02–5–0	QR0T02–0–2
QR0N02–5–1	QR0T02–1–2
QR0N02–5–2	QR0T02–2–2
QR0N02–5–3	QR0T02–3–2
QR0N02–5–4	QR0T02–4–2
QR0N02–5–5	QR0T02–5–2
QR0N02–5–6	QR0T02–6–2
QR0N02–5–7	QR0T02–7–2
QR0N02–5–8	QR0T03–0–2
QR0N02–5–9	QR0T03–1–2
QR0N02–5–10	QR0T03–2–2
QR0N02–5–11	QR0T03–3–2
QR0N02–5–12	QR0T03–4–2
QR0N02–5–13	QR0T03–5–2
QR0N02–5–14	QR0T03–6–2
QR0N02–5–15	QR0T03–7–2
QR0N02–6–0	QR0T04–0–2
QR0N02–6–1	QR0T04–1–2
QR0N02–6–2	QR0T04–2–2
QR0N02–6–3	QR0T04–3–2
QR0N02–6–4	QR0T04–4–2
QR0N02–6–5	QR0T04–5–2
QR0N02–6–6	QR0T04–6–2
QR0N02–6–7	QR0T04–7–2
QR0N02–6–8	QR0T05–0–2
QR0N02–6–9	QR0T05–1–2
QR0N02–6–10	QR0T05–2–2
QR0N02–6–11	QR0T05–3–2
QR0N02–6–12	QR0T05–4–2
QR0N02–6–13	QR0T05–5–2
QR0N02–6–14	QR0T05–6–2
QR0N02–6–15	QR0T05–7–2
QR0N02–7–0	QR0T06–0–2
QR0N02–7–1	QR0T06–1–2
QR0N02–7–2	QR0T06–2–2
QR0N02–7–3	QR0T06–3–2
QR0N02–7–4	QR0T06–4–2
QR0N02–7–5	QR0T06–5–2
QR0N02–7–6	QR0T06–6–2
QR0N02–7–7	QR0T06–7–2
QR0N02–7–8	QR0T07–0–2
QR0N02–7–9	QR0T07–1–2
QR0N02–7–10	QR0T07–2–2
QR0N02–7–11	QR0T07–3–2
QR0N02–7–12	QR0T07–4–2
QR0N02–7–13	QR0T07–5–2
QR0N02–7–14	QR0T07–6–2
QR0N02–7–15	QR0T07–7–2

Node Level Chassis 3

ORIGIN	DESTINATION
QR0N03–4–0	QR0T00–0–3
QR0N03–4–1	QR0T00–1–3
QR0N03–4–2	QR0T00–2–3
QR0N03–4–3	QR0T00–3–3
QR0N03–4–4	QR0T00–4–3
QR0N03–4–5	QR0T00–5–3
QR0N03–4–6	QR0T00–6–3
QR0N03–4–7	QR0T00–7–3
QR0N03–4–8	QR0T01–0–3
QR0N03–4–9	QR0T01–1–3
QR0N03–4–10	QR0T01–2–3
QR0N03–4–11	QR0T01–3–3
QR0N03–4–12	QR0T01–4–3
QR0N03–4–13	QR0T01–5–3
QR0N03–4–14	QR0T01–6–3
QR0N03–4–15	QR0T01–7–3
QR0N03–5–0	QR0T02–0–3
QR0N03–5–1	QR0T02–1–3
QR0N03–5–2	QR0T02–2–3
QR0N03–5–3	QR0T02–3–3
QR0N03–5–4	QR0T02–4–3
QR0N03–5–5	QR0T02–5–3
QR0N03–5–6	QR0T02–6–3
QR0N03–5–7	QR0T02–7–3
QR0N03–5–8	QR0T03–0–3
QR0N03–5–9	QR0T03–1–3
QR0N03–5–10	QR0T03–2–3
QR0N03–5–11	QR0T03–3–3
QR0N03–5–12	QR0T03–4–3
QR0N03–5–13	QR0T03–5–3
QR0N03–5–14	QR0T03–6–3
QR0N03–5–15	QR0T03–7–3
QR0N03–6–0	QR0T04–0–3
QR0N03–6–1	QR0T04–1–3
QR0N03–6–2	QR0T04–2–3
QR0N03–6–3	QR0T04–3–3
QR0N03–6–4	QR0T04–4–3
QR0N03–6–5	QR0T04–5–3
QR0N03–6–6	QR0T04–6–3
QR0N03–6–7	QR0T04–7–3
QR0N03–6–8	QR0T05–0–3
QR0N03–6–9	QR0T05–1–3
QR0N03–6–10	QR0T05–2–3
QR0N03–6–11	QR0T05–3–3
QR0N03–6–12	QR0T05–4–3
QR0N03–6–13	QR0T05–5–3
QR0N03–6–14	QR0T05–6–3
QR0N03–6–15	QR0T05–7–3
QR0N03–7–0	QR0T06–0–3
QR0N03–7–1	QR0T06–1–3
QR0N03–7–2	QR0T06–2–3
QR0N03–7–3	QR0T06–3–3
QR0N03–7–4	QR0T06–4–3
QR0N03–7–5	QR0T06–5–3
QR0N03–7–6	QR0T06–6–3
QR0N03–7–7	QR0T06–7–3
QR0N03–7–8	QR0T07–0–3
QR0N03–7–9	QR0T07–1–3
QR0N03–7–10	QR0T07–2–3
QR0N03–7–11	QR0T07–3–3
QR0N03–7–12	QR0T07–4–3
QR0N03–7–13	QR0T07–5–3
QR0N03–7–14	QR0T07–6–3
QR0N03–7–15	QR0T07–7–3

1024 NODE CONFIGURATION

Figure E–5 Default Wiring Topology for 1024-Port Federated Configuration (1 of 4)

Node Level Chassis 4

ORIGIN	DESTINATION
QRON04–4–0	QROT00–0–4
QRON04–4–1	QROT00–1–4
QRON04–4–2	QROT00–2–4
QRON04–4–3	QROT00–3–4
QRON04–4–4	QROT00–4–4
QRON04–4–5	QROT00–5–4
QRON04–4–6	QROT00–6–4
QRON04–4–7	QROT00–7–4
QRON04–4–8	QROT01–0–4
QRON04–4–9	QROT01–1–4
QRON04–4–10	QROT01–2–4
QRON04–4–11	QROT01–3–4
QRON04–4–12	QROT01–4–4
QRON04–4–13	QROT01–5–4
QRON04–4–14	QROT01–6–4
QRON04–4–15	QROT01–7–4
QRON04–5–0	QROT02–0–4
QRON04–5–1	QROT02–1–4
QRON04–5–2	QROT02–2–4
QRON04–5–3	QROT02–3–4
QRON04–5–4	QROT02–4–4
QRON04–5–5	QROT02–5–4
QRON04–5–6	QROT02–6–4
QRON04–5–7	QROT02–7–4
QRON04–5–8	QROT03–0–4
QRON04–5–9	QROT03–1–4
QRON04–5–10	QROT03–2–4
QRON04–5–11	QROT03–3–4
QRON04–5–12	QROT03–4–4
QRON04–5–13	QROT03–5–4
QRON04–5–14	QROT03–6–4
QRON04–5–15	QROT03–7–4
QRON04–6–0	QROT04–0–4
QRON04–6–1	QROT04–1–4
QRON04–6–2	QROT04–2–4
QRON04–6–3	QROT04–3–4
QRON04–6–4	QROT04–4–4
QRON04–6–5	QROT04–5–4
QRON04–6–6	QROT04–6–4
QRON04–6–7	QROT04–7–4
QRON04–6–8	QROT05–0–4
QRON04–6–9	QROT05–1–4
QRON04–6–10	QROT05–2–4
QRON04–6–11	QROT05–3–4
QRON04–6–12	QROT05–4–4
QRON04–6–13	QROT05–5–4
QRON04–6–14	QROT05–6–4
QRON04–6–15	QROT05–7–4
QRON04–7–0	QROT06–0–4
QRON04–7–1	QROT06–1–4
QRON04–7–2	QROT06–2–4
QRON04–7–3	QROT06–3–4
QRON04–7–4	QROT06–4–4
QRON04–7–5	QROT06–5–4
QRON04–7–6	QROT06–6–4
QRON04–7–7	QROT06–7–4
QRON04–7–8	QROT07–0–4
QRON04–7–9	QROT07–1–4
QRON04–7–10	QROT07–2–4
QRON04–7–11	QROT07–3–4
QRON04–7–12	QROT07–4–4
QRON04–7–13	QROT07–5–4
QRON04–7–14	QROT07–6–4
QRON04–7–15	QROT07–7–4

Node Level Chassis 5

ORIGIN	DESTINATION
QRON05–4–0	QROT00–0–5
QRON05–4–1	QROT00–1–5
QRON05–4–2	QROT00–2–5
QRON05–4–3	QROT00–3–5
QRON05–4–4	QROT00–4–5
QRON05–4–5	QROT00–5–5
QRON05–4–6	QROT00–6–5
QRON05–4–7	QROT00–7–5
QRON05–4–8	QROT01–0–5
QRON05–4–9	QROT01–1–5
QRON05–4–10	QROT01–2–5
QRON05–4–11	QROT01–3–5
QRON05–4–12	QROT01–4–5
QRON05–4–13	QROT01–5–5
QRON05–4–14	QROT01–6–5
QRON05–4–15	QROT01–7–5
QRON05–5–0	QROT02–0–5
QRON05–5–1	QROT02–1–5
QRON05–5–2	QROT02–2–5
QRON05–5–3	QROT02–3–5
QRON05–5–4	QROT02–4–5
QRON05–5–5	QROT02–5–5
QRON05–5–6	QROT02–6–5
QRON05–5–7	QROT02–7–5
QRON05–5–8	QROT03–0–5
QRON05–5–9	QROT03–1–5
QRON05–5–10	QROT03–2–5
QRON05–5–11	QROT03–3–5
QRON05–5–12	QROT03–4–5
QRON05–5–13	QROT03–5–5
QRON05–5–14	QROT03–6–5
QRON05–5–15	QROT03–7–5
QRON05–6–0	QROT04–0–5
QRON05–6–1	QROT04–1–5
QRON05–6–2	QROT04–2–5
QRON05–6–3	QROT04–3–5
QRON05–6–4	QROT04–4–5
QRON05–6–5	QROT04–5–5
QRON05–6–6	QROT04–6–5
QRON05–6–7	QROT04–7–5
QRON05–6–8	QROT05–0–5
QRON05–6–9	QROT05–1–5
QRON05–6–10	QROT05–2–5
QRON05–6–11	QROT05–3–5
QRON05–6–12	QROT05–4–5
QRON05–6–13	QROT05–5–5
QRON05–6–14	QROT05–6–5
QRON05–6–15	QROT05–7–5
QRON05–7–0	QROT06–0–5
QRON05–7–1	QROT06–1–5
QRON05–7–2	QROT06–2–5
QRON05–7–3	QROT06–3–5
QRON05–7–4	QROT06–4–5
QRON05–7–5	QROT06–5–5
QRON05–7–6	QROT06–6–5
QRON05–7–7	QROT06–7–5
QRON05–7–8	QROT07–0–5
QRON05–7–9	QROT07–1–5
QRON05–7–10	QROT07–2–5
QRON05–7–11	QROT07–3–5
QRON05–7–12	QROT07–4–5
QRON05–7–13	QROT07–5–5
QRON05–7–14	QROT07–6–5
QRON05–7–15	QROT07–7–5

Node Level Chassis 6

ORIGIN	DESTINATION
QRON06–4–0	QROT00–0–6
QRON06–4–1	QROT00–1–6
QRON06–4–2	QROT00–2–6
QRON06–4–3	QROT00–3–6
QRON06–4–4	QROT00–4–6
QRON06–4–5	QROT00–5–6
QRON06–4–6	QROT00–6–6
QRON06–4–7	QROT00–7–6
QRON06–4–8	QROT01–0–6
QRON06–4–9	QROT01–1–6
QRON06–4–10	QROT01–2–6
QRON06–4–11	QROT01–3–6
QRON06–4–12	QROT01–4–6
QRON06–4–13	QROT01–5–6
QRON06–4–14	QROT01–6–6
QRON06–4–15	QROT01–7–6
QRON06–5–0	QROT02–0–6
QRON06–5–1	QROT02–1–6
QRON06–5–2	QROT02–2–6
QRON06–5–3	QROT02–3–6
QRON06–5–4	QROT02–4–6
QRON06–5–5	QROT02–5–6
QRON06–5–6	QROT02–6–6
QRON06–5–7	QROT02–7–6
QRON06–5–8	QROT03–0–6
QRON06–5–9	QROT03–1–6
QRON06–5–10	QROT03–2–6
QRON06–5–11	QROT03–3–6
QRON06–5–12	QROT03–4–6
QRON06–5–13	QROT03–5–6
QRON06–5–14	QROT03–6–6
QRON06–5–15	QROT03–7–6
QRON06–6–0	QROT04–0–6
QRON06–6–1	QROT04–1–6
QRON06–6–2	QROT04–2–6
QRON06–6–3	QROT04–3–6
QRON06–6–4	QROT04–4–6
QRON06–6–5	QROT04–5–6
QRON06–6–6	QROT04–6–6
QRON06–6–7	QROT04–7–6
QRON06–6–8	QROT05–0–6
QRON06–6–9	QROT05–1–6
QRON06–6–10	QROT05–2–6
QRON06–6–11	QROT05–3–6
QRON06–6–12	QROT05–4–6
QRON06–6–13	QROT05–5–6
QRON06–6–14	QROT05–6–6
QRON06–6–15	QROT05–7–6
QRON06–7–0	QROT06–0–6
QRON06–7–1	QROT06–1–6
QRON06–7–2	QROT06–2–6
QRON06–7–3	QROT06–3–6
QRON06–7–4	QROT06–4–6
QRON06–7–5	QROT06–5–6
QRON06–7–6	QROT06–6–6
QRON06–7–7	QROT06–7–6
QRON06–7–8	QROT07–0–6
QRON06–7–9	QROT07–1–6
QRON06–7–10	QROT07–2–6
QRON06–7–11	QROT07–3–6
QRON06–7–12	QROT07–4–6
QRON06–7–13	QROT07–5–6
QRON06–7–14	QROT07–6–6
QRON06–7–15	QROT07–7–6

Node Level Chassis 7

ORIGIN	DESTINATION
QRON07–4–0	QROT00–0–7
QRON07–4–1	QROT00–1–7
QRON07–4–2	QROT00–2–7
QRON07–4–3	QROT00–3–7
QRON07–4–4	QROT00–4–7
QRON07–4–5	QROT00–5–7
QRON07–4–6	QROT00–6–7
QRON07–4–7	QROT00–7–7
QRON07–4–8	QROT01–0–7
QRON07–4–9	QROT01–1–7
QRON07–4–10	QROT01–2–7
QRON07–4–11	QROT01–3–7
QRON07–4–12	QROT01–4–7
QRON07–4–13	QROT01–5–7
QRON07–4–14	QROT01–6–7
QRON07–4–15	QROT01–7–7
QRON07–5–0	QROT02–0–7
QRON07–5–1	QROT02–1–7
QRON07–5–2	QROT02–2–7
QRON07–5–3	QROT02–3–7
QRON07–5–4	QROT02–4–7
QRON07–5–5	QROT02–5–7
QRON07–5–6	QROT02–6–7
QRON07–5–7	QROT02–7–7
QRON07–5–8	QROT03–0–7
QRON07–5–9	QROT03–1–7
QRON07–5–10	QROT03–2–7
QRON07–5–11	QROT03–3–7
QRON07–5–12	QROT03–4–7
QRON07–5–13	QROT03–5–7
QRON07–5–14	QROT03–6–7
QRON07–5–15	QROT03–7–7
QRON07–6–0	QROT04–0–7
QRON07–6–1	QROT04–1–7
QRON07–6–2	QROT04–2–7
QRON07–6–3	QROT04–3–7
QRON07–6–4	QROT04–4–7
QRON07–6–5	QROT04–5–7
QRON07–6–6	QROT04–6–7
QRON07–6–7	QROT04–7–7
QRON07–6–8	QROT05–0–7
QRON07–6–9	QROT05–1–7
QRON07–6–10	QROT05–2–7
QRON07–6–11	QROT05–3–7
QRON07–6–12	QROT05–4–7
QRON07–6–13	QROT05–5–7
QRON07–6–14	QROT05–6–7
QRON07–6–15	QROT05–7–7
QRON07–7–0	QROT06–0–7
QRON07–7–1	QROT06–1–7
QRON07–7–2	QROT06–2–7
QRON07–7–3	QROT06–3–7
QRON07–7–4	QROT06–4–7
QRON07–7–5	QROT06–5–7
QRON07–7–6	QROT06–6–7
QRON07–7–7	QROT06–7–7
QRON07–7–8	QROT07–0–7
QRON07–7–9	QROT07–1–7
QRON07–7–10	QROT07–2–7
QRON07–7–11	QROT07–3–7
QRON07–7–12	QROT07–4–7
QRON07–7–13	QROT07–5–7
QRON07–7–14	QROT07–6–7
QRON07–7–15	QROT07–7–7

1024 NODE CONFIGURATION

Figure E–6 Default Wiring Topology for 1024-Port Federated Configuration (2 of 4)

Node Level Chassis 8

ORIGIN	DESTINATION
QR0N08–4–0	QR0T00–0–8
QR0N08–4–1	QR0T00–1–8
QR0N08–4–2	QR0T00–2–8
QR0N08–4–3	QR0T00–3–8
QR0N08–4–4	QR0T00–4–8
QR0N08–4–5	QR0T00–5–8
QR0N08–4–6	QR0T00–6–8
QR0N08–4–7	QR0T00–7–8
QR0N08–4–8	QR0T01–0–8
QR0N08–4–9	QR0T01–1–8
QR0N08–4–10	QR0T01–2–8
QR0N08–4–11	QR0T01–3–8
QR0N08–4–12	QR0T01–4–8
QR0N08–4–13	QR0T01–5–8
QR0N08–4–14	QR0T01–6–8
QR0N08–4–15	QR0T01–7–8
QR0N08–5–0	QR0T02–0–8
QR0N08–5–1	QR0T02–1–8
QR0N08–5–2	QR0T02–2–8
QR0N08–5–3	QR0T02–3–8
QR0N08–5–4	QR0T02–4–8
QR0N08–5–5	QR0T02–5–8
QR0N08–5–6	QR0T02–6–8
QR0N08–5–7	QR0T02–7–8
QR0N08–5–8	QR0T03–0–8
QR0N08–5–9	QR0T03–1–8
QR0N08–5–10	QR0T03–2–8
QR0N08–5–11	QR0T03–3–8
QR0N08–5–12	QR0T03–4–8
QR0N08–5–13	QR0T03–5–8
QR0N08–5–14	QR0T03–6–8
QR0N08–5–15	QR0T03–7–8
QR0N08–6–0	QR0T04–0–8
QR0N08–6–1	QR0T04–1–8
QR0N08–6–2	QR0T04–2–8
QR0N08–6–3	QR0T04–3–8
QR0N08–6–4	QR0T04–4–8
QR0N08–6–5	QR0T04–5–8
QR0N08–6–6	QR0T04–6–8
QR0N08–6–7	QR0T04–7–8
QR0N08–6–8	QR0T05–0–8
QR0N08–6–9	QR0T05–1–8
QR0N08–6–10	QR0T05–2–8
QR0N08–6–11	QR0T05–3–8
QR0N08–6–12	QR0T05–4–8
QR0N08–6–13	QR0T05–5–8
QR0N08–6–14	QR0T05–6–8
QR0N08–6–15	QR0T05–7–8
QR0N08–7–0	QR0T06–0–8
QR0N08–7–1	QR0T06–1–8
QR0N08–7–2	QR0T06–2–8
QR0N08–7–3	QR0T06–3–8
QR0N08–7–4	QR0T06–4–8
QR0N08–7–5	QR0T06–5–8
QR0N08–7–6	QR0T06–6–8
QR0N08–7–7	QR0T06–7–8
QR0N08–7–8	QR0T07–0–8
QR0N08–7–9	QR0T07–1–8
QR0N08–7–10	QR0T07–2–8
QR0N08–7–11	QR0T07–3–8
QR0N08–7–12	QR0T07–4–8
QR0N08–7–13	QR0T07–5–8
QR0N08–7–14	QR0T07–6–8
QR0N08–7–15	QR0T07–7–8

Node Level Chassis 9

ORIGIN	DESTINATION
QR0N09–4–0	QR0T00–0–9
QR0N09–4–1	QR0T00–1–9
QR0N09–4–2	QR0T00–2–9
QR0N09–4–3	QR0T00–3–9
QR0N09–4–4	QR0T00–4–9
QR0N09–4–5	QR0T00–5–9
QR0N09–4–6	QR0T00–6–9
QR0N09–4–7	QR0T00–7–9
QR0N09–4–8	QR0T01–0–9
QR0N09–4–9	QR0T01–1–9
QR0N09–4–10	QR0T01–2–9
QR0N09–4–11	QR0T01–3–9
QR0N09–4–12	QR0T01–4–9
QR0N09–4–13	QR0T01–5–9
QR0N09–4–14	QR0T01–6–9
QR0N09–4–15	QR0T01–7–9
QR0N09–5–0	QR0T02–0–9
QR0N09–5–1	QR0T02–1–9
QR0N09–5–2	QR0T02–2–9
QR0N09–5–3	QR0T02–3–9
QR0N09–5–4	QR0T02–4–9
QR0N09–5–5	QR0T02–5–9
QR0N09–5–6	QR0T02–6–9
QR0N09–5–7	QR0T02–7–9
QR0N09–5–8	QR0T03–0–9
QR0N09–5–9	QR0T03–1–9
QR0N09–5–10	QR0T03–2–9
QR0N09–5–11	QR0T03–3–9
QR0N09–5–12	QR0T03–4–9
QR0N09–5–13	QR0T03–5–9
QR0N09–5–14	QR0T03–6–9
QR0N09–5–15	QR0T03–7–9
QR0N09–6–0	QR0T04–0–9
QR0N09–6–1	QR0T04–1–9
QR0N09–6–2	QR0T04–2–9
QR0N09–6–3	QR0T04–3–9
QR0N09–6–4	QR0T04–4–9
QR0N09–6–5	QR0T04–5–9
QR0N09–6–6	QR0T04–6–9
QR0N09–6–7	QR0T04–7–9
QR0N09–6–8	QR0T05–0–9
QR0N09–6–9	QR0T05–1–9
QR0N09–6–10	QR0T05–2–9
QR0N09–6–11	QR0T05–3–9
QR0N09–6–12	QR0T05–4–9
QR0N09–6–13	QR0T05–5–9
QR0N09–6–14	QR0T05–6–9
QR0N09–6–15	QR0T05–7–9
QR0N09–7–0	QR0T06–0–9
QR0N09–7–1	QR0T06–1–9
QR0N09–7–2	QR0T06–2–9
QR0N09–7–3	QR0T06–3–9
QR0N09–7–4	QR0T06–4–9
QR0N09–7–5	QR0T06–5–9
QR0N09–7–6	QR0T06–6–9
QR0N09–7–7	QR0T06–7–9
QR0N09–7–8	QR0T07–0–9
QR0N09–7–9	QR0T07–1–9
QR0N09–7–10	QR0T07–2–9
QR0N09–7–11	QR0T07–3–9
QR0N09–7–12	QR0T07–4–9
QR0N09–7–13	QR0T07–5–9
QR0N09–7–14	QR0T07–6–9
QR0N09–7–15	QR0T07–7–9

Node Level Chassis 10

ORIGIN	DESTINATION
QR0N10–4–0	QR0T00–0–10
QR0N10–4–1	QR0T00–1–10
QR0N10–4–2	QR0T00–2–10
QR0N10–4–3	QR0T00–3–10
QR0N10–4–4	QR0T00–4–10
QR0N10–4–5	QR0T00–5–10
QR0N10–4–6	QR0T00–6–10
QR0N10–4–7	QR0T00–7–10
QR0N10–4–8	QR0T01–0–10
QR0N10–4–9	QR0T01–1–10
QR0N10–4–10	QR0T01–2–10
QR0N10–4–11	QR0T01–3–10
QR0N10–4–12	QR0T01–4–10
QR0N10–4–13	QR0T01–5–10
QR0N10–4–14	QR0T01–6–10
QR0N10–4–15	QR0T01–7–10
QR0N10–5–0	QR0T02–0–10
QR0N10–5–1	QR0T02–1–10
QR0N10–5–2	QR0T02–2–10
QR0N10–5–3	QR0T02–3–10
QR0N10–5–4	QR0T02–4–10
QR0N10–5–5	QR0T02–5–10
QR0N10–5–6	QR0T02–6–10
QR0N10–5–7	QR0T02–7–10
QR0N10–5–8	QR0T03–0–10
QR0N10–5–9	QR0T03–1–10
QR0N10–5–10	QR0T03–2–10
QR0N10–5–11	QR0T03–3–10
QR0N10–5–12	QR0T03–4–10
QR0N10–5–13	QR0T03–5–10
QR0N10–5–14	QR0T03–6–10
QR0N10–5–15	QR0T03–7–10
QR0N10–6–0	QR0T04–0–10
QR0N10–6–1	QR0T04–1–10
QR0N10–6–2	QR0T04–2–10
QR0N10–6–3	QR0T04–3–10
QR0N10–6–4	QR0T04–4–10
QR0N10–6–5	QR0T04–5–10
QR0N10–6–6	QR0T04–6–10
QR0N10–6–7	QR0T04–7–10
QR0N10–6–8	QR0T05–0–10
QR0N10–6–9	QR0T05–1–10
QR0N10–6–10	QR0T05–2–10
QR0N10–6–11	QR0T05–3–10
QR0N10–6–12	QR0T05–4–10
QR0N10–6–13	QR0T05–5–10
QR0N10–6–14	QR0T05–6–10
QR0N10–6–15	QR0T05–7–10
QR0N10–7–0	QR0T06–0–10
QR0N10–7–1	QR0T06–1–10
QR0N10–7–2	QR0T06–2–10
QR0N10–7–3	QR0T06–3–10
QR0N10–7–4	QR0T06–4–10
QR0N10–7–5	QR0T06–5–10
QR0N10–7–6	QR0T06–6–10
QR0N10–7–7	QR0T06–7–10
QR0N10–7–8	QR0T07–0–10
QR0N10–7–9	QR0T07–1–10
QR0N10–7–10	QR0T07–2–10
QR0N10–7–11	QR0T07–3–10
QR0N10–7–12	QR0T07–4–10
QR0N10–7–13	QR0T07–5–10
QR0N10–7–14	QR0T07–6–10
QR0N10–7–15	QR0T07–7–10

Node Level Chassis 11

ORIGIN	DESTINATION
QR0N11–4–0	QR0T00–0–11
QR0N11–4–1	QR0T00–1–11
QR0N11–4–2	QR0T00–2–11
QR0N11–4–3	QR0T00–3–11
QR0N11–4–4	QR0T00–4–11
QR0N11–4–5	QR0T00–5–11
QR0N11–4–6	QR0T00–6–11
QR0N11–4–7	QR0T00–7–11
QR0N11–4–8	QR0T01–0–11
QR0N11–4–9	QR0T01–1–11
QR0N11–4–10	QR0T01–2–11
QR0N11–4–11	QR0T01–3–11
QR0N11–4–12	QR0T01–4–11
QR0N11–4–13	QR0T01–5–11
QR0N11–4–14	QR0T01–6–11
QR0N11–4–15	QR0T01–7–11
QR0N11–5–0	QR0T02–0–11
QR0N11–5–1	QR0T02–1–11
QR0N11–5–2	QR0T02–2–11
QR0N11–5–3	QR0T02–3–11
QR0N11–5–4	QR0T02–4–11
QR0N11–5–5	QR0T02–5–11
QR0N11–5–6	QR0T02–6–11
QR0N11–5–7	QR0T02–7–11
QR0N11–5–8	QR0T03–0–11
QR0N11–5–9	QR0T03–1–11
QR0N11–5–10	QR0T03–2–11
QR0N11–5–11	QR0T03–3–11
QR0N11–5–12	QR0T03–4–11
QR0N11–5–13	QR0T03–5–11
QR0N11–5–14	QR0T03–6–11
QR0N11–5–15	QR0T03–7–11
QR0N11–6–0	QR0T04–0–11
QR0N11–6–1	QR0T04–1–11
QR0N11–6–2	QR0T04–2–11
QR0N11–6–3	QR0T04–3–11
QR0N11–6–4	QR0T04–4–11
QR0N11–6–5	QR0T04–5–11
QR0N11–6–6	QR0T04–6–11
QR0N11–6–7	QR0T04–7–11
QR0N11–6–8	QR0T05–0–11
QR0N11–6–9	QR0T05–1–11
QR0N11–6–10	QR0T05–2–11
QR0N11–6–11	QR0T05–3–11
QR0N11–6–12	QR0T05–4–11
QR0N11–6–13	QR0T05–5–11
QR0N11–6–14	QR0T05–6–11
QR0N11–6–15	QR0T05–7–11
QR0N11–7–0	QR0T06–0–11
QR0N11–7–1	QR0T06–1–11
QR0N11–7–2	QR0T06–2–11
QR0N11–7–3	QR0T06–3–11
QR0N11–7–4	QR0T06–4–11
QR0N11–7–5	QR0T06–5–11
QR0N11–7–6	QR0T06–6–11
QR0N11–7–7	QR0T06–7–11
QR0N11–7–8	QR0T07–0–11
QR0N11–7–9	QR0T07–1–11
QR0N11–7–10	QR0T07–2–11
QR0N11–7–11	QR0T07–3–11
QR0N11–7–12	QR0T07–4–11
QR0N11–7–13	QR0T07–5–11
QR0N11–7–14	QR0T07–6–11
QR0N11–7–15	QR0T07–7–11

1024 NODE CONFIGURATION

Figure E–7 Default Wiring Topology for 1024-Port Federated Configuration (3 of 4)

Node Level Chassis 12

ORIGIN	DESTINATION
QR0N12–4–0	QR0T00–0–12
QR0N12–4–1	QR0T00–1–12
QR0N12–4–2	QR0T00–2–12
QR0N12–4–3	QR0T00–3–12
QR0N12–4–4	QR0T00–4–12
QR0N12–4–5	QR0T00–5–12
QR0N12–4–6	QR0T00–6–12
QR0N12–4–7	QR0T00–7–12
QR0N12–4–8	QR0T01–0–12
QR0N12–4–9	QR0T01–1–12
QR0N12–4–10	QR0T01–2–12
QR0N12–4–11	QR0T01–3–12
QR0N12–4–12	QR0T01–4–12
QR0N12–4–13	QR0T01–5–12
QR0N12–4–14	QR0T01–6–12
QR0N12–4–15	QR0T01–7–12
QR0N12–5–0	QR0T02–0–12
QR0N12–5–1	QR0T02–1–12
QR0N12–5–2	QR0T02–2–12
QR0N12–5–3	QR0T02–3–12
QR0N12–5–4	QR0T02–4–12
QR0N12–5–5	QR0T02–5–12
QR0N12–5–6	QR0T02–6–12
QR0N12–5–7	QR0T02–7–12
QR0N12–5–8	QR0T03–0–12
QR0N12–5–9	QR0T03–1–12
QR0N12–5–10	QR0T03–2–12
QR0N12–5–11	QR0T03–3–12
QR0N12–5–12	QR0T03–4–12
QR0N12–5–13	QR0T03–5–12
QR0N12–5–14	QR0T03–6–12
QR0N12–5–15	QR0T03–7–12
QR0N12–6–0	QR0T04–0–12
QR0N12–6–1	QR0T04–1–12
QR0N12–6–2	QR0T04–2–12
QR0N12–6–3	QR0T04–3–12
QR0N12–6–4	QR0T04–4–12
QR0N12–6–5	QR0T04–5–12
QR0N12–6–6	QR0T04–6–12
QR0N12–6–7	QR0T04–7–12
QR0N12–6–8	QR0T05–0–12
QR0N12–6–9	QR0T05–1–12
QR0N12–6–10	QR0T05–2–12
QR0N12–6–11	QR0T05–3–12
QR0N12–6–12	QR0T05–4–12
QR0N12–6–13	QR0T05–5–12
QR0N12–6–14	QR0T05–6–12
QR0N12–6–15	QR0T05–7–12
QR0N12–7–0	QR0T06–0–12
QR0N12–7–1	QR0T06–1–12
QR0N12–7–2	QR0T06–2–12
QR0N12–7–3	QR0T06–3–12
QR0N12–7–4	QR0T06–4–12
QR0N12–7–5	QR0T06–5–12
QR0N12–7–6	QR0T06–6–12
QR0N12–7–7	QR0T06–7–12
QR0N12–7–8	QR0T07–0–12
QR0N12–7–9	QR0T07–1–12
QR0N12–7–10	QR0T07–2–12
QR0N12–7–11	QR0T07–3–12
QR0N12–7–12	QR0T07–4–12
QR0N12–7–13	QR0T07–5–12
QR0N12–7–14	QR0T07–6–12
QR0N12–7–15	QR0T07–7–12

Node Level Chassis 13

ORIGIN	DESTINATION
QR0N13–4–0	QR0T00–0–13
QR0N13–4–1	QR0T00–1–13
QR0N13–4–2	QR0T00–2–13
QR0N13–4–3	QR0T00–3–13
QR0N13–4–4	QR0T00–4–13
QR0N13–4–5	QR0T00–5–13
QR0N13–4–6	QR0T00–6–13
QR0N13–4–7	QR0T00–7–13
QR0N13–4–8	QR0T01–0–13
QR0N13–4–9	QR0T01–1–13
QR0N13–4–10	QR0T01–2–13
QR0N13–4–11	QR0T01–3–13
QR0N13–4–12	QR0T01–4–13
QR0N13–4–13	QR0T01–5–13
QR0N13–4–14	QR0T01–6–13
QR0N13–4–15	QR0T01–7–13
QR0N13–5–0	QR0T02–0–13
QR0N13–5–1	QR0T02–1–13
QR0N13–5–2	QR0T02–2–13
QR0N13–5–3	QR0T02–3–13
QR0N13–5–4	QR0T02–4–13
QR0N13–5–5	QR0T02–5–13
QR0N13–5–6	QR0T02–6–13
QR0N13–5–7	QR0T02–7–13
QR0N13–5–8	QR0T03–0–13
QR0N13–5–9	QR0T03–1–13
QR0N13–5–10	QR0T03–2–13
QR0N13–5–11	QR0T03–3–13
QR0N13–5–12	QR0T03–4–13
QR0N13–5–13	QR0T03–5–13
QR0N13–5–14	QR0T03–6–13
QR0N13–5–15	QR0T03–7–13
QR0N13–6–0	QR0T04–0–13
QR0N13–6–1	QR0T04–1–13
QR0N13–6–2	QR0T04–2–13
QR0N13–6–3	QR0T04–3–13
QR0N13–6–4	QR0T04–4–13
QR0N13–6–5	QR0T04–5–13
QR0N13–6–6	QR0T04–6–13
QR0N13–6–7	QR0T04–7–13
QR0N13–6–8	QR0T05–0–13
QR0N13–6–9	QR0T05–1–13
QR0N13–6–10	QR0T05–2–13
QR0N13–6–11	QR0T05–3–13
QR0N13–6–12	QR0T05–4–13
QR0N13–6–13	QR0T05–5–13
QR0N13–6–14	QR0T05–6–13
QR0N13–6–15	QR0T05–7–13
QR0N13–7–0	QR0T06–0–13
QR0N13–7–1	QR0T06–1–13
QR0N13–7–2	QR0T06–2–13
QR0N13–7–3	QR0T06–3–13
QR0N13–7–4	QR0T06–4–13
QR0N13–7–5	QR0T06–5–13
QR0N13–7–6	QR0T06–6–13
QR0N13–7–7	QR0T06–7–13
QR0N13–7–8	QR0T07–0–13
QR0N13–7–9	QR0T07–1–13
QR0N13–7–10	QR0T07–2–13
QR0N13–7–11	QR0T07–3–13
QR0N13–7–12	QR0T07–4–13
QR0N13–7–13	QR0T07–5–13
QR0N13–7–14	QR0T07–6–13
QR0N13–7–15	QR0T07–7–13

Node Level Chassis 14

ORIGIN	DESTINATION
QR0N14–4–0	QR0T00–0–14
QR0N14–4–1	QR0T00–1–14
QR0N14–4–2	QR0T00–2–14
QR0N14–4–3	QR0T00–3–14
QR0N14–4–4	QR0T00–4–14
QR0N14–4–5	QR0T00–5–14
QR0N14–4–6	QR0T00–6–14
QR0N14–4–7	QR0T00–7–14
QR0N14–4–8	QR0T01–0–14
QR0N14–4–9	QR0T01–1–14
QR0N14–4–10	QR0T01–2–14
QR0N14–4–11	QR0T01–3–14
QR0N14–4–12	QR0T01–4–14
QR0N14–4–13	QR0T01–5–14
QR0N14–4–14	QR0T01–6–14
QR0N14–4–15	QR0T01–7–14
QR0N14–5–0	QR0T02–0–14
QR0N14–5–1	QR0T02–1–14
QR0N14–5–2	QR0T02–2–14
QR0N14–5–3	QR0T02–3–14
QR0N14–5–4	QR0T02–4–14
QR0N14–5–5	QR0T02–5–14
QR0N14–5–6	QR0T02–6–14
QR0N14–5–7	QR0T02–7–14
QR0N14–5–8	QR0T03–0–14
QR0N14–5–9	QR0T03–1–14
QR0N14–5–10	QR0T03–2–14
QR0N14–5–11	QR0T03–3–14
QR0N14–5–12	QR0T03–4–14
QR0N14–5–13	QR0T03–5–14
QR0N14–5–14	QR0T03–6–14
QR0N14–5–15	QR0T03–7–14
QR0N14–6–0	QR0T04–0–14
QR0N14–6–1	QR0T04–1–14
QR0N14–6–2	QR0T04–2–14
QR0N14–6–3	QR0T04–3–14
QR0N14–6–4	QR0T04–4–14
QR0N14–6–5	QR0T04–5–14
QR0N14–6–6	QR0T04–6–14
QR0N14–6–7	QR0T04–7–14
QR0N14–6–8	QR0T05–0–14
QR0N14–6–9	QR0T05–1–14
QR0N14–6–10	QR0T05–2–14
QR0N14–6–11	QR0T05–3–14
QR0N14–6–12	QR0T05–4–14
QR0N14–6–13	QR0T05–5–14
QR0N14–6–14	QR0T05–6–14
QR0N14–6–15	QR0T05–7–14
QR0N14–7–0	QR0T06–0–14
QR0N14–7–1	QR0T06–1–14
QR0N14–7–2	QR0T06–2–14
QR0N14–7–3	QR0T06–3–14
QR0N14–7–4	QR0T06–4–14
QR0N14–7–5	QR0T06–5–14
QR0N14–7–6	QR0T06–6–14
QR0N14–7–7	QR0T06–7–14
QR0N14–7–8	QR0T07–0–14
QR0N14–7–9	QR0T07–1–14
QR0N14–7–10	QR0T07–2–14
QR0N14–7–11	QR0T07–3–14
QR0N14–7–12	QR0T07–4–14
QR0N14–7–13	QR0T07–5–14
QR0N14–7–14	QR0T07–6–14
QR0N14–7–15	QR0T07–7–14

Node Level Chassis 15

ORIGIN	DESTINATION
QR0N15–4–0	QR0T00–0–15
QR0N15–4–1	QR0T00–1–15
QR0N15–4–2	QR0T00–2–15
QR0N15–4–3	QR0T00–3–15
QR0N15–4–4	QR0T00–4–15
QR0N15–4–5	QR0T00–5–15
QR0N15–4–6	QR0T00–6–15
QR0N15–4–7	QR0T00–7–15
QR0N15–4–8	QR0T01–0–15
QR0N15–4–9	QR0T01–1–15
QR0N15–4–10	QR0T01–2–15
QR0N15–4–11	QR0T01–3–15
QR0N15–4–12	QR0T01–4–15
QR0N15–4–13	QR0T01–5–15
QR0N15–4–14	QR0T01–6–15
QR0N15–4–15	QR0T01–7–15
QR0N15–5–0	QR0T02–0–15
QR0N15–5–1	QR0T02–1–15
QR0N15–5–2	QR0T02–2–15
QR0N15–5–3	QR0T02–3–15
QR0N15–5–4	QR0T02–4–15
QR0N15–5–5	QR0T02–5–15
QR0N15–5–6	QR0T02–6–15
QR0N15–5–7	QR0T02–7–15
QR0N15–5–8	QR0T03–0–15
QR0N15–5–9	QR0T03–1–15
QR0N15–5–10	QR0T03–2–15
QR0N15–5–11	QR0T03–3–15
QR0N15–5–12	QR0T03–4–15
QR0N15–5–13	QR0T03–5–15
QR0N15–5–14	QR0T03–6–15
QR0N15–5–15	QR0T03–7–15
QR0N15–6–0	QR0T04–0–15
QR0N15–6–1	QR0T04–1–15
QR0N15–6–2	QR0T04–2–15
QR0N15–6–3	QR0T04–3–15
QR0N15–6–4	QR0T04–4–15
QR0N15–6–5	QR0T04–5–15
QR0N15–6–6	QR0T04–6–15
QR0N15–6–7	QR0T04–7–15
QR0N15–6–8	QR0T05–0–15
QR0N15–6–9	QR0T05–1–15
QR0N15–6–10	QR0T05–2–15
QR0N15–6–11	QR0T05–3–15
QR0N15–6–12	QR0T05–4–15
QR0N15–6–13	QR0T05–5–15
QR0N15–6–14	QR0T05–6–15
QR0N15–6–15	QR0T05–7–15
QR0N15–7–0	QR0T06–0–15
QR0N15–7–1	QR0T06–1–15
QR0N15–7–2	QR0T06–2–15
QR0N15–7–3	QR0T06–3–15
QR0N15–7–4	QR0T06–4–15
QR0N15–7–5	QR0T06–5–15
QR0N15–7–6	QR0T06–6–15
QR0N15–7–7	QR0T06–7–15
QR0N15–7–8	QR0T07–0–15
QR0N15–7–9	QR0T07–1–15
QR0N15–7–10	QR0T07–2–15
QR0N15–7–11	QR0T07–3–15
QR0N15–7–12	QR0T07–4–15
QR0N15–7–13	QR0T07–5–15
QR0N15–7–14	QR0T07–6–15
QR0N15–7–15	QR0T07–7–15

1024 NODE CONFIGURATION

Figure E–8 Default Wiring Topology for 1024-Port Federated Configuration (4 of 4)

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