Sun Oracle Database Machine Multi-Rack Cabling Guide

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Contents

Preface

This document explains how to cable up to eight Sun Oracle Database Machine Full Racks together to achieve the highest performance and the greatest redundancy.

Who Should Use This Book

This document is for customers, and trained Oracle service staff .

Sun Online

The following table shows where to find Sun documents online.

Sun Function	URL	Description
Documentation	http://docs.sun.com	Navigate to the product page, download PDF, and view HTML documents.
Support	http://www.sun.com/support/	Obtain technical support and download patches.
Training	http://www.sun.com/training/	Learn about Sun courses.
Feedback	http://www.sun.com/hwdocs/feedback/	Submit your comments.

Related Documentation

The following table lists the available documents for the Sun Oracle Database Machine.

Description	Title	Part Number
Rack site planning	*Sun Oracle Database Machine Site Planning Guide*	821-0848
Rack installation	*Sun Oracle Database Machine Installation Guide*	821-0849

Description	Title	Part Number
Rack service	*Sun Oracle Database Machine Service Manual*	821-0850
Rack upgrade	*Sun Oracle Database Machine Upgrade Guide*	821-0851
Late-breaking information	*Sun Oracle Database Machine Product Notes*	821-0852
Multiple-rack cabling	*Sun Oracle Database Machine Multi-Rack Cabling Guide* `(this guide)`	821-0854

Documentation Comments

We are interested in improving the product documentation and welcome your comments and suggestions. You can submit comments by clicking the Feedback{+} link at: http://docs.sun.com

Please include the title and part number of your document with your feedback:

Sun Oracle Database Machine Multi-Rack Cabling Guide, part number 821-0854

◆ ◆ ◆ CHAPTER 1

Multi-Rack Cabling Overview

This chapter describes the Sun Oracle Database Machine multi-rack cabling service.

The following topics are covered:

About the Multi-Rack Cabling Service

The multi-rack cabling service allows customers to extend the capability of their Sun Oracle Database Machine Full Rack systems to beyond just a single full rack. The multi-rack cabling service allows customers to cable up to eight Sun Oracle Database Machine Full Racks together, without requiring any external InfiniBand switches.

It is assumed that all racks are adjacent to each other, in a side-by-side configuration. If racks are not side-by-side, then customers may need to purchase longer cables for the extended connections. Placing the racks in any location other than side-by-side may likely require the purchase of additional 10–meter cables. Cable lengths across computer room aisles can vary from site to site, and may increase the difficulty of determining the cable lengths that may need to be purchased.

Sun Oracle Database Machine Overview

The Sun Oracle Database Machine is the hardware component supported for use with Sun Oracle Exadata Storage Server Software.

Sun Oracle Database Machine Full Racks consist of the following major components:

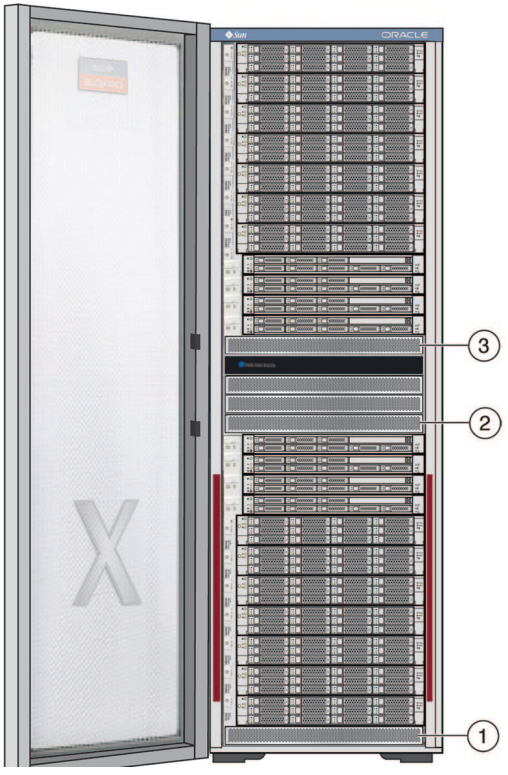
- Eight Sun Fire X4170 Oracle Database Servers

- 14 Exadata Storage Servers
- One 48-port Ethernet switch
- Keyboard, Video, Mouse (KVM) hardware
- Two Redundant 15 kVA PDUs (single-phase or three–phase, high-voltage or low-voltage)
- Three Sun Datacenter InfiniBand Switch 36

Database Machine InfiniBand Switch Network Overview

Sun Oracle Database Machine Full Rack includes three 1–unit (1U) Sun Datacenter InfiniBand Switch 36s. These switches attach to standard QSFP connectors at the ends of InfiniBand cables.

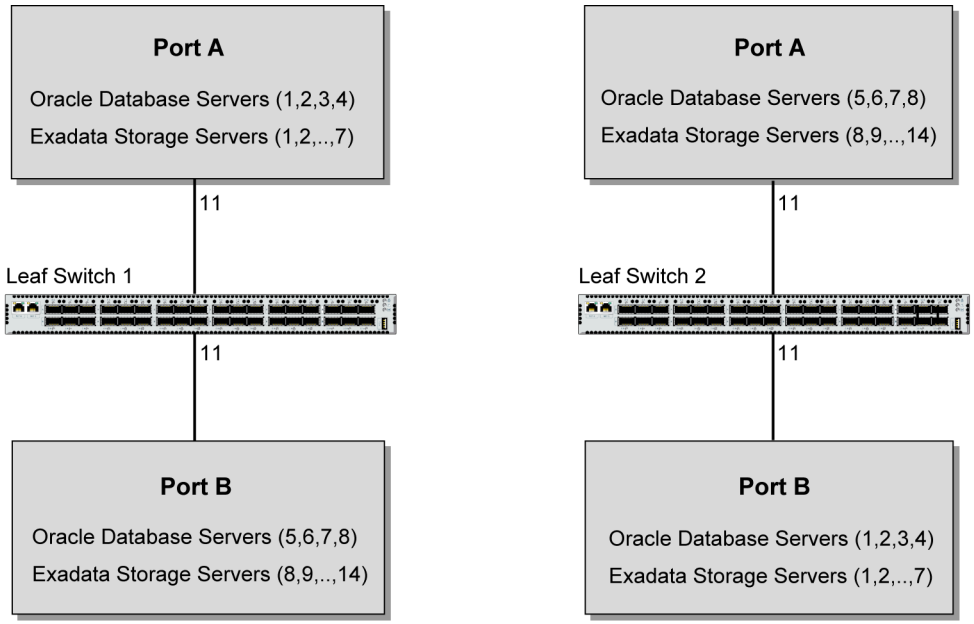
Sun Datacenter InfiniBand Switch 36s are indicated as 1, 2, and 3 in the following Sun Oracle Database Machine Full Rack illustration.



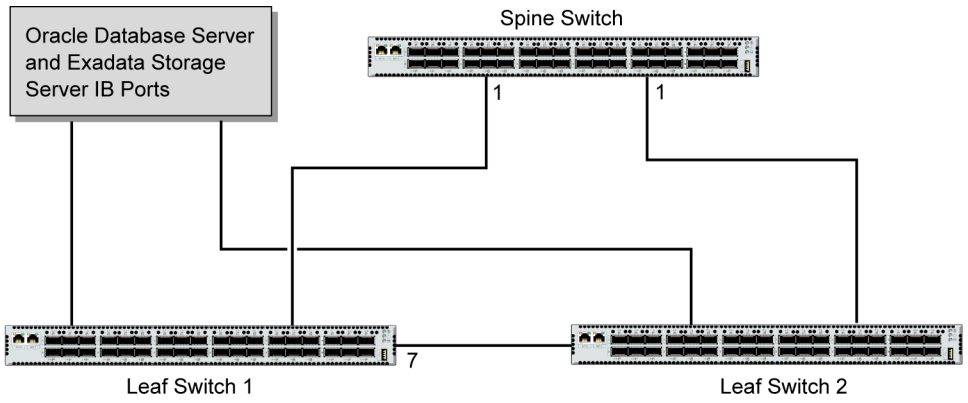
Number	Switch	Rack Unit
1	Spine switch	U1 (bottom)
2	Leaf switch	U20
3	Leaf switch	U24 (top)

Sun Datacenter InfiniBand Switch 36s function as leaf and spine switches. The switch at rack unit 1 (U1) at the bottom on the rack is the *spine* switch. The switches at U20 and U24 (rack positions in the center of the rack) are *leaf* switches.

In a Sun Oracle Database Machine Full Rack, the Sun Fire X4170 Oracle Database Servers, and Exadata Storage Servers connect to the two leaf switches as shown in the following illustration. These InfiniBand connections are not affected when you connect multiple Sun Oracle Database Machine Full Racks together.

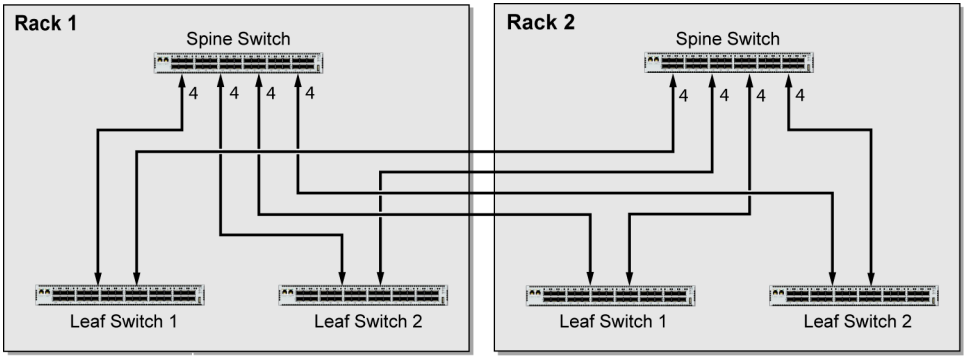


In the single rack case, the two leaf switches are interconnected with each other using seven connections. In addition, each leaf switch is connected to the spine switch with one link, as shown in the following illustration.



When you connect multiple racks together, first remove the existing inter-switch links between each of the leaf switches (seven cables) as well as the connections from the leaf switches to the spine switch (two cables).

Then from each leaf switch, distribute eight connections over the spine switches in all the racks. Note that in a multi-rack situation, leaf switches inside a rack are no longer directly interconnected, as shown in the following illustration.



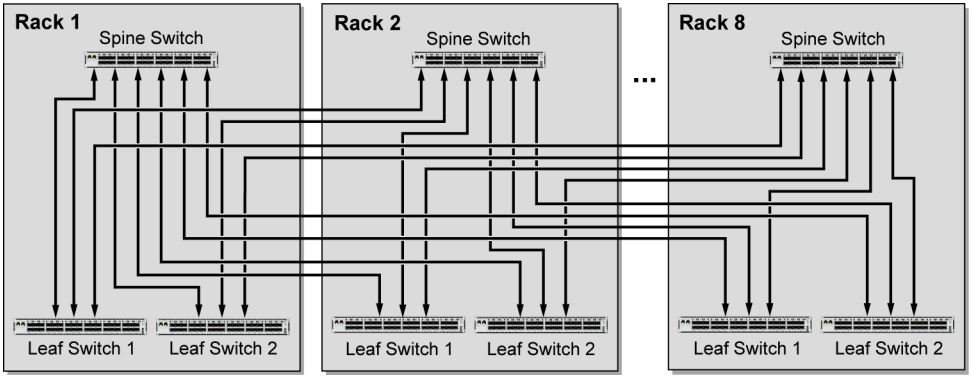
In a two-rack system, each leaf switch in rack 1 connects to the following switches:

- *Four* connections to its internal spine switch
- *Four* connections to the spine switch in rack 2

And, each spine switch in rack 1 connects to the following switches:

- *Eight* connections to both internal leaf switches
- *Eight* connections to both leaf switches in rack 2

As the number of racks used increases from two to eight, the pattern continues, as shown in the following eight-rack illustration:



Note the following:

- Each leaf switch has eight inter-switch links distributed over all the spine switches.
- Each spine switch has 16 inter-switch links distributed over all the leaf switches.
- Leaf switches are not directly interconnected with other leaf switches.
- Spine switches are not directly interconnected with other spine switches.

Multi–Rack Cabling Tasks

Before cabling a Sun Oracle Database Machine Full Rack for multiple rack operation, you must know the system configuration and obtain all the prerequisite information for system installation. It is assumed that all Sun Oracle Database Machine Full Racks have been properly installed and verified. Procedure in this guide assume that the racks are next to each other.

Before you begin installing Sun Oracle Database Machines, perform pre–installation planning. Complete the checklist in the *Sun Oracle Database Machine Site Planning Guide*. Verify the site space, access route, power, grounding, air flow, and network requirements that are provided in the *Sun Oracle Database Machine Site Planning Guide*.

Install Sun Oracle Database Machine Full Racks if the cabling service is performed as part of an initial installation. To install Sun Oracle Database Machines, follow the instructions in the *Sun Oracle Database Machine Installation Guide*. Ensure that you read the entire guide before beginning installation, and follow all safety precautions.

Perform the following multi-rack cabling tasks, in order, after completing the installation process.

- Review safety considerations.
- Perform preliminary tasks.
  - "Preparing a Multi-Rack Cabling Plan" on page 17
  - "Verifying Host Names and Addresses" on page 18
  - "Verifying Delivery of Additional Cable Orders" on page 19
  - "Gathering Tools" on page 20
- Perform cabling tasks.
  - "Shutting Down Affected Sun Oracle Database Machines" on page 21
  - "Disconnecting Inter-Switch Cables" on page 22
  - "Extracting Spare InfiniBand Cables" on page 22
  - "Unbundling Inter-Switch Cables" on page 23
  - "Applying Cable and Rack Labels" on page 23
  - "Connecting Cables" on page 23
  - "Bundling Cables" on page 24
  - "Inspecting Cables" on page 24
  - "Verifying Multi-Rack Systems" on page 24

◆ ◆ ◆ CHAPTER 2

Safety Considerations

This chapter describes important safety considerations that you should review before Sun Oracle Database Machine cabling begins.

The following topics are covered:

Equipment Safety Precautions

Observe the following precautions when cabling Sun Oracle Database Machines. Otherwise, the equipment can be damaged or a malfunction can result.

- Do not block any ventilation holes.
- Do not place cables under the equipment or have cables stretched tight. Also, do not disconnect a power cord from the equipment while its power is on.
- When disconnecting a LAN cable, you might not be able to reach the connector lock with your fingers. If that is the case, press the connector lock with a slotted screwdriver to disconnect the cable. You could damage the system board if you force your fingers into the gap rather than using a slotted screwdriver.
- Do not place anything on top of the system or perform any work directly above it.
- Take measures to prevent static electricity from being generated at the installation location. Note especially that static electricity is likely to be generated on carpets, and this could lead to a malfunction.
- Do not insert anything into any opening in the Sun Oracle Database Machine. The Sun Oracle Database Machine contains high-voltage parts. If a metal object or another conductor is inserted into an opening in the machine, it can cause a short circuit that could cause fire, electric shock, or equipment damage.

- For details on maintenance of the servers, contact a certified service engineer.

InfiniBand Cable Cautions

Caution – Fiber optic InfiniBand cables with laser transceivers *must* be of a type Class I.

Caution – Do not allow any copper core InfiniBand cable to bend tighter than a 5 inch (127 mm) radius. Do not allow any optical InfiniBand cable to bend tighter than a 3.4 inch (85 mm) radius. Tight bends can damage the cable internally.

Caution – Do not use zip ties to bundle or support InfiniBand cables. The sharp edges of the ties can damage the cables internally. Use hook and loop straps.

Caution – Do not allow any InfiniBand cable to experience extreme tension. Do not pull on an InfiniBand cable or allow it to drag. Unroll an InfiniBand cable for its length. Pulling on an InfiniBand cable can damage the cables internally.

Caution – Do not twist an InfiniBand cable more than one revolution for its entire length. Twisting an InfiniBand cable can damage the cable internally.

Caution – Do not route InfiniBand cables where they might be stepped upon or experience rolling loads. Such a crushing effect can damage the cable internally.

InfiniBand Cable Path Lengths

When handling a cable, consider the following:

- Bends in the cable path increase the required cable length. Bends in the cable path are usually necessary, and each bend increases the total length. Rarely does a cable travel in a straight line from connector to connector.
- Bundling increases the required length of the cables. Bundling causes one or more cables to follow a common path. However, the bend radius is different in different parts of the bundle. If the bundle is large and unorganized, and there are many bends, one cable might

experience only the inner radius of bends, while another cable might experience the outer radius of bends. In this situation, the differences of the required lengths of the cables are quite substantial.

- If you are routing the InfiniBand cables under the floor, consider the height of the raised floor.

InfiniBand Cable Bundling

When bundling InfiniBand cables in groups, use hook-and-loop straps to keep cables organized. If possible, use color-coordinated straps to help identify cables and their routing. The InfiniBand 4X copper conductor cables are fairly thick and heavy for their length. Consider the retention strength of the hook-and-loop straps when supporting cables. Bundle as few cables as reasonably possible.

You can bundle the cables using many hook-and-loop straps. Place the hook-and-loop straps as close together as reasonably possible, for example, every 1 foot (0.3 m). If a cable breaks free from a strap, the cable cannot fall far before it is retained by another strap. If the InfiniBand cables break free of their straps and fall free, the cables might break internally when they strike the floor or are jerked from tension.

Floor and Underfloor Delivery of InfiniBand Cables

The switch accepts InfiniBand cables from floor or underfloor delivery. Floor and underfloor delivery limits the tension in the InfiniBand cable to the weight of the cable for the rack height of the switch.

Note – Overhead cabling details are not included in this guide. For details on overhead cabling, contact a certified service engineer.

Preparing the Cabling Site

It is the customer's responsibility to prepare the site prior to multi-rack cabling of Sun Oracle Database Machines. Refer to the *Sun Oracle Database Machine Site Planning Guide* for any server or equipment you plan to install in the rack for additional site preparation requirements.

Prior to installing Sun Oracle Database Machines, perform the following tasks:

1. Thoroughly clean and vacuum the area in preparation for the installation.
2. Note any problems or peculiarities at the site that require special equipment.
3. Verify that the installation site flooring has a high enough strength rating to withstand the combined weight of a Sun Oracle Database Machine and any installed equipment.
4. Install all necessary electrical equipment and ensure that sufficient power is provided.

Refer to the *Sun Rack II Power Distribution Units User's Guide* for the power requirements of the Sun Rack II power distribution units (PDUs).

5. Ensure that the installation site provides adequate air conditioning.
6. Operate the air conditioning system for 48 hours to bring the room to the appropriate temperature.

Observing Safety Guidelines and Warnings

Before installing the Sun Oracle Database Machine, or installing any server or equipment into the rack, read the *Important Safety Information for Sun Hardware Systems* document included with the rack.

Observe all safety notices printed on the packaging and listed in the *Sun Rack II Safety and Compliance Guide* and the *Sun Rack II Power Distribution Units Users Guide*. Go to http://docs.sun.com to download these guides.

Note – Contact your service representative to confirm that your equipment is qualified for installation and use in a Sun Oracle Database Machine. Oracle is not liable for any issues when you install or use non-qualified equipment.

◆ ◆ ◆ CHAPTER 3

Preparing for Multi-Rack Cabling

This chapter describes the preliminary tasks you must complete before you begin to cable multiple Sun Oracle Database Machine Full Racks together, but after rack installation.

The following topics are covered:

Preparing a Multi-Rack Cabling Plan

Determine the number of Sun Oracle Database Machines Full Racks that you will connect.

See the appropriate appendix in this guide for a table that provides connection details for each supported multi-rack cabling option— from two racks up to eight racks. Print the applicable chart, so you can have it readily available.

The system naming conventions are as follows. "R" indicates the Sun Oracle Database Machine rack. For example, R8 indicates rack 8. "U" indicates the unit height in the rack. For example, U24 indicates rack unit 24. U1 is located at the bottom of the rack, and U42 is at the top of the rack.

Verifying Host Names and Addresses

Before installing the extended cabling, complete Sun Oracle Database Machine network configuration to ensure that the networking is complete and the system will not have any addressing conflicts. Verify that the installed Sun Oracle Database Machine Full Racks have been assigned unique host names and addresses. All servers in all interconnected Sun Oracle Database Machine Full Racks must have unique addresses and names.

You should consider extending the IP addresses and naming conventions for interconnected racks of Sun Oracle Database Machines. You might have used the NameCell_01 convention for the name of a single storage cell in a single rack. Extending the names to include a rack value such as name[Rack#]Cell_01 allows customers and repair personnel to identify the source of diagnostic messages that may be displayed.

Server addresses and naming conventions might differ in the following cases:

- Initial installation of all Sun Oracle Database Machine Full Racks. System address assignment and host naming should already be complete.
- Add new Sun Oracle Database Machine Full Racks to an existing cluster. An add-on configuration should require unique addresses and host names in new Sun Oracle Database Machines.
- Cluster two existing Sun Oracle Database Machine Full Racks. You can assign addresses and name hosts only if the Sun Oracle Database Machines are already assigned unique addresses and host names, or if the entire cluster must be re-configured.

Inventorying Cables

Collect and inventory the cables you ordered, if any. You should inventory spare cables from the kit and existing inter-switch cables. Each Sun Oracle Database Machine includes a kit of spare parts.

Some spare cables are used for multi-rack cabling. The following table lists the spare cables available for the switch, and their length.

Cable Part	Spare	Inter-Switch	Total
InfiniBand 2 meter	0	7	7
InfiniBand 3 meter	6	2	8
InfiniBand 5 meter	10	0	10

Verifying Delivery of Additional Cable Orders

No additional InfiniBand cables need be purchased when connecting up to three Sun Oracle Database Machine Full Racks. The cables provided in the spares kit with each Sun Oracle Database Machine Full Rack can be used for multi-rack cabling. When interconnecting four or more Sun Oracle Database Machine Full Racks, the customer needs to purchase additional 10m optical QSFP-to-QSFP QDR InfiniBand cables.

Cable sources used to interconnect multiple Sun Oracle Database Machine Full Racks are:

- Inter-switch cables that are included in Sun Oracle Database Machine Full Racks. Includes seven 2–meter InfiniBand cables and two 3–meter cables.
- Spares pool cables that are delivered with each Sun Oracle Database Machine Full Rack.
- New cables that may need to be purchased, if four or more Sun Oracle Database Machine Full Racks are to be interconnected, or if the racks are not adjacent to each other.

You can use some cables in the spare parts pool for multi-rack cabling. Each Sun Oracle Database Machine includes a kit of spare parts. Use the following chart to determine which cables you might need to purchase.

Rack	Cables Needed			Cables to Buy
	3 meter	5 meter	10 meter	10 meter
1	not needed	not needed	not needed	not needed
2	16	16	0	0
3	18	30	0	0
4	16	40	8	8
5	20	42	18	18
6	24	46	26	26
7	28	44	40	40
8	16	50	62	62

Note that if you intend to cable more than three racks together, you must purchase additional 10–meter cables to make the connections.

Gathering Tools

Gather the following tools:

- Pen
- Notepad
- Flashlight
- Magnifying glass
- Label maker and labels (for cables, KVM console, and rack)
- Cable ties (hook-and-loop straps suggested)

◆ ◆ ◆ CHAPTER 4

Multi-Rack Cabling Tasks

This chapter describes how to cable together two to eight Sun Oracle Database Machines into a multi-rack system.

The following topics are covered:

Shutting Down Affected Sun Oracle Database Machines

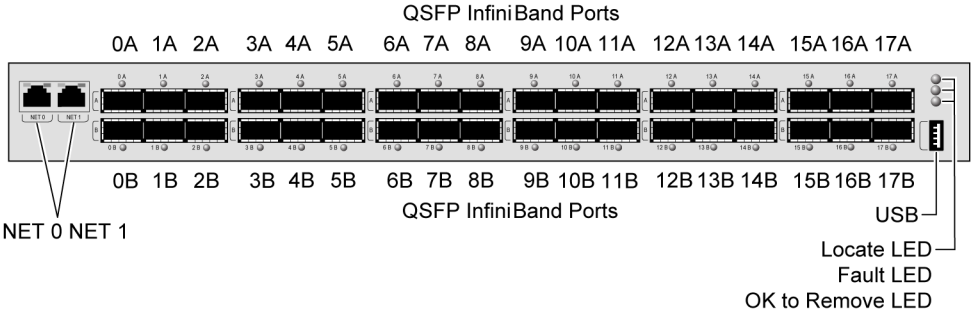
Before you can set up the multi-rack cabling, you must first shut down the affected Sun Oracle Database Machine Full Racks. Consider the operational impact of shutting down the systems, and take appropriate action. Refer to the *Sun Oracle Database Machine Owner's Guide* for shutdown procedures.

Disconnecting Inter-Switch Cables

Caution – Be careful when you handle InfiniBand cables. InfiniBand cables are very fragile. The cable ends might break off if the ends are dropped, or mishandled in any way. Before you handle any InfiniBand cables, you should be aware of all handling instructions. Read and follow *Important Guidelines When Handling InfiniBand Cables*. This document is included in the packaging of any new cables purchased. Or, go to http://docs.sun.com to access this document.

Remove all inter-switch, leaf-to-spine, and leaf-to-leaf cables inside each Sun Oracle Database Machine Full Rack. Inter-switch cables are on ports 8A, 8B, 9A, 9B, 10A, 10B, 11A, 11B on the two U20 and U24 leaf switches (rack positions in the center of the rack). Seven inter-switch cables connect the two leaf switches together. The eighth cable from each leaf switch (position 8B) connects to the spine switch.

Remove all connections on the spine switch (rack position U1).



Extracting Spare InfiniBand Cables

A spare cable bundle is provided with Sun Oracle Database Machines. Extract the spare InfiniBand cables from the bundle. You need to use the InfiniBand cables only. Restore spare Ethernet cables to the original spares location. You do not use the Ethernet cables.

Unbundling Inter-Switch Cables

Unbundle the inter-switch cables. Remove the cable ties holding the cables together, such as hook-and-loop fasteners. Lay the cables out *gently* in collections of like length. Observe safety precautions. Be careful when handling the cables to avoid cable damage.

Applying Cable and Rack Labels

Re-label all inter-rack cables from leaf switches to spine switches. Re-label each cable to identify the correct locations at both cable ends, and so cables can be connected correctly during future maintenance. Label all cables using the following convention:

```
Rack[#]LeafSW[#]Port[#] -> Rack[#]SpineSW[#]Port[#]
```

When labeling racks, label all installed Sun Oracle Database Machines according to the plan you prepared in the previous chapter. Make sure to label the following items on each rack with a designated rack number:

- Sun Oracle Database Machine KVM console (in front)
- Rear of Sun Oracle Database Machine Full Racks (on the horizontal support bar)

Connecting Cables

Connect the InfiniBand switches in the Sun Oracle Database Machine Full Racks together. Refer to the appropriate table for cable connection, available in the appendices of this guide. Connect each leaf switch (rack positions U20 and U24) to each spine switch (rack position U1) for *each* of the racks. Work through the bundles, first connecting the leaf switch ends. Then connect the bundles to the spine switches, starting with the longest cables first.

Connect each leaf switch (rack positions U24 and U20) to each spine switch (rack position U1) in the each of the racks. For example, ports 10A, 10B, 11A, 11B on the leaf switch in U24 in rack 1 are connected to ports 9B, 10B, 11B, 12B in the spine switch in U1 in rack 2.

Tip – Verify the required number of cables and cable lengths. Procedure in this guide assume that the racks are next to each other.

Tip – Label the cables, on both ends. Use the labeling format described in the cabling tables located in the appendices at the end of this document.

Bundling Cables

Bundle the cables together. The rows of the chart represent a convenient method for bundling the cables back together. Collect the cables indicated for the first row (rack 1, leaf switch at U20) and tie them together (with cable ties) into a bundle to be installed into Sun Oracle Database Machine Full Racks. Be sure and leave the last 18 inches free so that you can maneuver cables into position near the leaf switch. You should probably wait until each of the bundles is installed into its final position before you connect them together.

Inspecting Cables

Perform a visual inspection to confirm that the spine switches in each rack have 16 InfiniBand connections, divided as equally as possible across both leaf switches in all of the racks. You should also verify that the eight ports (8A, 8B, 9A, 9B, 10A, 10B, 11A, 11B) in each leaf switch are occupied. You should also verify that each spine switch has exactly 16 cables coming into it.

For example, the spine switch of Sun Oracle Database Machine Full Rack 1, in a two-rack configuration, contains:

- Rack 1 (U24) Ports 8A, 8B, 9A, 9B <-> 3A, 4A, 5A, 6A
- Rack 1 (U20) Ports 8A, 8B, 9A, 9B <-> 3B, 4B, 5B, 6B
- Rack 2 (U20) Ports10A, 10B, 11A, 11B <-> 7A, 8A, 9A, 10A
- Rack 2 (U20) Ports 10A, 10B, 11A, 11B <-> 7B, 8B, 9B, 10B

Verifying Multi-Rack Systems

After you have cabled and visually inspected the systems, start all Sun Oracle Database Machine Full Racks. Refer to the *Sun Oracle Database Machine Owner's Guide* for startup procedures. From the OS command line, run the `verify_topology` command to verify that Sun Oracle Database Machines see all the connections and that all connections can be used.

What's Next

Prepare Sun Oracle Database Machines for software configuration. After software configuration, return all Sun Oracle Database Machines to normal operation.

◆ ◆ ◆ APPENDIX A

Two-Rack System Cabling

This section shows the cabling chart for the two-rack system.

Two-Rack System

		Spine Switch R1-U1	Spine Switch R2-U1
Leaf Switches	R1 U24	R1-U24-P8A ← 3m → R1-U1-P3A	R1-U24-P10A ← 5m → R2-U1-P7A
		R1-U24-P8B ← 3m → R1-U1-P4A	R1-U24-P10B ← 5m → R2-U1-P8A
		R1-U24-P9A ← 3m → R1-U1-P5A	R1-U24-P11A ← 5m → R2-U1-P9A
		R1-U24-P9B ← 3m → R1-U1-P6A	R1-U24-P11B ← 5m → R2-U1-P10A
	R1 U20	R1-U20-P8A ← 3m → R1-U1-P3B	R1-U20-P10A ← 5m → R2-U1-P7B
		R1-U20-P8B ← 3m → R1-U1-P4B	R1-U20-P10B ← 5m → R2-U1-P8B
		R1-U20-P9A ← 3m → R1-U1-P5B	R1-U20-P11A ← 5m → R2-U1-P9B
		R1-U20-P9B ← 3m → R1-U1-P6B	R1-U20-P11B ← 5m → R2-U1-P10B

Leaf Switches	R2 U24	R2-U24-P10A ← 5m → R1-U1-P7A	R2-U24-P8A ← 3m → R2-U1-P3A
		R2-U24-P10B ← 5m → R1-U1-P8A	R2-U24-P8B ← 3m → R2-U1-P4A
		R2-U24-P11A ← 5m → R1-U1-P9A	R2-U24-P9A ← 3m → R2-U1-P5A
		R2-U24-P11B ← 5m → R1-U1-P10A	R1-U24-P9B ← 3m → R2-U1-P6A
	R2 U20	R2-U20-P10A ← 5m → R1-U1-P7B	R2-U20-P8A ← 3m → R2-U1-P3B
		R2-U20-P10B ← 5m → R1-U1-P8B	R2-U20-P8B ← 3m → R2-U1-P4B
		R2-U20-P11A ← 5m → R1-U1-P9B	R2-U20-P9A ← 3m → R2-U1-P5B
		R2-U20-P11B ← 5m → R1-U1-P10B	R2-U20-P9B ← 3m → R2-U1-P6B

◆ ◆ ◆ APPENDIX B

Three-Rack System Cabling

Three-Rack System

		Spine Switch R1-U1	Spine Switch R2-U1	Spine Switch R3-U1
Leaf Switches	R1 U24	R1-U24-P8A ← 3m → R1-U1-P3A	R1-U24-P9B ← 3m → R2-U1-P6A	R1-U24-P11A ← 5m → R3-U1-P9A
		R1-U24-P8B ← 3m → R1-U1-P4A	R1-U24-P10A ← 5m → R2-U1-P7A	R1-U24-P11B ← 5m → R3-U1-P10A
		R1-U24-P9A ← 3m → R1-U1-P5A	R1-U24-P10B ← 5m → R2-U1-P8A	
	R1 U20	R1-U20-P8A ← 3m → R1-U1-P3B	R1-U20-P9B ← 3m → R2-U1-P6B	R1-U20-P11A ← 5m → R3-U1-P9B
		R1-U20-P8B ← 3m → R1-U1-P4B	R1-U20-P10A ← 5m → R2-U1-P7B	R1-U20-P11B ← 5m → R3-U1-P10B
		R1-U20-P9A ← 3m → R1-U1-P5B	R1-U20-P10B ← 5m → R2-U1-P8B	

Leaf Switches	R2 U24	R2-U24-P11A ← 5m → R1-U1-P9A	R2-U24-P8A ← 3m → R2-U1-P3A	R2-U24-P9B ← 3m → R3-U1-P6A
		R2-U24-P11B ← 5m → R1-U1-P10A	R2-U24-P8B ← 3m → R2-U1-P4A	R2-U24-P10A ← 5m → R3-U1-P7A
			R2-U24-P9A ← 3m → R2-U1-P5A	R2-U24-P10B ← 5m → R3-U1-P8A
	R2 U20	R2-U20-P11A ← 5m → R1-U1-P9B	R2-U20-P8A ← 3m → R2-U1-P3B	R2-U20-P9B ← 3m → R3-U1-P6B
		R2-U20-P11B ← 5m → R1-U1-P10B	R2-U20-P8B ← 3m → R2-U1-P4B	R2-U20-P10A ← 5m → R3-U1-P7B
			R2-U20-P9A ← 3m → R2-U1-P5B	R2-U20-P10B ← 5m → R3-U1-P8B

Leaf Switches	R3 U24	R3-U24-P9B ← 3m → R1-U1-P6A	R3-U24-P11A ← 5m → R2-U1-P9A	R3-U24-P8A ← 3m → R3-U1-P3A
		R3-U24-P10A ← 5m → R1-U1-P7A	R3-U24-P11B ← 5m → R2-U1-P10A	R3-U24-P8B ← 3m → R3-U1-P4A
		R3-U24-P10B ← 5m → R1-U1-P8A		R3-U24-P9A ← 3m → R3-U1-P5A
	R3 U20	R3-U20-P9B ← 3m → R1-U1-P6B	R3-U20-P11A ← 5m → R2-U1-P9B	R3-U20-P8A ← 3m → R3-U1-P3B
		R3-U20-P10A ← 5m → R1-U1-P7B	R3-U20-P11B ← 5m → R2-U1-P10B	R3-U20-P8B ← 3m → R3-U1-P4B
		R3-U20-P10B ← 5m → R1-U1-P8B		R3-U20-P9A ← 3m → R3-U1-P5B

◆ ◆ ◆ APPENDIX C

Four-Rack Cabling

Four-Rack System

		Spine Switch R1-U1	Spine Switch R2-U1	Spine Switch R3-U1	Spine Switch R4-U1
Leaf Switches	R1-U24	R1-U24-P8A ← 3m →R1-U1-P3A	R1-U24-P9A ← 3m →R2-U1-P5A	P1-U24-P10B ← 5m →R3-U1-P7A	R1-U24-P11A ← 10m →R4-U1-P9A
		R1-U24-P8B ← 3m →R1-U1-P4A	R1-U24-P9B ← 3m →R2-U1-P6A	P1-U24-P10B ← 5m →R3-U1-P8A	R1-U24-P11B ← 10m →R4-U1-P10A
	R1-U20	R1-U20-P8A ← 3m →R1-U1-P3B	R1-U20-P9A ← 3m →R2-U1-P5B	R1-U20-P10A ← 5m →R3-U1-P7B	R1-U20-P11A ← 10m →R4-U1-P9B
		R1-U20-P8B ← 3m →R1-U1-P4B	R1-U20-P9B← 3m →R2-U1-P6A	R1-U20-P10B ← 5m →R3-U1-P8	R1-U20-P11B ← 10m →R4-U1-P10B
Leaf Switches	R2-U24	R2-U24-P11A ← 5m →R1-U1-P9A	R2-U24-P8A ← 3m →R2-U1-P3A	R2-U24-P9A ← 3m →R3-U1-P5A	R2-U24-P10A ← 5m →R4-U1-P7A
		R2-U24-P11B ← 5m →R1-U1-P10A	R2-U24-P8B ← 3m →R2-U1-P4A	R2-U24-P9B ← 3m →R3-U1-P6A	R2-U24-P10B ← 5m →R4-U1-P8A
	R2-U20	R2-U20-P11A ← 5m →R1-U1-P9B	R2-U20-P8A ← 3m →R2-U1-P3B	R2-U20-P9A ← 3m →R3-U1-P5B	R2-U20-P10A ← 5m →R4-U1-P7B
		R2-U20-P11B ← 5m →R1-U1-P10B	R2-U20-P8B ← 3m →R2-U1-P4B	R2-U20-P9B ← 3m →R3-U1-P6B	R2-U20-P10B ← 5m →R4-U1-P8B
Leaf Switches	R3-U24	R3-U24-P10A ← 5m →R1-U1-P7A	R3-U24-P11A ← 5m →R2-U1-P9A	R3-U24-P8A ← 3m →R3-U1-P3A	R3-U24-P9A ← 3m →R4-U1-P5A
		R3-U24-P10B ← 5m →R1-U1-P8A	R3-U24-P11B ← 5m →R2-U1-P10A	R3-U24-P8B ← 3m →R3-U1-P4A	R3-U24-P9B ← 3m →R4-U1-P6A
	R3-U20	R3-U20-P10A ← 5m →R1-U1-P7B	R3-U20-P11A ← 5m →R2-U1-P9B	R3-U20-P8A ← 3m →R3-U1-P3B	R3-U20-P9A ← 3m →R4-U1-P5B
		R3-U20-P10B ← 5m →R1-U1-P8B	R3-U20-P11B ← 5m →R2-U1-P10B	R3-U20-P8B ← 3m →R3-U1-P4B	R3-U20-P9B ← 3m →R4-U1-P6B
Leaf Switches	R4-U24	R4-U24-P9A ← 10m →R1-U1-P5A	R4-U24-P10A ← 5m →R2-U1-P7A	R4-U24-P11A ← 5m →R3-U1-P9A	R4-U24-P8A ← 3m →R4-U1-P3A
		R4-U24-P9B ← 10m →R1-U1-P6A	R4-U24-P10B ← 5m →R2-U1-P8A	R4-U24-P11B ← 5m →R3-U1-P10A	R4-U24-P8B ← 3m →R4-U1-P4A
	R4-U20	R4-U20-P9A ← 10m →R1-U1-P5B	R4-U20-P10A ← 5m →R2-U1-P7B	R4-U20-P11A ← 5m →R3-U1-P9B	R4-U20-P8A ← 3m →R4-U1-P3B
		R4-U20-P9B ← 10m →R1-U1-P6B	R4-U20-P10B ← 5m →R2-U1-P8B	R4-U20-P11B ← 5m →R3U1-P10B	R4-U20-P8B ← 3m →R4-U1-P4B

◆ ◆ ◆ APPENDIX D

Five-Rack System Cabling

Five-Rack System

Leaf Switches	Spine Switch R1-U1	Spine Switch R2-U1	Spine Switch R3-U1	Spine Switch R4-U1	Spine Switch R5-U1
R1-U24	R1-U24-P8A ← 3m → R1-U1-P3A R1-U24-P8B ← 3m → R1-U1-P4A	R1-U24-P9A ← 5m → R2-U1-P5A R1-U24-P9B ← 5m → R2-U1-P6A	R1-U24-P10A ← 5m → R3-U1-P7A R1-U24-P10B ← 5m → R3-U1-P8A	R1-U24-P11A ← 10m → R4-U1-P9A	R1-U24-P11B ← 10m → R5-U1-P10A
R1-U20	R1-U20-P8A ← 3m → R1-U1-P3B R1-U20-P8B ← 3m → R1-U1-P4B	R1-U20-P9A ← 5m → R2-U1-P5B R1-U20-P9B ← 5m → R2-U1-P6B	R1-U20-P10A ← 5m → R3-U1-P7B R1-U20-P10B ← 5m → R3-U1-P8B	R1-U20-P11A ← 10m → R4-U1-P9B	R1-U20-P11B ← 10m → R5-U1-P10B
R2-U24	R2-U24-P11B ← 5m → R1-U1-P10A	R2-U24-P8A ← 3m → R2-U1-P3A R2-U24-P8B ← 3m → R2-U1-P4A	R2-U24-P9A ← 5m → R3-U1-P5A R2-U24-P9B ← 5m → R3-U1-P6A	R2-U24-P10A ← 5m → R4-U1-P7A R2-U24-P10B ← 5m → R4-U1-P8A	R2-U24-P11A ← 10m → R5-U1-P9A
R2-U20	R2-U20-P11B ← 5m → R1-U1-P10B	R2-U20-P8A ← 3m → R2-U1-P3B R2-U20-P8B ← 3m → R2-U1-P4B	R2-U20-P9A ← 5m → R3-U1-P5B R2-U20-P9B ← 5m → R3-U1-P6B	R2-U20-P10A ← 5m → R4-U1-P7B R2-U20-P10B ← 5m → R4-U1-P8B	R2-U20-P11A ← 10m → R5-U1-P9B
R3-U24	R3-U24-P11A ← 5m → R1-U1-P9A	R3-U24-P11B ← 5m → R2-U1-P10A	R3-U24-P8A ← 3m → R3-U1-P3A R3-U24-P8B ← 3m → R3-U1-P4A	R3-U24-P9A ← 5m → R4-U1-P5A R3-U24-P9B ← 5m → R4-U1-P6A	R3-U24-P10A ← 5m → R5-U1-P7A R3-U24-P10B ← 5m → R5-U1-P8A
R3-U20	R3-U20-P11A ← 5m → R1-U1-P9B	R3-U20-P11B ← 5m → R2-U1-P10B	R3-U20-P8A ← 3m → R3-U1-P3B R3-U20-P8B ← 3m → R3-U1-P4B	R3-U20-P9A ← 5m → R4-U1-P5B R3-U20-P9B ← 5m → R4-U1-P6B	R3-U20-P10A ← 5m → R5-U1-P7B R3-U20-P10B ← 5m → R5-U1-P8B
R4-U24	R4-U24-P10A ← 10m → R1-U1-P7A R4-U24-P10B ← 10m → R1-U1-P8A	R4-U24-P11A ← 5m → R2-U1-P9A	R4-U24-P11B ← 5m → R3-U1-P10A	R4-U24-P8A ← 3m → R4-U1-P3A R4-U24-P8B ← 3m → R4-U1-P4A	R4-U24-P9A ← 5m → R5-U1-P5A R4-U24-P9B ← 5m → R5-U1-P6A
R4-U20	R4-U20-P10A ← 10m → R1-U1-P7B R4-U20-P10B ← 10m → R1-U1-P8B	R4-U20-P11A ← 5m → R2-U1-P9B	R4-U20-P11B ← 5m → R3-U1-P10B	R4-U20-P8A ← 3m → R4-U1-P3B R4-U20-P8B ← 3m → R4-U1-P4B	R4-U20-P9A ← 5m → R5-U1-P5B R4-U20-P9B ← 5m → R5-U1-P6B
R5-U24	R5-U24-P9A ← 10m → R1-U1-P5A R5-U24-P9B ← 10m → R1-U1-P6A	R5-U24-P10A ← 10m → R2-U1-P7A R5-U24-P10B ← 10m → R2-U1-P8A	R5-U24-P11A ← 5m → R3-U1-P9A	R5-U24-P11B ← 5m → R4-U1-P10A	R5-U24-P8A ← 3m → R5-U1-P3A R5-U24-P8B ← 3m → R5-U1-P4A
R5-U20	R5-U20-P9A ← 10m → R1-U1-P5B R5-U20-P9B ← 10m → R1-U1-P6B	R5-U20-P10A ← 10m → R2-U1-P7B R5-U20-P10B ← 10m → R2-U1-P8B	R5-U20-P11A ← 5m → R3-U1-P9B	R5-U20-P11B ← 5m → R4-U1-P10B	R5-U20-P8A ← 3m → R5-U1-P3B R5-U20-P8B ← 3m → R5-U1-P4B

◆ ◆ ◆ APPENDIX E

Six-Rack System Cabling

Six-Rack System

Leaf Switches	Spine Switch R1-U1	Spine Switch R2-U1	Spine Switch R3-U1	Spine Switch R4-U1	Spine Switch R5-U1	Spine Switch R6-U1
R1-U24	R1-U24-P8A ← 3m → R1-U1-P3A R1-U24-P8B ← 3m → R1-U1-P4A	R1-U24-P9A ← 5m → R2-U1-P5A R1-U24-P9B ← 5m → R2-U1-P6A	R1-U24-P10A ← 5m → R3-U1-P7A	R1-U24-P10B ← 10m → R4-U1-P8A	R1-U24-P11A ← 10m → R5-U1-P9A	R1-U24-P11B ← 10m → R6-U1-P10A
R1-U20	R1-U20-P8A ← 3m → R1-U1-P3B R1-U20-P8B ← 3m → R1-U1-P4B	R1-U20-P9A ← 5m → R2-U1-P5B R1-U20-P9B ← 5m → R2-U1-P6B	R1-U20-P10A ← 5m → R3-U1-P7B	R1-U20-P10B ← 10m → R4-U1-P8B	R1-U20-P11A ← 10m → R5-U1-P9B	R1-U20-P11B ← 10m → R6-U1-P10B
R2-U24	R2-U24-P11B ← 5m → R1-U1-P10A	R2-U24-P8A ← 3m → R2-U1-P3A R2-U24-P8B ← 3m → R2-U1-P4A	R2-U24-P9A ← 5m → R3-U1-P5A R2-U24-P9B ← 5m → R3-U1-P6A	R2-U24-P10A ← 5m → R4-U1-P7A	R2-U24-P10B ← 10m → R5-U1-P8A	R2-U24-P11A ← 10m → R6-U1-P9A
R2-U20	R2-U20-P11B ← 5m → R1-U1-P10B	R2-U20-P8A ← 3m → R2-U1-P3B R2-U20-P8B ← 3m → R2-U1-P4B	R2-U20-P9A ← 5m → R3-U1-P5B R2-U20-P9B ← 5m → R3-U1-P6B	R2-U20-P10A ← 5m → R4-U1-P7B	R2-U20-P10B ← 10m → R5-U1-P8B	R2-U20-P11A ← 10m → R6-U1-P9B
R3-U24	R3-U24-P11A ← 5m → R1-U1-P9A	R3-U24-P11B ← 5m → R2-U1-P10A	R3-U24-P8A ← 3m → R3-U1-P3A R3-U24-P8B ← 3m → R3-U1-P4A	R3-U24-P9A ← 5m → R4-U1-P5A R3-U24-P9B ← 5m → R4-U1-P6A	R3-U24-P10A ← 5m → R5-U1-P7A	R3-U24-P10B ← 10m → R6-U1-P8A
R3-U20	R3-U20-P11A ← 5m → R1-U1-P9B	R3-U20-P11B ← 5m → R2-U1-P10B	R3-U20-P8A ← 3m → R3-U1-P3B R3-U20-P8B ← 3m → R3-U1-P4B	R3-U20-P9A ← 5m → R4-U1-P5B R3-U20-P9B ← 5m → R4-U1-P6B	R3-U20-P10A ← 5m → R5-U1-P7B	R3-U20-P10B ← 10m → R63-U1-P8B
R4-U24	R4-U24-P10B ← 10m → R1-U1-P8A	R4-U24-P11A ← 5m → R2-U1-P9A	R4-U24-P11B ← 5m → R3-U1-P10A	R4-U24-P8A ← 3m → R4-U1-P3A R4-U24-P8B ← 3m → R4-U1-P4A	R4-U24-P9A ← 5m → R5-U1-P5A R4-U24-P9B ← 5m → R5-U1-P6A	R4-U24-P10A ← 5m → R6-U1-P7A
R4-U20	R4-U20-P10B ← 10m → R1-U1-P8B	R4-U20-P11A ← 5m → R2-U1-P9B	R4-U20-P11B ← 5m → R3-U1-P10B	R4-U20-P8A ← 3m → R4-U1-P3B R4-U20-P8B ← 3m → R4-U1-P4B	R4-U20-P9A ← 5m → R5-U1-P5B R4-U20-P9B ← 5m → R5-U1-P6B	R4-U20-P10A ← 5m → R6-U1-P7B
R5-U24	R5-U24-P10A ← 10m → R1-U1-P7A	R5-U24-P10B ← 10m → R2-U1-P8A	R5-U24-P11A ← 5m → R3-U1-P9A	R5-U24-P11B ← 5m → R4-U1-P10A	R5-U24-P8A ← 3m → R5-U1-P3A R5-U24-P8B ← 3m → R5-U1-P4A	R5-U24-P9A ← 5m → R6-U1-P5A R5-U24-P9B ← 5m → R6-U1-P6A
R5-U20	R5-U20-P10A ← 10m → R1-U1-P7B	R5-U20-P10B ← 10m → R2-U1-P8B	R5-U20-P11A ← 5m → R3-U1-P9B	R5-U20-P11B ← 5m → R4-U1-P10B	R5-U20-P8A ← 3m → R5-U1-P3B R5-U20-P8B ← 3m → R5-U1-P4B	R5-U20-P9A ← 5m → R6-U1-P5B R5-U20-P9B ← 5m → R6-U1-P6B
R6-U24	R6-U24-P9A ← 10m → R1-U1-P5A R6-U24-P9B ← 10m → R1-U1-P6A	R6-U24-P10A ← 10m → R2-U1-P7A	R6-U24-P10B ← 10m → R3-U1-P8A	R6-U24-P11A ← 5m → R4-U1-P9A	R6-U24-P11B ← 5m → R5-U1-P10A	R6-U24-P8A ← 3m → R6-U1-P3A R6-U24-P8B ← 3m → R6-U1-P4A
R6-U20	R6-U20-P9A ← 10m → R1-U1-P5B R6-U20-P9B ← 10m → R1-U1-P6B	R6-U20-P10A ← 10m → R2-U1-P7B	R6-U20-P10B ← 10m → R3-U1-P8B	R6-U20-P11A ← 5m → R4-U1-P9B	R6-U20-P11B ← 5m → R5-U1-P10B	R6-U20-P8A ← 3m → R6-U1-P3B R6-U20-P8B ← 3m → R6-U1-P4B

◆ ◆ ◆ APPENDIX F

Seven-Rack System Cabling

Seven-Rack System

Leaf Switches	Spine Switch R1-U1	Spine Switch R2-U1	Spine Switch R3-U1	Spine Switch R4-U1	Spine Switch R5-U1	Spine Switch R6-U1	Spine Switch R7-U1
R1-U24	R1-U24-P8A ← 3m → R1-U1-P3A R1-U24-P8B ← 3m → R1-U1-P4A	R1-U24-P9A ← 5m → R2-U1-P5A	R1-U24-P9B ← 5m → R3-U1-P6A	R1-U24-P10A ← 10m → R4-U1-P7A	R1-U24-P10B ← 10m → R5-U1-P8A	R1-U24-P11A ← 10m → R6-U1-P9A	R1-U24-P11B ← 10m → R7-U1-P10A
R1-U20	R1-U20-P8A ← 3m → R1-U1-P3B R1-U20-P8B ← 3m → R1-U1-P4B	R1-U20-P9A ← 5m → R2-U1-P5B	R1-U20-P9B ← 5m → R3-U1-P6B	R1-U20-P10A ← 10m → R4-U1-P7B	R1-U20-P10B ← 10m → R5-U1-P8B	R1-U20-P11A ← 10m → R6-U1-P9B	R1-U20-P11B ← 10m → R7-U1-P10B
R2-U24	R2-U24-P11B ← 5m → R1-U1-P10A	R2-U24-P8A ← 3m → R2-U1-P3A R2-U24-P8B ← 3m → R2-U1-P4A	R2-U24-P9A ← 5m → R3-U1-P5A	R2-U24-P9B ← 5m → R4-U1-P6A	R2-U24-P10A ← 10m → R5-U1-P7A	R2-U24-P10B ← 10m → R6-U1-P8A	R2-U24-P11A ← 10m → R7-U1-P9A
R2-U20	R2-U20-P11B ← 5m → R1-U1-P10B	R2-U20-P8A ← 3m → R2-U1-P3B R2-U20-P8B ← 3m → R2-U1-P4B	R2-U20-P9A ← 5m → R3-U1-P5B	R2-U20-P9B ← 5m → R4-U1-P6B	R2-U20-P10A ← 10m → R5-U1-P7B	R2-U20-P10B ← 10m → R6-U1-P8B	R2-U20-P11A ← 10m → R7-U1-P9B
R3-U24	R3-U24-P11A ← 5m → R1-U1-P9A	R3-U24-P11B ← 5m → R2-U1-P10A	R3-U24-P8A ← 3m → R3-U1-P3A R3-U24-P8B ← 3m → R3-U1-P4A	R3-U24-P9A ← 5m → R4-U1-P5A	R3-U24-P9B ← 5m → R5-U1-P6A	R3-U24-P10A ← 10m → R6-U1-P7A	R3-U24-P10B ← 10m → R7-U1-P8A
R3-U20	R3-U20-P11A ← 5m → R1-U1-P9B	R3-U20-P11B ← 5m → R2-U1-P10B	R3-U20-P8A ← 3m → R3-U1-P3B R3-U20-P8B ← 3m → R3-U1-P4B	R3-U20-P9A ← 5m → R4-U1-P5B	R3-U20-P9B ← 5m → R5-U1-P6B	R3-U20-P10A ← 10m → R6-U1-P7B	R3-U20-P10B ← 10m → R7-U1-P8B
R4-U24	R4-U24-P10B ← 10m → R1-U1-P8A	R4-U24-P11A ← 5m → R2-U1-P9A	R4-U24-P11B ← 5m → R3-U1-P10A	R4-U24-P8A ← 3m → R4-U1-P3A R4-U24-P8B ← 3m → R4-U1-P4A	R4-U24-P9A ← 5m → R5-U1-P5A	R4-U24-P9B ← 5m → R6-U1-P6A	R4-U24-P10A ← 10m → R7-U1-P7A
R4-U20	R4-U20-P10B ← 10m → R1-U1-P8B	R4-U20-P11A ← 5m → R2-U1-P9B	R4-U20-P11B ← 5m → R3-U1-P10B	R4-U20-P8A ← 3m → R4-U1-P3B R4-U20-P8B ← 3m → R4-U1-P4B	R4-U20-P9A ← 5m → R5-U1-P5B	R4-U20-P9B ← 5m → R6-U1-P6B	R4-U20-P10A ← 10m → R7-U1-P7B
R5-U24	R5-U24-P10A ← 10m → R1-U1-P7A	R5-U24-P10B ← 10m → R2-U1-P8A	R5-U24-P11A ← 5m → R3-U1-P9A	R5-U24-P11B ← 5m → R4-U1-P10A	R5-U24-P8A ← 3m → R5-U1-P3A R5-U24-P8B ← 3m → R5-U1-P4A	R5-U24-P9A ← 5m → R6-U1-P5A	R5-U24-P9B ← 5m → R7-U1-P6A
R5-U20	R5-U20-P10A ← 10m → R1-U1-P7B	R5-U20-P10B ← 10m → R2-U1-P8B	R5-U20-P11A ← 5m → R3-U1-P9B	R5-U20-P11B ← 5m → R4-U1-P10B	R5-U20-P8A ← 3m → R5-U1-P3B R5-U20-P8B ← 3m → R5-U1-P4B	R5-U20-P9A ← 5m → R6-U1-P5B	R5-U20-P9B ← 5m → R7-U1-P6B
R6-U24	R6-U24-P9B ← 10m → R1-U1-P6A	R16U24-P10A ← 10m → R2-U1-P7A	R6-U24-P10B ← 10m → R3-U1-P8A	R6-U24-P11A ← 5m → R4-U1-P9A	R6-U24-P11B ← 5m → R5-U1-P10A	R6-U24-P8A ← 3m → R6-U1-P3A R6-U24-P8B ← 3m → R6-U1-P4A	R6-U24-P9A ← 5m → R7-U1-P5A
R6-U20	R6-U20-P9B ← 10m → R1-U1-P6B	R6-U20-P10A ← 10m → R2-U1-P7B	R6-U20-P10B ← 10m → R3-U1-P8B	R6-U20-P11A ← 5m → R4-U1-P9B	R6-U20-P11B ← 5m → R5-U1-P10B	R6-U20-P8A ← 3m → R6-U1-P3B R6-U20-P8B ← 3m → R6-U1-P4B	R6-U20-P9A ← 5m → R7-U1-P5B
R7-U24	R7-U24-P9A ← 10m → R1-U1-P5A	R7-U24-P9B ← 10m → R2-U1-P6A	R7-U24-P10A ← 10m → R3-U1-P7A	R7-U24-P10B ← 10m → R4-U1-P8A	R7-U24-P11A ← 5m → R5-U1-P9A	R7-U24-P11B ← 5m → R6-U1-P10A	R7-U24-P8A ← 3m → R1-U7-P3A R7-U24-P8B ← 3m → R1-U7-P4A
R7-U20	R7-U20-P9A ← 10m → R1-U1-P5B	R7-U20-P9B ← 10m → R2-U1-P6B	R7-U20-P10A ← 10m → R3-U1-P7B	R7-U20-P10B ← 10m → R4-U1-P8B	R7-U20-P11A ← 5m → R5-U1-P9B	R7-U20-P11B ← 5m → R6-U1-P10B	R7-U20-P8A ← 3m → R7-U1-P3B R7-U20-P8B ← 3m → R7-U1-P4B

◆ ◆ ◆ APPENDIX G

Eight-Rack System Cabling

Eight-Rack System

Leaf Switches	Spine Switch R1-U1	Spine Switch R2-U1	Spine Switch R3-U1	Spine Switch R4-U1	Spine Switch R5-U1	Spine Switch R6-U1	Spine Switch R7-U1	Spine Switch R8-U1
R1-U24	R1-U24-P8A ← 3m →R1-U1-P3A	R1-U24-P8B ← 5m →R2-U1-P4A	R1-U24-P9A ← 5m → R3-U1-P5A	R1-U24-P9B ← 10m → R4-U1-P6A	R1-U24-P10A ← 10m → R5-U1-P7A	R1-U24-P10B ← 10m → R6-U1-P8A	R1-U24-P11A ← 10m → R7-U1-P9A	R1-U24-P11B ← 10m →R8-U1-P10A
R1-U20	R1-U20-P8A ← 3m →R1-U1-P3B	R1-U20-P8B ← 5m →R2-U1-P4B	R1-U20-P9A ← 5m → R3-U1-P5B	R1-U20-P9B ← 10m → R4-U1-P6B	R1-U20-P10A ← 10m → R5-U1-P7B	R1-U20-P10B ← 10m → R6-U1-P8B	R1-U20-P11A ← 10m →R7-U1-P9B	R1-U20-P11B ← 10m →R8-U1-P10B
R2-U24	R2-U24-P11B ← 5m →R1-U1-P10A	R2-U24-P8A ← 3m →R2-U1-P3A	R2-U24-P8B ← 5m →R3-U1-P4A	R2-U24-P9A ← 5m → R4-U1-P5A	R2-U24-P9B ← 10m → R5-U1-P6A	R2-U24-P10A ← 10m → R6-U1-P7A	R2-U24-P10B ← 10m → R7-U1-P8A	R2-U24-P11A ← 10m → R8-U1-P9A
R2-U20	R2-U20-P11B ← 5m →R1-U1-P10B	R2-U20-P8A ← 3m →R2-U1-P3B	R2-U20-P8B ← 5m →R3-U1-P4B	R2-U20-P9A ← 5m → R4-U1-P5B	R2-U20-P9B ← 10m → R5-U1-P6B	R2-U20-P10A ← 10m → R6-U1-P7B	R2-U20-P10B ← 10m → R7-U1-P8B	R2-U20-P11A ← 10m →R8-U1-P9B
R3-U24	R3-U24-P11A ← 5m → R1-U1-P9A	R3-U24-P11B ← 5m →R2-U1-P10A	R3-U24-P8A ← 3m →R3-U1-P3A	R3-U24-P8B ← 5m →R4-U1-P4A	R3-U24-P9A ← 5m → R5-U1-P5A	R3-U24-P9B ← 10m → R6-U1-P6A	R3-U24-P10A ← 10m → R7-U1-P7A	R3-U24-P10B ← 10m → R8-U1-P8A
R3-U20	R3-U20-P11A ← 5m →R1-U1-P9B	R3-U20-P11B ← 5m →R2-U1-P10B	R3-U20-P8A ← 3m →R3-U1-P3B	R3-U20-P8B ← 5m →R4-U1-P4B	R3-U20-P9A ← 5m → R5-U1-P5B	R3-U20-P9B ← 10m → R6-U1-P6B	R3-U20-P10A ← 10m → R7-U1-P7B	R3-U20-P10B ← 10m → R8-U1-P8B
R4-U24	R4-U24-P10B ← 10m → R1-U1-P8A	R4-U24-P11A ← 5m → R2-U1-P9A	R4-U24-P11B ← 5m →R3-U1-P10A	R4-U24-P8A ← 3m →R4-U1-P3A	R4-U24-P8B ← 5m →R5-U1-P4A	R4-U24-P9A ← 5m → R6-U1-P5A	R4-U24-P9B ← 10m → R7-U1-P6A	R4-U24-P10A ← 10m → R8-U1-P7A
R4-U20	R4-U20-P10B ← 10m → R1-U1-P8B	R4-U20-P11A ← 5m →R2-U1-P9B	R4-U20-P11B ← 5m →R3-U1-P10B	R4-U20-P8A ← 3m →R4-U1-P3B	R4-U20-P8B ← 5m →R5-U1-P4B	R4-U20-P9A ← 5m → R6-U1-P5B	R4-U20-P9B ← 10m → R7-U1-P6B	R4-U20-P10A ← 10m → R8-U1-P7B
R5-U24	R5-U24-P10A ← 10m → R1-U1-P7A	R5-U24-P10B ← 10m → R2-U1-P8A	R5-U24-P11A ← 5m → R3-U1-P9A	R5-U24-P11B ← 5m →R4-U1-P10A	R5-U24-P8A ← 3m →R5-U1-P3A	R5-U24-P8B ← 5m →R6-U1-P4A	R5-U24-P9A ← 5m → R7-U1-P5A	R5-U24-P9B ← 10m → R8-U1-P6A
R5-U20	R5-U20-P10A ← 10m → R1-U1-P7B	R5-U20-P10B ← 10m → R2-U1-P8B	R5-U20-P11A ← 5m →R3-U1-P9B	R5-U20-P11B ← 5m →R4-U1-P10B	R5-U20-P8A ← 3m →R5-U1-P3B	R5-U20-P8B ← 5m →R6-U1-P4B	R5-U20-P9A ← 5m → R7-U1-P5B	R5-U20-P9B ← 10m → R8-U1-P6B
R6-U24	R6-U24-P9B ← 10m → R1-U1-P6A	R6-U24-P10A ← 10m → R2-U1-P7A	R6-U24-P10B ← 10m → R3-U1-P8A	R6-U24-P11A ← 5m → R4-U1-P9A	R6-U24-P11B ← 5m →R5-U1-P10A	R6-U24-P8A ← 3m →R6-U1-P3A	R6-U24-P8B ← 5m →R7-U1-P4A	R6-U24-P9A ← 5m → R8-U1-P5A
R6-U20	R6-U20-P9B ← 10m → R1-U1-P6B	R6-U20-P10A ← 10m → R2-U1-P7B	R6-U20-P10B ← 10m → R3-U1-P8B	R6-U20-P11A ← 5m →R4-U1-P9B	R6-U20-P11B ← 5m →R5-U1-P10B	R6-U20-P8A ← 3m →R6-U1-P3B	R6-U20-P8B ← 5m →R7-U1-P4B	R6-U20-P9A ← 5m → R8-U1-P5B
R7-U24	R7-U24-P9A ← 10m → R1-U1-P5A	R7-U24-P9B ← 10m → R2-U1-P6A	R7-U24-P10A ← 10m → R3-U1-P7A	R7-U24-P10B ← 10m → R4-U1-P8A	R7-U24-P11A ← 5m → R5-U1-P9A	R7-U24-P11B ← 5m →R6-U1-P10A	R7-U24-P8A ← 3m →R7-U1-P3A	R7-U24-P8B ← 5m →R8-U1-P4A
R7-U20	R7-U20-P9A ← 10m → R1-U1-P5B	R7-U20-P9B ← 10m → R2-U1-P6B	R7-U20-P10A ← 10m → R3-U1-P7B	R7-U20-P10B ← 10m → R4-U1-P8B	R7-U20-P11A ← 5m →R5-U1-P9B	R7-U20-P11B ← 5m →R6-U1-P10B	R7-U20-P8A ← 3m →R7-U1-P3B	R7-U20-P8B ← 5m →R8-U1-P4B
R8-U24	R8-U24-P8B ← 10m →R1-U1-P4A	R8-U24-P9A ← 10m → R2-U1-P5A	R8-U24-P9B ← 10m → R3-U1-P6A	R8-U24-P10A ← 10m → R4-U1-P7A	R8-U24-P10B ← 10m → R5-U1-P8A	R8-U24-P11A ← 5m → R6-U1-P9A	R8-U24-P11B ← 5m →R7-U1-P10A	R8-U24-P8A ← 3m →R8-U1-P3A
R8-U20	R8-U20-P8B ← 10m →R1-U1-P4B	R8-U20-P9A ← 10m → R2-U1-P5B	R8-U20-P9B ← 10m → R3-U1-P6B	R8-U20-P10A ← 10m → R4-U1-P7B	R8-U20-P10B ← 10m → R5-U1-P8B	R8-U20-P11A ← 5m →R6-U1-P9B	R8-U20-P11B ← 5m →R7-U1-P10B	R8-U20-P8A ← 3m →R8-U1-P3B